



Ref. No. NCB-Works/PICIIP-15 (1)

Date: 07 July 2023

Subject: **MINUTES OF PRE-BID MEETING HELD AT PMU PICIIP OFFICE ON 09 JUNE 2023**

NCB-WORKS/PICIIP-15:

Upgradation of Punjab Local Government Academy (PLGA) campus at Lala Musa

As per the Bidding Documents issued on 29 May 2023, the date of the pre-bid meeting was scheduled on 09 June 2023. The pre-bid meeting was convened and chaired by the Deputy Program Director (DPD), Program Management Unit (PMU), Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government & Community Development Department, Punjab, Pakistan. Following officials from PMU, UMDS Consultant, representatives of contractors attended the meeting:

- i. Mr. Umar Tayyab (Deputy Program Director) PMU, PICIIP.
- ii. Mr. Muhammad Tahir Sheikh (Chief Engineer), PMU, PICIIP.
- iii. Mr. Salman Mirza (Director Admin & Finance) PMU, PICIIP.
- iv. Mr. Shuja Dar (Director Procurement & Contracts), PMU, PICIIP
- v. Mr. Zunair Bin Shafaqat (UMDS Consultant)
- vi. Mr. Muhammad Afzal (M/s Saif Construction Pvt. Ltd)
- vii. Mr. Mohsin Raza (M/s Saif Construction Pvt. Ltd)
- viii. Mr. Faisal Mahmood (M/s Elite Engineering Pvt Ltd)
- ix. Mr. Awais Ashraf (M/s Elite Engineering Pvt Ltd)
- x. Mr. Aamir Umar (M/s Zenith Construction & Engineering)

The meeting started with the recitation of Holy Quran. The chair welcomed the participants and asked the Director Procurement & Contracts to start with the agenda of the meeting. The participants were briefed on the bidding documents, particularly the contents of Section 2 (Bid Data Sheet), Section 3 (Evaluation and Qualification Criteria), Section 4 (Bidding Forms), and Section 8 (Particular Conditions of the Contract).

The meeting was held in two parts. During the first part, it was explained in detail by reading the important Instructions to Bidders clauses on the preparation of bids and application of (financial & experience) evaluation criteria. A thorough briefing was given regarding the significance of the responsiveness of bid submission.

During the second part of the meeting, the participants were invited to raise queries. A number of questions/queries were addressed during the meeting however the Director Procurement & Contracts also advised the bidders/contractors to submit their written queries through email (i.e. pmu.piciip@punjab.gov.pk) to PMU for written replies/advice accordingly.

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The Bidders submitted their written queries from time to time by (Friday) 07 July 2023 and the replies thereof, in writing, are attached as **Annex-A** and **Addendum No.1** attached as **Annex-B**.

The meeting was concluded with a vote of thanks to and from all the participants.

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Responses to the Queries by the Bidders

| Queries by the Bidder | Reference BOQ items | Response by PMU, PICLIP |
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| Windows Server 2022 what type of Server is Required (Standard/Enterprise/Datacenters) | Recording System (NS-23) | The Type of Server is already mentioned/provided in the Section 38 page 336-338 of the Specifications. |
| Windows Server 2022 How many cores are required? | (NS-26) Providing Servers, Core Router, Access switch, Core switch, Ups Servers (1). Form Factor: 2U Rack Mounted, Processor: Intel Xeon Silver 4310, 2. 1GHz, Turbo, 12 Cores or higher processor, CPU (Installed / Max): 2 /2,Memory: 4x 32GB DDR4 Memory, required minimum 24xDIMM slots, RAID controller: RAID Controller, 12Gbps, 2GB Cache or more, Support RAID 0, 1,5,6,Hard Disk Drives: 3x 2.4TB SAS 10K HDD Hot Plug, Optical Drives: Super Drive (Internal/External),Network: 4x 1G Base-T Network Ports, Graphics: Integrated Graphics, Ports: Required 1x VGA, At least 4 x USB 3.0 and USB 2.0 ports, Dedicated USB port for Server Management Keyboard & Mouse: Branded Standard USB, Monitor: Same Brand LED 18.5" or higher. Power Supply: 2xHot-plug compatible Redundant Power Supply, 2m PDU style Power Cords, System Management: Embedded Remote Management with dedicated RJ45 port, license must include Pre-OS virtual remote KVM (Keyboard Video, Mouse) functionality to see server boot process remotely or to perform Bios, RAID controller settings etc tasks. Accessories: Server Rack Mounting Kit with sliding rails and Cable Management Accessory, Warranty: Proposed Server should be quoted with minimum 3 years Hardware warranty and onsite support., Operating System Licensed Windows Server 2022 standard edition minimum 24 cores., Services: a. Assembly of Server (If required), b. Configuration of Raid | The detail of cores is provided in the Section 38 pages 336-338 of specifications. Fire Wall is required for 150 Users Addendum # 01 attached as Annex-B |

