

SECTION 5

TECHNICAL SPECIFICATION

SCOPE OF WORK

The work to be covered under this Specification shall generally be as follows:-

- (a) Supply, install, testing and commissioning of the complete system ***Dental Units and Associated Equipment*** to serve the **Klinik Kesihatan Jenis 3** as specified further in this specification, and in accordance with the details shown in the drawings attached to this specification.
- (b) Supply, install, testing and commissioning the ***infra works(piping, junction box etc) for Dental Units*** as specified further in this specification, and in accordance with the details shown in the drawings.
- (c) Servicing and maintaining the above-mentioned equipment for a period of one (1) year **(At least 12 times)** from the date of its handing over to the Jabatan Kerja Raya, in good operating condition.

PART I SPECIFICATION FOR SYSTEM AND EQUIPMENT

A. DENTAL SPECIALIST'S UNIT

1. General

The dental unit shall be built in such a way as to provide good ergonomics, hygiene and aesthetics. It shall enable the operator to be close to the patient, provide optimum vision of the operating field and safe control of all component devices. The whole setup shall give a clean look and shall not have areas where it will be difficult to clean. The Dental Specialist Unit is to be used for all dental specialities that include oral surgery, pediatric dentistry, orthodontics and periodontics.

2. Patient's Chair

The chair shall be suitable for both adult and children and specially designed for sit down dentistry with no hindrance from armrest, backrest or seat.

The chair shall be supplied with easy to clean seamless upholstery of **durable material**.

The chair shall be **fully motorised spindle driven** or **hydraulically driven** which give smooth and non-jerky start when switch is activated. The chair shall be supplied with two foot switches to control the movements by the doctor and the assistant.

The chair shall have integrated armrest (which is adjustable / detachable) moulded into the seat. It shall be equipped with electric safety cut/off switch in case of collision / obstruction with any object.

The headrest of the chair shall be adjustable, suitable for adult and children. The movement of the headrest shall be motorised for easy position of patient's head during treatment. The chair shall be always at the same distance from cabinets at the back whether the chair is in upright or fully reclined position.

The chair shall have wide range of movements and tilting movements are synchronised with inclination of backrest and legrest. The height of the seat shall be adjustable from **about 44-70cm**.

Chair position programme shall be programmed for exit and entry, automatic rinsing auto return to last position and at least two working position according to operator's preference. It shall have programmes for 4 working positions and shall have auto return to last working position. All programmes shall be controllable on both dentist's and assistant's side. Electrical safety shall comply with MS IEC 60601-1 standard or equivalent.

The chair shall be of internal umbilical type and have internal junction box.

3. Dental Unit

The unit shall have digital display for fault diagnosing of any malfunction of unit.

The unit shall also have at least 2 filters for air and water that is before the water and air reach the instrument.

The unit shall be supplied with foot control to control:-

- a. start and stop of turbine handpiece, micromotor and scaler.
- b. speed of turbine and micromotor and oscillating range of scaler.
- c. drilling with / without water.
- d. for positioning of chair

3.1 Assistant's Instrumentation

The instrument system shall be connected to the cuspidor in a neat convenient set-up and shall comprise the following minimum requirements:-

3.1.1 Control Panel

All control panel for the programme of the chair shall be of touch pad that can be disinfected and cleaned after each patient and identical to dentist unit.

3.1.2 Multiple Function Syringe

The instrument system shall have functions for air, water and spray. The nozzle shall be easily disconnected for autoclaving up to 135°C. It also shall be non-drip and non-water retraction. The nozzle shall be rotatable through 360 degrees. The syringe tubing shall be able to be disconnected for disinfection.

3.1.3 Saliva Ejector

The tip shall be autoclaveable up to 135°C and can also be replaced with disposable tips. It shall be rotatable through 360 degrees. The holder shall be designed for easy disinfection / cleaning by the assistant. It shall be supplied with universal adapter for disposable suction tip.

