7. Technical Specification of Kitchen Equipment

Technical specifications of Centralized" Kitchen Equipments" for respective sitesunder Assam Cancer Care foundation are as follows

7.1. REFRIGERATION SYSTEM

7.1.1. SCOPE OF WORK

This section of the Specification covers refrigeration systems. The work shall include, but not be limited to, the supply, delivery to site, installation, testing, commissioning and twelve (12) months free maintenance and warranty of the overall refrigeration system comprising condensing units, evaporator units, all associated works and items including the following:

a) Refrigerant pipework completes with solenoid valves, thermostat, expansion valves, hand valves, sight glass, filter-dryer, oil separators, piping insulation and refrigerant for each system. Distribution for condensate water piping within the compressor room.
b) Condensate drain with exterior traps for coldrooms.
c) Electrical works complete with wiring, with central control panels and local control panels with fault display panels, as required.

The omission from these specifications of express reference to any parts necessary for the complete installation is not to be construed as releasing the Kitchen contractor from responsibility for furnishing such parts.
System design should conform to all local codes, laws, and regulation. In addition, the Safety Code for Mechanical Refrigeration (ASA B9.1-1958) and the Code for refrigeration Piping (ASA B31.5-1962) should be adhered to.

7.1.2. DESIGN CONDITIONS

a) The outdoor design condition shall be taken as 32^{O}C DB and 28^{O}C WB. The cold room temperature shall be as listed in the schedule attached.
b) The selection of the appropriate evaporators and condensing units to suit the coldrooms shall be based on the information given in the schedule.
c) All refrigeration equipment for coldrooms shall operate on CFC free refrigerants, with O zone Depletion Potential of 0.
d) All refrigeration equipment shall be water-cooled and condensers shall be sized for water entering at 31^{O}C unless specified otherwise and water temperature difference shall not exceed 8^{O}C.

7.1.3. REFRIGERATION EQUIPMENT

The CONTRACTOR shall supply and install the entire refrigeration system and shall ensure that the equipment selected must conform to the following specifications:

a) Compressor Units -

The compressor unit packages shall consist of:

i. Unit framework and compressor base plate assemblies shall be of welded structural channel steel construction, be primed before and after fabrication and secure a coat of rust inhibiting grey machinery enamel.
ii. All components and factory piped sub-assemblies are to be rigidly mounted to reduce the possibility of refrigerant line fatigue failures.
iii. 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.

iv. The reciprocating 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, internal shaft driven oil pump, back seating suction and discharge valves, manual reset high pressure and oil failure switches. Low temperature units shall be equipped with head cooling fans. Since the motor is cooled by 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.

v. The location and installation of reciprocating 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.

b **Water Cooled Condensers**

1. Relevant sections of the safety code for Mechanical Refrigeration, under the rules and regulation of ASA Project B9, shall be strictly adhered to ensure the safe operation of shell and tube water cooled condensers.

i The shell and tube water cooled condensers not exceeding and internal f 6" irrespective of pressure, shall be listed either individually or as part of refrigeration equipment by the Underwriters Laboratory having a follow up inspection service. All water cooled condensers shall be pressure tested to withstand pressure of up to 650psi, and provided with pressure relief valve of 400psi.

ii. Condensers exceeding an internal diameter of 6" shall comply with the rules of ASME Boiler and Pressure Vessel code covering the requirements for the design, fabrication and inspection during construction of unfired pressure vessels. In addition to this, the following certification is necessary confirming the necessary inspection and tests:

Net Internal Volume of less than 1.5 cu. ft.	-	UM certification UL recognition
Net Internal volume of over 1.5 cu. ft.	-	National Board Certification

2. The condenser shall feature all copper water channels and epoxy coated tube sheet and water plate to prevent pitting caused by galvanic action. All models shall have easily removable end plates to facilitate cleaning.

3 The MEP contractor shall provide an incoming and return condensate water supply with a valve to the general location of the water cooled condenser. In the case of multiple water cooled condensers located within the same location, the CONTRACTOR will provide the internal distribution for the condensate water pipes to the individual condensers. Each condenser shall have its own isolating valve. The CONTRACTOR shall also provide an interlocking system between the incoming condensate piping system to all compressors with a flow switch, so that when the water flow is disrupted, the compressors shuts down immediately.

4. For this project, the condensing units for all the cold rooms except Cold Room R-22, R-23 and R-24 are located at a centralised condensing unit room at the Basement. The condensing units for R1, R2 and R3, are located above their respective cold rooms. The CONTRACTOR to include costs of condensing unit supports and mounting kits in scope of works.

c **Unit Cooler**

All unit coolers shall consist of:

i. 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.
ii. 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.
iii. Four row deep coils with 12mm OD staggered copper tubes mechanically expanded into corrugated aluminum fins spaced by tube collars. In view of the fact that wide fin spacing reduces air blockage caused by frost, 4-5 fin/inch spacing is to be used for low temperature applications and 6-7 fin/inch for medium temperature applications.
iv. Housing and drain pan to be constructed of textured corrosion resistant aluminum.
v. To maximize storage space, ceiling mounted unit coolers shall be used. Air shall be drawn from the back of the cooler and directed out through the front.
vi. For best operation, the units should be located away from doors or be placed in such a way that air from an open door cannot be drawn directly into the unit coil. Units must also be installed to provide proper drainage of condensate water. The maximum height of coolers shall not exceed 420mm. Units are to be located 230mm from walls for best results.

7.1.4. **DEFROSTING CYCLE**

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 affect 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.

7.1.5. **REFRIGERATION ACCESSORIES AND CONTROLS**

Each system shall consist of the following:

- Filter drier
- sight glass with moisture indicator
- liquid line solenoid valve c/w coil
- liquid line shut-off hand valve
- thermostatic externally equalized expansion valve
- suction accumulator
- by-pass valve for maintenance of filter drier
- defrost timer (for freezer rooms only)
- suction line U-trap
- room thermostat
- electric control panel
- hi-lo pressure switch
- Condenser flow sensing control interlocked to start/stop switch
- Fault display panel
- Pressure and temperature gauges in condenser water in/out lines
- Pressure gauge on hi-side of compressor
- High pressure relief valve

7.1.6. **REFRIGERANT PIPEWORK, VALVES AND FITTINGS**

7.1.7. **Condensate Water Piping**

The condensate should be drained to the nearest floor trap/drain. The condensate drain pipe shall be galvanized 'B' type and insulated with 25 mm "Armaflex" to prevent “sweating". The length of drain lines within the refrigerated space should be kept as shot as possible. The drainline should be pitched downwards 1" per ft and should exit from the cooler as quickly as possible. A trap in the drain line must be provided and should be located outside of the refrigerated space. Pipe heaters should be fitted onto the condensate drainpipes in the freezer coldrooms to prevent freeze-up, to be energized continuously. A heat input of 20 W/ft of drain line

for -18^{O}C and 30 W/ft for -29^{O}C should be satisfactory.

7.1.8. **Refrigeration Piping**

1 **Materials for piping and fittings**

- Unless otherwise specified all refrigeration piping shall be refrigeration grade Type L or Type K hard drawn degreased sealed copper tubing. Alternate proposals may be submitted for the use of Type L refrigeration grade soft copper tubing for long under floor runs only providing runs are straight and free from kinks and bends.
- Extreme care shall be taken to keep all refrigerant piping clean and dry. Each length shall be inspected and swabbed with a cloth soaked in refrigerant oil if any dirt, filings or visible moisture are present.
- All sweat type fittings shall be wrought copper or forged brass. All elbows and return bends shall be of the long radius type. If flare fittings are , they shall be of the frost proof type (except on connections not subject to condensation) and constructed of forged brass. Soldered joints are preferred and shall be used wherever practical.

2 **Installation**

- All refrigerant lines shall be sized in accordance with good industrial practice to sive pressure drops and in conformity to the requirements of the system capacity.
- Branch and main suction lines shall be sized to maintain adequate velocities to ensure proper oil return to the compressor under minimal load conditions at the lowest saturation suction pressure to be expected.
- Tubing shall be installed in a neat, workmanlike manner with horizontal runs sloped towards the compressor at a rate of 254mm per 1.6m.
- Where vertical rises of more than 1.52m occur in a suction line, the riser shall be trapped at the bottom.
- Where a branch suction line enters a main suction line, it shall enter at the top.
- Piping shall be arranged such that refrigerant or oil cannot drain from the suction line into the coil.

All suction lines shall be insulated as follows :

a) For high room temperature applications, 50mm Armaflex or equal.

b) For low room temperature applications below -18^{O}C and below,
Polyurethane insulation or equal. All insulation shall fit the tubing snugly and shall be applied and sealed in accordance to manufacturer's induction to prevent any formation of condensation on the outside of the insulation.

c) Before the refrigerant piping circuit is sealed up, the CONTRACTOR shall carry out pressure testing, tightness testing and flushing of the system to assure that the inside of the pipe is clean. All refrigerant pipe shall be protected by aluminum sheathing encasing the insulation.

All wiring associated with this installation shall be heat and moisture resistant type.

7.1.9. **Vibration isolation of piping system.**

The CONTRACTOR is to incorporate into his refrigeration piping design, features that would minimize effects of vibration so as to prevent physical damage to piping and transmission of noise through the building construction. The piping must be supported securely at intervals of not more than 2.44m using isolated sheath pipe hangers or any isolation hanger as permitted by local standards. Straps and rods attached directly to pipes should not be used.

Flexible metal hoses are to be used and located nearest the vibrating machine at suction and discharge lines in directions parallel to the crankshaft.

7.1.10. **TESTING & COMMISSIONING**

7.1.11. **Leak test**

After completion of the piping installation work, the entire system shall be leak tested. All piping and fittings shall not be painted nor insulated until the completion of the leak test. All weld lines are to be cleared of any slag prior to or during the leak test. The tests shall be carried out as follows:

- The complete system shall be partially charged to a pressure of approximately 35 psig and then further pressurised using and inert gas such as dry nitrogen to not more than 175 psig for testing purposes.
- Repair of leaks should only be carried out after the system is vented of the test pressure gas to 0 psig. Otherwise any heating of pipes could cause the refrigerant within to break down into toxic gases.
- Additional tests shall be carried out on piping that have been subjected to any work. As a final test, to ensure leak tightness, the entire system is to be p;o depressurized to 1 psig sealed and left for not less than 24 hrs.

Conditions

- Oxygen or air must not be used for pressurizing the system.
- Rotation machinery shall not be included in the tests.
- All test pressure for conducting of pressure tests shall be in accordance with the standards set by Underwriter's Laboratories Inc.

Evacuation

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.

7.2. Equipment Specifications:

7.2.1. EL. BOILING PAN+AUTO.FILL. -100L-EASYLINE

ITEM NO: ITEM NO-MK1				**EL. BOILING PAN+AUTO.FILL. -100L-EASYLINE**
QUANTITY: 1				
MAKE: ELECTROLUX / MKN / GARLAND				
MODEL: EBE100AWF/ 232189				
ALTERNATEMAKE: EQUIVALENT				
SIZE				
Width: 1068 mm	Depth: 780 mm	Height: 900 mm		
CAPACITY	100 ltrs			

M.E.P REQUIRMENT				**SPECIFICATIONS**
PLUMBING:				• Stainless steel construction with the deep drawn pan with rounded edges manufactured from AISI 304 stainless steel. Pan can be tilted beyond 90° to completely empty the food. Motorized tilting with tilting axis located in the middle of the pan to keep the pouring lip high and allow tall vessels to be filled. Automatic water filling of the steam generator. • Electric heating elements submerged directly in the water of the jacket. • Food is uniformly heated via the base and the side walls of the pan by an indirect heating system using integrally generated saturated steam at a temperature of 112°C in a jacket with an automatic deaeration system. Safety valve avoids overpressure of the steam in the jacket. Safety thermostat protects against low water level. Max pressure at 0,5 bar. • High thermal input and fast heat up. Electromechanical control. Lower temperate outside the panels. IPX5 water protection. For freestanding installation one left column is necessary for each unit.
Cold	Ø	½"		
Hot	Ø	½"		
Waste	Ø	½"		
ELECTRIC :				
Power	15.0kw			
Voltage	400v/50-60hz/3ph			
EXHAUST				
GAS:				
BTU/h KW	NA NA			
Con.		NA		

ACCESSORIES:	
	• Left leg/column (to be ordered always one unit for single or multiple installation) PNC 928000 • Floor fastening kit (fastening is integrated in the floor - for a correct installation you need 1 for each pan plus 1 for the left column) PNC 928001 • Kit for a correct and easy positioning and installation of the • pan (for a correct installation you need 1 for each pan) PNC 928002 • Floor fastening kit (fastening on the floor surface) PNC 928003 • Measure stick 100lt PNC 928008 • Strainer 8mm holes 100lt PNC 928012
SPECIAL NOTE:	

7.2.2. **100LT EL. BRAISING PAN-DUOMAT BOTTOM AUT.**

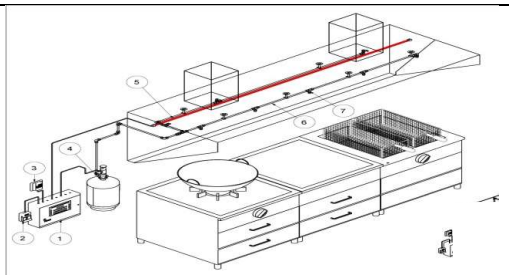
ITEM NO: **ITEM NO-MK2**				**100LT EL. BRAISING PAN-DUOMAT BOTTOM AUT.**
QUANTITY: 1				
MAKE: ELECTROLUX / MKN/GARLAND				
MODEL: E9BREJDPFM/ 391150				
ALTERNATEMAKE: EQUIVALENT				
SIZE				
Width: 1000 mm		Depth: 930 mm	Height: 850 mm	
CAPACITY		100 ltrs		

M.E.P REQUIRMENT				**SPECIFICATIONS**
PLUMBING:				• Unit to be Electrolux 900XP Electric Bratt Pan 100 liter capacity. • Electric characteristics to be ___ 400 V. Infrared heating elements positioned below the cooking surface. Unit shall have Duomat cooking surface for roasting, browning, stewing, preparation of sauces, sautéing, boiling and braising. • Unit can be installed on cantilever systems. Unit shall include mechanism to automatically tilt the pan and double-skinned closing lid in stainless steel. Cooking temperature can be set through thermostat and the energy input through an energy regulator. • Exterior panels of unit in Stainless steel with Scotch Brite finish. Unit has right-angled side edges to allow flush-fitting junction between units.
Cold	Ø	¾”		
Hot	Ø	NA		
Waste	Ø			
ELECTRIC:				
Power		17.0kw		
Voltage		380-400v/50-60hz/3ph		
EXHAUST				
GAS:				
BTU/h KW		NA NA		
Con.		NA		
ACCESSORIES:				
SPECIAL NOTE:				

7.2.3. **COMPENSATING EXHAUST HOOD WITH CAPMAX FILTERS**

<table>
<tr><td colspan="4">ITEM NO: MK 05</td><td colspan="4">COMPENSATING EXHAUST HOOD WITH CAPMAX FILTERS</td></tr>
<tr><td colspan="4">QUANTITY: 1</td><td colspan="4" rowspan="5">  </td></tr>
<tr><td colspan="4">MAKE: HALTON/ CHEFMATE / VIANEN</td></tr>
<tr><td colspan="4">MODEL: WMCH - 4</td></tr>
<tr><td colspan="4">ALTERNATE MAKE: EQUIVALENT</td></tr>
<tr><td colspan="4">SIZE</td></tr>
<tr><td colspan="2">Width:
5300 mm</td><td>Depth:
1500 mm</td><td>Height:
600 mm</td><td colspan="4"></td></tr>
<tr><td colspan="4">M.E.P REQUIRMENT</td><td colspan="4">SPECIFICATIONS</td></tr>
<tr><td colspan="4">PLUMBING :</td><td colspan="4" rowspan="15">• Material of construction SS 304 – 1 mm Thick
• Leak-proof SMACNA Compliant Construction
• Compliant to ASTM F 1704 for Capture and Containment Performance
• Compliant to ASHRAE standard 154, NFPA – 96
• Seamless welded finish for watertight construction
• No sharp edges and well ground surface for human safety
• High Efficiency CapMax® Baffle Filters compliant to NFPA 96
• Filter Inclination as per SMACNA for proper oil flow and collection
• Vapour proof LED fitting with toughened glass with 6500 K Colour temperature
• Sliding Damper for fine balancing of Air flow
• Pressure Sensing ports to monitor plenum pressure
• Ready to connect junction pin for LED light connection
• Peripheral jet SlipStream to contain fumes within the Hood as per ASHRAE 154
• Perforated front in Supply plenum for discharging low velocity make-up air
• Perforated Man cooling grill for Human Comfort</td></tr>
<tr><td>Cold</td><td>Ø</td><td>NA</td><td></td></tr>
<tr><td>Hot</td><td>Ø</td><td>NA</td><td></td></tr>
<tr><td>Waste</td><td>Ø</td><td>NA</td><td></td></tr>
<tr><td colspan="4">ELECTRIC :</td></tr>
<tr><td colspan="2">Power</td><td colspan="2">0.6 kw</td></tr>
<tr><td colspan="2">Voltage</td><td colspan="2">220v/50hz/1ph</td></tr>
<tr><td colspan="4">EXHAUST</td></tr>
<tr><td colspan="4">4000 CFM @ 150 Pa</td></tr>
<tr><td colspan="4">FRESH AIR THROUGH HOOD</td></tr>
<tr><td colspan="4">3400 CFM @ 80 Pa</td></tr>
<tr><td colspan="4">TFA THROUGH CEILING</td></tr>
<tr><td colspan="4">200 CFM</td></tr>
<tr><td colspan="4">ACCESSORIES:</td><td colspan="4"></td></tr>
<tr><td colspan="4"></td><td colspan="4"></td></tr>
<tr><td colspan="8">SPECIAL NOTE:</td></tr>
</table>

7.2.4. **FIRE SUPRESSION SYSTEM FOR EXHAUST HOOD**

ITEM NO: **ITEM NO-MK5A**			**FIRE SUPRESSION SYSTEM FOR EXHAUST HOOD**
QUANTITY: 1			
MAKE : SWASTIK SYNERGY / ANSUL			
MODEL: CONFERNO			
ALTERNATEMAKE: EQUIVALENT			
SIZE			
Width: 5300 mm	Depth: 1500 mm	Height: 600 mm	
CAPACITY			