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| <p>land 5.c. Disk Partitioning, d. Installation of Operating System, e. Rack Mounting.. Volume /LUNs creation. Font Panel: Quick removable front panel / cover, Expansion Slots: Required min 3xEmpty PCIe slots other than occupied, upgradable up to Eight PCI-Express 3.0 slots, Cooling Minimum: 6xRedundant Hot Plug Fans or higher, Drive Slots: Chassis with 8x2.5 inch HDD slots, must support/upgradable Up to 24 SFF drives. Server must support Red Hat Enterprise Linux, SUSE Linux Enterprise Server, VMware ESXi), Core Router + Firewall WAN 2 Units, Device Type: Firewall, Form Factor: 1U or above Rack Mounted, Ports: USB, Console, 2x GE RJ45 MGMT/DMZ Port, 4x GE RJ45 WAN Ports, 12x GE RJ45 Ports, 2x 10 GE SFP, 4x GE SFP Slots, 4x GE RJ45/SFP Shared Media Pairs Firewall throughput: 20 Gbps, IPS throughput: 2.6 Gbps, NGFW throughput: 1.6 Gbps, IPsec VPN throughput (512 bytes): 11.5 Gps, SSL VPN throughput: 1 Gbps, Threat protection: 1 Gbps, Features: Firewall should support UTM features IPS, antivirus, URL filtering, Web content filtering, Web Application Protection, Email Protection, Encryption, Concurrent sessions: 1.5 Million, New sessions / Second: 56,000, SSL inspection throughput (IPS, avg. HTTPS): 1 Gbps, Application control throughput: 2.2 Gbps, Accessories: Rack Cable, Rack Mounts, Console Cable, AC Power Supply: 100-240V AC, 50 - 60 Hz, Access Switch 26 Units, • 24 ports of Gigabit Ethernet (GbE 10/100/1000 desktop connectivity), • GbE Small Form-Factor Pluggable (SFP) uplinks, • 24 x 10/100/1000Base-T - RJ-45 PoE ports, • 1 x USB Type A, 1 x console /USB/RJ 45 for management, • 4 x SFP (mini-GBIC), Core Switch 4 Units, Device Type: Switch - 24 Ports- 13. managed - stackable, Form Factor: 1U or above Rack Mounted, Ports: 24 x 10/100/1000 ports, 4 x 10 Gigabit Ethernet (2 x 10GBase-T/SFP+combo + 2 x SFP+), Multimode 1G (SFP+) upto 5000M, DRAM Memory: 256 MB (installed) or above Flash Memory: 32 MB (installed) or above. Switching Capacity: Up to 128 Gbps or higher, Bandwidth Capacity: Up to 70 Mpps or higher, Management Protocol: Internet Group Management Protocol (IGMP) supports 4K multicast groups and Routing Information Protocol (RIPv2), VLAN: Up to 4094, Features: Flow control, layer 2 switching, VLAN support, IPv6 support, Spanning</p> | |
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| <p>Email Required for Firewall Registration</p> | <p>Tree Protocol (STP) support, Rapid Spanning Tree Protocol (RST) support, Multiple Spanning Tree Protocol (MSTP) support, Access Control List (ACL) support, Quality of Service (QoS), reset button, LACP support, Energy Efficient Ethernet, Dynamic VLAN Support (GVRP), MAC Table: Up to 16k entries or above Ia, Network Security: DHCP snooping, Dynamic ARP, IP/MC/Port Binding, Port Security, PVE, Management: SNA, SNMP, RMON, Licensing: Relevant licensed 10S to support the afore mentioned features, Accessories: Rack Cable, Rack Mounts, Console Cable, SKVax 3000W UPS (1)</p> | <p>An email will be provided by the client/end-user at the time of commissioning of IT equipment.</p> |
| <p>We need more information about these Items. Like Digging of Cables Splicing and quantity of ODF Boxes, Path cords, splicing, etc with PVC or HDPE pipe (NS-27 & NS-28)</p> | <p>(NS-27) Providing and fixing IP Camera (Security System, Camera, LED and accessories) Outdoor IP Camera: 64 Units, Resolution: 4 MP (2560 x 1440) ,2.8 mm / 100° lens, IR illuminator with range up to 50 m , H.265+/H.265/H.264+/H.264/MJPEG video compression, 3D-DNR, DWDR, BLC video processing functions, Access via application, Region of interest (ROI), Mechanically switching IR filter, IP67 rating, Power: 12 VDC or PoE (802.3af), Indoor IP Camera: 64 Units, Resolution: 4 MP (2560 x 1440) ,2.8 mm / 12 mm lens, IR illuminator with range up to 30 m , H.265+/H.265/H.264+/H.264/MJPEG video compression, 3D-DNR, DWDR, BLC video processing functions, Access via application Region of interest (ROI), Mechanically switching I filter, IP67 rating, Power: 12 VDC or PoE (802.3af), Network Video Recorder (NVR): Video/ Audio input: 64 Channels, Network Incoming bandwidth: 320Mbps, Video/Audio Output: HDMI Output: 1-ch, resolution: 4K(3840*2160)60Hz, 4K(3840*2160)30Hz, 1920*1080P/60Hz, 1600*1200/60Hz, 1280*1024/60Hz, 1280*720/60Hz, 1024*768/60Hz- Recording: Resolution: 12MP/ MP/6MP/5MP/4MP/3MP/1080p/UXGA/720p/VGA/4CIF/DCIF/2CIF/CIF/OCIF VGA Output: 1-ch, resolution: 1920*1080P/60Hz, 1280*1024/60Hz, 1280*720/60Hz, 1024*768/60Hz, Decoding: 2Units, Capability: 8-ch@1080P Live view, Playback: .MP/6MP/5MP/3MP/1080p/UXGA/720p/VGA/4CIF/DCIF/2CIF/CIF/OCI</p> | <p>For Digging of cables, cables splicing, ODF etc. will be calculated as per solution provider to full fill the site requirement and proper functioning of the system for 64 Units as mentioned in item No. NS-27 & for cables PVC pipe will be used as mentioned in item No. NS-27.</p> |


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| <p>F,HardDisk:8SATA interfaces with 8 HDDs Capacity with pre installed 6Bx8 HDDs, Switch: 1 Unit• Core Switch Layer - 2 Managed- 12 Port SFP Switch with SFP Modules upto 5Km Complete• Camera Cabling: CAT 6 Including Ducting Cat 6 UTP /STP 23AWG 3M, Schneider, or Equivalent. Transmission Frequency: 250Mhz including PVC Pipe etc 16000ft. • Optical Fiber • Optical Fiber: Single Mode 8 Core • Cabling and related accessories including Digging, laying ODF Boxes, Patch cords , splicing etc with in PVC or HDPE pipe wherever required., • Patch Panels: 24 Ports Patch Panel with loaded VO's- Tagging: Tagging of I/O, Patch Panel Ports, Cables (All Ends) 3000ft- Data Rack (30U) Branded- UPS 3KVAAPC Branded with 2 x 150 A Dry Batteries, LED 55" (2)</p> | <p>For Digging of cables, cables splicing, ODF etc. will be calculated as per solution provider to full fill the site requirement and proper functioning of the system for 64 Units as mentioned in Item No. NS-28 & for cables PVC pipe will be used as mentioned in Item No. NS-28.</p> |
| <p>(NS-28) Providing and fixing Networking Solution (Cable + Wi-Fi) LAN Cabling: CAT 6 Including Ducting Cat 6 UTP /STP 23AWG 3M, D- Link, Schneider, or Equivalent. 16,000ft Transmission Frequency: 250Mhz including PVC pipe etc Face Plates & Back Boxes: Dual I/O. 128 I/O: CAT6 I/O Patch Cord: 3 Meter 64 Patch Cord: 1 Meter 64 Ducting: PVC Pipe / Dura Duct, Flexible Pipe 8000ft Patch Panels: 24 Ports Patch Panel 6 Tagging: Tagging of I/O, Patch Panel Ports, Cables (All Ends) 1 Job Data Rack (42U) Branded 1 unit Related Services: • Ducting and Cabling of LAN • Installation of Switches, Patch Panels, Data Rack, I/O and RJ45 Connectors. • All services related to commissioning of LAN and Internet. • Fluke testing must be performed by supplier to verify the length and quality of cable. 6 core Single Mod Fiber complete is all aspect including splicing fiber patch cords digging etc Warranty: 1 Year</p> | |


