SECTION 3.0 TECHNICAL SPECIFICATION

3.4 KITCHEN EQUIPMENT SERVICES

SECTION 3.0 TECHNICAL SPECIFICATIONS

3.4 KITCHEN EQUIPMENT SERVICES

1 SCOPE OF WORK

The work to be covered under this specification is as listed hereunder:

(a) Supplying, installing, testing and commissioning of Kitchen Equipment Services as stated further in this specification and in accordance with the details shown in tender drawings attached to this specification;

(b) Designing, supplying, installing, testing and commissioning of the Liquefied Petroleum Gas (LPG) Pipe Reticulation System from the cooking equipment (including checking, servicing, testing, etc) complete with all necessary items for the safe and efficient functioning of the system as specified in this specification and in accordance with the "Akta Bekalan Gas 1993 (Akta 501) and Peraturan-Peraturan Bekalan Gas 1997"; Malaysia standard 830 (MS830) and Malaysia standard 930 (MS930).

(c) Designing, supplying, installing, testing and commissioning of the of the Cold Room (Chillers and Freezer Room) and ancillary equipment as stated further in this specification and in accordance with detail shown in tender drawings attached to this specification.

(d) Servicing and maintaining the above-mentioned systems for a period of one year (12 monthly) from the date of its handing over to the Jabatan Kerja Raya in good operating condition;

to serve **BLOK DEWAN MAKAN, PEMBINAAN BANGUNAN SEKOLAH MENENGAH KEBANGSAAN AGAMA SEBERANG PERAI TENGAH, PULAU PINANG** as specified further in this specification and in accordance with the details shown in the drawings attached with this specification.

It is the responsibility of the contractor to ensure that all equipment supplied and installed are acceptable to the various authorities having jurisdiction over the installation and to fill in all notices and requests required to obtain approval from them. The contractor shall pay all fees in connection with the approval.

It is the responsibility of the contractor to ensure that his labour forces are legitimate workers under Malaysian Laws.

The contractor shall take due care not to damage building works during the course of his work. Any damage on the building due to the contractors' negligence shall be made good by the contractor at his own expense.

It is the responsibility of the contractor to buy local materials, equipment, plants, etc. to comply with the government requirements as imposed in Pekeliling Perbendaharaan Malaysia. The contractor shall follow and comply with all procedures and requirements by the Government where imported products, materials, equipment, plants, etc. may be used or installed.

2 KITCHEN EQUIPMENT

2.1 Detail of Construction

The following specifications apply to all items mentioned earlier and embrace the particular details of construction. All deviations shall be described within the item itself.

a. Switches and Controls

The Kitchen Equipment Contractor shall supply on each motor driven appliance or electrically heated unit, a suitable starter or control switch of approved type. All controls mounted on vertical surfaces of fixtures will be set into recessed die-stamped stainless steel cups or otherwise located to prevent damage.

b. Electrical Elements

Electrically operated fixtures operating with water such as baine marie, etc. shall be provided with immersion type heating elements of sufficient wattage to heat the quantity of water contained in the fixture and maintain same at a temperature of 208°F. These elements shall be fitted with a water-tight bushing extending through the bottom or side of the fixture. Terminals are to be protected by removable cap. Each element shall be fitted with a thermostat control, with a pilot light indicator.

Electrically operated fixtures requiring dry heat such as plate warmers, etc. shall be fitted with strip or ring heaters of sufficient wattage to be provided the desired heat. Unless otherwise specified, these heaters shall be installed directly below the bottom shelf. They are to be mounted in suitable channels and are to be interconnected with asbestos covered nickel wire in accordance with Electrical Code. Each fixture shall be provided with one or more thermostatic controls, with a pilot light indicator.

All wiring is to be properly protected in metal enclosures as called for by the Electrical Code.

c. Non-Corrodible Alloy

Non-corrodible alloy or stainless steel, specified hereinafter shall be stainless steel grade 304 and shall have a standard analysis of 18% chromium and 8% nickel.

All gauges, where specified, shall be standard gauges. All exposed surfaces will be given a finish equal to No. 4 or 150 grit. Where manufacturing process and welding disturb the original finish, it shall be carefully re-ground and polished and restored to match the undisturbed surface.

d. Painting

All paints used shall be of highest quality, air dried and applied in accordance with manufacturer`s directions. Paints used on heated fixtures shall be heat resistant. Lead base paint shall not be used.

e. Welding

All welded parts shall be non-porous and free of imperfections. They shall be free of pits, cracks or discolorations. All welds of galvanised metal shall be ground smooth and sand blasted and sprayed with molten zinc at 1200°F to a thickness of 0.004". Tinning of welds will not be acceptable. All exposed welds of stainless steel shall be continuous, ground and polished to the original finish.

When welded seams are used, the weld area and deposited weld material shall meet the applicable corrosion resistant requirements.

f. Stainless Steel Stands (Legs) and Frames

All stainless steel stands for open base tables or dish tables shall be constructed of $1^{5}/_{8}$" O.D No. 16 gauge stainless steel tubing with cross rails of 1" O.D. No. 16 gauge stainless steel tubing. Cross rails must be supplied to reinforce each leg. Legs anchored to sanitary closed gussets at top only and without cross rails are not acceptable.

Cross rails shall be welded continuously all-round the main steel stands, ground and polished to match the original finish.

g. Sanitary Closed Gussets

Gussets used to reinforce stainless steel stands (legs) shall be of stainless steel sanitary closed type and tapering outwards towards the tabled tops to give rigidity. Where gusset is used, either close top of leg or butt leg against underside of top.

Gussets shall be continuously welded to the underside of top; intermittent welding is not acceptable. The legs shall be screwed to the gusset by means of allen screws.

h. Feet

All stainless steel legs shall be fitted with sanitary die-stamped stainless steel bullet shaped feet, fully enclosed and with a slightly rounded bottom to protect the floor. The top of these feet shall be fitted with a male threaded stem to fit into the end of the legs hereinabove specified and provide a total adjustment of 1". Stem shall be extra-long so that threads are not exposed. Bottom of legs shall be furnished off smoothly and shall overlap the stem to provide sanitary fitting and prevent the accumulation of grease or other debris at this point.

Cabinet type fixtures, which are not set on masonry bases, shall be mounted on either 8" or 6" high die-stamped sanitary 2 piece stainless steel feet not less than 2" diameter. The bottom adjusting member shall telescope up into the inside of the upper member. It shall be fitted with a male threaded stem and shall have an adjustment of 1" on the 6" high leg and $1^{5}/_{8}$" on the 8" high leg. The upper part shall be stamped in a neat design with a flared inversed shoulder and shall be welded to a stainless steel base plate designed for anchoring to the channel braces below cabinet type fixtures.

All feet are to have one piece die-stamped closed bottom to ensure sanitation.

i. Table Tops (Metal)

Metal table tops shall have all shop seams and corners, welded, ground smooth and polished. All working tops shall be reinforced on the underside with a framework of stainless steel angles. One angle runner, running lengthwise, shall be provided on tops up to 30". All tops shall be reinforced so that there will not be any noticeable deflection and all reinforcements shall be stud welded to the underside of the top such welds shall be at least $^{1}/_{4}$" long at 6" centres. No rivets or bolts to be used through the table top.

Field joints are to be provided in the top where necessary, and they are to be located for practical construction and consistent with sizes convenient for movement and accessibility into the building. See section entitled "Field Joints" for description of these joints.

All metal tops shall be of the thickness called for in the itemized specifications. They shall be turned down $1^{3}/_{4}$" in a bull nose roll except where adjacent to walls or other pieces of equipment. The wall side shall be turned up 6" and back 1" unless otherwise specified. Ends of this splash are to be closed. Free corners of tops shall be spherical.

j. Enclosed Bases

All enclosed bases or cabinet bodies shall be of the material and gauge as called for in the itemized specification. They are to be enclosed on the ends and sides as required and called for under each particular item. The bases shall be reinforced at the top with a framework of $1^{1}/_{8}$" x $1^{3}/_{4}$" x $^{1}/_{8}$" stainless steel angles with all corners of said framework mitred and welded. Bottom is to be reinforced with channels and gussets where necessary. Additional angles and channel cross members shall be provided to reinforce shelves and support tops. All free corners of enclosed bases or cabinets bodies shall be rounded on a $^{5}/_{8}$" radius and all corners against walls and other fixtures shall be square.

In the case of fixtures fitted against or between walls, the bodies shall be set in 1" from the wall line, but the tops will extend back to the wall line. This will permit adjustment to wall irregularities. A vertical trip strip of the same materials as the body shall be provided at each end of the fixtures to close the gap between the back edge of the body and the wall, or the end of the body shall extend 1" to the wall line.

These fixtures shall be constructed with either 6" or 8" legs as herein before specified, or as set on masonry bases as called for in the itemized specifications.

k. Sliding Doors

Sliding doors shall be constructed of material and in gauge as called for in the itemised specifications. These doors shall be of double pan construction, with $^{3}/_{4}$" thick sound deadening fibreglass between the thicknesses of metal. They are to be constructed without trim. They shall be operated on top hung ball bearing rollers. The bottom edge of the door shall be square and shall be fitted with a guide groove that rides in a nylon clip at the centre point.

All doors shall be fitted with stops and with die-stamped recessed stainless steel handles.

l. Undershelf

The undershelf on open tables shall consist or a removable rack of slotted 16 gauge stainless steel bars, $1^3/_4$" wide, welded to $1^1/_2$" x $1^1/_2$" stainless steel angles. Ends of the bar are to be turned down in a quarter circle and lap over the cross rails of the table. Each of the cross bars shall be die-stamped with a raised embossing down through the centre for rigidity. Racks shall be made in easily removable sections.

m. Interior Shelves

All interior shelves in cabinet bodies and enclosed based shall be constructed of 16 gauge stainless steel. The front shall be flanged down $1^3/_4$" under $^1/_2$". The rear and ends shall be turned up 2" against the interior of the body. Shelves shall be solid in unheated bases and shall be $^3/_4$" in diameter and spaced 4" on centres. All shelves shall be rigidly reinforced with angle and/or channel framework to prevent sagging.

n. Pipe Chases

Where top arrangement of enclosed base tables makes it necessary for plumbing and supply piping to be passed through the base, this piping shall be enclosed in a suitable pipe chase with easily removable access panels. These access panels are not to be held in place with screws or latches, but are to be formed up in a pen shape, removable without tools. The foregoing only applies to fixtures where an access is required from the front of the fixture, as in the case of sinks. Pipe chases at end of the fixtures containing bottom and intermediate shelves need not be enclosed unless specifically called for in the itemized specifications. Unless otherwise specified, shelves in these fixtures will be turned up a minimum of 3" at the edge of the pipe chase.

In detailing fixtures, kitchen equipment contractor is to make certain that due allowance is made for traps or other controls.

Where plumbing and supply piping pass through shelves on open base tables, shelves shall be neatly punched or die-stamped for the piping. Kitchen Equipment Contractor shall take note of the location of such pipe chase, or stamped openings, on his plan and/or detail drawings. There will be sufficient size to accommodate all necessary risers so that additional holes need not be cut in the field. Piping contractors are to be cautioned to rough in as near to these chases as possible and that all risers from roughing in to final connection must be run through the existing chases and/or slots.

o. Sinks

All sinks shall be of size and design as specified under a particular item and shall be constructed of no. 16 gauge stainless steel. The back, bottom and front shall be formed of one continuous sheet with the ends welded into place. Partitions for compartment sinks shall be of the same material electrically welded in place. The partitions are to be of double thickness with a half round edge.

All corners both vertical and horizontal shall be covered on a $^5/_8$" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.