3.1.4 High Vacuum Suction

The nozzle shall be easily disconnected for autoclaving up to 135°C. It shall be rotatable through 360 degrees. Suction intensity preferably can be controlled. It shall be supplied with 2 additional tips (narrow and wide nozzle).

The holder shall be with light barrier switch or button switch for easy disinfection / cleaning by assistant. The suction tubing shall be easily disconnected for cleaning and disinfection. It shall have continuous suction for not less than 2 hours.

3.2 Doctor's Instrumentation

The instrumentation shall be carried by an adjustable swivel arm with braking system or connected to dental chair base moving parallel to the chair.

All instruments shall be equipped with touch pad control panel for easy disinfection cleaning. It shall have Intra Oral and OPG Film viewer (attached/built-in).

All instrument tubings shall have smooth surface for easy disinfection. It shall be provided with individual air-pressure adjustment for each module and individual water flow shall be adjustable for all module.

The instrument holder sleeves preferably shall be removable for easier cleaning disinfection and shall have handpieces flush system.

The instrumentation shall have six (6) modules for instruments with internal bacterial water filter that consist of:-

3.2.1 Module I – A high torque turbine

The handpiece shall be rotatable 360 degrees and shall be autoclaveable to 135°C. All handpieces shall have adjustable water spray. The handpiece shall be non-drip and non-retraction. It also shall be with fibre optic system and push button chuck system.

The speed of the handpiece shall be not less than **350,000rpm**. The handpiece shall be preferably smooth for easy cleaning. It shall be supplied with four (4) handpieces consist of two (2) high torque handpieces with ceramic bearing and two (2) high torque miniature head turbine handpieces.

3.2.2 Module II – Micromotor

The micromotor shall be electric type and shall have a speed range of **minimum not more than 2,000 rpm and maximum not less than 30,000 rpm** with fibre optic system. It shall maintain high torque at all intensity with electric torque compensation which does not require any maintenance and cannot demagnetise. It shall be capable of clockwise and anti clockwise rotation.

The motor shall operate with low noise and shall be equipped with internal cooling water spray. The micromotor shall be supplied with the following handpieces (6 units):

- a. One (1) contra-angle handpieces 1:1 with light system
- b. One (1) contra-angle handpiece speed reducing 10:1 with light system
- c. One (1) contra-angle prophylaxis handpiece
- d. One (1) straight handpiece 1 :1
- e. Two (2) surgical straight handpiece 1:1

All handpiece shall be autoclaveable up to 135°C. All contra-angle handpieces shall have fibre optic system and all handpieces shall have integrated adjustable water spray. All handpieces shall be smooth for easy cleaning.

3.2.3 Module III – Light Cure Unit

Light Cure Unit shall be preferably smooth and contoured ergonomic design for comfort and easy cleaning. Light switch shall be located at the handpiece of the unit. Automatic signal sounds shall be programmed, with audible tone and digital display on handpiece.

The unit is automatically switched off if continuously in use over a period 3 minutes with frequency of 50-60 Hz and minimum light intensity **1,000mW/sq.cm**. It shall be supplied with an optical filter and a Cure Rite Meter.

3.2.4 Module IV – Ultrasonic Scaler

The handpiece shall be of magneto-strictive system or piezometer system with 28,000 Hz or more. The handpiece or handpiece sleeves shall be autoclaveable up to 135°C.

It shall be supplied with six (6) detachable working tips for scaling of:

- a. Buccal / lingual and proximal (2 tips)
- b. Subgingival (4 tips)

It also shall be supplied with additional handpiece and have adjustable water spray.

3.2.5 Module V – Intra Oral Camera

It shall be made of stainless steel or equivalent and with high sensitivity CCD for image sensor. The resolution shall not less than 752x582 pixels.

The camera shall have 470 line pairs for horizontal resolutions. The standard lens shall have at least 40x magnifications. Minimum 6 white LED for light source.

