1.0 General

1.1 Scope

1.1.1 This section of the Specification describes and specifies requirements for the supply, delivery, installation, testing, commissioning, handing over in approved working order and maintenance during the Defects Liability Period of the whole SMATV / MATV System in accordance with the Specification, Schedule of Technical Data, Supplementary Notes, Bill of Quantities, Conditions of Contract, drawings etc.

1.2 Technical Particulars

1.2.1 Tenderers shall submit at the time of tendering all catalogues, detailed technical particulars and guarantees in respect of the equipment offered, which shall be binding. No departure from these technical particulars and guarantees shall be permitted except with the written approval of the Superintendent Officer (S.O) or S.O's Representative. Notwithstanding any description, drawings, illustrations or pamphlets which may be submitted with the tender, all details other than those stated by the tenderers in the schedule of departures from specification, at the time of tendering, shall be deemed to be in full conformity with the specification.

1.3 Guarantees

1.3.1 The tenderers shall guarantee all equipment to be supplied under this contract against faulty design, materials and workmanship at the manufacturer's works within the defect liability period (DLP).

1.4 Electrical System

1.4.1 All equipment shall be rated for operation on a 230/400 V (within the tolerance as defined in MS IEC 60038; 230/400V, +10%, -6%), 3 phase, 4 wire, 50 Hz system with solidly earthed neutral.

1.5 Deviations to Specification

1.5.1 Any deviations, alternatives or substitutions of the materials as detailed in this specification shall be clearly stated in the tenderer's offer. In the absence of such indication, it shall be deemed that the tenderer is offering to supply goods fully in accordance with this specification.

2.0 Description

2.1 System Description

2.1.1 The SMATV / MATV system shall be able to receive all locally available terrestrial television transmission channels and satellite as specified in the drawings or bill of quantities.

3.0 Receiver

3.1 Description

3.1.1 The SMATV / MATV system shall be supplied complete with the necessary channelized antenna and satellite dish to receive the intended transmissions. They shall be constructed from material not susceptible to rusting or other form of corrosion due to local weather condition.

3.1.2 The antennas and dish shall be installed at the highest possible location to ensure strong and free from obstacle reception. Necessary site survey may be required to determine the most suitable antenna location. Off air measurement shall be conducted to determine the strongest and best signal orientation.

3.1.3 They shall be properly aligned for optimum reception and minimising interference. Antennas shall be mounted on dedicated hot dipped galvanised steel pole of minimum 25mm diameter complete with necessary accessories to ensure strong and sound installation. Pole length exceeding 2000mm shall be rigidly supported by two (2) minimum fixing points. The whole of the antenna installation shall be electrically continuous and bonded to the nearest lightning protection system using a minimum of 3mm x 25mm tinned copper tape.

3.1.4 All cable terminations shall have characteristic impedance of 75Ω.

3.2 Very High Frequency (VHF) Antenna

3.2.1 The antenna elements and support bar shall be constructed from aluminium. It shall be constructed of minimum 6 elements with frequency range from 174MHz to 230MHz. Gain shall be of minimum +8dB.

3.3 Ultra High Frequency (UHF) Antenna

3.3.1 The antenna elements and support bar shall be constructed from aluminium. It shall be constructed of minimum 10 elements with frequency range from 470MHz to 862MHz. Gain shall be of minimum +12dB.

3.4 Satellite Dish

3.4.1 It shall be of minimum 800mm diameter with frequency range from 10.7GHz to 12.7GHz. The satellite dish shall come complete with low noise block (LNB) down converter suitable for Ku-Band and digital satellite (ASTRO) reception. It shall be compatible with the vertical high (VH), vertical low (VL), horizontal high

(HH) and horizontal low (HL) polarisations. It shall have a minimum gain of +35dB @10.7GHz. The LNB shall have output frequency range of 950MHz to 2150MHz.