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| <p>Ref: Admin Block IT Equipment's Sr no. 12/Ref# NS -27 1- The specification given in the Part mentioned of BOQ is not completed.</p> | | <p>All the specifications which were incomplete in BOQs, we have added that specifications in reply of query sheet as NS- 26 to NS-30.</p> |
| <p>2- There are no details given about Passive works</p> | | <p>Itemized Specification inclusive of passive works has already been given in the Bill of Quantities which is self-explanatory and sufficient for bidding".</p> |
| <p>3- The UPS Specifications are not completed to define the requirements.</p> | | <p>Detailed Specification of UPS is given as Annexure B (Copy attached) as Section E15 of the Specifications.</p> |
| <p>Ref: Admin Block IT Equipment's Sr no 13/Ref# NS-26 PoE switch, which is used for providing power to Cameras, and also for Data Connections, is Missing in the solution. 1- Cat-6 Cable and other Passive Structure required Quantities are missing.</p> | <p>Providing and fixing IP Camera (Security System, Camera, LED and accessories) Outdoor IP Camera: 64 Units, Resolution: 4 MP (2560 x 1440) ,2.8 mm / 100° lens, IR illuminator with range up to 50 m ,H.265+/H.265/H.264+/H.264/MJPEG video compression, 3D-DNR, DWDR, BLC video processing functions, Access via application, Region of interest (ROI), Mechanically switching IR filter, IP67 rating, Power: 12 VDC or PoE (802.3af) Supply, Installation and Connection of Specified Ports Layer-2 PoE (Power Over Ethernet) data Network Switch specified ports x100 Mbps PoE, Min. 2x1 Gbps SFP UPLINK ports, made of Cisco USA/NOVAS Europe/Juniper USA / Huawei / H3C, Polio Australia or equivalent as approved and directed by the Engineer Incharge. 24 port, Min. 365 Watt PoE power QTY(04), Indoor IP Camera: 64 Units, Resolution: 4 MP (2560 x 1440) ,2.8 mm / 12 mm lens IR illuminator with range up to 30 m , H.265+/H.265/H.264+/H.264/MJPEG video compression, 3D-DNR, DWDR, BLC video processing functions, Access via application, Region of interest (ROI), Mechanically switching IR filter IP67 rating, Power: 12 VDC or PoE (802.3af) Network Video Recorder (NVR), Video/Audio input: 64 Channels Network: Incoming bandwidth: 320Mbps Video/Audio Output: HDMI Output: 1-ch, resolution: 4K(3840*2160)/60Hz, 4K(3840*2160)/30Hz, 1920*1080P/60Hz, 1600*1200/60Hz, 1280*1024/60Hz.</p> | <p>PoE switch quantity and specifications are already provided in item No. NS-26, Please see Yellow Highlighted. Cat 6 cable and fiber cables lengths are already mentioned in item No. NS-26, Please see the Yellow highlighted.</p> |


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| <p>Ref: Admin Block IT Equipment's Sr no. 14/Ref# NS-28 1- The required quantity for 6 core SM Fiber is not defined.</p> | <p>1280*720/60Hz, 1024*768/60Hz • Recording: Resolution:12MP/8MP/6MP/5MP/4MP/3MP/1080p/UXGA/720p/VGA/4CIF/DCIF/2CIF/CI F/QCIF VGA Output:1-ch, resolution: 1920*1080P/60Hz, 1280*1024/60Hz, 1280*720/60Hz, 1024*768/60Hz Decoding: 2Units, Capability:8-ch@1080P, Live view , Playback: 8MP/6MP/5MP/3MP/1080p/UXGA/720p/VGA/4CIF/DCIF/2CIF/CI F/QC IF Hard Disk: 8 SATA interfaces with 8 HDDs Capacity with pre installed 6TBx8 HDDs Switch: 1 Unit, • Core Switch Layer – 2 Managed- 12 Port SFP Switch with SFP Modules upto 5Km Complete • Camera Cabling: CAT 6 Including Ducting Cat 6 UTP /STP 23AWG 3M, Schneider, or Equivalent. Transmission Frequency: 250Mhz including PVC Pipe etc 16000ft• Optical Fiber: • Optical Fiber: Single Mode 8 Core • Cabling and related accessories including Digging, laying ODF Boxes, Patch cords , splicing etc with in PVC or HDPE pipe wherever required. • Patch Panels: 24 Ports Patch Panel with loaded I/O's • Tagging: Tagging of I/O, Patch Panel Ports, Cables (All Ends) 3000ft • Data Rack (30U) Branded • UPS 3KVA APC Branded with 2 x 150 A Dry Batteries LED 55" (2) Providing and fixing Networking Solution (Cable + Wt-FI) LAN Cabling: CAT 6 Including Ducting Cat 6 UTP /STP 23AWG 3M, D-Link, Schneider, or Equivalent. 16,000ft Transmission Frequency: 250Mhz including PVC pipe etc Face Plates & Back Boxes: Dual I/O. 128 I/O: CAT6 I/O Patch Cord: 3 Meter 64 Patch Cord: 1 Meter 64 Ducting: PVC Pipe / Dura Duct, Flexible Pipe 8000ft Patch Panels: 24 Ports Patch Panel 6 Tagging: Tagging of I/O, Patch Panel Ports, Cables (All Ends)1 Job Data Rack (42U) Branded 1 unit Related Services: • Ducting and Cabling of LAN • Installation of Switches, Patch Panels, Data Rack, I/O</p> | <p>The quantity of Single Mod Fiber cable of 1500 Rft is added in the Admin Block IT Equipment item NS-28 of description. The abovementioned detail is addressed in Addendum # 01 attached as Annex-B</p> |
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| <p>Ref: Admin Block IT Equipments's Sr no. 15/Ref# NS-29 1- Access switches are missing in the solution.</p> | <ul style="list-style-type: none"> • and RJ45 connectors • All services related to commissioning of LAN and Internet. • Fluke testing must be performed by supplier to verify the length and quality of cable. • 6 core Single Mod Fiber (approximately 1500 feet) complete is all aspect including splicing fiber patch cords digging etc <p>Warranty: 1 Year"</p> | <p>Itemized detail of passive works is sufficient for the tender process, furthermore, the access switch detail is already mentioned in item No. NS-29 Please see Yellow Highlighted</p> |
| <p>Ref: Admin Block IT Equipments's Sr no. 15/Ref# NS-29 1- Access switches are missing in the solution.</p> | <p>Providing and fixing Wireless LAN Controller: Should support 5 Gbps or higher throughput. 2 or higher 10G ports with compatible SFP modules, 8 or higher GE ports. Support of MAC based authentication, 802.1X authentication, Portal authentication, should be able to support at least 100 Aps on single controller (Licenses of 35APs included). Should support at least 1000 users on single controller. Support of WPA, WEP, TKIP. Built-in server for portal/802.1x authentication. Support of dynamic routing protocols OSPF, BGP etc., LACP. URL filtering, support of IDS/IPS, should be able to mitigate Trojan horse, worms and buffer overflow. Should support configuration management through CLI, web based as well as SSH. Should support SNMPv1/v2/v3. Should support wireless performance monitoring of APs, wireless controller. Should be able to support both 2.4Ghz and 5Ghz frequency. Controller should be able to enable/disable SSID on periodic basis. Should support secure guest access through portal. Note: Wireless LAN controller must not have EOL/EOS in next 5 years. WLAN Access Point (PoE) (Qty 35): Supply, Installation and Connection of Specified Ports Layer-2 PoE (Power Over Ethernet) data Network Switch specified ports x100 Mbps PoE, Min.2x1 Gbps SFP UPLINK ports, made of Cisco USA/NOVAS Europe/Juniper USA / Huawei / H3C, Pollo Australia or equivalent as approved and directed by the Engineer Incharge. 24 port, Min. 365 Watt PoE power QTY(02) Enterprise model fully comply IEEE802.11a/b/g/n/ac or 802.11ax. 3X3 MIMO or higher. Should be able to operate with quoted Wireless Lan Controller as well as stand-alone in case WLC is not functional. Data rate: 5.75Gbps</p> | |