M.E.P REQUIRMENT				**SPECIFICATIONS**
PLUMBING :				- Provide an automatic, Wet Chemical Fire Suppression System with provision of Manual Pull Station to be located in a path of egress at a maximum height of 60 inches above the floor. - Unit to be provided with nozzles with metal blow off caps for equipment protection, plenum protection and duct protection. - Should provide 100% protection as required by codes, standards, national, state, and local requirements. - Provide Heat Sensing Cable running through entire plenum covering duct cut outs. - Stainless steel pipe drops to be provided to the discharge nozzles and plenum both. Discharge nozzles should not exceed 650mm from each other. - The system, including all of its components, shall be UL Listed - Standard 300 - Automatic actuation shall be initiated by Heat Sensing Cable. - Control Panel shall have provision for indication of any faults in the system & event data logger. - Battery backup shall be provided in the Control panel. **UNIT SHOULD BE INTEGRATED WITH THE FOLLOWING:** - **GAS SHUT OFF VALVE** - **ELECTRICAL EQUIPMENT UNDER THE HOOD** - **HOOD LIGHT (INCASE THE SAME IS IN A NON FIRE RATED ENCLOSURE)** - **HVAC SYSTEM & BMS SYSTEM**
Cold	Ø	NA		
Hot	Ø	NA		
Waste	Ø	NA		
ELECTRIC :				
Power	0.50 k.w.			
Voltage	220v-50c-1p			
EXHAUST				
DETAILS :				
No. of nozzles	12 approx			
Plenum Nozzles	02			
Duct cut-out	04			

SPECIAL NOTE:

- Fire suppression system should be installed by a certified vendor and all testing and commissioning certificated needs to be provided.
- Minimum of five (05) years maintenance contract should be there between the client and the fire Suppression system vendor for periodic maintenance inclusive cylinder and accessories as per fire norms.
- Detail provided in this specification in terms of number of Nozzles, ducts cut outs, distance of unit etc. needs to be coordinated and verified by Vendor. Any Deviation from above mention and specification to be brought to the notice else it is expected that the vendor in following complete specification as mentioned above.
- False ceiling at periphery of hood at 2650 mm from FFL

7.2.5. **3-DOOR REFRIGERATED COUNTER**

ITEM NO: **ITEM NO-MK9/ MK28/ MK38**				**3-DOOR REFRIGERATED COUNTER A304 R290**
QUANTITY: 1+1+1				
MAKE: ELECTROLUX/KOLDTECH /WILLIAMS UK				
MODEL: AC1R3TAAA3/ 790500				
ALTERNATEMAKE: EQUIVALENT				
SIZE				
Width: 1803 mm		Depth: 700 mm	Height: 850 mm	
CAPACITY		259 ltrs		

M.E.P REQUIRMENT				**SPECIFICATIONS**
PLUMBING :				• 3 doors refrigerated counter. Built-in refrigeration unit. • External doors, front, back and side panels in AISI 304 Stainless Steel. • Internal panels and fittings in AISI 304 Stainless Steel. Worktop in AISI 304 Stainless Steel. Ventilated. High-density expanded polyurethane insulating foam, 60 mm in thickness, with cyclopenthane injection for long-term insulation and energy saving. • Digital control panel. Completely automatic defrosting and automatic evaporation of defrost water. • Temperature range: -2/+8° C. CFC and HCFC free. R290 refrigerant gas for the lowest environmental impact - CFC and HCFC free. • Self closing doors and magnetic door seal to guarantee perfect closure.
Cold	Ø	NA		
Hot	Ø	NA		
Waste	Ø	NA		
ELECTRIC :				
Power		0.46kw		
Voltage		220-240v/50-hz/1ph		
EXHAUST				
GAS:				
BTU/h KW		NA NA		
Con.		NA		
ACCESSORIES:				
SPECIAL NOTE:				

7.2.6. **SKYLINE PREMIUMS OVEN**

ITEM NO: ITEM NO-MK19			**SKYLINE PREMIUMS OVEN 10 GN 1/1 - ELECTRIC**
QUANTITY: 1			
MAKE: ELECTROLUX / MKN/ CONVOTHERM			
MODEL: ECOE101T2A0/ 217722			
ALTERNATEMAKE: EQUIVALENT			
SIZE			
Width: 867 mm	Depth: 775 mm	Height: 1058 mm	
CAPACITY	10 GN 1/1		

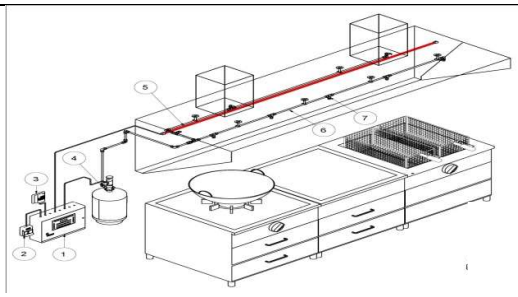
M.E.P REQUIRMENT				**SPECIFICATIONS**
PLUMBING:				• Combi oven with high resolution full touch screen interface, multilanguage - Built-in steam generator with real humidity control based upon Lambda Sensor - Opti Flow air distribution system to achieve maximum performance with 7 fan speed levels - Sky Clean: Automatic and built-in self-cleaning system with integrated descale of the steam generator. • 5 automatic cycles (soft, medium, strong, extra strong, rinse only) and green functions to save energy, water, detergent and rinse aid - Cooking modes: Automatic (9 food families with 100+ different pre-installed variants); Programs (a maximum of 1000 recipes can be stored and organized in 16 different categories); Manual (steam, combi and convection cycles); Specialistic Cycles (regeneration, Low Temperature Cooking, proving, Eco Delta, Sous-Vide, Static Combi, Pasteurization of pasta, dehydration, Food Safe Control and Advanced Food Safe Control) - Special functions: Multi Timer cooking, Plan-n-Save to cut running costs, Make-it Mine to customize interface, Sky Hub to customize homepage, agenda My Planner, Sky Duo connection to Skyline Chillers, automatic backup mode to avoid downtime - USB port to download HACCP data, programs and settings. Connectivity ready • 6-point multi sensor core temperature probe • Double glass door with LED lights • Stainless steel construction throughout • Supplied with n.1 tray rack 1/1 GN, 67 mm pitch.
Cold	Ø	¾”		
Hot	Ø	NA		
Waste	Ø	50MM		
ELECTRIC:				
Power	19.0kw			
Voltage	380-415v/50-hz/3ph			
EXHAUST				
GAS:				
BTU/h KW	NA NA			
Con.		NA		
ACCESSORIES:				

SPECIAL NOTE:

7.2.7. **COMPENSATING EXHAUST HOOD WITH CAPMAX FILTERS**

<table>
<tr><td colspan="4">ITEM NO: MK – 20</td><td colspan="4">COMPENSATING EXHAUST HOOD WITH CAPMAX FILTERS</td></tr>
<tr><td colspan="4">QUANTITY: 1</td><td colspan="4" rowspan="5">  </td></tr>
<tr><td colspan="4">MAKE: HALTON/ CHEFMATE /VIANEN</td></tr>
<tr><td colspan="4">MODEL: WMCH - 4</td></tr>
<tr><td colspan="4">ALTERNATE MAKE: EQUIVALENT</td></tr>
<tr><td colspan="4">SIZE</td></tr>
<tr><td colspan="2">Width:
4200 mm</td><td>Depth:
2800 mm</td><td>Height:
600 mm</td><td colspan="4"></td></tr>
<tr><td colspan="4">M.E.P REQUIRMENT</td><td colspan="4">SPECIFICATIONS</td></tr>
<tr><td colspan="4">PLUMBING:</td><td colspan="4" rowspan="15">• Material of construction SS 304 – 1 mm Thick
• Leak-proof SMACNA Compliant Construction
• Compliant to ASTM F 1704 for Capture and Containment Performance
• Compliant to ASHRAE standard 154, NFPA – 96
• Seamless welded finish for watertight construction
• No sharp edges and well ground surface for human safety
• High Efficiency CapMax® Baffle Filters compliant to NFPA 96
• Filter Inclination as per SMACNA for proper oil flow and collection
• Vapour proof LED fitting with toughened glass with 6500 K Colour temperature
• Sliding Damper for fine balancing of Air flow
• Pressure Sensing ports to monitor plenum pressure
• Ready to connect junction pin for LED light connection
• Peripheral jet SlipStream to contain fumes within the Hood as per ASHRAE 154
• Perforated front in Supply plenum for discharging low velocity make-up air
• Perforated Man cooling grill for Human Comfort</td></tr>
<tr><td>Cold</td><td>Ø</td><td>NA</td><td></td></tr>
<tr><td>Hot</td><td>Ø</td><td>NA</td><td></td></tr>
<tr><td>Waste</td><td>Ø</td><td>NA</td><td></td></tr>
<tr><td colspan="4">ELECTRIC:</td></tr>
<tr><td colspan="2">Power</td><td colspan="2">1.2 kw</td></tr>
<tr><td colspan="2">Voltage</td><td colspan="2">220v/50hz/1ph</td></tr>
<tr><td colspan="4">EXHAUST</td></tr>
<tr><td colspan="4">7200 CFM @ 150 Pa</td></tr>
<tr><td colspan="4">FRESH AIR THROUGH HOOD</td></tr>
<tr><td colspan="4">4800 CFM @ 90 Pa</td></tr>
<tr><td colspan="4">FRESH AIR THROUGH CEILING</td></tr>
<tr><td colspan="4">1600 CFM</td></tr>
<tr><td colspan="4">ACCESSORIES:</td><td colspan="4"></td></tr>
<tr><td colspan="4"></td><td colspan="4"></td></tr>
<tr><td colspan="8">SPECIAL NOTE:</td></tr>
</table>

7.2.8. **FIRE SUPRESSION SYSTEM FOR EXHAUST HOOD**

ITEM NO : **ITEM NO-MK20A**			**FIRE SUPRESSION SYSTEM FOR EXHAUST HOOD**
QUANTITY: 1			
MAKE : SWASTIK SYNERGY /ANSUL			
MODEL: CONFERNO			
ALTERNATEMAKE: EQUIVALENT			
SIZE			
Width: 4200 mm	Depth: 2800 mm	Height: 600 mm	
CAPACITY			

M.E.P REQUIRMENT				**SPECIFICATIONS**
PLUMBING :				- Provide an automatic, Wet Chemical Fire Suppression System with provision of Manual Pull Station to be located in a path of egress at a maximum height of 60 inches above the floor. - Unit to be provided with nozzles with metal blow off caps for equipment protection, plenum protection and duct protection. - Should provide 100% protection as required by codes, standards, national, state, and local requirements. - Provide Heat Sensing Cable running through entire plenum covering duct cut outs. - Stainless steel pipe drops to be provided to the discharge nozzles and plenum both. Discharge nozzles should not exceed 650mm from each other. - The system, including all of its components, shall be UL Listed - Standard 300 - Automatic actuation shall be initiated by Heat Sensing Cable. - Control Panel shall have provision for indication of any faults in the system & event data logger. - Battery backup shall be provided in the Control panel. **UNIT SHOULD BE INTEGRATED WITH THE FOLLOWING:** - **GAS SHUT OFF VALVE** - **ELECTRICAL EQUIPMENT UNDER THE HOOD** - **HOOD LIGHT (INCASE THE SAME IS IN A NON FIRE RATED ENCLOSURE)** - **HVAC SYSTEM & BMS SYSTEM**
Cold	Ø	NA		
Hot	Ø	NA		
Waste	Ø	NA		
ELECTRIC :				
Power	0.50 k.w.			
Voltage	220v-50c-1p			
EXHAUST				
DETAILS :				
No. of nozzles	14 approx			
Plenum Nozzles	04			
Duct cut-out	04			

SPECIAL NOTE:

- Fire suppression system should be installed by a certified vendor and all testing and commissioning certificated needs to be provided.
- Minimum of five (05) years maintenance contract should be there between the client and the fire Suppression system vendor for periodic maintenance inclusive cylinder and accessories as per fire norms.
- Detail provided in this specification in terms of number of Nozzles, ducts cut outs, distance of unit etc. needs to be coordinated and verified by Vendor. Any Deviation from above mention and specification to be brought to the notice else it is expected that the vendor in following complete specification as mentioned above.

7.2.9. **PLANETARY MIXER-ELECTRONIC**

<table>
<tr><td colspan="4">ITEM NO: MG2</td><td colspan="4">PLANETARY MIXER-ELECTRONIC 60LT 400/3</td></tr>
<tr><td colspan="4">QUANTITY: 1
MAKE: ELECTROLUX /SALVA/HOBART
MODEL: XBE60/ 600282
ALTERNATEMAKE: EQUIVALENT
SIZE
Width: 685 mm | Depth: 1050 mm | Height: 1445 mm
CAPACITY 60 ltrs</td><td colspan="4">  </td></tr>
<tr><td colspan="4">M.E.P REQUIRMENT</td><td colspan="4">SPECIFICATIONS</td></tr>
<tr><td colspan="4">PLUMBING :
Cold Ø NA
Hot Ø NA
Waste Ø NA
ELECTRIC :
Power 4.0kw
Voltage 380-440v/50-hz/3ph
EXHAUST
GAS:
BTU/h NA
KW NA
Con. NA</td><td colspan="4">• Floor model, suitable for all kneading, blending and whipping operations. Body in non-corrosive material with 18/8 (AISI 302) 60-liter stainless steel bowl.
• Powerful asynchronous motor (4000 W) with electronic speed variator (10 speed levels from 20 to 180 rpm).
• Removable and dismantled solid safety screen - made of a bisphenol-A free (BPA) copolyester.
• Bowl detection device allows the mixer to switch on only when the bowl and the safety screen are properly installed and positioned together.
• Motor and mechanism are protected against overloading.
• Heavy duty safety screen. Control panel with timer and bowl lighting.
• Geared motor drive system to raise and lower the bowl.
• Supplied with 3 tools: stainless steel spiral kneading hook, cast aluminum paddle and stainless steel wire whisk..</td></tr>
<tr><td colspan="4">ACCESSORIES:</td><td colspan="4"></td></tr>
<tr><td colspan="4"></td><td colspan="4"></td></tr>
<tr><td colspan="8">SPECIAL NOTE:</td></tr>
<tr><td colspan="8"></td></tr>
</table>

7.2.10. **WALK-IN COOLER**

ITEM NO : **WI4**				**WALK-IN COOLER**
QUANTITY: 1				
MAKE : TRUFROST / CELFROST/ BLUESTAR				
MODEL: Customized				
ALTERNATEMAKE: EQUIVALENT				
SIZE -				
Width: 2300		Depth: 2350	Height: 2400	
CAPACITY				
M.E.P REQUIRMENT				**SPECIFICATIONS**
PLUMBING :				PUF Panels 60mm thick . Wall to Wall, Wall to Floor, Wall to Ceiling with *Built-in round-off wall corners.* "T" joint cam-lock interlocking for two coldooms joining together. No use of flashing/riveting to join two rooms. Factory installed PVC gaskets in all PUF Panels for 100% leak-proof jointing. No use of silicon selaent to fill joint gaps
Cold	Ø	NA		
Hot	Ø	NA		
Waste	Ø	NA		
ELECTRIC :				All Inside Wall & Ceiling Area are 0.5mm Stainless Steel SS. Outside Exposed Wall Area 0.8mm Stainless Steel SS304
Power	2.5kw			Outside Un-exposed Wall Area 0.5mm Pre-painted GI Sheet
Voltage	415v/50hz/1ph			Galvanized steel cladded (0.5mm top /0.5mm)PUF Panels. Cam locks -Wall to Wall, Wall to Ceiling, Wall to Floor. Corner 'L' panels for corner panel jointing with side panels
EXHAUST				
				Door will Right/ Left hand side Hinged and Flushed. Built-in cylindrical lock, with cam lift-type self-closing door
GAS:				Dimensions: 850 x 1980mm High (opening)
BTU/h	NA			
KW	NA			
Con.		NA		BITZER Germany factory-make Semi-hermetic Aircooled Condensing Unit
				Trufrost Make Evaporators with SS Casing. Centrally Ceiling -mounted Slim-line evaporator with 150mm height. Dual-side Air Discharge design for uniform air flow .
				Microprocessor based programmable Control Panel for Freezer & Chiller rooms with Isolators, Single Phase protection, Hi-Lo Voltage Protection, Defrost Control, Temperature Control, Compressor Running indicator functions.
				Condensate water from evaporator unit to be routed through wall mounted wall drain traps. SS Box including P-trap to flush fit in civil wall cavity. Site coordination to be done for fitment of SS box as per site condition
ACCESSORIES:				
				Trap Alarm, High-Low Temperature Alarm, PVC Strip Curtain, View Port, 1mm SS Kick Plate on both side of Door, Vapour Proof IP 65 casing for light

7.2.11. **2-DOOR REFRIGERATED COUNTER ON TOP**

<table>
<tr><td colspan="4">ITEM NO: ITEM NO-SC2/ FFP9/ SFP10</td><td colspan="4">2-DOOR REFRIGERATED COUNTER ON TOP A304 R290</td></tr>
<tr><td colspan="4">QUANTITY: 1+2+1</td><td colspan="4" rowspan="5">  </td></tr>
<tr><td colspan="4">MAKE: ELECTROLUX //KOLDTECH/WILLIAMS</td></tr>
<tr><td colspan="4">MODEL: AC1R2NAA3/ 790490</td></tr>
<tr><td colspan="4">ALTERNATEMAKE: EQUIVALENT</td></tr>
<tr><td colspan="4">SIZE</td></tr>
<tr><td colspan="2">Width:
1350 mm</td><td colspan="2">Depth:
700 mm</td><td colspan="2">Height:
850 mm</td><td colspan="2"></td></tr>
<tr><td colspan="2">CAPACITY</td><td colspan="2">175 ltrs</td><td colspan="4"></td></tr>
<tr><td colspan="4">M.E.P REQUIRMENT</td><td colspan="4">SPECIFICATIONS</td></tr>
<tr><td colspan="4">PLUMBING :</td><td colspan="4" rowspan="11">• 2 doors refrigerated counter. Built-in refrigeration unit. External doors, front, back and side panels in AISI 304 Stainless Steel.
• Internal panels and fittings in AISI 304 Stainless Steel. Ventilated.
• High-density expanded polyurethane insulating foam, 60 mm
• in thickness, with cyclopenthane injection for long-term insulation and energy saving. Digital control panel. Completely automatic defrosting and automatic evaporation of defrost water.
• Temperature range: -2/+8° C. CFC and HCFC free. R290 refrigerant gas for the lowest environmental impact - CFC and HCFC free. Self closing doors and magnetic door seal to guarantee perfect closure.</td></tr>
<tr><td>Cold</td><td>Ø</td><td>NA</td><td></td></tr>
<tr><td>Hot</td><td>Ø</td><td>NA</td><td></td></tr>
<tr><td>Waste</td><td>Ø</td><td>NA</td><td></td></tr>
<tr><td colspan="4">ELECTRIC :</td></tr>
<tr><td>Power</td><td colspan="3">0.46kw</td></tr>
<tr><td>Voltage</td><td colspan="3">220-240v/50-hz/1ph</td></tr>
<tr><td colspan="4">EXHAUST</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">GAS:</td></tr>
<tr><td>BTU/h
KW</td><td colspan="3">NA
NA</td></tr>
<tr><td>Con.</td><td></td><td>NA</td><td></td></tr>
<tr><td colspan="4">ACCESSORIES:</td><td colspan="4"></td></tr>
<tr><td colspan="4"></td><td colspan="4"></td></tr>
<tr><td colspan="8">SPECIAL NOTE:</td></tr>
<tr><td colspan="8"></td></tr>
</table>