3.2.6 Module VI – Multiple Function Syringe

Syringe shall have functions for air, water and spray. Nozzle shall be easily disconnected for autoclaving up to 135°C, rotatable through 360 degrees, non-drip and non-water retraction. The syringe tubing shall be easily disconnected for cleaning and disinfection.

4. **Cuspidor Unit**

The cuspidor unit shall be firmly attached to the left side of the chair and moves together with the chair. The unit shall consist of a spittoon, automatic tumbler filler, saliva ejector and high volume

suction. The unit shall also have electric safety cut-off / limit switch in case of collision / obstruction with any object. The distance of the cuspidor from the patient shall be adjustable to allow the operator to work on the left side of patient.

The spittoon shall be durable and designed for easy cleaning and cross-infection control. The saliva ejector and high volume suction shall be swivelled for easy access by the assistant. The tumbler shall have automatic filler feature. It shall be fitted with a waste trap which prevents waste amalgam from filtering through. The spittoon bowl shall be of one-piece type.

4.1 **Automatic Separator for Suction System**

The automatic separator shall minimize bacterial contamination in the suction pipe line which can present a safety hazard for maintenance work. It shall be built into the cuspidor unit and can separate air from secretion and dirt particles. It must be fitted with a waste trap system which prevents 95% of waste amalgam from filtering through which comply to EN ISO 11143 or equivalent standards. The separator shall be less maintenance and easily cleaned.

5. **Dental Operating Light**

The dental operating light shall be mounted in such a way as to allow synchronised movement with chair in vertical direction. It should be with locking brake and height adjustment.

Reflector shall be of parabolic mirror with closed system. Light intensity shall be controlled from **9,000 to 24,000 lux**. Colour temperature shall be natural day light **5,500 Kelvin** at any selected intensity. Bulb shall be of halogen bulb/LED or equivalent of low voltage and easy to replace. The operating light shall be operated by touchless sensor, touch pad or foot control switch.

6. **Working Stool**

Two (2) units of operating stool shall be supplied. The stool for the operator and assistant shall be ergonomically designed to provide good lumbar support, ergonomic seating and have adjustable backrest which can function as armrest.

It shall have wide stable base with five (5) castors. The seat height shall be adjustable smoothly and conveniently from **470 - 630mm**.

7. **Multimedia System**

Shall consist a flat screen monitor built on to the dental unit for easy viewing by the operator and the patient.

Intra oral camera should be a module in the dentist instrumentation with ability to take intra oral and extra oral images. A component to be interphase with various hardware such as intra oral and extra oral digital imaging unit, printer, PC, video, DVD player etc. Cabling work shall be supply for the whole system and have USB port or CDRW.

10. **Other Features**

The component items of the dental unit shall be preferably from the same manufacturer.

The colour of the upholstery shall be negotiated later.
The power supply provided shall be **single phase 230V/50Hz**.

The Dental Specialist unit should have digital display for fault diagnosis, filters for air and waters, self contained water system for handpieces and shall be supplied with multifunction and easy to use foot switch/foot control. Details of all utility requirements like water, drain, compressed air, suction and electricity supply shall be provided by the equipment supplier, particularly location and capacity.

B. DENTAL OFFICER'S UNIT

1. General

The dental unit shall be built in such a way as to provide good ergonomics, hygiene and aesthetics. It shall enable the operator to be close to the patient, provide optimum vision of the operating field and safe control of all component devices. The whole setup shall have infection control features.

2. Patient's Chair

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last working position. All programmes shall be controllable on both dentist's and assistant's side. Electrical safety shall comply with MS IEC 60601-1 standard or equivalent.

The chair shall be of internal umbilical type and have internal junction box.

3. Dental Unit

The unit shall have digital display for fault diagnosis of any malfunction of unit.

The unit shall also have at least 2 filters for air and water that is before the water and air reach the instrument.

The unit shall be supplied with foot control to control:-

- a. start and stop of turbine handpiece, micromotor and scaler.
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All instrument tubings shall be easily disconnected preferably smooth for easy disinfection. It shall be provided with individual air-pressure adjustment for each module and individual water flow shall be adjustable for all module.

