STATE BANK OF PAKISTAN
SBP BANKING SERVICES CORPORATION
ENGINEERING DEPARTMENT
HEAD OFFICE KARACHI

VOLUME-I

VOLUME I: TECHNICAL PROPOSAL

Bidding documents

For

RENOVATION WORKS FOR ESTABLISHMENT OF RAAST SECRETARIAT AT 4TH FLOOR, AT SBP BSC HOUSE, HEAD OFFICE KARACHI

BIDDING AND CONTRACT DOCUMENT

INVITATION TO BID
INSTRUCTIONS TO BIDDERS
BIDDING DATA
FORM OF BID
QUALIFICATION CRITERIA
CONDITIONS OF CONTRACT
STANDARD FORMS
DRAWINGS
SPECIFICATIONS

Jan-26

SBP BANKING SERVICES CORPORATION
Engineering Department
Head Office Karachi

ITB No. ED/PROC-HOK/1061508/2026/307

INVITATION TO e-BID

1. SBP Banking Services Corporation, invites electronic bids from the suppliers/ contractors'/ service providers, who are registered with PPRA for E-Procurement on "e-Pak Acquisition and Disposal system (EPADS)", having Income & Sales Tax registration and are on Active Taxpayers List (ATL) of FBR.

Sr. No.	Tender No	Title of Procurement	Date & Time of		Bid Security (Rs.)
			Bid Submission	Bid Opening	
1.	307	Renovation Works for Establishment of RAAST Secretariat at 4th Floor, at SBP BSC House, Head Office Karachi	12-Feb-26 till 12:00 PM	12-Feb-26 at 12:30 PM	3,000,000/-

2. E-bidding documents as per regulations, containing detailed terms and conditions, specifications and requirements etc. are available for the registered bidders on EPADS at (www.eprocure.gov.pk).

3. The bidding shall be conducted in line with the Single Stage - Two Envelope Procedure - Rule 36 (b), prescribed under Public Procurement Rules 2004, e-Pak Procurement Regulations 2023 and any Regulations, Regulatory Guides, Procurement Guidelines or Instructions issued by the Authority (from time to time), and is open to all potential bidders registered in the EPADS.

4. All Bids must be accompanied by a Bid Security in the shape Payment Order/Bank Draft or an unconditional Bank Guarantee enforceable in Pakistan as mentioned in the table. The scanned copy of the Bid Security shall be uploaded in the EPADS while submitting bid, whereas the original Bid Security shall be submitted to the procuring agency at the Address mentioned before the bid submission deadline. The bidder who failed to submit the original bid security before the deadline shall be disqualified straightaway.

5. The e-bids, prepared in accordance with the instructions in the e-Bidding documents, must be submitted through EPADS on or before date/time specified in the table. E-bids will be opened on the same day at schedule mentioned in the table. Manual submission of Bids shall not be entertained. In case the bid opening date falls on a public holiday, the bids will be opened on the next working day at the same time.

6. In terms of Rules 48 of Public Procurement Rules, 2004 Grievance Redressal Committee (GRC) is notified for the subject procurement and notification copy is available on the procuring agency's website (www.sbp.org.pk) and on Authority's website at (www.ppra.org.pk).

Sd/-

Director Engineering
SBP Banking Services Corporation
Proc. Unit, Engg. Dept., 1st Floor Bolton Market
Building, MA Jinnah Road, Karachi
Phone: (92-21)–32454105, 32464122, Facsimile: 92-21-99221176
Website: www.sbp.org.pk

SBP BANKING SERVICES CORPORATION
ENGINEERING DEPARTMENT
HEAD OFFICE, KARACHI

Reference No.: ED/PROC-HOK/1061508/2026

INVITATION TO e-BID

1. State Bank of Pakistan Banking Services Corporation invites electronic bids from suppliers/contractors/service providers who are registered with the PPRA for E-Procurement on the "e-Pak Acquisition and Disposal System (EPADS)", having Income & Sales Tax registration, and are on the Active Taxpayers List (ATL) of the FBR.