7.2.12. **WALK-IN COOLER**

ITEM NO : **WI4**				**WALK-IN COOLER**
QUANTITY: 1				
MAKE : TRUFROST /CELFROST/BLUESTAR				
MODEL: Customized				
ALTERNATEMAKE: EQUIVALENT				
SIZE -				
Width: 3100		Depth: 2650	Height: 2400	
CAPACITY				
M.E.P REQUIRMENT				**SPECIFICATIONS**
PLUMBING :				PUF Panels 60mm thick . Wall to Wall, Wall to Floor, Wall to Ceiling with *Built-in round-off wall corners.*
Cold	Ø	NA		"T" joint cam-lock interlocking for two coldooms joining together. No use of flashing/riveting to join two rooms.
Hot	Ø	NA		Factory installed PVC gaskets in all PUF Panels for 100% leak-proof jointing. No use of silicon selaent to fill joint gaps
Waste	Ø	NA		
ELECTRIC :				All Inside Wall & Ceiling Area are 0.5mm Stainless Steel SS.
Power		2.5kw		Outside Exposed Wall Area 0.8mm Stainless Steel SS304
Voltage		415v/50hz/1ph		Outside Un-exposed Wall Area 0.5mm Pre-painted GI Sheet
EXHAUST				Galvanized steel cladded (0.5mm top /0.5mm)PUF Panels.
				Cam locks -Wall to Wall, Wall to Ceiling, Wall to Floor. Corner 'L' panels for corner panel jointing with side panels
GAS:				Door will Right/ Left hand side Hinged and Flushed. Built-in cylindrical lock, with cam lift-type self-closing door
BTU/h		NA		Dimensions: 850 x 1980mm High (opening)
KW		NA		
Con.		NA		BITZER Germany factory-make Semi-hermetic Aircooled Condensing Unit
				Trufrost Make Evaporators with SS Casing. Centrally Ceiling -mounted Slim-line evaporator with 150mm height. Dual-side Air Discharge design for uniform air flow .
				Microprocessor based programmable Control Panel for Freezer & Chiller rooms with Isolators, Single Phase protection, Hi-Lo Voltage Protection, Defrost Control, Temperature Control, Compressor Running indicator functions.
				Condensate water from evaporator unit to be routed through wall mounted wall drain traps. SS Box including P-trap to flush fit in civil wall cavity. Site coordination to be done for fitment of SS box as per site condition
ACCESSORIES:				
				Trap Alarm, High-Low Temperature Alarm, PVC Strip Curtain, View Port, 1mm SS Kick Plate on both side of Door, Vapour Proof IP 65 casing for light

7.2.13. **HEATED BANQUET TROLLEY**

ITEM NO: ITEM NO-FFP8, SFP7, ST1				**HEATED BANQUET TROLLEY-10 GN 2/1**
QUANTITY: 2+2+7				
MAKE: ELECTROLUX / BLANCO/ ALTO SHAAM				
MODEL: BT1021H/ 351156				
ALTERNATEMAKE: EQUIVALENT				
SIZE				
Width: 770 mm		Depth: 885 mm		Height: 1570 mm
CAPACITY		10GN 2/1.		

M.E.P REQUIRMENT				**SPECIFICATIONS**
PLUMBING :				• Constructed in double-walled, 304 AISI stainless steel with expanded polyurethane insulated panels. • Ergonomic handles for easy movement. • 304 AISI stainless steel grids capable of holding GN 2/1 • and GN 1/1 containers or plates. Temperature can be set from 30°C to 90°C with digital display. • Humidity can be added inside the chamber to keep food from drying. • N. 2 fixed castors and N. 2 swivelling castors with brakes, mm125 in diameter. • Full perimeter bumpers for added shock protection. • By using the optional eutectic plates it is possible to keep dishes at a temperature of +5°C for about two hours. • Load capacity: 170 Kg.
Cold	Ø	NA		
Hot	Ø	NA		
Waste	Ø	NA		
ELECTRIC :				
Power		2.7kw		
Voltage		230v/50-60hz/1ph		
EXHAUST				
GAS:				
BTU/h KW		NA NA		
Con.		NA		
ACCESSORIES:				
SPECIAL NOTE:				

7.3. EQUIPMENT, MATERIALS AND INSTALLATION

7.3.1. All equipment and materials shall be new and without blemish or defect.

7.3.2. Installations works, materials and equipment shall be in full compliance with the Local Code of Practice and Regulations. In the absence of a Local code, the UK's code and regulations shall govern. All costs and fees connected with any inspection, tests and permits for the installation carried out by the authorities shall be borne by the CONTRACTOR.

7.3.3. Electrical equipment and materials shall be products which will meet with the acceptance of the agency inspecting the electrical work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be examined, tested and certified as to the type or quality of materials or equipment as indicated.

7.3.4. All electrical equipment shall be rated for compatibility and operation on the single/three phases main power supply as provided by relevant local authorities for the project concerned.

7.3.5. Equipment shall conform to current standards established by the National Sanitation Foundation.

7.3.6. Steam heated equipment shall be in accordance with requirements of the A.S.M.E. or relevant B.S. specification.

7.3.7. Gas heated equipment shall be equipped with automatic pilot lights. Ovens and other concealed burners (including air blast wok ranges and steam cabinets) shall have flame failure devices fitted to CE standards or approved equal.

7.3.8. Exhaust hoods and fire protection system shall comply with the N.F.P.A. Bulletin 96, and requirements of the local fire department.

7.3.9. It is the intent of these specifications that wherever a manufacturer of a product is specified, and the terms "other approved" or "approved equal" or "equal" are used, the substituted items must conform in all respects to the specified item. No consideration will be given to claims that the substituted items meet the performance requirements with lesser construction. Performance as delineated in schedules and in the specification shall be interpreted as minimum performance.

7.3.10. The use of brand names shall serve as a guide as to the type and quality of equipment required and shall not preclude other makes being offered.

7.3.11. The CONTRACTOR shall be responsible to provide proof and evidence that equipment substituted by other makes than those specified shall conform in all respects to the specified items. Consideration with be given to the availability and quality of service and maintenance in the local market, notwithstanding the brand names being called up in the specifications.

7.3.12. The CONTRACTOR shall be responsible for obtaining approval from the Local Authority for the operation of the Food Service Equipment notwithstanding the brand names being called up in the specification.

7.3.13. All equipment of one type (such as pumps, valves, etc.) shall be the products of one manufacturer, wherever possible

7.3.14. Substituted equipment or optional equipment where permitted and approved, must conform to space requirements. Any substituted equipment that cannot meet space requirements, whether approved or not, shall be replaced at the contractor's expenses. any modifications of related systems as a result of substitutions shall be made at the contractor's expense.

7.3.15. Note that the approval of shop drawings, or other information submitted in accordance with the requirements herein before specified, does not assure that the Engineer, Architect, or any other Owner's Representative, attests to the dimensional accuracy or dimensional suitability of the material or equipment involved or the ability of the material or equipment involved or the mechanical performance of equipment. Approval of Shop Drawings does not invalidate the plans and specification if in conflict unless a letter requesting such change is submitted and approved on the Engineer's letterhead.

7.3.16. Substitutions of equipment for that shown on the schedules or designated by model number in the specification will not be considered if the item is not a regular catalogued item shown in the current catalogue of the manufacturer.

7.4. TOOLS

- All special tools for proper operation and maintenance of the equipment provided under this specification shall be included in the supply of this equipment and shall be delivered to the Owner's representative and a receipt requested for same.

7.5. MISCELLANEOUS FIRE PROTECTION

- In addition to fire protection means specified elsewhere in this specification, this CONTRACTOR shall comply with the following:
  All spaces between pipes and their respective sleeves shall be packed full depth with mineral wool, or other equally fire resistant material, and compressed firmly in place. Fibre glass shall not be used. Sleeve clearance shall not exceed 1/2" between pipes (or ducts) and sleeves. Use individual sleeves for each pipe or duct. Before escutcheons are attached caulking must be available for inspection and notification should be made to the site supervisor.

7.6. PHOTOGRAPHS AND MAINTENANCE/OPERATIONAL MANUALS

- The CONTRACTOR shall also furnish each of the same parties, a complete documentation of operational and maintenance manuals of all Foodservice equipment. CONTRACTOR should also provide a recommend list of spare parts to the owners.
- Manuals are to be separate for each location and as built drawings are to be part of the documentation (i.e. layout and rough-in)

7.7. TESTING, COMMISSIONING, TRAINING

- Prior to commissioning the equipment, the CONTRACTOR is to satisfy himself through extended equipment testing that all equipment is working satisfactorily and in accordance with manufacturer's instructions.

- The commissioning of the equipment shall be effected only for an entire area or kitchen at one time and which areas have to be fully operation and completed with all items, accessories, parts, etc. Sufficient advice of the commissioning period has to be given to the Arc and CONTRACTOR shall establish a detailed report on the event. All raw material and such as is deemed necessary and adequate for the purposes of testing, demonstrating and commissioning of the equipment shall be provided by the employer.

- All works of guarantee, rectifications, amendments etc., arising from the commissioning of the equipment and reasonably required by architect shall be rectified within the shortest possible period of time, to be stipulated at that point in time. Appropriate advice of the completed works has to be given.
- The hospital's F&B departmental key staff shall assist at the commissioning of all equipment. Moreover the CONTRACTOR will maintain on site a qualified engineer for a minimum period of four (4) days following the commissioning period for the purpose of providing repeated in-depth training on all equipment to the operators F&B departmental key staff. The CONTRACTOR should satisfy himself that the operator's staff is well instructed on the equipment and is able to handle and maintain the equipment in the manner as to guarantee minimal disturbance to the operation and maximum life span. A log book of all training activities shall be kept by the CONTRACTOR during the said training period and handed over to the owner after completion.

7.8. DEFECTS LIABILITY PERIOD

1. The Defects Liability Period shall be the 365 days following the date of successful final Commissioning and acceptance of the works by the architect. During the Defects Liability Period the CONTRACTOR shall provide full service and maintenance in accordance with the definitions in of this specifications.

7.9. PIPING SYSTEMS

7.9.1. PIPING SYSTEMS – GENERAL
7.9.2. The drawings indicate schematically the size and location of piping. Piping shall be set up and down and offset to meet field conditions and co-ordination between trades without additional cost. Piping shall conform to the latest BS code for pressure piping.
7.9.3. Pipework shall conform fully to the following requirements:

a) Provide proper provision for expansion and contraction in all portions of pipework, to prevent undue strains on piping or apparatus connected therewith.

b) Approved bolted, gasketed, flanged (screwed or welded) joints shall be installed at all apparatus and appurtenances, and wherever else required to permit easy connection and disconnection. Screwed unions with steel faces can be used on piping 2" or less.

7.9.4. Screwed piping shall conform to the following :

a) Pipe nipples - Any piece of pipe 3" in length and less shall be considered a nipple. All nipple with unthreaded portion 1 - 1/2" and less shall be extra heavy. Only shoulder nipples shall be used. No close nipples will be provided.

b) Screw threads shall be cut clean and true; screw joints made tight without caulking. No caulking will be permitted. A non hardening lubricant will be permitted. No bushings shall be used. Reductions, otherwise causing objectionable water or air pockets, to be made with eccentric reducers or eccentric fittings. All pipe shall be reamed out after cutting to remove all burrs

7.10. MATERIALS FOR PIPE

i. Pipe shall be fabricated from the following :

Steam	API Sch 40 seamless
Steam Condensate Return	2 - 1/2" & Smaller
Drips and Pump Discharge	API Sch 40 seamless
Hot & Cold Water	3" & Larger - Standard Weight Steel Type L Copper or B.S. 2871 Table X. Flanged pipe at 80mm (3.2") and above. Capillary joint pipes below 80mm (3.2").
Hot water pipe chased in	UPVC insulated copper pipes to BS 2871 Table X, walls up to 50mm (2") inside Part 1.
Old water Service	Un plasticized PVC pipes (BS Class D) to BS 3505, 4346 (Parts 1 & 2).
Gas Pipes	Galvanized steel to BS 1387 and heavy grade and fitting to BS 1740 for screw joints.
Cleansing water pipes	Galvanized steel to BS 1387 medium grade
Vent stacks at 80mm (3.2") NPS And above	Lead caulked cast iron socket and spigot pipe to BS 416.
Vent stacks and anti siphonage pipes below 80mm NPS	Galvanized steel to BS 1387 medium grade with screw joints.
Kitchen waste pipe up	Galvanized steel to BS 1387 medium grade withto 50mm (2") NPS screwed joints; or cast iron pipe to cast iron soil pipe institute standard 301-60T.
Compressed Air	Galvanized steel to BS 1387 Heavy Grade.
Air Vacuum	Galvanized steel to BS 1387 Medium Grade.

ii. Unless specified otherwise herein all pipes shall conform to be Local Waterworks Standard Requirements or British Standard Specification and shall be approved by the Building Authority.

iii. All copper tubing shall be not less than 99.9 per cent pure copper. Wherever possible, tubing shall be continuos with couplings up to 20 ft. in length. Tubing shall conform to BS 2871. Cast iron, ductile iron, galvanized wrought iron galvanized steel or copper pipes of approved grade will be used for fresh water inside service. Consideration can also be given for the use of unplasticized

iv. PVC pipes and fittings of approved grade on cold water inside service upon application by the authorised person or a licensed plumber nominated in writing by him. All unplasticized PVC pipes must be properly supported and shielded from direct sun rays and must be painted with white acrylic paint when exposed. CONTRACTOR is to provide details of type, make and duty of all pipe materials and fittings to be used on forms prescribed by Local Waterworks Authority to be submitted for approval.

v. No hub type cast iron pipe shall be in accordance with Cast Iron Soil Pipe Institute Standard 301-60T.

vi. Piping specifications shall be submitted as required with shop drawings.

vii. All exposed piping in the kitchen shall be chrome plated.

viii. Metallic piping should not be fixed in contact with magnesium oxychloride flooring composition; which is injurious to most metals and alloys or in contract with Keene's cement and certain other quick setting materials having acid constituents. All galvanized steel piping that comes into direct contact with concrete shall be bitumen coated and wrapped with hessian or other suitable material.

ix. Copper pipes are not to be used in conjunction with galvanized steel cisterns, cylinders or pipes. Where copper piping is used, consideration should be given to the use of copper cylinders and cisterns or cisterns of non-metallic material. In the event of contact of dissimilar metals in the presence of some waters resulting in corrosion due to galvanic action, the use of such metals should be avoided or kept apart by the use of fittings made of electrically non-conducting materials

x. Pipe sleeves shall be provided for all pipes penetrating floor slabs or walls. Spaces between pipes and sleeves are to be filled with a fire resistant material (mineral wool) and compressed firmly in place. The clearance between pipe and sleeve shall not exceed 12mm (0.5"). All pipe work shall be inspected by a representative of the Local Authority Governing Utilities before it is backfilled or covered over.

xi. All cast iron pipe work shall be coated internally/externally with black bitumen material to BS 3416 Type 2 (except where pipe is concrete lined)

7.11. MATERIAL FOR FITTINGS

i. Fittings shall conform to the following:

Note that table defines the pipe size above which it becomes mandatory to fabricate by means of welding. Where table indicates screwed fittings, the CONTRACTOR may elect to use welding fittings. Pressures shown are SWP (Steam Working Pressure).

Steam	2 - 1/2" & larger: flanged
Condensate, return, drip & condensate pump discharge	2" & smaller - 125 SWP: cast iron screwed.
Hot & Cold water	3" & Larger - Standard Weight Steel Type L Copper or B.S. 2871 Table X. Flanged pipe at 80mm (3.2") and above. Capillary joint pipes below 80mm (32').

Compressed air	Galvanized steel to BS 1387 Heavy Grade.
Air Vacuum	Galvanized steel to BS 1387 Heavy Grade.
Vents and reliefs	Galvanized steel to BS 1387 medium grade with siphonage pipes below screw joints.

ii. All welding elbows shall be long radius elbows.

iii. Welding end fittings shall have the same bursting pressure as pipe of the same size and schedule. The fittings shall be one piece except that weld holes are permitted where branches are at least one pipe size less than the main. Saddles are also permitted, where branches are at least one pipe size less than the main, for all services except steam 16 psig or higher, and water over 125 psig.

iv. All solder for copper tubing shall have a melting point of not less than 460 degrees F., composed of 95% tin and 5% antimony. All piping shall be installed in a workmanlike manner, according to the manufacturer's instruction. All joints shall be thoroughly cleaned before connecting.

7.12. VALVES

i. Furnish and install valves shown on the drawings, specified herein and/or necessary for the control and easy maintenance of all piping and equipment. All valves shall be first quality of approved manufacture, shall have proper clearances, and shall be tight at the specified test

ii. pressure. Each valve shall have the maker's name or brand, the figure or list number and the guaranteed ANSI working pressure cast on the body and cast or stamped on the bonnet, or shall be provided with other means of easy identification. All valves shall be the product of one manufacturer except for special application. Where figure numbers of one manufacturer are stated, equivalent figure numbers can be substituted.

iii. Valves shall be of minimum working pressure and materials as fittings specified for the service except as herein modified. All gate and globe valves shall be suitable for recapping under pressure. Regardless of service, valves shall not be designed for less that 125lbs. per square inch steam working pressure.

iv. Gate valves shall conform to the following categories. Where figure numbers of one manufacturer are stated, equivalent figure numbers can be substituted.

GA-V1

Gate valves 2" and below shall be Toyo fig 206A bronze, screwed, 125 # S.W.P. with sold wedge disc and non-rising stem.
Gate valves above 2" shall be Toyo fig 421A cast iron, flanged, 125 # S.W.P. OS & Y with bronze trim.

GA-V2

Gate valves 2" and below shall be Toyo fig 298 bronze, screwed, 150 # S.W.P. with solid wedge disc, union bonnet, rising stem.
Gate valves above 2" shall be Toyo fig 712 cast steel, flanged, 150 # S.W. OS & Y with bronze trim.