The instrument holder sleeves preferably shall be removable for easier cleaning disinfection and shall have handpieces flush system.

The instrumentation shall have five (5) modules for instruments with internal bacterial water filter that consist of:-

3.2.1 Module 1 – A high torque turbine

The handpiece shall be rotatable 360 degrees and shall be autoclaveable to 135°C. All handpieces shall have adjustable water spray. The handpiece shall be non-drip and non-retraction. It also shall be with fibre optic system and push button chuck system.

The speed of the handpiece shall be not less than **350,000rpm**. The handpiece shall be preferably smooth for easy cleaning. It shall be supplied with four (4) handpieces consist of two (2) high torque handpieces with ceramic bearing and two (2) high torque miniature head turbine handpieces.

3.2.2 Module II – Micromotor

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The motor shall operate with low noise and shall be equipped with internal cooling water spray.

The micromotor shall be supplied with the following handpieces (3 units):

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- c. One (1) straight handpiece 1 :1

All handpiece shall be autoclaveable up to 135°C. All handpieces shall have adjustable water spray and preferably smooth for easy cleaning.

3.2.3 Module III – Light Cure Unit

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It shall be supplied with six (6) detachable working tips for scaling of:

- a. Buccal / lingual and proximal (2 tips)
- b. Sub-gingival (4 tips)

It also shall be supplied with additional handpiece and have adjustable water spray.

3.2.5 Module V – Multiple Function Syringe

Syringe shall have functions for air, water and spray. Direction of spray shall be adjusted by rotating the nozzle.

Nozzle shall be easily disconnected for autoclaving up to 135°C, rotatable through 360 degrees, non-drip and non-water retraction. The syringe tubing shall be easily disconnected for cleaning and disinfection.

4. **Cuspidor Unit**

The cuspidor unit shall be firmly attached to the left side of the chair and moves together with the chair. The unit shall consist of a spittoon, automatic tumbler filler, saliva ejector and high volume suction. The unit shall also have electric safety cut-off / limit switch in case of collision / obstruction with any object. The distance of the cuspidor from the patient shall be adjustable to allow the operator to work on the left side of patient.

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4.1 **Automatic Separator for Suction System**

The automatic separator shall minimize bacterial contamination in the suction pipe line which can present a safety hazard for maintenance work. It shall be built into the cuspidor unit and can separate air from secretion and dirt particles. It must be fitted with a waste trap system which prevents 95% of waste amalgam from filtering through which comply to EN ISO 11143 or equivalent standards. The separator shall be less maintenance and easily cleaned.

5. **Dental Operating Light**

The dental operating light shall be mounted in such a way as to allow synchronised movement with chair in vertical direction. It shall be with locking brake and height adjustment.

Reflector shall be of parabolic mirror with closed system. Light intensity shall be controlled from **9,000 to 24,000 lux**. Colour temperature shall be natural day light 5,500 Kelvin at any selected intensity. Bulb shall be of halogen bulb or equivalent of low voltage and easy to replace. The operating light shall be operated by touchless sensor, touch pad or foot control switch.

6. **Working Stool**

Two (2) units of operating stool shall be supplied. The stool for the operator and assistant shall be ergonomically designed to provide good lumbar support, ergonomic seating and have adjustable backrest which can function as armrest.

It shall have wide stable base with five (5) castors. The seat height shall be adjustable smoothly and conveniently from **470 - 630mm**.

7. **Other Features**

The component items of the dental unit shall be preferably from the same manufacturer.

The colour of the upholstery shall be negotiated later.

The power supply provided shall be **single phase 230V/50Hz**.

The Dental Officer unit should have filters for air and waters, self contained water system for handpieces and shall be supplied with multifunction and easy to use foot switch/foot control. Details of all utility requirements like water, drain, compressed air, suction and electricity supply shall be provided by the equipment supplier, particularly location and capacity.

