TECHNICAL SPECIFICATION FOR MECHANICAL SERVICES

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TECHNICAL SPECIFICATION MECHANICAL SYSTEM

1.0 GENERAL

1.1 General Scope of Works

a. The specifications and requirements under this section cover the general scope of works for the mechanical services for the whole project.

b. The scope of work shall include supply and install all materials, equipment, plants and labour and perform all installation, testing and commissioning works required for the complete and satisfactory completion of the whole installation; repair and replace all defective and faulty materials, equipment, plants and works and perform all breakdown, scheduled and preventive maintenance works during the Maintenance Period.

1.2 General Instruction

All works, unless otherwise mentioned, shall be in accordance with normal JKR practices and the standard specifications currently in use.

a. The Contractor shall furnish all the necessary layout drawings, schematic drawings, system drawings, wiring diagrams, etc. Contractor shall also summit full specifications, technical details, catalogues, names of manufacturer, model numbers, etc. of the equipment and materials etc. together with their documents. A detailed program of works shall also be submitted. The electrical portion and the mechanical portion of the submission shall be in two separate volumes.

b. Wherever a manufacturer's name and/or model is mentioned in this document, it is intended as a guide to the type of construction, general appearance, performance, characteristic, quality and standard of manufacture of the equipment or materials and shall not exclude the Contractor from offering alternative equipment or materials of similar or better type. Preference shall be given to UiTM Standard of Equipment for standardizing purposes.

c. The prices quoted in the tender shall include all taxes, duties and other charges applicable.

1.3 Rules, Regulations and Standards

a. All works performed and materials and equipment supplied shall be in accordance with the latest Malaysian Standards and/or British Standards, IEE Wiring Regulations (16th.- Edition) or any other international standards or regulations subject to the approval of the Project Director.

b. All works performed shall be of good standard to the current practice, with good workmanship and shall comply with the requirements, rules and regulations of the Jabatan Kerja Raya (JKR), Tenaga Nasional Berhad (TNB),Syarikat Telekom Malaysia Berhad, Jabatan Keselamatan dan Kesihatan Pekerjaaan, Jabatan Bomba Malaysia, Jabatan Alam Sekitar and other supply authorities/utility authorize/local authorities.

c. All materials and equipment supplied shall be new, unused, of good quality, of reputable makes, with good after sale services and approved by the relevant authorities such as Tenaga Nasional Berhad (TNB), Syarikat Telekom Malaysia Berhad, Jabatan Kilang dan Jentera, Jabatan Bomba Malaysia, etc. They shall be of the approved types and acceptable by the Project Manager.

2.0 SCOPE OF MECHANICAL SERVICES

2.1 The scope of work for the mechanical services shall include Supply, Install, Testing & Commissioning and Service and Maintenance of the systems during defect liability period.

2.2 The Mechanical Services shall include, but not limited to the following works.

a. Fire Fighting Installation.

b. Air Conditioning System.

c. Cold Water and Sanitary Plumbing System

2.3 General Requirements

a. In the event where a air-conditioning system is to be installed in a particular building, all the subsequent spaces can be air-conditioned except for plant room, storage room (to clarified) and toilet. When a room/space is air-conditioned by a VRV/VRF system, it may have a second stand-by individual unit/split unit depending on the usage of that particular room/space. But if the existing individual unit/split unit is in a good condition is might be to use that suitable particular room/space with do the major service on the existing split unit system.

b. Fire Fighting System shall be installed in accordance with the Uniform Building by-Laws 1984 and all requirements by Jabatan Bomba Malaysia. Central Monitoring System shall be installed to all critical buildings/terminals within the camp area and shall be connected to a central controller located at Camp's Fire Brigade Station or controller room.

c. In the event of a particular space is not properly ventilated (naturally), a mechanical ventilation system shall be provided.

d. All buildings shall be supplied with direct water supply via gravity fed system. In location where the pressure is insufficient, the supply must be accomplished by means of pumping system.

e. Comply fully to the existing Building By-laws and the rules and regulations as laid down by Jabatan Bomba Malaysia.