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| <p>2- Passive Work details are not defined.</p> | <p>or higher, working in both 2.4GHz and 5GHz, Min. Antenna Gain: 1 dBi or higher on 2.4GHz and 3dBi on 5GHz. Built in antennas, MAC address authentication. 1X1GE port or higher, support of 16 SSIDs or more. Should support of 512 or more users per AP. 802.3at/af POE Power Supply (POE injector included), DHCP Snooping, WIDS, WIPS, Rouge Device Detection, AP Blacklisting and Whitelisting and other standard features. warranty: 3 years Note: Wireless Lan Controller, Access Points must not have EOL/EOS in next 5 years. 9x5xNBD warranty</p> | <p>Passive work is required for 35 Nos. Access Points as per Item No. NS-29. see Yellow Highlighted</p> |
| <p>Also please revisit the escalation formula as the new escalation formula with inputs approved by Punjab government shall be used for bid.</p> | | <p>It is submitted that in PICLIP the ADB guidelines are applicable only. Furthermore, the Bidding Documents are approved the ADB in which the Price Adjustment Table included and provided in Section 4 of the Bidding Documents.</p> |
| <p>The terms and conditions for joint ventures (JVs) in the bidding documents are quite stringent. In the JV, one company will cover a portion of the bidding documents, while the other company will cover the other portion.</p> | | <p>In the issued Bidding Documents Section 3 (Qualification and Evaluation Criteria) is the same for the Single or JV Bidders. Furthermore, if a Bidder submits a bid through a Joint Venture, then there is an option for the Bidder that at least One Partner shall have to meet the criteria of a Contract of Similar Size and nature and for the Key Activities, the bidders can meet jointly as mentioned in the Bidding Documents.</p> |


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| <p>CE10 code. I request the esteemed individuals to allow the leading company to fulfil the requirement of PEC category 3 and CE10 code in the bidding documents, as well as permit the JV member to fulfil the requirement of the work experience in the as mentioned bidding documents. This will ensure a healthy competition.</p> | | <p>Evaluation Criteria) regarding PEC registration is the same for the Single or JV Bidders. Furthermore, in issued Bidding Documents it mentioned that: "National Bidder must be registered with Pakistan Engineering Council (PEC) and shall have a valid registration Certificate (2022) in category for C-3 or above with Specialization in CE10 at the time of bid submission. If the winning bidder includes a local firm whose registration expires prior to contract award, the firm shall be given reasonable time to extend such registration." Moreover, the above-mentioned PEC Registration Certificate is changed to (2023) and also addressed in Addendum # 01 attached as Annex-B.</p> |
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| Loan No. and Title: | 3562-PAK: Punjab Intermediate Cities Improvement Investment Program (PICIIP) |
| Contract No. and Title: | NCB-Works/PICIIP-15: PLGA Lala Musa Academy |

Annex-B

Date: 07 July 2023

ADDENDUM No. 1

Subject: **AMENDMENT OF BID DOCUMENT FOR NCB-WORKS/PICIIP-15: UPGRADATION OF [PUNJAB LOCAL GOVERNMENT BOARD ACADEMY LALA MUSA IN ACCORDANCE WITH ITB 8.1 SECTION 1 (INSTRUCTIONS TO BIDDERS) OF ISSUED BIDDING DOCUMENT**

With reference to IFB Notice dated **29th May 2023**, the following amendments have been made in the respective sections of the Bidding Documents under this Addendum in accordance with ITB 8.1 in Section 4; Bidding Forms (Bill of Quantities). The addendum shall be read and construed as an integral part of the Bidding Documents and shall take precedence in case of any conflict/ambiguities in the Bidding Documents and other provisions within. The changes mentioned herein below are applicable for Contract No: NCB-Works/PICIIP-15, unless indicated otherwise.

1. Section 2: (Bid Data Sheet)

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| ITB 22.1 | For bid submission purposes only, the Employer's address is: | |
| | Attention: | Program Director Program Management Unit (PMU) Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government & Community Development Department, Punjab |
| | Street address: | 40, B-1, Gulberg 3, MM Alam Road, Lahore, Pakistan |
| | City: | Lahore |
| | ZIP code: | 54000 |
| | Country: | Islamic Republic of Pakistan |
| | The deadline for bid submission is: | |
| | Date: | 17 th July 2023 |
| Time: | 1530 Hours | |
| ITB 25.1 | The opening of Technical Bid shall take place at: | |
| | Office of the Program Director Program Management Unit (PMU) Punjab Intermediate Cities Improvement Investment Program (PICIIP) Local Government & Community Development Department, Punjab | |
| | Street address: | 40, B-1, Gulberg III, MM Alam Road, Lahore, Pakistan |
| | City: | Lahore |
| | ZIP code: | 54000 |
| | Country: | Islamic Republic of Pakistan |

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| Date: | 17 th July 2023 |
| Time: | The technical bids shall be opened immediately after the bid submission deadline. |

2. Section 3 (Evaluation and Qualification Criteria)

2.1.6 Registration with Pakistan Engineering Council (PEC)

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| National Bidder must be registered with Pakistan Engineering Council (PEC) and shall have a valid registration Certificate (2023) in the category for C-3 or above with Specialization in CE10 at the time of bid submission. <i>If the winning bidder includes a local firm whose registration expires prior to contract award, the firm shall be given reasonable time to extend such registration.</i> | must meet requirement | not applicable | JV partner must meet requirement as per their respective JV share | must meet requirement | Forms ELI - 1; ELI - 2 with attachments |
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3. Section 4: (Bill of Quantities)

I. Bill of Quantities, Ref # NS-26.

"The firewall is required for 150 users."

"Providing Servers, Core Router, Access switch, Core switch, Ups Servers (1). Form Factor: 2U Rack Mounted, Processor: Intel Xeon Silver 4310, 2. 1GHz, Turbo, 12 Cores or higher processor, CPU (Installed / Max): 2 /2,Memory: 4x 32GB DDR4 Memory, required minimum 24xDIMM slots, RAID controller: RAID Controller, 12Gbps, 2GB Cache or more, Support RAID 0,1,5,6,Hard Disk Drives: 3x 2.4TB SAS 10K HDD Hot Plug, Optical Drives: Super Drive (Internal/External),Network: 4x 1G Base-T Network Ports, Graphics: Integrated Graphics, Ports: Required 1x VGA, At least 4 x USB 3.0 and USB 2.0 ports, Dedicated USB port for Server Management Keyboard & Mouse: Branded Standard USB, Monitor: Same Brand LED 18.5" or higher. Power Supply: 2xHot-plug compatible Redundant Power Supply, 2m PDU style Power Cords, System Management: Embedded Remote Management with dedicated RJ45 port, license must include Pre-OS virtual remote KVM (Keyboard Video, Mouse) functionality to see server boot process remotely or to perform Bios, RAID controller settings etc tasks. Accessories: Server Rack Mounting Kit with sliding rails and Cable Management Accessory, Warranty: Proposed Server should be quoted with minimum 3 years Hardware warranty and onsite support., Operating System Licensed Windows Server 2022 standard edition maximum 24 cores., Services: a. Assembly of Server (If required), b. Configuration of Raid land 5, c. Disk Partitioning ,d. Installation of Operating System, e. Rack Mounting.. Volume creation. Font Panel: Quick removable front panel / cover, Expansion Slots: Required min 3xEmpty PCIe slots

