
	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b>
		<b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: i of i</b>

<b>SECTION</b>	<b>CONTENT</b>	<b>PAGE</b>
<b>1.0</b>	<b>General</b>	<b>S1/1-S1/1</b>
1.1	Scope	1
1.2	Technical Particulars	1
1.3	Guarantees	1
1.4	Electrical System	1
<b>2.0</b>	<b>Description</b>	<b>S2/1-S2/1</b>
2.1	System Description	1
<b>3.0</b>	<b>Equipment</b>	<b>S3/1-S3/6</b>
3.1	High Definition Multimedia Interface (HDMI) Receptacle Panel	1
3.2	HDMI Transmitter	1
3.3	HDMI Receiver	2
3.4	HDMI Switcher	3
3.5	HDMI Distribution Amplifier	4
3.6	HDMI Audio De-embedder	4
3.7	Projector Screen	5
3.8	Light Emitting Diode (LED) Display Monitor	5
3.9	Liquid Crystal Display (LCD) Projector	5
3.10	Equipment Rack	7
<b>4.0</b>	<b>Wiring</b>	<b>S4/1-S4/1</b>
4.1	General	1
4.2	Service Colour Identification	1
<b>5.0</b>	<b>Testing And Commissioning</b>	<b>S5/1-S5/1</b>
5.1	Test Instruments	1
5.2	Test And Test Certificates	1
<b>6.0</b>	<b>Service And Maintenance</b>	<b>S6/1</b>
<b>7.0</b>	<b>Shop Drawings And As Built Documents</b>	<b>S7/1-S7/3</b>
7.1	Shop Drawings	1
7.2	As Built Documents	1

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b>
		<b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S1 - 1 of 1</b>

## **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 Visual System in accordance with the Specification, Schedule of Technical Data, Important Notes to Tenderers, “Arahan Kepada Petender”, 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.

### **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; 230/400 V, +10% to -6% of the rated voltage), 3 phase, 4 wire, 50 Hz system with solidly earthed neutral.


	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b> <b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S2 - 1 of 1</b>

## 2.0 Description

### 2.1 System Description

2.1.1 The system generally consists of the following components:

- 2.1.1.1 HDMI receptacle panel
- 2.1.1.2 HDMI transmitter
- 2.1.1.3 HDMI receiver
- 2.1.1.4 HDMI switcher
- 2.1.1.5 HDMI distribution amplifier
- 2.1.1.6 HDMI audio de-embedder
- 2.1.1.7 Projector screen
- 2.1.1.8 LED display monitor
- 2.1.1.9 LCD projector
- 2.1.1.10 Equipment rack

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b> <b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S3 - 1 of 7</b>

### 3.0 Equipment

#### 3.1 HDMI Receptacle Panel

3.1.1 HDMI receptacle panel shall be remotely powered from HDMI receiver or HDMI switcher. It shall be complete with a built-in HDMI transmitter/extender to enable long distance transmission.

3.1.2 The HDMI receptacle panel shall comply with the following **minimum technical** specifications:


Input video	:	HDMI female connector
Connection to receiver or switcher	:	RJ-45 female connector
Audio	:	Embedded into HDMI signal
Video data rate	:	6.75 Gbps (or 2.25 Gbps per lane/channel); 225 MHz maximum pixel clock
Resolution	:	Full high definition (HD) 1080p (1920 x 1080 pixels)
Transmission range	:	40 metre or, as specified in bill of quantities (@ 1080p) or drawings
Power	:	Remotely powered from HDMI receiver or switcher through shielded twisted pair cable. No external power adapter shall be used.

3.1.3 The receptacle panel shall be completed with 0.8mm thick galvanised sheet steel back box and other accessories for a complete installation.

