SPESIFIKASI TEKNIKAL PENYELENGGARAAN SISTEM PENYAMAN UDARA DI UiTM NEGERI SEMBILAN.

1.0 GENERAL

The works to be covered under these specifications is as listed hereunder:

1.1 To carryout the scheduled service and maintenance of the air conditioning and refrigeration located in UiTM Negeri Sembilan, Kampus Kuala Pilah.

1.2 To inspect and service all air conditioning and refrigeration equipments as listed (inventory) as per schedule on the following page.

1.3 To carryout repair works inclusive spareparts during normal working hours/after office hour when required to do so by the S.O.

1.4 To conduct Condition Audit and update all inventory and as-built drawings to digital softcopy of the air conditioning and refrigeration equipments during the first 3 months upon signing the contract and last 3 months before contract expired.

1.5 To provide sufficient manpower (full time) to be stationed in order to carryout the above mentioned works to monitor such that all systems are always in good working condition though at the contract period consist of the following:

a) Engineer/Assistant Engineer/Supervisor (when required)
b) Competent Foreman - 1
c) Skill worker/serviceman - 2
d) Condition Audit Team (when required)

1.6 Where applicable, to check the air conditioning system daily operational condition and record the readings in Operation Data Sheet provided by S.O.

1.7 To conduct Indoor Air Quality (IAQ) inspection by *competent person* every year for all of air conditioning system equipment c/w executive comprehensive report.

1.8 Staff Uniform

The contractor must provide their worker a uniform which should follow standard of UiTM 's Contractor Uniform.

All of the worker must wear their uniform during working hour while doing their job in UiTM campus.

Attire used by contractor which shown any of UiTM identification while doing their work out side of UiTM compound is prohibited.

2.0 REPORTING SUBMISSION

2.1 To prepare a Comprehensive Report and submit immediately to Unit Operasi Mekanikal, Bahagian Pengurusan Fasiliti every first of the month and the report shall state the followings :

2.1.1 Details of complains arising on the particular month complete with cycle time to solve the problems, cause of the problems and permanent corrective action should be done.

2.1.2 Details of service report on the particular month.

2.1.3 To submit details of daily report and summarized it into monthly report using statistical method.

2.1.4 To prepare total cost of repair and service which have been done on the particular month.

3.0 SERVICING AND MAINTENANCE SCHEDULE

The contractor shall inspect and service all machinery and equipment comprising the complete Air-Conditioning and Ventilation System under this contract at least **ONCE EVERY FOUR MONTH DURING THE ONE (1) YEARS CONTRACT** except where otherwise directed by the S.O of UiTM.

At each such bi-monthly inspection and service of the complete air conditioning system and ancillary equipment the work detailed below shall be performed by the contractor:

ITEM	DESCRIPTION	Every Four Month	Every Six Month	Every Twelve Month
1.	General inspection. a) Checking proper function and damage unit.	X		
2.	Operation check a) Check for abnormal noise and vibration.	X		
	b) Check for condensation.	X		
	c) Check for missing knob,switches and etc.	**X**		
	d) Check operation of thermostata,fan and timer controls.	X		
3.	Maintenance a) Clean air filter and grills.	**X**		
	b) Check and clean condense drainage (flushing).	**X**		
	c) Clean air intake coil surface.	**X**		
4.	Electric Check a) Check integrity of cables and connectors.	**X**		
	b) Check operation of starter,lights and indicators.	**X**		
	c) Check & clean internal part of the distribution board & ensure spares ways available in the distribution board	X		
	d) Retightens all connections, terinations, etc	**X**		
	e) Check MCB's for tripping test	**X**		

ITEM	DESCRIPTION	Every Four Month	Every Six Month	Every Twelve Month
5.	Chemical servicing for spilt unit type and floor satnding type a) Chemical cleaning of outdoor and indoor unit e.g. condenser coil,evaporator,filter,fan,blower fan,cooling coil,casing body & related equipment using chemical and rinsing with water afterwards.Air filter cleaning,casing cleaning,blower fan wheel cleaning,running Amp checking,suction and discharge pressure checking,clean drain pan & flush pipe with compressed air,top gas R22 or R410A,lubricate fan bearings,checking & tightening electrical contacts.			**X**
6.	Educate the operator responsible for the operation of the air conditioning system and equipment on correct method of operating the air conditioning system and equipment and on the maintenance points to be watched. Record every activity such as monthly servicing, repair work, replacement, oil change in **LOG** book.	**X**		
7.	Report in writing (monthly) to the Resident Engineer if defect observed in any parts of the complete air conditioning system and ancillary equipment. The report shall state the course of the defects observed and shall include as estimate of the cost of repairs required.	**X**		