The edges of sink at front and ends, except where fitted with integral type drain boards, shall be furnished with a $1^1/_4$" dia. formed integral sanitary semi roll rim.

Across the back of all sinks, unless otherwise specified, there shall be a 10" high splashback coved back across the top 2". Ends are to be enclosed. Unless otherwise specified, two faucet holes on 8" centres are to be provided over the centre of partitions between the compartments, $2^1/_2$" down from the top of the splash.

The bottom of each compartment shall have four radial die-stamped grooves pitched to the centre drain, and shall be provided with lever operated twist waste valve of cast brass for quick opening. Provide connected overflow for drain valve & removable stainless steel strainer.

Body shall be mounted on $1^5/_8$" O.D. tubular stainless steel legs fitted with stainless steel adjustable feet. Legs shall be fitted with die-formed, enclosed sanitary closed gussets. Open types of two sided gussets are not acceptable. These are to be welded to under side of the sink.

p. Sink Inserts (Bowls)

Sink inserts or bowls shall be of one-piece deep drawn construction of 16 gauge stainless steel with all corners coved. Sinks are to be 2'-0" x 1'-6" x 1'-0" deep inside unless otherwise specified. Sinks are to be welded integral with counter tops with no lap between. Sinks shall be fitted with either a 2" cast brass lever operated quick opening drain valve with removable stainless steel strainer or a due strainer type drain with removable crumb cup as called for in the itemized specifications.

q. Sink Drainboards

Drainboards shall be constructed of same material as the sinks and shall be welded integral to same. Drainboards shall have 2" high rims with die-formed integral rolled edges to match sink edges. Front and corners shall be coved on $^5/_8$" radius electrically welded, ground and polished smooth. Solder filleting of these corners will not be accepted. Drainboards shall pitch to properly drain into the sink.

r. Field Joints

All field joints shall be welded at job site. Butt type joint shall not be acceptable. All joints shall be welded, ground and polished to match original finish.

s. Hinged Doors

All hinged doors for cabinet bodies and enclosed bases shall be constructed of the material and gauge as called for in the specification. They shall be of double pan construction with sound deadening insulation between the two pans. Doors shall be flush mounted without overlap and shall be fitted with stainless steel die stamped concealed hospital type of set butt hinges with concealed fasteners. They will be furnished with twist type rod lock catch with rod securing doors at top, and actuated by cast white metal chrome plated handle.

t. Drawers and Trays

All drawer bodies shall be die-stamped out of one piece of 16 swg stainless steel, 20"W x 20"D x 5"H unless otherwise called for in the specifications. Each drawer body shall set loosely in a channel frame so it can be lifted out for cleaning. All top edges are to be flanged out $^1/_2$". All interior horizontal corners are rounded on a 1" radius and all interior vertical corners on a 2" radius. The use of solder or other materials to fillet these corners will not be accepted.

The supporting frame is welded channel for stainless steel. It is die-stamped with a raised border for rigidity and has an integral die-formed open sanitary handle fixed into the face.

Drawers or tray slides are mounted on stainless steel channel frame and are fitted with ball bearing nylon rollers. Slides and frame are so designed to allow full opening of the drawers and are to be reinforced so that they will support a weight of 150 lbs. when fully extended. Adjustable stops are to be provided for each drawer at the fully opened position. Drawers on open base tables shall be enclosed in a 16 gauge housing of stainless steel.

u. Elevated Shelves

All elevated shelves above worktop shall be constructed of 16 gauge stainless steel. All edges shall be turned down bull nose roll $1^1/_2$" except where shelves are adjacent to walls where they shall be turned up 2". All corners shall be spherical.

All elevated shelves shall be of one piece construction, continuously welded to join the adjoining sections, ground smooth and polished. Riveting or other forms of joining the sections are not acceptable.

Shelves on wall line shall be mounted on stainless steel brackets rigidly fixed to the wall.

v. Hardware

All hardware to be heavy duty chrome plated brass or die-stamped stainless steel conceal type offset butt hinges with concealed fasteners.

Latches or pulls will be of the types as specified under the section "Hinged Door".

w. Water Piping

The Kitchen Equipment Contractor shall provide the necessary water piping from the standpipes provided to the individual kitchen equipment as indicated in the tender drawings and shall incorporate the necessary valves and fittings. Pipes used shall be stainless steel. The standpipes shall be provided by others.

x. Faucet, valves and fittings

All sinks shall be equipped with wall-mounted or deck mounted single or double ledge type faucets for the type of sink furnished as per S.O approval. All tap holes shall be size of 30mm minimum diameter.

For Ruang Basuh (Wash Area) the faucet shall be Pre-rinsed spray type come with two water feed (for cold and hot water) of 25mm each tap hole size complete with 12" ledge type additional bowl filler. Restraining device shall be provide as standard for the pre-rinsed faucet to prevent hose from over stretching into basin and reduce abuse. Minimum of pre-rinsed height shall be 1000mm and with additional height of 150mm when connected with bowl filler.

All faucets shall be equipped with cross head control come with monel metal trim spout as standard features.

3 KITCHEN EQUIPMENT UTILISING GAS

3.1 BLOK KANTIN (D1)

1. Kwali Range With 2 Burners

The unit shall be suitable for 24” diameter cast iron kwalis and shall be gas-operated. It shall have a stainless steel worktop of 1.6mm thick, 20” high splashback, 2” drain through and 12” skirting all round. The unit shall be supported on 4 nos $1^1/_2$" diameter stainless steel legs.

Each unit shall be provided with 2 burners, each with a rating of 34000 Btu/hr. The burners shall incorporate pilot lights and flame failure devices.

Each unit supplied shall be accompanied with 2 nos. 24" diameter kwali. A 13mm diameter cold water chrome swing spout faucet shall be incorporated for each kwali.

Approx. overall dimensions: 1200mmx 750mm x 750mm high.

2. 30 Gallons Water Boiler

The unit shall be of stainless steel type 304 with No. 4 finish, 0.9mm thick on the exterior and 1.2mm thick on the water tank. The unit shall be mounted on stainless steel stands with adjustable feet and 1 no. removable drip pan c/w perforated cover.

The water boiler tank shall be installed with a water supply inlet controlled by a gate valve installed at the control panel. A glass tube indicator c/w stainless steel cover shall be installed at the exterior front to indicate the level of water in the tank. Two numbers of detachable Tomlimson faucets of the non-drip type shall be installed at the exterior front for easy hot water dispensing.

The unit shall be installed with stick burners operated on 11" water column pressure at 4400 Btu/hr each, controlled by a main gas supply control valve, a manual pilot control valve for lighting the pilot burner and a control valve for the main burner. The total capacity of the burners shall be 160000 Btu/hr. Flame failure device shall be incorporated. Thermostat control shall be provided with the boiler.

Approx. overall dimensions : 750mm x 750mm x 600mm high.
Water inlet : $^1/_2$" diameter.

3. Counter Type Rice Cooker

The unit shall be able to cook rice with maximum capacity of 10 liters per cooking.

The unit's heavy duty aluminum pan and cover shall be constructed of aluminum. The outer body shall be enameled finish. Two nos. handle of low heat conductivity material shall be provided screwed to the outer body. The same shall be provided for the pan.

The unit shall be suitable for gas-fired cooking and shall be provided with a burner of 30,000 Btu/hr thermal rating. The burner shall come complete with electronic spark lighting and automatic gas cut-off when the rice is fully cooked. Flame failure device shall be incorporated.

Each unit supplied shall be complete with one (1) spare pan.

4. Gas Griddle

Gas griddle shall be floor standing type, gas heated type with 12mm thick polished steel griddle plate. The whole unit shall be supported by four (4) sturdy fully adjustable stainless steel tubular legs. Side skirting shall be fully welded around plate perimeter. Front grease trough with fully welded grease chute & grease box with quick lift handle shall be provided.

Thermostatically controlled burner equipped with snap action thermostat with piezo spark igniter shall be provided. The thermal output shall not be less than 78000 Btu/hr. The burners shall incorporate pilot light and flame failure device.

Approx. overall dimensions: 915mm x 750mm x 920mm high.

3.2 BLOK DEWAN MAKAN (B6)

1. Tilting Kettle

The unit shall be gas heated type. The kettle shall be of stainless steel with a capacity of 45 Gallons. It shall have stainless steel body panels of at least 1.5mm thick. It shall be supported by a frame work constructed by stainless steel frame.

The tilting mechanism for the kettle shall be mounted at the end of the framework, operating a worm gear mechanism. A turning hand handle shall be cover with phenolic heat insulated shall be provided to operate the tilt mechanism.

The burner shall consist approx. of 19 pieces of individual burners each of with heat value of 9,500 Btu/hr. A pilot light for safe lighting of the burners shall be installed in the casing. A pilot flame failure device shall be incorporated. Each kettle shall be provided with stainless steel hinged cover. The cover shall be locked when fully operated.

Cold water pipes and chrome plated faucet shall be provided installed together with the kettle. All stainless steel finish shall be No.4 finished.

Approx. overall dimension : 1400mm (L) x 800mm (D) x 1120mmm (H)
Wok Capacity : 45 Gallons.

2. Kwali Cooker

The unit shall be gas heated type. The kwali cooker shall be supply of cast iron wok of 36 inch. It shall have stainless steel body panels of at least 1.5mm thick. It shall be supported by a frame work constructed by stainless steel frame.

The aluminum cover mechanism for the cooker shall be mounted at the end of the framework. A turning hand handle shall be cover with phenolic heat insulated shall be provided to operate the tilt mechanism.

The unit shall be supply with standard cast iron ring burner with heat value at least 59,000 Btu/hr.

Approx. overall dimension : 900mm diameter x 300mm depth
Wok Dimension : 36 Inches diameter

3. Boiling Pan

The unit shall be of stainless steel type 304 grade with no.4 finish, 0.9mm thick on the exterior and 1.2mm thick of the water tank. The unit shall be mounted on stainless steel stand with adjustable feet and 1(one) number removable drip pan complete with perforated cover.

The aluminum cover mechanism for the cooker shall be mounted at the end of the framework. A turning hand handle shall be cover with phenolic heat insulated shall be provided to operate the tilt mechanism.

The unit shall be supply with stainless basket for rice cooking purposed.

The unit shall be supply with standard cast iron ring burner with heat value at least 59,000 Btu/hr.

Approx. overall dimension : 530mm diameter x 530mm depth
Approx. basket dimension : 460mm diameter x 450mm high

4. Single Ring Kwali Range

The unit shall be gas operated (high pressure type). The range shall be equipped by 3 number of 24” diameter cast iron kwalis. It shall have stainless steel worktop of 16” swg worktop, 12” bowl filler faucet mounted on 20” spillage back and 2” drain through position on the spillage tray. The spillage tray shall be installed by 12” skirting all rounds.

The unit shall be supported by 4 nos 1 1/2” diameter stainless steel legs.

The unit shall be installed on 13.5” cast iron stove ring complete with stand pilot. Insulated knob handle shall be standard features for easy handling. The gas rating shall approximately of 40,000 Btu/hr complete with flame failure safety devices.

Approx. overall dimension : 900mm (D) x 750mm(W) x 850mm (H)
Wok Dimension : 36 Inches diameter

5. 4 Open Burner c/w oven below

Gas griddle shall be floor standing type, gas heated type with 12mm thick polished steel griddle plate. The whole unit shall be supported by four (4) sturdy fully adjustable stainless steel tubular legs. Side skirting shall be fully welded around plate perimeter. Front grease trough with fully welded grease chute & grease box with quick lift handle shall be provided.