#### 3.2 HDMI Transmitter

3.2.1 The HDMI transmitter shall comply with the following **minimum technical** specifications:

Input video	:	HDMI female connector
Output video to another unit	:	RJ-45 female connector
Audio	:	Embedded into HDMI signal

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b>
		<b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S3 - 2 of 7</b>

Video data rate : 6.75 Gbps (or 2.25 Gbps per lane/channel); 225 MHz maximum pixel clock

Resolution : Full HD 1080p (1920 x 1080 pixels)

Transmission range : 40 metre or, as specified in bill of quantities (@ 1080p) or drawings

Power : Complete with power adapter and accessories.

3.2.2 HDMI transmitter shall be enclosed in an accessible polycarbonate service enclosure, except those located at the equipment rack.

### 3.3 HDMI Receiver

3.3.1 The HDMI receiver shall comply with the following **minimum technical** specifications:

Output video : HDMI female connector

Input video from another unit : RJ-45 female connector

Audio : Embedded into HDMI signal

Video data rate : 6.75 Gbps (or 2.25 Gbps per lane/channel); 225 MHz maximum pixel clock


Resolution : Full HD 1080p (1920 x 1080 pixels)

Transmission range : 40 metre or, as specified in bill of quantities (@ 1080p) or drawings

Power : Complete with power adapter and accessories.

3.3.2 HDMI receiver connected to a HDMI receptacle panel shall be able to provide power to it through shielded twisted pair cable. The equipment shall deem to fulfil this requirement.

3.3.3 HDMI receiver shall be enclosed in an accessible polycarbonate service enclosure, except those located at the equipment rack or mounted to a monitor.

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b> <b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S3 - 3 of 7</b>


### 3.4 HDMI Switcher

3.4.1 The HDMI switcher shall comply with the following **minimum technical** specifications:

Input video	:	HDMI female connectors; RJ-45 female connectors with built-in HDMI receiver
Output video	:	HDMI female connectors; RJ-45 female connectors with built-in HDMI transmitter
Input Audio	:	Embedded into HDMI signal
Output Audio	:	Embedded into HDMI signal; Analogue stereo audio as specified in bill of quantities or drawings;
Video data rate	:	6.75 Gbps (or 2.25 Gbps per lane/channel)
Resolution	:	Full HD 1080p (1920 x 1080 pixels)
Range (@1080p) for	:	40 metre or, as specified in bill of quantities built-in transmitter or drawings receiver
Control port	:	RS-232 / ethernet / USB / infrared if required, for connection to control panel as indicated in the drawing
Power	:	Complete with power adapter and accessories.

3.4.2 HDMI switcher connected to a HDMI receptacle panel shall be able to provide power to it through shielded twisted pair cable.

3.4.3 A matrix HDMI switcher shall be able to perform matrix routing in addition to the above specifications. Any input or group of inputs shall be able to be routed to any output or group of outputs.

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b> <b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S3 - 4 of 7</b>

### 3.5 HDMI Distribution Amplifier


3.5.1 The HDMI distribution amplifier shall comply with the following **minimum technical** specifications:

Input video	:	HDMI female connectors
Output video	:	HDMI female connectors; RJ-45 female connectors with built-in HDMI transmitter
Input/Output Audio	:	Embedded into HDMI signal
Video data rate	:	6.75 Gbps (or 2.25 Gbps per lane/channel)
Resolution	:	Full HD 1080p (1920 x 1080 pixels)
Range (@1080p) for	:	40 metre or, as specified in bill of quantities built-in transmitter or drawings receiver
Control port	:	RS-232 / ethernet / USB / infrared if required, for connection to control panel as indicated in the drawing
Power	:	Complete with power adapter and accessories.

### 3.6 HDMI Audio De-embedder

3.6.1 The HDMI audio de-embedder shall comply with the following **minimum technical** specifications:

Input/Output video	:	HDMI female connector
Input Audio	:	Embedded into HDMI signal
Output Audio	:	Embedded into HDMI signal; Stereo analogue audio
Video data rate	:	6.75 Gbps (or 2.25 Gbps per lane/channel)
Resolution	:	Full HD 1080p (1920 x 1080 pixels)
Power	:	Complete with power adapter and accessories.