GL-V1

Globe valves 2" and below shall be Toyo fig 220 bronze, screwed, 125 # S.W.P. with renewable teflon seat and non-rising stem.
Globe valves above 2" shall be Toyo fig 400A cast iron, flanged, 125 # S.W.P. OS & Y with bronze trim.

GL-V2

Globe valves 2" and below shall be Toyo fig 221 bronze, screwed, 150 #S.W.P. with renewable teflon seat, union bonnet, rising stem.
Globe valves about 2" shall be Toyo fig cast steel, flanged, 150 #S.W. OS & Y with bronze trim.

CH-V1

Check valve 2" and below shall be Toyo fig 236 swing type, brass or bronze, screw ends.

Check valve above 2" shall be Toyo fig 682 swing type, cast iron bronze trim, flange ends.

CH-V2

Check valves 2" and below shall be Toyo fig 230 lift type, brass or bronze, screw ends.

CH-V3

Check valve shall be butterfly type with spring return.

ST-1

Strainer 2" below shall be Toyo fig 380 brass or bronze with 20" mesh stainless screen.
Strainer above 2" shall be Toyo fig 381A cast iron body with 20 mesh brass screen.

ST-2

Strainer 2" and below shall be Toyo fig 380 brass or bronze with 20 mesh stainless steel screen. Strainer above 2" shall be Toyo fig 381A cast iron body with 20 mesh stainless screen.

7.13. WELDING PROCEDURE

i. Pipe welding shall comply with the provisions of the latest revision of the applicable code, or such local requirements as may supersede codes mentioned above.

ii. Before any new pipe welding is performed, submit a copy of welding Procedure specifications together with proof of its qualification as outlined and required by the mostrecent issue of the code having jurisdiction.

iii. Before any operator shall perform any pipe welding, submit the operator's Qualification Record in conformance with provisions of the code having jurisdiction, showing that the operator was tested under the proven Procedure Specification submitted.

7.14. - FOOD SERVICES EQUIPMENT: GENERAL REQUIREMENTS

SCOPE OF WORK

i. The work to be performed under this section of the Specification shall comprise the supply, delivery to site, installation, testing, commissioning and maintenance of the Food Services Equipment as hereinafter more fully described and shown on the Drawings; also including such minor works as are necessary for the proper carrying out of the installation and operation of the equipment, whether or not such works are specifically called for in the specification and Drawings.

ii. In all cases where a device or part of an equipment is herein referred to in the singular number, it is intended that such reference shall apply to as many devices as required to complete the installation.

7.15. GENERAL

i. Brand names and catalogue numbers used in the Contract Documents serve to define the specific requirements of each of the items of equipment with regard to type, size, capacity and quality required. All layout drawings are prepared on the basis of the brands. Offers of alternate brands must fit into the layouts as shown in the Drawings without exception. Should for any reason being the CONTRACTOR responsibility modifications be required and approved by the Arc all costs involved including cost of modifications to other related works shall be borne by the CONTRACTOR.

ii. Each item of equipment shall be supplied complete with all accessories and fittings whether specifically called up for in the specifications or not and shall be ready for operation when hooked-up to the appropriate services.

iii. All equipment shall be delivered completely prewired and piped to an external point for hooking up to the appropriate services. All wiring shall be carried out in galvanized steel conduits. The hook-up for all building services shall be done in a work-manship like manner in terms of aesthetics safety and function. No pipework or conduits shall be executed exposed to the view, they shall neatly concealed either by proper box-up or otherwise (except gas lines). Any exposed pipework which cannot be concealed at all shall be either stainless steel or chrome plated for ease of cleanability (except gas lines which may need to be colour coded).

iv. All socket outlets installed shall be water and vapour proof (subject to local code practice).

v. Equipment with permanently connected services must be adequately anchored to prevent movement.

7.16. STANDARD MANUFACTURED EQUIPMENT

i. Drawings, specifications, and other information provided by the manufacturers of manufactured equipment shall be followed whether or not the said information is included in the Contract Documents
ii. Furnish an approved gas pressure regulator for individual gas fired equipment, when one is not provided by the manufacturer. Gas pressure regulators shall be standard adjustable water column pressure and shall be of a type to properly regulate gas flow to burners and pilot lights. For modular in-line range assemblies the CONTRACTOR shall properly coordinate equipment requirement with other relevant trade to ensure the proper and correct gas supply pressures on the supply lines.

iii. Refrigerators and freezers shall be furnished with exterior digital thermometers with chrome plated bezels. Thermometers shall be adjustable and shall be calibrated after installation.

iv. Refrigerators and freezers with remote refrigeration systems shall be complete with thermostatic expansion valves at the evaporator coil.
v. Refrigerator and freezer hardware shall be heavy-duty. Hinges shall be self-closing up to 90 degrees; beyond which they shall stay open. Latches shall be magnetic edge mount-type, unless otherwise specified.
vi. Refrigerator and freezer door latches shall be fitted with heavy duty cylinder locks, all keyed alike within respective work areas and provided with master keys.
vii. Provide all dishwashers, internally wired by the manufacturer to junction boxes, including push button switches, motors, immersion heaters, solenoids, etc.
viii. The CONTRACTOR is to satisfy himself that the equipment supplies are suitable for operation with the energy media available locally notwithstanding the brand names called up in this specification.
ix. All roll-in refrigerators shall be furnished with a 2/1 angle trolley each

7.17. FABRICATED EQUIPMENT

Work as included under this heading of the specifications shall conform with current Standards and Revisions established by the National Sanitation Foundation (USA).

General Construction

i. Fabricated equipment must be undertaken by one manufacturer only, satisfactory to the Architect.
ii. Work shall be done in an approved workmanlike manner satisfactory to the Architect.
iii. Stainless steel shall be standard gauge, 18-8, Type 304 (not over .012% maximum carbon) No. 4 finish.
iv. All framework shall be of welded construction with welds ground smooth. The framework shall be stainless steel.
v. Edges for general shelving shall be 90 degrees bent down 40mm and inwards 90 degrees 12mm (0.5") unless otherwise detailed, with corners ground, and polish
vi. All seams and joints shall be welded. Welds shall be ground smooth and polished tomatch the original finish.

vii. Field joints in stainless steel tops, etc., where required due to equipment size orinstallation requirements, shall be welded, ground and polished to match surrounding surface.

Note : Butt joints made by riveting straps under seams and filling with solder is unacceptable

viii. Underside of open base table tops, shelves, sinks, and drain boards shall be sound deadened in accordance with N.S.F. with "Tacky Tape", or bitumen base. For tables with under shelves, the sound deadening material is to be applied between the support frames and tabletop sheet.
ix. Verify size and location of all duct connections with the VAC Contractor before fabrication.
x. Back and end splashes on table tops shall be bent 90 degree upwards, radius 19mm (0.75") 25mm (1"), shall be covered with a 80mm (3.2") high 12mm (0.5") deep s/s U-channel fixed with s/s tap screw and washer in linear intervals of not less than 600mm. Top edge of U-channel shall be sealed with MDL 582054 rubber profile or approved equal. Corners of U-channel shall be cut 45 degrees to assure smooth joint. Sidesplashes shall be provided whenever equipment abut a wall.
xi. Trademarks and names of fabricator shall not be affixed to equipment without written approval of the Architect.
xii. All components of fabricated equipment shall be of the following materials, unless otherwise specified in accordance with the ACCFModular Standards according to the class grade of material specified elsewhere in the specifications.
xiii. All hardware and plumbing fixtures shall be identified with manufacturers name and number so that broken or worn parts may be replaced. CONTRACTOR shall submit sample if requested.
xiv. All items to be fabricated as shown on drawings and elevations and subject to verification of site dimensions.
xv All fabricated equipment shall be inspected by FSC and client or the client's representative during factory visits. These factory visits shall be carried out in two stages. The first factory visit shall be carried to approve all sample materials and typical fabricated equipments. The second factory shall be carried out when the majority of equipments are completed prior to shipping.

7.18. DESCRIPTION OF MATERIAL GRADE C1

1	Metal table tops	16 ga s/s (1.58)
2	Wood table tops	2" (50.8mm) thick laminated hard Northern maple (unless prohibited by applicable health codes)
3	Sink, drainboards or backsplash	16 ga s/s (1.58)
4	Bain marie	16 ga (1.58mm)
5	Elevated shelves and under shelves	16 ga s/s (1.58mm)
6	Glass rack shelves	16 ga s/s (1.58mm)
7	Body, exposed	18 ga s/s (1.27mm)

8	Body, unexposed	18 ga s/s (1.27mm)
9	Legs	41.3mm x 41.3mm outer size 16 ga s/s (1.59mm) square tube
10	Crossrail	25mm x 25mm outer size 16 ga s/s (1.59mm) square tube
11	Feet	14 ga s/s (1.98mm) adjustable bullet type
12	Drawer pans	18 ga s/s (1.27mm) coved and removable
13	Drawer faces	18 ga s/s (1.27mm)
14	Drawer frames	14 ga s/s (1.98mm)
15	Outer hinged and sliding door pans	18 ga s/s (1.27mm)
16	Inner hinged and sliding door pans	20 ga s/s (0.95mm) 2B finish
17	False bottoms	18 ga s/s (1.27mm) perforated
18	Top and shelf braces	14 ga s/s (1.98mm)
19	Refrigerated fixture exterior	18 ga s/s (1.27mm)
20	Refrigerated fixture interior	20 ga s/s (0.95mm) 2B finish
21	Refrigerator shelving	s/s wire
22	Ice bins	exterior 16 ga s/s (1.59mm) interior 18 gas/s (1.27mm)
23	Wall brackets	14 ga s/s (1.98mm)
24	Exhaust ducts and collars	18 ga s/s (1.27mm)
25	Wall flashing	18 ga s/s (1.27mm)
26	Sink fitting	rotary waste valve with strainer and overflow
27	Shelf turn ups	on back and sides where table abut walls or equipment
28	Sound deadener	under table-top
29	Plumbing hook-up material	to general specifications
		conventional channel with gummi profile
30	Backsplash type	- fixed to wall

31. Tabletops

Metal tops shall be one-piece welded construction, reinforced on the underside with bracing welded in place to permit tops to support heavy weight without deflection. Lateral and cross bracing shall be 100mm (4") wide 40mm (1.6") turned down, 12mm (0.5") in U-channel, spot welded along both perimeters to underside of table, open end facing downward. The front edge of table shall be 50mm (2") turned down (channel edge), 20mm (0.79") bent inwards at 120 degree to vertical.

32. Legs And Crossrails

Welds at crossrails shall be ground smooth. Legs shall be fitted with sanitary feet with not less than 3/4" (19.0mm) adjustment. Legs shall be fastened to equipment continuously welded.

33. Cabinet Bodies

Enclosed cabinet bodies shall be fabricated from stainless steel sheets reinforced with U-channel frame members to form a rigid structure. Bodies shall be welded construction with front rails, mullions, etc., welded to appear as one-piece construction. Exposed and unexposed exterior and interior sections shall be stainless steel.

34. Drawers

i. Drawers front shall be sealed, double-pan construction.

ii. Drawer pulls shall be one piece construction, incorporated in front panel, as per enclosed cut sheet detail.

iii. Drawer slides shall be COMPONENT HARDWARE SERIES S25 or approved equal.

iv. Drawer assemblies shall be self-closing when empty and easily removed withouttools.

v. Drawer pan insert shall be S/S 1/1GN (RIEBER, FRANKE, BLANCO OR APPROVED EQUAL.) unless otherwise specified.

35. Doors

i Doors shall be double-pan, sound insulated construction, with outer corners weldedand polished. Outer and inner pans tack welded with seams soldered to form a 3/4"(19.0mm) finished thickness.

ii. Door pulls shall be one piece construction incorporated in front panel as per enclosedcutsheet detail.

iii. Single-pan doors shall be reinforced with 18 gauge (1.27mm) stainless steel closed at sections.

iv. Hinged doors shall be flush mounted with a continuous stainless steel, door pull.

v. Door hinges shall be COMPONENT HARDWARE R42-2842 or approved equal,spring loaded for self closing for all underbars, reach-ins and undercounter refrigerators/freezers.

vi. Sliding doors shall be suspended, quiet in operation, large size stainless steel wheelsand stainless steel ball bearings, mounted in overhead tracks as per COMPONENTHARDWARE B57 series or approved equal.

vii. Sliding doors shall be removable without the use of tools.

36. Shelves

i. Open base table undershelves shall be a full 90 degrees bent down 40mm (1.6") and 90 degrees bent inwards 12mm (0.5"), edges ground and welded tightly to legs. Under-shelves shall be turned up 1" (25.4mm) at back and sides where tables abut

walls and other equipment.

ii. Enclosed base table undershelves shall be stationary, unless otherwise specified, with back and ends turned up 1" (25.4mm) with hug edge to insure tight fit to the body. Front edge shall have square turn down and back as g.1 above.

iii. Wall mounted shelves shall have 90 degrees angle turned down 40mm (1.6") and 90 degrees back 12mm (0.5") in, in front and sides, with 2" (50.8mm) turned up with hug edge at back where ends abut walls and other equipment. Wall fixation shall consist of 600mm (23.6") high adjustable rails fixed with three heavy s/s top screws and wall anchors. Rail to receive s/s bracket at desired height.

iv. Free standing table mounted shelves shall have 90 degrees angle turned down 40mm (1.6") and 120 degrees turned back 20mm (0.79") on all sides. Supports shall be 1" (25.4mm) O.D. 15 gauge (1.59mm) stainless steel tubing welded to overhead superstructure.

v. Shelves shall have underbracing with U-channel of 60 (2.4") - 80mm (3.2") wide (depending on Width of shelf) 25mm (1") down 90 degrees and 12mm (0.5") in 90 degrees on longitudinal side only.

7.19. Sinks And Drainboards

i. Integral sinks shall be fabricated of same gauge and material as drainboard or tops. Sinks integral with tops shall be fabricated or die formed. Die formed sinks shall not be less than 18 gauge (1.27mm) stainless steel.

ii. Sink compartments shall have fully coved vertical and horizontal interior corners with fall to drain. Multiple compartment sink partitions shall be of same material, double wall, and continuously welded in table top with a distance of not less than 50mm (2") between sink tanks. Potwash sinks shall be 3 compartment type, separated from each other by decant overflow wells with coved corners and removable perforated stainless steel filter baskets, with 2 lift-up rods per baskets.

iii. Front and open end sink edges shall be 50mm (2") turned down, 90 degree, 20mm(0.79") bent inwards at 120 degrees with a marine type edge of 19mm (0.75") top border and bevelled recess of 12mm (0.5") to sink opening.

iv. Drainboards, splashes, and turned up edges shall have radius bends 5/8" (15.9mm) or larger at horizontal and vertical corners.

v. All sinkboards and table tops with sink tables, dish entry and exit tables shall have a fall towards sink or dish washing machine.

7.20. Drains

i. For centrally located sink drain holes
ii. Rotary handle drains shall be COMPONENT HARDWARE, model D-50-4591 or approved equal with flat strainer and connected overflow for deep sink installation and MODEL COMPONENT HARDWARE D50-7215 or approved equal for shallow sink installations.

For corner located sink drain holes

i Standpipe valve, chrome nickel steel standpipe, chrome nickel steel corner guard sieve plate shall be by FRANKE series 304 or approved equal.
ii. Free flow drain shall be COMPONENT HARDWARE or approved equal to fit standpipe.

Faucets

i. All faucets and pre-rinse assemblies shall be polished chromium plate

ii. Deck mounted mixing faucet assemblies shall be polished chromium plated, with 250mm (10") swing nozzle and non-splash aerator, as specified in the elevations.

iii. Wall mounted mixing faucet assemblies shall be series polished chromium plated, with 250mm (10") swing nozzle, is specified in the elevations.

iv Dipperwell and faucet sets/assemblies shall be COMPONENT HARDWARE MODEL K30-1010 or equal , unless specified otherwise

7.21. Pre-Rinse Assemblies

Wall and deck mounted pre rinse assemblies shall be similar and equal to as specified in the equipment specifications.

7.22. Scraping Block

Provide scrape unit on scrapping station, fixed to front edge of table top as manufactured by NORDIEN or approved equal.

7.23. Locks

i Locks for metal drawers shall be COMPONENT HARDWARE SERIES P-10-0370 or approved equal.

ii. Locks for metal sliding doors shall be COMPONENT HARDWARE SERIES P20-0490 or approved equal.

iii Locks for hinged doors shall be COMPONENT HARDWARE SERIES P30 or approved equal.

iv Locks shall be keyed alike within individual respective work areas and provided with master keys. The demarcation of work areas are to be established with the hospital administration

7.24. Castors

Castors shall be 5" (127.0mm) or 6" (152.4mm) diameter heavy-duty type, ball bearing, disc wheel, with replaceable greaseproof rubber or neoprene tires with a minimum tire tread width of 1-3/16" (30.2mm). Minimum capacity per caster shall be 250 pounds (112.5kg),unless otherwise specified. Provide grease fittings, thread guards, and polished plated finish.Provide with wheel locking device where specified.

7.25. Refrigerated Fixtures:

a) Insulation shall be 2" (50.8mm) polyurethane that has to be injected foamed-in-place using a blowing agent that is free of VOC (Volatile Organic Compound), has a low GWP(Global Warming Potential) and has an ODP (Ozone Depleting Potential) value of 0.Fibreglass or polystyrene will not be acceptable.

b) Cabinet bodies shall be of double-wall construction. Vertical and horizontal corners shall be coved and floor pan shall not be provided with a drain pipe. The condensate from the evaporator unit shall be bled off to a sweat evaporator pan outside the cabinet heated by hot gas pipe.

c) Provide electronic thermometer with electronic thermometer (vapour proof), exterior mounted on work side of each refrigerated compartment. Thermometers shall be adjustable and shall be calibrated after installation.

d) The interior shall be provided with a 15 watt light bulb per compartment.

e) Evaporator coils shall be blower type, with thermostatic expansion valve and properly sized to hold an internal cabinet temperature of 2□C for refrigerator or -18□C for freezer.

f) Provide breaker strips around the perimeter of all drawers, doors, pan openings and ice pans.

g) Provide "on-off" switch for self-contained refrigeration systems mounted on the work side.

h) Provide 18 gauge (1.27mm) stainless steel thresholds for all door openings. Pop rivets will not be acceptable.

i) Doors shall be double-wall construction. Insulation shall be 2" (50.8mm) polyurethane foam with door perimeters fitted with a COMPONENT HARDWARE SERIES, or approved equal, continuous magnet gasket. Refrigerated doors shall be double glass for refrigerator and triple glass for freezer with heater wires, temper resistant glass as manufactured by ANTHONY or approved equal.

j) Door hardware shall be heavy-duty similar and equal to COMPONENT HARDWARE SERIES self closing hinges, or approved equal. The door seal mechanism shall be magnetic gasket type with thresholds provided in type 403 chrome steel.

k) Refrigerated drawers shall be constructed as follows :-

- Drawer fronts shall be sealed double-pan construction with stainless steel ledge type pulls.
- Slides shall be 75kg capacity fully extendable for foodservice function and 150kg capacity fully extendable for heavy load bottle drawers as manufactured by MERZ, FRANKE, COUNTERLINE or approved equal.
- Gasket shall be magnetic type manufactured.
- Provide a 1/1 GN pan per drawer. Each drawer shall accommodate a 150mm deep1/1 GN pan unless otherwise stated. Pans shall be removable, stainless steel GN sized, as specified for foodservice application. Each food drawer shall be fixed to a perforated pan. For beverage storage, each drawer shall be fixed to be a solid pan with perforated sides for ventilation.
- Drawer assemblies shall be self-closing and easily removed without tools.

l) Each section shall be provided with bottom and intermediate adjustable, removable, wire shelves, mounted on stainless steel shelf brackets. The bottom shelf shall be equipped with stainless steel feet to hold shelf above bottom.

m) Table tops over condensing units shall be insulated with 50mm (2") polyurethane foam.

n) All refrigeration system shall operate on CFC free refrigerants. Refrigerant shall be free of VOC (Volatile Organic Compound), has a low GWP (Global Warming Potential) and has an ODP (Ozone Depleting Potential) value of 0.

o) All blower coils shall be equipped with a self evaporation pan, either electrically heated or otherwise.