The 4 open burners constructed of 304 grade stainless steel, cast iron burner ring with total capacity of approximately 25,000 Btu/hr per burner with pilot light and flame failure safety device individual insulated control knob (4 Nos).

Unit shall be mounted on stainless steel stand.

Heavy gauge welded frame construction with thermostat adjustable type range from 150ºF to 500ºF from accurate cooking and holding of 100% safety shut-off equipped with matchless push button ignition shall be installed.

Superior 28,000 Btu/hr aluminized steel burner controlled and baffled for even distribution and maximum efficiency shall be standard features.

Unit shall be fully stainless steel finishes. An adjustable thermostat shall be provided and shall position out of the heat zone for accurate temperature control.

Approx. overall dimension : 900mm (D) x 750mm(W) x 850mm (H)

6. Gas Griddle

Gas griddle shall be floor standing type, gas heated type with 12mm thick polished steel griddle plate. The whole unit shall be supported by four (4) sturdy fully adjustable stainless steel tubular legs. Side skirting shall be fully welded around plate perimeter. Front grease trough with fully welded grease chute & grease box with quick lift handle shall be provided.

Thermostatically controlled burner equipped with snap action thermostat with piezo spark igniter shall be provided. The thermal output shall not be less than 78000 Btu/hr. The burners shall incorporate pilot light and flame failure device.

Approx. overall dimensions: 915mm x 750mm x 920mm high.

7. Counter Type Rice Cooker

The unit shall be able to cook rice with maximum capacity of 10 liters per cooking.

The unit's heavy duty aluminum pan and cover shall be constructed of aluminum. The outer body shall be enameled finish. Two nos. handle of low heat conductivity material shall be provided screwed to the outer body. The same shall be provided for the pan.

The unit shall be suitable for gas-fired cooking and shall be provided with a burner of 30,000 Btu/hr thermal rating. The burner shall come complete with electronic spark lighting and automatic gas cut-off when the rice is fully cooked. Flame failure device shall be incorporated.

Each unit supplied shall be complete with one (1) spare pan.

Approx. overall dimensions: 550mm diameter x 450mm high.

4 KITCHEN EQUIPMENT UTILISING ELECTRICITY

4.1 BLOK KANTIN (D1)

1. Insect Killer

The equipment shall be suitable for luring flying insects away from food stuffs by short-wave “black-light” attraction. The unit shall be able to kills insects instantly by electrified grid and collects them into a built-in tray. It shall have the following characteristics:

(i) No chemical fall-out-no odour, no contamination risks.
(ii) No, mopping-up operation - insects are attracted killed and collected automatically. They cannot fall on to floor or counter - they cannot fly away to expire unnoticed in odd corners.
(iii) Continuous, automatic - protection starts the moment it is switched on and continues twenty-four hours a day, 365 days a year.
(iv) Low running costs.
(v) Long life and with negligible maintenance.
(vi) High safety - the grid that serves instant death to flying insect pests is harmless to humans and animals.
(vii) Each unit can protect area up to forty feet long and thirty feet wide.
(viii) Mounting: Designed for quick and easy mounting.
(ix) Lights: Two 15 watt "black light" fluorescent tubes.
(x) Electrical Characteristic: 240 volts / 50 Hz / single phase.

4.2 BLOK Dewan Makan (B6)

1. Digital Platform Weighing Scale

The unit shall be of platform mobile type and provided with 4 number of heavy-duty ball bearing castor of not less than 5” diameter. The maximum capacity of the unit shall be 300 Kg and minimum capacity of 10 kg complete with overload limit that will hint when the weight close to exceeding on it.

Approximate plater/platform size shall be standard of 800mm x 800mm x 80mm made by stainless steel grade 304 type.

The scale shall have moisture protection and load protector to keep it durable.

The unit shall be operated with dual mode from both main power supply and battery complete with battery charger. Numbers of keys provide shall be minimum of 6 segments.

The unit shall be provide with LCD electronic scale that makes it easy to measure with character function can read unit of pounds, ounces, grams, kilograms and etc. LCD display shall be clear enough to allow the user to easily see the accurate measurement in numeric message language. Digital digit shall be 7 numbers complete with storage capacity.

Note: Unit supply must be SIRIM approved and certified certificate from “Pejabat Sukat & Timbang” or any other government approved Metrology Agency.

2. Coconut Scrapper

The unit shall be standing type coconut scraper and electrical operated. The unit shall operate on 240V, 50Hz,1 phase 0.5 to 1.5 Hp motor with 14mm shaft. The motor shall be mounted on a steel frame with aluminum casing.

The motor shall be heavy duty motor and low power consumption. The direction of the rotation of motor shall be anti-clockwise. It shall be insulated with Class B insulation. The motor shall be TEFC type and fully tropicallised.

A motor starter, overload protection device and no-volt released shall be incorporated into the motor circuit.

The unit shall be fitted with two fixed and two sets of swivel 125 mm ball bearing casters with springs. It shall be fitted with stopper as a standard features.

One number of stainless steel tables with slatted shelf below shall be provided. Scrapped coconut collector container at the bottom and can be taken out after usage shall be provided.

The unit shall function to scrapped coconut easily and quickly. The aluminum shield of thickness not led than 1.5mm shall be provided to surround the scrapping head. The unit shall be supported on 4 nos $1\ ^1/_2$" diameter stainless steel legs.

The unit shall come complete with mounting screws and scrapper/grating head (the greater shall be bolted to a bench).

The greater assembly shall consist of a body and sheath which is replaceable.

The greater sheath is the replaceable outer covering that fits on greater head body. The complete head consists of reusable body and sheath which is replaceable. The sheath (which has the cutting teeth) shall be rugged non-ferrous steel cutter for long life usage. The sheath shall be construct with sharp opposite direction carved on the non-ferrous steel head for grinding out coconut white faster and come with lock bolt installing on 14mm diameter shaft.

The coconut scrapping head shall be supply with 2(two) sets of replaceable parts.

Approx. overall dimensions: 600mm x 600mm x 850mm (High)

3. Ice Cube Machine

The unit shall be conceal with a compressor, condenser and other part walled in the cabinet.

The unit shall be modular type machine, electrical type and shall be operate on 110 to 240V and 50Hz, 3 phases power supply.

The ice make shall be able to produce consistently up to 300 Kg of ice per day. Unit shall be equip with built-in antimicrobial production to inhibit bacteria growth on ice maker surfaces.

The air filter shall be washable type and easy to access. Proper drain shall be incorporated for draining purposes.

To ensure reliability and durable of the equipment shall be equipped with electrodes nickel plating on all evaporator plates.

The unit shall operate in automatic operations. When the ice storage bin is full, the machine stop making ice and proceeds to the cold preservation stage automatically and shall switches back to ice production mode once the ice is removed from the bin. The unit shall equipped with ON/OFF power switch allows to control functionally without complication.

The unit shall be constructed from stainless steel type 304 exterior and front vents. The unit shall also construct from corrosion-resistant stainless steel fingerprint-proof plastic.

An ice scoop shall be provided as a standard feature.

4. Water Boiler (floor standing)

The unit shall be of tank in tank stainless steel type 304 with polished food grade. The whole outward appearance shall be seamless stainless steel polished finished and shall cater minimum capacity of 80 liter of boiling water complete with build-in connector to source of incoming water supply.

The unit shall be electrical type and shall operate on 240V and 50Hz, 3 phases power supply complete with boil-dry out protection so that makes maintenance and checking work more convenient.

The unit shall be equip by variable thermostat to control temperature range of 5ºC to 40ºC with easy ON/OFF switch, heating and keep warm pilots so the consumers can be ease to use them.

The product quality shall be pledge by adopter electric element with good quality and shall be provided with automatic water valve, built in water indicator and keep temperature functions element.

The unit shall be equipped with 2(two) sets build in highly faucets complete with drip trap set.

The water boiler shall easily be operable, running reliable, high efficiency, safety and hygiene.

The unit shall function to scrapped coconut easily and quickly. The unit shall be supported on 4 nos $1^1/_2$" diameter stainless steel legs.

Approx. overall dimensions: 560mm (W) x 400mm (D) x 1000mm (High)

5. Water Urn

The unit shall be of tank in tank stainless steel type 304 with polished food grade. The whole outward appearance shall be seamless stainless steel polished finished and shall cater minimum capacity of 38 liter of boiling water complete with build-in connector to source of incoming water supply.

The unit shall be electrical type and shall operate on 240V and 50Hz, 3 phases power supply complete with boil-dry out protection so that makes maintenance and checking work more convenient.

The unit shall be equip by variable thermostat to control temperature range of 30ºC to 110ºC with easy ON/OFF switch, heating, keep warm pilots and locking lid with cool touched handles so the consumers can be ease to use them.

The product quality shall be pledge by adopter electric element with good quality and shall be provided with automatic water valve, built in water indicator to keep temperature functions element.

The unit shall be equipped with 1(one) set build in highly faucets.

The water urn shall easily be operable, running reliable, high efficiency, safety and hygiene.

Approx. overall dimensions: 450mm diameter x 600mm (High)

6. Bain-Marie

The unit shall be wet bain-marie type. The water well / tank shall be single type. Water well will help to keep the food moist.

General construction of the unit shall be stainless steel grade 304 for body construction with polished stainless steel complete with 1(one) tier adjustable shelf and 1(one) fixed bottom shelf.

The unit shall be supply with at least with 1(one) drain valve. Valve shall be chrome plated. The drain valve installed shall operate to easily empty the drain water. The minimum size of waste drain valve shall be 25mm diameter pipe.

The unit shall be installed with 1.5mm lead as standard and suitable for used with 240V, 50 Hz, 1 phase power supply. The electrical supply shall be protected by a suitably residual current protection device as standard features. Gantry mounted electronic controller shall be installed on operator side.

Heating rate shall be between 3 kW to 5 kW that will supply with 13 Amp or 15 Amp plug top (depend on the kilowatt ratings). Lower heat rod elements and lower heat mat on ceran hotplate shall be installed in the unit and shall be control electronically. Digital temperature controlled shall be installed to give indication of water temperature.

The feature of digital display, easy empty valve, adjustable thermostat from 0ºC to 110ºC shall be as standard for the unit offer. The thermostat installed shall be precise thermostat control grade. High quality of the thermostat shall easily adjust and achieve different temperature to the user needs. The control panel shall made for easy and convenient operation.

The unit shall be install with service compartment with hinged door in front. The unit shall have double pan sliding door in front complete with ball bearing sliding guide. The unit shall be installed with heavy duty PVC door handle. The legs for the unit shall be adjustable legs with stainless steel material.

The unit shall be include by 5 Number gastronome 1/1 size food pans at 150mm depth with lids. The gastronome pain container shall be stainless steel grade 304 with corrosion resistant, taste free and odorless, easy to cleaning and optimum hygiene. Temperature resistant for the pan shall be -40ºC to +280ºC. The lid for the pan shall be rugged, sturdy lids for all gastronome containers, simple and secure lifting without risk of burning or injury. All lid supply shall have handle with crossbar type.

Approx. overall dimensions: 1800mm (W) x 750mm (D) x 850mm (High)

7. Twin Tank Juice Dispenser

The unit panel shall be made of stainless steel 304 grade. The unit shall suitable power supply of 240V, 50 Hz, 3 phases.

The unit capacity shall be counter/tabletop type dispenser that can cater minimum of 18 liters for each dispenser container. Twin tank shall be provided for each unit of dispenser.

The unit shall be both cooling and heating function machine that can do mixing and spraying function with automatic control.

The unit shall use air-cooled condenser and the compressor shall be hermetic type. Red copper evaporator shall be used to make sure unit can conducts cool air very fast.