2.4 Fire Fighting Installation

2.4.1 Scope of Work

The fire fighting installation shall include but not limited to the system as mentioned below. The installation shall comprise of hose reel system, fire alarm and portable fire extinguisher. The design and requirement of any of the above mentioned installation shall comply fully to the existing Building By-Law and the rules and regulation as laid down by Jabatan Bomba Malaysia.

a. Standards listed below shall be used for the purpose of designing and installation:

(1) Malaysia Standard.

(2) British Standard Institute (BSI)

(3) Rules of the Fire Office Committee/Loss Prevention Council (UK).

(4) National Fire Codes/NFPA (USA).

(5) Australia Standard.

(6) Uniform Building By-Laws 1984 (UBBL)

(7) Tenaga Nasional Berhad (TNB)

(8) Suruhanjaya Tenaga

(9) Factory Mutual Insurance.

b. The material, equipment, tools and parts installed for the system shall be of a reputable made in the market and shall be approved by Jabatan Bomba, SIRIM or JBE. The system used and installed shall have reliable back-up spares (at least 10 years) and good after sales services.

2.4.2 Hose *Reel System.*

a. Hose Reel System shall comprise of suitably sized storage tank, duty and standby sets of pumps with electric motors and diesel engines as prime movers (if generating set is not provided as a standby-by power supply), control and indicating panels, automatic and manual control

devices, piping, valves, etc., necessary for the smooth and effective operation of the system. All the existing tank and HR pumps shall be use and contractor need to be service and repair (if necessary) to make it the system functional.

b. The new hose reel cabinet shall be of enclosed or recessed type and shall be made of steel. The recessed type shall have one-piece, hollow frame door attached to wall trim by full length hinge. The cabinet shall be provided with key in signal red colour to avoid unauthorized used of hose reel. The new HR drum at Block A need to be connected with existing HR pipe at Block B.

c. The existing storage water tank use hot dipped galvanized pressed steel and shall be coloured in Bomba's red. Material used for the piping shall be Galvanized Iron with screwed connection

d. The rubber hose shall be non-kinking type and shall be manufactured with an inner rubber tube lining, a reinforced of braided textile material and an abrasion resistance rubber cover. The reinforcement shall consist of a single rayon braid or a double braid of cotton. The rubber hose shall be of reputable made in the market.

2.4.3 The Fire Alarm Systems.

Shall comprise of fire alarm break glass panels, alarm bells, fire alarm control and indication' panels, smoke and heat detection system (if necessary) and central monitoring system. The system design shall be incorporate false alarm monitoring facilities. The standby power unit shall be of D.C. power supply units of approved 24 Volts Nickel-Cadmium batteries.

2.4.4 Smoke and Thermal detection system.

Shall be installed in rooms/areas as required by the Building By-Laws and Jabatan Bomba. Operation of the system shall give local alarm and also indications and alarm at the main fire alarm and indication panel. The system shall be designed in such a way that

effective monitoring, sensing and alarm is achieved. The main fire alarm and indication panel shall be connected to the Central Monitoring System available.

2.4.5 Central Monitoring System

Shall be designed and installed where the zoning of certain buildings/areas are required for the effective monitoring as required by Building By-Laws and Jabatan Bomba. Operation of the system shall give overall monitoring of the alarm and indication of that particular area and shall be able to be linked to district Bomba alarm monitoring facility. The system shall comprise of sub-panels and main panel at suitable locations.

2.4.6 Portable fire Extinguishers.

Portable Fire Extinguisher effective to the class of fire anticipated and hazard of occupancy shall be provided within the buildings. Type of fire extinguishers installed shall be easily operated on and shall have the same method of actuation. All types of fire extinguisher shall have SIRIM's approval.

2.5 Air Conditioning and Ventilation System

2.5.1 Scope of Work

The air-conditioning and Ventilation system shall comprise of the supply, delivery, installation, testing and commissioning of the complete system. The system to be installed can be of VRV/VRF and window/split unit for the certain area (based on drawing and BQ). The refrigerant used shall be the type that would not pose any CFC effect. Contractor shall submit proposal to UiTM for approval brand of the system to be used for particular buildings/offices.

2.5.2 Design Condition / Design Codes and Standards

The air-conditioned spaces/areas shall be designed to the required temperature based on the ambient temperature of the project site. Areas/spaces where outside air ventilation is required, a minimum of 15 CFM per person or one air change per hour whichever is higher.