S. No.	Tender No.	Title of Procurement	Date & Time of		Bid Security (Rs.)
			Bid Submission	Bid Opening	
1	305	Supply of Sweet Water at Various Premises of State Bank of Pakistan, Head Office, Karachi	29-Jan-2026 till 12:00 PM	29-Jan-2026 at 12:30 PM	700,000/-
2	306	Waterproofing of the raised terrace garden after removal of existing flooring and PCC from the top of the RCC slab to reduce the dead weight from the slab at MBB SBP Head Office, Karachi			100,000/-
3	307	Renovation Works for Establishment of RAAST Secretariat at 4th Floor, BSC House, SBP Head Office, Karachi	12-Feb-2026 till 12:00 PM	12-Feb-2026 at 12:30 PM	3,000,000/-

2. E-bidding documents as per regulations, containing detailed terms and conditions, specifications, and requirements, etc., are available for the registered bidders on EPADS at (www.eprocure.gov.pk).
3. All bids must be accompanied by a Bid Security as mentioned in the table. The scanned copy of the Bid Security shall be uploaded in the EPADS, whereas the original Bid Security shall be submitted to the procuring agency at the address, i.e., Engg. Department, Procurement Division, 1st Floor, SBP-BSC Bolton Market Building, M.A. Jinnah Road, Karachi, Phone: 021-32454122/05 before the bid opening deadline. The bidder who failed to submit the original bid security shall be disqualified straightaway.
4. The e-bids, prepared in accordance with the instructions in the e-Bidding documents, must be submitted through EPADS on or before the date/time specified in the table. E-bids will be opened on the same day at schedule mentioned in the table. Manual submission of Bids shall not be entertained. In case the bid opening date falls on a public holiday, the bids will be opened on the next working day at the same time.

Sd/-
Head/Director Engineering

PID (K-2356/25)

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SECTION II: INSTRUCTIONS TO BIDDERS

A. Introduction		
1. Scope of Bid	1.1	The Procuring agency/Employer (PA), as indicated in the **Bid Data Sheet** (BDS) invites Bids for the execution of Works as specified in the BDS and **Section V- Works Requirements**. The name, identification, and number of lots (contracts) of this National/ International Competitive Bidding process are specified in BDS.
2. Source of Funds	2.1	Source of funds as referred in Bid Data Sheet.
3. Eligible Bidders	3.1	A bidder may be natural person, company or firm or public or semi-public agency of Pakistan or any foreign country**,** or any combination of them with a formal existing agreement (on Judicial Papers) in the form of a joint venture or consortium. In the case of a joint venture or consortium, all members shall be jointly and severally liable for the execution of the Contract in accordance with the terms and conditions of the Contract. The joint venture or consortium shall nominate a Lead Member as nominated in the BDS, who shall have the authority to conduct all business for and on behalf of any and all the members of the joint venture or consortium during the Bidding process, and in case of award of contract, during the execution of contract. *(The limit on the number of members of JV or Consortium may be prescribed in BDS, in accordance with the guidelines issued by the PPRA)*.
	3.2	The appointment of Lead Member in the joint venture or consortium shall be confirmed by submission of a valid Power of Attorney to the Procuring agency/Employer
	3.3	Verifiable copy of the agreement that forms a joint venture or consortium shall be required to be submitted as part of the Bid.
	3.4	Any bid submitted by the joint venture or consortium shall indicate the part of proposed contract to be performed by each party and each party shall be evaluated (or post qualified if required) with respect to its contribution only, and the responsibilities of each party shall not be substantially altered without prior written approval of the Procuring agency/Employer and in line with any instructions issued by the Authority.
	3.5	The invitation for bids is open to all prospective bidder's subject to any provisions of incorporation or licensing by the respective national/ international incorporating agency or statutory body established for that particular trade or business.
	3.6 .	Foreign Bidders must be locally registered with the appropriate national incorporating body or the statutory body, before participating in the national/international competitive bidding with the exception of such procurements made by the foreign missions of Pakistan. For such purpose the bidder must have to initiate the registration process before the bid submission and the necessary evidence shall be submitted to the Procuring agency/Employer along with their bid, however, the final award will be subject to the complete registration process.
	3.7	A Bidder shall not have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidders may be considered to have a conflict of interest with one or more parties in this Bidding process, if they: a) are associated or have been associated in the past, directly or indirectly with a firm or any of its affiliates which have been engaged by the Procuring agency/Employer to provide consulting services for the preparation of design or technical specifications of the works that are the subject of the bid; or b) any of its affiliates has been hired (or is proposed to be hired) by the Procuring agency/Employer as Engineer for the Contract implementation; or c) The works to be executed are resulting from or directly related to consulting services for the preparation or implementation of the project that the bidder provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm; d) have controlling shareholders in common; or e) receive or have received any direct or indirect subsidy from any of them; or f) have the same legal representative for purposes of this Bid; or g) have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another