7.26. False Bottoms

False bottoms shall have 1/2" (12.7mm) diameter perforations 1" finger holes at each end. Edge shall be 90 degrees bent down 40mm (1.6") and 90 degrees back 20mm (0.79").

7.27. Exhaust Ducts

i. Dishwasher exhaust ducts shall be all welded construction with one (1) piece trim collar at ceiling. Ducts shall be sized to fit inside the exhaust vents of the dishwasher and over the duct stub down at the ceiling. Ducts shall be attached to dishwasher, stub down and collar with tack welds.

ii. Dishwashers not having exhaust vent connection shall have ducts sized per the manufacturer's specifications, extended past top of dishwasher with air control damper.

iii. Exposed duct work from equipment to ceiling shall be all welded construction with trim collar at ceiling. Grease ducts shall be continuos welded to the equipment and the duct stub down

7.28. Fabricated Exhaust Ventilator And Canopies

i. Exhaust hoods shall be constructed fully in 18 ga stainless steel 304, no 4 finish. Hood to be wall type or island type vertical front and drip tray throughout at bottom perimeter. All seams and joints are continuously welded, ground and polished to match surrounding surface. Filter housing in stainless steel full length of hood for stainless steel dual filters as per

ii. COMPONENT HARDWARE SERIES F30-2020 or approved equal to be installed on not less than 45 degree angle. Filter housing to terminate at bottom in pitched drip tray. At low point of tray provide drain with valve to terminate in enclosed grease container of 200mlcapacity to be easily removal for cleaning.
Furnish necessary rod hanger plates at front, to suspend from ceiling. Furnish necessary angle frame members at rear for fastening to wall.
Vapour proof lights to be installed on 4' max. centers, completely inner wired,

iii. COMPONENT HARDWARE VXS-100-PX-WG SERIES or approved equal. Provide duct collar 5" high, size as shown on drawing fully welded to be connected to ventilation systemby VAC contractor.

iv. Provide necessary space and facilities to install fire extinguishing system (specified elsewhere in general specifications or by others).

7.29. Wall Flashing

i Provide 18 ga. wall flashing from 1" above bottom edge of hood or as shown in cut sheet down to 1" below top edge of equipment.

ii. Apply to wall with heat resistant epoxy.

iii. Joints shall be vertical only, sealed with silicone and trimmed with 1" wide stainless steel snap-on moulding, COMPONENT HARDWARE SERIES J60 or approved equal.

7.30. Wall Hung Shelves And Cabinets

The Kitchen Equipment Contractor shall verify supporting requirements for all wall hung shelves, racks, cabinets etc.

7.31. Angle Trolley G/N

The trolley shall be off fully welded stainless steel construction, with frames, cross bracing and support bracing of 25mm (1") x 25mm (1") square tube 2mm thick, bottom bracing in Z-shape for nesting , supplied with heavy duty castors with non-marking, elastic tyres, two with brakes, diameter 150mm (5.1") and corner bumpers, total height to be 1600mm (5' 1"), 16 pairs of tray slides welded to vertical post equally spaced between top & bottom to accommodate 2/1 GN tray .

7.32. Bakery Trolley E/N

The trolley shall be off fully welded stainless steel construction, with frames, cross bracing and support bracing of 25mm (1") x 25mm (1") square tube 2mm thick, bottom bracing in Z - shape for nesting , supplied with heavy duty castors with non-marking, elastic tyres, two with brakes, diameter 150mm (5.1") and corner bumpers, total height to be 1600mm (5' 1"), 16 pairs of tray slides welded to vertical post equally spaced between top & bottom to accommodate EN tray.

7.33. Hand Wash Sink

The hand wash sink shall be constructed in stainless steel consisting of a base frame with sink of 250 x 350 x 200mm (deep) and cabinet base with swing door below to accommodate waste bin by operator. With backsplash to suit adjacent equipment and side splashes where applicable. Supply one mixing faucet for hot and cold water with electronic sensor, towel and soap dispenser.

7.34. Stock Pot Stove

The pot shall be constructed with heavy duty legs, bracing , housing for burners and cast iron grates with a typical dimension of 650 X 550 X 500mm H with backsplash of 150mm H . The burner shall be 3 step coronation burner rated 48 000 kcal/h with 3 controls, central shut off valve, flame failure device and pilot light.

7.35. Charcoal Grill

The charcoal grill shall be constructed of stainless steel body with frames with side and rear splash guard ,adjustable removable cast iron grates , cast iron grates to hold charcoal ,burner protection cover, removable ash drawer, removable front panel ,control valves, 17 650 kcal/hr burner at every 300mm equally spaced , pilot light ,flame failure device and flue riser.

7.36. Bain Marie With Heated Cabinet

The bain marie shall be constructed fully in stainless steel with rockwool insulation to hold cooked food at 60°C and above .Wet bain marie to accommodate 4 x 1/1GN with submersible water inlet, removable frames to hold other combination of GN pans, automatic over flow, drain outlet , thermostatic controls for 30 - 100□C with indicated light, perforated bottom shelf over heating element, low water cut off. And heated cabinet below with sliding doors, air distribution fan, controls, rockwool insulation and M& E service compartment.

7.37. Heated Cabinet

The heated cabinet shall be constructed fully in stainless steel with rockwool insulation, sliding door, thermostatic controls for 30 -100°C, intermediate perforated shelf, removable perforated panel on top of dry heating element air distribution fan, M&E services compartment with light indicators.

7.38. Pot Wash Sink

Substructure shall consist of soak cross bracing, legs and sink sanitizer. Table top shall have soak sink, wash sink and sanitization sink with 300mm high backsplash. Soak sink and wash sink shall be separated by decant over flow wells and removable strainer basket with twolift rods. Sanitization sink shall have a sink sanitizer.

7.39. Dish Landing Table

Substructure to be open to accommodate mobile equipments with cross bracing between legs (no long bracing) Table top to accommodate a pre rinse sink of 450x 450 x 300 , pre rinse unit , 20mm deep recess for the flow of dish racks. Table top to slope towards the sink and lip for hooking of dishwasher. Superstructure to have table mounted two tier over shelve, lower shelve extended and inclined towards

landing side turned up 50mm at 1450MM from finish floor to lowest part of rack shelve, with drain to connected to flexible hose to table top. Table top height to be coordinated with dish washing machine.

7.40. Dish Exit Table

Substructure to be open below to accommodate dish trucks with cross rails and long rail at the back or with bottom shelve with slides for dish racks. Table top to be supplied with 20mm deep recess for dish racks 300mm high backsplash .Lip to hook dishwasher. Install with fall towards dishwasher.

7.41. DISH EXIT TABLE WITH ROLLERS

Substructure to be open below with cross rails and long rail at the back. Table top to be provide with trough to accommodate 50mm dia. PVC free rollers, with drain pipe. Rollers shall be easily removable for cleaning and spaced at 200mm distance away (centre to centre), 300mm backsplash.

7.42. Rack Shelve (Slanted)

Substructure to be slanted (28°deg) rack shelve to accommodate dish rack either welded to slot rack shelve above or self contained mounted to wall , with drain pipe connected to flexible hose.

7.43. Rack Shelve (Slotted)

Superstructure to be square tube frame construction with slots for racks to be wall or ceiling mounted , 10mm dia. dividers separating each rack slots. Bottom part welded to rack shelve or self contained.

7.44. Electrical Compartment

Item to be a cabinet base with a swing door, inside to accommodate electrical power points and switches by contractor, corresponding with the Electrical Rough-In Layout Plan. Top section of cabinet is equipped with water-proofed sockets with stainless steel flip-up cover. Cover shall also have cutouts for appliances wire to go through.

7.45. Storage Shelves Square Tube (Dishwash Storage)

Constructed with 4 nos of 40 X 40 mm square tube post with 4 tier shelves. Shelves shall be constructed with 32 x 32mm square tube frames and members.

7.46. Grid Shelving

Shelving shall be constructed with 32 x 32 mm square tube open frames, with square tubes welded horizontally and mounting brackets. Brackets shall not be more 1200mm centre to centre apart.

7.47. Soaking Trolley

Tub shall have fully coved vertical and horizontal corners with integral rim at the top. Provide castors with brakes, cross bracing, legs perforated bottom plate and rotary waste valve with strainer.

7.48. Linen Trolley

Item to be constructed with 32 mm dia. tube frames, castors stainless steel hooks welded

on each side of underside of upper tube to receive heavy duty canvas laundry bag. Open bottom shelve with 6mm dia. rods welded horizontally. Provide with 2 nos. heavy canvas bag with upper envelope seam with integrated cord to close with 4 nos. brass eyes each side
to fit in linen trolley.

7.49. Flour Rack

Substructure shall be open with legs, cross and support bracings and frames. Open base to accommodate floor bins. Top section shall be cabinet open on the front and top to accommodate flour bags. Internal sides and bottom shall have rubber bumper with S/S strip rubber holder at 100mm apart center to center.

7.50. Wooden/ Marble Top Table

Substructure shall be open to accommodate flour bin with cross bracing and legs. Table top have frame construction with bracings to accommodate wooden (50mm thick)/ marble(25mm thick) top. Wooden/marble top to be food grade type. Table top corners to have protection taps.

7.51. Indian Pot Wash Sink

Substructure shall be open base legs, cross rails and support legs welded to sink bowl. Top to have sink, with removable grid plate flush with sink top, backsplash and pre rinse unit. Refer drawings for sink bowl size. Height shall be 650 from top sink to floor finish.

7.52. Praline Cabinet

The Praline cabinet shall be constructed with swing door and tray slides to accommodate 600 X 400MM EN trays at 70 mm spacing centre to centre horizontally. Refer cut sheets and drawings for details.

7.53. Cake Ring Rack

The ring rack shall consist of heavy duty two tier wall mounted bracket 100mm high with slanted horizontal 12mm dia rods welded at 300mm apart for cake ring rings and utensils.

7.54. Butcher Bin

Basin with fully coved vertical and horizontal corners with integral rim at the top, 4 nos. swivel castors, 2 with brakes and perforated bottom panel. Accessories: Stainless steel 1/2 sliding lift-off lids.

7.55. Fish Prep Sink

Substructure with open space below for waste bin with cross rails on the sides and rear , table top with sink, 100(W) X 200 (D) drain trough with perforated basket at the back, table top to sloped towards drain trough with 25mm thick removable nylon cutting board chrome plated spray pipe in front of preparation section with deflector , pre rinse unit and backslash.

Accessories: 1 no. 25mm thick white thermoplastic cutting board size as per plan, affixed onto table tap via stainless steel studs, easily removable for cleaning.

7.56. Thawing Trolley

Item to be provided with 4 nos. slanted drain shelves with perforated drain panels for each shelve , drain shelves are slanted towards drain, drain tube to be welded into each drain shelf, drain tube shall be welded from bottom of top shelve to top edge of shelf below less 50mm, supply with 1 no. bottom pan to collect condensed water with drain cock, total

height 1600mm.

7.57. Work Cabinet With Bain Marie And Rice Warmer

Substructure to be open cabinet, all insulated in 1" thick rockwool, MnE services compartment with accessible door, thermostatic controls for 30 - 100□C range with indicator light, table top with bain marie for 4 nos. 1/1GN pan, bottom with fall to drain, standpipe and perforated bottom shelf over wet heating element, thermostatic controls with low water cut-off provided with submersible hot water inlets, waste drain and rice warmer with dry heating element. Top to have cut out for rice container . Cut outsize of rice warmer to be coordinated .

7.58. Tray /Cutlery Trolley

Substructure 32 mm□Ø stainless steel tubular construction, low and top shelf, 4 nos. heavy duty swivel castors with 2 nos. brakes, superstructure with fully enclosed cutlery container to accommodate 5 nos drop in plastic cutlery inserts.

7.59. Cold Pan

Substructure open base cabinet with low shelf . Counter top to have 25 mm thick insulated ice chest with stainless steel perforated pan and drain outlet.

7.60. Tray Slide (Tube)

Constructed from 3 nos. polished stainless steel tube with round end caps welded. To be installed with STANDARD KEIL #1509-101-01251 trayslide brackets fixed to wall/ counters. Equally spaced in intervals of not more than 1200mm.

7.61. Tray Slide Cabinet

Backsplash of trayslide top to be turned up approximately 60mm with a radius of 15mm to fit under front edge of dishout table, tabletop to have 3nos die stamp inverted (45 °) "V" , substructure to be an open cabinet with intermediate and low shelves with double pan dividing panels equally spaced in intervals of not more than 2000mm long.

7.62. Mobile Bussing Station

Substructure to have intermediate and bottom shelve with 25mm turn ups on all side with 4nos of heavy castors two numbers with brakes. Table top with cut outs to accommodate 3nos of 1/1 GN pans . Accessories : provide three numbers of 1/1 GN pans.

7.63. Utility Trolley

Item shall be constructed with 32mm square tubes , castors 4 nos castors 2 nos with brakes, top ,intermediate and bottom shelf.

7.64. Vegetable Trolley

Tub shall have fully coved vertical and horizontal corners with integral rim at the top, 4 nos castors 2 nos with brakes ,cross bracing ,legs and rotary waste valve with overflow pipe. A removable perforated basket insert with hooks and handles . The base of the perforated basket shall be 50mm above the base of tub.

7.65. Seafood Trolley

Tub shall have fully coved vertical and horizontal corners with integral rim at the top, with 4 nos castors 2 nos with brakes, handles and waste drain valve . Base of tub shall have a removal perforated panel.

7.66. Charcoal Trolley

Item to be constructed in mild steel and painted. Bin with fully coved vertical and horizontal corners with integral rim at the top with removable cover and handle . Provide removable sieve inside bin. Capacity of bin shall 30 kg, with 4 nos heavy duty castors , 2 nos brakes.

7.67. Waste Bin Drying Rack

Item is a heavy duty 2 tier removable slatted shelving each with 2 reinforcement C-channels. Height and depth of rack to be coordinated with operator .

7.68. Bussing Trolley

Open substructure with low and intermediate shelf with turnups on all side , heavy duty wheels two with brakes . Recessed table top accommodate dish racks.

7.69. Japanese Sink

Open substructure with legs and cross rail at the back and sides . Table top with sink, recessed to accommodate 75mm thick removable cutting board with support frame screwed to cutting board and with pre rinse unit.

7.70. Stainless Steel Die Top W/Finger Hole

Item shall be a stainless steel cover plate to flush fit sink top opening , with finger hole for easy removal Edges of plate shall be turned down 90 deg and 90 deg again at the front and back.

7.71. Protective Coverings

Fabricated stainless steel equipment shall be protected with a coat of masking material; SHURFORD'S SURETAPE, CROWN ZELLERBACH CORPORATION, or approved equal. The protective covering shall be applied to all exposed flat, horizontal and vertical surfaces. It shall not be removed until the installation has been completed, the site is cleared of all debris, and the equipment is ready for testing.

7.72. FASTNERS

Exposed screw or bolts will not be permitted on the surface of fixtures. Rivets, if specified, shall be countersunk, flush and of the same material as the pieces joined together.

7.73. HEATING EQUIPMENTS

1. Gas, electrical or steam heated equipment and thermostatic controls shall be complete and of material, size and rating as required by the contract documents. Such equipment shall be fabricated and installed so as to be readily cleanable or easily removed for cleaning.

2. Electric appliance or heating element circuits of single phase voltage shall not exceed 2000 watts, unless otherwise specified.

3. Built-in steam heated equipment shall be complete with steam by pass control system,including brass fittings, valves, traps, strainers and pressure reducing valve (if

4. required) ready for final connection. Globe control valves shall be provided with heat resistant handle positioned in recessed panel in front of equipment.

5. All electric or steam heated warming cabinets shall be completed with air distribution fans tomaintain uniformity of temperature within heating space. The air distribution mechanism shall be blow-through type with hot air discharged at low level and returned at high level.

6. The thermal insulation material to be used for all heated warming equipment and side panels of all air blast type wok/steamer ranges shall be robust type consisting of long fine fibres spun from molten natural rock bonded with a thermosetting resin, 25mm (1") thick with maximum service temperature of 450^{O}C, 0.05 W/mK at 100^{O}C; fire, moisture and corrosion resistant as manufactured by BRADFORD ROCKWOOL type FIBRETEX-450 or approved equal.

7.74. SWITCHES, CONTROLS AND ELECTRICAL WORK

1. Provide each motor driven appliance or electrical heating unit with suitable control switches or starter of proper type.

2. Provide internal wiring for fabricated equipment, including all electrical devices, control wiring, switches etc., built into or forming an integral part of such equipment with all components wired to a junction box, or breaker panel, ready for final connection.

3. Provide BS approved type plug with suitable length three (3) wire cord for equipment powered by plugging into single-phase, grounding type socket outlet. Provide earthing protection for indigenous equipment by connecting earthing conductors from equipment body to common earthing point mounted on wall or floor in accordance with current regulations and local codes

4. Provide light fixtures and ballasts, where specified or detailed as part of counters, cases, or fixtures. Provide warm white lamps for light fixtures.

5. Provide Waterproof socket outlets 13A and 15A according to BS standards and wiring for fabricated equipment as called for in the contract documents.