The air conditioning and ventilation systems shall conform to the latest edition of the following standards and regulations of:

a) Jabatan Keselamatan dan Kesihatan Pekerja (JKKP)

b) Jabatan Perkhidmatan Bomba Malaysia (JPBM)

c) Tenaga Nsional Berhad (TNB)

d) Jabatan Alam Sekitar (JAS)

e) All other authorities having jurisdiction over this installation

The air conditioning and ventilation installations and applications shall conform to the latest edition of the following standards where applicable:

a) Royal Ordinance Directorate statement of requirements for Explosives Store House (ESH).

b) Australia Standards 1668 Mechanical Ventilation and Air Conditioning Code.

Part 1 Fire Precautions in Building with Air Handling Systems.

Part 2 Ventilation Requirements.

c) Fire Mode Operation and Smoke Control (AS 1668 Part 1 " Fire Precautions in Building Air Handling System'')

d) ASHRAE – American Society of Heating, Refrigerating & Air Conditioning Engineers Inc.

e) SMACNA – Sheet Metal and Air Conditioning Contractor National Association, Inc.

f) Uniform Building By-Laws.

g) ARI – Air Conditioning & Refrigeration Institute.

h) Relevant Malaysia or British Standards and Code of Practice.

2.5.3 General Design Criteria

The following design criteria shall be applicable to all air conditioning and mechanically ventilated areas unless otherwise noted.

a) Inside design condition:
24.0 deg. C □ 1.0 deg. C db
60% □ 5% RH

b) Outside design condition:
33.0 deg. C db
27.0 deg. C wb

c) Glass shading coefficient:
0.65 minimum

d) Roof Insulation: 75 mm thick fiberglass of density 32 kg/m plus double sided sisalation foil, or roof with equivalent thermal performance.

e) Air change rate for mechanically ventilated areas is based on a temperature rise of no more than 5 C above the maximum design ambient.

f) Ventilation air quantity

Generally	:	7.5 L/S person
Kitchen	:	30 air changes / hr
Mechanical / Electrical Room	:	12 air changes / hr
Toilets	:	10 air changes / hr

2.5.4 Equipment Location.

All air conditioning equipment such as air handling units, refrigeration machine condensing unit, etc. shall be located in area where the sound levels can be tolerated and with an area large enough to carry maintenance jobs.

(1) Any equipment rooms adjacent to occupied spaces should be acoustically treated,

(2) For the Air handling units (AHU) its location must able to supply an adequate fresh air free of dust, oil mist and odour.

(3) Outdoor condensing unit shall be located at a well ventilated place and protected from direct sunlight and

operating at sound level that will not annoy the user. The condensing unit casing shall be of all weather casing.

(4) For window/split unit the compressor shall be hermetic and rotary or screw type. It shall be robust in structure and of low noise level.

2.5.5 Dehumidifier Systems

a. The dehumidifier system shall comprise of the supply, delivery, installation, testing and commissioning of the complete system. All calculation involved in the design of the system shall also be submitted.

b. Design Condition. The dehumidifier design shall meet the following operating conditions:

(1), Humidity Resistance. The performance reliability of the dehumidifier shall not weaken under high humidity condition of more than 90 % Relative Humidity (RH).

(2). Reliability. All components shall be highly reliable when used in any ambient environment.

(3). Maintainability. The system shall require minimum maintenance after installation.

(4). Environment. The dehumidifier system shall be able to function in all weather conditions, primarily in tropical climate.

(5). Environmental Friendly. The adsorbent characteristic of the dehumidifier shall be in-situ synthesized metal silicate desiccant, non toxic and poses no health hazards.

(6). Resistance to Corrosion and Heat. The machine shall be insulated (wherever required) with high quality materials to prevent condensation and chemical corrosion.

(7). User Friendly. The dehumidifier shall be versatile and shall be easy to operate.

c. Equipment Location. All dehumidifier equipment such shall be located in area where the sound levels can be tolerated and with an area large enough to carry maintenance jobs.

2.6 Cold Water and Sanitary Plumbing System

2.6.1 Scope of Work

The cold water and sanitary plumbing system shall comprise of the supply, delivery, installation, testing and commissioning of the complete system. The works to be carded out under this Contract shall include the whole of the materials and all necessary labour for the complete installation strictly in accordance with the Specification current standards and the requirements of all relevant Authorities having jurisdiction over the installation.