ITEM	DESCRIPTION	Every Four Month	Every Six Month	Every Twelve Month
8.	To record down every activities or defect for every chillers and others system in a proper Maintenance Record Sheet / System: history maintenance and willing to report immediately when instructed by S.O.	**X**		
9.	Provide one foreman and two skill workers to station in UiTM all the time during normal working hours. The contractor shall also provide qualified skill workers for 'stand-by' (**without any claim on that extra working hour**) during special functioning or emengency at UiTM if required to do so by the Resident Engineer. **NOTE : During Contract Period**	**X**		

4.0 The maintenance service furnished hereunder shall not include the normal function of starting and stopping the equipment describe above which function includes the opening and closing the valve, dampers or regulators normally installed to protect the equipment against damages not shall it include the defrosting of evaporators.

5.0 Any repairs, refrigerant and supplies, deemed necessary and recommended by the contractor for efficient operation of the installation are to be authorized by the Resident Engineer. Unless these recommendation are accepted and authorized is given to perform this service, the contractor will not proceed.

6.0 In the even the contractor is required to make emergency calls occasioned by the improper operation of the equipment of due to damaged caused by floods, lighting, fire, element rebellion, riots, strikes, laborers trouble, civil commotion of any kind or due to failure to follow the contractor's recommendations as noted above or for any cause beyond the contractor's control. The contractor shall be reimbursed for the expenses occur in making the emergency call in question, in accordance with the current established rates for performing such services.

7.0 The contractor shall not be held liable for any loss or damage due to delay in furnishing labor or material caused by reason of strike or labor troubles affecting his employee who perform the service herein agreed or by unusual delays in procuring supplies or for any other cause beyond his control. As mentioned in ISO 9001:2000. Pejabat Pengurusan Fasiliti:-

Response time of any breakdown report.

Intially response	:	1 hours (normal working hours)
Minor repair	:	1 – 3 days (working days)
Major repair	:	7 days
Others	:	Put in writing in order to prevent Unsatisfaction of Customers/clients.

8.0 The contractor shall repair defect in the complete air conditioning equipment on the instruction of the owner.

The contractor shall carry out a monthly inspection on the main chilled water supply and return pipe and if any case of any leakage should be repaired immediately using pre insulated pipe of appropriate size and covered with aluminium foil/sheet.

9.0 All workers and the supervisors shall be easily indentified in full uniforms and the contractor can use the company logo on the uniform.

10.0 The contractor is responsible in submitted the monthly quality and attendance report to the Resident Engineer. Failure to company with this provision shall render the contractor in breach of his obligation and the Resident Engineer shall have the right to deduct any monies due to contractor for the numbers of equipment the contractor has failed to submit the report.

11.0 All the workers must be in permanent of the contractor.

12.0 The contractor shall provide each of its staff with **security passes** approved by the University Teknology MARA.

13.0 Contractor will be allowed to store his belongings and tools meant for use within UiTM but the University bears no responsibility regarding the safety in whatever respect at any time.

14.0 All works, whether general servicing or repair work can be started when the Resident Engineer or his officers before further action are taken.

15.0 All defect parts already replaced must be produced to the Resident Engineer or his officers before further action are taken.

16.0 Commencing and completion of works will be only being recognized as done if instructions and certification are recorded in writing.

17.0 SERVICE AND MAINTENANCE RECORD

17.1 The contractor shall provide a service and maintenance record book for the complete Air-Conditioning Plant and ancillary equipment being service and maintained by him. This record book shall be kept in the plant room of the Air-Conditioning Plant and ancillary equipment being serviced and maintained and brief details of all

service, maintenance and repairs carried out on the complete Air-Conditioning Plant and Ancillary Equipment shall be entered by the Contractor into this book for checking purpose.

17.2 The address and telephone number of the Contractor service office shall also be entered into this record book to facilities emergency service calls.

17.3 The contractor shall also keep an accurate details record in duplicate of all service maintenance and repair work carried out by him on the complete Air-Conditioning Plant and Ancillary Equipment. This record shall be in the form of a Maintenance / Repair Sheet and shall be countersigned by the Employer each time the Air-Conditioning Plant and Ancillary Equipment is attended to by the Contractor.

18.0 The University will use the time frame below as guidance to deduct any monies due to contractor, should the S.O of UiTM feels that the contractor deliberately delaying works.

19.0 The frame below is effective from the time, a written instruction is issued by the S.O or his officers of UiTM.

20.0 Failure to comply within the time frame above mentioned, a fine will be imposed on the eventual claim of the job concerned and the rate deducted is 5% per no. of day of hour of delay whichever applicable.