7.75. QUIETNESS OF OPERATION

Quietness of operation of all foodservice equipment is a requirement. The CONTRACTOR shall be required to remove or repair any equipment producing objectionable noise, in the opinion of the Arc.

7.76. INDIRECT DRAINS

Provide 1" (25.4mm) minimum copper line extended to nearest floor sink or drain where code of usage requires equipment to have indirect drains. Drain lines for ice water drainage shall be fully insulated. Condensate drains for all refrigerated equipment such as ice machines, cabinets, sandwich units etc., shall be provided with an S-trap or P-trap for sanitation reasons

7.77. VENTILATION OF REFRIGERATED EQUIPMENT

1. Adequate air supply and exhaust shall be provided for all refrigeration condensing units, both fabricated and manufactured as required for proper operation at 1000 m^3Hr per kw for supply and exhaust.

2. If, in the opinion of the CONTRACTOR, additional ventilation is required to insure proper operation of condensing units, he shall so state in writing to request for evaluation and decision before proceeding with fabrication and installation.

7.78. DOORS

All items with doors shall be hinged per specifications plans and details.

7.79. GAS FIRED EQUIPMENT

Gas fired equipment shall be fabricated to operate on type of gas made available for the project in concern.

7.80. PLASTIC LAMINATE

Plastic laminated material specified for millwork or other areas, shall be of the OKULEN type non-toxic or approved equal suitable for foodservice operations. Laminates shall be veneered with a Urea based adhesive, waterproof and heatproof. Rubber based adhesives are not acceptable. Adhesive shall be applied directly over close-grained, marine, Douglas Fir, plywood of selected smooth sanded stock to insure a smooth ripple-free laminated surface. Vertical panels may be cored with 1/16" (1.6mm) material and corresponding back faced with 1/32" (0.8mm) backing material. Self-edges shall have top sheet placed on and over edge sheet.

7.81. PREFABRICATED WALK-IN REFRIGERATORS AND FREEZERS

SCOPE OF WORK

The work to be performed under this section of the Specifications shall consist of the supply, delivery to site, installation, testing, commissioning and maintenance of prefabricated Walk-in Refrigerators and Freezers all as per the 'Schedule of Equipment' appended here to comprising of but not necessarily limited to the following :-

- Pre-fabricated wall floor and ceiling insulation panels.
- Ceiling support structure where required.
- Doors complete with all door furnishings.
- Lighting fittings and switches.
- Temperature alarm system.
- Digital and dial thermometers.
- Pressure relief vents.
- Coil supports.
- Utility penetrations.
- Escutcheon plates and finish trims.
- All electrical works complete with panels.

All as hereinafter more fully described and shown on the Drawings, also including such minor works as are necessary for the proper carrying out of the installation and operation whether or not, such works are specifically called for in the Specification and Drawings.

7.82. MODULAR PANEL CONSTRUCTION

Modular panel sections shall be available in the following standard panel width:

- Walls, centre ceilings, centre floors: 11-1/2", 23", 34-1/2" & 46".

- End ceilings, end floors: 23" & 34-1/2".
- Horizontal and vertical tee sections (at partitions): 11-1/2" & 23".
- Coved corners: 11-1/2" X 11-1/2" pre-formed, one piece to ensure perfect alignment.
- Heights: 8' 6". (Actual height to verify with site conditions).

The interior and exterior metal pans shall be exactly formed with metal dies to ensure panel uniformity and thus ensure interchangeability with like panels. Metal panels shall have n inside preparation coat of bonding agent to create adhesion with the polyurethane insulation and enhance the chemical bonding capabilities of the foam. Metal panels shall be as described in paragraph 4.05, "Finishes." Insulation shall be rigid polyurethane as described in paragraph 4.03.

The metal pans shall be placed in steel moulds with polyurethane injected into the mould to form a rigid insulation. It must be "foamed-in-place", and form a chemical bond to the interior and exterior metal pans to form a strong, dimensionally stable panel unit.

Panels shall be made without internal wood or metal structural members, with 100% of each panel exclusive of metal pans and locking devices being polyurethane insulation.

Panel edges shall be tongue and groove configuration to assure proper alignment and air-tight, vapour-proof joints.

A double set of gaskets at both interior and exterior edges shall be provided,"foamed-in-place". Gasket material shall be oil resistant and form a tight, positive seal.

To divide walk-ins into more than one compartment, modular partition panels shall be utilised. Partition panels shall cam-lock into special wall, ceiling and floor tee sections. For proper alignment, corner tee sections shall be one piece, 90 and have an overall standing leg dimension of 11-1/2".

7.83. INSULATION

Insulation shall be rigid, 40Kg/M^3 foamed-in-place polyurethane chemically bonded to interior and exterior metal surfaces. Wall thickness shall be a full four inches with a closed cell rating of not less than 97%. The thermal conductivity ("K") factor shall not exceed 0.117 BTU per hour/foot square/Fº/inch. Overall coefficient of heat transfer ("U") factor shall not exceed 0.029 with a resulting "R" value of 34, where R is the total thermal resistance of the wall section. The insulation must remain stable at an operating temperature range of minus 40ºC to plus 120ºC.

7.84. SECTION FASTENING

All modular panel sections shall be locked securely together with cam-lock fasteners consisting of a cam action hooked locking arm placed in the tongue section and a steel rod positioned in the groove section. Locking arm and steel rod shall be contained within metal housings. By the rotation of the locking arm, the hook shall engage over the rod and draw the panel sections tightly together. Locking arms shall be actuated from inside the walk-in by means of a standard hexagonal wrench provided as part of the walk-in. Press-fit caps shall be provided to close wrench holes. There shall be not less than three cam-lock fasteners in each vertical joint. Horizontal placement of cam-locks at wall/ceiling or wall/floor juncture shall not exceed 23" interval.

7.85. FINISHES

The interior finish of walls and ceilings except as specified otherwise shall be provided as specified, except for floors which shall be tiled or monolithic floor finish (wet works by builder) with up to 300 pounds per square foot uniformly distributed loading. The inner floor surface of coldroom floor shall be properly coordinated with door opening and exterior floor finish by CONTRACTOR to prevent a ramped in situation unless prior approved by the kitchen consultant. The exterior and interior wall finish shall be of 0.7mm stainless steel No.4 finish unless otherwise specified. A pre-approved wall protection bar shall be provided on all exterior exposed walls (except where stainless

steel is specified).

7.86. WALK-IN DOOR SECTIONS

Door furnished with walk-ins shall be hinged, in fitting, flush mounted type where hinged doors have been specified. Standard door sizes shall be as follows: 34" X 78" clear opening sizes in 46" wide panels. Door leaf and door panel construction shall be as described in paragraph 4.02. Door panel opening shall be reinforced with a special high strength plastic frame to prevent cracking or distortion. Metal framing shall not be used for this purpose in order to minimise heat conduction through the wall section at door. All door openings shall be provided with one heater cable for condensation control installed beneath a removable metal cover at the sides and top of jambs and across floor beneath sill plate. Additionally, doors of walk-ins operating below +32 F shall have two heater cables installed around perimeter of door leaf at gasket contact area. One cable is active and the second shall act as a spare in the event of amalfunction of the primary cable. Door panel shall be equipped with an interior vapour proof light which shall be electrically linked to all other lights within a particular coldroom; all wired to an external single-phase/50Hz power switch. The CONTRACTOR shall provide a 60w vapour proof bulb with shatter-proof cover to specifications for every 100 sq.ft. of coldroom floor. Provision shall be made by the Kitchen Equipment Contractor to wire all door heaters to the relevant refrigeration main control panels. Door panel shall be equipped with a 2" diameter flush mounted dial thermometer providing temperature readings in a range of -25^{o}C to +30^{o}C. Dial thermometer for freezers shall be mounted on the panel of the external chiller panel. All coldroom doors shall be self closing when angle between front panel and door is 45^{o} or less. All coldrooms that opens to any kitchen area is to be fitted with a jet air curtain to be separately specified, where jet curtains not provided, strip curtains shall be provided, when a double action swing door is not specified.

7.87. Sliding Door

Single slide entrance doors are made to slide horizontally to the left (or right)
by manual operation. The sliding door(s) are to be at minimum 4" thick. They are to slide freely on metal tracks with steel rollers. Finish, construction and insulation of the door and door panel shall be similar to the swing door specifications as afore mentioned. Heaters are provided to eliminate condensate or frost formation. The door contains padlocking provisions and includes an inside safety release. Gaskets are to be resistant to oil, fats, water and sunlight and are to be of a replaceable type and shall form a positive, tight seal.

The exterior and interior finish of all doors shall be stainless steel except
when specified otherwise.

7.88. HARDWARE FOR STANDARD WALK-IN DOORS

A latch and strike assembly shall be used and shall be die cast metal with polished
chrome finish. Latch shall have provisions for padlocking but shall have inside emergency release so that door can be opened from the inside even though padlocked on the outside. Hinges shall be of a style and finish to match the latch and strike assembly. For 34" width-in clear doors, hinge blade shall not be less than 9" long. Two hinges shall be used. For 48" width-in-clear doors, hinge blade shall be not less than 15" long. Three hinges shall be used. Hinges shall be self-closing, cam-lift type with Delrin bearings and stainless steel pins; hardware to be COMPONENT
HARDWARE SERIES W60 or approved equal.

7.89. MISCELLANEOUS EXTRAS

- Observation Windows. Double glass sealed units. Standard size 12" x 18".

- High temperature alarms. A high temperature alarm facility shall be provided for
each coldroom box and shall consist of a time delay thermostatic device that picks up
a signal when the room temperature rises 7 degrees and above from set point and remains so for more than 30 minutes, to activate an audio alarm of 110db capacity.
The alarm shall be located in a 24hour manned security area. The manual reset of the high temperature alarm shall

be located inside the control panel for the coldroom,
with only supervised access (keyed switch).

Facilities shall be provided for the signal to be picked up by the BAS (by others).

7.90. COLDROOM CONTROL PANELS

a) All coldrooms on the same floor shall have their control panels located in the same location. The control panel shall indicate the status of each coldroom, with the following information compressor run, blower run, defrost, normal supply, essential supply, trip, condenser water pump run, high temperature alarm, etc..

For water cooled systems, the CONTRACTOR shall provide an interlock between water flow sensing and the compressor motor start to protect the refrigeration system against frequent high pressure cut-outs.

7.91. INSTALLATION INSTRUCTION

a) The manufacturer shall include with the shipment, complete assembly instructions for the walk-in including installation instructions of the refrigeration equipment when supply as part of the walk-in.

7.92. WARRANTY - 5 YEARS

a) Manufacturer shall warrant that any part of the installed Walk-in, (except the refrigeration system and its related accessories), is free from defects in material or workmanship under normal use and service, and will be obligated to repair or replace any part of said equipment which proves to be defective within the period of five (5) years, from the date of original installation. This warranty shall not apply to equipment which has been subjected to any accident, alteration, abuse, misuse or improper installation and does not include any labour charges for replacement or repair of defective parts of refrigerant.

7.93. FIRE EXTINGUISHING SYSTEM

7.94. WET CHEMICAL FIRE EXTINGUISHING SYSTEM

The wet chemical fire extinguishing system shall be an automatic, pre-engineered system, cartridge operated, regulated pressure type, with a fixed nozzle agent distribution network as manufactured by ANSUL R-102 or approved equal. It shall be listed with Underwriter's Laborities Inc (UL) and conform to the codes of NFPA. The system shall have fire suppression capabilities for the following kitchen hazard areas related to cooking equipment; ventilating structures including hoods, ducts, plenums and filters; fryers, griddles and range tops; natural charcoal or chain-type broilers; electric, lava rock or gas-radiant char-broilers and woks. The system shall be capable of automatic detection as well as actuation with local or remote manual actuation. The power or fuel supply to the kitchen hazard areas mentioned above shall be shut-off automatically upon actuation of the extinguishing systems by means of approved electrical shut down devices. All shut down devices shall be considered integral parts of the fire extinguishing system and shall function with the system and shall function with the system operation. All such devices shall be of the type requiring manual resetting prior to fuel or power being restored.
(NFPA Bulletin #17 - 4.4)
The system shall be capable of reacting during the first critical stages of a fire emergency before extensive damage occurs.
The chemical agent shall be of the wet type in accordance with NFPA Bulletin #18 and shall be capable of reacting with hot grease or oil coating to form a blanket of foam that:

- is non-ignitable
- reduces the release of combustible vapour
- seals of unreacted fuel from atmospheric oxygen
- cools the fuel on the appliance surface, further reducing the possibility of a fire reflash.
- can be easily and quickly cleaned up after a fire
- A detailed technical manual shall be supplied including system description, design,
- installation, recharge and maintenance procedures plus accessory installation and reset instructions.

7.95. SYSTEM EQUIPMENT

a) Regulated Release Mechanism

The regulated release mechanism shall be the spring-loaded,mechanical/pneumatic type capable of providing the expellent gas supply to agent tanks. It shall contain a factory-installed regulator set at 100 psi (6.9bar) with an internal relief of approximately 145 psi (10.0 bar). In the "armed" position, the main spring force to the puncture pin piston shall be 150Ib (68kg). The mechanism shall have a visual indicator of the cooked or fired condition without having to open the enclosure.

The regulated release mechanism shall have the following actuation capabilities: automatic actuation by a fusible link detection system; remote manual actuation by a mechanical pull station; local manual actuation by a push button located at the front of the release mechanism enclosure.

The regulated release mechanism shall contain an actuator assembly, regulator, expellant gas hose, and storage agent tank housed in a stainless steel enclosure with cover. The enclosure shall contain knock-outs for 1/2in. conduit. The cover shall contain openings for the push button and visual indicator.
The regulated release mechanism shall be compatible with electrically operated shut-off devices for appliances.

b) Fire Extinguishing Agents

Fire extinguishing agents shall be specially formulated, aqueous solutions of inorganic salts. These agents

shall be pre-mixed, eliminating the need for dilution before system charging. They shall be designed for fast flame knock-down, securement of grease-related fires, cooling effect which further enhances its ability to prevent fire re-ignition, and ease of recharge and post-fire cleanup. These agents shall be environmental-friendly and shall produce non-toxic by-products.

c) Storage Tank and Bracket

The liquid agent storage tank shall be deep drawn carbon steel chrome-plated with a 3 gallon (11.4 L) capacity. The shell assembly shall meet the following pressure test requirements: 100 psi (6.9 bar) working pressure, 300 psi (20.7 bar) test pressure, 600 psi (41.4 bar) minimum burst pressure.The tank shall include a chrome-plated adaptor/tube assembly complete with welded steel bracket for mounting of additional tanks in a minimum amount of space. These agent tanks shall be secured with hinged bracket bands.
Note : The CONTRACTOR shall provide sensors with tap-off points for each system for interconnecting by others to the Building Automation System.

d) Cartridges

The cartridge shall be a sealed steel pressure vessel containing either carbon dioxide or nitrogen gas. The cartridge seal shall be designed to be punctured by the releasing device supplying the required pressure to expel wet chemical agent from the storage tank.

e) Supply piping

Piping is used to distribute extinguishing agent to discharge nozzles. The piping shall be stainless steel pipe conforming to ASTM A10

f) Discharge Nozzles

Each discharge nozzle shall be tested. Nozzle placement shall be determined by the size of the orifice in the nozzle tip. The nozzle tip shall be brass or chrome-plated brass, and stamped with the part number and flow rating. The nozzle tip retainer and body shall be chrome-plated brass. The nozzle strainer shall be a brass with stainless 50 mesh screen. Each nozzle tip shall be covered by a protective blow-off cap.

g) Automatic Detection System

The regulated release assembly shall be compatible with a fusible link detection system. The fusible link shall be provided above each cooking appliance and at the entrance to the duct according to the operating temperature in the ventilating system.

The fusible links shall be rated as follows:

Fusible Link Temperature Rating	**Use Where Operating Temperature Does Not Exceed**
280°F (130°C)	225°F (107°C)
360°F (182°C)	290°F (143°C)
450 F (232 C)	360°F (182°C)
00°F (260°C)	400 F (204 C)

The fusible link shall be supported by a detector bracket/linkage assembly which shall have provisions for connecting 12mm (0.5") rigid or EMT thin wall conduit and 1.6mm diameter flexible stainless steel rope. Changes in the direction of the conduit and steel rope shall be accomplished with die cast aluminium alloy, 90 deg. pulley elbows.

7.96. DUAL AGENT FIRE EXTINGUISHING SYSTEM

The dual-agent fire extinguishing sytem where employed shall be a pre-engineered, fixed, automatic fire extinguishing system utilising a liquid fire suppressant and water as manufactured by *Ansul PIRANHA^{TM} Restaurant Wet Agent Fire Suppression System or approved equal.* It shall be constructed in compliance with NFPA 96, NFPA #17A, UL Listing, and International Association of Plumbing and Mechanical Officials Interim Guide IGC 113-97.

The system shall have fire suppression capabilities for the following kitchen hazard areas related to cooking equipment; ventilating structures including hoods, ducts, plenums and filters; fryers, griddles and range tops; natural charcoal or chain-type broilers; electric, lava rock or gas-radiant char-broilers and woks.

The system shall be capable of automatic detection as well as actuation with local or remote manual actuation. The power or fuel supply to the kitchen hazard areas mentioned above shall be shut-off automatically upon actuation of the extinguishing systems by means of approved electrical shut down devices. All shut down devices shall be considered integral parts of the fire extinguishing system and shall function with the system and shall function with the system operation. All such devices shall be of the type requiring manual resetting prior to fuel or power being restore

The system shall be capable of reacting during the first critical stages of a fire emergency before extensive damage occurs.The chemical agent shall be of the wet type in accordance with NFPA Bulletin #18 and shall be capable of reacting with hot grease or oil coating to form a blanket of foam that :

- is non-ignitable
- reduces the release of combustible vapour
- seals of unreacted fuel from atmospheric oxygen
- cools the fuel on the appliance surface, further reducing the possibility of a firereflash.
- can be easily and quickly cleaned up after a fire

A detailed technical manual shall be supplied including system description, design, installation, recharge and maintenance procedures plus accessory installation and reset instructions.
In contrast to the R102 system, the PIRANHA system shall utilise a liquid fire suppressant *and* water. Water has long been recognised as a highly efficient extinguishing agent. Nevertheless, water alone on a fuel fire loses its extinguishing and cooling advantage before enough water can be introduced to begin reducing the fuel temperature. The PIRANHA system has been developed based on the benefits of water in extinguishing fires.
In extinguishing a kitchen fire, the PIRANHA system shall discharge the fire-extinguishing agent immediately followed by water spray. The existence of water helps replenish the foam blanket formed by the agent until the fuel temperature has fallen below its re-ignition temperature. The replenishment of the foam blanket shall maintain a secure surface throughout the cooling process. Within two minutes, the fuel temperature shall be brought down below the re-ignition temperature.