C. DENTAL COMPRESSED AIR SYSTEM

1. General

The compressed air system shall be able to produce medical grade, clean, dry and hygienically impeccable compressed air for use in dental practice and low noise level type. The compressed air is generally used in the multi-purpose spray and the cooling spray and for driving the turbine and air motor.

The quality of the compressed air should be the same as for medical air as given below:

Parameter	Specification
Oil content (droplet or mist)	< 0.5mg/m ³
Carbon monoxide (CO)	5.5mg/ m ³
Carbon dioxide (CO ₂)	900mg/ m ³
Moisture	None
Odour	None
Water content	Equivalent to a dew point of -20°C at atmospheric pressure

The quality of the dental air should be tested annually (or more frequently if specified by the manufacturer or if requested by the quality controller) at the plant test point using the test equipment and procedures specified in HTM 2022 'Validation and verification'.

2. Compressed Air System

The compressed air system shall be able to produce compressed air for up to 7 bar pressure. The capacity shall be adequate to meet the requirements as mention in **SECTION 7**; Schedule of Equipment. The operation of the system shall be automatic, with manual change over.

The system shall comprise but not limited to the following:-

- a) **Two (2)** units compressors; one on duty and one on standby.
- b) Dryer System
- c) Air Tank reservoir
- d) Valves, fittings and piping to the equipment served.
- e) Dust Filter, Water Filter and Bacterial Air Filter.
- f) Electrical and control wiring and switchboard / control panel.

3. Compressor

The air compressor shall be of the oil-less type. It shall be robust in construction and shall meet the requirements of high operation safety. It shall be reliable and shall require little or no maintenance.

It shall be approved by the Department of Occupational Safety and Health (DOSH) Malaysia. It also shall be supplied with an appropriate installation in order to reduce the noise level and to

meet the **National Noise Regulation** and **HTM 2022 Supplement 1** under **Chapter 3.0 Dental Compressed Air System : Compressor Systems – Types And Noise Levels ; Clause 3.32 : Table 3.2 Maximum Free Field Noise Levels At 1 M For Unsilenced Compressed Air Plant.**

The compressor unit shall be fitted with noise suppressors and vibration insulation to ensure quite and non-vibratile operation.

The compressor and motor shall be cooled by a suitable size fan. A temperature sensor may be fitted with suitable controls to cut off the power supply in the event of excessive temperature.

The compressor unit shall include air intake filter with silencer, safety valve, shut off valve, non-return valve, drain trap, pressure gauge, testing flange, automatic pressure switch with unloaded start and safety motor switch. The air filters should comply with **BS7226:1989** and be either medium filters or grade CA paper element filters.

4. **Air Dryer System**

The compressed air shall be dried by either a refrigerant dryer or a desiccant dryer. The capacity of the dryer shall be sufficient to cater for the compressors installed. Whatever the type, the dryer shall be fully automatic in operation.

Refrigerant Dryer

The dryer shall be reliable and shall require little or no maintenance. It shall be equipped for wall mounting.

The power supply shall be single phase 230V.

The unit shall include a refrigeration system, an air-to-refrigerant heat exchanger, a separator and an automatic condensate drain trap.

Desiccant Dryer

The dryer shall include an after cooler, a separator and drain, and a drying tower with desiccant material.

The dryer shall have a built-in regeneration process for the desiccant. The process shall be automatic and shall not interrupt the compressed air supply to the dental chairs.

5. **Air Tank Reservoir**

The air tank shall be sized to the requirement of the system and shall be designed for the system working pressure and shall be hydrostatic tested to the approval of Department of Occupational Safety and Health (DOSH) Malaysia approval or equivalent. The tank shall be coated or lined internally with a corrosion prevention material.

A pressure monitor shall maintain the pressure in the air tank constant between 5.5 bar and 7.0 bar. A non-return valve prevents the pressure dropping during pauses in work.