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b> <b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S3 - 5 of 7</b>

### 3.7 Projector Screen

3.7.1 The projector screen shall comply with the following **minimum technical** specifications:

Type	:	Motorised
Material	:	Matte white PVC laminated fibreglass base
Display Area Size	:	As specified in the drawing or bill of quantities;
Control	:	Up / Down / Stop
Screen Gain	:	1
Aspect Ratio	:	16 : 10

### 3.8 LED Display Monitor


3.8.1 The LED display monitor shall comply with the following **minimum technical** specifications: -

Diagonal Screen Size	:	As specified in bill of quantities or drawings;
Resolution	:	Full HD (1920 x 1080 pixels)
HDMI Input	:	2 nos
USB Input	:	1 no
Component In (Y/Pb/Pr)	:	1 no
Component In (AV)	:	1 no
Audio Out (Mini Jack)	:	1 no

### 3.9 LCD Projector


3.9.1 The LCD projector shall comply with the **minimum technical** specifications as shown in Table 3A.

3.9.2 The projector shall be supplied complete with one (1) number original spare replacement lamp.

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b> <b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S3 - 6 of 7</b>


Parameter	Projector		
Light Output (ANSI Lumens)	≥ 3500 lumens ≤ 4000 lumens	> 4000 lumens < 5500 lumens	≥ 5500 lumens
Type	3 LCD panel		
Aspect Ratio	16:10		
Resolution	Wide ultra-extended graphic array (WUXGA) 1920 x 1200 pixels		
Contrast Ratio	3000:1	5000:1	
Keystone Correction	Yes		
Lamp Hours Life	2000 hrs		
Lens Type	Zoom lens		
Lens Throw Ratio	The following throw type and ratio shall be used:-  i) Ultra-short throw - < 0.5 : 1 ii) Short throw - 0.5 to 1.0 : 1 iii) Standard throw - 1.2 to 2.2 : 1 iv) Medium throw - 2.5 to 3.5 : 1 v) Long throw - > 3.5 : 1  Unless otherwise specified in the bill of quantities or drawings, the default throw ratio shall be of standard throw.		
Focus/zoom Mechanism	Manual		Motorised
Lens Shift	Not applicable		Motorised +50% vertical ±10% horizontal
Input/output Terminal	HDMI in, VGA or RGB in, audio in/out, serial RS-232; Quantities as specified in bill of quantities or drawings		
Remote Control	Yes		
Network Connectivity	As specified in bill of quantities or drawings		

Table 3A : Minimum specification for LCD projector

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b>
		<b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S3 - 7 of 7</b>

### 3.10 Equipment Rack

- 3.10.1 The equipment rack shall be of the floor standing type complete with heavy-duty levelling feet. The rack shall be made of metal plate with black epoxy coating, internal reinforcement and provided with vents for air ventilation. Low noise ventilation fans shall be installed at the top of the rack. The rack shall be adequate in size to house all the necessary equipment
- 3.10.2 The equipment rack shall be provided with lockable door for security reason. Front clear Perspex panel shall be provided for easy monitoring of equipment status. The rack shall be constructed such that all equipment can be withdrawn from the front for servicing and maintenance. Equipment shall be arranged as such to allow for heat to flow and be convected freely minimising any temperature built-up. Heat generating equipment shall be stacked appropriately with minimum of 1U separation from other equipment.
- 3.10.3 All inter-racking cables shall be deemed included whether they are explicitly mentioned in the drawings or bill of quantities. All cables shall be arranged in a neat and systematic manner. Cables within the rack shall be fixed securely without strain by means of approved heavy-duty UV resistant nylon cable ties. For identification purpose, all cables shall be labelled accordingly.