7.97. SYSTEM EQUIPMENT

a) Regulated Release Mechanism

The regulated release mechanism shall be the spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to agent tanks. It shall contain a factory-installed regulator set at 150 psi (10.3 bar) with an internal relief of approximately 190 psi (13.1 bar). The mechanism shall have a visual indicator of the cooked or fired condition without having to open the enclosure.
The regulated release mechanism shall have the following actuation capabilities: automatic actuation by

a fusible link detection system; remote manual actuation by a mechanical pull station; local manual actuation by a push button located at the front of the front of the release mechanism enclosure.

The regulated release mechanism shall contain an actuator assembly regulator, expellant gas hose, and storage agent tank housed in a stainless steel enclosure with cover. The enclosure shall contain knock-outs for 1/2in. conduit. The cover shall contain openings for the push button and visual indicator.

The regulated release mechanism shall be compatible with electrically operated shut-off devices for appliances.The regulated release assembly shall contain an anti-siphon valve to prevent back-siphonage of possible contaminated water into the potable water supply.

b) Fire Extinguishing Agents

Fire extinguishing agents are specially-formulated, aqueous solutions of inorganic salts. These agents are pre-mixed, eliminating the need for dilution before system charging. They are designed for fast flame knock-down, securement of grease-related fires, cooling effect which further enhances its ability to prevent fire re-ignition, and ease of recharge and post-fire cleanup.These agents shall be environmental-friendly and shall produce non-toxic by-products.

c) Water System

This feature is only required by the PIRANHA system. The water supply pressure is set from 30 to 100 psi. The water pipe size is 3/4" for 1 and 2 tank system; 1" for 3 tank system. The water supply piping must include a shut off, lock in position type valve (provided by M&E) to allow authorised personnel to close the valve after a system actuation and stop the flow of water into the hazard area. A water shutdown device shall be installed in the water supply piping. This device shall automatically shutdown the flow of water to the discharge nozzles approximately 10 minutes after system actuation.

d) Storage Tank and Bracket

The liquid agent storage tank shall be deep drawn carbon steel chrome- plated. The tank shall be available in three sizes; 1.5 gallon (5.7 L), 2.25 gallon (8.5 L), and 3.0 gallon (11.4L). The shell assembly shall meet the following pressure test requirements: 150 psi (10.3 bar) working pressure,450 psi (31.0 bar) test pressure, 900 psi (62.1 bar) minimum burst pressure.

The tank shall have a valve that is designed to discharge dual agent onto the hazards being protected. The valve shall automatically shuttle to switch from wet chemical agent discharge to water discharge.

The tank shall include a chrome-plated adaptor/tube assembly complete with welded steel bracket for mounting of additional tanks in a minimum amount of space. These agent tanks shall be secured with hinged bracket bands.

Note : The CONTRACTOR shall provide sensors with tap-off points for each system for interconnecting by others to the Building Automation System.

e) Cartridges

The cartridge shall be a sealed steel pressure vessel containing either carbon dioxide or nitrogen gas. The cartridge seal shall be designed to be punctured by the releasing device supplying the required pressure to expel wet chemical agent from the storage tank.

f) Supply piping

Piping is used to distribute extinguishing agent to discharge nozzles. The piping shall be stainless steel pipe conforming to ASTM A106.

g) Discharge Nozzles

Each discharge nozzle shall be tested. Nozzle placement shall be determined by the size of the orifice in the nozzle tip. The nozzle tip shall be brass or chrome-plated brass, and stamped with the part number and flow rating. The nozzle tip retainer and body shall be chrome-plated brass. The nozzle strainer shall be a brass with stainless 50 mesh screen. Each nozzle tip shall be covered by a protective blow-off cap.

Once actuated, the system discharges a fixed amount of wet chemical agent followed by water through all the same discharge nozzles.

h) Automatic Detection System

The regulated release assembly shall be compatible with a fusible link detection system. The fusible link shall be provided above each cooking appliance and at the entrance to the duct according to the operating temperature in the ventilating system.

The fusible links shall be rated as follows:

Fusible Line Temperature Rating	Use Where Operating Temperature Does Not Exceed
280°F (130°C)	225°F (107°C)
360°F (182°C)	290°F (143°C)
450 F (232 C)	360 F (182 C)
500°F (260°C)	400°F (204°C)

The fusible link shall be supported by a detector bracket/linkage assembly which shall have provisions for connecting 12mm (0.5") rigid or EMT thin wall conduit and 1.6mm diameter flexible stainless steel rope. Changes in the direction of the conduit and steel rope shall be accomplished with die cast aluminium alloy, 90 pulley elbows.

7.98. ACCESSORY EQUIPMENT

The following accessory equipment shall be available, and shall be compatible with the selected fire suppression system:

a) Remote Manual Pull Station

If the release assembly is not accessible to manual actuation, a remote manual pull station shall be provided as the primary means of manual actuation. The pull station shall be the glass break-rod type, and shall be connected to the release assembly trip lever by means of a 1/16 in. (1.6mm) diameter stainless steel rope and 1/2 in. conduit. The pull station shall be located at a distance of not more than 125 ft. (38m) from the release assembly and along the fire escape path.

b) Fuel Shut-Off Devices

The CONTRACTOR shall provide electrical auto-disconnect devices where applicable in conjunction with the fire detection system. This is required to isolate the fuel supply to the fire source. The installation of the devices shall be co-ordinated with other trades to ensure compatibility.

c) Fire System Cabinet

This stainless steel cabinet provides a mounting location for all system controls and equipment. The cabinet shall be built into wall. CONTRACTOR is to coordinate with builder on cutouts and chasings for pipe work.

d) Chrome Appliance Drops

Chrome sleeving is required for appliance drops and piping in exposed areas.

7.99. ELECTRICAL

7.99.1. CABLE SELECTION AND ELECTRICAL WIRING

Every cable shall be so selected and installed as to be suitable for operation in compliance with the British Standard Specification. The type of insulation and protective covering shall be selected so as to allow compliance with the requirements as to precautions against mechanical damage, damage by heat, fire or explosion, dampness and corrosion.

a) Protection against dampness and corrosion

Every cable shall be installed where it will not be exposed to any form of moisture, oil or corrosive liquid. Wherever they are exposed to such conditions, all metal sheaths and armour of cables, metal conduit, ducts, trunking etc. shall be of corrosion resisting material or finish and shall not be placed in contact with other metals with which they are liable to set up electrolytic action.

Flexible cables and cords which in normal use are exposed to risk of contact with water shall be of a type sheated with superior PVC. PVC is not to be used for applications where the operating temperature exceeds 70^{O}C or below 0^{O}C (refrigerating rooms).

b) Protection against damage by heat

Every type of cable shall be so selected that the maximum temperature of its insulation, and sheath if any, under normal working conditions does not exceed the appropriate values specified by local code of practice.
Special heat resisting flexible cables in compliance with BS 6007 and BS 3456 are to be used for wiring up washable exhaust hoods.

c) Precautions against the spread of fire

Where cables, conduits or trunking pass through fire rated walls, partitions or ceilings, the surrounding hole or space shall be made good with cement or similar fire resisting material to the full thickness of the floor, wall etc.

d) Precaution against mechanical damage

All cables shall be adequately protected against any risk of mechanical damage subject to 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, oil 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 exceeds 60 C. Metal conduits shall be earthed in accordance with local codes. Where steel pipes are used they shall 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%

e) Refrigerating Room

Every refrigerating room including freezing rooms, chilling rooms and other artificially refrigerated space used for the storage of goods shall be regarded as a damp situation. (Unit type refrigerators such as under counters etc. are not applicable). As such the electrical installation shall comply with the requirements of damp situations.

Wiring of such locations shall be of a type which shall not provide pockets or channels in which moisture

may accumulate or through which it may pass into apparatus. Where conduit is used it shall be of the screwed or the thermoplastic type and each conduit shall be provided with adequate drainage facilities and shall be sealed by a non setting sealing compound at any point where it passes from the refrigerated to the non refrigerated space. Cables installed in conduits shall be of the tough rubber sheathed or thermoplastic sheathed type. Alternatively, MICS and those suitable for low temperature applications may be used.Cable troughing shall not be used as a cable enclosure. The point of entry of cables into lighting fittings, switches and other apparatus shall be effectively sealed with a non setting sealing compound.

7.99.2. **ELECTRIC MOTOR POWER SUPPLY WIRING**

a) The inter-wiring between electric motors, associated starters and other control devices is here-in-before specified to be part of the motorized equipment. In addition to the above, the plumbing work shall, in conjunction with each motor, include a power supply point located in the same rooms as the motor.

b) The supply point will consist of a joint box provided by the electrical contractor, at the located identified on the electrical drawings. Conductor of adequate length will be provided by the plumbing sub contractor for connecting motor starters and other control devices to the joint box.

c) Each feeder shall consist of single core wires run in conduit. Sizing of phase legs and conduit shall relate to motor size and shall be in accordance with local standards. Wires carrying the starting, accelerating and load current of motor shall be of rating at least equal to the full load current rating of the motor when rated in accordance with the relevant British Standards. Neutral and earthing wires in addition to those listed shall be included in the conduit for each feeder with the phase leg wires as hereinafter specified, if not specified otherwise elsewhere.

d) Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.

e) With each feeder a neutral conductor must (for control wiring supply purposes) be included with the phase leg wires. The neutral wire shall be of the same type as specified hereinafter generally for the feeder wires. It shall be sized according to local regulations and shall be in addition to the earthing wire hereinafter called for. The conduit shall be sized to include the neutral wire.

f) Conduit for feeders shall be of galvanized steel only. It shall be of the light weight, "slip-on" type having minimum wall thickness which comply with the following :

Nominal Size mm	Minimum Wall Thickness mm
16	1.00
20	1.10
25	1.35
32	1.50
40	1.60
50	1.60
65	1.60
80	1.60
100	1.60

g) Wires for feeders shall be PVC insulated. Insulation shall be suitable for 70^{O}C conductor temperature, and shall be rated for at least 600 volts (alternating current) line to earth regardless of actual application.

h) Wires for feeders shall have stranded construction conductors of soft, 98% minimum conductivity, properly refined copper.

i) Wires for feeders shall be color coded to identify phase, neutral and earthing conductors in

strict accordance with the approved standard practice.

j) Each conduit for a feeder shall contain an earthing wire. The earthing wire shall be of the same type as specified here-in-before generally for the feeder wires. Conduits sizing above accounts for the inclusion of the earthing wire. Earthing wires shall be bonded to the metallic casings of motors, sheet metal pull boxes, and motor control center or individual motor starter enclosures.

k) The earthing wire in each conduit shall be sized in relation to the phase leg wires in the conduit and in accordance with the following .

SIZE OF PHASE LEG WIRES	SIZE OF EARTH WIRE
MM^2	MM^2
25	10
4	25
6	25
10	6
16	6
25	16
35	16
50	16
70	50
95	50

l) Final connections to motor starters which are integrally mounted with motorized equipment shall be with .50m of suitable flexible conduit.

7.99.3. **MOTOR STARTERS**

Every electric motor having a rating exceeding a rating of 0.37 KW but below 2.2 KW shall be provided with control apparatus incorporating a suitable starting device affording protection against excess current. Electric motors having a rating exceeding 2.2 KW shall be provided with starting arrangement acceptable to local authorities.

7.99.4. CONTROL PANEL

All electrical control panels shall be constructed and wired in accordance with British Standard Specifications and Local Electric Power Supply Authority's Rules and Regulations, both with regard to the design, constructions, performances and tests.

Electrical control panel shall generally serve kitchen engineering systems such as but not limited to fire protection system, ventilator wash system, refrigeration system, pressure cleaning system and shall have the following panel construction (if not furnished by manufacturer).

i. Wall mounted, totally enclosed and front connected with all live parts concealed behind an escutcheon plate.
ii. The enclosure fabricated from 16 gauge mild steel, rust protected and finished stoved enamel, with cast corner members and internal fixing holes.
iii. All connecting cables to exit from wall into enclosed cabinet such as to avoid any external/visible cabling.
iv. Doors of the hinged type and fitted with dustproof gasket and lockable chrome plate handle.
v. The maximum depth of the enclosure shall not exceed 0.3m. The enclosure shall provide separate compartment for mounting contactors, starters and time switches where required.
vi. All parts shall be designed to withstand without any sag, deformation or warping, the loads likely to be experienced during normal operation or maintenance or under maximum fault condition.

7.99.5. CONTROL PANEL INDICATOR LIGHTS/SWITCH BUTTONS

All control panel switch buttons for selecting the various modes of operations and indicator lights shall be flush with front surface of panel. The colour codes for indicator lights covering the full range of the standard fault conditions shall be decided in liaison with the hospital engineering department.

7.99.6. **CIRCUIT BREAKERS, SWITCHES AND ISOLATORS**

All devices shall have voltage ratings and frequency suitable for the supply characteristics to which they are applied and shall conform to the latest British Standard Specifications in all respect with regard to designs, constructions, performance and tests. Devices manufactured in accordance with other technical specifications will only be considered if Test Certificates issued by KEMA or other recognized testing authorities are submitted to show their full compliance with British Standard and ASTA rules.

7.99.7. **SWITCHES & ISOLATORS**

Switches and isolators shall be selected in accordance with the following :-

i. .They shall be of totally enclosed, metal-clad, double air break, quick-break and quick-make type and arranged to break all poles simultaneously.

ii. They shall comply fully with BS 861 : Part 1 and Part 2 and relevant parts of BS 3078.

iii. They shall be equipped with manual operating handles, positive `on-off' indicators and mechanical door interlocks.

iv. They shall be capable of sustaining load making and load breaking duties of their normal rated current.

v. Switches where used for control purposes shall be of rotary and all insulated type complying with relevant section of BS 9563.

vi. Switches used for motor circuits and control shall be able to sustain switching duties at lock-rotor condition.

7.99.8. **CONTACTORS, STARTERS AND RELAYS**

All device shall have voltage ratings and frequency suitable for the supply characteristics to which they are applied and their designs, constructions, performances and tests shall conform with the latest British Standard Specifications and Rules and Regulations of the Local Electricity Power Supply Authority.

7.99.9. **CONTACTORS**

Contactors shall be selected in accordance with the following :-

i They shall be the moulded contact base type supported by metal side brackets on steel base plates and fixed with shock absorbing bushes and captive screws inside the totally enclosed dust proof, rust protected, enamel finished pressed steel cabinets of flushed type of surface mounting type.

ii. They shall comply fully with BS 755 Part 1, BS 764 and relevant parts of BS 9200.

iii. They shall be of the double air-break, quick-make and quick-break type for eachpole.

iv. They shall comprised of basic assemblies capable of being built into any combination of poles, switching arrangements and attachments for mechanical interlocks,

auxiliary contacts and timing device.

v. Their main contacts shall, for at least 100 operations and without damage or pitting, be able to interrupt current equal to six times the continuos requirements at less than 0.35 power factor at specified voltaage

vi. Their main contacts shall, without damage of any sort, able to sustain a closing current surge equal to ten times the continuos rate requirements at specified voltage

vii. Their main contacts shall be able to carry continuously the rated current without damage in an enclosure having an ambient temperature of 50□C.

viii. They shall have coils vacuum impregnated and wound on moulded formers. The coils shall be capable of operating within -15% to +10% of the nominal voltage.

ix. Where used as automatic changeover devices, they shall be of the mechanically and electrically interlocked type which excludes the possibility of paralleling two separate incoming supply source.

7.99.10. **STARTERS**

Starters shall be selected in accordance with the following :-

i. They shall comprises of main contactors, auxiliary contacts, protective and controldevices, switches, operating coils and wiring all assemblied as an integrated unit and housed inside a totally enclosed dust proof, rust protected, enamel finished pressedsteel cabinets of either flush type or surface mounting type.They shall comply fully with BS 140 and BS 587.

ii. They shall be manually operatable by means of external mounted `start-stop-reset' push buttons, control push buttons and toggle type isolating switches, all having positive visual indications showing the actual status of the starters.

iii. Protective devices shall include thermal overload of bimetal type having differential movement for preventing single phasing of three-phase motors. They shall have adjustable settings with ambient temperature compensators.

iv. Their contactors shall be of similar constructions, performances and designs as described under Clause 3.02.

7.99.11. **CONTROL RELAYS**

Control relays shall be selected in accordance with the following :-

i They shall be either A.C. operated or D.C. operated with or without latching devices and having voltage rating as shown in the Drawings.

ii. They shall be of the moulded contact base type supported by metal brackets on steel base plates and stable from shocks or vibrations.

iii. They shall comply fully with BS 9150 and BS 9151.

iv. They shall be equipped with double air-break contacts of self wiping quick action type in each pole.

v. They shall comprise of basic assemblies, capable of being built into any combination of operating contacts with `normally close' action and with attachments.

vi. They shall have making and breaking capacity of not less than 10 times rated current in A.C. rating and 2 times rated current in D.C. rating.

vii. Latched control relays shall be of mechanically held-in type so that they remain lock

in position.

Timers shall be of either :-

a Pneumatic disc type, A.C. or D.C. operated with manually operatable adjustable time setting from 0.2 second.

b Solid state type with hybrid integrated circuits having manually operatable time adjustment from 0.1 second to 60 second.

c Motor drive type with time adjustment from 1 minute to 45 minutes.

Voltage coil shall have regulation between -15% to +10% nominal rating.

All relay blocks shall be equipped with self clamping terminals for front wirings.

Where specified as time switches, they shall be of the totally enclosed, flush or surface mounting type, having removable transparent plastic cover at the front and overall metal casing at the back to house every components associated with. They shall be equipment with visual time dial, manually operatable on-off-automatic selection switch and self-wounded 24-hour spring reserved from taking over the timing when the supply source is loss. Unless otherwise specified, the programme period shall be 24 hours duration with adjustment from minimum switching interval of 15 minutes.

7.100. PAINTING AND LABELLING

SCOPE OF WORK

This section of the Specification covers the painting and labelling of the equipment and works installed under the other sections of this Specification.
The work involved includes but shall not be limited to the supply and application of paint, thinners, identification labels, etc., unless specifically excluded elsewhere in this Specification.

7.100.1. PREVIOUSLY PAINTED SURFACE

If equipment is delivered to the Site already painted but not generally in accordance with the requirements of this Specifications, the Architect may at his discretion order any of the following action :-

i If the paint already applied to surfaces which will not be exposed to view in the finished installation is not considered to provide suitable protection for those surfaces, it shall be completely stripped off by an approved method and the surface cleaned down for repainting as specified. If the existing paint is considered to provide suitable protection, no further painting will be required for those surfaces.

ii. If the paint already applied to exposed surfaces is considered to be a suitable base it shall be cleaned down and one undercoat and two finishing coats as specified shall be superimposed.

iii. If the paint already applied to exposed surfaces is not considered to be a suitable base, it shall be completely stripped off by an approved method and the surface cleaned down for complete repainting as specified.