20.1 The University will use the time frame below as guidance to deduct any monies due to contractor, should the Resident Engineer feels that the contractor deliberately delaying works.

20.2 Time frame above is effective from the time; a written instruction is issued by Resident Engineer of his officers.

20.3 Failure to comply within the time frame above mentioned, a fine will be imposed on the eventual claim of the job concerned and the rate deducted is 5% per no. of day or hour of delay which ever applicable.

NO	DESCRIPTION OF WORKS	DURATION
1.	Replacement of pipe and fittings (refrigerant and water) c/w insulation where applicable.	2 days
2.	Electrical faults (replacement of fuss, contactors carbon brushe, isolator)	3 days
3.	Chemical cleaning of : a) Outdoor Unit b) Indoor Unit	 2 nos/day 3 nos/day
4.	Replacement of compressor of all size.	3 days
5.	Replacement of all motors including fan motor (outdoor unit) and motor blower indoor unit).	3 days
6.	Repair piping leakage and re insulate .	3 days

Exemption of the fine above mentioned can be granted by the Resident Engineer if enough justification can be produced by contractor.

21.0 The contractor shall be deemed to have visited and examined all the designated building satisfied himself as to the local conditions of equipment operation. Any supply and conditions effecting labor and material, transportation of labor and material, transportation labor, materials, equipment etc. send the execution of the contract generally, as no claim the ground of want of knowledge in this respect shall be entertained.

22.0 The contractor shall at all times have their employment sufficient numbers of employer : one (1) person responsibility in supervision, one (1) person competent employer, one (1) person skilled worker and one (1) person non-skilled worker as in order to effectively perform this contract and to ensure the proper and efficient execution of the work. (Total employment : 4 person)
The Resident Engineer shall be at liberty to object to and require the contractor to remove forth with from the buildings, compound or any site any person employed by the contractor who in the opinion of the Resident Engineer as misbehaved himself/herself, or his incompetence or negligent in the proper performance of his/her Resident Engineer to be undesirable.

Any person so removed from the works shall be replaced as soon as possible but not later than one (1) week by a competence substitute approved by the Resident Engineer.

a) The contractor may provide his technical staff with uniforms approved by the Resident Engineer.

b) The contractor shall ensure that his staffs are early and tidily attired at all times.

c) All uniforms shall carry the name of company. No T-shirts, slippers shall be worn by the staff at any times.

23.0 The contractor shall supply all the necessary equipment, machine, instruments, tools and materials for the efficient execution of the work including specialized tools.

24.0 The Resident Engineer reserve the absolute right to engage other contractor to execute works and / or service which in his opinion are specialized in nature or in which the contractor has failed to perform in accordance to the specifications. In such an event the contractor as provided for in the contract.

25.0 a) All water and electricity required for the works shall be provided free of charge. The contractor shall exercise every effort to prevent the abused of this privileged and to economize in the use of water and the electricity and to ensure all rules and regulations applicable to the use of same are strictly complied with by his technical staff.

b) The contractor must ensure that his staff switch off all lights and turn off taps as soon as their work is completed.

c) Proper correction must be made to power point accordance in the prevailing rules and safety precautions. The contractor shall be made liable for damages to electrical circuits and installations of designated building.

26.0 a) Injury to person – The contractor shall indemnify government in respect of any liability, loss, claim or proceedings whats over whether arising at common law or by status in respect of personal injuries to or caused by the execution of the works unless due to any act or neglect of Government or its servants.

b) Injury to property – The contractor shall indemnify government in respect of any liability, loss, claim or proceeding and for any injury or demage whats over arising out of or in the cause of any reason of the execution of the works to any immovable or moveable property due to any negligence, omission or default or himself, his agent or his servants

or any authorized dub-contractor or to any circumstances within his control.

27.0 a) Default – If the contractor shall make default in any of the following respects, namely:

i) Without reasonable cause suspend the service maintenance required hereunder.

ii) Fails to proceed with the service and maintenance with the reasonable diligence, if any such default shall continue for ***fourteen (14) days*** after a notice sent by registered post to the contractor from the Resident Engineer, the Resident Engineer may there upon by notice sent by registered post determine this contract.

28.0 ELECTRICAL SWITCHBOARD

a) Features and Construction

The contractor shall supply and install metal switchboard, which shall house all circuit breakers, starter, contactor, relays, selector switchs and indicating instrument of the air conditioning equipment, inclusive and voltmeters.

The metal cubicle switchboard shall be fabricated from pressed steel sheet of not less than no. 14 B.S.W gauge in thickness and shall be rigid structural construction with all joints neatly welded and all bare edges turned over or lipped.