4.0 Head-End and Amplification

4.1 Description

4.1.1 The system shall be provided with suitable channelized amplifier or broadband amplifier.

4.1.2 A lockable polycarbonate head-end housing/cabinet complete with power supply module suitable for the equipment and base plate/mounting rail shall come as standard. A 75Ω F-type connectors shall be used on all radio frequency (RF) input and output.

4.1.3 Amplifier module shall be enclosed in a fully screened aluminium housing providing protection against RF interference. Its components shall be able to operate within temperature range of +15°C to +60°C. Each amplifier module shall be equipped with power/function light emitting diode (LED) indicator.

4.2 VHF Channelized Amplifier

4.2.1 It shall have an operating frequency range of 174MHz to 230MHz. Minimum gain shall be +40dB or as indicated in the drawings or bill of quantities, whichever is higher. Minimum output level shall be 110 dBµV.

4.3 UHF Channelized Amplifier

4.3.1 It shall have an operating frequency range of 470MHz to 862MHz. Minimum gain shall be +40dB or as indicated in the drawings or bill of quantities, whichever is higher. Minimum output level shall be 110 dBµV.

4.4 Broadband Amplifier

4.4.1 It shall have operating frequency ranges of VHF from 174MHz to 240MHz and UHF from 470MHz to 862MHz. It shall be equipped with inputs connector corresponding to the specified band (VHF or UHF). Minimum gain shall be +35dB or as indicated in the drawings or bill of quantities, whichever is higher. Minimum output level shall be 110 dBµV.

4.5 Satellite Amplifier

4.5.1 It shall have an operating frequency range of 950MHz to 2150MHz. Minimum gain shall be +20dB or as indicated in the drawings or bill of quantities, whichever is higher. It shall be equipped with minimum four (4) inputs connectors for the VH, VL, HH and HL polarisations.

5.0 Distribution

5.1 Description

5.1.1 The signal level at the wall outlet shall be between 65 dBµV to 75 dBµV. The signal shall be free from any distortion such as ghosting, adjacent channels interference etc.

5.1.2 The distribution system typically consisting of the followings: -

5.1.2.1 Splitter;
5.1.2.2 Tap-off unit;
5.1.2.3 Multiswitch;
5.1.2.4 Vertical cabling;
5.1.2.5 Horizontal cabling;
5.1.2.6 Wall outlet;
5.1.2.7 Terrestrial booster amplifier.

5.2 Splitter

5.2.1 The splitter shall be of passive type with a die cast metal body and RF shielding properties. The number of ways shall be as indicated in the drawings or bill of quantities with an operating frequency range of 5MHz to 862MHz (for terrestrial signal) and 5MHz to 2150 MHz (for terrestrial and satellite signal). Maximum insertion/through loss shall be as shown in Table 5A.

No. of ways	Insertion / Through Loss (dB)		
	5-862 MHz	950-1550 MHz	1551-2300 MHz
2	≤ 4.5	≤ 5.5	≤ 6
3	≤ 8	≤ 10	≤ 11
4	≤ 9	≤ 11	≤ 12
6	≤ 12	≤ 14	≤ 16
8	≤ 13.5	≤ 15.5	≤ 17.5

Table 5A: Splitter unit maximum insertion/through loss (dB).

5.2.2 Minimum output isolation shall be +20dB. All connections shall have 75Ω characteristics impedance and spare ways shall be terminated with 75Ω terminating resistors.

5.2.3 Splitter or groups of splitters shall be enclosed in accessible polycarbonate service enclosures labelled as “SMATV / MATV Service Box” for identification. They shall be installed in the service riser at 1450mm height measured from the underside of the equipment to the finished floor level, or other locations as indicated in the drawings.

5.3 Tap-off Unit

5.3.1 The tap-off unit shall be of passive type with a die cast metal body and RF shielding properties. The number of ways shall be as indicated in the drawings or bill of quantities with an operating frequency range of 5MHz to 862MHz.

