



For PAA

For Contractor

IN CASE OF ANY CONFLICT / CONTRADICTION BETWEEN PPRA STANDARD BIDDING DOCUMENTS AND PAA BIDDING DOCUMENTS, THE PROVISIONS STIPULATED UNDER PAA BIDDING DOCUMENTS SHALL PREVAIL AND BE TREATED AS FINAL



PAKISTAN AIRPORTS AUTHORITY
JINNAH INTERNATIONAL AIRPORT
(ES E&M – HVAC SECTION)

TECHNICAL **PROPOSAL**

INSTALLATION OF CHILLER PLANT MANAGER AT UTILITY BUILDING JIAP



For PAA

For Contractor



For PAA

For Contractor



CONTRACT DOCUMENT

PAKISTAN AIRPORTS AUTHORITY

NAME OF WORK:

INSTALLATION OF CHILLER PLANT MANAGER AT UTILITY
BUILDING JIAP



For PAA

For Contractor



1. Date and time of Receipt of Bid(s)	As per provision of EPADS
2. Date and time of opening of Bid(s)	As per provision of EPADS
3. Submission of Bids	Online through EPADS & Office of Sr. Joint Director (HVAC), Room # 3076, Level – III, East Side, JIAP Karachi

Sr. Joint Director (HVAC)]
JIAP – Karachi

GENERAL INSTRUCTIONS

- 1) Bids shall be submitted electronically on PPRA EPADS portal.
- 2) Bidders are advised in their own interest to review the contents of Bidding Documents thoroughly and perform due diligence at their own cost prior to participating in the bidding process.
- 3) The Bid Security shall be in the form as prescribed in the Invitation to Bids.
- 4) Original instrument of Bid Security must be submitted at the time of Bid Opening in sealed envelope well before the closing date and time mentioned in Invitation to Bids and its scanned copy must be attached with the electronic bid to be submitted online on EPADS.
- 5) Should a Bidder fail to submit original instrument of Bid Security in sealed envelope before the closing date and time of Bid Opening or does not attach its scanned copy with the electronic bid, their bid shall be rejected outrightly.
- 6) All Bidders are requested to submit the bidding documents, without making any changes to the original text, complete with drawings, specifications etc. containing the signatures of the Bidder's representative on each and every page of the documents.
- 7) The Bidders are advised to submit physical (hard form) bid in original on the date and time mentioned in the invitation to bids to assist in evaluation, however that is not mandatory. In case of any discrepancies between the bid submitted physically and on EPADS, the latter shall prevail.



For PAA

For Contractor

DECLARATION

It is hereby solemnly affirmed and declared that I / we are not serving employees of any Government organization including PAA, and that it is further assured that if I / we had been previously engaged with PAA as an employee, then that service or employment had ceased to be in effect two years prior to the date of advertisement for this Work.

It is hereby further solemnly affirmed and declared that no serving or retired employee who has not completed two years after retirement from PAA is employed at our Contracting business.

It is hereby further undertaken and guaranteed that no serving or retired employee who has not completed two years after retirement from PAA shall be permitted to have any financial interest in the said Contracting business during the currency of this Contract with PAA.

It is clearly understood and agreed that in the event of a breach of the above undertaking during the currency of this Contract, the said Contract shall be liable to immediate cancellation in which case the security deposits and all other monies due or which may become due to PAA shall stand forfeited and be absolutely at the disposal of the PAA.

[Contractor's Signatures with Seal]

For PAA

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For Contractor



INVITATION TO BIDS

Date: _____

1. Pakistan Airports Authority invites bids from eligible Constructors licensed by the Pakistan Engineering Council in the appropriate category for the Works named on the cover page.
2. The bidding process shall be conducted in line with the **single stage two envelopes** procedure prescribed under Public Procurement Rules 2004, e-Pak Procurement Regulations, 2023 and any Regulations, Regulatory Guides, Procurement Guidelines or Instructions issued by the PPRA (from time to time), and is open to all potential eligible bidders registered in the EPADS.
3. All bids must be accompanied by Bid Security (**amounting to PKR 1,500,000/-**) in an acceptable form.
4. The electronic bids prepared in accordance with the instructions prescribed in the electronic bidding documents must be submitted through EPADS on or before the bid closing date and time. Electronic bids will be opened by using EPADS on the same day 30 minutes after bid closing time.
5. The bidders are required to attach and submit following documents electronically.
 - a) Scanned copy of CNIC, and attested copy to be submitted physically.
 - b) Scanned original valid PEC License, and attested copy to be submitted physically (**financial category C-5 (or above) and specialization code is ME-01 & ME-04.**)
 - c) Attested copy of valid NTN Certificate
 - d) Affidavit for no blacklisting and litigation.

[Sr. Joint Director (HVAC)]
JIAP – Karachi



For PAA

For Contractor

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For PAA

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For Contractor



INSTRUCTIONS TO BIDDERS

1. The invitation to bids shall contain the name of work to be carried out as well as the date for submitting and opening the bids and the time allowed for carrying out the work; also the amount of *bid security* to be deposited with the bid. Copies of the specifications, designs and drawings and any other documents required in connection with the work signed for the purpose of identification by Pakistan Airports Authority (PAA) shall also be open for inspection by the Contractor at the office of the Additional Director / Project Manager / Divisional Engineer during office hours.
2. Where a bid is being submitted by a firm, it must be signed separately by each partner thereof, or in the event of the absence of any Partner, it must be signed on his behalf by a person holding a power of attorney authorizing him to do so, such power-of-attorney to be produced with the bid and a Photostat of the Partnership Deed should accompany the bid.
3. Where a firm of Contractors is an incorporated company registered under the Companies Act, the Contractors shall furnish the following documents:
 - a) Memorandum and Articles of Association together with a copy of certificate of incorporation.
 - b) In case the Contract is to be signed by one of the Directors of the Contractor's Company, a certified copy of the resolution of the Board of Directors or a Photocopy of the General Power of Attorney executed by the Company authorizing such Directors to enter into and sign the Contract with PAA.
4. The memorandum of work and the schedule of materials to be supplied by the PAA and their issue rates, shall be filled, and completed in the office of Divisional Engineer before the bidding document is uploaded on EPADS.
5. The bidder shall also produce a certificate of registration with the Income Tax Authority, and proof of being Active Taxpayer and attach it with the bid.
6. Bidders may request clarification of the Bidding Documents by sending a written query to the PAA through EPADS. The PAA may, if deemed appropriate, respond to the request at least two days before the bid submission deadline.
7. PAA may, at its discretion convene a pre-bid meeting to provide clarifications on the Bidding Documents. If held, the date, time, and venue of the meeting shall be specified on the EPADS. Bidders are encouraged to submit any queries in writing no later than seven (7) days prior to the scheduled meeting. The minutes of the meeting, including all questions raised and responses provided, shall be promptly circulated to all recipients of the Bidding Documents.
8. Bidders are advised to visit and inspect the Site and its surroundings at their own risk and cost, and to conduct all necessary due diligence to obtain sufficient information for the preparation of their bids and execution of the Contract. PAA shall permit such visits, subject to prior coordination; however, bidders and their representatives shall enter the site entirely at their own risk and shall indemnify and hold harmless the PAA, its personnel, and agents from any liability, loss, damage, injury, or expense arising from or related to such visits.
9. PAA may amend the Bidding Documents at any time before the bid submission deadline, either on their own or in response to a bidder's request for clarification, by issuing a written addendum. Each addendum will become part of the Bidding Documents and will be shared with all purchasers, who must acknowledge receipt in writing. If needed, PAA may extend the bid submission deadline to allow bidders sufficient time to consider the changes.
10. Bidders who propose any alteration in the work specified in the said form of an invitation to bid, or in the time allowed for carrying out the work, or which contain any other condition of any sort,

will be liable to rejection. No single bid shall include more than one work, but Contractors who wish to bid for two or more works shall submit a separate bid for each work.

11. No alterations or additions shall be made by the Contractor in the schedule of quantities and rates must be filled in ink (blue or black) or typed out both in figures and words clearly and legibly in the columns provided in the schedule of Quantities. All corrections must be signed by the Contractors.

12. Bidders shall not be reimbursed any cost of any kind whatsoever incurred by them in connection with preparation and submission of their Bids.

13. Arithmetical errors in the bid will be rectified on the following basis:

- a) If there is a discrepancy between the amounts in figures and in words, the amount in words will govern; and if there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern, unless in the opinion of the PAA there is an obviously gross misplacement of the decimal point in the unit rate, in which case the line item total as quoted will govern and the unit rate will be corrected.
- b) If the bidder quotes different rates for the same items across sub-heads, or attaches page(s) containing items with varying rates for the same item(s), the lowest unit rate will be considered for evaluation.
- c) If the bidder does not accept the corrected / evaluated amount of bid, their bid will be rejected, and bid security shall be forfeited.

14. Bids shall be accompanied by a Call Deposit Receipt, Pay Order, or a Banker's Cheque of the amount given in the Memorandum as Bid Security. The Bid Security shall be returned to the unsuccessful bidders, after the work has been awarded.

15. The quoted bid rates or amounts shall be inclusive of all taxes (but excluding provincial sales tax on services), duties, and cess, etc as applicable fourteen (14) days prior to the date of bid opening, and no claim on this account shall be entertained by PAA.

16. The completed Bid form shall be submitted in accordance with the instructions prescribed by PPRA for submitting electronic bids through EPADS on or before the closing date and time. Electronic bids will be opened by using EPADS on the same day 30 minutes after bid closing time.

17. Original bid submitted electronically shall also be submitted physically along with *Bid Security* in a Sealed Envelope and addressed and delivered in person or sent by Registered post / courier so that it reaches well in time before the opening date, as notified by the PAA. The sealed envelope shall have the name of work, as mentioned in invitation to bids, written on top of it. In case of any discrepancies between the bid submitted physically and on EPADS, the latter shall prevail. The instrument of Earnest Bid Security shall compulsorily be submitted in physical form on the opening date and time, whereas submission of the bid physically is recommended but not mandatory.

18. When a bid is accepted, a receipt for the *bid security* forwarded therewith shall thereupon be given to the Contractor. In the event of a bid being rejected the *bid security* forwarded with such unaccepted bid shall thereupon be returned to the Contractor.

19. The receipt given by an accountant or clerk for any money paid by the Contractor will not be considered as an acknowledgement of payment to the PAA and the Contractor shall be responsible for seeing that he procures a receipt signed by the Divisional Engineer or his authorized officer.

20. Bids will be opened and read in public on the date and time for the opening. Bids whose bid security is received after the time set for receipt shall be rejected. Bidders who submit their bid security, but their bids are not uploaded on EPADS or fail to show on EPADS will be considered and held as non-participants.

21. Additional Director / Project Manager / Divisional Engineer or his duly authorized representative shall open bids in the presence of intending Contractor who may be present at the time and will enter the amounts of all the bids in a Comparative Statement in a suitable form.
22. PAA reserves the rights to postpone the date or time of submission and opening of Bids. Should the date of opening the Bids be postponed, PAA shall give notice of such postponement.
23. The bid shall remain valid for a period of One Hundred & Twenty (120) days from the date of bid opening. In exceptional cases, before this period expires, PAA may request an extension—no longer than the original validity period. Bidders may refuse to extend the bid validity without losing their Bid Security. Those who agree must extend the Bid Security accordingly but cannot change their bids.
24. PAA is not bound to award the Contract to the lowest or to any Bidder and reserves the right to reject any or all Bids and to waive any formalities in the Bids received such as deviations in the use and presentation of the specified Bidding Documents and forms, if it appears to be in the interest of the PAA.
25. Bid shall be accepted by the competent officer of PAA. The acceptance of the Bid shall bind the Bidder to execute the Contract Agreement within the specified period failing which the Bidder shall forfeit his Bid Security not as penalty, but as liquidated damages.
26. For works costing more than Rs. 10 Million, the Contractor shall furnish to the PAA within fourteen (14) days after receipt of Letter of Acceptance, a Performance Security in the form of an irrevocable Bank Guarantee from the Banks approved by PAA (as per the list provided in Appendix-E to Bidding Documents) for an amount equaling to five percent (5%) of the total amount of bid at the time of signing the agreement. The irrevocable Performance Security shall have validity till thirty (30) days after the date of final completion of works. The bond for Performance Security shall be executed on non-judicial stamp paper of appropriate value.
27. For works costing more than Rs. 65 Million, the Contractor may be given a Mobilization Advance of up to 10% of the bid cost by PAA on production of an irrevocable bank guarantee of an equivalent amount from Banks approved by PAA (as per the list provided in Appendix-E to Bidding Documents). The same will be recovered at the rate of 10% of gross amount of the running bills of the Contractors.
28. Prior to engaging in the bidding process, the bidders should at their own cost, read and acquaint themselves with the PAA's procedure for blacklisting of contractors and suppliers available on PAA website: (<https://paawebadmin.paa.gov.pk/media/fdpcknji/caao-003-escw.pdf>)

Attachment:

- (i) Eligibility Criteria (Annexure-A)
- (ii) Additional Special Terms & Conditions (Annexure-B)
- (iii) Technical Specifications (Annexure-C)
- (iv) Draft SLA (Annexure-D)
- (v) HSE Manual for Contractor, Suppliers & Concessionaries (Annexure-E)



For PAA

For Contractor

MEMORANDUM

- a) **Name of Work** INSTALLATION OF CHILLER PLANT
MANAGER AT UTILITY BUILDING JIAP
- b) **General Description of Works** _____

- c) **Bid shall be enclosed with (Bid Security)** Call Deposit Receipt, Pay Order, or a Banker's Cheque from a scheduled Bank in Pakistan, of an amount mentioned in the invitation to bids.
- d) **Security Deposit (including Bid Security)** Five per cent (5%) of the Contract Price.
- e) **Deduction of Income Tax** As per Income Tax Ordinance 2001 amended from time to time.
- f) **Time allowed for the work** **11 Months** (from the date of written order to commence)
- g) **Bill of Quantities** As per attached schedule.

For PAA

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For Contractor





For PAA

For Contractor

LETTER OF OFFER FOR EXECUTION OF WORKS

I / We hereby submit our offer (bid) for the execution of the work specified in the above written memorandum within the time specified in each memorandum at the rates specified therein, and in accordance with the specifications, designs, drawings and instructions and with such materials as are provided for by and in all other respects in accordance with such conditions so far as applicable.

2. I / We understand that all the Schedules and Annexes attached hereto form part of this Bid.
4. I / We agree to abide by this bid for the period of one-hundred twenty (120) days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
3. Should this bid be accepted, I / We hereby agree to abide by and fulfil all the terms and provisions of the said conditions of contract annexed hereto so far as applicable or on default thereof to forfeit and pay to the Pakistan Airports Authority (PAA) the sum of money mentioned in the said conditions.
5. Unless and until a formal Agreement is prepared and executed, this bid, together with your written acceptance thereof, shall constitute a binding contract between us.
6. I / We undertake, if our bid is accepted, to execute the Performance Security referred to in Conditions of Contract for the due performance of the Contract.
7. I / We understand that you are not bound to accept the lowest evaluated or any bid you may receive.
8. I / We do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other person or persons submitted a bid for the Works.
9. As security for due performance of the undertakings and obligations of this Bid, we submit herewith a *Bid Security* in the amount of _____ drawn in your favour or made payable to you and valid for a period of twenty-eight (28) days beyond the period of validity of bid.

Dated the _____ day of _____ 20____

Witness

[Signature of Contractor]

Address

The above bid is hereby accepted by me on behalf of PAA.

Dated the _____ day of _____ 20____

**[Signature of Officer by whom
accepted]**

For PAA

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For Contractor





For PAA

For Contractor

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(On appropriate valued non-judicial stamp papers)

FORM OF AGREEMENT

THIS CONTRACT AGREEMENT (hereinafter called the "Agreement") made on the

_____ day of _____ 20_____ between **PAKISTAN AIRPORTS AUTHORITY**, established under the Pakistan Airports Authority Act, 2023, having its Head Office at Terminal-I, JIAP, Karachi, through its duly authorized officer (hereinafter called the "PAA") of the one part;

AND

M/s. _____ registered with Pakistan Engineering Council as a licensed Constructor / Operator, having its office at "through its duly authorized person namely _____ (designation) (hereinafter called the "Contractor") (which term shall include its successors-in-interest, authorized representatives and executors) of the other part.

WHEREAS the PAA is desirous that certain Works,

Viz. _____

should be executed by the Contractor and has accepted a Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the General Conditions of Contract hereinafter referred to.
2. The following documents after incorporating addenda, if any, shall be deemed to form and be read and construed as part of this Agreement, viz:
 - (a) The Letter of Acceptance;
 - (b) The completed Letter of Offer for Execution of Works;
 - (c) The General Conditions of Contract;
 - (d) The Special Conditions of Contract (if attached).
 - (e) The Bill of Quantities;
 - (f) The Specifications; and
 - (g) The Drawings
3. In consideration of the payments to be made by the PAA to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the PAA to execute and complete the Works and remedy defects therein in conformity and in all respects within the provisions of the Contract.
4. The PAA hereby covenants to pay the Contractor, in consideration of the execution and completion of the Works as per provisions of the Contract, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS WHEREOF the parties hereto have caused this Contract Agreement to be executed on the day, month, and year first before written in accordance with their respective laws.

(For and on behalf of Contractor)

PAA) CNIC No. _____

Signed, Sealed and Delivered in the presence of:

Witness (1):

(Name, CNIC No. and Address)_____
(For and on behalf of

Witness (2):

(Name, CNIC No. and Address)

For PAA

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For Contractor



TECHNICAL BID**INSTALLATION OF CHILLER PLANT MANAGER AT UTILITY BUILDING JIAP****BILL OF QUANTITIES / SCHEDULE OF PRICE**

S#	Description	Unit	Qty.	Rate Per Unit		Amount (PKR)
				In Figures	In words	
Sub Head: 1 Installation of Chiller Plant Manager						
01	Provisioning and installation of a complete Chiller Plant Manager (CPM) System on a Turn-key basis. The detail of the HVAC equipment installed at the Utility Building is mentioned in the Technical Specifications. The CPM will be comprised of but not limited to DDC Controller (BACnet Compliant), compatible I/O Expansion Modules, Rack-mount UPS for controllers, immersion type temperature Sensors, Brass thermowells, water flow Switches, differential pressure switches, current switches, water flow sensor with transmitter, pressure transmitters, conductivity transmitters, motorized butterfly valves, Modbus router (RS485 to IP), BACnet MS/TP to IP Router, Energy Analyzer with CTs. The scope besides provisioning of all hardware including server, field sensors, valves, monitoring LED screen and wirings also includes the development of GUI, programming, modifications to existing DCP-H12.1/12.2 panel, identification and tagging, software calibration, testing and commissioning with CPM Software including field diagnostics and trial runs including the development of cause and effect tables for different scenarios complete in all respect for upgradation to more advance features from existing Honeywell operation methodology following instructions of the OEM and Technical Specifications complete in all respect.	P/Job	01	Quoted	Quoted	Quoted
Sub Head: 2 Automation Control of AHU-44						
02	Provisioning and installation of complete components required to satisfactorily install and deploy the BMS on AHU-44 on a Turn-key basis. The detail of the HVAC equipment installed at the Utility Building is mentioned in the Technical Specifications. The CPM will be comprised of but not limited to duct-type temperature and relative humidity sensors, immersion-type temperature sensors, brass thermowells, water flow	P/Job	01	Quoted	Quoted	Quoted

For PAA

For Contractor

S#	Description	Unit	Qty.	Rate Per Unit		Amount (PKR)
				In Figures	In words	
	switches, differential pressure switches, current switches, chilled water pressure sensors, duct-type smoke detectors, damper actuators, 2-way chilled water control valve, modulating valve actuator, actuators for fire dampers. The scope also includes installation of all BMS Components including Hardware, Software, Sensors, Controls, Monitoring Devices, etc with Troubleshooting, Field Wiring, Interconnections, Programming, Modifications on AHU 44, Identification and Tagging, Software Calibration, Testing and Commissioning with BMS Software including field diagnostics, Modifications and trial runs including development of cause and effect tables for different scenarios complete in all respect for up gradation to advance features from existing Honeywell operation methodology in accordance with instructions of the OEM and Technical Specifications complete in all respect.					
Sub Head: 3 Network Wiring Between PTB and Utility Building						
03	Wiring of CCTV Camera with STP Cat-6 in existing PVC conduit/duct i/c connectors complete in all respect as approved by the Engineer Incharge.	P/Mtr	20	Quoted	Quoted	Quoted
04	Providing, punching, testing and commissioning of RJ-45 connector, complete in all respect as approved by engineer incharge.	Each	12	Quoted	Quoted	Quoted
05	Providing, Supplying, installation, fitting, fixing and commissioning of 12 Core single mode Fiber Optics Cable in given existing PVC Conduit, Box Conduit, complete in all respect as approved by the Engineer Incharge	P/Mtr	900	Quoted	Quoted	Quoted
06	Providing, installation, testing and commissioning of Media Converter, used for data conversion from fiber optic to Cat-6 ethernet cable, complete in all respect as approved by the engineer incharge	Each	2	Quoted	Quoted	Quoted
07	Providing, Supplying, installation, fitting, fixing and commissioning of ODF with Up & down fiber connectivity with required programming as needed, complete in all respect as approved by the Engineer Incharge (12 Port ODF)	Each	1	Quoted	Quoted	Quoted
08	Splicing of Fiber Optic cable with Splicing machine and its allied material, i/c complete testing & commissioning as approved by the engineer incharge.	Job	2	Quoted	Quoted	Quoted
	Total Amount PKR					XXXXXXX

Total Amount in words :xx.

For PAA

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For Contractor



For PAA

For Contractor



Sr. Joint Director (HVAC) – JIAP
ES (E&M) JIAP – Karachi



For PAA

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For Contractor

Annexure – A**ELIGIBILITY CRITERIA**

Sr.	Documentary Evidences	Provided = YES Not Provided = NO Not Applicable = N/A
(a)	Attach & Upload Original Bid Security for Rs. 1,500,000/- furnished in accordance with Clause : 3 of Invitation to Bids (Refer page – iv). <i>Note: The physical financial instrument shall reach the office of Sr. Joint Director (HVAC) – JIAP in envelope before opening of bids & Original Bid Security must be uploaded electronically on EPADS.</i>	
(b)	Attach & Upload Certificate of incorporation / Memorandum & Article of Association or Partnership Deed / Sole Proprietorship etc. <i>Note: Dully attested (by notary public/ oath commissioner) document shall be acceptable.</i>	
(c)	Attach & Upload Joint Venture Agreement (if applicable). In case of foreign firm/company, Joint Venture with Pakistani firm and registration with SECP OR give an undertaking for non-applicability	
(d)	Attach & Upload Affidavit on non-judicial stamp paper valuing PKR : 500/- to the effect that the firm has not been blacklisted by any Government, Semi Government and Autonomous Body. Clause : 5(d) of Invitation to Bids (Refer page – iv). <i>Note: Dully attested (by notary public/ oath commissioner)</i>	
(e)	Attach & Upload Active Taxpayer Status (ATL) & NTN and Professional Tax Certificate (Valid). 5(c) of Invitation to Bids (Refer page – iv). <i>Note: Valid documents and dully attested (by notary public/ oath commissioner)</i>	
(f)	Attach & Upload Valid Certification/ License by the Pakistan Engineering Council (PEC) i.e. C-5 (or above) and relevant Specialization Codes i.e. ME-01 & ME-04 . <i>Note: Dully attested (by notary public/ oath commissioner) document shall be acceptable.</i>	
(g)	Attach & Upload Power of Attorney (if applicable) on non-judicial stamp paper valuing PKR : 500/- OR give an undertaking for non-applicability	
(h)	Bidding Documents with each page to be signed and stamped by Authorized Representative of the Bidder, as detailed below: a) Instructions to Bidders (IB) b) Contract Documents c) Memorandum for Running Bills & Extension of Time (Page-i) d) General Instructions for Bidders (Page-ii) e) Declaration (Page-iii) to be sign & stamps f) Invitation of Bids (Page-iv) g) Instructions to Bidders (Page-vi to viii) h) Memorandum (Page-ix) i) Letter of offer for execution of Works (Page-x) to be fill details, sign & stamp (j) Form of Agreement (Page-xi) (k) Bill of Quantities (l) Technical Specifications (if attached) (m) General Conditions of Contract (Page 01 to 17) (n) Special Conditions of Contract (Page 18 to 21) (o) Addendum (if any)	
(i)	Technical Submittal as per following: ▪ The bidders are required to provide relevant technical data i.e. brochure or Product Data Sheets with technical bids in shape of compliance matrix against applicable BOQ items or give technical specifications for required material as mentioned.	



For PAA

For Contractor

IMPORTANT NOTE

- I. The bidders who respond "Yes" in all of the above requirement and provide documentary evidences in support of their "Yes" shall be technically evaluated. The technical evaluation/marking shall be carried out according to the technical evaluation criteria. Any "No" to above checklist or non-submission of supporting documents or furnishing forged documents or concealment of facts or submission of false information may lead to disqualification of such bidder.
- II. The technical proposal shall be examined for compliance with Technical Specifications. The Bidders are required to provide relevant technical data i. e. brochure, catalogue or Product Data Sheet with Technical bids in shape of compliance matrix against Technical Specifications.
- III. Client may, at its discretion, waive any minor non-conformity or any minor irregularity in bid. This shall be binding on all competitors and client reserve the right for such waivers.
- IV. Client may at its absolute discretion, exclude or reject any bid that in the reasonable opinion of client contains any false or misleading claims or statements. Client has no liability to any person for excluding or rejecting any such bid.
- V. All bids fulfilling requirements mentioned above shall be considered as technically responsive.

For PAA

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For Contractor



Annexure – B**ADDITIONAL SPECIAL TERMS AND CONDITIONS**

1. These under mentioned Specifications/ Terms shall have to be read in conjunction with the General Conditions of the Contract and BOO: The provisions given hereunder shall take precedence, and decision of accepting officer shall be final in case of variance or any doubt in interpretation. The method of construction and workmanship where not specifically stated will be in accordance with best engineering practices and principles.
2. All the equipment quoted shall be models in current production and shall be of quality workmanship and material. The equipment offered shall be NEW (used, demonstrator, prototype, remanufactured, reconditioned, or discontinued models are not acceptable).
3. The equipment shall, as a minimum, be in accordance with the requirements of the specification and shall be the manufacturer's standard commercial product. Additional or better features which are not specifically prohibited by this specification but which are a part of the manufacturer's standard commercial product shall be included in the equipment being furnished. A standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model.
4. Equipment and installation shall be in compliance with ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers) 15 (latest edition). Field adjustments required (if any) shall be made by local authorized agent upon delivery and commissioning and the equipment will be made ready in all respects for induction in to service.
5. Contractor shall not execute any hot work prior to information / approval of The Engineer. Contractor shall coordinate equipment shutdowns, interruptions in services, or disconnection of services for PAA approval which requires three (3) days prior notification.
6. The contractor shall supply all expendable materials or services, which are necessary to test or set to work the system at his own expense. The contractor shall provide all special tools and testing equipment to execute the job and allied work.
7. Contractor shall limit use of premises to the immediate work area while execution and shall coordinate use of premises under direction and approval of The Engineer.
8. Contractor shall stack, pack and return / deposit all the dismantled / unserviceable material at PAA store if any and submit the receipt of dismantled material deposited with the final bill.
9. Contractor shall be fully responsible for protection and safekeeping of Contractor's materials, equipment and spares under this works.
10. All contractor personnel on site must have a clean background check with no felony conviction; the personnel should bear good moral and ethical character.
11. Contractor should arrange the Airport Entry Passes (AEP) from Airport Security Forces (ASF) for his manpower and equipment etc including all codal formalities.

12. Commissioning and site acceptance of equipment will be undertaken at Jinnah Int'l Airport, Karachi and will re-check all parameters and any other parameters required to validate the performance as per its specifications.

13. It is the responsibility of contractor/bidder to complete the first maintenance (after break-in period) at completion of factory recommended running hours/duration with provisioning of all OEM spares and consumables. Security deposit shall be released after completion of this maintenance. The cost of this maintenance shall be built into the proposal.

14. Warning :- Pay orders / Bank drafts or any other financial instruments to be submitted by bidders and contractors as tender cost, Earnest money / bid security and bank guarantees, if found fake and dishonored by issuing bank / financial institution at any pre / post contract stage of the case would call for blacklisting and legal action as per law of land.

15. The Contractor shall indemnify PAA against all third party claims, including claims of infringement of Intellectual Property Rights including but not limited to patent, trademark, industrial design rights arising from use of the goods or any part thereof.

16. WARRANTY & AFTER SALES SUPPORT:

The complete new installation and equipment shall be warranted against all defects in material and workmanship for a minimum period of 12 months. The warranty shall cover replacement of defective parts and labor charges etc.

The warranty period shall commence on the date the unit is accepted at site / commissioned.

During the warranty period the bidder shall be responsible for labor, materials, and any other cost required to make the unit functional by replacement of defective parts / components at Karachi airport.

Response against notified defects during warranty period shall be immediate and not later than three working days after notification is made to the local authorized agent of the equipment manufacturer for need of repairs.

The equipment manufacturer shall have a local authorized agent in Pakistan who shall have trained personnel available for attending to faults during warranty period and shall have adequate spares available in stock. For those spares which are required for warranty repairs and not held in stock the bidder will undertake immediate shipment by air / courier and shall be liable for its customs clearance and duties /taxes'.

During the warranty period the contractor shall fully support the PAA operational team for smooth operation and gaining full knowledge and command on the equipment operations and maintenance.

17. Supplier/Contractor must provide all the relevant details of Control Systems (Hardware and Software) used for the operations and control of entire precision units. All information related to equipment vendor must be provided to PAA.

18. All work and materials should be subject to observation and review at any and all times by authorized representatives of PAA.

For PAA

For Contractor

19. The contractor shall submit the Manufacturer recommended un-priced list of spares and consumable for 02 years of continuous operations of the units for all new installation along with the technical proposal.