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| 6. | Dust Filter | There should be a dust filter downstream of the dryers to remove particles down to 1 micron with a DOP penetration of less than 0.03% when tested in accordance with BS3928. |
| 7. | Air Intake Filter | A 5 micron air intake filter is required to prevent blockage of internal air/oil separators. |
| 8. | Bacterial Filter | A bacterial filter should be fitted downstream of the plant, with appropriate isolating valves. The filters should provide particle removal to 0.01 mg/m ³ and a DOP penetration of less than 0.0001%. |

D. DENTAL SUCTION AIR SYSTEM

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|----|---------------------------|---|
| 1. | General | The suction air system shall be able to produce hygienically impeccable suction air for use in dental practice and low noise level type. The units shall be Dry Suction System . |
| 2. | Suction Air System | <p>The suction air system shall be able to produce to the required suction pressure. The capacity shall be adequate to meet the requirements as mention in SECTION 7; Schedule of Equipment. The operation of the system shall be automatic, with manual change over.</p> <p>The system shall comprise but not limited to the following:-</p> <ul style="list-style-type: none"> a) Two (2) units vacuums; one on duty and one on standby. b) Exhaust with silencer fitted. c) Valves, fittings and piping to the equipment served. e) Bacterial Air Filter. f) Electrical and control wiring and switchboard / control panel. |
| 3. | Bacterial Filter | A bacterial filter should be fitted downstream of the plant, with appropriate isolating valves. The filters should provide particle removal to 0.01 mg/m ³ and a DOP penetration of less than 0.0001%. |

E. WATER FILTER

- | | | |
|----|--------------------------------|--|
| 1. | General | A water filter shall be incorporated in Junction Box to ensure the cleanliness of water supply. |
| 2. | Heavy Duty Water Filter | Heavy duty water filter which can filter at least 5 micron debris should be fitted to the pipe before reaching the Junction Box to ensure the cleanliness of water supply. |

F. BOOSTER PUMP (SCOPE UNDER FIRE FIGHTING SYSTEM CONTRACTOR)**1. General**

The booster pump shall be fully packaged vertical in line with single/multi stage centrifugal pump, variable speed, capable of adjusting the pump speed automatically to suit the system requirement, and supplied as complete set including all fittings, pressure transmitter, pressure switch or level switch for dry running protection, diaphragm tank for optimum operating conditions and control facilities which include:

- automatic pump change over and change of pump starting sequence
- alarm signal

The pump shaft and impeller shall be stainless steel, statically and dynamically balance in factory. The pump discharge range and head shall be as tabulated in the Schedule of Equipment.

The control unit/electric controller and pump units shall be of the same manufacturer and suitable for 3 phase/400 V/50 Hz.

G. VALVE, FITTINGS & PIPING

All pipeworks, fittings and valves shall conform to the relevant standards and code of practice for compressed/suction air system and HTM 2022. Copper pipes conforming to **BS EN 13348:2001, BS EN 1412:1996 grade CW024A** shall be used. Fittings and valves shall be of bronze. Safety valves should be provided in accordance with the system requirements. All valves should conform to BS 6759 Part 2:1984 or equivalent. All pipeworks run in walls and slab shall be wrapped/insulated with anti corrosive wrapping material or as specified in drawing.

H. ELECTRICAL & CONTROL WIRING & SWITCHBOARD/PANEL

All electrical and control wiring and switchboard/panel shall conform to the requirements of the various electrical regulations. All pipework and electrical conduits connected to the plant should be fitted with flexible connectors where necessary to prevent the transmission of noise and vibration along the pipelines and conduits.

I. DENTAL TECHNICIAN WORKING UNIT**1. General**

The dental technician working unit shall be used in dental laboratory. The dimensions of the unit shall be 110cm - 120cm (L), 60cm - 70cm (W) and 80cm - 90cm height. The material of the work top surface shall be of corrosion free and fire, heat, abrasion and chemical resistance type.

It should have a regulator (attached/built-in) to regulate the compressed air.

The unit shall have built in facilities for electrical (3 units of 3 pin plug) and compressed air pipe line. The unit shall have adjustable foot rest.