2.6.2 System Description

Cold Water Services

Water supply for domestic services shall be tapped from the external water reticulation mains to storage tanks. Water storage capacity shall be based on the latest requirement by the local authority. Domestic cold water storage tanks shall be of HDPE/FRP tank construction. The water supplied for each building shall cater for a minimum one (1) and half-day water storage reserve. But the existing water tank is in good condition and existing tank should be remain and capacity of storage no need to be sizing up.

Distribution of domestic water to the toilets will be via gravity feed from the roof storage tank but contractor need to check pressure, if pressure

is not sufficient booster pump design necessary to use. Minimum outlet pressure of the required standards shall be adopted at the most remote point of the user of the equipment and fittings and this shall be used for design of the cold water system.

The riser pipe shall be Pvc Pipe Class E or HDPE PN 12.5 and the droppers/distribution pipe works shall be Pvc pipe Class D or HDPE PN 12.5. Isolating valves of globe valve shall be provided for every group of fittings or single fitting in order to isolate different sections of the pipe works.

All valves, fittings and connection shall be generally of construction in accordance with relevant British Standard specifications.

Sanitary Plumbing Services

All work shall be in accordance to the Uniform Buildings By-Laws and Local Authority requirements. A fully ventilated one-pipe system with vent and soil/waste stacks shall be used. Soil and waste pipe shall be discharged to inspection chamber prior to discharge to the septic tank/Super Sept The sanitary system shall be designed to dispose soil and waste from all plumbing fixtures, through a vented gravity piping system inside the building and discharge to external manholes.

Manholes shall be constructed of reinforced concrete base and walls of brickwork (English bond pattern), complete with heavy-duty access covers and frames. Internal surfaces of the manholes shall be tendered with high alumina cement to exclude infiltration of surface of ground water. Therefore Manholes/inspection chamber was use the existing until discharge to existing STP. The contractor shall be service and checking the existing system and make sure system was functional.

All soil, vent and waste pipes and fittings shall be hubless cast iron. Underground sanitary pipes within building shall be cast iron to B.S. 416

or UPVC `Brown'. External and underground sewer pipes shall be UPVC 'Brown' to BS 4660.

As an alternative, soil and waste pipes above ground and 80mm diameter and above shall be UPVC pipes and fittings to B.S. 4514. Waste pipes 50mm diameter and below shall be of galvanized iron to B.S. 1387 class 'C' for below ground. UPVC pipes to B.S. 5255 for other areas. Sanitary appliances shall conform to the local authority's standards.

2.6.3 Design Criteria

The hydraulic services (Cold Water & Sanitary Plumbing System) shall designed generally in accordance with relevant codes and requirement of the local authorities having jurisdiction over the works.

These include:

- Jabatan Perkhidmatan Pembetungan
- Jabatan Bekalan Air (JBA)
- British Standard Institution
- Department of Environment (DOE)
- Jabatan Kilang dan Jentera (JKJ)

3.0 DRAWINGS, TECHNICAL DETAILS AND CATALOGUES

1. The Contractor shall also submit shop drawings and catalogue to the project manager for comment prior to fabrication and installation.

2. Within three months after the completion and handing over of the project, the Contractor shall submit as-built drawings, technical information, catalogue, operation and maintenance manuals, spare parts list, etc. to the Project Manager for comment and retention. These documents shall be properly bound with hard cover. If, the Project Manager is not satisfied with the submissions, the Contractor

shall make the necessary alterations and amendments and resubmit the documents within three weeks after the comment is made. A set of transparency of the as-built drawings shall also be provided.

3. A copy of the relevant main schematic electrical and mechanical diagram, a copy of the layout drawing showing the electrical and mechanical services, a copy of artificial respiration charts shall be supplied and framed up in the substations, switch rooms, and plant rooms.

4.0 TESTING AND COMMISSIONING

1. After the works have been completed, the Contractor shall arrange the whole installation works to be tested and certified completed and safe to use, according to the rules and regulations and requirements of the supply authorities, the local authorities and any other authority having jurisdiction in the installation works and the equipment installed.