20. The contractor shall be responsible for the preparation of shop drawings for execution of work and final as-built drawings. All the drawings shall be approved by the engineer Incharge in order to be valid. Both hard and soft (CAD Version) of drawing must be provided to PAA.

21. Complete three sets (01 original and two photocopy) of documentations including operation, maintenance and troubleshooting instructions, parts lists with elaborated/exploded views, control parameters ranges, set-point, alarm and shutdown values, calibrations values, applicable test and calibration certificates, field wiring drawings, certified drawings should be furnished with the project, necessary field instructions should be affixed firmly at the relevant secure location on the equipment and should be waterproof. Soft copies of the manuals and CAD drawings shall also be provided on write-protected Optical media.

22. The Contractor shall impart complete operations & maintenance training to minimum 05 PAA representative for at-least 10 days on installed system.

23. The Contractor shall enter into a SLA Contract with PAA after successful handover. The SLA shall comprise of complete operation & all types of maintenance for the period of 03 years and extendable for further 02 years. (Draft SLA is enclosed herewith)

24. Upon successful testing, commissioning and handover of the complete CPM Project, PAA shall withheld 05% of the contract price from final bill (in additional to the Security Deposit). It shall be payable only after a 06 months Measurement and verification (M&V) Proving Period. During this period, the CPM must generate automated reports proving it has met the guaranteed reduce kWh. If it fails, liquid damaged (penalties) are applied to this final bill.

25. The final 05% of the Contract Price payment and the subsequent phased release of the Security Deposit shall be contingent upon Measurement and Verification (M&V) report. This report must demonstrate that eh actual kWh consumed by the sub-metered chiller plant is less than or equal to the projected baseline kWh for those specific weather conditions, achieving the guaranteed percentage savings.

26. **Penalty Clause:** If the installed CPM fails to maintain the guaranteed efficiency in any given year the Client reserves the right to deduct an amount equivalent to the full or partial financial value of the unrealized energy savings from the respective year's Security Deposit release.

27. All the measuring instruments including energy meter required to measure the power consumption shall be calibrated and jointly sealed by PAA site i/c and Contractor. This scaled meter shall be used for the calculation of power savings.

28. The Contractor shall supply the following equipment for use at ES Directorate HQPAA office, toe support the requisite project activities. The supplied equipment shall become the property of the Client upon completion of the Defect Liability Period DLP) and no claim whatsoever, in this regard will be entertained by Contractor.

- (i) 02 Nos. New Laptop – HP Spectre 14-EU0097NR Intel Core Ultra 7 155H 16GB 1TB 14" 3K OLEDX360 Touch Backlit KB FPR Win11 or equivalent.
- (ii) 01 No. Laser Printer Brother HL-L5200DW Black/White Laser Printer or equivalent.
- (iii) 01 No. Canon Scanner 6130010 (made n Japan) or equivalent.

For PAA

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For Contractor



For PAA

For Contractor

Annexure- D

DRAFT SERVICE LEVEL AGREEMENT (SLA)
FOR OPERATIONS AND MAINTENANCE OF CHILLER PLANT MANAGER (CPM)
SYSTEM
AT UTILITY BUILDING, JINNAH INTERNATIONAL AIRPORT, KARACHI

1. Purpose

This Service Level Agreement (SLA) defines the minimum responsibilities, standards, and obligations for the operation and maintenance of the Chiller Plant Manager (CPM) system installed at the Utility Building, Jinnah International Airport, Karachi, ensuring its safe, efficient, and reliable performance. The SLA shall come in force through formal agreement after the completion of CPM works and the time Handing Taking is Carried out.

2. Scope of Services

The Contractor shall be responsible for the full-time **operation and maintenance** of the CPM system including:

- Day-to-day monitoring, control, and supervision.
- Preventive and corrective maintenance of field devices (comprising of but not limited to sensors, actuators, controllers, UPS/batteries, wiring/cables and computers with software).
- System diagnostics and troubleshooting.
- Providing system and chiller plant operational data and trends on required format hard or soft copy
- Historical data backup and alarm/event management.
- Reporting system performance and proposing optimizations.
- Support for third-party systems, interfaces and integrations
- Any other required technical support from OEM/Third Party.

3. Contractor Responsibilities

- Formulate a Standard Operating Procedure/s (SOP/s) at the start of SLA in coordination with SWE HVAC JIAP PAA. PAA shall approve the SOP for implementation, the SLA Service Provider shall bound to follow the SOP/s.
- Provide qualified and trained staff to operate and maintain the system.
- Arrange, manage, and be responsible for all tools, testing equipment, workmen, transportation, and safety gear required for execution of services.
- Ensure continuous availability and proper functioning of all devices and system components.
- Maintain cleanliness and physical integrity of panels, servers, and workstations.
- Observe safety, cyber-security, and operational protocols.

For PAA

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For Contractor



4. Spare Parts Management

- The Owner (PAA) shall be responsible for supplying the necessary spare parts.
- The Contractor shall **proactively monitor** inventory and submit **timely requests** for spare parts based on condition, runtime, and forecasted failures.
- Failure to raise timely spare requests resulting in downtime will be considered a lapse in contractor's performance.
- The standard consumables i.e. adhesives, contact cleaner sprays, paints, polish (for minor/localized touchups), HT/Masking/Binding tape, jubilee clamp, lock tight liquids, glycerin, nut/bolt/rivet, duster, fastener, seals, duct sealants/ pastes, cable lugs/thimbles, cable ties, heat shrinkable tubes, shims/spacers (and similar minor sheet metal items), RJ45 and other connectors/clips, cartridge fuses below 05 Amps, glint, petrol (for minor applications), and special purpose tools required for maintenance shall be arranged by the Service Provider (within 24-hours of requirement). The cost of such standards consumables is deemed to be covered in quoted cost.

5. Maintenance Standards

a. Preventive Maintenance

To be carried out as per the approved schedule, at minimum once every quarter. Includes:

- Inspection and testing of sensors, actuators, and controllers.
- Calibration of instruments.
- Server health checks and software log verification.
- Alarm/event clearance and response testing.

b. Corrective Maintenance

To resolve faults or failures notified by alarm, report, or inspection.

Component	Rectification Time (Max)
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Software bugs/faults	24 hours
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Sensors/field devices	48 hours
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Controllers/DDC units	72 hours
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Server/Workstation issues	48 hours
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6. Response Times

Severity Level	Description	Maximum Response Time
Critical	System down, no control/alarm function	4 hours
Major	System partially functional	12 hours
Minor	Non-urgent observation/fault	24 hours

7. Penalties for Non-Compliance

Failure to adhere to response or rectification times will result in penalties as below:

Delay Duration Penalty per Incident per Day

Up to 2 days	PKR 50,000
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**Delay Duration Penalty per Incident per Day**

3 to 5 days PKR 100,000

Beyond 5 days PKR 200,000 or possible contract review

Additional Notes:

- Repeated failures (3 or more in a month) will invoke a performance warning.
- Continuous non-performance over two consecutive months may lead to termination of the SLA.

8. Audits and Compliance

- PAA or its authorized third party may conduct **audits** (technical and procedural) to evaluate system health, documentation, response logs, and preventive maintenance records.
- The Contractor shall fully cooperate and provide necessary access to logs, documents, personnel, and systems.
- Any discrepancies found during audits must be resolved within **30 working days**.

9. Reporting & Documentation

- Monthly performance and maintenance reports.
- Quarterly system health status and trend analytics.
- Records of faults, resolutions, and spare part usage.

10. Duration

The SLA shall be valid for **three years** from the issuance of the Taking Over Certificate (TOC), with the possibility of renewal based on satisfactory performance. The SLA shall be further extendable to **two years**.

11. Training and Handover

- Contractor shall fully train PAA staff for routine operations and monitoring.
- Upon contract completion, full system access, all level passwords, software, and credentials shall be handed over.

12. Release of Security Deposit

- The 05% retained Security Deposit (SD) shall be released in phases during the Maintenance Period, subject to the satisfactory rectification of any defects and the sustained achievement of the Guaranteed Plant Efficiency, in accordance with the following schedule





For PAA

For Contractor

- 1% of the SD Value shall be released upon the expiry of the first year, provided the annual M&V report demonstrates the guaranteed reduce kWh was maintained;
 - A further 2% of the SD shall be released upon the expiry of the second year, subject to the same efficiency criteria; and
 - The remaining balance of the Security Deposit shall be released upon the expiry of the third year, subject to final performance validation.
- PAA retains the right to forfeit the SD partially or fully if any violation occurs including non-payment of penalties.

For PAA

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For Contractor



INSTALLATION OF CHILLER PLANT MANAGER AT UTILITY BUILDING JIAP

Detailed Technical Evaluation Criteria

The quoted system and components will be examined for compliance with provisions of Technical Specifications. The bidder's proposals would be evaluated and scores would be given accordingly in technical evaluation. Bidders are required to provide all the technical literatures and product brochures with technical bids in order to minimize clarifications and other correspondence for product/feature confirmations.

Compliance to all the clauses prescribed in the technical specifications is mandatory. Compliance through any deviation/alternate solution should be stated therein.

Technical Evaluation would be conducted for parameters as shown in the table below:

S. #	Evaluation Parameters	Required Supporting Document	Minimum Threshold Mark	Marks
1.	Bidders must be a chiller plant manager manufacturer (OEM) or OEM's authorized agent / partner of the manufacturer for Pakistan	Valid authorization certificate of OEM in case of agent/ dealer/ partner partnership certificate for Pakistan as evidence of being an authorized partner	07	10
2.	Applicant Firm profiles and No. of associates/employees.	Please attach copy of required list	10	10
3.	General Experience of Bidder	Attach list of purchaser or delivery orders or contracts or project completion or sign-off certificate.	05	10
4.	Particular Experience of the Bidder	Attach list of purchaser or delivery orders or contracts or project completion or sign-off certificate with contact details.	05	10
5.	Guarantee for Percentage Reduction in Sub-Metered Plant Energy	Prepare and attach a detailed technical proposal for improvement of operational efficiency and reduction in the Plant Energy Consumption.	10	25
6.	Bidders Technical Capacity	Please attach copy of PEC valid registration certificate with specific category.	07	10
7.	Bidder must have Technical Strength of at least one (01) OEM Certified / Trained Engineer for after sales services and support.	Please attach copies of OEM certificate with Technicians / Engineers profiles	05	05
8.	Financial Capacity of the bidder.	Copies of Audited Financial Statement is required for	05	10



For PAA

For Contractor

		last three years.		
9.	Time schedule to design, manufacture, transport, hardware installation with software deployment at site, debugging testing commissioning, provision of training and handing over of the System to PAA.	Gantt chart with complete time schedule and milestones will be provided.	05	10
Total Points				100

Technical Qualification

In order to qualify in the Technical Evaluation, following two conditions must be fulfilled.

- a) The bidder must obtain minimum threshold marks in every evaluation parameter.
- b) The bidder must achieve at least 70% cumulative marks.

Financial Proposal

- a) The cost indicated in the financial proposal shall be deemed as final.
- b) Financial proposal will be un-conditional, failing which the bid shall be rejected.

For PAA

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For Contractor



INSTALLATION OF CHILLER PLANT MANAGER AT UTILITY BUILDING JIAP

Sr. No.	Evaluation Parameters	Required Supporting Document	Max Marks	Marking Criteria
1.	Bidders must be a Chiller Plant Manager Manufacturer (OEM) or OEM's authorized agent / partner of the manufacturer for Pakistan	Valid authorization certificate of OEM in case of Agent/Dealer/Partner partnership certificate for Pakistan as evidence of being an authorized partner.	10	❖ 05 Marks are given, if the contractor is authorized dealer for Pakistan. More Marks are given as below. ❖ One additional mark shall be given for each year of being authorized dealer of OEM in Pakistan. ❖ Full Marks are given in case of 20 years or more of being the authorize dealer in Pakistan.
2.	Applicant Firm / Contractor profiles resources and project planning.	Please submit a complete proposal/plan for Work methodology, PAA officials training program and Service Level Agreement (SLA) for Operations and Maintenance of delivered Chiller Plant Manager (CPM).	10	a. Full descriptive and quantitate Work Methodology demonstrating the complete deployment of Chiller Plant Manager (CPM) with allied works at JIAP with all required resources planning etc shall be prepared and submitted (max 06 marks). ❖ 03 Marks are given if the step-by-step breakup of activities linked with manpower is provided with job responsibility and personal qualification/profile of the deployed staff. ❖ 03 Marks are given if the detailed breakup project is given with deployed tools/plant, testing equipment, workbench, hardware other tangible and non-tangible resources. b. 02 Marks are given if complete training plan for PAA Officials is prepared and shared. c. 02 Marks are given if a concise and elaborative Service Level Agreement (SLA) plan for Operations and Maintenance of installed CPM is prepared and submitted.

3.	General Experience of Bidder.	Attach list of purchaser or delivery orders or contracts or project completion or sign-off certificate with contact details.	10	❖ 08 Marks will be given, if the bidder has commissioned 10 IBMS for HVAC System in Pakistan during the last 10 years. ❖ For less than 10 IBMS for HVAC System in Pakistan during the last 10 years. ➤ 08 x (A/10) ❖ For more than 10 IBMS for HVAC System in Pakistan during the last 10 years. ➤ 08+ (A/20) x 2 ❖ A = No of IBMS installed in Pakistan. ❖ Full Marks will be given in case of 20 IBMS for HVAC System have been completed in the last 10 years.
4.	Particular Experience of Bidder.	Attach list of purchaser or delivery orders or contracts or project completion or sign-off certificate with contact details for Chiller Plant Manager (CPM).	10	❖ 08 Marks will be given, if the bidder has commissioned 05 CPM of at least 5,000 TR chiller plant capacity Globally during the last 10 years. ❖ For less than 05 CPM of at least 5,000 TR chiller plant capacity Globally during the last 10 years. ➤ 08 x (A/5) ❖ For more than 05 CPM of at least 5,000 TR chiller plant capacity Globally during the last 10 years. ➤ 08+ (A/10) x 2 ❖ A = No of CPM of at least 5,000 TR chiller plant. ❖ Full Marks will be given in case of 10 CPM of at least 5,000 TR chiller plant have been completed in the last 10 years.
5.	Guarantee for Percentage Reduction in Sub-Metered Plant Energy	Prepare and attach a detailed technical proposal for improvement of operational efficiency and reduction in the plant energy consumption. The contractor shall install energy analyzers (on the chillers/pumps and towers) under the required scope of	25	Bidder shall guarantee a minimum percentage reduction in electrical consumption (kWh) of the generation-side equipment (Chillers, Pumps, Cooling Towers) compared to the established pre-CPM baseline, normalized for ambient weather conditions and same cooling capacity (TR) • Guaranteed Savings ≥ 20%: 30Marks
For	PAA	(xxvi)		For Contractor

		project. For a30-days baseline period under different loading conditions before the CPM is activated, the plant shall be run manually to establish the existing baseline kWh consumed by the HVAC generation side against the ambient outdoor temperature.		- Guaranteed Savings 15% - 19.9%:20 Marks - Guaranteed Savings 10% - 14.9%:10 Marks - Guaranteed Saving <10%:0Marks
6.	Bidders Technical Capacity	Please attach copy of PEC valid registration certificate with specific category.	10	❖ 05 marks will be given to a bidder having the PEC registration in at-least C-5 category or above. One mark will be deducted for each lower category from C5 and one (01) mark will be added for each higher category. ❖ 01 marks will be given if the firm has PEC registration the category ME-01 ❖ 01 marks will be given if the firm has PEC registration the category ME-04
7.	Bidder must have Technical Strength of at least one (01) OEM Certified / Trained Engineer for after sales services and support.	Please attach copies of OEM certificate with Technicians / Engineers profiles.	05	❖ Certificate / proof of OEM certificate of at-least 01 trained engineer for after sales services and support.
8.	Financial Capacity of the bidder.	Copies of Audited Financial Statement for last three financial years shall be provided i.e. 2021-22, 2022-23, 2023-24.	10	❖ 5 Marks are given if the average annual turnover of last 3 years is equal to Rs 100 Million. ❖ For Average annual income less than Rs. 100 Million, use following weightage ➤ $5 \times (A/100)$ ❖ For the Average Annual Income more than Rs. 100 million but less than Rs.200 million use following weightage ➤ $5 + (A/200) \times 5$ ❖ A= Average Annual Turnover ❖ Full Marks are given in case of "A" Rs.200 million or more.
9.	Time schedule to design, manufacture, transport, hardware installation with	Gantt chart with complete time schedule and milestones will be	10	❖ 05 Marks are given if the complete Gantt chart showing complete work schedules with milestones is submitted with

For PAA

For Contractor

	software deployment at site, debugging testing commissioning, provision of training and handing over of the System to PAA.	provided.		technical bid. ❖ 5 Marks are given if the contractor has shown to complete the project in 300 days in his Gantt chart. ❖ For more than 300days of project completion time following weightage will be used. ➤ $(335-A)/7$ ❖ A = project completion time in days ❖ Maximum completion time shall not exceed 335 Days.
Total Points			100	

For PAA

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For Contractor

Annexure - C**TECHNICAL SPECIFICATIONS****I. BACKGROUND:**

The Jinnah Terminal Complex JIAP was inaugurated in 1992. The central air-conditioning system of the Passenger Terminal Building (PTB) was designed with the aid of centrifugal chillers, cooling towers, water pumps, and others located at a distant location named the Utility Building. The HVAC system was installed with local and remote monitoring and control functions. The details of the existing HVAC and Control equipment at Utility Building JIAP along with its Technical Specifications and Operation Schemes are attached herewith.

The Utility Building contains HVAC equipment including chillers, cooling towers, chilled water pumps, condenser water pumps, air handling unit, exhaust fans, a water monitoring system, and a motor control centre with many field devices, which were manufactured by different renowned manufacturers. The detail of the equipment is also attached herewith.

The Chiller Plant Control System was designed and installed by M/s Honeywell in 1992 using field devices and software in use at that time. The installed system is unserviceable due to obsolescence.

II. PURPOSE:

PCAA intends to install a modern Chiller Plant Manager (CPM) to monitor and control the HVAC facilities installed at the Utility Building (also with local and remote monitoring and control functions) on a Turn-key basis. The system should have an easy-to-understand Graphic User Interface to monitor the system performance and energy utilization along with an immediate display of alarms and complete data history. The basic role of CPM shall be integration of all HVAC Mechanical & Electrical system onto a standard software platform for global building services management.

The scope of the works shall include the design, procurement, materials, manufacture, supply, installation, testing and commissioning of a complete CPM at Jinnah International Airport Karachi.

The overall design criterion is to provide a total solution, built on international standards and non-proprietary protocols which will provide the Utility Building and Passenger Terminal Building of JIAP with future expandable/upgradable system in a manner that additional features, services and technology can be introduced into the overall infrastructure without the need for major upgrade work, software development or system reconfiguration. The system shall comprise entirely of commercially available hardware and software concept without any reliance on a particular vendor.

The offered solution must have the capability to be developed and extended by the addition of new features, functions, system and sub-systems throughout the life of the building in a functionally integrated manner.

Contractor shall provide details of all protocols, interfaces and standards that will be supported in this open, integrated environment.

The design criterion of the CPM is to provide a total solution, based on International standards such as OLE for Process Control (OPC) through TCP/IP and not proprietary protocols. It should utilise commercially available components, hardware and software and

shall be based on current IT networking standards to allow additional features, services and technology to be introduced into the overall infrastructure without major replacement or modification of entire CPM.

Implementation of the CPM shall be carried out with internationally recognized ISO9002 procedures to maintain quality standards. Due to the nature of this work, Contractors must have a proven track record in works of similar nature.

III. TECHNICAL DETAILS:

Bidders are required to visit and examine the existing HVAC facilities at the Utility Building and provide the latest generation microcontroller-based Chiller Plant Manager (CPM) with modern interfaces and replacement of field devices/components to meet the intended purpose. The proposed system should have the option of customization according to operation and maintenance needs, future expandability and upgradable. At minimum, following equipment shall be included for design and implementation of the Chiller Plant Manager:

Sr. #	Equipment	Quantity	Sr. #	Equipment	Quantity
1.	AHU (79 kW)	1	15.	Shutter Gate	2
2.	Cooling Tower (5,524 kW each)	4	16.	Chemical Dosing Pump **	2
3.	Chiller Plant (4,500 kW each)	4	17.	Chilled Water System	
4.	Chilled Water Pump (108 kW each)	4	17.1	Different Dial Gauges	42
5.	Condensed Water Pump (46 kW each)	4	17.2	Valves (MOV+HOV)	43
6.	Booster Pump (0.75 kW each)	2	17.3	Strainers	4
7.	Other Pump and Bleed Off System	1 + 1	18.	Condenser Water System	
8.	LV Trolleys	12	18.1	Different Dial Gauges	8
9.	Data Control Panel (DCP)	1	18.2	Valves (HOV+MOV)	20
10.	Exhaust & Smoke Fans	7	18.3	Strainers	4
11.	Fire Dampers for AHU	2	19	Sand Filter **	01
12.	Chiller Starter Panels	04	20	DX Units **	02
13.	Expansion Tank	2	21	UPS (15 kVA, 3-Phase)	01
14.	Overhead Crane	1	22	AHU Dampers	02

** Status, Monitoring and applicable notifications.

The flow charts, single line diagrams and I/O tables are provided for reference and to determine the operational logic. However, the CPM should be optimized, and compatible with BACnet support and the latest devices, hardware and software as quoted by the bidder for subject works.

The CPM contractor shall provide necessary power requirement in the form of isolators and switches socket outlets for all devices, including all associated cables and cableways. This shall include all associated builders work including making good of all openings and penetrations.

The CPM package shall comprise of commercially available hardware and software for true

“Open Architecture” concept without any reliance on a particular vendor. The CPM shall comprise of at minimum, the following components.

- a) System Main Servers
- b) Real Time Servers
- c) Client Operator /User Interface Workstations
- d) Local Area Network & Network Accessories
- e) Telecommunications Modems
- f) Consoles
- g) Software/Graphical User Interface (GUI) and Utility Software (extendable to Passenger Terminal Building in future without any major changes/ up-gradation)
- h) Relevant and essential software for the each system in order to meet the requirement stipulated.

The proposed system should have its own DDC Controller (BACnet Compliant), I/O Expansion modules and rack-mount online PS (minimum 1-hour backup) and will be installed in the existing panel named DCP-H12.1/12.2.

The CPM control devices include Immersion-type matched hair (where required) Temperature sensors, brass thermo wells, water flow switches, differential pressure switches for pumps and sand filters, Digital energy analysers (for 13 equipment – 3 phase) with CTs, 08 motorized butterfly valves for cooling towers (14-inch size), current switches for pumps and cooling towers, water flow sensors with transmitters flow metess on chilled & condenser water header of required class & accuracy, pressure transmitters for chillers and expansion tanks, conductivity transmitters and all power and control wirings (CAT-6) with terminations. The system would be able to perform at ambient temperatures of 0-50 degrees Celsius and humidity of 5-90% RH non-condensing.

The Workstation (HP or Dell), deployed at point of use (either at Utility Building or Passenger Terminal Building) should comply with the requirement of the CPM but not less than the specification of i7 - 12th generation, 32 GB RAM, 1 TB hard disk with 5kVA UPS (APC or equivalent) including provisioning of at least two 50-inch LED screen and associated software and furniture. The system would also have Modbus R485 to IP Router for power analysers integration, BACnet MSTP/IP Router for chillers integration and Control panel for Routers.

The software should be a web-based building monitoring and management solution built upon the Niagara 4.9 platform (or other technically equivalent) able to connect and support at least 10 DDC and have a minimum of 500 license points (including 100 points for future expansion). The software should be capable of integrating BACnet (Primary Protocol) and Niagara controllers (or any other relevant secondary protocol), third-party devices and internet protocols into a centralized software platform to manage buildings at a corporate level (to handle a huge amount of data). It should serve as real-time graphical information to standard web browser clients. It also provides server-level functions such as: centralized data logging, archiving, alarming, real-time graphical displays, master scheduling, system-wide database management, and integration with corporate software applications.

It should comprise of comprehensive graphical engineering tool set, embedded in the single engineering tool for DDC Controller. The salient features would be

Web Access	Access to alarms, graphics, schedules, logs and configuration data with a web browser and mobile devices
RealTime Graphic Display	Free configurable HTML5 user interface. Supported by libraries and template functions for an efficient user interface engineering
Alarming	Sophisticated alarm segregation, processing, escalation and routing, including e-mail alarm acknowledging
Connectivity	BACnet driver with server and client support. C-Bus, Modbus IP, LON IP, MBUS, KNX IP, OPC and SNMP drivers should be supported by open point license
Scheduling	Provisions to read / write access to BACnet, C-Bus and Niagara schedules. Global schedule and calendar functions "Scheduling" on Supervisor support to manage device without internal schedule function
Centralized Data Logging	All points should be added to a history database. Interval and Change Of Value (COV) algorithms should be supported. History data can be visualized in easy and intuitive way.
Energy Management	Basic energy management functions should be included; enhanced features can be added. Provisions for Energy Manager extension module to the supervisor should be available.
Audit	Provisions for "Audit Trail" of database changes, database storage and backup, global time functions, calendar, central scheduling, control, and energy management routines
Navigation	Navigation should be easily adjustable to end-user permissions and needs
Scripting / Logic	Freely programmed scripts and logic should be used to implement control and management functions on supervisor level. Batch functions should be executed to force actions or adjust settings across the system.
Plant Controller	Should Support multiple range of DDC controllers connected to a local Ethernet network, or the Internet, integration utility for efficient Supervisor setup of BACnet systems. Virtual BACnet point property support for competitive BACnet system pricing. Remote back up of Niagara based Controller applications to Supervisor.
Configurable Room Controller	Should Support template for efficient configuration of MERLIN applications.
Meta Data Support (tagging)	Additional information should be added to all integrated objects. This information should be usable to structure data, search data and prepare data for further analytics.

For PAA

For Contractor

Documentation	Full Supervisor documentation should be available on “one click”.
Dashboarding	Data summary views should be customizable by end-users
Search	Ability to finds data quickly, by using the clear text search function.
Security	Provisions for password protection and security using authentication and encryption techniques with optional security supported via an external LDAP connection

The proposed control system for the Air Handling Unit (termed AHU 44) should contain duct-type temperature and relative humidity sensors, immersion-type temperature sensors, brass thermo-wells, water flow switches, Differential Pressure Switches, Current Switches, chilled water pressure sensors, duct smoke detector, damper actuator, 2-way chilled water control valve, modulating actuator and actuators for fire dampers. The system shall also control the associated booster pump (1+1) operations in integration with AHU – 44.

The bidder should maintain the installed infrastructure and train the PAA officials during the maintenance period of one year, starting after the issuance of the Taking Over Certificate (TOC). The spares of the system should remain available for the next 10 years. All software including the application software shall have life time subscription and functionality. All software updates from the manufacturer should be provided at no cost to PAA for at least 5 years. After the completion of the maintenance period, the entire system should become PAA property and each level's passwords, and access should be provided to PAA.

The Contractor shall use standard off-the-shelf components and/or products possible, with minimum customisation to comply with the requirement at no additional cost to PAA

The LAN design and installation shall be conducted under the supervision of a network design engineer specializing in Eathernet topologies and TCP/IP configurations. The engineer shall supervise all LAN work.

Contractor shall deploy adequate programmers on site to carry out necessary programming scheduling and subsequent adjustments to all monitoring and control points to achieve system optimization and operational requirements imposed by PAA.

The requirement of the system is provided for understanding the design intent/scope of the system and control thereof. The bidder is required to meet/exceed the requirements as per modern techniques and equipment available in the market. The system should qualify and comply with design and quality standard codes and relevant national and international building and other safety codes.

For PAA

(xxxi)

For Contractor



IV. SUBMITTALS

The Contractor shall submit the following products and software literature for review and approval:

- a) All hardware, computers, peripherals and other components.
- b) All software, which includes Database, Utility, SCADA, Graphical, Office Suite and Operating (OS) Software.
- c) Surge suppression; power conditioning equipment and un-Interruptible power (UPS) system components.
- d) Identify clearly, any and all exceptions taken to the requirements of the specifications.
- e) Installation and Users Manuals
- f) In addition to technical literature, the Contractor should submit the following for review and approval during tender:
 - **Project Management Plan** including, project organization chart, resumes of all key personnel. The Contractor project management team shall include key project and engineering personnel that have experience in implementing large airport projects.
 - **Track Record.** The Contractor shall submit list major of projects successfully implemented in the last 10 years for evaluation.
 - **Software Development Plan**
 - **Quality Assurance Plan.** As software is a significant part of the entire scope, the Quality Assurance Plan shall include software assurance. The Contractor must have experience in software assurance from previous projects. All Contractors must submit sample software assurance plans and procedures implemented from previous project.
 - **Comprehensive Energy Management Plan.** All Contractors must submit a comprehensive write-up of an Energy Management Plan to make HVAC Operations, specifically the chillers, at Jinnah International Airport one of the greenest and most energy-efficient in line with the National Aviation Policy and guidelines of The Planning Commissions of Pakistan. Among other things, the write-up shall include innovative energy-saving techniques to be employed, appropriate energy calculations to support energy savings as well as control sequences for safe and proper operation.
 - Sample of O&M manual
 - Sample of Interface Program Documentation
 - Sample of panel configuration drawing
 - Sample of global database sharing and centralized distributed management.
 - Sample of Help Desk System. This submittal shall describe fully how users will use his/her PC terminal to report facility faults and problems and request for additional Services when the need arises.



The contractor shall submit a network architecture diagram indicating the network nodes, file servers, gateways, routers, bridges and all other components included in the CPM LAN. The proposed network physical specifications and performance shall be indicated. The Contractor shall submit software flow diagrams for all custom application programs to be developed to satisfy the specified requirements.