		bidder, or influence the decisions of the Procuring agency/Employer regarding this Bidding process; or h) Submit more than one bid in this bidding process.
	3.8	A Bidder may be ineligible if – (a) he is declared bankrupt or, in the case of company or firm, insolvent; (b) payments in favor of the bidder is suspended in accordance with the judgment of a court of law other than a judgment declaring bankruptcy and resulting (in accordance with the national laws) in the total or partial loss of the right to administer and dispose of its property; (c) legal proceedings are instituted against such bidder involving an order suspending payments and which may result, in accordance with the national laws, in a declaration of bankruptcy or in any other situation entailing the total or partial loss of the right to administer and dispose of the property; (d) the bidder is convicted, by a final judgment of a Court of Law or relevant Professional Statuary Body, of any offence involving professional conduct; (e) The bidder is debarred/ blacklisted by a national level Procuring agency/Employer and hence debarred due to involvement in corrupt and fraudulent practices, or performance failure or due to breach of bid securing declaration. (f) The bidder is blacklisted or debarred by a foreign country, international organization, or other foreign institutions for the period defined by them.
	3.9	Bidders shall provide to the Procuring agency/Employer evidence of their eligibility, proof of compliance with the necessary legal requirements to carry out the contract effectively.
	3.10	Bidders shall provide such evidence of their continued eligibility to the satisfaction of the Procuring agency/Employer, as the Procuring agency/Employer shall reasonably request.
	3.11	Bidders shall submit proposal relating to the nature, conditions and modalities of sub-contracting wherever the sub-contracting of any elements of the contract is envisaged.
4. Eligible Material and Equipment	4.1	All the material and equipment to be mobilized under the contract shall have their origin in eligible source countries, and all expenditures made under the contract will be limited to such materials and equipment. For this purpose, ineligible countries are stated in the section-IV titled as “Eligible Countries”.
	4.2	For purposes of this Clause, “origin” means the place where the material, equipment is produced, manufactured, or processed, or through manufacture, procession, or assembly, another commercially recognized article results that differs substantially in its basic characteristics from its imported components or the place from where the services are/to be supplied.
	4.3	The nationality of the bidder shall not determine the origin of the material and equipment.
	4.4	To establish the eligibility of the material and equipment, Bidders shall fill the country-of-origin declarations included in the Form of Bid.
5. One Bid per Bidder	5.1	A bidder shall submit only one bid, in the same bidding process, either individually as a bidder or as a member in a joint venture or any similar arrangement.
	5.2	No bidder can be a sub-contractor while submitting a bid individually or as a member of a joint venture in the same bidding process.
6. Cost of Bidding	6.1	The Bidder shall bear all costs associated with the preparation and submission of its bid, and the Procuring agency/Employer shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