2. **Dental Technician Working Unit**

The dental technician working unit shall be supplied with:

 - a. Vertically adjustable Fluorescent Light with length of 100cm – 110cm and light rating minimum 1000 lux.
 - b. Posture guide with arm rests, magnifying lens and air nozzle with automatic retraction.
 - c. Storage cabinet and drawers with durable lining material.
 - d. Waste collector drawer with removable insert for capturing precious metal.
 - e. Work trays with fold out flap/identification inserts and work tray holder.
 - f. Safety glass shield to protect against facial injuries and act as a deflector to divert dust to the dust extraction system.
 - g. To supply one(1) unit induction burner/heater, one(1) unit wax pot and one(1) unit gas torch.
 - h. To supply attached magnifying glass with light.
3. **Dust Extraction System**

The unit shall be supplied with dust extraction system with built in suction motor, suction hood, fully automatic double filter system and automatic switch off when filter bag is full. It also shall have removable filter bag, additional microfilter and automatic run when the handpiece is activated.
4. **Micromotor**

The unit shall be supplied with high frequency micromotor with high frequency handpiece of 1,000 - 50,000 rpm. It shall be heavy duty, maintenance free and with handpiece rest. The micromotor shall also have foot or knee controller.
5. **Laboratory Chair**

The laboratory chair shall be cushioned seat with vinyl cover and adjustable backrest and height. The chair shall be integrated armrest (which is adjustable / detachable) moulded into the seat. It shall be wide stable base castors.

PART II TESTING AND COMMISSIONING

The sub-contractor shall demonstrate the engineering performance of the dental chair/ unit and ensure it is performing according to specifications. It shall comply with specifications to the approval/certification of relevant authority. The sub-contractor shall ensure air compressor for each unit is supplied with certification of fitness from DOSH.

The sub-contractor shall also train the operator and technical staff on the correct operation of the equipment which shall include the mechanical and the electrical components as well as routine maintenance of the equipment.

The operating instruction and tuition shall be conducted for ten (10) JKR representatives to be nominated by the Pengarah Kanan Cawangan Kejuruteraan Mekanikal, Ibu Pejabat JKR Malaysia.

The purpose of the operating instruction and tuition is to provide essential level of requirements of the principal design, installation, maintenance, testing, quality and safety assurance and performance of the Dental Chair System with necessary skills and practices to apply the guidelines of HTM 2022 or equivalent to the standard. The operating instruction and tuition shall be comprised and conducted in one (1) module.

Module 1 – Operating Instruction And Tuition For Dental Chair System.

The module shall be delivered at least in **three (3)** days. The contents shall be divided into theory, design installation application, practice session and reading materials to be presented to the representatives. It is essential that all personnel who use or maintain the dental compressed air and vacuum systems acquire general knowledge of the principles, design, safety procedures and have received training. It shall be conducted by the equipment supplier or equivalent which shall comprise the following topics:

- i. General Principles
- ii. Operation of Dental Chair and Associated Equipments
- iii. Water Supplies to Dental Installations
- iv. Design and Selection of Compressor and Vacuum Systems
- v. Pipeline Design and Materials
- vi. Testing and Commissioning for Dental System
- vii. Maintenance for Dental System

The operating instruction and tuition shall also give exposure of Dental Chair and associated equipments. The representative should be awarded with certificate of attendant upon their completion during the madule.

The contractor shall include in the tender all cost incurred for the operating instruction and tuition including food, traveling and hotel accommodation not inferior to the current Government practice for a period specified above, excluding traveling days.