- The Contractor shall submit a layout plan for the CPM Room.
- The Contractor shall submit a plan layout for all the servers.
- The Contractor shall submit samples of engineering schematics and installation details for evaluation of engineering capabilities and Installation quality standards.
- The Contractor shall submit samples of
- Facility management reports
- Utility and command software tools and features such as:
- Screen, Windows and menu penetration.
- Data presentation.
- New and computer generated data editing features.
- Data formatting.
- Data and document management features.
- Tutorials and help features.

V. GENERAL REQUIREMENTS

1) MATERIALS

Use new products that the manufacturer is currently manufacturing and that have been installed in a minimum of 30 similar installations globally. Spare parts shall be available for at least ten years after completion of this contract.

CONTROLS SYSTEM ARCHITECTURE

A. General

1. The Controls Systems shall consist of multiple Nodes and associated equipment connected by industry standard digital and communication network arrangements.
2. The Engineering Control Centre (ECC), building controllers and principal communications network equipment shall be standard/commercial products of recognized major manufacturers available through normal PC and computer vendor channels – not "Clones" assembled by a third-party subcontractor.
3. The networks shall, at minimum, comprise, as necessary, the following:
 - a. A fixed ECC.
 - b. Network computer processing, data storage and BACnet-compliant communication equipment including Servers and digital data processors.
 - c. BACnet-compliant routers, bridges, switches, hubs, modems, gateways, interfaces and similar communication equipment.

- d. Active processing BACnet-compliant chiller/building controllers connected to other BACnet-compliant controllers together with their power supplies and associated equipment.
- e. Addressable elements, sensors, transducers and end devices.
- f. Third-party equipment interfaces and gateways as described and required by the Contract Documents.
- g. Other components required for a complete and working Control Systems as specified.

B. The Specifications for the individual elements and component subsystems shall be minimum requirements and shall be augmented as necessary by the Contractor to achieve both compliance with all applicable codes, standards, and to meet all requirements of the Contract Documents.

C. Network Architecture

1. The Controls communication network shall utilize BACnet communications protocol operating over a standard Ethernet LAN and operate at a minimum speed of 100 Mb/sec.
2. The networks shall utilize only copper and optical fiber communication media as appropriate and shall comply with applicable codes, ordinances and regulations.
3. All necessary telephone lines, ISDN lines and internet Service Provider services and connections will be provided by the PAA.

D. Third Party Interfaces:

1. The contractor administered by this Section of the technical specifications shall include necessary hardware, equipment, software and programming to allow data communications between the controls systems and building systems supplied by other trades.
2. Other manufacturers and contractors supplying other associated systems and equipment shall provide their necessary hardware, software and startup at their cost and shall cooperate fully with the contractor administered to ensure complete functional integration.
3. All third party interfaces and obligations shall be performed by the Contractor with no additional Cost and Time to PAA.

E. Servers:

1. Provide data storage 5 year (s) to archive historical data including trends, alarm and event histories and transaction logs.
2. Equip these server(s) with the same software tool set that is located in the BACnet chiller/building controllers for system configuration and custom logic definition and color graphic configuration.
3. Access to all information on the data storage server(s) shall be through the same browser functionality used to access individual nodes. When logged onto a server the operator will be able to also interact with any other controller on the control system as required for the functional operation of the controls systems. The contractor administered by this Section of the technical specifications shall provide all necessary digital processor programmable data storage server(s).
4. These server(s) shall be utilized for controls systems application configuration, for archiving, reporting and trending of data, for operator transaction archiving and

reporting, for network information management, for alarm annunciation, for operator interface tasks, for controls application management and similar.

5. These server(s) shall utilize IT industry standard data base platforms which utilize a database declarative language designed for managing data in relational database management systems (RDBMS).

COMMUNICATION

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.

B. Each controller shall have a communication port for connection to an operator interface.

C. Internetwork operator interface and value passing shall be transparent to internetwork architecture.

1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, reports, system software, and custom programs shall be viewable and editable from each internet controller.
2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute specified control system operation. An authorized operator shall be able to edit cross-controller links by typing a standard object address.//

D. System shall be expandable to at least accommodate the Passenger Terminal Building (PTB) required input and output objects with additional controllers, associated devices, and wiring. Expansion shall not require operator interface hardware additions or software revisions.

E. ECCs and Controllers with real-time clocks shall use the BACnet Time Synchronization service. The system shall automatically synchronize system clocks daily from an operator-designated device via the internetwork. The system shall automatically adjust for daylight savings and standard time as applicable.

2) ENGINEERING CONTROL CENTER (ECC)

A. The ECC shall reside on a high-speed network with controllers. The ECC and each standard browser connected to server shall be able to access all system information.

B. ECC and controllers shall communicate using BACnet as Primary protocol. ECC and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ASHRAE/ANSI 135, BACnet Annex J.

C. Hardware: ECC shall conform to the BACnet Advanced Workstation (B-AWS) Profile and shall be BTL-Listed as a B-AWS device.

1. ECC shall be based on commercially available server grade hardware. Computers based on desktop architectures shall not be permitted. ECC shall have remote management capabilities.
2. Processor(s):

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- a. Processors shall be either Intel Xeon or AMD EPYC chips sets designed specifically for server use. Desktop processors will not be allowed.
 - b. Minimum core count shall be 12 cores. Each Core shall be capable of executing 2 threads simultaneously.
 - c. Minimum base clock speed shall be 3.0 GHz
 - 3. Memory:
 - a. Engineering Control Center shall be equipped with a minimum of 32GB of DDR4 Error Correcting Code (ECC) memory. After installation of required 32GB of RAM, the motherboard must still have a minimum of 2 DIMM slots open for expansion. Motherboard shall be capable of minimum of 64GB of ECC memory.
 - b. Minimum speed shall be 2133 MHz for memory
 - 4. Storage:
 - a. ECC shall be equipped with a RAID capable drive controller capable of handling at least 8 internal, hot swappable drives.
 - b. All installed drives shall be "Enterprise Class" drives designed specifically for server use.
 - c. Minimum configuration shall consist of 6 drives in 2 separate RAID arrays:
 - 1) The operating system shall be stored on a RAID 1 array comprising of 2 drives with each drive having a minimum capacity of 256 GB each.
 - 2) The software and all its related databases shall be stored in RAID 5 array consisting of 4 drives with each drive have a minimum of 1TB capacity for a minimum storage capacity of 3TB's.
 - 3) An alternative configuration for the 2 RAID arrays described above is 8 drives arrayed in a RAID 10 configuration. In this case the OS RAID array would consist of 4 drives of 1TB minimum each, and the B-AWS RAID array consisting of 4 drives of 16TB minimum each. This configuration would provide faster write times and much quicker rebuild times in the event of a drive failure.
 - d. ECC will include an 16X DVD R/W drive
 - 5. Case:
 - a. Case shall have space for a minimum of 8 hot swap 3.5 inch hard drives and one internal optical drive
 - b. Real-time clock:
 - 1) Accuracy: Plus or minus 1 minute per month.
 - 2) Time Keeping Format: 24-hour time format including seconds, minutes, hours, date, day, and month; automatic reset by software.
 - 3) Clock shall function for one year without power.
 - 4) Provide automatic time correction once every 24 hours by synchronizing clock with the Time Service Department of the U.S. Naval Observatory for local time zone in Pakistan.
 - c. Serial ports: Four USB ports and two RS-232-F serial ports for general use, with additional ports as required. Data transmission rates shall be selectable under program control.
 - d. Parallel port: Enhanced.
 - e. Sound card: For playback and recording of digital WAV sound files associated with audible warning and alarm functions.



- f. Color monitor: PC compatible, not less than 50 inches, LCD type, with a minimum resolution of 1280 by 1024 pixels, non-interlaced, and a maximum dot pitch of 0.28 mm.
 - g. Keyboard: Minimum of 64 characters, standard ASCII character set based on ANSI INCITS 154.
 - h. Mouse: Standard, compatible with installed software.
 - i. Removable disk storage: Include the following, each with appropriate controller:
 - 1) Minimum 1 TB removable hard disk, maximum average access time of 10 ms.
 - j. Network interface card (NIC): integrated 10-100-1000 Base-TX Ethernet NIC with an RJ45 connector or a 100Base-FX Ethernet NIC with an SC/ST connector.
6. Cable modem: 42.88 MBit/s, DOCSIS 2.0 Certified, also backwards compatible with DOCSIS 1.1/1.0 standards. Provide Ethernet or USB connectivity.
7. Optical modem: full duplex link, for use on 10 GBase-R single-mode and multi-mode fiber with a XENPAK module.
8. Self-contained uninterruptible power supply (UPS):
- a. Size: Provide a minimum of five hours of operation of ECC equipment, including one hours of alarm printer operation.
 - b. Batteries: Sealed, valve regulated, recombinant, lead calcium or equivalent.
 - c. Accessories:
 - 1) Transient voltage suppression.
 - 2) Input-harmonics reduction.
 - 3) Rectifier/charger.
 - 4) Battery disconnect device.
 - 5) Static bypass transfer switch.
 - 6) Internal maintenance bypass/isolation switch.
 - 7) External maintenance bypass/isolation switch.
 - 8) Output isolation transformer.
 - 9) Remote UPS monitoring.
 - 10) Battery monitoring.
 - 11) Remote battery monitoring.
- D. Printer: Provide a dedicated black/white tractor-feed dot matrix printer for status/alarm message printing, minimum 10 characters per inch, minimum 160 characters per second, connected to the Workstation at point of use through a USB interface.
- 1) Paper Handling: Automatic sheet feeder with 250-sheet x 8.5 inch x 11inch paper cassette and with automatic feed.
 - 2) Paper: One box of 2000 sheets of 8-1/2x11 inch multi-fold type printer paper

E. ECC Software:

1. Provide for automatic system database save and restore on the ECC's hard disk a copy of the current database of each Controller. This database shall be updated whenever a change is made in any system panel. In the event of a database loss in a building management panel, the ECC shall automatically restore the database for that panel. This capability may be disabled by the operator.
2. Provide for manual database save and restore. An operator with proper clearance shall be able to save the database from any system panel. The operator also shall be able to clear a panel database and manually initiate a download of a specified database to any panel in the system.
3. Provide a method of configuring the system. This shall allow for future system changes or additions by users with proper clearance.
4. Operating System. Furnish a concurrent multi-tasking operating system. The operating system also shall support the use of other common software applications. Acceptable operating systems are **Windows Server 2025** (with 12 years free of cost support), Linux, and UNIX.
5. System Graphics. The operator workstation software shall be graphically oriented. The system shall allow display of up to 10 graphic screens at once for comparison and monitoring of system status. Provide a method for the operator to easily move between graphic displays and change the size and location of graphic displays on the screen. The system graphics shall be able to be modified while on-line. An operator with the proper password level shall be able to add, delete, or change dynamic objects on a graphic. Dynamic objects shall include analog and binary values, dynamic text, static text, and animation files. Graphics shall have the ability to show animation by shifting image files based on the status of the object.
6. Custom Graphics. Custom graphic files shall be created with the use of a graphics generation package furnished with the system. The graphics generation package shall be a graphically based system that uses the mouse to create and modify graphics that are saved in industry standard formats such as PCX, TIFF, and GEM. The graphics generation package also shall provide the capability of capturing or converting graphics from other programs such as Designer or AutoCAD.
7. Graphics Library. Furnish a complete library of standard HVAC equipment graphics such as chillers, cooling towers, air handlers, terminals, fan coils, main pumps and unit ventilators. This library also shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library shall be furnished in a file format compatible with the graphics generation package program.
8. The Controls Systems Operator Interfaces shall be user friendly, readily understood and shall make maximum use of colors, graphics, icons, embedded images, animation, text based information and data visualization techniques to enhance and simplify the use and understanding of the displays by authorized users at the ECC. The operating system shall be Windows 11 latest version, or better, and shall support the third party software.
9. Provide graphical user software, which shall minimize the use of keyboard through the use of the mouse and "point and click" approach to menu selection.

10. The software shall provide a multi-tasking type environment that will allow the user to run several applications simultaneously. The mouse or Alt-Tab keys shall be used to quickly select and switch between multiple applications. The operator shall be able automatically export data to and work in Microsoft Word, Excel, and other Windows based software programs, while concurrently on-line system alarms and monitoring information.
11. On-Line Help. Provide a context-sensitive, on-line help system to assist the operator in operating and editing the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext.
12. User access shall be protected by a flexible and Owner re-definable software-based password access protection. Password protection shall be multi-level and partition able to accommodate the varied access requirements of the different user groups to which individual users may be assigned. Provide the means to define unique access privileges for each individual authorized user. Provide the means to on-line manage password access control under the control of a project specific Master Password. Provide an audit trail of all user activity on the Controls Systems including all actions and changes.
13. The system shall be completely field-programmable from the common operator's keyboard thus allowing hard disk storage of all data automatically. All programs for the CUs shall be able to be downloaded from the hard disk. The software shall provide the following functionality as a minimum:
 - a. Point database editing, storage and downloading of controller databases.
 - b. Scheduling and override of building environmental control systems.
 - c. Collection and analysis of historical data.
 - d. Alarm reporting, routing, messaging, and acknowledgement.
 - e. Definition and construction of dynamic color graphic displays.
 - f. Real-time graphical viewing and control of environment.
 - g. Scheduling trend reports.
 - h. Program editing.
 - i. Operating activity log and system security.
 - j. Transfer data to third party software.
14. Provide functionality such that using the least number of steps to initiate the desired event may perform any of the following simultaneously:
 - a. Dynamic color graphics and graphic control.
 - b. Alarm management.
 - c. Event scheduling.
 - d. Dynamic trend definition and presentation.
 - e. Program and database editing.
 - f. Each operator shall be required to log on to the system with a username and password to view, edit or delete the data. System security shall be selectable for each operator, and the password shall be able to restrict the operator's access for viewing and changing the system programs. Each operator shall automatically be logged off the system if no keyboard or mouse activity is detected for a selected time.
15. Graphic Displays: At minimum the CPM shall be designed, configured and programmed to collect and provide the following data regarding the installed equipment

- Selector Position (Mode)
 - Operational Mode
 - Persisting Command
 - Interlock Alarm
 - Alert/Trip Status
 - Total and Last start Run Time
 - Equipment Operational Parameters (as approved for each equipment)
 - Trend for above
- a. The workstation shall allow the operator to access various system schematics and floor plans via a graphical penetration scheme, menu selection, or text-based commands. Graphic software shall permit the importing of AutoCAD or scanned pictures in the industry standard format (such as PCX, BMP, GIF, and JPEG) for use in the system.
 - b. System Graphics shall be project specific and schematically correct for each system. (i.e.: coils, fans, dampers located per equipment) Standard system graphics that do not match equipment or system configurations are prohibited. Operator shall have capability to manually operate the entire system from each graphic screen at the ECC. Each system graphic shall include a button/tab to a display of the applicable sequence of operation.
 - c. Dynamic temperature values, humidity values, flow rates, and status indication shall be shown in their locations and shall automatically update to represent current conditions without operator intervention and without pre-defined screen refresh values.
 - d. Color shall be used to indicate status and change in status of the equipment. The state colors shall be user definable.
 - e. A clipart library of HVAC equipment, such as chillers, cooling towers, air handling units, fans, terminal units, pumps, coils, standard ductwork, piping, valves and laboratory symbols shall be provided in the system. The operator shall have the ability to add custom symbols to the clipart library.
 - f. A dynamic display of the site-specific architecture showing status of the controllers, the ECC and network shall be provided.
 - g. The windowing environment of the workstation shall allow the user to simultaneously view several applications at a time to analyze total building operation or to allow the display of graphic associated with an alarm to be viewed without interrupting work in progress. The graphic system software shall also have the capability to split screen, half portion of the screen with graphical representation and the other half with sequence of operation of the same HVAC system.
16. Trend reports shall be generated on demand or pre-defined schedule and directed to monitor display, printers or disk. As a minimum, the system shall allow the operator to easily obtain the following types of reports:
- a. A general list of all selected points in the network.
 - b. List of all points in the alarm.
 - c. List of all points in the override status.
 - d. List of all disabled points.

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- e. List of all points currently locked out.
 - f. List of user accounts and password access levels.
 - g. List of weekly schedules.
 - h. List of holiday programming.
 - i. List of limits and dead bands.
 - j. Custom reports.
 - k. System diagnostic reports, including, list of digital controllers on the network.
 - l. List of programs.
17. ASHRAE Standard 147 Report: Provide a daily report that shows the operating condition of each chiller as recommended by ASHRAE Standard 147. At a minimum, this report shall include:
- a. Chilled water (or other secondary coolant) inlet and outlet temperature
 - b. Chilled water (or other secondary coolant) flow
 - c. Chilled water (or other secondary coolant) inlet and outlet pressures
 - d. Evaporator refrigerant pressure and temperature
 - e. Condenser refrigerant pressure and liquid temperature
 - f. Condenser water inlet and outlet temperatures
 - g. Condenser water flow
 - h. Refrigerant levels
 - i. Oil pressure and temperature
 - j. Oil level
 - k. Compressor refrigerant discharge temperature
 - l. Compressor refrigerant suction temperature
 - m. Addition of refrigerant
 - n. Addition of oil
 - o. Vibration levels or observation that vibration is not excessive
 - p. Motor amperes per phase
 - q. Motor volts per phase
 - r. PPM refrigerant monitor level
 - s. Purge exhaust time or discharge count
 - t. Ambient temperature (dry-bulb and wet-bulb)
 - u. Date and time logged
18. Electrical, Gas, and Weather Reports
- a. Electrical Meter Report: Provide a monthly report showing the daily electrical consumption and peak electrical demand with time and date stamp for each building meter.
 - b. Provide an annual (12-month) summary report showing the monthly electrical consumption and peak demand with time and date stamp for each meter.
 - c. Water Meter Report: Provide a monthly report showing the daily water consumption for each installed meter (total quantity 04). Provide an annual (12-month) report that shows the monthly consumption for each meter.
 - d. Weather Data Report: Provide a monthly report showing the daily minimum, maximum, and average outdoor air temperature, as well as the number of heating and cooling degree-days for each day. Provide an annual (12-month) report showing the minimum, maximum, and average outdoor air temperature for the month, as well as the number of heating and cooling degree-days for the month.
19. Scheduling and Override:
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- a. Provide override access through menu selection from the graphical interface and through a function key.
 - b. Provide a calendar type format for time-of-day scheduling and overrides of chiller/building control systems. Schedules reside in the ECC. The digital controllers shall ensure equipment time scheduling when the ECC is off-line. The ECC shall not be required to execute time scheduling. Provide the following spreadsheet graphics as a minimum:
 - 1) Weekly schedules.
 - 2) Zone schedules, minimum of 100 zones.
 - 3) Scheduling up to 365 days in advance.
 - 4) Scheduled reports to print at workstation.
20. Collection and Analysis of Historical Data:
- a. Provide trending capabilities that will allow the operator to monitor and store records of system activity over an extended period. Points may be trended automatically on time-based intervals or change of value, both of which shall be user definable. The trend interval could be five (1) minutes to 200 hours. Trend data may be stored on hard disk for future diagnostic and reporting. Additionally trend data may be archived to network drives or removable disk media for off-site retrieval.
 - b. Reports may be customized to include individual points or predefined groups of at least six points. Provide additional functionality to allow pre-defined groups of up to 250 trended points to be easily accessible by other industry standard word processing and spreadsheet packages. The reports shall be time and date stamped and shall contain a report title and the name of the facility.
 - c. System shall have the set up to generate spreadsheet reports to track energy usage and cost based on weekly or monthly interval, equipment run times, equipment efficiency, and/or building environmental conditions.
 - d. Provide additional functionality that will allow the operator to view real time trend data on trend graph displays. A minimum of 20 points may be graphed regardless of whether they have been predefined for trending. In addition, the user may pause the graph and take snapshots of the screens to be stored on the workstation disk for future reference and trend analysis. Exact point values may be viewed, and the graph may be printed. Operator shall be able to command points directly on the trend plot by double clicking on the point.
21. Alarm Management:
- a. Alarm routing shall allow the operator to send alarm notification to selected printers or operator workstation based on time of day, alarm severity, or point type.
 - b. Alarm notification shall be provided via two alarm icons, to distinguish between routine, maintenance type alarms and critical alarms. The critical alarms shall display on the screen at the time of its occurrence, while others shall display by clicking on their icon.
 - c. Alarm display shall list the alarms with highest priority at the top of the display. The alarm display shall provide selector buttons for display of the associated point graphic and message in English language. The operator shall be able to sort out the alarms.
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- d. Alarm messages shall be customized for each point to display detailed instructions to the operator regarding actions to take in the event of an alarm.
 - e. An operator with proper security level access may acknowledge and clear the alarm. All that have not been cleared shall be archived at workstation disk.
22. Remote Communications: The system shall have the ability to dial out in the event of an alarm. Receivers shall include operator workstations, e-mail addresses, mobile SMS services, and alpha-numeric pagers. The alarm message shall include the name of the calling location, the device that generated the alarm, and the alarm message itself.
23. System Configuration:
- a. Network control strategies shall not be restricted to a single digital controller but shall be able to include data from all other network devices to allow the development of global control strategies.
 - b. Provide automatic backup and restore of all digital controller databases on the workstation hard disk. In addition to all backup data, all databases shall be performed while the workstation is on-line without disturbing other system operations.

BACNET DEVICES

A. All BACnet Devices – controllers, gateways, routers, actuators, Operator Displays, and sensors shall conform to BACnet Device Profiles and shall be BACnet Testing Laboratories (BTL) -Listed as conforming to those Device Profiles. Protocol Implementation Conformance Statements (PICSs), describing the BACnet capabilities of the Devices shall be published and available for the Devices through links in the BTL website.

- 1. BACnet Chiller/Building Controllers, shall conform to the BACnet B-BC Device Profile, and shall be BTL-Listed as conforming to the B-BC Device Profile. The Device's PICS shall be submitted.
- 2. BACnet Advanced Application Controllers shall conform to the BACnet B-AAC Device Profile and shall be BTL-Listed as conforming to the B-AAC Device Profile. The Device's PICS shall be submitted.
- 3. BACnet Application Specific Controllers shall conform to the BACnet B-ASC Device Profile and shall be BTL-Listed as conforming to the B-ASC Device Profile. The Device's PICS shall be submitted.
- 4. BACnet Smart Actuators shall conform to the BACnet B-SA Device Profile and shall be BTL-Listed as conforming to the B-SA Device Profile. The Device's PICS shall be submitted.
- 5. BACnet Smart Sensors shall conform to the BACnet B-SS Device Profile and shall be BTL-Listed as conforming to the B-SS Device Profile. The Device's PICS shall be submitted.
- 6. BACnet routers and gateways shall conform to the BACnet B-OTH Device Profile, and shall be BTL-Listed as conforming to the B-OTH Device Profile. The Device's PICS shall be submitted.

3) BACnet PROTOCOL ANALYZER

For ease of troubleshooting and maintenance, provide a BACnet protocol analyzer. Provide its associated fittings, cables and appurtenances, for connection to the communications network. The BACnet protocol analyzer shall be able to, at a



minimum: capture and store to a file all data traffic on all network levels; measure bandwidth usage; filter out (ignore) selected traffic.

4) NETWORK AND DEVICE NAMING CONVENTION

A. Network Numbers

1. BACnet network numbers shall be based on a "facility code, network" concept. The "facility code" is the JIUB or JIAP UB assigned numeric value assigned to a specific facility or building. The "network" typically corresponds to a "floor" or other logical configuration within the building. BACnet allows 65535 network numbers per BACnet internet work.
2. The network numbers are thus formed as follows: "Net #" = "FFFNN" where:
 - a. FFF = Facility code (see below)
 - b. NN = 00-99 This allows up to 100 networks per facility or building

B. Device Instances

1. BACnet allows 4194305 unique device instances per BACnet internet work. Using Agency's unique device instances are formed as follows: "Dev #" = "FFFNDD" where
 - a. FFF and N are as above and
 - b. DD= 00-99, this allows up to 100 devices per network.
2. Note Special cases, where the network architecture of limiting device numbering to DD causes excessive subnet works. The device number can be expanded to DDD and the network number N can become a single digit. In NO case shall the network number N and the device number D exceed 4 digits.
3. Facility code assignments:
4. 000-400 Building/facility number
5. Note that some facilities have a facility code with an alphabetic suffix to denote wings, related structures, etc. The suffix will be ignored. Network numbers for facility codes greater than 400 will be assigned in the range 000-399.

C. Device Names

1. Name the control devices based on facility name, location within a facility, the system or systems that the device monitors and/or controls, or the area served. The intent of the device naming is to be easily recognized. Names can be up to 254 characters in length, without embedded spaces. Provide the shortest descriptive, but unambiguous, name. For example, in Utility Building, if there is only one chilled water pump "CHWP-1", a valid name would be "UB.CHWP.1.STARTSTOP". If there are two pumps designated "CHWP-1", one in a basement mechanical room (Room 0001) and one in a penthouse mechanical room (Room PH01), the names could be "UB.R0001.CHWP.1. STARTSTOP" or "UB.RPH01.CHWP.1.STARTSTOP". In the case of unitary controllers, for example a VAV box controller, a name might be "UB.R101.VAV". These names should be used for the value of the "Object Name" property of the BACnet Device objects of the controllers involved so that the BACnet name and the EMCS name are the same.

5) BACnet DEVICES

All BACnet Devices – controllers, gateways, routers, actuators, Operator Displays, and sensors shall conform to BACnet Device Profiles and shall be BACnet Testing Laboratories (BTL) -Listed as conforming to those Device Profiles. Protocol Implementation Conformance Statements (PICSs), describing the BACnet capabilities of the Devices shall be published and available for the Devices through links in the BTL website.

2. BACnet Chiller/Building Controllers, shall conform to the BACnet B-BC Device Profile, and shall be BTL-Listed as conforming to the B-BC Device Profile. The Device's PICS shall be submitted.
3. BACnet Advanced Application Controllers shall conform to the BACnet B-AAC Device Profile and shall be BTL-Listed as conforming to the B-AAC Device Profile. The Device's PICS shall be submitted.
4. BACnet Application Specific Controllers shall conform to the BACnet B-ASC Device Profile and shall be BTL-Listed as conforming to the B-ASC Device Profile. The Device's PICS shall be submitted.
5. BACnet Smart Actuators shall conform to the BACnet B-SA Device Profile and shall be BTL-Listed as conforming to the B-SA Device Profile. The Device's PICS shall be submitted.
6. BACnet Smart Sensors shall conform to the BACnet B-SS Device Profile and shall be BTL-Listed as conforming to the B-SS Device Profile. The Device's PICS shall be submitted.
7. BACnet routers and gateways shall conform to the BACnet B-OTH Device Profile, and shall be BTL-Listed as conforming to the B-OTH Device Profile. The Device's PICS shall be submitted.

6) CONTROLLERS

A. General. Provide an adequate number of BTL listed B-BC building controllers, BTL listed B-AAC, BTL listed B-ASC, BTL listed B-SA, and BTL listed B-SS's to achieve the required "System Performance." Each of these controllers shall meet the following requirements.

1. Communication.
 - a. Each B-BC controller shall reside on a BACnet network using the ISO 8802-3 (Ethernet) Data Link/Physical layer protocol for its communications.
 - b. Each B-BC controller shall provide a service communication port using BACnet Data Link/Physical layer protocol for connection to a portable operator's terminal. If this port is not available built into the controller, contractor is to install a 4 port unmanaged switch inside the B-BC control cabinet.
2. Keypad. A local keypad and display shall be provided for each controller. The keypad shall be provided for interrogating and editing data. Provide a system security password to prevent unauthorized use of the keypad and display.
3. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.

4. Memory. The controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.
5. The controller shall be able to operate at 90 percent to 110 percent of nominal voltage rating and shall perform an orderly shutdown less than 80 percent nominal voltage. Controller operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 watt at 1 meter (3 feet).
6. Transformer. Power supply for the ASC must be rated at a minimum of 125 percent of B-ASC power consumption and shall be of the fused or current limiting type.

B. Provide BTL-Listed B-ASC application specific controllers (if applicable to meet the required output) for each piece of equipment for which they are constructed. Application specific controllers shall communicate with other BACnet devices on the internetwork using the BACnet Read (Execute) Property service.

1. Each B-ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
2. Each B-ASC will contain sufficient I/O capacity to control the target system.
3. Communication.
 - a. Each controller shall reside on a BACnet network using the ISO 8802-3 (Ethernet) Data Link/Physical layer protocol for its communications. Each chiller/building controller also shall perform BACnet routing if connected to a network of custom application and application specific controllers.
 - b. Each controller shall have a BACnet Data Link/Physical layer compatible connection for a laptop computer or a portable operator's tool. This connection shall be extended to a space temperature sensor port where shown.
4. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
5. Memory. The application specific controller shall use nonvolatile memory and maintain all BIOS and programming information in the event of a power loss.
6. Immunity to power and noise. Controllers shall be able to operate at 90 percent to 110 percent of nominal voltage rating and shall perform an orderly shutdown below 80 percent. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 watts at 1 meter (3 feet).

C. Direct Digital Controller Software

1. The software programs specified in this section shall be commercially available, concurrent, multi-tasking operating system and support the use of software application that operates under Operating System.
2. All points shall be identified by up to 30-character point name and 16-character point descriptor. The same names shall be used at the ECC.
3. All control functions shall execute within the stand-alone control units. All new controllers installed will also include all software and/or hardware required to program, commission, or alter the sequence of operation of said controller(s). Controllers requiring software or hardware that is not commercially available will not be allowed. Installation of software and/or hardware for controller configuration will be the responsibility of the Contractor. The PAA shall be able to customize control strategies and sequences of operations defining the

appropriate control loop algorithms and choosing the optimum loop parameters without requiring the services of the Contractor.