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b>
		<b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S4 - 1 of 1</b>


## **4.0 Wiring**

### **4.1 General**

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

### **4.2 Service Colour Identification**

- 4.2.1 All conduits and trunking for the system shall be clearly identified and distinguished from other services.
- 4.2.2 Trunking for visual system shall be identified using black "AUDIO VISUAL" letterings over white background. The letterings shall have a minimum height of 15 mm but need not exceed 50 mm, and at an interval not more than 1000 mm. All letterings shall be clearly legible, and to the satisfaction of the S.O or S.O's Representative.
- 4.2.3 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.

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b>
		<b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S5 - 1 of 2</b>


## 5.0 Testing and Commissioning

### 5.1 Test Instruments


- 5.1.1 All measuring and test instruments used for testing and commissioning 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 two (2) years from the date of issuance.
- 5.1.2 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.

### 5.2 Test and Test Certificates

- 5.2.1 After the installation work has been completed and before Certificate of Practical Completion is issued, the whole system shall be tested for compliance and performance as follows: -
- 5.2.1.1 Cables shall be tested for continuity;
  - 5.2.1.2 Functional test to indicate correct operation and performance of all equipment; and
  - 5.2.1.3 Any other tests which may be needed to demonstrate the satisfactory function of the system
- 5.2.2 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 S.O's 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


	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b> <b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S5 - 2 of 2</b>

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.

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b>
		<b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S6 - 1 of 1</b>

## 6.0 Service and Maintenance

- 6.1 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 skilled 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.
- 6.2 The service and maintenance to be performed and defects to be rectified and making good shall include but not limited to the following: -
- 6.2.1 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;
  - 6.2.2 Replacement and making goods of all wiring and accessories;
  - 6.2.3 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
  - 6.2.4 All other works deemed as necessary by the S.O or S.O's Representative.
- 6.3 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.

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b>
		<b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S7 - 1 of 3</b>

## **7.0 Shop Drawings and As Built Documents**

### **7.1 Shop Drawings**

7.1.1 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 (2) 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 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.


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

- 7.1.2.1 Co-ordinated dimensioned general arrangements, layouts and positions of accessories, equipment racks and all others necessary for the complete installation;
- 7.1.2.2 Schematic line diagrams of the installation;
- 7.1.2.3 The dimensioned general arrangements, layouts and routes of final circuits;
- 7.1.2.4 The dimensioned general arrangements, layouts, routes and positions of all lateral and vertical mains and/or sub-mains;
- 7.1.2.5 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
- 7.1.2.6 Co-ordinated routes for all cables laid external of the building;

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

### **7.2 As Built Documents**

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

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b>
		<b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S7 - 2 of 3</b>

7.2.2 The as installed drawings shall comprise of: -

- 7.2.2.1 Site plan;
- 7.2.2.2 External cable routes;
- 7.2.2.3 Internal layout plans; and
- 7.2.2.4 Schematic diagrams.


7.2.3 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.:

7.2.4 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.

7.2.5 Manual and documents for the installation shall be supplied. It shall comprise of: -

- 7.2.5.1 Installation manual;
- 7.2.5.2 Operation manual;
- 7.2.5.3 Service and maintenance manual;
- 7.2.5.4 Inventories and parts list;
- 7.2.5.5 Product data and catalogue;
- 7.2.5.6 Product test certificates; and
- 7.2.5.7 Installation test results.

	<b>SPECIFICATION FOR VISUAL SYSTEM (L-S32)</b>	<b>CKE.LS.06.32.(00).2019</b> <b>Date Issued: May 2019</b>
		<b>Revision: 0</b>
		<b>Date: May 2019</b>
		<b>Page: S7 - 3 of 3</b>

- 7.2.6 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.
- 7.2.7 In addition, one (1) set of the as installed drawing shall be submitted in the form of tracing/original document, and two (2) sets in CD ROM.
- 7.2.8 The cost of all these prints, manuals, tools etc. whether or not provided in the Bill of Quantities, is deemed to be included in the Contract.