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other than occupied, upgradable up to Eight PCI-Express 3.0 slots, Cooling Minimum: 6xRedundant Hot Plug Fans or higher, Drive Slots: Chassis with 8x2.5 inch HDD slots, must support/upgradable Up to 24 SFF drives. Server must support Red Hat Enterprise Linux, SUSE Linux Enterprise Server, VMware ESXi), Core Router + Firewall WAN 2 Units, Device Type: Firewall. Form Factor: 1U or above Rack Mounted , Ports: | USB, | Console, 2x GE RJ45 MGMT/DMZ Port, 4x GE RJ45 WAN Ports, 12x GE RJ45 Ports, 2x 10 GE SFP, 4x GE SFP Slots, 4x GE RJ45/SFP Shared Media Pairs Firewall throughput: 20 Gbps, IPS throughput: 2.6 Gbps, NGFW throughput: 1.6 Gbps, IPsec VPN throughput (512 bytes): 11.5 Gps, SSL VPN throughput: 1 Gbps, Threat protection: 1 Gbps, Features: Firewall should support UTM features IPS, antivirus, URL filtering, Web content filtering, Web Application Protection, Email Protection, Encryption, Concurrent sessions: 1.5 Million, New sessions / Second: 56,000,SSL inspection throughput (IPS, avg. HTTPs): 1 Gbps, Application control throughput: 2.2 Gbps, Accessories: Rack Cable, Rack Mounts, Console Cable. AC Power Supply: 100-240V AC, 50 - 60 Hz, Access Switch 26 Units, • 24 ports of Gigabit Ethernet (GbE 10/100/1000 desktop connectivity. | GbE Small Form-Factor Pluggable (SP) uplinks,• 24 x 10/100/1000Base-T - RJ-45 PoE ports,• 1 x USB Type A, 1 x console /USB/RJ 45 for management,• 4 x SFP (mini-GBIC),Core Switch 4 Units, Device Type: Switch - 24 Ports- 13. managed - stackable, Form Factor: |U or above Rack Mounted, Ports: 24 x 10/100/1000 ports, 4 x 10 Gigabit Ethernet (2 x 10GBase-T/SFP+combo + 2 x SFP+), Multimode 1G (SFP+) upto 500M, DRAM Memory: 256 MB (installed) or above Flash Memory: 32 MB (installed) or above. Switching Capacity: Up to 128 Gbps or higher, Bandwidth Capacity: Up to 70 Mpps or higher, Management Protocol: Internet Group Management Protocol (IGMP) supports 4K multicast groups and Routing Information Protocol (RIPV2), VLAN: Up to 4094, Features: Flow control, layer 2 switching, VLAN support, IPv6 support, Spanning Tree Protocol (STP) support, Rapid Spanning Tree Protocol (RST) support, Multiple Spanning Tree Protocol (MSTP) support, Access Control List (ACL) support, Quality of Service (QoS), reset button, LACP support, Energy Efficient Ethernet, Dynamic VLAN Support (GVRP).MAC Table: Up to 16k entries or above la, Network Security: DHCP snooping, Dynamic ARP, IP/MC/Port Binding, Port Security, PVE, Management: SNA, SNMP, RMON, Licensing: Relevant licensed 10S to support the afore mentioned features, Accessories: Rack Cable, Rack Mounts, Console Cable. SKVA x 3000W UPS (1)”

II. Bill of Quantities, Admin Block IT Equipment's Sr no. 14/Ref# NS-28

The quantity of Single Mod Fiber cable of 1500 Rft is added in the item of description and may be read as,


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| PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP) | | | | | | | |
|---|---------------|---|------|----------|-----------------|----------|--------------|
| UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA | | | | | | | |
| 01. ADMINISTRATION BLOCK | | | | | | | |
| BILL OF QUANTITIES (IT EQUIPMENTS) | | | | | | | |
| Sr. No. | Reference No. | Description | Unit | Quantity | Unit Rate (Rs.) | | Amount (Rs.) |
| | | | | | In Figure | In Words | |
| 14 | NS-28 | Providing and fixing Networking Solution (Cable + Wi-Fi) LAN Cabling: CAT 6 Including Ducting Cat 6 UTP /STP 23AWG 3M. D-Link, Schneider. or Equivalent. 16,000ft Transmission Frequency: 250Mhz including PVC pipe etc Face Plates & Back Boxes: Dual I/O. 128 I/O: CAT6 I/O Patch Cord: 3 Meter 64 Patch Cord: 1 Meter 64 Ducting: PVC Pipe / Dura Duct. Flexible Pipe 8000ft Patch Panels: 24 Ports Patch Panel 6 Tagging: Tagging of I/O. Patch Panel Ports, Cables (All Ends) 1 Job Data Rack (42U) Branded 1 unit Related Services: • Ducting and Cabling of LAN • Installation of Switches, Patch Panels, Data Rack, I/O and RJ45 Connectors. • All services related to commissioning of LAN and Internet. • Fluke testing must be performed by supplier to verify the length and quality of cable. 6 core Single Mod Fiber (approximately 1500 feet) complete is all aspect including splicing fiber patch cords digging etc Warranty: 1 Year | No. | 1 | | | |

III. The complete Specifications of UPS are attached as Annex-C

This Addendum shall now serve as a mandatory part of the bidding document for the relevant sections and shall be referred to while preparing the bid.

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SECTION E15**UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEM****1.0 GENERAL****1.01 Work Description**

- A. This section specifies the engineering, supply, delivery to site, installation, testing, commissioning and maintenance of Uninterruptible Power Supply (UPS) System as described herein and shown on the Drawings.
- B. The UPS system shall consist of rectifier/battery charger, batteries, inverter, static bypass transfer switch, synchronizing devices, protective devices, external mechanical bypass switch, filter circuits, and accessories as specified herein that will automatically maintain the continuity of electrical power within specified tolerances, without interruption, upon failure or deterioration of the normal power supply. Continuity of electric power to the load shall be maintained during the power failure period with the inverter supplied by the batteries, for the duration as specified or until restoration of the normal power supply as required to meet the project requirement.
- C. The UPS system shall be manufactured in a modular way so as to enable the power of the UPS system installed to be easily increased on the site by paralleling more than one module to meet the new operating requirements and the desired reliability. The modules must be hot swap. In this connection, transformation of a unitary module into a multi-module configuration shall be able to be carried out directly on site without returning the equipment to the factory for modification and with a minimum installation down time.
- D. Single module system shall have the rectifier / charger, inverter, static bypass switch and all the necessary monitoring and control functions contained in a single metallic cabinet. Multi-module system shall have separate cabinet containing the rectifier / charger, inverter and the necessary monitoring and control functions for each module, and with a separate dedicated cabinet to house the system control and monitoring functions and static bypass switch.
- E. All equipment except portable equipment shall be firmly held in place. Fastenings and supports shall be adequate to support their loads with a minimum safety factor of three (3) times.