4. All controllers shall be capable of being programmed to utilize stored default values for assured fail-safe operation of critical processes. Default values shall be invoked upon sensor failure or, if the primary value is normally provided by the central or another CU, or by loss of bus communication. Individual application software packages shall be structured to assume a fail-safe condition upon loss of input sensors. Loss of an input sensor shall result in output of a sensor-failed message at the ECC. Each ACU and RCU shall have capability for local readouts of all functions. The UCUs shall be read remotely.
5. All DDC control loops shall be able to utilize any of the following control modes:
 - a. Two position (on-off, slow-fast) control.
 - b. Proportional control.
 - c. Proportional plus integral (PI) control.
 - d. Proportional plus integral plus derivative (PID) control. All PID programs shall automatically invoke integral wind up prevention routines whenever the controlled unit is off, under manual control of an automation system or time-initiated program.
 - e. Automatic tuning of control loops.
6. System Security: Operator access shall be secured using individual password and operator's name. Passwords shall restrict the operator to the level of object, applications, and system functions assigned to him. A minimum of three (3) or a maximum of six (6) levels of security for operator access shall be provided.
7. Application Software: The controllers shall provide the following programs as a minimum for the purpose of optimizing energy consumption while maintaining comfortable environment for occupants. All application software shall reside and run in the system digital controllers. Editing of the application shall occur at the ECC or via a portable operator's terminal, when it is necessary, to access directly the programmable unit.
 - a. Power Demand Limiting (PDL): Power demand limiting program shall monitor the chiller/building power consumption and limit the consumption of electricity to prevent peak demand charges. PDL shall continuously track the electricity consumption from a pulse input generated at the kilowatt-hour/demand electric meter. PDL shall sample the meter data to continuously forecast the electric demand likely to be used during successive time intervals. If the forecast demand indicates that electricity usage will likely to exceed a user preset maximum allowable level, then PDL shall automatically shed electrical loads. Once the demand load has met, loads that have been shed shall be restored and returned to normal mode. Control system shall be capable of demand limiting by resetting the HVAC system set points to reduce load while maintaining indoor air quality.
 - b. Economizer: An economizer program shall be provided for VAV systems. This program shall control the position of air handler relief, return, and outdoor dampers. If the outdoor air dry bulb temperature and humidity fall below changeover set point the energy control center will modulate the dampers to provide 100 percent outdoor air. The operator shall be able to override the economizer cycle and return to minimum outdoor air operation at any time.

- c. Night Setback/Morning Warm up Control: The system shall provide the ability to automatically adjust set points for this mode of operation.
- d. Optimum Start/Stop (OSS): Optimum start/stop program shall automatically be coordinated with event scheduling. The OSS program shall start HVAC equipment at the latest possible time that will allow the equipment to achieve the desired zone condition by the time of occupancy, and it shall also shut down HVAC equipment at the earliest possible time before the end of the occupancy period and still maintain desired comfort conditions. The OSS program shall consider both outside weather conditions and inside zone conditions. The program shall automatically assign longer lead times for weekend and holiday shutdowns. The program shall poll all zones served by the associated AHU and shall select the warmest and coolest zones. These shall be used in the start time calculation. It shall be possible to assign occupancy start times on a per air handler unit basis. The program shall meet the local code requirements for minimum outdoor air while the building is occupied. Modification of assigned occupancy start/stop times shall be possible via the ECC.
- e. Event Scheduling: Provide a comprehensive menu driven program to automatically start and stop designated points or a group of points according to a stored time. This program shall provide the capability to individually command a point or group of points. When points are assigned to one common load group it shall be possible to assign variable time advances/delays between each successive start or stop within that group. Scheduling shall be calendar based and advance schedules may be defined up to one year in advance. Advance schedule shall override the day-to-day schedule. The operator shall be able to define the following information:
 - 1) Time, day.
 - 2) Commands such as on, off, auto.
 - 3) Time delays between successive commands.
 - 4) Manual overriding of each schedule.
 - 5) Allow operator intervention.
- f. Alarm Reporting: The operator shall be able to determine the action to be taken in the event of an alarm. Alarms shall be routed to the ECC based on time and events. An alarm shall be able to start programs, login the event, print and display the messages. The system shall allow the operator to prioritize the alarms to minimize nuisance reporting and to speed operator's response to critical alarms. A minimum of six (6) priority levels of alarms shall be provided for each point.
- g. Remote Communications: The system shall have the ability to dial out in the event of an alarm to the ECC, mobile SIM service and alpha-numeric pagers. The alarm message shall include the name of the calling location, the device that generated the alarm, and the alarm message itself. The operator shall be able to remotely access and operate the system using dial up communications. Remote access shall allow the operator to function the same as local access.
- h. Maintenance Management (PM): The program shall monitor equipment status and generate maintenance messages based upon the operators defined equipment run time, starts, and/or calendar date limits. A preventative

maintenance alarm shall be printed indicating maintenance requirements based on pre-defined run time. Each preventive message shall include point description, limit criteria and preventative maintenance instruction assigned to that limit. A minimum of 480-character PM shall be provided for each component of units such as air handling units.

- i. Chilled water Plant Operation: This program shall have the ability to sequence the multiple chillers to minimize energy consumption. The program shall provide sequence of operation as described on the drawings and include the following as a minimum:
 - 1) Automatic start/stop of chillers and auxiliaries in accordance with the sequence of operation shown on the drawings, while incorporating requirements and restraints, such as starting frequency of the equipment imposed by equipment manufacturers.
 - 2) Secondary chilled water pumps and controls.
 - 3) Generate chilled water plant load profiles for different seasons for use in forecasting efficient operating schedule.
 - 4) Cooling Tower Operation Program: The objective of cooling tower control is to optimize chiller/tower energy use within the equipment restraints and minimum condenser water temperature limit recommended by the equipment manufacturer. Maintain chilled water plant performance records and print reports at intervals selected by the operator. It shall be possible for the operator to change the set points and the operating schedule.
 - 5) The chilled water plant program shall display the following as a minimum:
 - a) Secondary chilled flow rate.
 - b) Secondary chilled water supply and return temperature.
 - c) Condenser water supply and return temperature.
 - d) Outdoor air dry bulb temperature.
 - e) Outdoor air wet bulb temperature.
 - f) Ton-hours of chilled water per day/month/year.
 - g) On-off status for each chiller.
 - h) Chilled water flow rate.
 - i) Chilled water supply and return temperature.
 - j) Operating set points-temperature and pressure.
 - k) Kilowatts and power factor.
 - l) Current limit set point.
 - m) Date and time.
 - n) Operating or alarm status.
 - o) Operating hours.
 - p) Cooler Shell Approach
 - q) Condenser Shell Approach
 - r) Cooling Tower Approach

7) SENSORS (AIR, WATER AND ELECTRICITY)

A. Sensors' measurements shall be read back to the DDC system, and shall be visible by the ECC.

B. Temperature and Humidity Sensors shall be weather-proof, vibration and corrosion resistant for wall, immersion, and/or duct mounting. Provide all remote sensors as required for the systems.

1. Temperature Sensors: thermistor type for terminal units and Resistance Temperature Device (RTD) with an integral 4-20 mA or 0-10 VDC transmitter type for all other sensors.
 - a. Duct sensors shall be rigid or averaging type as shown on drawings. Averaging sensor shall be a minimum of 1 linear foot of sensing element for each square feet of cooling/heating coil face area.
 - b. Immersion sensors shall be provided with a separable well made of stainless steel. Pressure rating of well is to be consistent with the system pressure in which it is to be installed. Temperature well shall be filled with a thermal compound compatible with installed sensor.
 - c. All space sensors shall be equipped with in-space User set-point adjustment, override switch, numerical temperature display on sensor cover, and BACnet communication port. Match room thermostats. Provide a tooled-access cover.
 - 1) Equipment room/space sensor: set point adjustment shall be only through the ECC or through the DDC system's diagnostic device/laptop. Do not provide in-space User set-point adjustment. Provide a stainless-steel cover plate with an insulated back and security screws if needed to restrict in-space User set-point adjustment.
 - d. Outdoor air temperature sensors shall have watertight inlet fittings and be shielded from direct sunlight.
 - e. Door/Room security sensors shall have stainless steel cover plate with insulated back and security screws.
 - f. Wire: Twisted, shielded-pair cable.
 - g. Output Signal: 4-20 mA or 0-10 VDC.
2. Humidity Sensors: Bulk polymer sensing element type.
 - a. Duct and room sensors shall have a sensing range of 20 to 80 percent with accuracy of ± 2 to ± 5 percent RH, including hysteresis, linearity, and repeatability.
 - b. Outdoor humidity sensors shall be furnished with element guard and mounting plate and have a sensing range of 0 to 100 percent RH. All outdoor installations shall be Stainless Steel based.
 - c. Continuous Output Signal: 4-20 mA or 0-10 VDC.

C. Static Pressure Sensors: Non-directional, temperature compensated.

1. 4-20 mA or 0-10 VDC output signal.
2. 0 to 5 inches wg for duct static pressure range.
3. 0 to 0.25 inch wg for Building static pressure range.

D. Vortex / Magnetic Water flow sensors:

1. Type: Insertion vortex type with retractable probe assembly and 2 inch full port gate valve.
 - a. Pipe size: up to DN 600.
 - b. Retractor: ASME threaded, non-rising stem type with hand wheel.
 - c. Mounting connection: 2 inch 150 PSI flange or thread.
 - d. Sensor assembly: Design for expected water flow and pipe size.
 - e. Seal: Teflon (PTFE).

2. Controller:
 - a. Integral to unit.
 - b. Locally display flow rate and total.
 - c. Output flow signal to BAS/EMS/BES/BMCS: Digital pulse or BACnet type.
3. Performance:
 - a. Turndown: 20:1
 - b. Response time: Adjustable from 1 to 100 seconds.
 - c. Power: 24 volt AC or DC
4. Install flow meters according to manufacturer's recommendations. Where recommended by manufacturer because of mounting conditions, provide flow rectifier.

E. Flow switches:

1. Shall be either paddle or differential pressure type.
 - a. Paddle-type switches (liquid service only) shall be UL Listed, SPDT snap-acting, adjustable sensitivity with NEMA 4 enclosure.
 - b. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap acting, NEMA 4 enclosure, with scale range and differential suitable for specified application.

F. Current Switches: Current operated switches shall be self powered, solid state with adjustable trip current as well as status, power, and relay command status LED indication. The switches shall be selected to match the current of the application and output requirements of the systems.

8) CONTROL CABLES

A. General:

1. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
2. Cable conductors to provide protection against induction in circuits. Crosstalk attenuation within the System shall be in excess of -80 dB throughout the frequency ranges specified.
3. Minimize the radiation of RF noise generated by the System equipment so as not to interfere with any audio, video, data, computer main distribution frame (MDF), telephone customer service unit (CSU), and electronic private branch exchange (EPBX) equipment the System may service.
4. The as-installed drawings shall identify each cable as labeled, used cable, and bad cable pairs.
5. Label system's cables on each end. Test and certify cables in writing to the VA before conducting proof-of-performance testing. Minimum cable test requirements are for impedance compliance, inductance, capacitance, signal level compliance, opens, shorts, cross talk, noise, and distortion, and split pairs on all cables in the frequency ranges used. Make available all cable installation and test records at demonstration to the PAA. All changes (used pair, failed pair, etc.) shall be posted in these records as the change occurs.

6. Power wiring shall not be run in conduit with communications trunk wiring or signal or control wiring operating at 100 volts or less.
- B. Analogue control cabling shall be not less than No. 18 AWG solid or stranded, with thermoplastic insulated conductors.
- C. Copper digital communication cable between the ECC and the B-BC and B-AAC controllers shall be 100BASE-TX Ethernet, Category 5e or 6, not less than minimum 24 American Wire Gauge (AWG) solid, Shielded Twisted Pair (STP) or Unshielded Twisted Pair (UTP), with thermoplastic insulated conductors, enclosed in a thermoplastic outer jacket.
1. Other types of media commonly used within IEEE Std 802.3 LANs (e.g., 10Base-T and 10Base-2) shall be used only in cases to interconnect with existing media.
- D. All MS/TP communications cables for devices utilizing the EIA-485 standard must be listed for use on EIA-485 networks by the manufacturer of the cable. This requirement overrides any cable recommendation by the controller manufacturer. The use of EIA-485 communication cables shall not affect the warranty from the installing DDC contractor. Cables shall have the following characteristic:
1. Nominal Impedance: 100-130 Ohms
 2. Twisted/shielded construction of 1, 1.5, or 2 pairs depending on controller requirements.
 3. Be plenum rated when required
 4. Cables designated for use by the cable manufacturer for use in PA or Speaker systems shall not be allowed, regardless of recommendations by the controller manufacturer.
- E. Optical digital communication fiber, if used, shall be Multimode or Single mode fiber, 62.5/125 micron for multimode or 10/125 micron for single mode micron with SC or ST connectors as specified in TIA-568-C.1. Terminations, patch panels, and other hardware shall be compatible with the specified fiber and shall be as specified in Section 27 15 00. Fiber-optic cable shall be suitable for use with the 100Base-FX or the 100Base-SX standard (as applicable) as defined in IEEE Std 802.3.

9) EXECUTION

INSTALLATION

i. General:

1. Examine project plans for control devices and equipment locations; and report any discrepancies, conflicts, or omissions to PAA for resolution before proceeding for installation.
2. Utilization of existing cable containment must be ensured. Install equipment, piping, wiring /conduit parallel to or at right angles to building lines.
3. Install all equipment and piping in readily accessible locations. Do not run tubing and conduit concealed under insulation or inside ducts.
4. Mount control devices, tubing and conduit located on ducts and apparatus with external insulation on standoff support to avoid interference with insulation.

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5. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
 6. Run tubing and wire connecting devices on or in control cabinets parallel with the sides of the cabinet neatly racked to permit tracing.
 7. Install equipment level and plumb.
- ii. Electrical Wiring Installation:
1. All wiring and cabling shall be installed in conduits. Install conduits and wiring in accordance with best Engineering practices and Local Code. Conduits carrying control wiring and cabling shall be dedicated to the control wiring and cabling; these conduits shall not carry power wiring. Provide plastic end sleeves at all conduit terminations to protect wiring from burrs.
 2. Install analog signal and communication cables in conduit and in accordance with best Engineering practices and Local Code.
 3. Install conduit and wiring between operator workstation(s), digital controllers, electrical panels, indicating devices, instrumentation, miscellaneous alarm points, thermostats, and relays as per site provisions and approved by PAA.
 4. Install all electrical work required for a fully functional system and not shown on electrical plans or required by electrical specifications. Where low voltage (less than 50 volt) power is required, provide suitable Class B transformers.
 5. Install all system components in accordance with local Building Code and National Electric Code.
 - a. Splices: Splices in shielded and coaxial cables shall consist of terminations and the use of shielded cable couplers. Terminations shall be in accessible locations. Cables shall be harnessed with cable ties.
 - b. Equipment: Fit all equipment contained in cabinets or panels with service loops, each loop being at least 300 mm (12 inches) long. Equipment for fiber optics system shall be rack mounted, as applicable, in ventilated, self-supporting, code gauge steel enclosure. Cables shall be supported for minimum sag.
 - c. Cable Runs: Keep cable runs as short as possible. Allow extra length for connecting to the terminal board. Do not bend flexible coaxial cables in a radius less than ten times the cable outside diameter.
 - d. Use vinyl tape, sleeves, or grommets to protect cables from vibration at points where they pass around sharp corners, through walls, panel cabinets, etc.
 6. Conceal cables, except in mechanical rooms and areas where other conduits and piping are exposed.
 7. Permanently label or code each point of all field terminal strips to show the instrument or item served. Color-coded cable with cable diagrams may be used to accomplish cable identification.



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8. Grounding: ground electrical systems per manufacturer's written requirements for proper and safe operation.
- iii. Install Sensors and Controls:
1. Temperature Sensors:
 - a. Install all sensors and instrumentation according to manufacturer's written instructions. Temperature sensor locations shall be readily accessible, permitting quick replacement and servicing of them without special skills and tools.
 - b. Calibrate sensors to accuracy specified, if not factory calibrated.
 - c. Use of sensors shall be limited to its duty, e.g., duct sensor shall not be used in lieu of room sensor.
 - d. Install room sensors permanently supported on wall frame. They shall be mounted at 1.5 meter (5.0 feet) above the finished floor unless otherwise noted on the plans or drawings.
 - e. Mount sensors rigidly and adequately for the environment within which the sensor operates. Separate extended-bulb sensors from contact with metal casings and coils using insulated standoffs.
 - f. Sensors used in mixing plenum, and hot and cold decks shall be of the averaging of type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.
 - g. All pipe mounted temperature sensors shall be installed in wells.
 - h. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor reading.
 - i. Permanently mark terminal blocks for identification. Protect all circuits to avoid interruption of service due to short-circuiting or other conditions. Line-protect all wiring that comes from external sources to the site from lightning and static electricity.
 2. Pressure Sensors:
 - a. Install duct static pressure sensor tips facing directly downstream of airflow.
 - b. Install high-pressure side of the differential switch between the pump discharge and the check valve.
 - c. Install snubbers and isolation valves on steam pressure sensing devices.
 3. Actuators:
 - a. Mount and link damper and valve actuators according to manufacturer's written instructions.
 - b. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed position.



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- c. Check operation of valve/actuator combination to confirm that actuator modulates valve smoothly in both open and closed position.
 - 4. Flow Switches:
 - a. Install flow switch according to manufacturer's written instructions.
 - b. Mount flow switch a minimum of 6 to 10 pipe diameters up stream and 6 to 10 pipe diameters downstream or 600 mm (2 feet) whichever is greater, from fittings and other obstructions.
 - c. Assure correct flow direction and alignment.
 - d. Mount in horizontal piping-flow switch on top of the pipe.
 - iv. Installation of network:
 - 1. Ethernet:
 - a. The network shall employ Ethernet LAN architecture, as defined by IEEE 802.3. The Network Interface shall be fully Internet Protocol (IP) compliant allowing connection to currently installed IEEE 802.3, Compliant Ethernet Networks.
 - b. The network shall directly support connectivity to a variety of cabling types. As a minimum provide the following connectivity: 100 Base TX (Category 5e cabling) for the communications between the ECC and the B-BC and the B-AAC controllers.
 - 2. Third party interfaces: Contractor shall integrate real-time data from building systems by other trades and databases originating from other manufacturers as specified and required to make the system work as one system.
 - v. Installation of digital controllers and programming:
 - 1. Provide a separate digital control panel for each major piece of equipment, such as air handling unit, chiller, pumping unit, cooling towers etc. Points used for control loop reset such as outdoor air, outdoor humidity, or space temperature could be located on any of the remote-control units.
 - 2. Provide sufficient internal memory for the specified control sequences, alarm/alert, history and trend logging. There shall be a minimum of 50 percent of available memory free for future use.
 - 3. System point names shall be human readable, permitting easy operator interface without the use of a written point index.
 - 4. Provide software programming for the applications intended for the systems specified, and adhere to the strategy algorithms provided.
 - 5. Provide graphics for each piece of equipment and floor plan in the building. This includes each chiller, cooling tower, air handling unit, fan, terminal unit, cooling tower, pumping unit etc. These graphics shall show all points dynamically as specified in the point list.



SYSTEM VALIDATION AND DEMONSTRATION

- i. As part of final system acceptance, a system demonstration is required (see below). Prior to start of this demonstration, the contractor is to perform a complete validation of all aspects of the controls and instrumentation system. The system validation/test shall be part of the commissioning and shall be witnessed by the PAA.
- ii. Validation
 1. Prepare and submit for approval a validation test plan including test procedures for the performance verification tests. Test Plan shall be submitted for review with the control system submittal as indicated in paragraph 10 "Testing". Test Plan address all specified functions of the ECC and all specified sequences of operation. Explain in detail actions and expected results used to demonstrate compliance with the requirements of this specification. Explain the method for simulating the necessary conditions of operation used to demonstrate performance of the system. Test plan shall include a test check list to be used by the Installer's agent to check and initial that each test has been successfully completed. Deliver test plan documentation for the performance verification tests to the owner's representative 10 days prior to start of performance verification tests. Provide draft copy of operation and maintenance manual with performance verification test.
 2. After approval of the validation test plan, installer shall carry out all tests and procedures therein. Installer shall completely check out, calibrate, and test all connected hardware and software to ensure that system performs in accordance with approved specifications and sequences of operation submitted. Installer shall complete and submit Test Check List.
- iii. Demonstration
 1. System operation and calibration to be demonstrated by the installer in the presence of the PAA representative on random samples of equipment as dictated by the COR. Should random sampling indicate improper work, the owner reserves the right to subsequently witness complete calibration of the system at no addition cost to the PAA.
 2. Make accessible, personnel to provide necessary adjustments and corrections to systems as directed by balancing agency.
 3. The following witnessed demonstrations of field control equipment shall be included:
 - a. Observe HVAC systems in shut down condition. Check dampers and valves for normal position.
 - b. Test application software for its ability to communicate with digital controllers, operator workstation, and uploading and downloading of control programs.
 - c. Demonstrate the software ability to edit the control program off-line.

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- d. Demonstrate reporting of alarm conditions for each alarm and ensure that these alarms are received at the assigned location, including operator workstations.
 - e. Demonstrate ability of software program to function for the intended applications-trend reports, change in status etc.
 - f. Demonstrate via graphed trends to show the sequence of operation is executed in correct manner, and that the HVAC systems operate properly through the complete sequence of operation, e.g., seasonal change, occupied/unoccupied mode, and warm-up condition.
 - g. Demonstrate hardware interlocks and safeties functions, and that the control systems perform the correct sequence of operation after power loss and resumption of power loss.
 - h. Prepare and deliver to the PAA graphed trends of all control loops to demonstrate that each control loop is stable and the set points are maintained.
 - i. Demonstrate that each control loop responds to set point adjustment and stabilizes within one 1 minute. Control loop trend data shall be instantaneous and the time between data points shall not be greater than one (1) minute.
4. Witnessed demonstration of ECC functions shall consist of:
- a. Running each specified report.
 - b. Display and demonstrate each data entry to show site specific customizing capability. Demonstrate parameter changes.
 - c. Step through penetration tree, display all graphics, demonstrate dynamic update, and direct access to graphics.
 - d. Execute digital and analog commands in graphic mode.
 - e. Demonstrate DDC loop precision and stability via trend logs of inputs and outputs (6 loops minimum).
 - f. Demonstrate Energy Management System (EMS) performance via trend logs and command trace.
 - g. Demonstrate scan, update, and alarm responsiveness.
 - h. Demonstrate spreadsheet/curve plot software, and its integration with database.
 - i. Demonstrate on-line user guide, and help function and mail facility.
 - j. Demonstrate digital system configuration graphics with interactive upline and downline load, and demonstrate specified diagnostics.
 - k. Demonstrate multitasking by showing dynamic curve plot, and graphic construction operating simultaneously via split screen.
 - l. Demonstrate class programming with point options of beep duration, beep rate, alarm archiving, and color banding.//





For PAA

For Contractor

SAFETY

Provide hard-wired interlocked connections for such all applicable safety devices, such as freeze stats, smoke detectors, smoke dampers, and refrigerant leak detection devices. All safety devices shall be provided with additional dry contacts and shall be connected to the DDC system for monitoring and sequencing.

10) TESTING

1. All testing, calibration and setting of equipment and controls associated with this installation shall be performed and instruments, materials and labour necessary for the testing and pre-commissioning shall be supplied by the Contractor.
2. The Contractor shall be responsible for the complete and thorough testing, pre-commissioning and adjusting of the systems and equipment installed to bring the entire system into safe and reliable operation.
3. The Contractor shall be responsible for the testing of all control units, main cabling, sub-circuits, etc., and shall certify that they are safe and that they are installed in accordance with the requirements of the specification before supply is allowed to be energized.
4. There will be various level of On-site acceptance tests involved such as cable insulation test, resistance test, simulation test for all control and monitoring devices, loop test within DDC units and sub-systems control panels and switch boards....etc. On-site acceptance tests shall be performed as the pre-commissioning test at Jinnah International Airport. The Contractor shall submit the schedule and test procedure for this test to the PAA representative for approval fifteen (15) days before the test.
5. When any defects are detected, correct defects and repeat test at no additional cost or time to the PAA.
6. Test Plan
The Contractor shall state the following items in his proposal:
 - a. Proposed test schedule
 - b. Proposed major test items
 - c. Test or measuring equipment

For PAA

(lxi)

For Contractor



11) Chiller System Manager (CSM)

I. **General:**

The Chiller System Manager, CSM, shall issue enable/disable commands to each chiller PIC. A running status from the PIC to the CSM shall only be validated when the PIC has confirmed that the chiller auxiliary equipment (chilled water pump, cooling tower, oil pump, etc.) is and has operated correctly.

Each time a chiller is commanded on the CSM shall fully open the differential pressure valve(s). Whenever a chiller is running, the CSM shall modulate the differential pressure valve to maintain its adjustable differential pressure setpoint. The valve(s) opening rate shall be unrestricted to open the valve(s) quickly when a chiller starts. The closing rate shall be restricted to help prevent unstable operation.

II. **Occupancy:**

The CSM shall through its internal time schedule, an operator initiated timed override or a network command enable the chilled water plant control unless the operator has disabled the program through the toggle enable/disable point.

III. **Summer/Winter Selection Mode:**

The CSM shall automatically select one of two different chiller sequences based on operator adjustable calendar dates of November 1st (Winter mode) and March 1st (Summer mode). This sequence assumes that no chillers are running when the season changeover occurs and does not use the soft start demand limiting program. If the operator requests, the sequence shall be expanded to include both.

IV. **Summer Mode (with feathering chiller):**

After the CSM has determined that it is in occupied mode, it shall start the feathering chiller and allow its local PIC to control its capacity by sending the PIC a local Chilled Water setpoint to maintain.

Each PIC shall maintain its own ramping and loading rates.

V. **Additional Cooling Required:**

The first lead chiller shall be enabled to start if the inhibit timers are below the unoccupied time, the pulldown rate is less than .5°F/ minute, the running capacity is above a calculated value, and the supply water temperature is above the current supply water temperature setpoint plus an adjustable delta temperature value. After the CSM has proven that the first lead chiller was started successfully, it shall disable the feathering chiller. If the start inhibit timers are clear and the ACR routine determines that another stage of cooling is required, the feathering chiller shall once again be enabled. This sequence will continue to assume that load continues to increase until all chillers are enabled to run ending with the feathering chiller.

VI. Reduced Cooling Required:

The feathering chiller shall be disabled when the CSM determines through a load target program that the average %kW of all running chillers is at or below the corrected RCR kW setpoint, the control sensor is below its setpoint (plus the delta temperature entered), and the stop requirements for the delay timers have cleared. If the load continues to decrease and all of the requirements detailed above are true, the last lag chiller started shall be stopped and the feathering chiller shall be enabled. If the load continues to drop and all the RCR load conditions detailed above are still true, the feathering chiller shall be stopped. If the load continues to drop and all RCR requirements are true, the CSM shall start the feathering chiller and after proving its run status the CSM shall stop the next lag chiller.

This sequence will continue to assume that load conditions decrease until all chillers except for the feathering chiller are off.

VII. Summer Mode — Faulting:

If the feathering chiller is faulted by the CSM, it shall automatically send a stop command and start the next chiller in the sequence until the feathering chiller is available again. If the CSM faults any of the other chillers in the sequence, it shall automatically send a stop command to the faulted chiller, and shall start the next available chiller(s) until the on-line capacity is greater than or equal to the current load capacity (tons) prior to the fault. If the total on-line capacity is greater than or equal to the current load capacity prior to the chiller fault an additional chiller shall not be started.

VIII. Winter Mode (starting lead chiller):

After the CSM has determined that it is in occupied mode it shall start the reciprocating chiller and allow its local PIC to control its capacity by sending the PIC a local chilled water setpoint to maintain. Each PIC shall maintain its own ramping and loading rates.

IX. Additional Cooling Required:

The next chiller in the sequence shall be enabled to start if the inhibit timers are below the unoccupied time, the pulldown rate is less than .5°F/minute, the running capacity is above an operator entered value, and the supply water temperature is above the current supply water temperature setpoint plus an adjustable delta temperature value. After the CSM has proven that the first lead chiller was started successfully, it shall disable the reciprocating chiller and it shall be moved to the end of the start sequence. If the start inhibit timers are clear and the ACR routine determines that another stage of cooling is required, the second lead chiller shall be enabled. This sequence will continue to assume that load continues to increase until all chillers are enabled to run ending with the reciprocating chiller.

X. Reduced Cooling Required:

The last lag chiller started shall be disabled when the CSM determines through a load target program that the average %kW of all running chillers is at or below the

corrected RCR kW setpoint, the control sensor is below its setpoint (plus the delta temperature entered), and the stop requirements for the delay timers have cleared. If the load continues to decrease and all of the requirements detailed above are true, the next lag chiller started shall be stopped. When the load has reached a point that the CSM is ready to disable the last lead chiller, the CSM shall start the reciprocating chiller and after it has proven its running status, it shall disable the last centrifugal chiller.

XI. Winter Mode — Faulting:

If the reciprocating chiller is faulted by the CSM it shall automatically send a stop command and start the next lead chiller in the sequence. The reciprocating chiller shall be removed from the sequence until the chiller becomes available again.

If the CSM faults any of the other chillers in the sequence, it shall automatically send a stop command to the faulted chiller, and shall start the next available chiller if the on-line capacity is greater than or equal to the current load capacity (tons) prior to the fault. If the total on-line capacity is greater than or equal to the current load capacity prior to the chiller fault, an additional chiller shall not be started.

XII. Unoccupied:

The CSM shall automatically index the chilled water plant to an occupied mode based on its internal time schedules. When the chilled water plant becomes unoccupied, all chillers shall be stopped at one minute intervals.