2. The tests shall be carried out by qualified and competent personnel according to the local laws. A set of the testing results and reports shall be submitted to the Project Manager for approval before any commissioning work is commenced. The Contractor shall inform the Project Manager at least one week in advance before any testing work is commenced so that the testing may be witnessed by the representatives of the Project Manager.

3. The Contractor shall also inform the Project Manager at least one week in advance before any commissioning work is to be carried out.

4. All commissioning works shall be carried out in the presence of the representatives of the Project Manager unless otherwise approved by the Project Manager.

5.0 TRAINING

1. The Contractor shall arrange for proper training for a team of government personnel on the operation and maintenance of the systems, equipment, plants, etc. in the complex at a suitable time for a suitable period before and/or after the handing over of the project.

6.0 INSPECTION AND ACCEPTANCE OF EQUIPMENT

1. Equipment to be provided shall be subjected to acceptance, inspection and tests prior to delivery and installation. For equipments which are not manufactured locally, necessary arrangement shall be made for mechanical and electrical engineers of UiTM to witness the test at the manufacturer's plant or factory overseas. These staffs shall also be in the Acceptance Team for the first part of the process of accepting the equipment.

2. The cost and expenses for providing all the necessary facilities for the above mentioned engineers to witness the tests i.e. food, lodging, accommodation, transport and travelling expenses shall deem to be included in the Contract Sum. The second part of the process which includes routine test and performance test shall be done locally at the supplier's assembly plant before dispatch to site.

3. For equipment which are locally made, the contractor shall make necessary arrangement for respective mechanical and electrical engineers to witness all the necessary testing.

7.0 GUARANTEE AND MAINTENANCE

1. The Contractor shall be responsible for maintaining the whole installation, except those works which have been handed over to the supply authorities/utilities authorities, for a period of 1 years after completion of the works.

2. The Contractor shall repair and/or replace all defective and faulty parts/items and to carry out all breakdowns, scheduled and preventive maintenance works during the Maintenance Period.

3. All materials, replacement parts, equipment, consumable items, labour etc., required for the repair and maintenance of the installation, equipment and plant shall be provided by the Contractor. The consumable items provided shall include but not limited to the following items:

    a. Lamps (all types).

    b. Fuses and mobs.

    c. Lamp control gears and starters (all types).

    d. Telephone terminal lighting arrestor blocks .

    e. Fuel filters, air filters, belt, lubrication oil, coolant and other consumable items for the generating sets.

    f. Consumable items for air-conditioning plants including refilling of refrigerant.

    g. Consumable items for pumps such as belting systems etc.

    h. Fire protection items such as fuses, carbon brushes, contact points: lubricants, greases, oil, alarm panel indicating lights, seals, gland packing.

    i. Other consumable items required for the proper operation and functioning of the equipment, plants, systems etc. of the whole electrical and mechanical installations.

4. All electrical fittings and mechanical equipment shall be provided with maintenance numbering. The numbering plate is similar to name-tag size and material.

5. Warranty provided by manufactures/suppliers if longer or more than the defect liability period shall also be transferred to the Government.

6. The Contractor shall take immediate action to carry out any repair work and restore the installation to its normal operating conditions upon receipt of the complaint from the officer in-charge of the complex or his representatives. If no action is taken to carry out the repair work within twenty four hours upon lodging of the report, the Project Director shall reserve the right to engage a third party to carry out the repair works with all the costs and expenses charged to the Contractor. If any equipment or plant requires more than two days to be repaired or replaced, the contractor shall arrange for a similar equipment or plant to be installed and used temporary until such times the equipment or plant has been repaired or replaced; failing which, the Project Director shall reserve the right to arrange for a similar equipment or plant to be used with all the costs and expenses charged to the Contractor.

8.0 SCHEDULE OF PREFFERED MECHANICAL EQUIPMENTS /MATERIALS/ACCESSORIES

All equipment and materials to be supplied and installed under this project shall be of the first grade design and manufactured and comply with the latest British Standards, Malaysian Standards and other relevant standards, JBE, Department of Safety and Health (DOSH) and other Local Authorities requirements. All electrical and mechanical equipment to be use must have approval from UiTM's Electrical and Mechanical Engineer.