B. Bidding Documents		
7. Contents of Bidding Documents	7.1	The scope of Works, bidding procedures, and terms and conditions of the contract are prescribed in the bidding documents. In addition to the Invitation for Bids, the bidding documents which should be read in conjunction with any addenda issued in accordance with **ITB 9.2** include: **Section I -**Invitation for Bids **Section II** Instructions to Bidders (ITBs) **Section III** Bid Data Sheet (BDS) **Section IV** Eligible Countries **Section V** Works Requirements Technical Specifications & Schedule of Requirements **Section VI** Standard Bidding Forms **Section VII** General Conditions of Contract (GCC) **Section VIII** Special Conditions of Contract (SCC) **Section IX** Contract Forms
	7.2	The number of copies to be completed and submitted with the Bid is specified in the **BDS.**
	7.3	The Procuring agency/Employer is not responsible for the completeness of the bidding documents and their addenda, if they were not obtained directly from the Procuring agency/Employer or the signed pdf version downloaded from the website of the Procuring agency/Employer or the Authority's website or e-Procurement System as the case may be. However, procuring agency/Employer shall place both the pdf and editable version of the same on its website and Authority's website or e-Procurement System to facilitate the bidder for filling the standard bidding forms.
	7.4	The bidder is expected to examine all instructions, forms, specifications, terms and conditions prescribed in the bidding documents. Failure to furnish all the information required in the bidding documents will be at the bidder's risk and may result in the rejection of his bid.
8. Clarification of Bidding Document, Pre-bid Meeting	8.1	A prospective bidder requiring any clarification of the bidding document may notify the Procuring agency/Employer in writing or in electronic form that provides record of the contents of communication at the Procuring agency/Employer's address indicated in the **BDS.**
	8.2	The Procuring agency/Employer will within three (3) working days after receiving the request for clarification, respond in writing or in electronic form to any request for clarification provided that such request is received not later than three (03) days prior to the deadline for the submission of Bids as prescribed in **ITB 24.1.** However, this clause shall not apply in case of alternate methods of procurement.
	8.3	Copies of the Procuring agency/Employer's response will be forwarded to all identified prospective bidders through an identified source of communication, including a description of the inquiry, but without specifying its source. In case of downloading of the bidding documents from the website of Procuring agency/Employer or e-Procurement System, the response of all such queries will also be available on the same platform available at the website.
	8.4	Should the Procuring agency/Employer deem it necessary to amend the bidding documents as a result of a clarification, it shall do so following the procedure as prescribed under **ITB 09.**
	8.5	If indicated **in the BDS**, the bidder's designated representative is invited at the bidder's cost to attend a pre-bid meeting at the place, date and time mentioned in the **BDS**. During this pre-bid meeting, prospective bidders may request clarification of the schedule of requirement, the evaluation criteria or any other aspects of the bidding documents.
	8.6	Minutes of the pre-bid meeting, if applicable, including the text of the questions asked by bidders, including those during the meeting (without identifying the source) and the responses given, together with any responses prepared after the meeting will be transmitted promptly to all prospective bidders who have obtained the bidding documents. Any modification to the bidding documents that may become necessary as a result of the pre-bid meeting shall be made by the Procuring agency/Employer exclusively through the use of an

		Addendum pursuant to **ITB 9.** Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.
	8.7	The bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the bidder's own expense.
	8.8	The bidder and any of its authorized personnel will be granted permission by the Procuring agency/Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the bidder and its personnel will release and indemnify the Procuring agency/Employer from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.
9. Amendment of Bidding Documents	9.1	Before the deadline for submission of bids, the Procuring agency/Employer for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder or pre-bid meeting may modify the bidding documents by issuing addenda.
	9.2	Any addendum issued including the notice of any extension of the deadline shall be part of the bidding documents pursuant to **ITB 7.1** and shall be communicated in a timely manner and on equal opportunity basis. Where notification of such change, addition, modification or deletion becomes essential, such notification shall be made in a manner similar to the original advertisement. *Provided that the bidder who had either already submitted their bid or handed over the bid to the courier prior to the issuance of any such addendum shall have the right to withdraw his already filed bid and submit the revised bid prior to the original or extended bid submission deadline.*
	9.3	To give prospective bidders reasonable time in which to take an addendum/corrigendum into account in preparing their bids, the Procuring agency/Employer may, at its discretion, extend the deadline for the submission of bids: *Provided that the Procuring agency/Employer shall extend the deadline for submission of bid, if such an addendum is issued within last three (03) days of the bid submission deadline.*
C. Preparation of Bids		
10. Language of Bid	10.1	The bid prepared by the bidder, as well as all correspondence and documents relating to the bid exchanged by the bidder and the Procuring agency/Employer shall be written in the English language unless specified in the B**DS.** Supporting documents and printed literature furnished by the bidder may be in another language provided they are accompanied by an accurate translation of the relevant pages in the English language unless specified in the **BDS**, in which case, for purposes of interpretation of the bidder, the translation shall govern.
11. **Documents Establishing Eligibility of Material, Equipment and Works, their Conformity to Bidding Documents**	11.1	The bid prepared by the bidder shall constitute the following components: - a) Documentary evidence established in accordance with **ITB 11** that the material, equipment and services to be provided by the Bidder are eligible material, equipment and services, and conform to the Bidding Documents; b) Documentary evidence established in accordance with **ITB 12** that the bidder has been authorized to carry out the Construction works; c) Documentary evidence established in accordance with **ITB 12** that the bidder is eligible and/or qualified for the subject bidding process; d) Form of Bid and Bid Prices completed in accordance with **ITB 14 and 15;** **e)** Completed schedules as required, including priced Bill of Quantities in accordance with **ITB 13 & 15.** **f)** Technical Proposal completed in all aspects in accordance with **ITB-17**. g) Bid security or Bid Securing Declaration furnished in accordance with **ITB 19;** h) Alternative bids, if permissible, in accordance with **ITB 20;** i) Duly Notarized Power of Attorney authorizing the signatory of the Bidder to submit the bid**;** and j) Any other document required in the **BDS**.
	11.2	In addition to the requirements, bids submitted by a JV shall include a copy of the Joint Venture Agreement entered into by all members. Alternatively, a letter of intent to execute