1.02 Standards

- A. All equipment shall be designed and built in accordance with accepted engineering practice and applicable international standards, in particular the standards listed below.
 - 1. 89/336/EEC
 - 2. 73/23EEC
 - 3. EN/IEC62040-1-1, EN/IEC/UL60950-1
 - 4. EN50091-2/IEC62040-2 (class A), FCC15A
 - 5. IEC EN/IEC62040-3
 - 6. IEC62040-2/EN/IEC 61000-4-2 level 3, performance criteria A
 - 7. IEC62040-2/EN/IEC 61000-4-4 level 2, performance criteria A
 - 8. IEC62040-2/EN/IEC 61000-4-3 level 2, performance criteria A
 - 9. IEC62040-2/EN/IEC 61000-4-5 Level 3, performance criteria A
 - 10. BS7671- Code of Practice for Electrical Installations
 - 11. BS7430- Code of Practice for Earthing

12. BS 727- Specification for Radio-Interference Measuring Apparatus
 13. BS 800- Specification for Radio-Interference Limits
 14. BS 4417- Specification for Semi-Conductor Rectifier Equipment
- B. The manufacturing of the BUSBAR/cable shall also conform to the requirements of all relevant local codes, as applicable, together with the additional requirements referred to in this Specification and Drawings, whichever is the more stringent and acceptable to the Engineer
- C. In the adoption of standards and requirements, the Contractor shall take the following precedence:
1. Engineer's decision;
 2. Local codes of practice;
 3. Drawings;
 4. Specification;
 5. International standards and requirements.

1.03 Quality Assurance

- A. UPS ratings shall be the final effective values after the application of all appropriate derating factors. These ratings shall be adjusted to suit local conditions, viz. maximum ambient temperature, etc. Derating factor due to the non-linearity of the load to be connected to the UPS shall be taken into account in sizing the UPS.
- B. The UPS shall be manufactured for continuous reliable operation such that the "Mean-Time-Between-Failures" (MTBF) for individual modules of the UPS viz. Rectifier / charger unit, inverter unit and static switch, etc. shall be more than 8760 hours (1-year).
- C. To ensure minimum down time, the "Mean-Time-To-Repair (MTTR) of the UPS shall not exceed one (1) hour. The MTTR shall be the time required to diagnose the fault and restore the UPS to normal working condition, say by means of module replacement at site, but excluding the travelling time.
- D. All battery use shall be heavy duty type of service life span of minimum 3-5 years
- E. Factory Acceptance Test

The factory acceptance test shall be detailed and performed to ensure that all features of the equipment are functioning properly and that the equipment site test will be accomplished without any major problems.

The factory acceptance test shall include the following as a minimum:

1. Full load and half load efficiency test;
2. Frequency and voltage limits over the whole range of load;
3. Overload voltage and short circuit protection;
4. Voltage and frequency regulation during sudden load application;
5. Overload performance;
6. Instrument calibration;
7. Output tests while being supplied for batteries only; and
8. Battery charging and discharging test.

1.04 Submission

- A. All technical submissions shall be approved by the engineer prior to the respective stages of construction.

- B. As a minimum requirement, the submission shall include the following:
 - 1. Equipment submission with manufacturer's data;
 - 2. Shop Drawings showing the co-ordinated installation detail and control block diagram
 - 3. Builder's works requirement;
 - 4. Battery arrangement and manufacturer confirmation on "zero" gas emission by battery to meet project requirement without separate room ventilation requirement.

2.0 SYSTEM OPERATION

- A. The UPS system shall generally include its basic and supporting equipment for the monitoring, control and protection of the system, including input and output AC filters, electronic AC line conditioner, AC and DC input and output circuit breakers, converter, inverter, shielded isolation transformer, static by-pass switch and mechanical bypass switch. The battery bank may be in a separate matching battery enclosure(s).
- B. Under normal conditions, power from the mains shall be supplied to the rectifier/charger unit. The rectifier/charger unit shall convert the incoming AC power to DC power which is fed into the inverter unit and battery unit. The inverter unit shall convert the DC power to AC power, which is then supplied to the load through the static transfer switch. As long as the operable inverter unit is supplied with DC, it shall supply AC to the load.
- C. Upon failure of the mains, the battery shall maintain the flow of DC to the inverter unit and the inverter unit shall continue to supply the load without interruption. Upon restoration of mains supply or when the generator supply is available, input power for the inverter unit and for the re-charging of the batteries shall automatically be supplied from the rectifier/charger output without interruption. If the battery is exhausted before the availability of the mains or generator supply, the UPS system shall shut down automatically.
- D. The static transfer switch shall normally connect the inverter output power to the load. Should the inverter malfunction, the static switch shall automatically transfer the load to the bypass source without interruption of the power supply to the load.
- E. During periods when the UPS system is being serviced, the transfer switch shall be operated to transfer the load to the bypass source.
- F. In the case of the parallel redundant system, the total system load shall be automatically distributed equally between the two UPS modules under normal conditions. Malfunction in one of the UPS modules shall cause instantaneous isolation of the faulty module from the system and the remaining healthy UPS module shall take over the full critical load without interruption. If both UPS modules fail, the critical load shall be transferred to the bypass source.

3.0 MAJOR COMPONENTS

3.01 General

- A. The UPS shall be detailed to permit access to modules and assemblies. The placement of parts, test points and terminals shall be such that they are accessible for circuit checking, adjustment and maintenance without the removal of any adjacent module or assembly.

- B. The UPS system shall be provided with sufficient built-in diagnostic aids to facilitate trouble-shooting, maintenance and circuit calibration. Each circuit module of the UPS system shall be accompanied by suitable indicators and test points allowing the current status of each module to be monitored as required. The UPS system shall be equipped with an event recorder so that hard copy of critical data or status can be made available for analyzing when necessary.
- C. The UPS system shall be constructed in heavy duty metallic enclosures, manufactured for floor mounting. The UPS shall be structurally adequate and have provisions for hoisting, jacking and forklift handling.
- D. The individual cabinets shall be capable of being arranged butted side-by-side. Wire runs shall be protected in a manner to separate power and control wiring. Provisions shall be made in the cabinet to permit installation of input, output and inter-cabinet cabling, using raceway or conduit.
- E. The UPS cabinets shall be cleaned, primed and painted to the manufacturer's standard.
- F. Adequate forced air cooling by suitably rated blowers shall be installed to ensure that all components are operated within their environmental ratings. The power supply of blowers shall be from the UPS system and treated as part of the critical load. Spare blowers shall be provided. All blowers shall be equipped with wind vanes sensor connected to an alarm and the control panels. All air-intake area shall be provided with dust filter of approval detail.

3.02 Rectifier / Charger Unit

- A. The rectifier / charger unit shall be provided with an input moulded case circuit breaker. The circuit breaker shall be of the frame size and trip rating to supply full rated current to the critical load and recharge the drained battery at the same time.
- B. The charger shall be float type charger and operate on an input voltage of $230V \pm 10\%$ or $400V \pm 10\%$ and complete with DC voltmeter, ammeter, AC voltmeter, surge suppressor, float and boost charging selector, battery discharging indicators, charger failure alarm and all necessary protection device.
- C. The output of the charger shall be capable to maintain the battery terminal voltage at between 1.40 to 1.45 volts per cell while supplying the necessary loads over a variation of $\pm 10\%$ of main voltage.
- D. A boost charge at between 1.55 and 1.65 volts per cell with all necessary load remain in circuit can be made if required. Failure of any component of the charging circuit will not cause permanent damage to the battery by overcharging.
- E. Battery charger shall be all solid state providing a constant DC charging voltage to the inverter and for battery charging.
- F. The charging voltage shall rise above the float voltage after every load application and then return the charging voltage to float value.
- G. Load regulation and voltage regulation shall be automatic. Overload protection shall be current limiting.
- H. Charger shall be of the following construction:
 - 1. Enclosed in a ventilated galvanized steel housing, bake enamel painted, and provided with hinged front panel and vermin proof guard.
 - 2. Hermetically sealed silicon diode full-wave rectifier.
 - 3. Automatic surge suppressor