For PAA

For Contractor

INSTALLATION OF CHILLER PLANT MANAGER AT UTILITY BUILDING JIAP

SUMMARY TABLE FOR CHILLER PLANT

Utility Building			HARDWARE								SOFTWARE														
			Output		input						Alarms				Applications										
			Digital		Digital				Analog																
System: Condenser Unit			Control Relays	2-Position Control	Flow Switch	Closed Limit Switch	Open Limit Switch	Zero Speed Switch	Temperature	Conductivity	Contact Closure		Run Time	High Limit		Optimum Start/Stop	Scheduled Start/Stop	Economizer	Chiller Optimization	Cooling Tower Profile	Condenser Water Reset			Failure Mode	
Quantity Required		1																							
Graphic Display		Yes																							
Point Description																									
Valve 1 – Condenser 1			X			X	X									X	X	X	X					C	
Valve 2 – Condenser 2			X			X	X									X	X	X	X					C	
Valve 3 – Condenser 3			X			X	X									X	X	X	X					C	
Valve 4 – Condenser 4			X			X	X									X	X	X	X					C	
Pump – 1 Condenser Water			X					X					X			X	X	X	X					C	
Pump – 2 Condenser Water			X					X					X			X	X	X	X					C	
Pump – 3 Condenser Water			X					X					X			X	X	X	X					C	
Pump – 4 Condenser Water			X					X					X			X	X	X	X					C	
Condenser Water Supply									X	X				X				X	X					N	
Condenser Water Blow down valve			X				X				X													N	
Condenser Water Return – 1					X																				
Condenser Water Return – 2					X															X					
Condenser Water Return – 3					X															X					
Condenser Water Return – 4					X															X					
Cooling Tower Fan – 1			X	X									X					X		X				C	
Cooling Tower Fan – 2			X	X									X					X		X				C	
Cooling Tower Fan – 3			X	X									X					X		X				C	
Cooling Tower Fan – 4			X	X									X					X		X				C	
Condenser – 1 Water supply									X										X	X					
Condenser – 2 Water supply									X										X	X					
Condenser – 3 Water supply									X										X	X					
Condenser – 4 Water supply									X										X	X					
N = LOCAL LOOP																									
C = LAST COMMAND																									

Utility Building		HARDWARE	SOFTWARE
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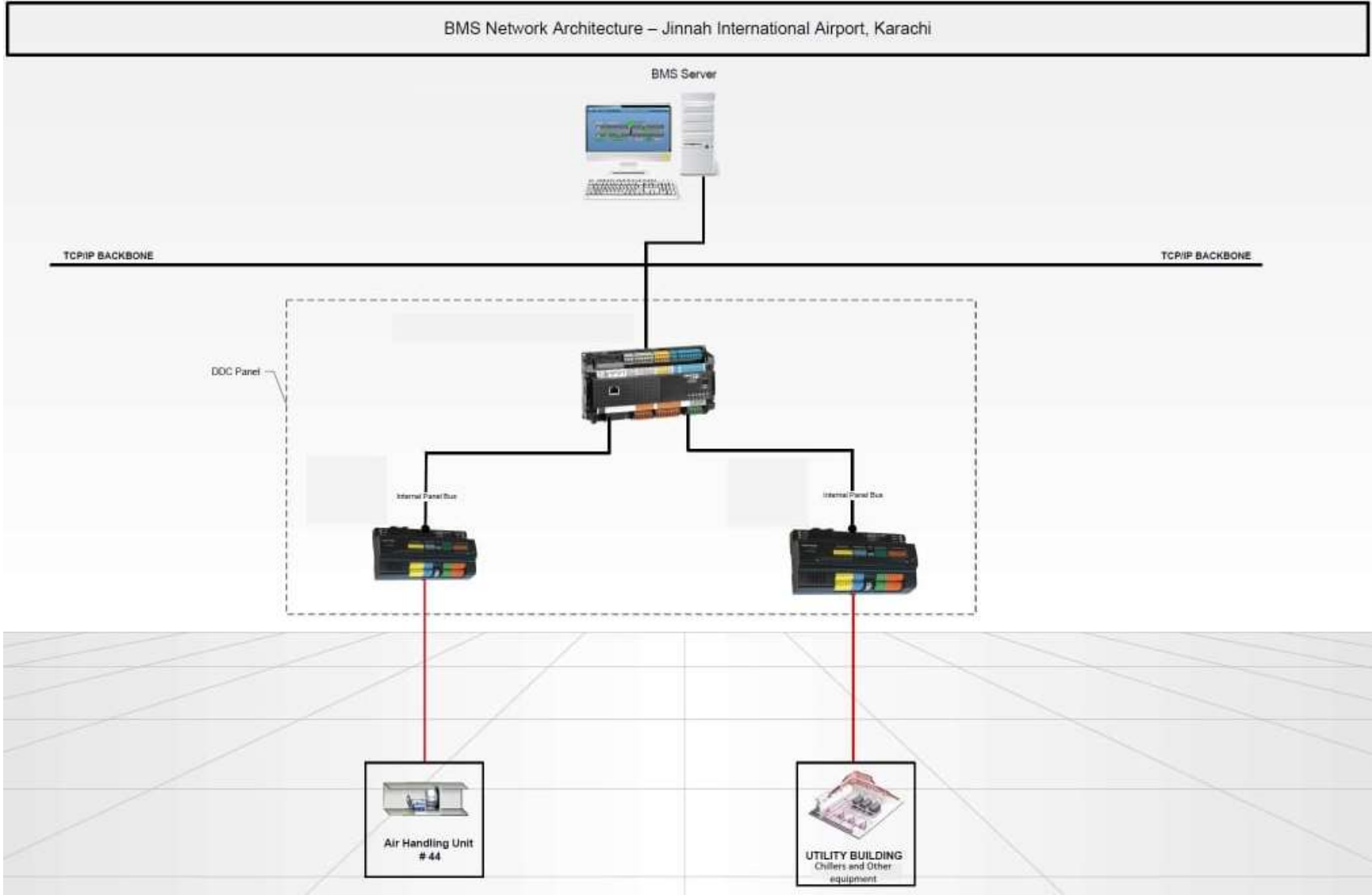
For Contractor

C = LAST COMMAND

Handwritten signature or mark.

For PAA

For Contractor



For Contractor
EXISTING AHU 44 CONTROL SCHEME

KARACHI INTERNATIONAL AIRPORT
SEQUENCE OF OPERATION

AHU TYPE 'G'

1. Supply Air Fan

The fan ON/OFF command from the CCC may either be automatic Time/Event programs or operator's specific request. Operator's command will always have higher priority over that of automatic programs. The FID monitors the ON/OFF status of the fan and this provided by the differential pressure switch across the fan (DP-3).

3. Chilled Water Valve

The chilled water valve is controlled by the return air temperatures (TE-2) according to a P-I algorithm computed by the FID. The supply air temperature (TE-1) provides a low limit override in that should the supply air temperature falls below the low limit, the chilled water valve will be forced closed. On the other hand, the return air relative humidity provides the high limit override. In the event the return air relative humidity rises above its high limit, the chilled water valve will be overridden full open. The supply air override has priority over that of return air relative humidity. The control signal to the chilled water valve defaults to zero when the supply air fan is OFF.

4. Fire Detection

FID monitors the status of the fire dampers via auxilliary contacts. Activation of any of these fire dampers will stop both the supply and return fans.

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GENERAL CONDITIONS OF CONTRACT**1 Definitions**

In the Contract (as hereinafter defined) the following words and expressions shall have the meanings assigned to them except where the context otherwise requires:

- 1.1 **“PAA”** means Pakistan Airports Authority and includes its duly authorized agents, successors and assigns.
- 1.2 **“Competent authority”** means an officer of PAA under whose competence the acceptance of bid lies.
- 1.3 **“Contractor”** means the person or persons, firm or Company whose Bid (as hereinafter defined) has been accepted by PAA and includes the Contractor’s personal representatives, successors and permitted assigns, but does not include any sub-contractor.
- 1.4 **“Divisional Engineer”** means an Engineer duly authorized by the PAA for execution of work.
- 1.5 **“Representative of Divisional Engineer”** means any duly authorized officer or officers appointed by the PAA to perform the duties set forth.
- 1.6 The expression **“Works”** means all the works specified or set forth and required in and by the said specifications, drawings and schedule hereto or to be hereafter specified or required in such explanatory instructions and drawings and also in such additional Instructions and drawings as such from time to time, during the progress of the work hereby contracted for, be supplied by PAA.
- 1.7 **“Contract”** means the Conditions of Contract specifications, Drawings, priced schedule of Quantities, Bid and the Contract Agreement.
- 1.8 **“Contract Price”** means the amount / sum stated in the letter of Acceptance, subject to such additions thereto or deductions there from as may be made under the provisions hereinafter contained.
- 1.9 **“Construction Plant”** means all appliances, equipment or things of whatsoever nature required in or about the execution, completion or maintenance of the Works or Temporary works.
- 1.10 **“Temporary Works”** means all temporary works of every kind required in or about the execution completion or maintenance of the work.
- 1.11 **“Drawings”** means the drawings referred to in the Specifications and any modifications of such drawings approved in writing by the PAA and such other drawings as may from time to time be furnished or approved in writing by the Divisional Engineer.
- 1.12 **“Site”** means the lands and other places on, under, in, through which the works are to be executed or carried out and any other lands or places provided by the PAA for purposes of the Contract.
- 1.13 **“Approved”** means approved in writing including subsequent written confirmation of previous verbal approval and “Approval” means approved in writing including as aforesaid.

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1.14 **“Bid”** means a tender, bid, or proposed remuneration, price, or cost submitted by a natural person, firm, corporation, or other legal entity in response to an invitation to bid, expressing the intent to undertake a specifically defined scope of works in conformity with the prescribed specifications, designs, drawings, instructions, and materials as stipulated under the Contract, and in compliance with all other applicable terms and conditions, including any and all annexures, schedules, or supplementary documents attached to or referenced in the offer.

- 2 Extent of Contract** The Contract comprises the construction, completion and maintenance of the Works and except in so far as the Contract otherwise provides, the provision of all labour, materials, construction plant, temporary works and everything whether of temporary or permanent nature required in and for such construction, completion and maintenance so far as the necessity for providing the same as specified in or reasonably to be inferred from the Contract.
- 3 Documents Mutually Explanatory** The several documents forming the Contract are to be taken as mutually explanatory of one another and in case of ambiguities or discrepancies, the same shall be explained by the Divisional Engineer whose explanation in this respect shall be final.
- 4 Sufficiency of Bid** The Contractor shall be deemed to have satisfied himself before bidding as to the correctness, completeness and sufficiency of his Bid for the works and of the rates and prices stated in the priced schedule of Quantities which rates and prices shall except in so far as otherwise provided in the Contract cover all his obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the Works.
- 5 Inspection of Site** The Contractor shall inspect and examine the Site and its surroundings and shall satisfy himself before submitting the bid, as to the nature of ground and sub soil, the form and nature of the Site, the quantities and nature of the work and materials necessary for the completion of the works and the means of access of the Site, the accommodation he may require and in general shall himself obtain all necessary information as to risk, contingencies and other circumstances which may influence or affect his Bid.
- 6 Possession of Site** The Divisional Engineer, with the written order to commence the works will give to the Contractor possession of the Site as may be required to enable the Contractor to commence and proceed with the construction of the works in accordance with the program referred to in clause 10 hereof and otherwise in accordance with such reasonable proposals of the Contractor as he shall by notices in writing to the Divisional Engineer make and will from time to time as the works proceed give to the Contractor possession of such further portions of the Site as may be required to enable the Contractor to proceed with the construction of

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Works with due diligence in accordance with the said programme or proposals (as the case may be).

7 Drawings

Three copies of each of the approved Drawings shall be furnished by PAA to the Contractor free of cost. The Contractor shall provide and make at his own expense any further copies required by him.

8 Drawings to be kept on Site

One copy of each of the Drawings furnished to the Contractor as aforesaid shall be kept by the Contractor on the Site and the same shall at all times be available for inspection and use by the Divisional Engineer the representative of the Divisional Engineer.

9 Further Drawing and Instructions

The Divisional Engineer shall have full power and authority to supply to the Contractor from time to time during the progress of the works such further Drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and maintenance of the works and the Contractor shall carry out and be bound by the same.

10 Programme to be furnished

As soon as practicable after the acceptance of his Bid, the Contractor shall submit to the Divisional Engineer for his approval a programme showing the order of procedure and method in which he proposes to carry out the Work and shall furnish for his information, particulars in writing of the Contractor's arrangements for carrying out of the works and the constructional plant and temporary works which the Contractor intends to supply, use or construct, as the case may be. The submission to and approval by the Divisional Engineer or the Representative of the Divisional Engineer of such programme or the furnishing of such particulars shall not relieve Contractor of any of his duties or responsibilities under the Contract.

11 Commencement

The Contractor shall commence the Works on Site after the receipt by him of an order in writing to commence work from the Divisional Engineer and shall proceed for the same with due diligence (time being the essence of the Contract on the part of the Contractor).

12 Contractor's Superintendence

The Contractor shall give or provide all necessary superintendence during the execution of the Works and as long thereafter as the Divisional Engineer may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. The Contractor or his competent, qualified and authorized agent or representative approved by the Divisional Engineer in writing (which approval may at any time be withdrawn) is to be constantly on the Works and shall give his whole time to the superintendence of the same if such approval shall be withdrawn by the Divisional Engineer, the Contractor shall without any delay, after receiving written notice of such withdrawal, remove the Agent from the site and shall not thereafter employ him again on the Site in any capacity and shall replace him by another agent approved by the Officer, Such authorized agent or representative shall receive, on behalf of the Contractor directions and instructions from the Divisional Engineer or the representative of the Divisional Engineer. The Contractor shall also

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employ full time Engineer / Sub-Engineer, duly qualified in Civil / Electrical / Mechanical Engineering and having professional experience of at least three years for the purpose of execution of the proposed works and giving full time engineering / technical superintendence during all phases of execution and for receiving technical directions and instructions from the Divisional Engineer.

13 Contractor's Employees

The Contractor shall provide and employ on the Site in connection with the execution and maintenance of the Works:

13.1 Only such technical personnel as are skilled and experience in their respective fields and such sub-agents, foremen and leading hands as are competent to give proper supervision to the work they are required to supervise.

13.2 Such skilled and semi-skilled and unskilled labour as is necessary for the proper and timely execution and maintenance of the Works.

14 Removal of Contractor's Employees

The Divisional Engineer shall have the power to object in writing to and require the Contractor to remove forthwith from the Work any person employed by the Contractor in or about the execution or maintenance of the works who in the opinion of the Divisional Engineer is misconducting himself or is incompetent or negligent in the proper performance of his duties or whose employment is otherwise considered reasonably by the Divisional Engineer to be undesirable. Any person so removed from the works shall be replaced without delay by a competent substitute approved by the Divisional Engineer. The Contractor shall not demand the reasons from the Divisional Engineer for requiring the removal of any one of his employees.

15 Supply of Plant Materials and Labour

Except where otherwise expressly specified, the Contractor shall at his own expense supply and provide all the Constructional plants, work materials, both for temporary and for permanent works, labour (including the supervision thereof) transport to or from the site and in and about the works and other things of every kind required for the construction, completion and maintenance of the works.

16 Works to be executed in accordance with specifications drawings etc.

The Contractor shall execute the whole and every part of the work in the most substantial and workman-like manner and both as regards materials and otherwise in every respect in strict accordance with the specifications. The Works executed by the Contractor shall also conform exactly, fully and faithfully to the designs, drawings and instructions in writing relating to the work issued by the Divisional Engineer.

17 Action where no specification

In the case of any class of work for which there is no such specifications, such work shall be carried out in accordance with the written instructions, and requirements of the Divisional Engineer.

18 Quality of Material,

All materials and workmanship shall be of the respective kinds described in the Contract and in accordance with the instructions of the Divisional Engineer and shall be subjected from time to time to such tests as the

- Workmanship and Tests** Divisional Engineer may direct at the place of manufacture or fabrication on the Site or at all or any of such places. The Contractor shall provide such assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any materials used and shall supply samples of materials before incorporation in the works for testing as may be selected and required by the Divisional Engineer. All samples shall be supplied by the Contractor at his own cost. The cost of making all tests specified in the Contract shall be borne by the Contractor.
- 19 Delegation of Power to Divisional Engineer's Representatives.** The Divisional Engineer may from time to time in writing delegate to the representatives of the Divisional Engineer any of the powers and authorities vested in the Divisional Engineer. Any written instruction or approval given by the representative of the Divisional Engineer to the Contractor within the term of such delegation (but not otherwise) shall bind the Contractor and the PAA, as though it has been given by the Divisional Engineer provided as follow:
- 19.1 Failure of the representative of the Divisional Engineer to disapprove any work or materials shall not prejudice the power of the Divisional Engineer thereafter to disapprove such work or materials and to order the pulling down, removal or breaking up thereof.
- 19.2 If the Contractor shall be dissatisfied by reason of any decision of the representative of the Divisional Engineer he shall be entitled to refer the matter to the Divisional Engineer who shall thereupon confirm, reverse or vary or modify such decision, and whose decision shall be final.
- 19.3 The Agreement shall be rescinded by the PAA and the final measurements shall be recorded by the Divisional Engineer or his any authorized representative shall record the final measurement and Contractor will not claim for any item not recorded by the Divisional Engineer or his representative.
- 20 Access to Site** The Divisional Engineer and any person authorized by him shall at all times have access to the Works and to the Site and to all Workshops and places where work is being done or where materials, manufactured articles or machinery are being obtained for the Works and the Contractor shall afford every assistance in or obtaining the right to such access.
- 21 Way leave etc.** The Contractor shall bear all expenses and charges for special or temporary way leaves required by him in connection with access to the Site. The Contractor shall also provide with the written approval of Divisional Engineer at his own cost any reasonable additional accommodation at Site required by him for the purposes of the Works.
- 22 Rate of Progress and permission to work during Night.** The whole of the materials, plant and labour to be provided by the Contractor and the mode, manner and speed of execution and maintenance of the works are to be of a kind and conducted in a manner approved by the Divisional Engineer. Should the rate of progress of the Works or any

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part thereof be at any time in the opinion of the Divisional Engineer too slow to ensure the completion, the Divisional Engineer shall so notify the Contractor in writing and the Contractor shall thereupon take such steps as may be necessary and the Divisional Engineer may approve to expedite progress so as to complete the Works by the prescribed time or extended time for completion. If the work is not being carried on by day and by night and the Contractor shall request permission to work by night as well as by day, then, if the Divisional Engineer shall grant such permission, the Contractor shall not be entitled to any additional payments. The contractor shall indemnify the PAA from and against all claims, liabilities, demands, proceedings, costs and expenses whatsoever in regard or in relation to such permission. All work at night shall be carried out without unreasonable noise and disturbance.

23 Time for Completion

Subject to any requirement in the Specification of any portion of the Works before completion of the whole of the works, the whole work shall be completed within the stipulated time.

24 Extension of time for completion

Should the amount of extra or additional work of any kind or other special circumstances of any kind whatsoever (acts of God and events beyond the control of PAA etc.) which may occur be such as fairly to entitle the Contractor to an extension of time for the completion of the work, the Divisional Engineer shall determine and grant such an extension of time. Provided that the Divisional Engineer is not bound to take into account any extra additional work or other special circumstances unless the Contractor has within fourteen (14) days after such work has been commenced or such circumstances have arisen, delivered to the representative of the Divisional Engineer full and detailed particulars of any claim for extension of time to which he may consider himself entitled in order that such claim may be investigated at the time.

25 Termination of Contract for slow progress

If in the opinion of the Divisional Engineer the progress of the Works is slow that it cannot be completed within the prescribed period or within the extended period granted to the Contractor, the Divisional Engineer shall give a notice in writing to the Contractor calling upon him to speed up the work by employing more labour and by increasing the rate of supply of material, equipment and plant to an extent to be mentioned in the notice. In case the Contractor fails to comply with the requirements of the notice within ten days from its issue, the Divisional Engineer shall have the power to have the works completed through any other agency at the risk and cost of the Contractor. In any such event, the work executed by the Contractor shall be measured up and all plant, machinery, equipment and material at Site will be taken over by the Divisional Engineer after preparing and inventory thereof, such stores to be used for the completion of the work will be at the cost of the Contractor. All payments due to the Contractor shall be withheld till the completion of the work and any loss suffered by the PAA or expenditure incurred in getting the works executed, shall be recovered from the Contractor.

26 Action and Compensation payable in case of works below specification

If it shall appear to the Divisional Engineer or his representative, that any work has been executed with unsound, imperfect or unskilled workmanship or with materials of any inferior description or that any materials or articles provided by him for the execution of the work are unsound or of a quality inferior to that contracted for or otherwise not in accordance with the contract, the Contractor shall on demand in writing from the Divisional Engineer specifying the work, materials or articles complained of notwithstanding that the same may have been inadvertently passed, certified and paid for, forth-with rectify, or remove and reconstruct the work so specified and provide other proper and suitable materials or articles at his own cost; and in the event of his failing to do so with in a period to be specified by the Divisional Engineer in his demand aforesaid, then the Contractor shall be liable to pay compensation at the rate of one percent on the total cost of work for every day not exceeding ten days apart from the cost of rectification, while his failure to do so, shall continue and in the case of any such failure the Divisional Engineer may rectify or remove, and re-execute the work which may include additional work necessary to strengthen or set right the unsound work carried out by the Contractor or remove and replace with others, the materials or articles complained of as the case may be at the risk and cost of the Contractor in all respect.

27 Security Deposits

The Contractor shall permit the PAA at the time of making any payment to him for work done under the contract to deduct such sum as will amount to be five per cent (5%) of all money so payable; such deductions to be held by PAA by way of security deposit. The sum five per cent (5%) of the amount of the bills including the earnest money held by the PAA by way of security deposit shall be paid back to the Contractor after the satisfactory expiration of Period of Maintenance as defined in the clause 49 hereof.

28 Forfeiture of Security deposit

28.1 In any case in which under any clause, or clauses of this agreement the Contractor shall have rendered himself liable to pay compensation amounting to the whole of his security deposit (whether paid in one sum or deduction by instalments) the PAA shall have the power in its own discretion to adopt any of the following courses, best suited to the interest of the PAA.

- a) To rescind the Contract (of which recession notice in writing by the Divisional Engineer to the Contractor shall be conclusive evidence) and in which case the security deposit of the Contractor as available with the PAA shall stand forfeited and be absolutely at the disposal of PAA.
- b) To employ labour paid by PAA and to supply materials to carry out the work or any part of the work debiting the Contractor with the cost of the labour and the price of the materials (of the amount of which cost and price a certificate of the Divisional Engineer shall be final and conclusive against the Contractor) and crediting him with the new value of the work done, in all respect in the same manner and at the same rates as if it had been

carried out by the Contractor under the terms of his Contract, the certificates of the Divisional Engineer as to the value of work done shall be final and conclusive against the Contractor.

- c) To measure up the work of the Contractor and to take such part thereof as shall be unexecuted out of his hand, and to give it to another contractor to complete, in which case any expenses which may be incurred in excess of the sum which would have been paid to the original Contractor, if the whole work had been executed by him (of the amount of which exceed, the certificate in writing to the Divisional Engineer shall be final and conclusive) shall be borne and paid by the original Contractor and may be deducted from any money due to him by the PAA under the contract or otherwise or from his security deposit, or the proceeds of sale thereof or a sufficient part thereof.

28.2 In the event of any of the above courses being adopted by the PAA, the Contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials, or entered into any engagements or made any advance on account of or with a view to the execution of the work or the performance of the Contract. And, in case the Contract is rescinded under the aforesaid provisions, the Contractor shall not be entitled to recover or be paid any sum for any work therefore actually performed under this contract. Unless and until the Divisional Engineer will have certified in writing the performance of such work and the value payable in respect thereof, and he shall only be entitled to be paid the value so certified. Again, the Contractor will not in any manner hinder or prevent the owner or Divisional Engineer or any of the workmen and other employed by him from proceeding to complete the said buildings and works as aforesaid.

**29 Liquidated
damages for delay**

If the Contractor fails to complete the works within the stipulated time for completion prescribed under the Contract, or any extended time allowed for completion in accordance with the Contract, then the Contractor shall pay to the PAA a sum equal to ten (10) per cent or less of the Contract Price as liquidated damages (and not as a penalty) for the delay beyond the time prescribed in the Contract or the extended time for completion, as the case may be. The said sum shall be payable by the sole fact of the delay without the need for any previous notice or any legal proceedings, or proof of damage, which shall in all cases be considered as ascertained. The PAA may, without prejudice to any other method of recovery, deduct the amount of such liquidated damages from any monies in its hands due or which may become due to the Contractor. The payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Works or from any other of his obligations and liabilities under the Contract.

**30 Notice to be given
before work is
covered up**

The Contractor shall give not less than five clear days' notice in writing to the Divisional Engineer or his representative before covering up or otherwise placing beyond the reach of measurement of any work, in order

that the same may be measured, and correct dimensions thereof be taken before the same is so covered up or placed beyond the reach of measurement without the consent in writing of the Divisional Engineer or his representative, and if any work shall be covered up or placed beyond the reach of measurement without such notice have been given or consent obtained the same shall be uncovered at the Contractor's expense, or in default thereof no payment or allowance shall be made for such work on the materials, with which the same was executed.

31 Suspension of work

The Contractor shall on the written order of the Divisional Engineer suspend the progress of the works or any part thereof for such time or times and in such manner as the Divisional Engineer may consider necessary and shall during such suspension properly protect and secure the work so far as is necessary in the opinion of the Divisional Engineer. The extra cost (if any) incurred by the Contractor in giving effect to the Divisional Engineer's instructions under this clause shall be borne by the Contractor, if such suspension is:

- a) as per the provision of the contract, or
- b) Necessary for the proper execution of the work or by reason of weather conditions affecting the safety or quality or the Works or by some default on the part of the Contractor, or
- c) Necessary for the safety of the works or any part thereof.

32 Care of works

From the commencement to the completion of the Works, the Contractor shall take full responsibility for the care thereof and of all temporary works, and in the event that any damage, loss or injury should happen to the Works or to any part thereof or to any temporary works from any cause whatsoever (save and except the "expected risk(s)" as defined in clause 33 hereof), the Contractor shall at his own cost repair and make good the same so that at completion, the works shall be in good order and condition and in conformity in every respect with the requirements of the contract and the Divisional Engineer's instructions. The Contractor shall also be liable for any damage to the Works occasioned by him in the course of any operations carried out by him for the purpose of complying with his obligations under Clause 50 hereof. The Contractor shall be fully responsible for the review of the Engineering design and details of the works and shall inform the PAA of any mistakes or incorrectness in such design and details which would affect the works.

33 Expected Risk

The "Expected Risk" are hostilities (where war be declared or not) invasion, act of foreign enemies, rebellion revolution insurrection or military or usurped power civil war or (otherwise than among the Contractor's own employees) riot, commotion or disorder or use by occupation by the PAA of any portion of the Works in respect of which a certificate of completion has been issued or any such operation of the forces of nature as reasonable foresight and ability on the part of the Contractor could not foresee or reasonably provide against (all of which are herein collectively referred as "the expected risk").

- 34 Damage to persons and property.** The Contractor shall (except if and so far as the Contract provides otherwise) indemnify and keep indemnified the PAA and its Employees from and against all suits, claims, demands, proceedings, and liability of any nature or kind, including costs and expenses, for injuries or damages to any person or any property whatsoever which may arise out of or in consequence of acts or omissions of the Contractor or its agents, employees, servants or subcontractors in the execution of the Contract.
- 35 Accident or injury to Workmen** The PAA shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other persons in the employment of the Contractor or any sub-contractor. The Contractor shall indemnify and keep indemnified the PAA against all such damages, compensation and against all claims, demands, proceedings, cost charges and expenses whatsoever in respect thereof or in relation thereto.
- 36 Insurance** The Contractor shall obtain and keep in force policies in respect of Erection All Risks, Contractor's All Risks and Workmen's Compensation act, which shall apply specifically and solely to the Contractor and shall fulfil all Contractor's obligations for Insurance in connection with this Contract from an Insurance Company in Pakistan having at latest AA rating from PACRA / JCR-VIS.
- 37 Compliance with Statutes, Regulations etc.** The Contractor shall conform in all respects with any such Statutes, Ordinances, Laws, Regulations, Bye-laws or requirements of any such local or other authority / authorities which may be applicable to the Works or to any Temporary Works and shall keep the PAA indemnified against all penalties and liability of every kind for breach of any such Statutes, Ordinances, Laws, Regulations, Bye-laws or requirements.
- 38 Fossils etc.** All fossils, coins, article of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the site of the Works shall as between the PAA and the Contractor be deemed to be the absolute property of the PAA and the Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing or damaging any such article or thing and shall immediately upon discovery thereof and before removal acquaint the PAA of such discovery.
- 39 Variation** The Divisional Engineer may introduce any variations to the form, quality or quantity of the work or any part thereof which he considers necessary and for that purpose or if for any other reasons it shall, in his opinion be desirable, he shall have power to order the Contractor to do and the Contractor shall do any of the following:
- a) increase or decrease the quantity of any work included in the Contract;
 - b) omit any such work;
 - c) change the character or quality or kind of any such work;

- d) change the levels, lines position and dimension of any part of the Works; and
- e) execute additional work of any kind necessary for the completion of the works.

and no such variation shall in any way vitiate or invalidate the Contract nor it will entitle the Contractor of any claims for compensation whatsoever, but the value (if any) of all such variations shall be taken into account in ascertaining the amount of the Contract Price.

**40 Order for
variation to be in
writing**

No such variation shall be made by the Contractor without an order in writing from the Divisional Engineer. Provided that, subject to the provisions of the Contract, no order in writing shall be required for any increase or decrease in the quantity of any work where such increase or decrease is not the result of an order given under this Clause but is the result of the quantities exceeding or being less than those stated in the Bill of Quantities. If for any reason, Divisional Engineer considers it desirable to give any such order verbally, the Contractor shall comply with such order but shall get it confirmed in writing from the Divisional Engineer within four days of the issue of such verbal order.

**41 Valuation of
Variation**

41.1 The Divisional Engineer shall determine the amount (if any) to be added to or deducted from Contract Price in respect of any variation, addition, or omission made by his order. The valuation of any variation, addition or omission shall be calculated on the basis of the unit prices contained in the Bill of Quantities if in the opinion of the Divisional Engineer the same shall be applicable; if not then on the market rates.