		a Joint Venture Agreement in the event of a successful bid shall be signed by all members and submitted with the bid, together with a copy of the proposed Agreement.
	11.3	The bidder shall furnish, as part of its bid, all those documents establishing the eligibility in conformity to the terms and conditions specified in the bidding documents for all material, equipment and works which the bidder proposes to execute.
	11.4	The documentary evidence of conformity of the material, equipment and works to the Bidding Documents may be in the form of literature, drawings, and data, and shall consist of: a) a detailed description of the work methodology, approach, schedule and resources to be mobilized at site; b) an item-by-item commentary on the Procuring agency/Employer's Technical Specifications demonstrating substantial responsiveness of the material, equipment and works to those specifications, or a statement of deviations and exceptions to the provisions of the Technical Specifications; c) any other procurement specific documentation requirement as stated in the **BDS**.
	11.5	The required documents and other accompanying documents must be in English. In case any other language than English is used the pertinent translation into English shall be attached to the original version.
12. Documents Establishing Eligibility and Qualification of the Bidder	12.1	The bidder shall furnish, as part of its bid, all those documents establishing the bidder's eligibility to participate in the bidding process and/or its qualification to perform the contract if its bid is accepted.
	12.2	The documentary evidence of the bidder's eligibility to bid shall establish to the satisfaction of the Procuring agency/Employer that the bidder, at the time of submission of its bid, is from an eligible country as defined in Section-IV titled as "Eligible Countries".
	12.3	The documentary evidence of the bidder's qualification to perform the contract if its bid is accepted shall establish to the satisfaction of Procuring agency/Employer that: a) The bidder has the financial and technical capability necessary to perform the Contract, meets the qualification criteria specified in Section-V, Evaluation and Qualification Criteria and **BDS**. b) In the case of a bidder not doing business within Pakistan, the bidder is or will be (if awarded the contract) represented by a local bidder (Joint Venture) in accordance with the PEC works bylaws, and in case of award of works such foreign firm is required to participate in the execution of works to carry out its obligations as prescribed in the Conditions of Contract and /or Technical Specifications. c) That the bidder meets the qualification criteria listed in Section-V, Evaluation and Qualification Criteria and **BDS.**
13. Letter of Bid and Schedules	13.1	The Letter of Bid (Technical or Financial as the case may be) and Schedules, including the Bill of Quantities, shall be prepared using the relevant forms furnished in Standard Bid Forms. The forms must be completed without any alterations to the text, and no substitutes shall be accepted except as provided under **ITB 22.** All blank spaces shall be filled in with the information requested.
14. Letter of Bid	14.1	The bidder shall fill the Letter of Bid (Technical or Financial as the case may be) furnished in the bidding documents. The Standard Bid Forms must be completed without any alterations to its format and no substitute shall be accepted.
15. Bid Prices	15.1	The bid prices quoted by the bidder in the Standard bid Forms, Bill of Quantities and in the Price Schedules shall conform to the requirements specified below or exclusively mentioned hereafter in the bidding documents.
	15.2	The bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. If a Price Schedule shows items listed but not priced, their prices shall be construed to be included in the prices of other items in the Bill of Quantities and will not be paid for separately by the Procuring agency/Employer.