- I. The rectifier/charger unit shall have input current limiting facility whereby the maximum input current shall be limited to 125% of the full input current rating. Preferably, the current limit shall be adjustable from 100% to 125% of the full input current rating.
- J. The rectifier / charger unit shall provide features whereby when the alternate current (AC) power is returned to the alternate current (AC) input bus after the UPS has been operating on battery power or has been de-energized, the total initial current requirement at the input terminals will not exceed 20% of rated load current, and the current will gradually increase to 100% of full rating over a 15 second time interval.
- K. Charging current shall be voltage regulated current limiting. The charging rate shall be sufficient to restore the battery from discharge to 95% charge within ten (10) times the discharge time at full load. After the battery is recharged, the rectifier / charger shall maintain the battery at full charge until the next emergency operation.

3.03 Inverter Unit

- A. The UPS inverter shall constantly recreate the UPS output voltage waveform by converting the DC bus voltage to AC voltage through a set of IGBT driven bi-directional power converters. In both normal operation and battery operation, the output inverters shall create an output voltage independent of the mains input voltage. Input voltage anomalies such as brown-outs, spikes, surges, sags, and outages shall not affect the amplitude or sinusoidal nature of the recreated output voltage sine wave of the output inverters.
- B. The inverter shall be able to sustain an overload across its output terminals, while supplying any load within its rating. The inverter shall not shut off, but shall continue to operate with a current limit of at least 125% of rated current for at least 10 minutes. Above 125% of full output power, the UPS module output voltage shall be progressively reduced to prevent the total load current exceeding 125% of the rated value. If the short circuit is sustained, the inverter shall shutdown and disconnect automatically from the load bus.
- C. The inverter shall contain an oscillator capable of operating and maintaining the output frequency of the inverter as specified. The inverter oscillator shall be capable of frequency-synchronizing and phase locking to the main power source frequency. When operating as a slave to the main power and a failure occurs in the slaving signal, the inverter oscillator shall automatically revert to a free running state and maintain the specified limits.
- D. The inverter shall have a fault sensing device to activate the static transfer switch for removal of the inverter output from the load, without affecting it to an extent outside the limits as stated in this Specification.
- E. Power semiconductors in the inverter shall be fused with fast acting fuses to prevent cascading failures. Each fuse shall be provided with a blown fuse indicator with an alarm light on the control panel.
- F. In the case of parallel redundant system, the inverters shall be totally synchronized to meet the requirements as specified in this Specification.

3.04 Battery Circuit Breaker

- A. The UPS system shall be provided with a battery circuit breaker. When open, the battery shall be completely isolated from the rectifier / charger and from the inverter.
- B. The UPS system shall automatically be disconnected from the battery by opening the circuit breaker when the discharge limit of volts per cell is reached, or when signaled by

other control functions. The circuit breaker may also be manually operated during servicing of the batteries.

3.05 System Bypass Switches

A. Maintenance Bypass Switch

The UPS shall be provided with an external mechanical bypass switch to manually bypass the entire UPS system for maintenance and service purposes. Load transfer to and from the bypass source shall be a "make-before-break" type switching such that disturbances seen by the load during a bypass shall not be greater than that specified in this Specification.

B. Static Bypass Switch

A static bypass switch shall be equipped to provide uninterrupted transfer of the load to the bypass source automatically when a malfunction or overload occurs in the UPS system. The transfer shall be performed on "make-before-break" basis such that the static bypass switch is closed before the static interrupter and/or the output circuit breaker is tripped open. The static bypass switch shall preferably be paralleled with a circuit breaker which is activated together with the static switch and subsequently taking over from the static switch. If the transfer of load to bypass source is the result of an overload, when the overload is removed the load shall be re-transferred back to the inverter automatically. A selection switch shall be provided for manual transfer as well.

3.06 Storage Battery

- A. The UPS battery shall be of modular construction made up of trained-user replaceable, swappable, fused, battery modules. Each battery module shall be monitored for voltage and temperature for use by the UPS battery diagnostic, and temperature compensated charger circuitry.
- B. The battery jars housed within each removable battery module shall be of the Valve Regulated Lead Acid (VRLA) type.
- C. The Contractor shall submit discharge and charging curves of the battery proposed and calculations to substantiate that the battery bank provided is of adequate ampere hour capacity.
- D. The UPS shall incorporate a battery management system to continuously monitor the health of each removable battery module. This system shall notify the user in the event that a failed or weak battery module is found.
- E. Battery shall be supplied with:
 - 1. Rack protected with electrolyte resistant paint
 - 2. Intercell and interior connectors protected with anti-corrosive plastic covers
 - 3. Special tools and fittings required to assemble the batteries.
- F. Battery selection shall be "zero" gas emission to allow the battery to be located in the location without separate room ventilation to meet project requirement.
- G. The batteries shall have design life of 10 to 12 years and a battery service life of minimum 3 to 5 years. The battery casing shall be flame retardant type.

4.0 UPS CONTROLLER

4.01 General

- A. The UPS system shall be fitted with an integral control and indication panel. In case of a separate system control cabinet being provided, it shall match the construction and appearance of the UPS modules and shall contain bus bar connections for the output and bypass switch. The control and indication panel of the system control cabinet shall include all the necessary instrumentation, alarms and indicators showing the operation of the UPS system.

4.02 Instrumentation

- A. The UPS shall be provided with, as a minimum, the meters indicated below. All meters shall have an accuracy of at least $\pm 2\%$ of full scale:
1. Input voltage and current with phase selection;
 2. DC battery charge / discharge current;
 3. DC battery voltage;
 4. UPS output voltage and current with phase selection;
 5. Reserve source input voltage and current with phase selection; and
 6. Frequency of UPS output and reserve source.

4.03 Alarm and Indications

The following separate alarms shall be provided for effective monitoring of the UPS system operation, with audible and visual alarms:

- A. Rectifier
1. Input under-voltage
 2. Over-temperature shutdown
 3. Blown fuse
 4. Rectifier failure
- B. Battery
1. Breaker open
 2. Discharging
 3. Battery low voltage
- C. Inverter
1. Output under-voltage
 2. Output over-voltage
 3. Over-temperature shutdown
 4. Blown fuse
 5. Overload
 6. Overload shutdown
- D. Static Transfer Switch
1. Transfer to reserve inhibited
 2. Re-transfer to inverter inhibited
 3. Load on reserve
 4. Output earth fault
 5. Output breaker open

- E. Cabinet
 - 1. Ambient over temperature
 - 2. Fan failure
- F. IBMS Interfacing
 - 1. Interfacing to IBMS System shall be provided.

4.04 Control

The following system level control functions shall be provided:

- A. UPS / bypass transfer / re-transfer switch;
- B. Emergency shutdown push button with protective cover;
- C. Lamp test / reset push buttons;
- D. Audio alarm test / reset; and
- E. AC output voltage adjustable for $\pm 5\%$.