Dispenser tank shall be made of Non-toxic Polycarbonate (PC) material which is high/low temperature resistance, innoxious, anti-flaming and has good flexibility. The tank shall be lift-off type and easy use and easy to remove for cleaning.

Each dispenser unit shall be equipped with 2(two) sets heavy duty PVC faucets and dispersive valve.

Approx. overall dimensions: 500mm (W) x 360mm (D) x 710mm (High)

8. Water Heater 30 Gallon

The unit shall be instant hot water heater horizontal or vertical type (shall be refer to the drawing attach to this specification) and shall operate on 240V, 50Hz, 3 Phase electrical supply.

The capacity of the unit shall be 136 liter (30 Gallon) of hot water with minimum temperature of 90°C and maximum of 150°C.

The inner tank shall be rust free stainless steel grade 304 type and shall consist of 2” of environmental friendly CFC free Polyurethane Foam insulation to reduce heat loss.

The unit shall come with at least single element range between 3800W to 4500W and automatic thermostat to keep the water at the desired temperature. The unit shall be factory installed by temperature and pressure relief valve, drain valve, thermostat safety cut-out and thermal cut-off to ensure safe operation.

The ¾" water connection shall be included with the water heater for easy installation.

The unit shall be hung by anti-rust steel bracket to the building wall.

Overall dimensions: 510mm diameter x 1250mm High

9. 4 Door Upright Chiller

The unit panel shall be made of stainless steel 304 grade. The unit shall suitable for power supply of 240V, 50 Hz, 1 phases.

The unit shall be construct with stainless steel 304 grade sheet metal for exterior front, exterior back, top and bottom. The interior shall be minimum 24 gauge stainless steel insulated with high density polyurethane of 80mm thick. The base cabinet shall be mounted on 150mm stainless steel legs with adjustable bullet feet.

Door of the refrigerator are as detail in the itemized specification and shall be constructed with heavy duty hinges, cam lift type and shall allow the door to remain stationary when opened to 120 degree. Door shall be equipped with renewable polyvinyl plastic gasket with magnetic core to ensure and air tight seal. All door frames shall be fitted with hot heaters to prevent condensation.

Refrigeration system shall be completely top mounted and equipped with energy saving condense evaporator that requires no electric heaters and thus eliminates costly drainage connections. All parts shall be accessible for servicing by removing front louver assembly.

Visual thermometer shall be mounted on exterior of cabinet for at a glance reading. Thermometer dial shall also be fitted with incandescent lighting actuated by a switch mounted externally.

Unit shall be provided with stainless steel shelves. Shelves shall be adjustable on approximately 25mm of the center.

Capacity	:	approx. 1000 litres.
No. of Selves	:	8
Adjustable Feet	:	approx. 50mm
Operation	:	240V, 50Hz, 1 Phase
Compressor Motor Power	:	1 Hp
Cold Consumption	:	approx. 600 kCal/Hr
Evaporation Temp	:	approx. -10°C
Condensation Temp	:	approx. +35°C
Approx. External Dimension	:	1300mm x 760mm x 2000mm (H)

1. Mobile Rice Warmer Container

The unit shall be free standing counter top dry/wet rice warmer. It shall has features of fast heating and easy operation.

General construction shall be stainless steel grade 304 with number 4 finish complete with fiber glass insulation. The counter top shall be installed with no skip devices as a standard features.

The unit shall be fitted with two fixed and two sets of swivel 125 mm ball bearing casters with springs. It shall be fitted with stopper as a standard features.

It shall suitable to operate with incoming power supply of 240V, 50 Hz, 1 phase

The thermostat shall control temperature within 20ºC to 85ºC with one temperature controller come with pilot lamp indicator.

For wet used, air wash insulation shall be installed to eliminate burn-off smoke/smell upon startup. Unit shall also be equipped at least with one manifold drain assemble.

The warmer shall be able to handle capacity of 10 liter pot size per serving.

Approx. overall dimensions: 750mm (W) x 750mm (D) x 850mm (High)

10. Insect Killer

The equipment shall be suitable for luring flying insects away from food stuffs by short-wave “black-light” attraction. The unit shall be able to kills insects instantly by electrified grid and collects them into a built-in tray. It shall have the following characteristics:

(i) No chemical fall-out-no odour, no contamination risks.
(ii) No, mopping-up operation - insects are attracted killed and collected automatically. They cannot fall on to floor or counter - they cannot fly away to expire unnoticed in odd corners.
(iii) Continuous, automatic - protection starts the moment it is switched on and continues twenty-four hours a day, 365 days a year.
(iv) Low running costs.
(v) Long life and with negligible maintenance.
(vi) High safety - the grid that serves instant death to flying insect pests is harmless to humans and animals.
(vii) Each unit can protect area up to forty feet long and thirty feet wide.
(viii) Mounting: Designed for quick and easy mounting.
(ix) Lights: Two 15 watt "black light" fluorescent tubes.
(x) Electrical Characteristic: 230 volts / 50 Hz / single phase.

5 GENERAL KITCHEN EQUIPMENT

2. Service Trolley

The service trolley shall be 1.6mm thick stainless steel construction. It shall be suitable for serving teas, sandwiches etc. for 50 to 60 person and for clearing trays.

The trollibar shall be strong, versatile and yet light and fabricated from 22mm diameter stainless steel tube. The trolley shall be fitted with two fixed and two sets of swivel 125 mm ball bearing casters with springs. It shall be fitted with a hand rail.

Overall dimensions: 600mm W x 900mm L x 875mm H (excluding handrail dimension)

3. Chopping Block

The equipment shall be NYLON chopping block. The size shal be 600mm x 600mm x 100mm nylon block top. The block shall mount on a stainless steel robust stand construction. The legs should be constructed of 40mm diameter stainless steel grade 304 come with cross rail, framing with gussets and adjustable feet.

The copping board shall suitable for bones, meat, vegetables and fruits etc. usage. The unit shall be provided with 1(one) stainless steel undershelf fixed 150mm below above floor, and 1(one) drower 225mm deep directly below the block.t shall

Dimension for block : 600mm x 600mm x 100mm
General Dimension : 600mm x 600mm x 850mm (H)

Insulated Drink Dispenser

The equipment shall be Polyethylene material with scratch resistant built up. Thick foam insulation shall hold the temperature in the safe zones up to over 6 hours.

The capacity of the dispenser shall cater 10 gallon capacity of beverages.

The dispenser shall consist of easy-grip formed handle for transport purposes.

Spring action faucet for dripless service, sure grip handles for two person stable lift and pop-up vent for pressure release shall be a standard feature.

4. Ice bin container

The unit shall be free standing counter top ice bin counter. It shall be stainless steel grade 304 underbar ice bin pass-thru unit type with fiber glass insulation.

The capacity of container shall cater 100 kg of ice with interior depth chest of 12" minimum size complete with ½" drain pipe for cleaning purposes.

The legs should be constructed of 40mm diameter stainless steel grade 304 come with cross rail, framing with gussets and adjustable feet.

An ice scoop shall be provided as a standard features.

Approx. overall dimensions: 650mm (W) x 750mm (D) x 850mm (High)

6 Kitchen Hood & Exhaust System

6.1 BLOK KANTIN (D1)

1. Exhaust Hood

The exhaust hood shall be wall-hung canopy hood type. Hood dimensions as shown in the tender drawings.

The body of the hood shall be constructed from 1.6mm thick stainless steel sheet with integral condensation gutter all round. The body shall be properly reinforced with 40mm x 40mm x 5mm stainless steel angles to give good rigidity.

The hood shall be properly suspended from the building structure with 40mm x 40mm x 5mm and 60mm x 60mm x 6mm stainless steel angles as shown in the tender drawings.

The exhaust duct shall be constructed of 0.7mm thick stainless steel. Stainless steel discharge grille shall be provided at the exhaust duct outlet.

2. Light Fitting

3 nos. 40W fluorescent light fittings of the vapor-proof type shall be provided c/w light switch wired from the Exhaust Fan control panel.

3. Filters and Filter Housing

The interior of the hood shall be fitted with filter housing complete with approved type filter elements. Each filter element shall be of 600mm x 500mm x 50mm thick (24" x 20" x 2") which can be easily and readily removed for washing and cleaning. The filters shall be arranged in a V-assembly as shown in the tender drawings and a drip tray shall be installed below the grease filters.

4. Switch board

The switch board shall be include of isolator, starter, contactors, Amp-meter, Volt meter, fuses etc. and conduit wiring. A direct-on-line starter, overload protection devices and under voltage release shall be incorporated in the motor circuit.

The Exhaust fan shall be control by modulator switch for Low,Medium & High speed as standard features in the switch board.

5. Exhaust Fans

The hood shall incorporate aerofoil axial flow type exhaust fans with motors designed to operate on 415V/50Hz/1ph power supply. The motor shall be totally enclosed, fume resistant and fully tropicalised. A direct on line starter, overload protection devices and under voltage release shall be incorporated in the motor circuit.

6. Exhaust Fan Data

Type of fan	:	Aerofoil axial flow.
No. of fan	:	2
Diameter of fan	:	15"
Static pressure of each fan	:	0.58" wg
Air delivery of each fan	:	2000 cfm
Electrical characteristics	:	415V/50Hz/3ph
Rpm of each fan	:	1440 rpm
Fan Total Efficiency	:	>73%
Fan Sound Pressure Level	:	71.5 dB

7. Duct Silencer

All duct silencer shall be fabricated from good quality galvanized sheet steel of 1.2mm thick for duct below 1100mm width/height and 1.6mm thick for duct above 1100mm width/height. The contractor shall size the silencer to match the ductwork size properly.

The pressure drop through the silencer shall not exceed 40 Pascal. The contractor shall submit the calculations and catalogues to substantiate his tender.

NOTE: Noise level within the kitchen shall be limited to 55 db (A). The contractor shall install silencer as necessary to achieve this requirement. It is the contractor's responsibility to size the correct silencer's length and characteristic to suit his fans and the proposal calculation shall be submit together with this tender.

6.2 BLOK DEWAN MAKAN (B6)

1. Exhaust Hood

The exhaust hood shall be wall-hung canopy hood type. Hood dimensions as shown in the tender drawings.

The body of the hood shall be constructed from 1.6mm thick stainless steel sheet with integral condensation gutter all round. The body shall be properly reinforced with 40mm x 40mm x 5mm stainless steel angles to give good rigidity.

The hood shall be properly suspended from the building structure with 40mm x 40mm x 5mm and 60mm x 60mm x 6mm stainless steel angles as shown in the tender drawings.

The exhaust duct shall be constructed of 0.7mm thick stainless steel. Stainless steel discharge grille shall be provided at the exhaust duct outlet.

2. Light Fitting

6 nos. 40W fluorescent light fittings of the explosion and vapor proof type shall be provided complete with light switch wired from the Exhaust Fan control panel.

3. Filters and Filter Housing

The interior of the hood shall be fitted with filter housing complete with approved type filter elements. Sizes of filter are as shown in the tender drawings. Each filter element shall be easily and readily removed for washing and cleaning. The filters shall be arranged in a V-assembly as shown in the tender drawings and a drip tray shall be installed below the grease filters.

4. Switch board

The switch board shall be include of isolator, starter, contactors, Amp-meter, Volt meter, fuses etc. and conduit wiring. A direct-on-line starter, overload protection devices and under voltage release shall be incorporated in the motor circuit.

The Exhaust fan shall be control by modulator switch for Low,Medium & High speed as standard features in the switch board.

5. Exhaust Fans

The hood shall incorporate with centrifugal flow type exhaust fans with motors designed to operate on 415V/50Hz/3 phase power supply. The motor shall be totally enclosed, fume resistant and fully tropicalised. A direct on line starter, overload protection devices and under voltage release shall be incorporated in the motor circuit.