	15.3	Items not listed in the Price Schedule shall be assumed not to be included in the bid, and provided that the bid is still substantially responsive in their absence or due to their nominal nature, the corresponding average price of the respective item(s) of the remaining substantially responsive bidder(s) shall be construed to be the price of those missing item(s): Provided that: a) where there is only one (substantially) responsive bidder, or b) where there is provision for alternate proposals and the respective items are not listed in the other bids, The Procuring agency/Employer may fix the price of missing items in accordance with market survey, and the same shall be considered as final price.
	15.4	The Bid price to be quoted in the Form of Bid in accordance with **ITB 15.1** shall be the total price of the bid.
	15.5	Unless otherwise specified in the **BDS** and the Contract, the rates and prices quoted by the bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract.
	15.6	If so specified in **ITB 1.1**, bids may be invited for individual lots (contracts) or for any combination of lots (packages).
	15.7	Prices quoted by the Bidder shall be fixed during the bidder's performance of the contract and not subject to variation on any account. A bid submitted with an adjustable price will be treated as non-responsive and shall be rejected, pursuant to **ITB 30,** unless otherwise price adjustment is permissible under Conditions of the Contract.
	15.8	All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date twenty-eight (28) days prior to the deadline for submission of bids, shall be included in the rates and prices and the total bid price submitted by the bidder.
16. Currencies of Bid and Payment	16.1	The currency(ies) of the bid and the currency(ies) of payments shall be as specified in the **BDS.**
	16.2	For the purposes of comparison of bids quoted in different currencies, the price shall be converted into a single currency specified in the bidding documents. The rate of exchange shall be the selling rate, prevailing on the date of opening of (financial part of) bids specified in the bidding documents, as notified by the State Bank of Pakistan on that day.
	16.3	Bidders shall indicate details of their expected foreign currency requirements in the Bid, if prescribed in the BDS.
	16.4	Bidders may be required by the Procuring agency/Employer to clarify their foreign currency requirements, if prescribed in the BDS and to substantiate that the amounts included in Lump Sum and in the **SCC** are reasonable and responsive to **ITB 16.1**.
17. Documents Comprising the Technical Proposal	17.1	The bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in **Section IV – Standard Bid Forms**, in sufficient detail to demonstrate the adequacy of the bidder's proposal to meet the work requirements and the completion time.
18. Bid Validity Period	18.1	Bids shall remain valid for the period specified in the **BDS** after the bid submission deadline prescribed by the Procuring agency/Employer. A bid valid for a shorter period shall be rejected by the Procuring agency/Employer as non-responsive**.** The period of bid validity will be determined from the complementary bid securing instrument i.e. the expiry period of bid security or bid securing declaration as the case may be.
	18.2	Under exceptional circumstances, prior to the expiration of the initial bid validity period, the Procuring agency/Employer may request the bidders' consent to an extension of the period of validity of their bids only once, for the period not more than the period of initial bid validity. The request and the bidders' responses shall be made in writing or in electronic forms that provide record of the content of communication. The Bid Security provided under **ITB 19** shall also be extended 28 days beyond the deadline of extended bid validity period. A bidder may refuse the request for the extension of his bid without forfeiting his bid security or causing to be executed his Bid Securing Declaration. A bidder agreeing to the request will not be required nor permitted to modify its bid, but will be required to extend the validity of its Bid Security or Bid Securing Declaration for the period of the extension, and in compliance with **ITB 19** in all respects.