5.3.2 It shall be characterised by the tap loss and its associated insertion/through loss. The tap loss and insertion/through loss shall be selected such that the signals level at the wall outlet are as specified in para 5.1.1. Minimum directional and tap to tap isolation shall be +20dB.

5.3.3 Tap-off unit or groups of tap-off units shall be enclosed in accessible polycarbonate service enclosures labelled as “SMATV / MATV Service Box” for identification. They shall be installed in the service riser at 1450mm height measured from the underside of the equipment to the finished floor level, or other locations as indicated in the drawings.

5.4 Multiswitch

5.4.1 The distribution of the digital satellite signal shall be by means of multiswitch. It shall have four (4) satellite inputs (VH, VL, HH and HL polarisations) and one (1) terrestrial input.

5.4.2 It shall support satellite signal with frequency range of 950MHz to 2150MHz and terrestrial signal from 5MHz to 862MHz. It shall be of active type.

5.4.3 The number of outputs shall be as indicated in the drawings or bill of quantities. Where multiple multiswitches are to be used, they shall be of a cascadable type with satellite and terrestrial maximum through losses as indicated in the drawings or bill of quantities. The multiswitch shall have maximum losses such that the signals level at the wall outlet are as specified in para 5.1.1.

5.4.4 Multiswitch or groups of multiswitches shall be enclosed in accessible polycarbonate service enclosures labelled as “SMATV / MATV Service Box” for identification. They shall be installed in the service riser at 1450mm height measured from the underside of the equipment to the finished floor level, or other locations as indicated in the drawings.

5.4.5 If required, tap-off, splitter units and multiswitch may be installed in the same service enclosures.

5.5 Vertical Cabling

5.5.1 Vertical cabling from the antennas and satellite dish to the head-end equipment, splitters, multiswitch and tap-off units shall be of RG11 coaxial cable. The cable shall be constructed from minimum 14AWG (2.0 mm^2) solid bare copper covered steel (BCCS) conductor with gas injected foam polyethylene dielectric. It shall be double shielded with metal foil and braid to reduce interference. The outer sheath shall be of polyvinyl chloride (PVC). The cable maximum attenuation shall be as shown in Table 5B.

Frequency (MHz)	Maximum Attenuation (dB/100m)
5	1.2
240	6.3
300	7.0
500	9.3
1000	13.8
2250	23.5

Table 5B: RG11 cable maximum attenuation (dB).

5.6 Horizontal Cabling

5.6.1 Horizontal cabling from splitters, multiswitch or tap-off units to wall outlet shall be of RG6 coaxial cable. Cable shall be constructed from minimum 18AWG (0.8 mm^2) solid bare copper covered steel (BCCS) conductor with gas injected foam polyethylene dielectric. It shall be double shielded with metal foil and braid to reduce interference. The outer sheath shall be of PVC. The cable maximum attenuation shall be as shown in Table 5C.

5.7 Wall Outlet

5.7.1 Wall outlet shall be complete with terrestrial (TV) and/or satellite (SAT) outputs. It shall be constructed from die cast metal integrated with connectors for good RF shielding. It shall have built-in filtering circuitry to split out the appropriate signal and feeds it to the relevant output connections. The operating frequency range shall be from 5MHz to 862 MHz for terrestrial and 5MHz to 2150MHz for satellite.

The insertion/transfer loss between input terminal and outputs shall be such that the signals level at the wall outlet output are as specified in para 5.1.1.

5.7.2 Face plate shall be snap-on type complete with TV and/or SAT labelling. Unless otherwise specified, mounting height from finished floor level (f.f.l) shall be as shown in Table 5D. Wall outlets location shall be coordinated with other services in its vicinity.

5.7.3 No pass-through or looping cable shall be allowed between wall outlets.

Frequency (MHz)	Maximum Attenuation (dB/100m)
5	2.2
240	10.1
300	11.2
500	14.7
1000	21.4
2250	32.8

Table 5C: RG6 cable maximum attenuation (dB).