6. Exhaust Fan Data

Type of fan	:	Centrifugal Fan
No. of fan	:	2
Static pressure of each fan	:	2.5" wg
Air delivery of each fan	:	4000 cfm
Electrical characteristics	:	415V/50Hz/3ph
Rpm of each fan	:	500- 1450 rpm
Fan Sound Pressure Level	:	65 dBA (free field)

7. Duct Silencer

All duct silencer shall be fabricated from good quality galvanized sheet steel of 1.2mm thick for duct below 1100mm width/height and 1.6mm thick for duct above 1100mm width/height. The contractor shall size the silencer to match the ductwork size properly.

The pressure drop through the silencer shall not exceed 40 Pascal. The contractor shall submit the calculations and catalogues to substantiate his tender.

NOTE: Noise level within the kitchen shall be limited to 55 db (A). The contractor shall install silencer as necessary to achieve this requirement. It is the contractor's responsibility to size the correct silencer's length and characteristic to suit his fans and the proposal calculation shall be submit together with this tender.

7 Wet Chemical Fire Suppression System

7.1 Standard And Codes Of Practice Applicable

The following publication of the issues listed below, but referred to thereafter by designation only, form a part of this specification to the extent indicated by the reference thereto (latest edition):

1. NFPA 17A : Standard on Wet Chemical Extinguishing System.
2. NFPA 96 : Standard for the installation of equipment for removal of smoke and grease laden vapors from commercial cooking equipment.
3. Underwriters Laboratories, Inc. (UL): Fire Protection Equipment Directory

7.2 Technical Specification (Design Requirements)

(a) Manufacturer : Company specializing in the design and manufacture of wet chemical kitchen hood fire suppression systems.

(b) Installer : Company authorized and trained by the manufacturer to design, install and maintain wet chemical kitchen hood fire suppression systems

(c) Regulatory Requirement

Conform to building code for requirement applicable to the work specified herein.

Codes and Permits: Conform to the local code requirements applicable to this section. Obtain and pay any necessary permits prior to the beginning work involved in this section.

All system components must be UL listed as part of the manufacturer's total system.

(d) After Sales Service and Guarantee

The principal (or authorised agent) of the wet chemical system shall have agents at the regional level in Peninsular Malaysia to provide quick back-up service for the system. Upon completion of the installation, the tenderer must guarantee the performance of the system for a period of 12 months.

7.3 System Description

(a) General

The Wet Chemical Kitchen Hood Fire Suppression system shall be a pre-engineered, wet chemical, cartridge operated, regulated pressure type with a fixed nozzle agent distribution network. Listed with Underwriters Laboratories, Inc (UL).

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

The system shall have Fire Suppression capabilities for the following restaurant hazard areas : ventilating structures including hoods, ducts, plenums and filters; deep fat fryers; griddles and range tops; upright, natural charcoal or chain- type boilers; electric, lava rock, mesquite or gas radiant charboilers.

(b) Mode of Operations

The detection portion of the kitchen hood fire suppression system shall be of mechanical type and shall allow for automatic detection by means of specific rated fusible links, which, when the temperature reaches the rating of the link, the link separates, allowing the regulated release to actuate.

7.4 Material And Equipment Specifications

(a) General

The basic system consists of regulated release assembly which includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzles, blow off caps, detectors, cartridges, agent, fusible links, and pulley elbows shall be supplied in separate packages in the quantities needed for fire suppression system arrangements.

Additional equipment includes: remote manual pull station, mechanical and electrical gas valves, pressure switches and electrical switches for automatic equipment and gas line shut off. Accessories such as alarms, warning lights, etc.., to installations where required shall be priced for by the contractor.

i. Tank can be multiple arrangements to allow for larger hazard coverage. Each tank is limited to a listed maximum amount of flow numbers.

ii. To ascertain high standard of safety and reliability of the system, major component shall be produced by a single manufacturer. Alternates shall not be accepted.

iii. To substantiate the origin of major components and to facilitate, in case of any warranty claims to the manufacturer, the major equipment shall be supplied with an original copy of letter of origin by the manufacturer and certified by the local agent.

(b) Wet Chemical Agent

The extinguishing agent shall be a potassium carbonate, potassium acetate-base formulation designed for flame knockdown and securement of grease related fires. The agent shall be available in plastic container, labelled with handling and usage instructions.

(c) Agent Tank

The agent tank shall be installed in a (stainless steel enclosure c/w bracket). The tank shall be constructed of deep drawn carbon steel, finished in red enamel, (1.5gallon (5.7L)) (3.0gallon (11.4L) in size. Tanks shall have 100 psi (690 kPa) working pressure, 300 psi (2069 kPa) test pressure and 600 psi (4137 kPa) minimum burst pressure.

(d) Tank Adaptor

Tank adaptor assembly shall be chrome plated steel with a 1/4" NPT female inlet and a 3/4" NPT male outlet.

(e) Regulated Release Mechanism

The regulated release mechanism shall be spring loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one or two agent tanks, depending on the capacity of the N2 cartridge used. It shall contains a factory installed regulator deadset at 100 psi (690 kPa) with an internal relief of approximately 145 psi (1000kPa).

It shall have the following actuation capabilities; automatic actuation by a fusible link detection system and remote manual actuation by a mechanical pull station.

The regulated release mechanism shall contain a release assembly, regulator, expellant gas hose and agent storage tank housed in a stainless steel enclosure with cover. The enclosure contains knock outs for 1/2" 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, it is compatible with electric gas line or appliance shut-off devices.

(f) Regulated Actuator Assembly

When more than two agent's tanks are required, the regulated actuator shall provide expellant gas for additional tanks. It shall contain a factory installed regulator deadset at 100 psi (690 kPa).

The regulated actuator assembly shall contain a regulated actuator, regulator, expellant gas hose and agent tank housed in a stainless steel enclosure with cover. The enclosure contains knockouts to permit installation of the expellant gas line.

(g) Discharge Nozzle

Each discharge nozzles shall be tested and listed with the R102 system for a specific application. Nozzles shall be stamped with the flow number designation (1/2, 1, 2 and 3) and the tip part number. Each nozzle must have a metal or rubber blow off cap to keep the nozzle tip orifice free of cooking grease build up.

(h) Piping

i. System piping shall be of non-combustible material having physical and chemical characteristic such that its integrity under stress can be predicted with reliability.

ii. Distribution piping : Schedule 40 black steel pipe and fittings. All piping shall be sealed with pipe tape.

iii. Actuation and Expellant Gas Piping : Schedule 40, black steel pipe and fittings. All piping shall be sealed with pipe tape

iv. All piping shall comply with NFPA 2001.

v. Piping shall be installed in accordance with good commercial practice to the appropriate codes, securely supported with hangers and arrange with close attention to the design layout since deviations may alter the design flow performance as calculated.

vi. All piping shall be reamed, blown clear and swabbed with appropriate solvent to remove mill varnish and cutting oils before assembly.

vii. Assembly of all joints shall confirm to the appropriate standards. Threaded pipe joints shall utilize Teflon tape applied to the male threads only.

(i) Alarms

Audible fire alarm bell of 150mm dia., strident tone type shall be supplied and installed and, the number and location as indicated in the tender drawings or otherwise to be decided on site. The minimum sound level shall be either 65 dB(A) or 5 dB above any background noise, which ever greater, if the noise persist more than 30 seconds.

An alarm indicating failure of supervised devices or equipment shall give prompt and positive indication of any failure and shall be distinctive from alarms indicating operation or hazardous condition.

(j) Manual Operation

A remote manual mechanical pull handle with labelling for **OFF/DISCHARGE** shall be provided as indicated in the tender drawing for manual actuation of the Wet chemical agent.

(k) Painting

The tenderer shall include the cost of painting of all equipment included in this tender. The colour of the paint shall be approved by the local fire services department and shall consist of 1 primer coat, 1 under coat and 2 top coats hard matte finish paint. Before any painting is carried out, the contractor shall ensure that the surface is clean, free from grease and rust. If necessary, degreasing and derusting procedures shall be carried out. Each coat of paint shall be applied by brush and when thoroughly dry, smoothed with suitable paper or cloth before the next coat is applied.

(l) Inspection, Testing & Commissioning

i. General

The supply of all instruments, equipment and labour for conducting inspection, test and demonstration shall be provided in this contract and the cost thereof shall be deemed included in the tender amount.

ii. Inspection

- The completed installation shall be instructed by factory authorized and trained personnel.

- The inspection shall include a full operational test of all components as per equipment manufacturer's recommendations.
- Inspection shall be performed in the presence of the JKR mechanical engineer or his representative.
- All mechanical and electrical components shall be tested according to the manufacturer's recommended procedure to verify system integrity.
- Inspections shall include a complete checkout of the detection / control system and certification of cylinder pressure. A written report shall be filed with the JKR.
- The quantity of agent shall reflect the actual design quantity of Wet Chemical agent.
- The system shall be tested according to the designed mode of operation in the presence of JKR mechanical engineer or his representative.

(m) Test of the Detection System

The contractor shall carry out simulation test as instructed and with the presence of JKR mechanical engineer or his representative. The contractor shall price in his tender for all consumables such as fusible links etc. used in the test.

7.5 Submittals

A system owner's manual shall be submitted containing basic information pertaining to system operation and maintenance.

A detailed technical manual shall also be submitted including system description, design, installation, recharge and maintenance procedures, plus additional equipment installation and resetting instructions.

7.6 Guarantee And Maintenance

(a) Upon handling over of the installation to JKR, the contractor must guarantee the performance of the system for a period of 12 months. Within this period the contractor shall carry out inspection and maintenance every three (3) months. A written report certified by the owner of the premise shall be submitted to JKR after each inspection and maintenance being done.

(b) Agent tanks shall be examined for evidence of corrosion or mechanical damage. The pressure must be checked every month. If a cylinder shows a loss in pressure (adjusted for pressure) of more than 10 %, it shall be replaced.

(c) Distribution piping shall be examined of corrosion. Pipe hangers, brackets and fittings should be examined to ensure that the pipes are firmly secured. Should there be any discrepancy found, the contractor are to inform the owner.

(d) Discharge nozzles shall be checked to determine that the orifice is clear, unobstructed and firmly secured.

(e) The detection System shall be checked at once every 3 months. The Detection System shall be checked to determine that they are in satisfactory condition. The methods and procedures for this inspection shall be in accordance with the manufacturer's recommendation.

8 LPG Piping System

8.1 Responsibilities of the Sub-contractor

4. Submitting the name of competent person and welder registered with Suruhanjaya Tenaga Malaysia (ST) and Jabatan Kesihatan & Keselamatan Pekerjaan (JKKP) Malaysia. A copy of certificate of compentency shall be enclosed during submission of tender stage. Incomplete submission shall be rejected.

5. To ensure that all items supplied and installed for the system are approved by the Suruhanjaya Tenaga Malaysia (ST) and Jabatan Kesihatan & Keselamatan Pekerjan (JKKP) Malaysia, the contractor shall also be responsible to fill in all notices and requests required to obtain approvals from the agencies. The contractor shall also pay all related fees in connection with the approvals.

6. The successful contractor awarded with this tender, shall submit to the S.O representative a copy of the calculations and sufficient copies of detail construction drawings duly endorsed by a competent person and approved by ST/JKKP. The enclosed drawings shall be not considered as working drawings. Nevertheless, the price to be offered by the tenderers shall be based in the drawings, apart from the scope of work and the specification.

7. The contractor shall submit for **S.O approval sample materials proposed to be used in the project**. **No installation** can be carried out without getting the approval of the S.O.