PART III **SPECIFICATION FOR SERVICE AND MAINTENANCE**

1. General

- (a) This portion of the Specification shall cover all service and maintenance work to be carried out during the guarantee period of twelve months from the date of handing over of the system.
- (b) This maintenance work shall include the supply of all materials, appliances, labour and necessary incidentals. All work shall be performed in accordance with the best commercial practice, and must be in strict accordance to this Specification.
- (c) The sub-contractor shall have in his direct employment, skilled workmen and technicians to carry out the servicing and repair work. Such workmen shall be expected to perform quality work in accordance to good engineering practice and to the satisfaction of the Superintending Officer.
- (d) All materials, to be supplied in connection with the work, shall be new and unused, and shall in general be of the best quality as regards to manufacture and performance.
- (e) The sub-contractor shall provide a log book in the plant room to record the date, time and details of each maintenance service performed.
- (f) The normal daily function of starting, operating and stopping the equipment will not be included in the maintenance service. However, it shall include emergency services when called upon.

2. Supervision

The sub-contractor shall have a Foreman in charge of the service, maintenance and repair work to be carried out. The Foreman must be thoroughly competent in supervising such work, involving general ***Dental Chairs System*** installation, and shall be in direct employ of the sub-contractor, and acceptable to the Superintending Officer.

3. Scope of Work

3.1 Duties

The sub-contractor shall service and maintain all machinery and equipment comprising the complete system, including all ancillary equipment. The work to be performed shall include regular and systematic checking, cleaning and where necessary adjustment or testing to the system.

The sub-contractor shall also be required to attend to any emergency service and repair, during normal working hours or overtime hours.

3.2 Check List

The sub-contractor shall draw out an approved check list for the regular service and maintenance of the systems.

3.3 Defects Report

It shall be the responsibility of the sub-contractor to report, and advise, in writing to the Superintending Officer, any defects in the system, and ancillary equipment, in order that preventive maintenance be carried out.

The report shall state observed defects and its cause, parts to be replaced or renewed, and shall also include an estimate of the cost of repairs required.

3.4 Repairs

The sub-contractor shall repair all defects in the system, including all ancillary equipment on the instructions of the Superintending Officer.

The costs of such repairs shall be separate and shall not be included in the costs for monthly service and maintenance. However, the sub-contractor shall rectify all defects in repair, done during the maintenance and guarantee period, which follows from the date of handing over, at his own expense.

All repairs on the complete **Dental Chairs System** and ancillary equipment shall be guaranteed by the sub-contractor against defects in workmanship and materials, for a period of one year to take effect from the date of completion of the repairs.

3.5 Consumable Materials

The sub-contractor shall supply the following consumable materials as and when required:-

- (a) All oils and greases required for lubrication of compressors, fan bearings, motor bearings, pivots and other moving parts.
- (b) All carbon brushes required to replace worn brushes in electric motors.
- (c) All electric contact points required to replace worn electric contact points in switch gears and electric relays.
- (d) All electric fuses required to replace blown fuses.
- (e) All cotton waste, soap detergent and other cleaning materials required for cleaning purposes.

The costs of these consumable materials shall not be charged for separately by the sub-contractor, but shall be included in the fixed monthly rate quoted by the sub-contractor for the service and maintenance of the complete installation after the guaranteed period.

3.6 Service and Maintenance Records

- (a) The sub-contractor shall provide a service and maintenance record book for the complete system, serviced and maintained by him. This record book shall be kept in the plant room and brief details of all services, maintenance and repairs carried out shall be entered into this book for checking purposes.

The address and telephone number of the contractor's service station shall also be entered into this record book to facilitate emergency service calls.

- (b) The sub-contractor shall also keep an accurate detailed record in duplicate of all services, maintenance and repair work carried out by him. This record shall be in the form of a Maintenance/Repair Sheet, and shall be countersigned by the Superintending Officer each time the installation is attended to by the sub-contractor.

3.7 Rates for Service and Maintenance

The sub-contractor shall quote the rates for the service and maintenance of the complete system in the form provided.

These rates quoted by the sub-contractor at the time of tender, shall hold good for a period of three years, commencing from the expiry of the guarantee period.

The sub-contractor may be required to enter into a contract for the above period with the Government on the Standard Form of Contract for service and maintenance, a copy of which may be inspected at the office of the Pengarah Kanan Cawangan Kejuruteraan Mekanikal, Ibu Pejabat JKR, Kuala Lumpur.