Location	Mounting height
Dwelling (quarters, hostel etc.)	400mm
Public waiting areas (counter service, circulation etc.)	2000mm
Public waiting areas (counter service, circulation etc.)	Inside ceiling (if no wall present), subject to site suitability
Public waiting areas at office	1450mm

Table 5D: Wall outlet mounting height (mm).

5.8 Terrestrial Booster Amplifier

5.8.1 It shall be equipped with minimum one (1) input and one (1) output connectors. It shall have an operating frequency range of 5MHz to 862MHz for terrestrial use. Its minimum gain shall be +30dB and minimum output level shall be +110 dBµV.

6.0 Wiring

6.1 General

6.1.1 General system of wiring, conduits, trunking, cable tray or cable ladder etc. shall be referred to the latest JKR Specification for Low Voltage Internal Electrical Installation (L-S1).

6.2 Service Colour Identification

6.2.1 All conduits and trunking for the SMATV / MATV system shall be clearly identified and distinguished from other services.

6.2.2 Trunking for SMATV / MATV service shall be labelled using black “SMATV” or ”MATV” letterings over white background. The letterings shall have a minimum height of 15mm but need not exceed 50mm, and at an interval not more than 1000mm. All letterings shall be clearly legible, and to the satisfaction of the S.O or S.O’s Representative.

6.2.3 Colour bands for conduits identification shall be as specified in the latest JKR Specification for Low Voltage Internal Electrical Installation (L-S1) or as approved by the S.O or S.O’s Representative.

7.0 Testing And Commissioning

7.1 Test Instruments

7.1.1 All measuring and test instruments used for testing of the installations shall be regularly tested and calibrated by the manufacturers or accredited calibration laboratories for their functionality and accuracy. Test and Calibration Reports or Certificates for the measuring and test instruments issued by the calibration laboratory shall be valid for a maximum of two (2) years from the date of issuance.

7.1.2 The instruments and their Test and Calibration Reports or Certificates shall be submitted to S.O or S.O's Representative for verification two (2) weeks before testing of the installations being carried out. No test on the installations shall be carried out without prior approval of the S.O or S.O's Representative. Notwithstanding the validity of the aforesaid Reports or Certificates the measuring and test instruments shall be re-calibrated if so required by the S.O or S.O's Representative after any mechanical or electrical mishandling. Fee required for the testing and calibrating of the measuring and test instruments is deemed to be included in the Contract.

7.2 Test and Test Certificates

7.2.1 After the installation work has been completed and before Certificate of Practical Completion is issued, the whole SMATV / MATV system shall be tested for compliance and performance as follows: -

7.2.1.1 Continuity test for coaxial cables;

7.2.1.2 Functional test to indicate correct operation and performance of all equipment; and

7.2.1.3 Measurement of signal level at the respective terrestrial and satellite channels. Measurement shall be done at the head-end equipment and wall outlets.

7.2.2 The S.O or S.O's Representative reserves the right to be present at all tests and the Contractor shall give at least one (1) week notice in writing to the S.O or his Representative for this purpose. In any case, no test shall be carried out without prior approval of the S.O or S.O's Representative. Copies of all the test certificates together with As-Installed Drawings properly bound and titled shall be submitted to the S.O or S.O's Representative within one (1) week after the completion of the testing.

8.0 Service and Maintenance

8.0.1 During the Defects Liability Period, the Contractor shall be responsible for the service and maintenance work of the complete installation. All works shall be carried out by competent person. All labour, material, tools and parts necessary to rectify the defect due to manufacturing/installation faults shall be supplied/executed at the Contractor's cost.