8. Prior to installation, the contractor shall submit to the S.O a copy of **Approval To Install (ATI) from Suruhanjaya Tenaga Malaysia (ST).**

9. Prior to operation (before handling over), the contractor shall also submit to the S.O a copy of **Approval To Operate (ATO) from Suruhanjaya Tenaga Malaysia (ST).**

10. Making/coring of holes, and embedding in concrete floor and making good where the gas pipes run through walls, partitions, work benches, or are chased/concealed and buried in concrete floor or are run where service channels/conduit/trunking are not provided as shown in the drawings.

11. Concealing all wiring conduits, including hacking of chases, holes etc. and making good damages.

12. Extending the electrical wiring from incoming isolator to the equipment.

8.2 General

The Low Pressure Gas Installation shall be in accordance with the manufacturer specification and shall comply with the Rules and Regulations of the Local Authorities and the relevant clauses of the British Standard 6400 & 6891, Malaysian Standards MS 830:1983(P) & MS930:1984(P), and National Fuel Gas Code Handbook 3rd Edition.

The successful tenderer shall install all necessary gas pipes complete with the appropriate valves and regulators suitable for LPG from automatic change –over regulator to the individual appliances as detailed in the tender drawings attached to this specification.

The installation of gas pipes, valves and regulators shall conform generally with the following safety regulations:

i. The piping is to be free internally and externally of cutting burrs, loose scale, dirt, dust and other foreign matters before installation is completed.

ii. All pipe joints should be screwed, welded or brazed with a material having a melting point of 1000°F. Joints with valves or other devices which are removable for servicing are excluded from this recommendation.

iii. Piping shall be so located or protected as to avoid extreme temperature which might give rise to cracking of the gas pipe.

iv. Provision must be made to avoid damage to the piping by its expansion, vibration or by settlement of the building by which it is carried.

v. Where used threaded connections are to be have tapered threads according to BS 21. A jointing compound which is resistant to LPG and which remain plastic must be used, but should be applied only to the male threads.

vi. Suitable line shut off valves should be fitted for each appliance or burner. If this valve is close it should shut off gas to that appliance only, and it may also serve as a control valve, but its design must be suitable for both functions. All shut off valves shall be suitable for LPG service and designed for not less than the maximum pressure to which they may be subjected.

vii. The open ends of piping and/or fittings (with the exception of the terminal taps or valves in regular use) must always be made gas tight by means of a plug, welded or brazed in position. Welding or brazing materials must have a melting point of at least 1000°F. Hammering over the ends of piping or plugging with wood as a means of sealing is not allowed.

viii. The use of cast iron valves, fittings and accessories is prohibited.

ix. Piping shall be tested after assembly and proved free from leaks at not less than normal operating pressures.

x. All materials used for valve seats, packings, gaskets, diaphragm etc., shall be resistant to the action of LPG.

xi. All gas piping shall be of seamless steel pipe BSP Class "C" or Schedule 40.

8.3 Cylinder, Cylinder Manifold And Pressure Regulator

The LPG Cylinder manifold shall rigidly supported and arrange in two banks each consisting of cylinders as specified. The capacity of each cylinder shall be approximately 50 Kg of LPG. Storage containers for gas shall be capable of withstanding total pressure of 3.34 Mpa exerted by the gas at the maximum temperature contemplated in use. Each container must be equipped with a discharge valve capable of discharging at the required rate.

The cylinder manifold shall be of seamless steel piping. A suitable automatic change-over regulator with remote indicator shall be incorporated in the manifold header.

Connection to the manifold shall be by copper pigtails and shall be fitted with non-return valves. All joints between manifold headers and cylinder connectors shall be readily accessible.

The joints in manifold headers which do not have to be broken in normal use should be welded or brazed using materials which must have a melting point of at least 1000ºF.

The automatic change-over regulator shall be capable of reducing the cylinder pressure to a constant burner pressure of 11" w.c. It shall provide convenience of uninterrupted service on multiple cylinder installations. When gas is exhausted from the SUPPLY cylinders, the unit shall automatically switch to the RESERVE cylinders to maintain constant gas supply. The unit shall also provide visual indication at the regulator to show that the supply is exhausted.

Manifold headers, regulators and cylinder connectors shall be of suitable dimensions to supply the estimated gas off take without undue pressure drop.

Pressure regulator shall be reputable brand and approved type capable of handling the likely of take of the gas to the required pressure. The unit shall also provide visual indication at the regulator to show that the supply is exhausted. Regulators shall be constructed of bronze and have screwed ends and shall comply with BS 3016 and BS21.

(i) First Stage – Automatic changeover regulator

Outlet pressure setting	:	5 Psig
Adjustment Range	:	5 to 20 Psig

(ii) At Second Stage Regulator

Outlet pressure setting	:	11 inches w.c
Adjustment Range	:	9 – 13 inches w.c

Second stage regulator/s shall be installed in the riser as indicated on the tender drawings complete with a shut-off ball valve.

Pressure regulators shall be rigidly installed and provided with a vent line to the outside air with the discharge outlet not less than 1 meter horizontally away from any building below the discharge outlet.

8.4 Cylinder, Cylinder Manifold And Pressure Regulator

The LPG Cylinder manifold shall rigidly supported and arrange in two banks each consisting of cylinders as specified. The capacity of each cylinder shall be approximately 50 Kg of LPG.

8.5 Valves – Shut-off, Line Shut-off and Emergency Shut-off

All valves shall be constructed of bronze and have screwed ends and be of globe type, either internally or externally screwed stem and shall generally require to be leakproof and follow API 6D, Class 150 for low pressure and Class 600 for high pressure LPG. In addition such valves shall have renewable 'TEFLON' and valve disc and gland packing.

The LPG Cylinder manifold shall rigidly supported and arrange in two banks each consisting of cylinders as specified. The capacity of each cylinder shall be approximately 50 Kg of LPG.

Emergency Shut-off Valve (ESV) shall be of reputable brand and approved type provided at each gas main riser. In case of an emergency of gas leak the individual gas main riser can be isolated by breaking the glass window of the ESV box and pulling the cable handle linked with the ESV.

Location of shut-off valves shall be installed in readily accessible positions for ease to operate and must be outside of gas store or gas room.

The shut-off valves shall have clear indication for ON-OFF position and they shall be installed in appropriate metal valves boxes, clearly marked to indicate their function and type of gases.

Each valve box shall be lockable and fitted with suitable glass fronted cover. The box shall be provided with vents at the top and bottom and large enough to allow adequate access for maintenance. The box shall be recess mounted. The valve box shall be fabricated from 16 gauge GI sheet.

Suitable line shut-off valves of approved type shall be fitted for each appliance or burner. They shall be of the same size as the pipe to which they are screwed-jointed.

8.6 Safety Relief Valve

A safety relief valve shall be installed between each pair of shut-off valves on LP Gas piping to relieve over pressure to atmosphere. It shall be so placed that, in the event of its operation, escaping LP Gas cannot impinge on containers fittings or other equipment nor on the ground.

The minimum setting of safety relief valve installed in piping shall be not less than 140% and not more than 200% of the container safety relief valve setting.

8.7 Gas Taps

Gas tap shall be suitable for LP Gas and shall be capable of withstand a test pressure of 1.5 times the maximum operating pressure to which they may be subjected to under normal use and must be approved by Suruhanjaya Tenaga Malaysia (ST).

Gas tap shall be of the safety push-knob or drop key type conforming to BS 1552 and colour to DIN 19290. As in the case of LP Gas it shall be coloured yellow. All gas tap must be epoxy coated to withstand chemical attacks.

8.8 Pipes and Installation

Materials of pipes shall be seamless carbon steel pipe to standard API 5L, Grade B, Schedule 40 and copper pipe to BS EN 1057 (Class X and Y). The jointing compound must be of a type which is resistant to LP Gas and remains plastic and it shall be applied to the male thread only. Hemp and similar material must not be used in pipe joints. In under-ground, or in inaccessible places, all joints shall be screwed welded or brazed.

All piping, tubing, fitting, valves and similar equipment (not subject to cylinder pressure) shall be suitable for LP Gas and shall be capable of withstanding a test pressure 1.5 times the maximum operating pressure to which they may be subjected to under normal use.

Bending, drilling, welding of pipes to create tees or bends are not allowed. All joints, bends, elbows and tees in steel or copper pipes shall be made strictly using the appropriate fittings. All changes in pipe direction requiring turns or offsets shall be free from flattening, buckling or thinning of tube wall at any point.

Piping and valves should be suitably dimensioned and installed in such a way the burners are supplied with required gas rate and pressure and any likely increase in the estimated gas off take should be allowed for.

The open ends of piping or fittings shall always be made gas tight by means of a plug, welded or brazed in position. Hammering over the ends of the pipes or plugging with wood as a means of sealing is strictly prohibited.

Piping shall be free internally and externally of cutting burrs, loose scales, dirt, dust or other foreign matter before and after installation and all pipe work have to be purged before the installation completed.

Pipes with threads which are stripped, chipped, corroded or otherwise damage shall not be used.

Piping shall not be chase in/run along drains to avoid damage to the pipes by acids and other corrosive chemicals.

Piping in riser shall not be chase in walls but along surface.

Provision must be made to avoid damage to the piping by its expansion, contraction, vibration or by settlement of the building on which it is carried.

Piping shall be located and/or protected as to avoid extremes of temperature which might give rise to condensation or cracking of the gas insulation.

The insulation of piping shall in no way weaken significantly the building structure.

No device shall be placed inside the piping or fittings that will reduce the cross-sectional area or otherwise obstruct the free flow of gas.

Piping shall be adequately supported with a free air space between the piping and the wall structure. The piping must be securely positioned to prevent them being moved from their original place. The maximum interval between pipe support is 2 meter for vertical and horizontal run.

Piping buried in floors and embedded in concrete shall be surrounded with a minimum of 2" concrete and shall not be in physical contact with other metallic structures such as reinforcing rods or electrical neutral conductors. All pipe work buried in a solid floor shall also be factory wrapped or sheathed in PVC pipes to avoid corrosion.

When piping may be subjected to corrosion at point of entry into concrete slab, or where piping is in contact with earth or other material which may corrode the piping, it shall be suitably protected against corrosion in an approved manner. When dissimilar metal are joined underground, an insulating coupling shall be used.

All branch outlet piping shall be taken from the top or sided of horizontal lines and not from the bottom.

All exposed piping shall be given one coat of primer paint and two coat of finished oil paint of colour yellow or to be determined by S.O.

8.9 Joints

All pipe joints shall be welded or brazed and shall be gas tight and leak proof. Welding or brazing material used must have a melting point of at least 540ºF.

Only joints with valves or other devices which are removable for servicing may be jointed by threaded connections. Where used, threaded connections are to have tapered threads according to BS 21.

A jointing compound which is resistant to LP Gases and which remain plastic must be used.

The open ends of piping and/or fittings (with the exception of terminal taps or valves) must always be made of gas tight by means of a plug, welded or brazed in position.

8.10 Support

Piping shall be supported with pipe hooks, metal pipe straps, bands or hangers suitable for the size of piping of adequate strength and quality, and shall not in any case be more than 2 meter distant.

Gas piping shall not be supported by other piping.

8.11 Fittings

All fittings shall be forged or wrought-copper, bronze or brass made especially for solder type connections where possible or for flared nuts where this is more suitable.

Piping, fitting and valves shall be tested after assembly and prove free leaks at not less than normal operating pressures.
The use of cast iron valves, fittings and accessories is <u>PROHIBITED.</u>

All materials used for valves seats, packing, gasket diaphagms etc. shall be resistant to the action of LP Gases.