Each component of the cubicle shall be fitted with a neoprene dust seal or insert rubber gasket.

b) Associate Components

All switchboards shall comprise of air circuit breakers, earth fault relay, power factor means, voltmeters and current transformers MCB, MCCB, etc.

Busbars shall be hard drawn high conductivity copper of adequate rectangular section to carry continuously the specified current without overheating and also colored in accordance with latest British Standard.

An earthling busbar of suitable cross section shall be run the full length at the base of the main switchboard.

Connection from busbar to the circuit breakers, MCB shall be affected by means of copper bars or rods securely clamped to the busbars and identified by means of colored plastic sieving to indicate the phase colors.

All relays shall be heavy-duty pattern, unaffected by external vibration and capable of operation in any position. All meters and relays shall be fully trivialized. All contactor, starter, relays and controller shall be fitted on insulated panels. All incoming and outgoing circuit and wiring PVC insulated steel armoured PVC sheeted cable shall be manufactured and tested to BS 3346.

c) MICC Cables

When MICC Cables are to install the size the cables shall be suitable to ensure adequate current carrying capacity and that the voltage drop at the apparatus is not excessive. All work and material must be in accordance with the relevant British Standard Specification listed and the current rating shall be as listed by the IEE.

d) Electric Motors

All electric motor shall be dip proof, fan cooled and fully tropicalised and shal be furnished with Class 'E' Insulation BS 2757 and BS 263 and shall be specifically designed for operation on 50 cycles electric power supplies.

All electric motors shall be furnished with isolator gears and appropriate starter gears which be fully tropicalised and comply with BS 587.

Thermal overload protection devices in all phases over current protection devices and under voltage releases shall be furnished and incorporated in the circuit of electric motors.

i) Power Factor Requirement

All motor from 1.75 Kw up to 74.6 Kw shall have a power factor of not less than 0.85 at 80% load. Motor over 74.6 Kw shall have a power factor of not less than 0.9 at 80% load.

If the above specified power factors cannot be achieved, the contractor shall supply and install power capacitors for power factor improvement at his own expense. The entire capacitor unit shall conform to BS 1650 with the dielectric of high-grade craft tissue.

ii) Overload Protection

Thermal overload relays in accordance with BS 4941 shall be fitted to all motors. Thermal overload relays shall be manufactured by the same manufacture of the contractor.

Shall be brought to the contactor, starter, relays and controller via insulated terminals strips mounted within the cubicle and all wiring between terminal strips and electrical equipment inside the control panel shall be neatly run and toped in accordance with the requirement of **"TENAGA NASIONAL BERHAD"**

29.0 WIRING AND CABLES

All wiring to equipment and control shall be carried out in conduit with PVC insulated 250V 600V grade cables and conforming to the relevant current BS specification.

All cables shall be of size capable of carrying maximum current without exceeding 1 Volt plus 2% of nominal voltage drops from consumer's terminal to any point in the installation under normal conditions of services in accordance with the latest edition of the IEE Regulation for the electric equipment of Buildings. Cable smaller than 2.5mm² shall not be permitted in any power circuit.

All capable intallation shall comply with the following specification:

a) Cable, Conduit Trays and Trunking

For surface or concealed wiring PVC insulated cables in G.I. conduit shall be employed. Underground conduit wiring shall be carried out with PVC insulated and sheathed cables.

Capacities of conduits shall be in accordance with table B5 of IEE Regulation for the electrical equipment of Building 14 Th. Edition; in generally conduits for PVC insulated cables shall not be less than 18 mm².

Perforated hot dip galvanized mild steel can be applied where applicable. Trays shall be adequate width with upturned flange on both sides 18 mm, deep and shall be completed with all necessary fitting.

b) PVC Cables

PVC cables for sub main shall high conductivity strained cooper conductor to BS 3360, PVC insulated to BS 2004 and 2746 as applicable. Cables drawn into non-metalic pipe conduits or fixed to cable trays shall be PVC sheated.

All the overload relays shall be adjusted type, so selected that the full load current of the motor shall be about the mid point of the overload calibration.

The thermal overload relay shall, by the way of deferential trip action between the bimetal elements on each phase, be able to protect the motor from single phasing burnt out.

All thermal overload relays shall be of manual reset type.

c) Starter

The starter for each motor shall comply with the regulations of **"TENAGA NASIONAL BERHAD"** unless otherwise specified or indicated, the air conditioning contractor shall provide the following type of starter:

i) Fractional HP motors shall comply be squirrel cage type with split phase starting.

ii) Motors from 1 HP shall be squirrel cage type with the direct on line starting.

iii) Motors above 10 HP shall be squirrel cage type with star delta starting.

iv) Motor above 10 HP shall be squirrel cage type with automatic close transition autotransformer starting.