41.2 No deviation from specifications stipulated in the Contract or additional items of work shall be carried out by the Contractor unless the rates of the substituted, extra, altered or additional item have been approved in writing by the competent authority failing which the PAA will not be bound to entertain any claim on this account.

42 Quantities

The quantities set out in the Bill of Quantities are the estimated quantities of the work but they are not to be taken as the actual and correct quantities of the works to be executed by the Contractor in fulfilment of his obligation under the Contract.

**43 Work to be
Measured**

The Divisional Engineer shall except as otherwise stated ascertain and determine by measurement the value of work done in accordance with the Contract. The Divisional Engineer shall, when he requires any part or parts of the Works to be measured, give notice to the Contractor or the Contractor's authorized agent or representative who shall forthwith attend or send a qualified agent to assist the Divisional Engineer or his representative in making such measurement and shall furnish all particulars required by either of them. Should the Contractor not attend or neglect or fail to send such agent, then the measurement made by the Divisional Engineer or approved by him shall be taken to be the correct

measurement of the work. The purpose of measuring is to ascertain the volume of work executed by the Contractor and therefore determine the amount of the monthly payments.

**44 Method of
Measurement**

The works shall be measured, notwithstanding any general or local custom except where otherwise specifically described or prescribed in the Contract.

**45 Clearance of Site
on Completion**

On the completion of the Works, the Contractor at his own cost shall clear away and remove from the Site all Constructional plant, surplus materials, rubbish and Temporary Works of every kind and leave the whole of the Site and works clean and in a workman-like condition to the satisfaction of the Divisional Engineer, rubbish should be disposed of in the manner as directed by the Divisional Engineer or his representative.

**46 Certificates for
Completion of
Works**

46.1 When the whole of the Works have been substantially completed and have satisfactorily passed any test on completion as prescribed by the Contract, the Contractor may give a notice to that effect to the Divisional Engineer accompanied by an undertaking to finish any outstanding work during the Period of Maintenance. Such notice and undertaking shall be in writing and shall be deemed to be a request by the Contractor, for the Divisional Engineer to issue a Certificate of Substantial Completion in respect of the Works. The Divisional Engineer shall, within twenty-one (21) days of the date of delivery of such notice either issue to the Contractor a Certificate of Substantial Completion stating the date on which, in his opinion, the Works were substantially completed in accordance with the Contract or give instructions in writing to the Contractor specifying all the work which, in his opinion, are required to be done by the Contractor before the issuance of such Certificate. The Divisional Engineer shall also notify the Contractor of any defects in the Works affecting substantial completion that may appear after such instructions and before completion of the work specified therein. The Contractor shall be entitled to receive such Certificate of Substantial Completion within twenty-one (21) days of completion, to the satisfaction of the Divisional Engineer, of the work so specified and making good any defect so notified. Upon issuance of the Certificate of Substantial Completion of the Works, the Contractor shall be deemed to have undertaken to complete with due expedition any outstanding work during the Period of Maintenance.

46.2 Upon satisfactory completion of the work outstanding on the Works, the Divisional Engineer shall within twenty-eight (28) days of the expiration of the Period of Maintenance issue a Certificate of Final Completion to the Contractor. The Contract shall be deemed to be completed upon issuance of such Certificate, provided that the provisions of the Contract which remain unperformed shall remain in force for as long as is necessary to dispose of any outstanding matters or issues between the Parties.

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47 Period of Maintenance

The “Period of Maintenance” shall be of 12 Months duration unless otherwise specified in the Special Conditions of the Contract, calculated from the date of completion of the Works stated in the Certificate of Substantial Completion issued by the Divisional Engineer in accordance with the Clause 46 hereof or, in respect of any Section or part of the Works for which a separate Certificate of Substantial Completion has been issued, from the date of completion of that Section or part as stated in the relevant Certificate. The expression “the Works” shall, in respect of the “Period of Maintenance”, be construed accordingly.

48 Completion of Outstanding Works and Remedying Defects etc.

During the Period of Maintenance, the Contractor shall finish the work, if any, outstanding at the date of the Certificate of Substantial Completion, and shall execute all such work of repair, amendment, reconstruction, rectification and making good defects, imperfections, shrinkages or other faults as may be required of the Contractor in writing by the Divisional Engineer during the Period of Maintenance and within fourteen (14) days after its expiration, as a result of an inspection made by or on behalf of the Divisional Engineer prior to expiration of the Period of Maintenance. To the intent that the works shall as soon as practicable after the expiry of the Period of Maintenance be delivered to the PAA in as good and perfect condition (fair wear and accepted tear) to the satisfaction of the Divisional Engineer as that in which they were at the commencement of the Period of Maintenance. All such outstanding work shall be carried out by the Contractor at his own expense if the necessity thereof shall, in the opinion of the Divisional Engineer, be due to the use of material or workmanship not in accordance with the Contract, or to neglect or failure on the part of the Contractor to comply with any obligation expressed or implied, on the Contractor’s part under the Contract. In case the Contractor fails to comply with the requirements of the notice within ten days from its issue, the Divisional Engineer shall have the power to have the works completed through any other agency at the risk and cost of the Contractor.

49 Refund of Security Deposits

The Security Deposit shall not be refunded prior to 12 Months after the completion of the whole work, unless and until a certificate is issued by the Divisional Engineer for successful and satisfactory passing of the Period of Maintenance with no other liability on the Contractor.

50 Contractor’s Liability for Damage done

If the Contractor or his workmen or servants shall break, deface, injure or destroy any part of a building, in which they may be working or any building, road, road kerbs, runway, taxiway, apron, culverts, ducts, fence enclosure, water pipes, cables, drains, electric or telephone or wire poles, trees, grass or grassland or cultivated ground contiguous to the premises on which the work or any part of it is being executed, or if any damage shall happen to the work, while in progress from any cause whatsoever, or any imperfections become apparent in it within three (03) months after a certificate, final or otherwise of its completion shall have been given by the Divisional Engineer as aforesaid, the Contractor shall make the same good at his own expense, or in default, the Divisional Engineer may cause the same to be made good by other workmen, and deduct the expense (of

which the certificate of the Divisional Engineer shall be final) from any sums that may then, or at any time thereafter may become, due to the Contractor, or from his security deposit or the proceeds of the sale thereof, or a sufficient portion thereof.

**51 Assignment &
Sub-Letting**

The Contractor shall not assign or sublet the Contract or any part thereof or any benefit or interest thereon or there under without the prior written consent of PAA. In case of failure, the Divisional Engineer shall by giving Notice in writing rescind the Contract and have the Works executed at the risk and cost of the Contractor.

**52 Stores to be
supplied by PAA**

If the specification or estimate of the work provides for the use of any special description of materials to be supplied by PAA or if it is required that the Contractor shall use certain stores to be provided by the PAA (such materials and stores, and the prices to be charged therefore as hereinafter mentioned being so far as practicable for the convenience of the Contractor, but not so as in any way to control the meaning or effect of this Contract, specified in the schedule of memorandum hereto annexed). The Contractor shall be supplied with such materials and stores as required from time to time to be used by him for the purpose of the Contract only, and the value of the full quantity of materials and stores so supplied at the rates specified in the said schedule or memorandum may be set off or deducted from any sums then due, or thereafter to become due to the Contractor under the contract or otherwise or against or from the security deposit, or the proceeds of sale thereof. All materials supplied to the Contractor shall remain the absolute property of PAA and shall not on any account be removed from the Site of the work and shall at all times be open to inspection by Divisional Engineer. Any such material unused and in perfectly good condition at the time of the completion or termination of the Contract shall be returned to PAA; but the contractor shall not be entitled to return any such materials unless with such consent, and shall have no claim for compensation on account of any such materials so supplied to him, as aforesaid being unused by him, or for any wastage in or damage to any such materials.

**53 Bills to be
submitted monthly**

A bill shall be submitted by the Contractor each month on or before the date fixed by the Divisional Engineer for all works executed in the previous month and the Divisional Engineer shall take or cause to be taken the requisite measurement for purposes of having the same verified, and the claim, as far as admissible, adjusted, if possible, before the expiry of ten days from the presentation of the bill. If the Contractor does not submit the bill within the time fixed as aforesaid, the Divisional Engineer may prepare a bill which shall be binding on the Contractor in all respects.

**54 Completion
drawings**

The completion report of the work along with drawings on prescribed proforma shall be submitted by the Contractor in five copies along with the final bill. In case of failure to submit the completion report and completion drawings by the Contractor on the basis of which the work has been finally completed, the final bill shall be withheld till their submission. The completion report and drawings should be complete in all respects.

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Works relating to maintenance do not come under the preview of this clause.

55 Final Bills

The final bill shall be submitted by the Contractor within one month from the date of completion of the Works otherwise the Divisional Engineer's certificate of the measurement and of the total amount payable for the work accordingly shall be final and binding on all parties, and will not be called in to question by anyone.

56 Urgent repair

If by reason of any accident or failure or other event occurring to or in connection with the Works or any part thereof during the execution of the Works or during the Period of Maintenance any remedial or other work on repair shall in the opinion of the Divisional Engineer or his representative be urgently necessary and the Contractor is unable or unwilling at once to do such work or repair, the Divisional Engineer may by his own or other workmen do such work or repair as the Divisional Engineer or his representative may consider necessary. If the work or repair so done by the Divisional Engineer is work which in the opinion of PAA the Contractor was liable to do at its own expense, under the Contract, then all costs and charges properly incurred by the PAA, in so doing shall on demand be paid by the Contractor to the PAA or may be deducted by PAA from any monies due or which may become due to the Contractor. Provided always that the Divisional Engineer shall as soon as after the occurrence of any such emergency as may be reasonably practicable notify the Contractor thereof in writing.

**57 Bribes,
Commission etc.**

Any bribe, commission gift or advantage given promised or offered by or on behalf of the Contractor or his partner, agent, or servant in relation to obtaining or to the execution of this or any other Contract with PAA, or given, promised, or offered by, or on behalf of, the Contractor, or his partner, agent, or servant, to any officer or person in the service or employment of PAA, who shall be in any way connected with the obtaining or the execution of this or any other Contract, shall in addition to any criminal liability, which he may incur subjects the Contractor to cancellation of this Contract, and also to payment of any loss resulting from any such cancellation. Any question or dispute to the commission of any offence under this Clause shall be settled by the PAA, in such manner as it deems fit and sufficient and its decision shall be final and conclusive.

**58 Law governing the
contract**

This Contract shall be governed by and construed in accordance with the laws of the Islamic Republic of Pakistan, and the obligations, rights and remedies of the parties hereunder shall be determined in accordance with such laws. Resort to litigation by either of the parties in respect of any disputes should be had only before a court of appropriate and competent jurisdiction.

**59 Increase or
Decrease of Cost.**

59.1 The Contractor is deemed to have quoted rates given in the Contract (Bill of Quantities) based on the prices of certain specified materials

prevalent in the month during which the last day of the submission of Bid fell.

- 59.2 No price adjustment shall be allowed under this clause except in respect of the materials specified in Appendix-A to Bidding Document which have actually been incorporated in the Permanent Works during the corresponding period of increase or decrease.
- 59.3 Adjustment shall be allowed for the specified materials according to the method prescribed in the Appendix-A to Bidding Document.
- 59.4 All claims for additional payments under this Clause shall be lodged by the Contractor with the Divisional Engineer within such reasonable time from the date of occurrence of the event which, according to the Contractor, entitles him to such additional payments by PAA, but in no case after the expiry of twenty-eight (28) days thereof, such claims shall invariably be supported with all relevant necessary details and particulars required for proper verification thereof and the Divisional Engineer shall be entitled to require the Contractor to provide such further details / information as may be required for due and effective verification of such claims.
- 59.5 The Divisional Engineer shall verify and certify for payment, if any, claims lodged by the Contractor under this Clause within a period not exceeding twenty-eight (28) days from the date on which the same are submitted by the Contractor as aforesaid.
- 59.6 In case the PAA is entitled to recover from the Contractor any sum or sums under this Clause arising from any decrease in the said prices for materials, the provisions of this Clause shall apply mutatis mutandis to such recoveries by the PAA.
- 59.7 If the Contractor fails to complete the works within the time for completion, adjustment of prices therefore until the date of completion of the works shall be made using either the indices or prices, whichever are more favourable to the PAA, provided that if extension of time is granted the above provision shall apply only to adjustments made up to the expiry of such extension of time.
- 59.8 No escalation shall be allowed to the Contractor in respect of the period extended for the completion of the work due to his own fault.

**60 Water Supply/
Power Supply etc.**

The Contractor should make his own arrangement for water and power supply required for execution of work and nothing will be paid for the same, by the PAA. Provided that in case water supply is allowed by the PAA to the Contractor from water mains passing through areas where the work is required to be carried out, the Contractor shall pay the cost of water to the department at one-half (1/2) per cent of the total cost of work for drinking purpose and one (01) per cent of the total cost of the items of work involving use of water (that is for constructional purposes). The Contractor shall bear full charges for laying its water lines of all length and size / dimensions from the mains to the site of his underground tanks as he may require and construct for storage purposes at its own cost.

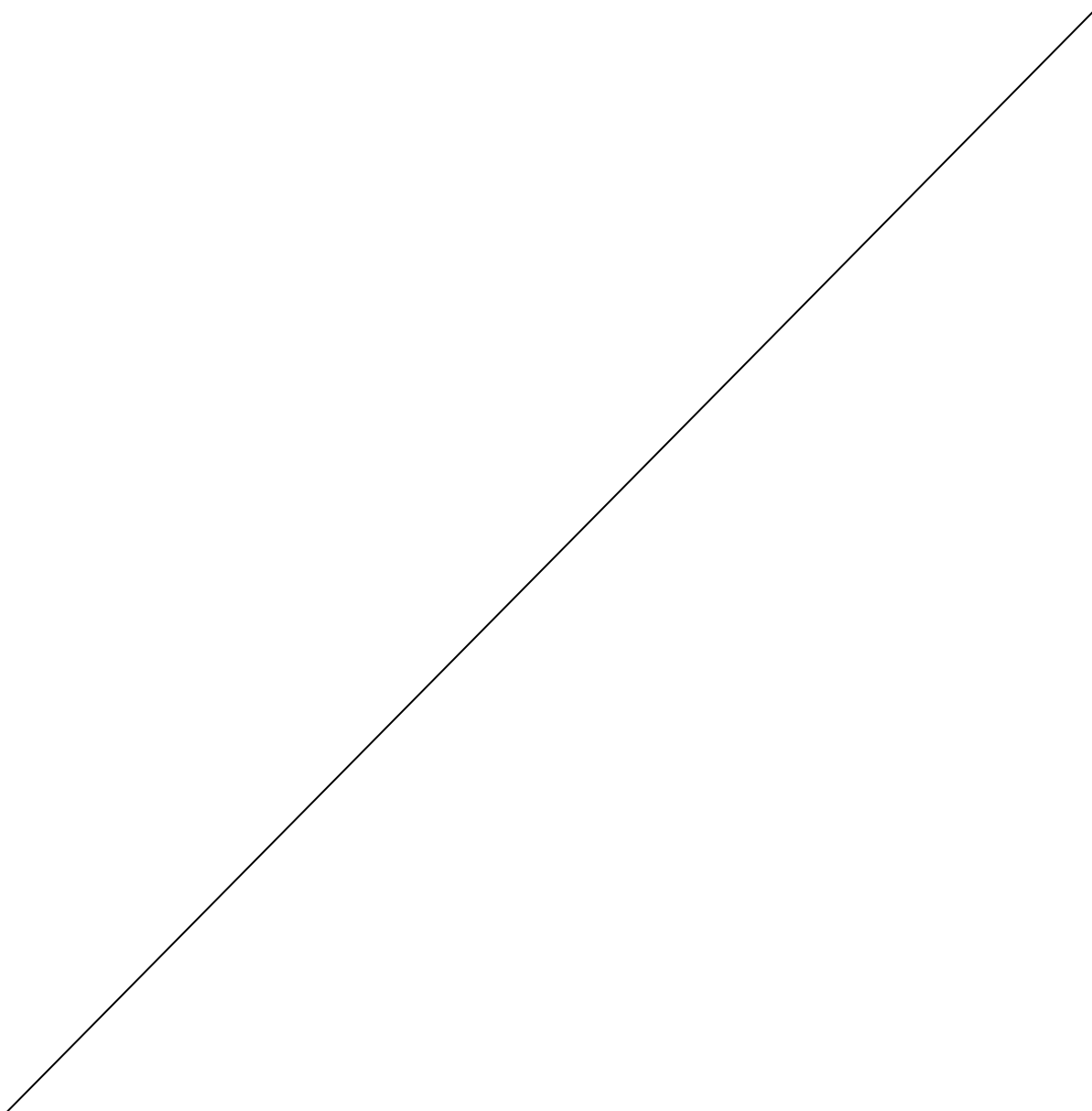


For PAA

For Contractor

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- 61 Abandonment of work by PAA.** PAA shall have the power to abandon any work whether in progress or otherwise and in such an event, the Contractor shall have no claim for any compensation of any kind whatsoever from PAA except the actual cost of the work executed at the Site under the Contract for which the contract requires payment to be made.
- 62 Materials obtained from excavation & dismantling.** All materials (e.g. stone and other materials) obtained in the work of dismantling, excavation etc., will be considered PAA property and may be issued to Contractor (if they require the same for their own use) at rates approved by the Divisional Engineer. If these materials are not required by them, they will be disposed of as found fit by the PAA.
- 63 Danger Signs to be provided by Contractor** Lights for illumination, danger signs for warning, and information / cautionary signs in approved colours and sizes shall be provided by the Contractor wherever required at his own cost on the barriers as directed by the Divisional Engineer.



For PAA

For Contractor



SPECIAL CONDITIONS OF CONTRACT**6 Possession of Site**

(Substitute the clause 6 with following text)

- 6.1 The Divisional Engineer shall, together with the written order to commence the Works, grant the Contractor possession of such portions of the Site as are necessary to enable the Contractor to commence and carry out the Works in accordance with the programme referred to in Clause 10, subject to any sequencing or phasing requirements prescribed in the Contract.
- 6.2 Thereafter, and from time to time as the Works progress, the Divisional Engineer shall grant possession of further portions of the Site, as required for execution of the Works with due dispatch, provided such possession aligns with the Contractor's reasonable proposals as approved by the Divisional Engineer.
- 6.3 The Contractor shall submit any such proposals for staging of site possession in writing to the Divisional Engineer for review and approval, and no right to possession shall arise unless and until expressly granted by the Divisional Engineer.
- 6.4 PAA shall not be liable for any delay or claim arising from staged or partial possession of the Site, provided such staging is consistent with the Contract or approved programme.

10 Programme to be furnished

(For works with a contract price exceeding the financial limit prescribed for PEC Constructor Registration Category C-3, as revised from time to time, Clause 10 shall be substituted with the following text)

- 10.1 The Contractor shall, within fifteen (15) days of receiving the Letter of Acceptance, submit a detailed Programme of Works to the Divisional Engineer for approval. The Programme shall include all activities, including mobilization, and clearly identify critical path items using a computerized Critical Path Method (CPM) format. The Programme shall be updated monthly, incorporating a chart of forecasted principal activities, an updated cash flow schedule for payments, and any revisions necessary to reflect actual progress. It shall serve as the baseline for assessing progress and determining Liquidated Damages under Clause 29. Monthly progress reports shall include an up-to-date analysis of actual versus planned progress, identification of current or emerging critical items, and the Contractor's proposed measures for mitigation.

18 Quality of Material, Workmanship and Tests

- 18.1 Expenditure on account of laboratory testing to ascertain suitability of materials and all other required tests etc. shall be borne by the Contractor.

24 Extension of time for completion

(For works with a contract price exceeding the financial limit prescribed for PEC Constructor Registration Category C-3, as revised from time to time, Clause 24 shall be substituted with the following text)

- 24.1 In the event of:
- (a) the amount or nature of extra or additional work,
 - (b) exceptionally adverse climatic conditions,
 - (c) any delay, impediment or prevention by the PAA, or
 - (d) other special circumstances which may occur, other than through a default of or breach of contract by the Contractor for which he is responsible, being such as fairly to entitle

the Contractor to an extension of the Time for Completion of the Works, or any Section or part thereof,

the Divisional Engineer shall, after due consultation with the Contractor, determine the amount of such extension and shall notify the Contractor accordingly. Provided that the Divisional Engineer is not bound to take into account any extra additional work or other special circumstances unless the Contractor has within fourteen (14) days after such work has been commenced or such circumstances have arisen, delivered to the representative of the Divisional Engineer full and detailed particulars of any claim for extension of time to which he may consider himself entitled in order that such claim may be investigated at the time.

25 Termination of Contract for slow progress

25.1 In the event of termination by the Divisional Engineer, the Contractor shall have the right to file an appeal before the Director General PAA, within seven (07) days from the receipt of such termination notice. The decision of the Director General PAA shall be final and binding.

29 Liquidated damages for delay

29.1 The amount of Liquidated Damages for each day of delay in completion of the whole of the Works, or if applicable for any Section thereof, shall be imposed at the rate of 0.05% of Contract Price as stated in Letter of Acceptance for each day of delay in completion of the Works. Provided that the amount of Liquidated Damages for delay shall not exceed ten (10) per cent of the Contract Price as stated in Letter of Acceptance in all cases.

29.2 In cases where liquidated damages have been imposed or have been proposed to be imposed, the amount to be retained in lieu of Security Deposit during the Maintenance Period shall be based on the cost of works executed, and not the reduced amount to be paid to the Contractor after imposition of liquidated damages.

29.3 Where a work has been delayed beyond the stipulated date of completion, the Contractor shall be required to extend the securities and insurances as per the revised dates at his own cost.

31 Suspension of Works

31.1 Partial / complete suspension in work is likely to take place during emergency operations and VIP movements etc. labour, equipment, and material, etc. shall be removed from the site of work during such suspension periods to a distance for essential security requirements. No compensation whatsoever on this account shall be claimed by the Contractor for those losses likely to occur. All such unforeseen disruptions during working hours may result in idleness of manpower and equipment and waste of material, etc. for which no compensation shall be paid to the Contractor.

31.2 No compensation is payable for interruption in the work due to any reason beyond the control of PAA.

32 Care of Works

32.1 The Construction materials should be stacked at a suitable place as per the direction of the Divisional Engineer or his representative.

32.2 The work shall be so arranged as not to cause any disturbance to the passengers / functionaries and other agencies working at the airport.

41 Valuation of Works

41.1 For works items described in the priced bill of quantities (BoQ), the valuation of works shall be made as per the evaluated rates provided in the corrected priced BoQ, and

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- 41.2 For work items not described in the priced bill of quantities (BoQ) but available in the Pak PWD Schedule of Rates (SoR), the valuation of works shall be made on pro rata basis, and
- 41.3 For work items neither described in the priced bill of quantities (BoQ) nor available in the Pak PWD Schedule of Rates (SoR), the valuation of works shall be made on the basis of actual cost (market rates) plus a lumpsum of twenty-five per cent (25%) as overheads and profit.
- 47 Period of Maintenance**
- 47.1 Period of Maintenance or Defects Liability Period shall be of 12 Months duration.
- 59 Increase or Decrease of Cost**
- 59.1 The Price Adjustment shall be applicable only for the Contracts having stipulated completion period greater than eighteen months and contract price exceeding financial limit of PEC Constructor's Registration Category C-3 as amended from time to time. Contracts having stipulated completion period less than or equal to eighteen months and value equal to or less than the abovesaid limit will be considered as fixed price contracts.
- 64 Payments to Contractor**
- 64.1 PAA shall release payment to the Contractor within fifty-six (56) calendar days from the date of certification of the Contractor's bill by the Divisional Engineer. Should payment be delayed beyond this period, a simple interest at the rate of zero-point zero five percent (0.05%) per annum shall accrue on the unpaid amount, calculated from the day immediately following the due date until the date of actual payment.
- 65 Settlement of Disputes**
- 65.1 Any difference or dispute arising between the PAA and the Contractor regarding the interpretation, execution, or performance of any provision of this Contract shall be referred exclusively to the Director General PAA, whose decision shall be final, conclusive, and binding on both parties. The Contractor shall not initiate or pursue any legal proceedings or remedies in relation to such matters. This shall be without prejudice to the rights of the parties under the applicable laws.
- 66 Authenticity of Financial Instruments**
- 66.1 Any financial instrument, submitted by the Contractor as Bid Security, and Performance Guarantee, if found fake or dishonoured by the issuing bank / financial institution at any pre- / post-contractual stage shall, in addition to any criminal liability, call for blacklisting of the Contractor.
- 67 Obligations of the Contractor**
- 67.1 The Contractor, during the execution of works, shall be responsible for following the instructions and directions of the Divisional Engineer or his representative only.
- 67.2 The Contractor shall be responsible to provide and use quality construction material as per the specifications, and to the satisfaction of the Divisional Engineer.
- 67.3 The Contractor shall strictly adhere to all design requirements and technical specifications established by the Design Engineer and approved by PAA. The charges of which shall be borne by the Contractor, but the additional quantity of any materials used in executing the Works shall be paid as per Contractor's quoted rate.
- 67.4 The Contractor shall clean the existing rusty steel by approved means at his own cost and no compensation whatsoever shall be given to the Contractor.
- 67.5 The Contractor will be fully responsible to arrange security clearance of his workmen employed on the job in accordance with the rules requirements enforced at the time of

execution and shall not be entitled for any compensation whatsoever on account of wastage of time and labour due to any reason.

- 67.6 The Contractor shall enclose the work / site area as per direction of the Divisional Engineer or his representative at his own cost. He will also ensure safety of workers as well as passenger(s) and airport staff during and after the work hours.
- 67.7 The Contractor shall submit a list of fittings, fixtures, equipment etc. to be dismantled as approved by Engineer In charge accordingly.
- 67.8 Generally, the works will be carried in accordance with Electrical Act 1910 read with Electricity Rules 1937 and any amendments thereto, Pak PWD Specifications for Electrical Works & latest editions of I.E.E rules of Building Equipment.
- 67.9 All wires & Cables to be used for executions of work will be copper conductors.
- 67.10 Damages done by the contractor during execution of work will be made good by the Contractor as per Engineering specifications and to the complete satisfaction of the Divisional Engineer.
- 67.11 The contractor will perform all types of tests as directed by E&M Engineer In charge after / before executions of his work & will submit test reports in this regard if required.
- 67.12 Cost of samples of materials will not be claimed & test charges for all required tests as instructed by the E&M Engineer from Govt. or other authorities will be borne by the contractor without any extra claim of this effect.
- 67.13 The Contractor will submit warranty / guarantees & literature of the Air-Conditioning equipment, Electrical equipment or Mechanical equipment etc as desired by Engineer In charge.
- 67.14 The approved makes of materials, accessories & equipment are provided in Appendix-F. works shall be executed subject to approval of samples from Engineer In charge.
- 67.15 Any equipment / items during execution / testing / commissioning & during maintenance period if burnt out / malfunctioning or broken will be replaced by the contractor without any extra cost.

SCHEDULE OF BASIC PRICES OF SPECIFIED MATERIALS

A) Basic Price Materials (To be filled by the Bidder)

We confirm herewith that the following prices were prevalent in the month during which the last day of the submission of bidder fell and have been taken as a basis for quoting the prices given in our Bidder.

Adjustment of increase / decrease in price shall only be admissible for the materials listed herein under:

S.No.	Materials	Unit	Basic Price Ex-Factory/Works	Remarks
1	2	3	4	5
1.	Cement i) Ordinary Portland Cement ii) Sulphate Resisting Cement	Bag (50 Kg)		The basis of the rate is the Monthly Statistical Bulletin issued by the Pakistan Bureau of Statistics. -- do --
2.	Steel i) Reinforcement Bars ii) M.S. Sections	Kg		-- do -- -- do --
3.	Bitumen i) Grade 60/70 ii) Grade 80/100 iii) Cutback Bitumen a) Medium Curing b) Rapid Curing	Tonne (1000Kg)		The basis of the rate is the Monthly Statistical Bulletin issued by the Pakistan Bureau of Statistics. If not available then basis would be National Refinery, Attock Refinery or from an approved equivalent source. -- do -- -- do -- -- do -- -- do --

Note:

(1) If the price paid by the Contractor for any of the Specified Materials shall differ from the basic thereof and shall cause an increase or decrease of cost to the extent of five (5) per cent or more to the Contractor in carrying out the Contract, the increase or decrease of such cost shall be adjusted in the Contract Price accordingly. The actual payments shall be made on the basis of quantities actually measured and certified for payment. Any fluctuation in the prices of materials other than the Specified Materials shall not be subject to adjustment of the Contract Price.

(2) The Bidders shall submit satisfactory documentary evidence in support of the rates and prices filled up in this Appendix.

We agree that price variation in the above listed basic prices during the currency of the Contract will be adjusted only to the extent as stipulated under the Conditions of Contract.

Authorized Signatures _____

Name _____

Seal _____

Date _____



For PAA

For Contractor

Appendix - B

MATERIALS TO BE PROVIDED BY PAA

Schedule showing (approximately) materials to be supplied by the PAA under Clause 52 of the General Conditions of the Contract or for work contracted to be executed and the rates at which they are to be charged for

Particulars	Rate at which the material shall be charged to the Contractor		Place of Delivery
	Unit	Rs.	

Note: The person or firm submitting the Bid should see that the rates in the above schedule are filled up by the Divisional Engineer on the issue of the form prior to the submission of the Bid.

For PAA

A-2

For Contractor



PERFORMANCE BOND GUARANTEE

Guarantee No:
 Date of Issue:
 Amount of Guarantee:
 Date of expiry:

By this Bond We (hereinafter called "THE SURETY"), (1) do hereby bind ourselves and our successors and assign jointly and severally by these presents to pay to the PAKISTAN AIRPORTS AUTHORITY, KARACHI (hereinafter referred to as the PAA which term shall include his successors in office and assigns) unconditionally on demand and without further question, the sum of Rs. (Rupees), sealed with our respective seal and dated this

WHEREAS, M/s. (hereinafter referred to as "THE CONTRACTOR") by an agreement made between the PAA of the one part and the Contractor of the part have entered into a Contract hereinafter called "Said Contract" for the Construction, completion and maintenance of as therein mentioned in conformity with the provisions of the said contract and the sum mentioned in the above written Bond represent the amount of Performance Bond to be furnished by the Contractor for due fulfilment of obligations under the said Contract.