8.12 Operation Conditions

The installation is required to supply gas to the gas equipment after the regulator at a normal pressure of 11" w.c gauge.

8.13 Pipework purging

After all installation is complete and before testing, the contractor shall purge the whole of the pipework with dry nitrogen.

8.14 Earthing

Pipelines shall be bonded to the consumer's earth terminals. This bonding shall be made as near as possible to the point at which the pipeline enters the building from the plant.

Approved bonding conductor shall be used and the pipeline shall not themselves be used for earthing the electrical equipment.

8.15 Sample for installation

The contractor shall be submit to S.O for approval samples for fitting, pipes, valves, emergency shut-off valve, automatic change-over regulator and second stage regulator, pigtail, 1-way kitchen equipment gas taps, high pressure gauge and low pressure gauge and other parts requested by S.O that will be used in the project before any installation works begin at site.

8.16 Testing

Before the system of piping is finally put into service it shall be carefully tested to ensure that it is gas tight. The test pressures to be used for checking gas-tightness are given below. These pressures must be held for at least 30 minutes.

a. Portions of installation not subjected to container pressure but carrying gas at pressures in excess of 20" wg. Test pressure 60 psig.

b. Portions of installations subjected to gas pressure of 20" wg or less. Test pressure 15 psig.

c. For portions of the installation protected by relief devices or valves, the test pressure may be the pressure at which these relief devices or valves operate. Defective pipes or fittings are to be replaced and may not be repaired on site.

8.17 Fire Protection

The contractor shall provide one (1) approved 20 lbs. dry chemical fire extinguisher which shall be installed in a conspicuous and readily accessible location adjacent to the gas store room.

8.18 Painting

All equipment and exposed pipework, conduits and other incidentals items shall be given one coat primer paint and two coats of finishing oil paint to a colour scheme selected by the Jabatan Kerja Raya or according to colour code approved by Suruhanjaya Tenaga Malaysia (ST).

8.19 Identification and Sign Writing

i. Valve box to bear the name:

"INJAP PENGASING LPG"

ii. LPG store shall be provided with notice bearing the words:

"**BAHAYA, MUDAH TERBAKAR, MEROKOK, MENGIMPAL DAN API-API TERDEDAH TIDAK DIBENARKAN"**

9 Cold Room System

9.1 System Requirement

The cold rooms' temperature range shall be as below:

i. The Chiller shall be maintained at room of 3°C
ii. The Freezer room shall be maintained at temperature of -20°C

9.2 Cold Room

1 General

The Cold Room shall be prefabricated recessed walk-in cold room type, Chiller and Freezer room, on-floor complete with air-cooled refrigerant systems.

The cold room shall be made of interlocking panels, safety devices, air dryers, automatic temperature recorder, main control panel, meter and gauges and etc.

The internal dimension (ID) of the Chiller Rooms shall be 4300mm (11'-2'') Length, 2850mm (9'-4'') Depth and 2400mm (7'-11'') Height.

2 Insulation

Insulation panel shall be CFC free rigid foreign expand foamed in place pressure-injected polyurethane chemically bonded with thermal conductivity of K factor shall not exceed 0.016 W/m.K with density of approximately 42 to 45 Kg/m to the interior and exterior metal surfaces. The Polyurethane shall be injected into the mold under not less than 6 bar pressure and at not higher than 21 º C using modern injection technologies.

All insulation install shall be fire-retardant and meet the standard code of British Standard of BS 4735.

Wall and ceiling minimum thickness shall be 100mm with closed cell rating of not less than 97%. The insulation shall remain stable at an operating temperature ranging of 68°C to 121 °C. The expanding agent shall be only Foreign 11 with an inherent pressure of 262 kPa when foam is heated to 65ºC.

The insulation panels shall be of the appropriate thickness as follows unless stated otherwise:

Ultra low temperature (less than -25 °C) = 5 inches at 42 to 45 KG/M³ (+/-5%) density.
Medium temperature (2º to 6º C) = 4 inches at 42 to 45 KG/M³ (+/-5%) density.

Insulation panels shall be of the foamed-in-placed polyurethane type complying to B.S 476: Part 6: 1989 and 476: Part 7 : 1971 or equivalent. The panel shall be self-extinguishing type cladded on both sides with pre-galvanized, polyester coated steel sheet of 0.5mm thickness.

3 Wall Panels

Wall panel shall be approximately 0.55 mm colour bond within 100 to 150mm PU insulation. The interior face of the wall panel shall be entirely coated with impact

adhesive before the insulation is injected to provide a rigid sandwich and a strong, light, permanent one-peace panel.

Wall panel shall be interlocked using a cam lock or other systems. All joint shall be filled with non-hardening, flexible, non-dry, low-modulus silicon sealant which will retain its elastomeric properties under temperature range of -50°C to 100°C. Wall panels shall be finished with white epoxy paint, over-baked.

Panels shall be of non-CFC resins preferably R-141B based, injected with high-pressure injection machine to attain quick bonding of the polyurethane to the cladding surfaces. Forming by pouring method shall not be accepted. The bonding is such that shear strength is present throughout the area of the panels.

Panel cladding, before injection, must be profiled with corrugations of the normal pattern and the joints edges to be bent at 90°, for jointing purposes.

Panel edges shall be Z type or equivalent configuration to assure proper alignment and airtight vapor-proof joints. The sectional panels shall be joined with either semi-cam-lock. Panel edges shall be with a permanent and positive non-hardening butyl sealant. The sealant shall prevent the ingress of capors, water, vermin and shall resist mold and fungi growth.

4 Floor And Ceiling Panels

Generally same as for wall panels but with coved corners, the exterior finish shall be with aluminium edging strips. The floor finished shall be with epoxy screed.

5 Flooring And Floor Panels

The floor shall be built in at site with a minimum of 100 mm (4”) thick polyurethane insulation slab(plastic vapour barrier) for chiller and freezer room application. On top, the contractor shall cast in situ embedded reinforced concrete (G25) with A8 re-bar (wearing floor). Two layers of vapour seal compound shall be laid in between the insulation slab and the concrete surface and one layer of 75mm thickness RC slab finished with heavy duty non slip homogeneous vinyl or epoxy coating or any other homogeneous material approved by the S.O on top of the cold room application. Floor outlet shall be incorporated in the Cold Room and drain pipe shall be insulated all round.

The floor shall be designed to withstand a uniform load for not less than 300 lb/sq.ft.

All joints shall be water proofed on site with silicone sealants mentioned previously.

6 Door

Manual swing PU door with reinforcement aluminium frame and Stainless steel SS316 hinged finish. The door handle shall be stainless steel SS316 finish air tight with heater for defross avoiding door jam at freezing temperature.

The door shall be stainless steel SS316 hinged on plated, acid resistant hardware. The locking lever handling shall be equipped with an internal release mechanism to prevent personnel from being entrapped inside the cold room. The external door handle shall be lockable.

i. Door Gasket

The door shall be lined with suitable rubber gaskets and a wiper gasket at the bottom othe door panel. The gasket shall be resistant to oil (grease resistant), fats, water and sunlight and shall be replaceable.

ii. Anti-sweat Heaters

Each door shall be provided with anti-sweat heater to prevent condensation and frost formation for freezer room only. The heater shall be concealed behind the metal edge of the door frame and lined around the entire door frame and lined around the entire door perimeter.

7 Lighting

The cold room shall be provided with water and vapor proof lights. The switch with pilot lamp shall be fitted inside the room immediately adjacent to the door.

8 Pressure Ports

A pressure port shall be fitted to cold room (for freezer only) which temperature is below 0 ºC to equalize internal and external pressures caused by sudden temperature change due to opening of doors, loading product and defrosting of coils.

9 Safety Features (High Temperature Alarm/ Man In Cold Room Alarm Kits)

Each walk-in cold room shall be provided with a high temperature alarm system.

A buzzer with a warning light shall be installed outside each of the cold room to warn the attendant should the temperature or relative humidity in the cold room rise above the tolerable design condition.

The warning light shall be installed in a position such that it can be seen easily. The buzzer shall be continuous sounding and the warning light is the intermittent flashing type. The alarm shall be automatically switch off when the cold room conditions are restored to the design conditions. These warning devices shall also been installed at remotely mounted on request.

A SAFETY ALARM SYSTEM consisting of an alarm switch and EMERGENCY SHUT DOWN push button located inside each cold room, with buzzer outside, shall be provided to safeguard accidental lock-up of personnel inside the cold room.

The system shall also include a manually-operated timer-switch, for selection of period of intended use, with suitable light indicators, to indicate presence of personnel inside the cold room. The timer switch shall be manually re-set/switched-off immediately after the user leaves the cold room.

Man in cold room alarm kit must be consisting of control unit with acoustic /visual warning, comes complete with buffer battery and luminous emergency in-room push button.

The kit allows a person trapped inside the deep freezer cold room to activate an acoustic-luminous alarm features a siren and flashing light installed outside the room

and so calls for help. The system will work even in the event of temporary power cut or black-out. This device also must have a clean contact (closed when alarm is active) that can be used to inhibit refrigeration, switch on the interior room light or activate other devices such as a dialer for remote alarm activation.

10 Digital Temperature Display

A Digital Temperature Display (±0.1ºC) control by controller at the starter board shall be fitted outside of the cold room c/w sensing bulb to display the temperature and humidity inside the cold room (as per drawing attached). A thermostat shall be provided to regulate the cold room temperature with the accuracy of ±0.1ºC c/w screen and adjustable set point.

11 Drainage

The Contractor shall install proper drainage of insulated galvanized steel pipes for the cold room. PVC drain pipes may be used for the evaporator unit drainage. Heater tapes shall be provided to the evaporator drain to prevent ice formation.

Each evaporator shall be provided with a drain pan and connected with PVC pipe for drainage.

For low temperature cold room and freezer, the drip pan and drain pipes shall be provided with insulated resistance-wire heaters to prevent freezing of the condensate water.

All drain pipes running external of the walk-in cold-room shall be insulated with Insulflex pipe insulation material.

12 Automatic Temperature and Humidity Recorder

The Contractor shall supply an automatic temperature and Humidity recorder, the recorder shall monitor all the cold room temperature and humidity over 24 hours 7 days and 366 days time span. It shall be wall mounted and enclosed.

13 Refrigerant System

The refrigerant system shall be sized to maintain the specified operating temperature with provision for adjustment of room temperature. The refrigerant capacity shall not less than the specified values in all cases

13.1 Condenser

The Compressor shall be hermetic, air cooled type with R134a/404a/507C refrigerant with seamless steel receiver. The Compressor and condenser shall be mounted in such a way to provide good ventilation. Suction and discharge shut-off valves shall be provided together with refrigerant sight glass and filter drier. High and low pressure controls, oil separator shall be provided and mounting method should be on rubber vibration isolation.

Motors shall be hermetic, high torque, three phase (single phase for motors for 1.5HP and below) type or autotransformer. The motor starter shall be magnetic across-the-line type up to 3HP and star-delta type for larger ones. The condensing units shall be new, free from defects and the compressor shall carry a five (5) years warranty.

The speed of the compressor and motor shall not exceed 1450 rpm and the compressor cooling capacity rating and power rating shall be based on 0 superheat/ 25°C return gas and 45°C with 3°C sub cooling for condensing temperature. The compressor shall be at AC induction type specifically designed for operation on 415 Volts, 3 phase, 50 cycles electric supplies.