8.0.2 The service and maintenance to be performed and defects to be rectified and making good shall include but not limited to the following: -

8.0.2.1 Repairs and replacement of all equipment and accessories that become faulty due to manufacturing and installation defects whether it is under the manufacturer’s warranty or not;

8.0.2.2 Replacement and making goods of all wiring and accessories;

8.0.2.3 Making good any damage to roads, buildings, drains, cables, pipes, concrete areas, paved areas etc. which had not been properly made good arising out of his work; and

8.0.2.4 All other works deemed as necessary by the S.O or S.O’s Representative.

8.0.3 All works shall be carried out as soon as the Contractor is being informed by the S.O or S.O’s Representative or the occupant, and shall be completed within a reasonable time except under emergency situation. If the Contractor fails to comply with the above requirements, the S.O or S.O’s Representative reserves the right to engage another party to carry out the work, in which case, the Contractor shall be responsible for all the expenses incurred.

9.0 Shop Drawings And As Built Documents

9.1 Shop Drawings

9.1.1 Two (2) sets of prints of shop drawings for construction and/or installation shall be submitted to the S.O or S.O's Representative for approval. The Contractor shall prepare and submit shop drawings for the whole work or parts of the work at least two weeks before the work begins. If the shop drawings submitted are not acceptable by the S.O or S.O's Representative, the Contractor shall amend and re-submit the shop drawings within two (2) weeks from the date of return of the shop drawings. No work shall be carried out without the shop drawings being approved by the S.O or S.O's Representative.

9.1.2 The shop drawings shall include and show the following:-

9.1.2.1 The dimensioned general arrangements, layouts and positions of accessories, equipment racks and all others necessary for the complete installation;

9.1.2.2 Schematic line diagrams of the installation;

9.1.2.3 The dimensioned general arrangements, layouts and routes of final circuits;

9.1.2.4 The dimensioned general arrangements, layouts, routes and positions of all lateral and vertical mains and/or sub-mains;

9.1.2.5 The dimensioned layouts and positions of all holes and cut-through in the walls and floors for the lateral and vertical mains and/or sub-mains; and

9.1.2.6 Co-ordinated routes for all cables laid external of the building;

9.1.3 The cost of all these shop drawings is deemed to be included in the Contract.

9.2 As Built Documents

9.2.1 As-Built document shall consist of but not limited to the as installed drawings, manuals, certificates, catalogues, inventories and parts lists.

9.2.2 The as installed drawing shall comprise of (where applicable): -

9.2.2.1 Site plan;

9.2.2.2 External cable routes;

9.2.2.3 Internal layout plans; and

9.4.1.4 Schematic diagrams.

9.2.3 These drawings shall be labelled at the lower right hand corner with the Electrical Contractor's name and address, date of commissioning, scale, drawing number (the drawing number to be obtained from the S.O or S.O's Representative), title and following particulars: -

JABATAN KERJA RAYA
CAWANGAN KEJURUTERAAN ELEKTRIK
CONTRACT NO.:

9.2.4 If the drawings submitted are not according to the actual installation at site and/or not acceptable to the S.O or S.O's Representative, the Contractor shall amend and re-submit the drawings within two (2) weeks from the date of return of the drawings to the satisfaction of the S.O or S.O's Representative.

9.2.5 Manual and documents for the SMATV / MATV system installation shall be supplied. It shall comprise of:-

9.2.5.1 Installation manual;

9.2.5.2 Operation manual;

9.2.5.3 Service and maintenance manual;

9.2.5.4 Inventories and parts list;

9.2.5.5 Technical data and catalogue; and

9.2.5.6 Installation test results.

9.2.6 Each of the As-Built documents shall be bound together with hard cover and submitted in minimum four (4) sets upon issuance of Certificate of Practical Completion of the project.

9.2.7 In addition, one (1) set of the as installed drawing shall be submitted in the form of tracing or printed document, and two (2) sets in CD ROM/DVD.

9.2.8 The cost of all these prints, manuals, tools etc. is deemed to be included in the Contract.