NOW THE CONDITION OF the above written Bond is such that if the Contractor shall duly perform & observe all the terms, provisions, conditions & stipulations of the said contract on the Contractor's part to be performed & observed according to the true purpose, intent & meaning hereof as determined by the PAA who shall be the sole judge in the matter, or if on default by the Contractor for which the PAA shall be sole judge the Sureties/Surety shall pay the amount of this Bond to PAA without reference to the Contract, then this obligation shall be null and void but otherwise shall be and remain in full force and effect but no alteration in terms of the said Contract made by agreement, between the PAA and the Contractor or in the text or nature of the works to be constructed, completed and maintained thereunder and no allowance of time by PAA under the said Contract nor any forbearance or forgiveness in or in respect of any matter or thing concerning the said Contract on the part of the PAA shall in any way release the Sureties/Surety from any liability under the above written Bond.

AND WE agree that this Bond shall be irrevocable and the Guarantee hereby given shall be valid up to and that a Certificate signed by the Director Engineering Services / Additional Director, stating that the Bond has become due will be sufficient proof of its forfeiture and we shall pay the amount so demanded without, any further proof of any kind and that the payment shall be made by us forthwith on the receipt of the Certificate of the Director Engineering Services / Additional Director as aforesaid.

Notwithstanding anything contained hereinabove, the Bank's liability under this Guarantee shall in no event exceed the sum of Rs. (Rupees), and this guarantee shall remain valid up to where after the Bank shall be completely discharged and released from all its liabilities hereunder unless a claim is received before the aforesaid expiry date.

Signed, sealed and delivered by the said in the presences of:

For and on behalf of
M/s

CONTRACTOR

WITNESSES:

1. Signature.
Name.
CNIC:
Address.

For and on behalf of

SURETY

2. Signature.
Name.
CNIC:
Address.

MOBILIZATION ADVANCE GUARANTEE**(Bank Guarantee)**

Guarantee No. _____

Date _____

WHEREAS the Pakistan Airports Authority (hereinafter called PAA) has entered into a Contract for _____ (Particulars of Contract), with Constructor "M/s _____" (hereinafter called the "Contractor").

AND WHEREAS, PAA has agreed to advance to the Contractor, at the Contractor's request an amount of Rupees _____ (Rs. _____), which amount shall be advanced to the Contractor as per provisions of this Contract.

AND WHEREAS, PAA has asked the Contractor to furnish Guarantee to secure the advance payment for the performance of his obligations under the said Contract.

AND WHEREAS, _____ (Scheduled Bank) (hereinafter called the "Guarantor") at the request of the Contractor and in consideration of the PAA agreeing to make the above advance to the Contractor, has agreed to furnish the said Guarantee.

NOW, THEREFORE, the Guarantor hereby guarantees that the Contractor shall use the advance for the purpose of above-mentioned Contract and if he fails and commits default in fulfilment of any of his obligations for which the advance payment is made, the Guarantor shall be liable to PAA for payment not exceeding the aforementioned amount.

Notice in writing of any default, of which the PAA shall be the sole and final judge, on the part of the Contractor, shall be given by the PAA to the Guarantor, and on such first written demand, payment shall be made by the Guarantor forthwith of all sums then due under this Guarantee as determined by the PAA without any reference to the Contractor and without any objection.

This Guarantee shall remain in force until the advance is fully adjusted against payments from the interim Payment Bills of the Contractor or until (Date) _____ whichever is earlier.

The Guarantor's liability under, this Guarantee shall not in any case exceed the sum of Rupees _____ (Rs. _____).

This Guarantee which is unconditional and irrevocable, shall remain valid up to the aforesaid date and shall be null and void after the aforesaid date or earlier if the advance made to the Contractor is fully adjusted against payments from interim Payment Bills of the Contractor provided that the Guarantor agrees that the aforesaid period of validity shall be deemed to be extended if on the above mentioned date the advance payment is not fully adjusted as payments from interim Payment Bills of the Contractor.

GUARANTOR

For _____

(Bank Limited)

1. Signature _____
2. Name _____
3. Title _____

LIST OF BANKS

Following is the list of approved schedule banks (financial institutions) acceptable to PAA for obtaining Bank Guarantee(s):

Public Sector

- 1) National Bank of Pakistan
- 2) Sindh Bank Limited
- 3) The Bank of Punjab

Private Sector

- 4) Allied Bank Limited
- 5) Askari Bank Limited
- 6) Bank Al Habib Ltd.
- 7) Faysal Bank Ltd.
- 8) Habib Bank Ltd.
- 9) Habib Metropolitan Bank Ltd.
- 10) JS Bank Ltd.
- 11) MCB Bank Ltd
- 12) Samba Bank Ltd.
- 13) Soneri Bank Ltd.
- 14) Standard Chartered Bank Ltd.
- 15) United Bank Ltd.
- 16) Industrial and Commercial Bank of China Ltd.

Islamic Banks

- 17) Al Baraka Bank (Pakistan) Limited
- 18) BankIslami Pakistan Limited
- 19) Dubai Islamic Bank (Pakistan) Limited
- 20) Meezan Bank Limited

LIST OF APPROVED MANUFACTURERS / SOURCES

This list of recommended manufactures / suppliers of different materials / equipment with brand names have been provided in order to establish a standard level of performance. The Contractor is supposed to provide and fix the materials / equipment of acceptable quality from the list or equivalent as approved by the Engineer. Whereas the preference of brand and model will be decided by the Engineer. Material from approved list shall stand rejected, if it fails in any of the specified tests or quality standards.

Sr. No.	Description	Manufacturer/Supplier/Source
Civil Works		
1	Cement (OPC, SR)	Lucky, Pioneer, Maple Leaf, Fauji, Askari, Power, Cherat, DG Khan, Dewan
2	Cement (White)	Kohat, Maple Leaf, Zealpak
3	Construction Chemicals & Sealants	Sika, Fosroc, BASF, Ultra, Fastchem, Vertex, MAPEI, KALON, Mitchell
4	Anchoring / Fixing Systems	Strong hold, Strong force, Hilti, Fischer
5	Sand	Bholari, Lawrencepur or from any other approved source as per Mix Design.
7	Aggregate	From approved source.
8	Steel Reinforcement	Amreli, FF Steel, AFCO, Ittehad, Ittefaq, Fazal, PECO, Razzaque, Metropolitan, Mughal, Pak Steel, Model Steel, Nizami Brothers, Moiz Steel, Poiner, Tayyaba Steel or approved equivalent.
9	Bitumen (Cold)	National Refinery, Attock Petroleum, PARCO
10	Bricks/Blocks	Local (Brand / source to be approved by the Engineer)
11	Ceramic / Porcelain Tiles	Shabbir, Master, Time Ceramic, National, or equivalent imported
12	Vinyl Tiles	Decora, Marflex, A.T.S. Synthetic
13	Wooden Flooring	Sarina, Firstfloor or equivalent
14	Textured Decorative Wall Coating	Rockwall, Wall Tec, Rock Shield, Sand Tec, Graffito, Jotun
15	Aluminum Doors / Windows	ALCOP, Pakistan Cables, Chawla, Prime, Ittehad Aluminium, Thermec, Eng: Co, Alhali Aluminum Co (Pvt) Ltd, Krudson, Lucky or equivalent
16	Aluminum Composite Panel	ALCOP, Chawla, Pakistan Safety Glass (Alucobond), AKB (EuroBond – Exterior. & DuBond – Interior)
17	Paint	ICI (Dulux, Paintex), Berger Robbialac, Brighto, Master, Kansai (Japan), Nippon, Jotun, Diamond, Buxly, Pakistan Phthalates Limited (Kalon Chemicals Company) or equivalent.
18	Powder Coating	Jotun or approved equivalent
19	Concrete Pavers	Tuff Tiles, Izhar, Envicrete, National Pavers, Banu Mukhtar, Magnacrete or equivalent
20	Insulation	Diamond (Jumbolon), Pakistan Insulations, Safe line, Insugreen

Sr. No.	Description	Manufacturer/Supplier/Source
21	Membranes for Roof and Basement walls	Polytec (Henkel Polybit), Hygrip, Roof Grip, A.T.S. Synthetic, Petro Seal, Bitumat (Saudi Arabia), Pakistan Phthalates Limited (Kalon Chemicals Company), Sika Raingard
22	uPVC Doors / Windows	Framez, Uniwin, Nasar Steel, U-Tech, Green Door, V-Make, Chawla
23	Steel Doors and windows	SECCO or any other approved equivalent
24	Termite Proofing	Agenda (Termidor), Biflex, Fiprokil, Mirage, Termicure, Ability
25	Terrazzo Tiles	As approved by Engineer
27	Pre-Engineered Steel Buildings	Zamil, Mammut, Mabani, Kirby, Banu Mukhtar, Izhar, SACHAL
28	Gypsum False Ceiling	Elephant, Lodhia (Arish), DFB, United
29	Glass	Pakistan Safety Glass, Ghani, Al-Fattah, Khawaja, Nowshera Prince or equivalent.
30	Door hardware	Kolf, Sitara Hardware, Jb.Saeed, IM Hardware (Yale), Alpha, Khas, Babar, or approved equivalent.
32	SS Railing	Dah Shi (Taiwan), IIL, or equivalent
33	Medium Density Fibreboard	Al-Noor, ZRK, Nuboard or equivalent.
34	High Density Fibreboard	Patex, Sonitex or equivalent
35	Plywood	Patex, Marineplex or equivalent.
PUBLIC HEALTH WORKS		
1	Sanitary Ware (WC Indian, WC European, Basin / Vanity, Urinal, Flushing Cistern)	Porta, Marachi, Master, ICL, Finecera, Karam, Cera and 3 Star or equivalent.
2	Bottle trap	Porta, Master, Faisal, Sonex, Asia and Super Asia or equivalent.
3	Bath / Kit. Fittings	Porta, Master, Faisal, Sonex or equivalent.
4	PPR-C Pipes & Fitting	Dadex, Beta, Master, Plasco, Turk Plast, Popular Pipe, Accufit, Minhas, Dura Built, IIL, Builtec, Euro Gulf, YAH Plastic Industry, Pelikan Pipe Industry (Civic)
5	uPVC Pipes & Fittings	Dadex, Shavyl, Galco, Beta, Turk Plast, Jamal, Fast Flow, Plasco, Popular Pipe, Master, Accufit, Dura Built, Builtec, Euro Gulf, YAH Plastic Industry, Newtech, Pelikan Pipe Industry (Civic), Prime Star Industries or approved equivalent.
6	RCC Pipe	Shalimar, Pakistan Pipes, National Pipe Industry
7	G.I. Pipes	International Industries Ltd. (IIL), Master Pipe, Jamal, Victory, Steelex or equivalent
8	C.I. Pipes	C.I. Engineering / Corp: Teepu, Alpine, NPC and CME or equivalent.
9	Gate / Sluice Valves	KITZ (Star Corporation), Teepu, Anwer, Asia, Rehman Group, Sirajia Trading co.

Sr. No.	Description	Manufacturer/Supplier/Source
10	G.I. Fittings	KITZ (Star Corporation), Health Engineering (HE)
11	C.I. Fittings & Valves	Teepu, Alpine, Sirajia Trading co.
12	C.I. Manhole Cover	CME, Teepu, Alpine, Turk Plast
17	MS Seamless Pipe	Huffaz Industries, Jamal, KITZ, Sirajia Trading co., Master Pipes, Victory
18	PVC Water Stop	Fosroc, Sika, Decora, Marflex
19	HDPE pipe and Fittings	Dadex, Jamal, Plasco, Turk Plast, Beta, Popular Pipe, Accufit, IIL, DURA BUILT, Bultec, Fast Flow, YAH Plastic Industry, Newtech, Pelikan Pipe Industry (Pelikan), Prime Star Industries
21	Water Tank	Master, Super Tuff, Dura, Accufit, Prime Master
22	Kitchen Sink	Porta, Atlas, Asia or approved equivalent
ELECTRICAL & MECHANICAL WORKS		
1	Wires and Cables	Pakistan Cables, Fast, AGE, Newage, GM
2	Air Switch Breaker, Load brake switches, MCCB and MCB etc.	Terasaki Japan, Siemens, ABB, MG, Hager, Schneider Electric
3	Switches and Sockets	Schneider, Philips
4	Down Light/ Batten Lights	Sunlight, Pierlite, Future Technology, Orient
5	Flood Lights	Philips/ Signify, Osram, GE, Thorn
6	Fans Ceiling/Exhaust/Bracket	Pak, Royal, SK, Super Asia,
7	UPS	Huawei, Homage, Inverex, Goodwee, Crown, Fronius, APC
8	Tubular batteries	AGS, Phoenix, Osaka, Exide, Volta
9	AC Units	Gree, Haier, Orient, Green Air, Dawlance, PEL, Kenwood
10	Air Curtains	Gree, Haier, Orient, Green Air, Dawlance, PEL, Kenwood or Equivalent
11	PVC Conduits and Pipes	Polupar, Galco, Sheval, Adamjee, GM, Dadex
12	PVC Cable Trunk	Adamjee, Jeddah or equivalent
13	Termination Kit / Straight Jointing Kit	Raychem (Germany), 3M (USA), Elastimod (Egypt)
14	LV main distribution panel	Siemens, PEL, FICO, Schneider Electric, ABB, Sunbeams, Engineers & Engineering, Libra, Hussein & Co., BLS

Annexure - E

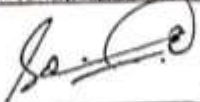
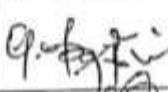
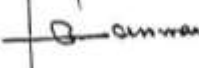
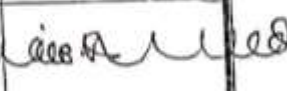
Note: Wherever the word Civil Aviation Authority (CAA) is mentioned in this section of the document, it shall be read, interpreted, treated and dealt as Pakistan Airports Authority (PAA).

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HSE MANUAL FOR CAA CONTRACTORS, SUPPLIERS & CONCESSIONAIRES

MANUAL

VERSION : 2.0
DATE OF IMPLEMENTATION : 15-03-2017
OFFICE OF PRIME INTEREST : Directorate of Safety & Quality Management System (SQMS)

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STATUS OF DOCUMENT	CONTROLLED		

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HISTORY

As day to day activities have become highly sophisticated, so has our understanding of how to create a safe, healthful work environment. In the past "Accident Prevention" for organizations simply meant freedom from serious injuries to Employees and property loss. Today, however, "Loss Control" being a part of HSE covers not only injury but occupational diseases and environmental concerns along with fire and property damage control. This new understanding of HSE is not only reflected at all levels of management but also in contractors, suppliers & concessionaires activities.

These days most of the Organizations show their concerns with regard to the welfare of their employees but some-how leave aside the part suppliers, contractors and concessionaires play during routine operations, which at times harm the organizations and employees as well. It is the need of the time that suppliers', contractors' and concessionaires' level of understanding about HSE issues be made at par with that of an organization they are working for.

The present CAA Management has made a concentric and serious effort of establishing International HSE Standards by initiating the process of Integrated Management System (IMS) implementation, in which contrary to the past, role of CAA suppliers, contractors and concessionaires is addressed, so as to keep their activities on harmonious track with CAA operations and to ensure fulfillment of CAA HSE requirements. The publication of this HSE manual is part of the same campaign and commitment made by CAA's top management.

The Directorate of Safety & Quality Management System has been established with its field offices at various airports / locations to provide onsite support and guidance on the issues pertaining to the Health, Safety, Environmental Protection, Energy Conservation, Customer Satisfaction, Aviation Security and Information Security Management System. The requirement detailed in this Manual are derived based upon international standards and industry best practices. The CAA reserves the right to change / amend the requirement stated in this document with the change in requirement of international standard or to suit CAA's requirement.

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RECORDS OF AMENDMENTS AND CORRIGENDA

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FOREWORD

Pakistan Civil Aviation Authority is focused on improving the Health, Safety and Environment related aspects which would enable to control occupational hazards & safety risks essentially required to implement Environmental Management System. The development and implementation of an Integrated Management System is already in process through which CAA has already acquired ISO 9001:2008 (Quality management System) and is now steadily moving forward to acquire ISO 14001:2004 (Environmental Management System), OHSAS 18001:2006 (Occupational Health and Safety Management System), CS ISO 10001:2007 (Customer Satisfaction), ISMS ISO 27001:2005 (Information Security Management System), EnMS 50001:2011 (Energy Management System) and ICAO SeMS (Security Management System) duly integrated with ICAO's Aviation Safety Management System.

I would like to highlight the pivotal role of contractors, suppliers, and concessionaires in different activities being carried out at our premises to conform to the acceptable safety standards in order to control adverse environmental impacts and safety hazards / risks. We shall constantly need the support of contractors, suppliers, and concessionaires to assist in inculcating a safe and environment friendly culture at our premises.

This Manual contains guidelines to be followed by the contractors, suppliers, and concessionaires in compliance with all the standards and regulation of safety, environment, occupational health and quality based on continual improvement concept while performing work / activity within the areas of responsibility at Pakistan Civil Aviation Authority premises. The relevant CAA officials will extend maximum possible assistance wherever clarifications are required regarding interpretation of this manual.

I would also like to acknowledge the contributions made by the contractors, suppliers and concessionaires in developing and maintaining the infrastructure at the Pakistan Civil Aviation Authority airports and other locations. At the same time, I urge them to actively participate in our efforts to create positive improvements by strengthening the institution through adoption of best quality, health, safety, and environmental practices enabling Pakistan Civil Aviation Authority to become a leading aviation organization.

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Handwritten signature of Asim Suleiman

(ASIM SULEIMAN)

Air Marshal

(Retd.) Director

General

Pakistan Civil Aviation Authority

Dated: - **11 March 2017**

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For PAA



HSE MANUAL FOR CAA CONTRACTORS, SUPPLIERS & CONCESSIONAIRES

For Contractor

ACRONYMS

ATS	AIR TRAFFIC SERVICE(S)
CAA	CIVIL AVIATION AUTHORITY
CARs	CIVIL AVIATION RULES
CAAF	CIVIL AVIATION AUTHORITY FORM
CAAO	CIVIL AVIATION AUTHORITY ORDER
DMR	DEPUTY MANAGEMENT REPRESENTATIVE
HQCAA	HEADQUARTER CIVIL AVIATION AUTHORITY
HSE	HEALTH SAFETY ENVIRONMENT
IAR	IMPROVEMENT ACTION REPORT
IMS	INTEGRATED MANAGEMENT SYSTEM
MR	MANAGEMENT REPRESENTATIVE
PPE	PERSONAL PROTECTIVE EQUIPMENT
PTW	PERMIT TO WORK
EMS	ENVIRONMENTAL MANAGEMENT SYSTEM
ISO	INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
LOTO	LOCK-OUT TAG-OUT
LPG	LIQUID PETROLEUM GAS
MNL	MANUAL
MSDS	MATERIAL SAFETY DATA SHEET
NEQS	NATIONAL ENVIRONMENTAL QUALITY STANDARDS
OH&SMS	OCCUPATIONAL HEALTH & SAFETY MANAGEMENT SYSTEM
OPI	OFFICE OF PRIME INTEREST
QMS	QUALITY MANAGEMENT SYSTEM
SMS	SAFETY MANAGEMENT SYSTEM
TQM	TOTAL QUALITY MANAGEMENT

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15/03/2017
For PAA

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MNL-002-MSXX-
For Contractor

Chapter 1

INTRODUCTION

1.1 INTRODUCTION

Integrated Management System comprising International Management System standards ISO 9001: 2008 (Quality Management System), ISO 14001: 2004 (Environmental Management System), OHSAS 18001: 2007 (Occupational Health and Safety Management System), and ICAO's SMS (Safety Management System) has been implemented in Pakistan CAA. These standards require adherence from all the stakeholders to fulfill their respective obligations towards vital aspects of Safety, Quality, Occupational Health and Environment. This HSE Manual outlines the responsibilities of contractors, suppliers and concessionaires working for CAA or on the areas under CAA's jurisdiction

1.2 CAA IMS POLICY

Top Management commitment is demonstrated in IMS Policy, attached as **Appendix-A** (English version) and **Appendix-B** (Urdu version).

1.3 RESPONSIBILITY & AUTHORITY

1.3.1 RESPONSIBILITY FOR HSE COMPLIANCE:

- 1.3.1.1 CAA shall require Contractors and/or Sub-contractors / Suppliers / Concessionaires to affirm that all supervisors are responsible for ensuring that the works / activities are performed in accordance with all applicable health, safety and environmental rules, regulations and good working practices with equal diligence being paid to the fulfillment of the contractual technical specifications. CAA will require Contractors and Sub-contractors to advise such personnel of their safety responsibilities. Contractors / Suppliers / Concessionaires shall also provide CAA with their organizational setup for a particular contract / subcontract / renewal / bid invitation document, where applicable, specifying the areas of safety responsibilities of their supervisors.
- 1.3.1.2 **All DDGs** shall ensure imparting necessary directions and establish requisite monitoring & evaluation mechanism in their respective area of responsibilities to fulfill the vision and the objectives contained in this manual.
- 1.3.1.3 **The concerned Directors / Additional Directors / Airport Managers/Chief Operations Officers / Location Heads / Sectional Heads**, involved / engaged in the purchase of materials, services and contracts (including sub-contracts, if any), shall ensure effective implementation of this manual. They shall also be responsible to designate **Contract Coordinators** where applicable especially on large scale projects.
- 1.3.1.4 **Contract Coordinator** (a designated CAA Employee) shall be responsible for the on-site implementation of HSE requirements by the contractors and their officials / workers. He shall also be responsible to record on-site management activities and meetings specific to the HSE issues.
- 1.3.1.5 **Deputy Management Representatives (DMRs)** shall be responsible to oversee the implementation and effectiveness of this manual at their respective Airports / ATS Units / Locations.
- 1.3.1.6 The concerned **Directors / Additional Directors / Airport Managers / Chief Operations Officers / Location Heads / Sectional Heads**, involved / engaged in the purchase of materials, services and contracts (including sub-contracts, if any), shall ensure incorporation of specific clause(s) on Safety, Health & Environment in the contract agreements or their renewals / bid invitation documents indicating the need for compliance with the detailed guidelines as outlined in this manual.

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- 1.3.1.7 All Safety, Health and Environment requirements contained in this manual shall also be made part of the bid invitation documents / contracts.
- 1.3.1.8 Any specific requirements not covered in this manual and in the existing HSE clause of the contract / lease agreement may be specified in the contract / lease documents by the respective CAA functions, in consultation with Additional Director SQMS (REG/CF), Additional Director SQMS (ANS/APS) at HQCAA and concerned DMRs at Airports / ATS Units / Locations. These may include but not limited to:
- Working procedures
 - Risk / impact assessment of the job
 - Requirements of transporting carrier, machinery / equipment and tools
 - Handling / packaging identification requirements
 - Information about the product composition
 - Compliance to the related Safety, Health & Environment procedures for performing the activity
 - Usage of Personal Protective Equipment (PPE)
 - Competence / training requirements of workers
 - Handling and disposal of waste, etc
 - The need to obtain Permit To Work (PTW), where required
 - Emergency procedures
 - Accident / incident reporting
 - Legal requirements
- 1.3.1.9 The **concerned Directors / Additional Directors / Airport Managers / Chief Operations Officers / Location Heads / Sectional Heads** may ask the supplier / contractor / concessionaire to carry out a **risk assessment** before awarding a contract for high-risk tasks, where applicable.

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1.3.2 ONSITE MANAGEMENT OF CONTRACTORS FOR MEGA / MAJOR PROJECTS:

- 1.3.2.1 The **concerned DDGs / Directors / Additional Directors / Airport Managers / Chief Operations Officers / Location Heads / Sectional Heads** shall ask the contractor / supplier / concessionaire to designate a **Safety Officer** wherever applicable, depending upon the quantum of contract, who shall be the focal person and responsible for on-site implementation of HSE requirements on part of contractors / suppliers / concessionaires. For Contracts / Agreements of smaller quantum, the contractor / supplier / concessionaire shall be directly responsible in this regard without having the need to designate such representatives.
- 1.3.2.2 The **concerned Directors / Additional Directors / Airport Managers / Chief Operations Officers / Location Heads / Sectional Heads** shall be responsible to nominate a representative (**Contract Coordinator**) for on-site management of contractors for mega / major projects. The contract coordinator / representative shall monitor the HSE compliance by the contractor / supplier. This includes monitoring of:
- Controls to prevent HSE risks
 - Contractor equipment for appropriateness
 - Compliance of work procedures
 - Waste Disposal & Record keeping

- e. Compliance of regulatory requirements, to this HSE Manual or their own HSE Manual(s) if exceeding the requirement stipulated by the CAA and PTW by contractors / suppliers / concessionaires
- 1.3.2.3 **Regular on-site meetings with the contractor** must be convened / held to discuss the HSE compliance and related aspects of the job. Records of such meetings and on-site management activities must be maintained by the Contract Coordinator.
- 1.3.2.4 **HSE audit or on-site inspections** shall be carried out randomly by the authorized Inspectors of SQMS Directorate in coordination with the concerned Directorate / Branch at HQCAA and concerned Section at airports / locations for checking HSE compliance. IAR (Improvement Action Report) on **CAAF-002-MSXX** shall be raised / generated in case any non-conformity is observed or if any corrective or preventive action is required. All proceedings of the audit or on-site inspections shall be documented by the respective inspectors.
- 1.3.2.5 All the works, purchase / supplies and services being carried out / rendered by Contractors / Suppliers / Concessionaires shall be liable to monitoring and supervision by CAA's authorized / designated official(s) to ensure their HSE- worthiness. Surprise inspection may be carried out at any time by SQMS Officials.
- 1.3.2.6 The monitoring / supervision so required shall be made under the relevant clause(s) of the contract. The performance monitoring data of contractors with regard to compliance to HSE manual and CAAO will be collected / maintained and documented on periodical basis by the respective DDGs as well as by SQMS Directorate / SQMS teams at locations, to develop necessary corrective / preventive actions accordingly. This significant data of a particular contractor / supplier / concessionaire, will be critically observed and be given due consideration at the time of awarding / continuation / renewals etc of any contract.
- 1.3.2.7 All potential Contractors, Suppliers and Concessionaires shall be informed about the availability of HSE manual which would require compliance from them. The latest version of this Manual shall be posted on the CAA's Official Website www.caapakistan.com.pk.
- 1.3.2.8 The concerned Directorate / Branch / Airport / Location shall provide the hard copy of the latest version of HSE Manual to the Contractors / Suppliers / Concessionaires at the time of signing of the Contract Agreements / License Agreements / Lease Deeds / Purchase Orders / Supply Orders, etc.
- a. No work be executed without supervision of concerned representation of OPI Section / Branch, especially at aerodrome.
- b. The representation of OPI section / function shall ensure implementation of preventive control measures during execution of work and corrective measures in case of any abnormal / emergency situation.
- c. All food concessionaires shall preferably be certified in Food Safety Management System ISO 22000: 2017.
- 1.3.2.9 In case of existence of any Contractor's, Supplier's and Concessionaire's HSE Manual having provisions more stringent to this HSE manual, those shall be applicable as far as the currency of that particular contract is concerned.
- 1.3.2.10 All the Contractors, Suppliers and Concessionaires shall be responsible to provide and update bare minimum training / awareness on HSE to their employees and subsequent implementation. Any breach / violation thereof by any of such employee(s) shall be construed upon to be on behalf of that very Contractor, Supplier and Concessionaire. Records pertaining to HSE related training / awareness shall be maintained and provided to concerned CAA official(s) designated by the OPI and/or Representative(s) of CAA's SQMS team.

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- 1.3.2.11 The training / awareness described above shall include but not limited to the following: -
- a. Site acquaintance (i.e. Aerodrome / Building layout, Building Evacuation Procedure, etc).
 - b. General aerodrome layout & hazards and handling of standard equipment.
 - c. HSE related operational hazards / environmental aspects and risks / environmental impacts associated and related control measures with the particular contract / agreement.
 - d. Basic First Aid and other corrective measures.
 - e. Application of Permit to Work / Lock Out and Tag Out.
 - f. Special MSDS, classification / composition of hazardous material for handling of hazardous material.
 - g. Incident(s) / accident(s) including environmental incidents (spills, etc) reporting.
 - h. Waste management.
 - i. Basic Fire Fighting.
 - j. Safe driving.
 - k. Response in emergency.
 - l. Personal Protective Equipment (PPE).



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Chapter 2

GENERAL INFORMATION

2.1 BASIC SAFETY & SECURITY RESTRAINTS

2.1.1 The following are some basic safety & security restraints. In case of violation of any of these, Contractors / Suppliers / Concessionaire shall be dealt with in accordance with **Rule 91 (Section 10) of CARs 94**:

- 2.1.1.1 Possession or use of alcoholic beverages or illegal drugs.
- 2.1.1.2 Possession of un-authorized explosives, firearms, ammunition, and other weapons.
- 2.1.1.3 Violation of any safety or security rules or requirements as laid down in **Part VIII, Section 10 of CARs, 94 (Rule 92-110)**.
- 2.1.1.4 Illegal dumping, handling, or disposal of hazardous materials.
- 2.1.1.5 Demolition or removal, without written permission, of any property belonging to CAA.
- 2.1.1.6 Intimidating, threatening, harassing, impeding or interfering with CAA employee(s) or designated representative(s).
- 2.1.1.7 Misuse of fire prevention and protection equipment.
- 2.1.1.8 Unauthorized removal or destruction of a safety barricade, handrail, guardrail, warning sign, fall protection, or other warning devices intended to protect employees or property.