The compressor unit shall be equipped with oil level sight glass, oil sump drain plug, internal shaft driven oil pump if applicable, back seating suction and discharge valves, manual reset high pressure and oil failure switches. Low temperature units shall be equipped with Suction Accumulator at suction gas, a full flow refrigerant drier must be utilized on the liquid line to prevent acidification of the refrigerant due to contact with moisture and others application have to equipped with Oil separator.

Units shall be factory piped, wired and tested. Suction and discharge manifolds shall be factory fabricated. Suction line filters, liquid line filter driers, oil separators, oil reservoir and float controlled oil supply system shall all be factory fabricated and mounted.

The motor compressors shall be of accessible hermetic construction suitable for use on CFC free refrigerants with built in 3 phase motor overload protection. The compressor unit shall be equipped with oil level sight glass, oil sump drain plug, driven oil pump if applicable, back seating suction and discharge valves, manual reset high pressure and oil failure switches. Low temperature units shall be equipped with Suction Accumulator at suction gas, a full flow refrigerant drier must be utilized on the liquid line to prevent acidification of the refrigerant due to contact with moisture and others application have to equipped with Oil separator.

The location and installation of compressor shall be in accordance with local and other code requirement. The equipment shall be manufactured and rated in accordance with applicable sections of ARI, ASME, ANSI B-9, ASHRAE and NEC. Factory testing shall include a complete electrical continuity check and system leak test (400 psi high side and 150 psi low side). Units shall be shipped with a dry nitrogen charge.

Notes: All condensing unit for -25ºC low temperature application must be semi-sealed type (2 stages), incorporate with oil protection device for system's oil management. (Condenser's fan must be "EC Fan" installed for energy saving purpose).

13.2 Evaporator

The Evaporator (unit cooler) shall be ceiling mounted type, constructed of aluminium fins on copper tubes and encased in rust free embossed aluminium blades. It shall be completed with air circulation fan designed to discharge air parallel to the ceiling through a multi-fin and tube type coil and grille assembled in a protective housing. Brackets for ceiling installation shall be made of stainless steel. Fan guards shall be provided. A defrost heater element shall be provided together with the evaporator (internal overheat protection). Fin spacing shall not to be less than 7 mm for chiller room and 11 mm for freezer room application respectively.

Low noise level axial fans with sound levels ranging from 57 dB generated by one fan unit to 63 dB produced by 6 fan units as measured on the "A" scale, 6 feet in front of the unit cooler.

Each Evaporator shall have one or more units of electric high pressure propeller fans. The evaporator shall be mounted in a position which maximizes space usage at the same time not throwing cold air directly into the entrance door. The fan motor shall be

totally enclosed with internal overheat protection and life time lubricated ball bearings.

Fan sections shall be individually compartmentalized to prevent reverse rotation in event of motor failure.

Each evaporator shall have one or more units of axial fans with protection “class F IP54”. Each evaporator shall equip with electrical defrost heater for coil, and tray heaters for freezer room applications.

All evaporators units must carry with 2 years product warranty and “EUROVENT” third party certification on the accuracy of capacity and performance on all evaporators supplied by factory.

Notes:

(1) Evaporator selected for -20ºC freezer must come with insulated drip tray and fan guard heaters for fan protection purpose.

(2) Evaporator selected for 2°C cold room must come with defrost heater and “EC Fan” installed for energy saving purpose.

13.3 Refrigerant Pipings

The Refrigerant piping shall be seamless copper tubing complying to BS 659. Piping shall be designed to absorb the vibration of the connection equipment. Hot gas lines shall be graded to permit gravity draining of away from the compressor and towards the condensers. All fittings and connections shall be of flared type with heavy forged brass flare nuts.

The whole of the liquid and suction line refrigerant lines including all fittings, valves and strainer bodies, flanges etc. shall be insulated with 50mm thick Armaflex expanded rubber compound or approved equipment material having a thermal conductivity not greater than 0.3 Btu/hr/sq.ft/in/F at a mean temperature of 73EF. It shall be supplied in a tabular form without a longitudinal joint. At the joints, adjacent insulation shall be closely butted and strapped with and approved, pressure sensitivity type. Strapping shall extended 3O on either side of the joint.

Condensate pipe shall be PVC pipes unless anti freezing heating element is use to prevent condensation. In which case, copper pipe shall be provided. A water sealed shall be incorporated unless stated otherwise.

Refrigerant and condensate drain pipes shall be insulated with 25mm (suction line) and 12mm (condensate pipe) armaflex or Insulflex of flexible expanded rubber compound or approved equivalent and self-regulating heater wrap around the copper drain pipes for all room below 0ºC.

Each system shall be provided with a filter-drier and moisture-indicative sight glass at the condensing unit end. Shut-off valves shall be provided at suitable places for system isolation.

13.4 Defrost Control

Evaporators for low temperature cold room and freezer shall be designed for electric defrost where the medium temperature cold room can be of off-cycle defrost type (air-

defrost).

Electrical defrosting stainless steel tubular heaters manufactured according to appropriate standards shall be fitted for all low temperature coolers. Defrost cycles are to be time clock/initiated and temperature terminated by a factory mounted adjustable thermostat which creates a fan restarting delay preventing warm air and condensate from being discharged into the refrigerated air space. The timer is to have a fail-safe feature which is to effect a second termination if the thermostat should fail. During off cycle, the crankcase heater installed in the compressor shall be energized to prevent liquid slugging and foaming in the crankcase.

13.5 Control Panel

The Control Panel shall be self-contained, wall mounted, cubical type of 16 swg steel. It shall house the starters, fuse distribution boards, defrost timers, air circuit breakers, contactors, indicating lamps, fuse switches, labeled wirings, digital temperature controller with adjustable set point (0.1ºC) etc. Each indicator lamp shall be labeled.

For Freezer Room Application, if the setting temperature and humidity inside the cold room has achieved -10ºC and 85% RH, 1(one) compressor will be cut out to maintain set point temperature and consequently minimizing electricity consumption.

Should the temperature arise beyond set point value, the compressor shall cut in again.

All electrical boards specified in the drawings shall be manufactured in accordance with the approved schematic drawings and board's dimensional drawings.

Control panels shall meet the requirement of Suruhanjaya Tenaga Malaysia and other authorities having jurisdiction in that locality.

The Control Panel shall be located outside the cold room and shall be specified by the Superintending Officer.

All wiring work must be performed in strict compliance with prevailing JBE and IEE regulations. All PVC conduit and trunking shall be made of fire rated materials to Bomba's approval.

13.6 Leak Testing And Evacuation

The system shall be pressurized at 200 psi with nitrogen for at least 12 hours for leak detection with all the valves in the refrigeration lines fully open.

After the system has been fully tested to be leak free, it shall be evacuated to a vacuum pressure of not more than 5mm Hg. For low temperature system a double evacuation procedure will be followed to ensure a complete dehydration of the system.

On conclusion of the leak tests, evacuation shall be carried out to completely remove air from the system. For this purpose a triple evacuation shall be used; twice to 1500 microns and the final time to 500 microns. The vacuum should be broken to 2 psig each time with the same type of refrigerant to be used in the system.

13.7 Protection Against Mechanical Damage

All cables shall be adequately protected against any risk of mechanical damage subject

at local code. All surface wiring shall be protected by enclosure in conduit trunking or equivalent mechanical protection subject to conditions stated by local code of practice.

Rigid PVC conduits which are unaffected by water, acids, oils and soils can be safely buried in concrete, plaster or lime. PVC conduits are not to be used where the normal working temperature of the conduits exceed 60°C. Metal conduits shall be earthed in accordance with local comply with BS 1387 and shall have a corrosion resistant finish inside and outside. The number of cables to pull into a conduit will be based on a space factor of less than 40%.

13.8 Operation On Essential

All Cold Rooms shall run on essential power supply in the case of main power failure. The essential standby power supply from the generator shall be provided by Electrical Specialist Sub-Contractor.

The Cold Room Specialist Sub-Contractor must supply and install separate and complete wiring to attain the above mentioned mode of operation. Terminals must also be provided at the Main Switchboard for connection of standby power supply.

13.9 Other Accessories Inside The Cold Room

i. PVC Curtain At Door Entrance

Low Temperature PVC curtain with 50% overlapping and the width not less than the opening shall be installed above the doors.

14 Testing and Commissioning

On completion the installation, the Sub-contractor shall perform all necessary works to install the system as specified herein, and commissioned the system into proper operation to prove that the individual performance specified for all. He shall also carry out test on the plant as a whole to prove that equipment has been properly adjusted and calibrated to produce the required guaranteed performance as called for according to specification of this tender.

The sub-contractor shall notify the Superintending Officer (S.O) when these test are to be conducted so that a Superintending Officer (S.O) representative may be present to see that the test are carried satisfactorily.

Regular maintenance service will be provided during the twelve months' warranty period. In additional all parts and labour shall be provided free of charge to rectify all defects in manufacture of workmanship during this period.

15 Testing Equipment And Accessories

The Sub-Contractor shall have all necessary testing equipment in order to calibrate and test the system and shall generally include and not limited to the following:

(a) Dry bulb thermometers (0.5°F accuracy)
(b) Sling psychrometer
(c) Velometer with hot wire sensing element
(d) Air velocity meter
(e) Manometer for static pressure

(f) Pressure gauges
(g) Ammeter, voltmeter, power factor meter, megger
(h) Tachometer (N.A)

16 Piping Systems

(a) All pipes, valves, fittings, etc. shall be tested to hydrostatic pressure of 1½ times the normal working pressure of the system, but in no case less than 100 psig for a period a 48 hours. During this period pressure readings as well as the ambient temperature shall be taken at intervals of 3 hours.

(b) During the pressure test, all welding joints, bends, fittings and valves shall be checked for any leaks or deformations for the entire piping system. Expanded conditions of all piping shall be carefully studied and any necessary changes in hangers, anchors or guide locations shall be made.

(c) All equipment not capable of withstanding the test pressure, shall be disconnected when testing the piping with 100 psig, but shall be reconnected and tested with actual working pressure and temperature.

(d) The flow rates through all of the piping system components shall be verified and adjusted until the proper temperature differentials are obtained at full load operation.

(e) All control valves shall also be tested for pressure drop and set for the specified flow rates. When flow rate in the system has been properly set, the spindle and yoke shall be clearly marked and its control hand wheel removed.

17 Control System

(a) All controller and actuators shall be tested for the modulating range to ensure correct operation of all control systems.

(b) Control sequences shall also be verified.

(c) All safety controls shall be tested and if necessary under simulated conditions.

18 Electrical

(a) All thermal overloads on starters shall be checked and adjusted for the actual load and the settings recorded.

(b) All circuit breakers overload settings shall be checked and recorded.

(c) Each motor shall have its voltage and current draw recorded.

19 Reliability Test And Test Records

(a) When the preparatory tests have been completed successfully and the Contractor has notified the S.O. that the installation will be required to operate either continuously or intermittently as maybe required without failure of any kind before the "Handing Over Certificate" will be issued.

(b) Should any failure occur due to, or arising from, faulty fittings, materials or workmanship but otherwise sufficient to prevent the commercial use of the installation, a reliability test period of one calendar month shall be recommended after the Contractor has remedied the cause of failure to the satisfaction of the S.O.

(c) On completion of the testing and commissioning of the installation, the Sub-Contractor shall submit two (2) copies of all test records to the S.O. for verification.

(d) Door release mechanisms should be examined to ensure that they are in good working condition and the door can be opened with the minimum effort. If a positive latch device is fitted, there should also be an emergency door release. Latching devices and emergency release mechanisms should be tested regularly.

20 Equipment Performance Test

Chilled / Freezer Room equipment shall be witness tested at the manufacturer's premises by 2 representatives from Jabatan Kerja Raya (JKR) before equipment being delivered to site.