7.100.2. SURFACE FINISHES

i. All ferrous metal surfaces without protective finishes shall be painted except surfaces of

moving parts which shall be thoroughly oiled and greased as required.

ii. Surfaces to be chromium plated shall be first copper plated and then nickel plated.

iii. Galvanized metal surfaces may be left unpainted unless called for or required for the purposes of colour coding and aesthetics.

iv. Equipment and appliance delivered factory painted may, if required by the Architect for the purposes of colour coding and aesthetics, be painted as specified.

v. Non-ferrous surfaces may be left unpainted unless called for in the Specification or required by the Architects for the purposes of colour coding and aesthetics.

vi. All timber surfaces shall be dressed and painted

vii. All bare surfaces requiring painting shall first be given a priming coat followed by a undercoat and two finishing coats.

7.100.3. SURFACE PREPARATION

Surfaces to be painted shall be cleaned to remove dust, dirt, oil or grease. Ferrous metal surfaces showing signs of rusting shall be wire brushed and sanded down to bright steel, cleaned and immediately given a coat of approved rush inhibitive primer. Galvanized steel surfaces shall be suitable etched to receive paint work. Timber surfaces shall be sanded to smooth finish and wiped to remove all dust. Care shall be taken to ensure that all surfaces are perfectly clean and dry before any paint is applied.

7.101. MATERIALS

All paints and other materials required shall be of the best quality of their respective kinds.
All primers, undercoats and finishing coats shall be suitable for the specific application and each shall be compatible with one another as recommended by the manufacturer.
All paints shall be epoxy based type of approved brands and shall generally be prepared by the manufacturer for use without thinning or reducing unless otherwise specified.
All materials shall conform to the relevant British Standards and shall be delivered to the Site in unopened tins or bottles or in sealed packets, in each case bearing the manufacturer's name and the nature of the contents. The containers shall not be opened until just prior to their use.

7.101.1. COLOURS

The finished colours required will be nominated by the Architect on request prior to the commencement of painting. except for clear lacquers, successive coats of paint shall be of different shades as directed by the Architect.

7.101.2. APPROVAL

Samples of finishes, colours and materials shall be submitted to the Architect and approval obtained before painting is commenced.

7.101.3. APPLICATION

i. The painting shall be carried out by experienced tradesmen in accordance with best trade practice and shall afford a first class finish within the limitations imposed by the surface nature of the items painted.

ii. Containers shall not be opened until required. Care shall be taken to ensure that the paint is thoroughly stirred before use. Thinners shall not be used except for improving the consistency.

iii. Each sub-coat shall be applied in a different shade and each coat allowed to dry before the application of the subsequent coat. Any drips or uneven finish shall be scrapped off and

sanded before the application of the subsequent coat.

iv. No painting shall be carried out in unsuitable weather or in damp and unventilated environment.

v. Tarpaulins, sheets or covers shall be provided to protect floors, walls, finished work, etc., while painting is in progress.

7.101.4. **PROTECTION AND MAKING GOOD**

Paint shall not be mixed on the finished floors of the buildings. A separate shed or sheltered area shall be provided for mixing.The painters shall be equipped with as many drip cloths as may be necessary to fully protect all parts of the equipment buildings and other works. They shall take all the necessary or usual precautions to avert damage to their own work, including placing warning signs as required, and shall make good any damage incurred to their own or other work.. Paint spots, splashes and overruns shall be removed before they have hardened and the area
shall be kept clean and tidy.

7.101.5. **HEAT RESISTANT PAINTS**

The paints applied to any surfaces which may become hotter than the highest temperature for which normal paints are suitable shall be heat resistant to a degree commensurate with the highest temperature they may called upon to withstand.

7.101.6. **PRIMING**

All surfaces shall have one priming coat applied. Steel and iron shall be primed with a rust inhibiting primer and galvanized surfaces shall be primed with an etching primer. A second priming coat shall be applied to all surfaces which will be covered by insulation or attached equipment and to all other surfaces where the Architect considers the first primer has proved inadequate for its purpose.

7.101.7. **STEELWORK AND EQUIPMENT**

One undercoat and two high gloss finishing coats shall be applied to all surfaces not covered by insulation or attached equipment. Areas of equipment which may be inaccessible after installation shall be painted before hand where possible.

7.101.8. **WORK TO BE PAINTED**

In the absence of more specific instructions the following principles shall be adopted as regards to work requiring painting :-

i. All surfaces requiring protective coating, e.g. ferrous and timber surfaces.

ii. All work required by regulations to be painted for purposes of identification, e.g., fire protection piping, electrical conduits, industrial water, etc.

iii. All work exposed to view irrespective of surface material, e.g., equipment, ductwork, pipe work, etc.

Notwithstanding the above, all pipe work shall be banded and labelled as specified elsewhere in the specification.Items of work which are difficult to paint after installation shall be prepainted. All hangers, brackets and supports must be prepainted before installation.

7.101.9. **SIGN WRITING**

All major items of equipment shall be identified with approved names and/or numbers of suitable size in

proportion to the size of the respective items. Pipelines shall be marked with contrasting colour directional arrows adjacent connections, valves and branches and at intervals of not more than 5 metres. These arrows shall be 75mm (3")long on pipes up to 50mm (2") diameter and 150mm (6") long on pipes over 50mm (2")diameter.

7.101.10. IDENTIFICATION

a) Motor Control Identification

Mount black lamacoid nameplates on each motor controller identifying primary control function and individual position indication such as Pump No. 1, etc. Nameplates shall be cut through to white background and have bevelled edges. Mount with chromium plated acorn head screws.

b) Piping Identification and Coding

i Apply colour coded Polyvinyl Chloride pipe bands identifying pipe contents and direction of flow.

ii. On exposed piping apply bands on 30 foot centres of straight runs, at valve locations, at points where piping enters and leaves a partition, wall, floor or ceiling.

iii. On concealed piping installed above non-removable ceiling construction apply bands in manner described for exposed piping.

iv. On concealed piping installed above non-removable ceiling construction, or in pipe shafts, apply bands at valve or other devices that are made accessibly by means of access doors or panels.

v. Apply bands at exit and entrance points to each vessel, tank or piece of equipment.

vi. Band widths shall be 8" for pipes up to 10" diameter and 16" wide for large diameter piping. Letter heights stating service shall be pre-printed on band 3/4" high for 8" bands and 1 1/2" high for 16" bands.

viii. For insulated pipes apply bands after insulation and painting work has been completed.

ix. Colours shall conform to ASA Standard A13.1. Provided 24 additional bands of each type for future use by Employer's personnel.

x. Follow manufacturer's instruction for application procedures using non-combustible materials and contact adhesives.

Submit list of all identification for review and approval six months prior to start-up of earlier system.

7.101.11. CLEANING

Upon completion of the installation work the CONTRACTOR shall clear all building debris from the plant rooms and to ensure that all building works required to be carried out therein are satisfactorily completed to his requirements as regards to finishes to walls and floors to provide an environment free from dirt and dust as required for the efficient operation of his equipment.

If any work us not satisfactorily completed, the CONTRACTOR shall bring same to the attention of the MCON who shall cause same to be rectified.

Before any test is carried out, the CONTRACTOR shall ensure that all equipment and installation work is cleaned and no debris is lodged in any of the moving parts.

7.101.12. **SHOP DRAWINGS**

7.101.13. **GENERAL REQUIREMENTS**

Shop drawings submitted for approval must be complete in all respects and shall be prepared by competent draughtsmen experienced in the type and nature of work being considered. The drawings shall be prepared in ink on good quality tracing paper and shall be of standard metric scale and size. The number of drawing size adopted shall be kept to the minimum and once selected the same size shall be used throughout for each class of drawings.

Each drawing shall be suitably titled and numbered and shall bear the date of issue and the date of details of all subsequent revisions.

The drawings to be submitted for approval shall be classified broadly into the following types:-

i Layout Drawing

ii. Builder's Work Details including recess drawings

iii. Services Layout for plumbing engineer

iv. Services Layout for electrical engineer

v. Fabrication Details, including elevations

7.101.14. **DRAWING LAYOUT**

The drawing layout shall be set out generally as the contract drawings.

The title block shall provide the following information :-

i Title :

ii. The particular engineering services pertained to (e.g. Ventilation and Air Conditioning, Electrical Services, Piped Services, Fire Protection Services).

iii. The subject of the drawing.

iv. The date of issue.

v. The drawing number.

vi. The scale or scales used.

A revision column shall also be provided to note the date and details of each revision.
The conventions and symbols to be adopted in the drawings shall be as the contract drawings.
Any departure shall have the prior approval of the Arc.

7.101.15. **ARRANGEMENT & SETTING OUT**

The arrangement of the various equipment and associated services shall follow closely that set out in the contract drawings except where modification is required to suit the specific materials and equipment to be provided, to fit the latest available information on the building construction details, to meet the requirements of other services and equipment or to incorporate improvements proposed by the CONTRACTOR, and such other modifications as approved by the Arc.

The setting out and design details shall be in accordance with best engineering and trade practice. In particular the arrangement of the various equipment and systems shall be such as to allow for proper operations and ease in servicing and maintenance of the installation. All controls and operating devices shall be readily accessible; and warning devices clearly visible. Where unavoidable access platforms shall be provided.

All services run (pipes, conduits, ducting, etc.) shall be fixed clear of each other and shall be arranged so far as is reasonably possible to afford easy access for maintenance and repair. No service run shall be installed or fixed behind other services run and shall be readily replaceable along its full length.

The following information and details shall be provided where appropriate :-

i All services runs shall be located with reference to the nearest grid line and dimensions indicated on the drawings.

ii. The bottom elevation of each of the services runs shall be indicated on the drawings and any change in elevation clearly noted.

iii. The dimensions of all services runs must be given and where appropriate the gradient and direction of flow given.

iv. Positions of all hangers and supports shall be indicated with each particular type clearly differentiated and reference to detailed fabrication drawings.

v. The load imposed on the structure by each of the hangers and supports shall be given and the direction and magnitude of all dynamic thrusts noted.

vi. All structural penetrations must be indicated (the details of such penetrations shall be given in the builder's work drawings) and embedment clearly noted.

vii. The position of all joints, fittings, connections and tee-off shall be indicated. Any special provisions such as expansion joints, test points, etc. shall be clearly noted and positions dimensioned.

viii. All access openings required for operation and maintenance of the system shall be indicated and dimensioned.

ix. All applied finishes, such as insulation, sheathing, painting, fire rated enclosures, furring, etc., shall be noted.

x As many sections and elevations as are necessary to clarify the plan layouts shall be given.

xi. Schematic flow diagrams and single line diagrams shall be provided to amplify the plan layouts where details shown are insufficient to give a clear picture of the systems proposed.

xii. A legend shall be given to explain all symbols used in the drawings

7.101.16. **SERVICES LAYOUT**

Drawings described must be detailed to a scale of not less than 1:50.

The physical size and shape of all plant and equipment to be installed in each room or location shall be shown in full.

All installation and connection details must be shown and noted in the drawings. Fixing to and embedment in structural members must be noted and the magnitude of each load point given. Where impact or dynamic load is expected the magnitude and direction of such loads shall be given.

All access provisions (such as trenches, ladders, platforms, etc.) for installation, operation and maintenance of the equipment must be fully detailed.

As many sections and elevations as are necessary to clarify the plan layouts shall be given.

For the purposes of this clause all water storage tanks, sump pump pits, ejector pits and grease traps, etc. shall be considered and treated as an item of plant in the provision of details and information for approval.

In support of the detail shown in these drawings the CONTRACTOR must submit at the same time manufacturer's dimension sheets, installation and operation details, together with details of all ancillary equipment, control and wiring diagrams, schematic flow diagrams, etc. as may be appropriate for the detailed evaluation of the submission.

7.101.17. **BUILDER'S WORK DETAILS**

A set of drawings showing MCON's work in connection with the services shall be submitted together with the installation layout drawings. These drawings shall be used by the Employer for co-ordinating with his structural shop drawings.
These drawings shall be prepared on a structural background to a scale of 1:50 and shall show to scale where appropriate the following :-

i Equipment foundations and plinths, holding down bolts and fixing details.
ii. Structural openings and core holes through walls, floors and beams (size and configuration must be given).
iii. Cast in sleeves and frames (size and type must be given and adequately referenced to fabrication details).
iv. Embedment in structural concrete (anchor inserts, pipe sections, fixing bolts, drain outlets, etc.).
v. Trenches and cast-in conduit runs and pipework.
vi. Structural enclosures.

The details shown must be fully dimensioned and located with reference to the structural gridline. Where appropriate elevation levels must be given.

7.101.18. **- SERVICES & MAINTENANCE**

7.101.19. **SCOPE OF WORK**

The work to be performed by the CONTRACTOR shall include the supply and delivery of all materials, labour and incidentals for the service and maintenance of the Food Services Equipment and shall include but not be limited to the following :-

i Free service and maintenance during the Defects Liability Period.

ii. Two (2) years regular services and maintenance commencing from the date of expiry of the Defects Liability Period (at the option of the Employer).

iv. Supply and replace all defective parts and equipment as necessary.

a. During the Defects Liability Period - free of charge.

b. After the Defect Liability Period - at normal market rate.

7.101.20. **ROUTINE MAINTENANCE**

The CONTRACTOR shall make monthly inspection of the equipment and shall perform normal services which shall include but not be limited to the following :-

i Inspect all steam and condensate pipework and,

a. Check all seals and gaskets for leaks and rectify as necessary.
b. Check all valves, traps and strainers, etc. for correct function and rectify as necessary.

ii. Inspect all gas pipework and,

a. Check all seals, gaskets and connections for leaks and rectify as necessary.
b. Check all valves, regulators, etc. for function and rectify as necessary.

iii. Inspect and service all kitchen equipment and ventilators in accordance with the manufacturer's recommendations with special attention to the lubrication of bearings and gearboxes, adjustment of V-belt drives and electric motor brush gear where installed.

iv. Cooling Water System.

a. Clean all pump suction strainers.
b. Check pumps for bearing noise, bearing lubrication and rectify as necessary.
c. Check pump mechanical seal/packing for leakage and rectify as necessary.

d. Check pump drive coupling and replace as necessary.
e. Check pump leakage drain lines.
f Check and operate valves to ensure they operate smoothly without binding.
g. Check and tighten loose pipe supports.

7.101.21. **Refrigeration System.**

a. Check all seals and gaskets for leaks and rectify as necessary.
b. Check all oil levels and top up as necessary.
c. Check all refrigerant levels and charge up as necessary.
d. Check all condenser pressures and clean condensers as necessary.
e. Check all suction pressures and rectify as necessary.
f Check all belt drives for tension and adjust as necessary.
g. Check all controls and adjust as necessary.
h. Check all safety devices and ensure they operate as designed.
i. Tighten all bolts and nuts, and loose connections.

7.101.22. **Electrical**

a. Check for tightness of electrical connections, and tighten as necessary.
b. Clean motors and housings.
c. Check motor bearings and replace as necessary.
d. Check overload elements and adjust as necessary.
e. Check Switchboard, Control Panel and Local Control Panels, Test Automatic and Manual

Operations, and check all indication lights.

7.101.23. **REPAIRS**

The Kitchen Equipment Contractor shall, at the request of the Employer, send a competent person during the CONTRACTOR's normal working hours immediately. He is available, at times other than those of the inspection and servicing herein before described, for the purpose of adjusting or rectifying any fault. The Employer shall notify the CONTRACTOR of any fault in the proper operation of the plant or equipment as early as possible after occurrence thereof. No extra payment shall be made for additional visits or servicing required under this clause.

7.101.24. **EMERGENCY SERVICE AND REPAIRS**

In addition to the regular inspection and servicing, a 24-hour emergency service shall be provided. A competent person must be made available at all times to attend to any emergency required.

7.101.25. **COMPETENT PERSONS**

The CONTRACTOR shall ensure that all servicing, maintenance and repairs carried out under this Contract are performed by competent persons and shall, if so required, inform the Employer of the name of such person or persons.

The CONTRACTOR shall ensure that the provisions of the regulations or of any law relating to the installation for the time in force are complied with so far as they apply to the work to be executed under this Contract.

7.101.26. **REPORTS**

A log book shall be provided by the Contractor in the Plant Supervisor's Office to record the date, time and details of each maintenance.

The record shall give a listing of details of all services, maintenance, repairs, parts replace, etc., and the name and signature of the personnel carrying out the work.

7.101.27. **GUARANTEE & WARRANTY**

During the Defects Liability or Warranty Period, all equipment and works installed by the performing satisfactorily shall be replaced without charges.The Warranty Period shall commence from the date of project handover. All warranties onspare parts shall be one (1) year from commencement of warranties, manufacturers' defects two (2) years, and all electronic parts one and a half (1.5) years. All warranties shall be prepared and submitted to the Owner for signing when the handover is certified.During the warranty period, CONTRACTOR shall be available for on-call warranty servicing seven (7)days per week, twenty-four (24) hours per day and shall respond to such calls and commence remedial action within a twenty-four (24) hour period for city locations and a forty-eight (48) hour period for remote locations. All necessary tools, spare parts and manuals for such servicing shall reside with CONTRACTOR. If any part breaks more than one time during the warranty period, it shall be fully replaced with a new part. CONTRACTOR shall exercise all reasonable efforts and due diligence to carry out repairs and minimize the down-time or non-availability. No repair shall take more than one (1) day from commencement of remedial action, unless prior notice is given and accepted by the Owner. If CONTRACTOR fails to complete the repairs to the satisfaction of the Owner within the said period, CONTRACTOR shall pay the Owner liquidated damages of the rate of two tenth percent (0.2%) of the Contract Price of the equipment for each day or part of a day the equipment is not available as a consequence of such delay in repair.

7.101.28. **SPARES**

CONTRACTOR shall submit spare parts list and manufacturers' regional hotlines and area contacts for all equipment specified here-in after the project has been awarded. Equipment manufacturer's recommendations shall be followed by the CONTRACTOR in the preparation of recommended spare parts list. CONTRACTOR shall note down long lead items and the availability of shelf replacement parts.

All spare parts furnished by CONTRACTOR shall be wrapped and packaged to preserve original as new condition under normal conditions of storage. The same parts shall be properly tagged by stainless steel tags and coded so that later identification as to their intended equipment usage will be facilitated. All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment in accordance with the instructions from Purchaser. Packing lists shall be furnished complete and in detail so that parts can be handled without uncrating, if desired.