2.2 SAFETY PERMITS

2.2.1 All CAA contractors, suppliers or concessionaires shall obtain prior approval for PTW from CAA's authorized / designated official(s) and follow all the safety requirements, precautions, controls of PPEs classified as PTW related tasks as any of the operations mentioned below may present a hazard to people, property and environment.

- 2.2.1.1 Performing burning, welding, cutting, soldering, or other hot work.
- 2.2.1.2 Working on fire protection / detection systems.
- 2.2.1.3 Working on electrical, steam, chilled water systems or other energized systems.
- 2.2.1.4 Installing a temporary electrical service
- 2.2.1.5 Working with hazardous chemicals (including solvents and paints).
- 2.2.1.6 Handling, transporting or generating hazardous wastes (including hospital biological waste, waste oil, chemicals, condensate, etc).
- 2.2.1.7 Using a gas, diesel, or LPG (such as Propane) powered engines.
- 2.2.1.8 Working on gas pipe lines or associated equipment.
- 2.2.1.9 Operating a power vehicle or self-propelled work platform.
- 2.2.1.10 Excavation / trenching.
- 2.2.1.11 Using radioactive sources or conducting field radiography (x -ray).
- 2.2.1.12 Working with asbestos & asbestos – containing materials.
- 2.2.1.13 Working on security systems.
- 2.2.1.14 Working with compressed air / gases.
- 2.2.1.15 Working on heating, ventilation, or air conditioning equipment.

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- 2.2.1.16 Working with chemicals, polishing or grinding.
- 2.2.1.17 Working at heights of more than 06 feet or on roofs.
- 2.2.1.18 Entering or working in confined spaces like fuel tanks, trenches, service shafts, sewer system, etc.
- 2.2.1.19 Lifting or hoisting with cranes or hoists.
- 2.2.1.20 Blasting operations, etc.

2.3 **PERFORMANCE MONITORING**

- 2.3.1 The Contractors / Suppliers / Concessionaires shall monitor HSE performance of their employees and activities.
- 2.3.2 They shall in addition monitor all those performance monitoring actions agreed between CAA and the Contractors / Suppliers / Concessionaires.

2.4 **HOUSE KEEPING**

- 2.4.1 All Contractors / Suppliers / Concessionaires shall maintain good housekeeping by keeping work areas neat, clean, orderly, free of excess trash, debris and shall block walkways, stairs, exits, or create a tripping hazard. Poor housekeeping at a job site may lead to an increased potential for safety hazards and an increased frequency of accidents, falls, cuts, spills, leaks, fires or electrocution.
- 2.4.2 Tools, wires, materials shall not be left or haphazardly spread out at the work place.
- 2.4.3 Open holes, trenches, or excavations into which people may fall shall be identified, covered or provided with guardrails.
- 2.4.4 In order to protect the employees and environment, safety blinding shall be provided at all works execution sites, where necessary.

2.5 **REPORT OF ACCIDENT, INCIDENT, INJURY OR ILLNESS**

- 2.5.1 The area representatives of contractor shall inform fire, electrical, civil inquiries officials each day before start of work.
- 2.5.2 All work related accidents, incidents, fatalities, injuries, and illnesses must immediately be reported to the CAA authorized / designated officials.
- 2.5.3 Every incident / accident happened during execution of contractors work shall properly be analyzed as per **CAA0-015-MSXX** and if fall in Major / Catastrophic categories be published / mentioned in IOU report by the OPI Section / Branch.



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Chapter 3

HAZARDOUS WASTE

3.1 HAZARDOUS WASTE MANAGEMENT

- 3.1.1 Hazardous waste generated by a Contractor / Supplier / Concessionaire as part of its work must be properly identified, stored and disposed in accordance with applicable laws / rules / regulations. The Contractor / Supplier / Concessionaire must coordinate with CAA representative(s) of relevant sections to provide a list of hazardous waste(s) which is / are likely to be generated during the project / activity, and to determine the location(s) for hazardous waste storage.
- 3.1.2 The Contractor / Supplier / Concessionaire must also ensure, at a minimum:
- 3.1.2.1 Proper labeling in terms of MSDS.
 - 3.1.2.2 Adequate secondary containment.
 - 3.1.2.3 Segregation of incompatible materials.
 - 3.1.2.4 Routine inspection of storage areas.
- 3.1.3 In addition, all hazardous waste containers shall be constructed of a material compatible with the waste, in sound condition, and kept securely closed to avoid spill or leakage.

3.2 WASTE DISPOSAL DOCUMENTS

The Contractors / Suppliers / Concessionaires shall be responsible for completing all waste disposal documents as per statutory / regulatory requirements, where applicable and as required by CAA. This may relate to CAA's own waste that is periodically removed for further disposal purposes, or waste created by Contractor / Supplier / Concessionaire while performing a task at CAA premises / areas under CAA's jurisdiction. OPI shall also ensure all normal wastes are also removed by the contracts.

3.3 TRAINING

Contractor / Supplier / Concessionaire must ensure that their employees are appropriately trained in hazardous waste management procedures. In the event a Contractor / Supplier Concessionaire encounters unidentified material that is reasonably believed to be hazardous (radioactive, volatile, corrosive, flammable, explosive, magnetic, infectious, toxic), the Contractor / Supplier / Concessionaire shall immediately stop work in the affected area and report the condition to the CAA's authorized / designated official(s). At no time shall such material be disposed in chutes, drains, pipes or in any other unauthorized manner.

3.4 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS

- 3.4.1 Transportation of hazardous materials on CAA property shall be conducted in accordance with CAA specified instructions. It shall not be disposed to burn or be used in a manner that is harmful to people or environment. While transporting hazardous materials, Contractor / Supplier / Concessionaire shall ensure that no harm is done to people or environment because of poor containers, packing, covering, lashing, fixing, loading, stacking or improper vehicle or mode of transport.
- 3.4.2 All transportation of dangerous / hazardous goods and materials by air shall be conducted strictly in accordance with provisions of Part XVI, Sections 1-3 and 5-6 of the Civil Aviation Rules, 1994.

3.5 SPILL PREVENTION AND CONTROL

- 3.5.1 Based on the inventory of oil and hazardous chemicals that will be brought on-site, the Contractor / Supplier / Concessionaire shall have available equipment (e.g., secondary containment pallets, absorbent pads, absorbent booms, speed-dry etc.) that is suitable and sufficient to control a potential spill / release.

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- 3.5.2 The Contractor / Supplier / Concessionaire is responsible for identifying outlets to the environment (e.g., sumps, sewers, storm / floor drains, etc.) and adequately minimizing spill potential to these areas.
- 3.5.3 The Contractor / Supplier / Concessionaire is responsible for the proper storage of all flammable and combustible chemicals that are brought and/or stored on site to complete the work. Such storage may require the use of safety containers, safety cabinets, and/or secondary containment.
- 3.5.4 The Contractor / Supplier / Concessionaire shall also ensure that any incompatible chemicals are safely segregated. The Contractor / Supplier / Concessionaire is Responsible for maintaining and securing all chemical containers and all chemical storage-areas. This requires selecting locations and methods to minimize exposure to rainfall, surface water, and the ground surface or subsurface.
- 3.5.5 The Contractors / Suppliers / Concessionaires must ensure that their employees are adequately trained in spill control procedures and are aware of the use of spill control kits.
- 3.5.6 In the event of a release or spill, the Contractor / Supplier / Concessionaire must immediately inform CAA's authorized / designated official(s).

3.6 AIR EMISSIONS

- 3.6.1 Any conditions discovered which could result in an increase in air pollutant emissions must immediately be reported to the CAA's authorized / designated official(s).
- 3.6.2 Contractors / Suppliers / Concessionaires activities should not cause unacceptable level of emissions (emissions not meeting NEQS – National Environmental Quality Standards).
- 3.6.3 Contractors / Suppliers / Concessionaires shall immediately notify the CAA's authorized / designated official(s) whenever they become aware of any unintentional or intentional release of CFCs (Chloro-Fluoro Carbons), Halons etc.

3.7 WASTE WATER DISCHARGES

- 3.7.1 Waste water must NOT include any corrosive, flammable, or toxic substances / hazardous liquid, etc.
- 3.7.2 Contractor / Supplier / Concessionaire must ensure no waste water is discharged that violates NEQS.

3.8 BIOLOGICAL / CHEMICAL / RADIOACTIVE HAZARDS

- 3.8.1 Some CAA operations may involve the use of biological, chemical, or radioactive material that can be hazardous to persons or property, if not handled or disposed safely. Contractors / Suppliers / Concessionaire will mark the areas where work with biological, chemical, or radioactive materials is being performed with proper signs.
- 3.8.2 The Contractor / Supplier / Concessionaire shall not disturb damage or otherwise handle any suspected asbestos containing material.
- 3.8.3 The Contractor / Supplier / Concessionaire shall not sweep, dust, vacuum or mop dust / debris which are the product of a suspected asbestos containing material. The Contractor / Supplier / Concessionaire shall also not pick up or throw away any suspected asbestos-containing waste or trash.
- 3.8.4 Sand blasting, grinding, drilling, brazing, scraping, polishing of floors and other dust emitting surfaces will be done by persons wearing appropriate PPEs.

3.9 HAZARDOUS MATERIALS AND HAZARD COMMUNICATION

- 3.9.1 Hazardous materials shall not be handled or used by the Contractor / Supplier / Concessionaire without providing training to the concerned employees.



- 3.9.2 No solvents, paints, or similar flammable, toxic, or irritating materials shall be used in CAA premises / areas under the jurisdiction of CAA unless specifically authorized by CAA.
- 3.9.3 Adequate ventilation shall be maintained when paints or solvents are used.
- 3.9.4 Flammable solvents and materials shall be used with extreme caution.
- 3.9.5 It shall be ensured that flammable paints and solvents are isolated and stored in approved locations, if inside the building.
- 3.9.6 The Contractor / Supplier / Concessionaire shall submit an inventory of all hazardous chemicals / liquids / materials that are brought on-site or sold to CAA. These should be accompanied by MSDS.
- 3.9.7 The Contractor / Supplier / Concessionaire shall also ensure that all containers that are brought on site for the storage of hazardous chemicals (e.g., gas, paint, etc.) are labeled and inspected for correctness.
- 3.9.8 The Contractor / Supplier / Concessionaire shall remove at earliest all hazardous chemicals that it brings on-site when work involving a specific hazardous chemical has been completed.

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Chapter 4

SPECIFIC SAFETY REQUIREMENTS

4.1 CONFINED SPACE ENTRY

- 4.1.1 Contractor / Supplier / Concessionaire will obtain Confined Space Entry Certificate before entering / working in confined spaces. If during the course of work, the Contractor / Supplier / Concessionaire encounters a confined space that has not been previously identified by the CAA, it must immediately bring the space to the attention of the CAA's authorized / designated official(s), and delays entry until the space is examined by the CAA's authorized / designated official
- 4.1.2 When CAA and Contractor / Supplier / Concessionaire personnel are working in or near confined spaces, the Contractor / Supplier / Concessionaire shall coordinate all operations, with likely-to-be-affected CAA personnel before entry.
- 4.1.3 Prior coordination shall also be required on entering a confined space with or without a CAA employee

4.2 LOCK-OUT / TAG-OUT (WHERE APPLICABLE)

- 4.2.1 As part of CAA's Electrical Isolation / De-Isolation permit requirement, standard locks and tags are used to control the start-up of equipment that is being serviced or maintained by its employees. At no time shall the Contractor / Supplier / Concessionaire or its employees override any locks or tags that they encounter during the performance of their work.
- 4.2.2 The Contractors / Suppliers / Concessionaires are responsible for developing, implementing and maintaining their own Lock-out / Tag-out Program.
- 4.2.3 The Contractor / Supplier / Concessionaire shall submit a copy of its Lock-out / Tag-out Program to the CAA's authorized / designated official(s) before the start of any work.

4.3 GENERAL ELECTRICAL SAFETY

- 4.3.1 Temporary electrical connection(s), where required, shall be obtained from CAA as per the prescribed procedure only.
- 4.3.2 Only qualified electricians are permitted to work on electrical systems and equipment that use or control electrical / power.
- 4.3.3 Electrical tools or equipment shall not be operated in wet areas or areas where potentially flammable dusts, vapors, gases, or liquids are present, unless specifically approved.
- 4.3.4 Should a circuit breaker or other protective device "trip," it is to be ensured that a qualified electrician checks the circuit and equipment and corrects problem before resetting the breaker. Moreover, there should always be a provision for safety isolation of the circuit where needed
- 4.3.5 Barriers and post warning signs shall be erected to ensure that the non-authorized personnel stay clear of the work area.
- 4.3.6 Hazards (lack of protective guards or covers, damaged equipment, etc.) shall be reported to the CAA's authorized / designated official(s) immediately.
- 4.3.7 Electrical boxes, switch gear, cabinets, or electrical rooms shall not be left open when not directly attended.
- 4.3.8 It shall be ensured to insulate energized parts when have been removed or doors are closed. Use of cardboard, plywood or other flammable to cover energized circuits is prohibited.
- 4.3.9 Proper grounding / earthing and arc quenching, where required, shall be ensured.

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4.3.10 The size of the cable / conductor should match with the actual on-site requirement.

4.4 COMPRESSED GAS CYLINDERS

The following measures must be taken for the protection of persons and property:

- 4.4.1 All the cylinders brought in by the Contractors / Suppliers / Concessionaires shall have valid test certificates performed by a certified testing agency.
- 4.4.2 Pressure and leak testing shall invariably be carried out and documented in all jobs associated with compressed gas or liquid handling.
- 4.4.3 Valve protection caps must be in place when compressed gas cylinders are transported, moved, or stored.
- 4.4.4 Cylinder valves must be closed and valve covers must be replaced when work is complete and when cylinders are empty or moved.
- 4.4.5 Compressed gas cylinders must be secured in an upright position in a welding cart or to a solid object (using chains, straps, or a rigid retaining bar).
- 4.4.6 Compressed gas cylinders must be secured on an approved carrier while being transported.
- 4.4.7 Cylinders shall be kept at a safe distance or shielded from welding or cutting operations. Cylinders shall not be placed where they can contact an electrical circuit.
- 4.4.8 It shall be ensured to keep oxygen and flammable gas regulators in proper working order and a wrench in position on the acetylene valve when in use.
- 4.4.9 If a leak develops in a cylinder and it cannot be immediately corrected, the cylinder shall be moved to a safe location outside the building / away from the location of work.
- 4.4.10 Cylinders must not be taken into or stored in confined spaces.
- 4.4.11 Empty & filled cylinders must be kept separately.
- 4.4.12 Hoses and regulators must not be stored in unventilated or closed containers or areas.

4.5 WELDING, CUTTING AND BRAZING

The Contractors / Suppliers / Concessionaires shall ensure the following:

- 4.5.1 Obtain PTW.
- 4.5.2 Inform CAA's authorized / designated official(s) prior to the start of any welding / cutting / brazing work.
- 4.5.3 Remove combustible materials from the area before beginning work.
- 4.5.4 Install anti flashback (safety / check) valves in both the oxygen / acetylene hoses at the regulator.
- 4.5.5 Shield adjacent areas with welding partitions.
- 4.5.6 Persons involved are adequately trained in using portable fire extinguishers.
- 4.5.7 Have a second person trained in basic firefighting as standby with an approved fire extinguisher for welding and cutting operations.

4.6 CRANES AND RIGGING

- 4.6.1 Each crane or hoist brought onto CAA property must have a valid inspection testing performed by a certified testing agency.
- 4.6.2 The operator is responsible for the proper placement of the crane in relationship to the load to be handled and the landing area so as to obtain the best rated lift capacity, and the installation and maintenance of crane swing radius protection.
- 4.6.3 All operators must possess a valid crane / hoist operating / driving license as applicable.

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**4.7 FITNESS**

- 4.7.1 Suppliers / Contractors / Concessionaires shall ensure that all their personnel working in CAA premises are medically fit to perform their assigned tasks.
- 4.7.2 If requested by CAA, Contractors / Suppliers / Concessionaires shall provide the fitness / health certificates of their employees.

4.8 DRIVING

- 4.8.1 All Contractors' / Suppliers' / Concessionaires' vehicles while in CAA premises or performing CAA duties shall adhere to speed limits (applicable in that particular zone), and also comply with all other traffic and road safety regulations of CAA.
- 4.8.2 The drivers should be in possession of valid driving license.
- 4.8.3 All Contractor / Supplier / Concessionaire vehicles should have:
- 4.8.3.1 Standard seat belts. The seat belts should be neat and clean and in proper working condition.
 - 4.8.3.2 Standard fire extinguisher.
 - 4.8.3.3 Standard first aid box.

4.9 INDEMNITY

Suppliers / Contractors / Concessionaires shall keep harmless and indemnify Pakistan CAA against all losses, damages, injuries, death of any person, claims, actions, third party action arising out of acts and omissions by their employees/ personnel or non-compliance with the terms and conditions as stated herein and/or any applicable laws and regulation. Contractor shall take clearance with concerned offices before handing / taking over the area to be restored on the same condition(s) as was/were before start of work (as per contract agreement).

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For PAA



HSE MANUAL FOR CAA CONTRACTORS, SUPPLIERS & CONCESSIONAIRES

For Contractor

APPENDICES

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15/03/2017
For PAA

MNL-002-MSXX-
For Contractor

APPENDIX-A

PAKISTAN CIVIL AVIATION AUTHORITY
INTEGRATED MANAGEMENT SYSTEM POLICY

Pakistan Civil Aviation Authority (CAA) is committed to regulate aviation activities effectively and be a world class service provider in the Aviation Industry. Safety, Security, Quality and Environmental protection are integral to our Vision and Performance. CAA commits to develop, implement, maintain and continually improve an effective and proactive Integrated Management System in accordance with the requirements of National Standards, and International Standards contained in ICAO Annexes, Aviation Safety & Security Management Systems, Quality Management System, Information Security Management System, Environmental Management System, Energy Management System, Customer Satisfaction and Occupational Health & Safety Management System.

Pakistan CAA ensures to:

- ✦ Continually improve the Safety performance, Security measures and quality of its activities, products & services, prevent significant environmental pollution, and take care of the health & safety of its employees and stakeholders.
- ✦ Implement Energy conservation program in the organization including use of renewable/ alternate energy resources.
- ✦ Provide services of highest possible standard to meet customer satisfaction.
- ✦ Implement National Civil Aviation Security Program to safeguard against unlawful interference.
- ✦ Implement an effective Quality Control Program to ensure satisfactory security measures in compliance with National and International obligations for reducing Security Risks in aviation business.
- ✦ Protect Information in all its forms from accidental or intentional unauthorized modification, destruction or disclosure throughout its life cycle and ensure appropriate level of security over the equipment and software used to process, store and transmit that information.
- ✦ Comply with the applicable legislation and regulatory requirements concerning its activities, products and services.
- ✦ Adopt zero tolerance towards violation of procedures and standards pertaining to its operation.
- ✦ Provide adequate resources and frameworks for identification, hazard reporting and safety risk management.
- ✦ Provide mechanism for setting up and review of IMS objectives and targets.
- ✦ Take effective measures to continually improve its system and provide training to employees on safety, Security, Quality and Environmental issues to enable them in carrying out their jobs in a safe, efficient and competent manner.
- ✦ Develop a Safety and Quality culture in all activities and services which fastens safe practices, encourages non-punitive safety reporting & communication by recognizing that safety is paramount at all times.
- ✦ Prevent occupational injury and ill-health by managing safety risks at workplace and promoting a culture in which all its employees work in a Safe, and Healthy environment.

All management levels and every employee of Pakistan Civil Aviation Authority are accountable and responsible to meet their obligations toward Safety, Security, Quality and Environmental protection for the delivery of highest level of Safety / Security Performance.

(Signature)
(MUHAMMAD IRFAN ELAHI)
Sq. Ldr. (Retd.)
Secretary Aviation/
Chairman CAA Board

31st March 2018
Policy-001-MSXX-4.0

(Signature)
(ASIM SULEIMAN)
Air Marshal (Retd.)
Director General
Pakistan Civil Aviation Authority

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For PAA

For Contractor

APPENDIX-B



پاکستان سول ایئر وے اتھارٹی

آئی ایم ایس پالیسی

ادارہ شہری ہوابازی پاکستان ملک میں تمام شہری ہوابازی سے متعلق سرگرمیوں کو مربوط کرنے اور ہوابازی کی صنعت کو بین الاقوامی معیار پر لانے کے لیے پر عزم ہے۔ مخلوط سفر، مسافروں کا تحفظ، اعلیٰ کارکردگی اور ماحولیاتی تحفظ ہمارے نصب العین اور کارکردگی کا حصہ ہے۔ ادارہ شہری ہوابازی ملک میں ایک ایسے مربوط نظام جو کہ بین الاقوامی ادارہ شہری ہوابازی کے قوانین، ہوابازی کی صنعت کے تحفظ اور حفاظت، معیاری کارکردگی، معلومات و ماحولیات کے تحفظ، توانائی کے بچاؤ، مسافروں کے حقوق اور ان کے اطمینان اور پیشہ ورانہ صحت اور تحفظ پر مشتمل ہو، قومی اور بین الاقوامی معیار کی مطلوب ضروریات کے ساتھ ہمے کرے ہوئے ارتقاء، اطلاق و تسلسل اور بروقت بہتری کے عہد پر قائم ہے۔ ادارہ شہری ہوابازی پاکستان متعدد پالیسیوں اور کوئیٹنی بناتا ہے۔

ہم کارکردگی کو مسلسل بہتر بنانا، حفاظتی اقدامات کو معیاری بنانا، مصنوعات اور خدمات فراہم کرنا، ماحولیاتی آلودگی کو روکنا نیز اپنے ملازمین اور شرکاء داروں کی صحت اور حفاظت کا خیال رکھنا۔

ہم قابل تجدید / متبادل توانائی کے وسائل کے استعمال کے ساتھ ساتھ توانائی کے تحفظ پر عمل درآمد کرنا۔

ہم صارفین کے اطمینان پر پورا اترنے کے لیے اعلیٰ ترین خدمات کا معیار قائم کرنا۔

ہم غیر قانونی مداخلت سے مخلوط رہنے کے لیے قومی ہوابازی کے تحفظ کے کام کا احاطہ کرتے ہیں۔

ہم ایک ایسے موثر تحفظ نظام کا اطلاق کرنا جو کہ ہوابازی کو صنعت میں تحفظ سے حفاظتی خدمات کو کم کرنے کے لیے قومی دہائی ذمہ داریوں کے تحت تحفظ کے لیے متعلقہ شخص اور یٹنی بنائے۔

ہم ہوابازی کی صنعت میں اطلاعات کی ترسیل کو ہر طرح کے حادثے اور خطرات سے بروقت مخلوط بنانا اور تمام آلات و وسائل کی درستگی کے ساتھ ساتھ کرنا۔

ہم اپنی سرگرمیوں و خدمات پر لاگو تمام قوانین کی پاسداری کرنا اور قوانین و احکامات کی تعمیل کرنا۔

ہم اپنے کام کے طریقہ کار اور معیارات کی خلاف ورزی کے خاتمے کے عزم پر ہر وقت کے اصول پر کاربند رہنا۔

ہم خطرات کی آگاہی و نشاندہی اور ان سے تحفظ کے درجہ جات کے نظام کے لیے مناسب وسائل فراہم کرنا۔

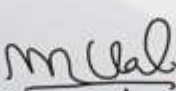
ہم مربوط نظام کے متناصروں اور اہل کار کے تعین اور ان پر نظر رانی کا طریقہ کار واضح کرنا۔

ہم اپنے نظام کی بہتری کے لیے مسلسل موثر اقدامات کرنا اپنے ملازمین کو اعلیٰ معیار، ماحولیات، حفاظت اور تحفظ کے بارے میں تربیت فراہم کرنا تاکہ وہ اپنی مہارت سے اپنی پیشہ ورانہ ذمہ داریوں سے ہمہ گیر ہوں۔

ہم تمام سرگرمیاں اور خدمات کی فراہمی میں معیار اور تحفظ پر مبنی ایک ایسے تمدن کو فروغ دینا جو کہ مخلوط طریقہ کار میں غیر تادیبی حفاظتی رپورٹنگ اور تریبل کی حوصلہ افزائی کرے بلکہ یہ بھی تسلیم کرے کہ تحفظ ہی مقدم ہے۔

ہم فراہم کنندگی کی ادائیگی کے دوران ہونے والے گم ہائی حادثات اور بیماریوں سے بچاؤ کے لیے معقولہ کوشش کرنا اور ایک ایسے تمدن کو فروغ دینا جس میں ملازمین مخلوط اور صحت منداحول میں کام کریں۔

پاکستان شہری ہوابازی کے تمام محکمات و ملازم ادارے میں اعلیٰ معیار، تحفظ و حفاظت اور ماحولیاتی تحفظ کے لیے اعلیٰ درجہ کی معیاری اور تحفظ پر مبنی خدمات سرانجام دینے کے ذمہ دار اور ہمہ جہت ہیں۔



(محمد عرفان الہی)

اسکواڈن لیڈر (ریٹائرڈ)

لنکریٹری ایئر وے اتھارٹی / چیئر مین سی اے اے بورڈ



(عاصم سلیمان)

ایگزیکٹو ڈائریکٹر

ڈائریکٹر جنرل پاکستان سول ایئر وے اتھارٹی

31st March 2016
Policy-001-MSXX-4.0

MASTER COPY

For PAA

For Contractor



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For Contractor

IN CASE OF ANY CONFLICT / CONTRADICTION BETWEEN PPRA STANDARD BIDDING DOCUMENTS AND PAA BIDDING DOCUMENTS, THE PROVISIONS STIPULATED UNDER PAA BIDDING DOCUMENTS SHALL PREVAIL AND BE TREATED AS FINAL



PAKISTAN AIRPORTS AUTHORITY
JINNAH INTERNATIONAL AIRPORT
(ES E&M – HVAC SECTION)

FINANCIAL **PROPOSAL**

INSTALLATION OF CHILLER PLANT MANAGER AT UTILITY BUILDING JIAP



For PAA

For Contractor



For PAA

FINANCIAL BID

For Contractor

INSTALLATION OF CHILLER PLANT MANAGER AT UTILITY BUILDING JIAP**BILL OF QUANTITIES / SCHEDULE OF PRICE**

S#	Description	Unit	Qty.	Rate Per Unit		Amount (PKR)
				In Figures	In words	
Sub Head: 1 Installation of Chiller Plant Manager						
01	Provisioning and installation of a complete Chiller Plant Manager (CPM) System on a Turn-key basis. The detail of the HVAC equipment installed at the Utility Building is mentioned in the Technical Specifications. The CPM will be comprised of but not limited to DDC Controller (BACnet Compliant), compatible I/O Expansion Modules, Rack-mount UPS for controllers, immersion type temperature Sensors, Brass thermowells, water flow Switches, differential pressure switches, current switches, water flow sensor with transmitter, pressure transmitters, conductivity transmitters, motorized butterfly valves, Modbus router (RS485 to IP), BACnet MS/TP to IP Router, Energy Analyzer with CTs. The scope besides provisioning of all hardware including server, field sensors, valves, monitoring LED screen and wirings also includes the development of GUI, programming, modifications to existing DCP-H12.1/12.2 panel, identification and tagging, software calibration, testing and commissioning with CPM Software including field diagnostics and trial runs including the development of cause and effect tables for different scenarios complete in all respect for upgradation to more advance features from existing Honeywell operation methodology following instructions of the OEM and Technical Specifications complete in all respect.	P/Job	01			
Sub Head: 2 Automation Control of AHU-44						
02	Provisioning and installation of complete components required to satisfactorily install and deploy the BMS on AHU-44 on a Turn-key basis. The detail of the HVAC equipment installed at the Utility Building is mentioned in the Technical Specifications. The CPM will be comprised of but not limited to duct-type temperature and relative humidity sensors, immersion-type temperature sensors, brass thermowells, water flow switches, differential pressure switches, current switches, chilled water pressure sensors, duct-type smoke detectors, damper	P/Job	01			



For PAA

For Contractor

For PAA				For Contractor		
S#	Description	Unit	Qty.	Rate Per Unit		Amount (PKR)
				In Figures	In words	
	actuators, 2-way chilled water control valve, modulating valve actuator, actuators for fire dampers. The scope also includes installation of all BMS Components including Hardware, Software, Sensors, Controls, Monitoring Devices, etc with Troubleshooting, Field Wiring, Interconnections, Programming, Modifications on AHU 44, Identification and Tagging, Software Calibration, Testing and Commissioning with BMS Software including field diagnostics, Modifications and trial runs including development of cause and effect tables for different scenarios complete in all respect for up gradation to advance features from existing Honeywell operation methodology in accordance with instructions of the OEM and Technical Specifications complete in all respect.					
Sub Head: 3 Network Wiring Between PTB and Utility Building						
03	Wiring of CCTV Camera with STP Cat-6 in existing PVC conduit/duct i/c connectors complete in all respect as approved by the Engineer Incharge.	P/Mtr	20			
04	Providing, punching, testing and commissioning of RJ-45 connector, complete in all respect as approved by engineer incharge.	Each	12			
05	Providing, Supplying, installation, fitting, fixing and commissioning of 12 Core single mode Fiber Optics Cable in given existing PVC Conduit, Box Conduit, complete in all respect as approved by the Engineer Incharge	P/Mtr	900			
06	Providing, installation, testing and commissioning of Media Converter, used for data conversion from fiber optic to Cat-6 ethernet cable, complete in all respect as approved by the engineer incharge	Each	2			
07	Providing, Supplying, installation, fitting, fixing and commissioning of ODF with Up & down fiber connectivity with required programming as needed, complete in all respect as approved by the Engineer Incharge (12 Port ODF)	Each	1			
08	Splicing of Fiber Optic cable with Splicing machine and its allied material, i/c complete testing & commissioning as approved by the engineer incharge.	Job	2			
Total Amount PKR						

Total in Words :

 For PAA

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Sr. Joint Director (HVAC)– JIAP
ES E&M JIAP - Karachi



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