4.05 MIMIC Bus

A mimic bus with indicating lights shall be provided on the control and indication panel or the system control cabinet. The mimic shall depict a complete single line diagram of the UPS system. The following circuit breakers shall be indicated:

- A. Module AC input circuit breaker;
- B. Battery circuit breaker;
- C. System output circuit breaker; and
- D. System bypass circuit breaker.

4.06 Emergency Shutdown

Local emergency shutdown provisions shall be provided. Activation of the local emergency shutdown switch shall cause the module input, output and battery circuit breakers to open, completely isolating the UPS system from all sources of power. The critical load shall be automatically transferred to bypass uninterrupted when the emergency shutdown is activated.

4.07 UPS Remote Alarm Panel

- A. Where indicated on the Drawings, a wall mounted remote monitoring panel shall be provided and shall have the following indications as a minimum requirement:
 - 1. UPS on battery alarm;
 - 2. Low battery alarm;
 - 3. Load on bypass alarm;
 - 4. Summary alarm for all module malfunctions;
 - 5. Audible alarm with reset push button;
 - 6. Lamp test push button; and
 - 7. System healthy indicator.

In addition to the above, voltage free contacts shall be available on the UPS module for connection to the remote monitoring panel.

5.0 ELECTRICAL CHARACTERISTICS AND PERFORMANCE

5.01 Protection

- A. The UPS shall have built-in self-protection against:
1. Over and under voltage power line surges;
 2. Over voltage and voltage surges introduced at the output terminals at paralleled sources;
 3. Load switching and circuit breaker operation in the distribution system;
 4. Sudden changes in output load exceeding the rating limit;
 5. Short-circuits at the output terminals;
 6. Power semi-conductors in the UPS shall be fused with fast acting fuses so that the loss of any one power semi-conductor will not cause cascading failures.
 7. Thermostats shall be fitted to monitor the temperature of the power semi-conductors, such that when over-temperature is sensed, the UPS system shall automatically be shut down and the critical load transferred to the bypass source via the static bypass switch.
- B. The UPS shall have built-in protection against permanent damage to itself and the connected load for all predictable types of failures within the UPS. Fast acting current-limiting devices shall be used to protect against failure of solid state devices. Internal failure of the UPS shall cause the UPS to trip off-line and switch to bypass automatically. All failure shall generate visual and audible indications.
- C. Information shall be generated say in LCD screen display with logging function, within the UPS to maintenance personnel regarding the reasons for tripping.

5.02 Audible Noise

- A. Noise generated by the UPS system under any normal operating condition shall not exceed the allowable sound pressure level of 75 dBA measured at 1 meters from the nearest surface of the UPS cabinet.

5.03 Electrical Characteristics

- A. **Input**
1. **AC Input Nominal Voltage:** 380 V, 400 V or 415 V with 3 Phase 4 wire, with ground
 2. **AC Input Voltage Window:** 200 V - 477 V
(If 100% load: 340V-477V providing charging to the battery system, depending on load system can be recharged from as low as 200 V)
 3. **Frequency:** 50/60 Hz
 4. **Maximum Frequency Range:** 40-70 Hz
 5. **Power Factor:** 1.0
 6. **Soft-Start:** Shall be linear from 0-100% input current and shall not exhibit inrush. This shall take place over a 15 second time period
 7. **Input connection through BUSBARS.**
- B. **Output**
1. **AC Output Nominal Output:** 380V/400V/415V, 3 Phase 4 wire with ground
 2. **AC Output Voltage Regulation:**
 - a. +/- 1% For 100 % linear load
 - b. +/- 3% for 100% non-linear load
 3. **Voltage Transient Response:** +/- 5% maximum for 100% load step
 4. **Voltage Transient Recovery** within <50 milliseconds

5. **System AC-AC Efficiency:** >95% at 35 - 100% load
6. **Output Voltage Harmonic Distortion according to IEC/EN62040-3:**
 - a. <2% THD maximum for a 100% linear load
 - b. <6% THD maximum for a 100% non-linear load
7. **Overload Rating:**
 - a. **Normal Operation:**
 - 150% for 60 seconds in normal operation
 - 125% for 10 minutes in normal operation
 - 150% for 60 seconds in battery operation
 - b. **Bypass Operation:**
 - 110% continuous (with PDU-XR)
 - 1000% for 100 milliseconds
8. **Output Power Factor Rating:** For loads exhibiting a power factor of 0.5 leading to 0.5 lagging no derating of the UPS shall be required.
9. **Output connection through BUSBARS.**

C. Static Transfer Switch – Transfer Characteristics

1. **Transfer time:** 100ms (overlapping)
2. **Detection time:** 4.2ms maximum
3. **Re-transfer mode:** Automatic/Inhibit(selectable)
4. **Re-transfer delay:** 2 to 32 seconds in automatic mode (selectable)

D. Efficiency

The UPS efficiency shall be 95% minimum under the following conditions: -

1. The UPS is operating at rated load.
2. The battery is fully charged and floating on the system.
3. The input voltage is within $\pm 10\%$ of 400V AC / 230V AC.
4. Radio Suppression

During the normal operation of the UPS system, no radio interference shall be allowed to exceed limits laid down in BS 800 when measurements are made in accordance with BS 727.

6.0 INTERFACING WITH BUILDING MANAGEMENT SYSTEM (BMS)

- A. The BMS, to be provided by others, will monitor and log the conditions of the UPS system. All status wirings to be linked to the BMS shall be brought to a marshalling cubicle from which the information will be picked up by the field equipment of the BMS. All status indications shall be provided in the form of dry contacts and in pairs of N.O. and N.C. contacts and RS 485 serial interface.
- B. The marshalling cubicle shall be installed at an approved location in an approved detail inside the UPS Room

7.0 EQUIPMENT EARTHING

- A. The UPS system output neutral shall be connected to the star-point of the output transformer and the electrical earth. All cabinet(s) shall be solidly bonded to the electrical earth provided in accordance with BS7430 using adequate section of cable or busbar. The earth connections at the cabinet(s) shall be made to the frame earth

terminal provided or alternatively to a substantial part of the basic frame rather than to a bolted-on panel.

8.0 TESTING AND COMMISSIONING

A. The Contractor shall supply all tools, devices and equipment needed to complete the test. Site test requiring a load bank shall be performed only if specially requested by the Employer. The load bank shall be furnished by the Contractor, if required.

B. Start-up and Site Test

On-site inspection and testing of the UPS system after installation shall be provided by the Contractor and included in the Contract. The site acceptance test shall be detailed and performed to ensure that the equipment will perform with the actual load as installed.

C. Site Acceptance Test

The site acceptance test shall include:

1. Functional tests on all equipment to demonstrate the system constructed are fully in compliance with the specification;
2. Simulation tests to simulate all alarms and faults;
3. System bypass, mains failure simulation test; and
4. Noise level test;
5. Full load test to verify the battery capacity.

9.0 TRAINING

UPS service training workshop: A UPS service training workshop shall be available from the UPS manufacturer. The service training workshop shall include a combination of lecture and practical instruction with hands-on laboratory sessions. The service training workshop shall include instruction about safety procedures, UPS operational theory, sub-assembly identification and operation, system controls and adjustment, preventative maintenance, and troubleshooting.