19. Bid Security or Bid Securing Declaration	19.1	Pursuant to **ITB 11.1** unless otherwise specified in the **BDS**, the bidder shall furnish as part of its bid, a Bid Security in form of fixed amount not exceeding five percent of the estimated value of procurement determined by the Procuring agency/Employer and in the amount and currency specified in the **BDS** or Bid Securing Declaration as specified in the **BDS** in the format provided in **Section VI (Standard Bidding Forms)**. In case Procuring agency/Employer is inviting bids in lots / packages, the bidder shall be required to submit his bid security against the respective lot/ package for which he is submitting his bid, which shall not exceed five percent of the estimated value of that particular lot/ package.
	19.2	The Bid Security or Bid Securing Declaration is required to protect the Procuring agency/Employer against the risk of Bidder's conduct before award of the contract to the most advantageous bidder which would warrant the security's forfeiture, pursuant to **ITB 19.9.**
	19.3	The Bid Security shall be denominated in the local currency or in another freely convertible currency, and it shall be in the form specified in the **BDS** which shall be in any of the following: a) A bank guarantee, an irrevocable letter of credit issued by a Scheduled bank in the form provided in the Bidding Documents or another form acceptable to the Procuring agency/Employer and valid for twenty-eight (28) days beyond the end of the validity of the Bid. This shall also apply if the period for Bid Validity is extended. In either case, the form must include the complete name of the bidder; b) A cashier's or certified cheque; or c) Another security as indicated in the **BDS.**
	19.4	The Bid Security or Bid Securing Declaration shall be in accordance with the Form of the Bid Security or Bid Securing Declaration included in **Section VI (Standard Bidding Forms)** or another form approved by the Procuring agency/Employer prior to the bid submission.
	19.5	The Bid Security shall be payable promptly upon written demand by the Procuring agency/Employer in case any of the conditions listed in **ITB 19.9** are invoked.
	19.6	Any bid not accompanied by a Bid Security or Bid Securing Declaration in accordance with **ITB 19.1 or 19.3** shall be rejected by the Procuring agency/Employer and shall be declared as non-responsive bid, pursuant to **ITB 30**.
	19.7	Unsuccessful bidders' Bid Security will be discharged or returned as promptly as possible, however in no case later than thirty (30) days after the expiration of the period of Bid Validity prescribed by the Procuring agency/Employer pursuant to **ITB 18**. The Procuring agency/Employer shall make no claim to the amount of the Bid Security, and shall promptly return the Bid Security document, after whichever of the following that occurs earliest: (a) The expiry of the Bid Security; (b) The entry into force of a procurement contract and the provision of a performance security (or guarantee), for the performance of the contract if such a security (or guarantee), is required by the Biding documents; (c) The rejection by the Procuring agency/Employer of all Bids; (d) The withdrawal of the bid prior to the deadline for the submission of bids, unless the biding documents stipulate that no such withdrawal is permitted.
	19.8	The successful bidder's Bid Security will be discharged upon the bidder signing the contract pursuant to **ITB 47,** or furnishing the performance security (or guarantee), pursuant to **ITB 48**.
	19.9	The Bid Security may be forfeited or the Bid Securing Declaration executed: a) if a Bidder: i) Withdraws its Bid during the period of Bid Validity as specified by the Procuring agency/Employer, and referred by the bidder on the Form of Bid except as provided for in **ITB 18.2**; or ii) Does not accept the correction of errors pursuant to **ITB 32;** or b) In the case of a successful bidder, if the bidder fails: i) to sign the contract in accordance with **ITB 47**; or

		ii) to furnish performance security (or guarantee) in accordance with **ITB 48.**
	19.10	In case of Bid Security issued by the foreign bank is allowed by the Procuring agency/Employer, the same should be counter guaranteed by a corresponding bank in Pakistan. Furthermore, in case of joint venture, it should be in the name of Joint venture to ensure joint responsibility.
20. Alternative Bids by Bidders	20.1	Bidders shall submit offers that comply with the requirements of the bidding documents, including the basic bidder's technical design as indicated in the specifications and Bill of Quantities. Alternatives will not be considered, unless specifically allowed for in the **BDS**. If so allowed, **ITB 20** shall prevail.
	20.2	When alternative schedule for execution of works is explicitly invited, a statement of that effect will be included in the **BDS** as will the method for evaluating different schedule for execution of works.
	20.3	If so allowed in the **BDS**, bidders wishing to offer technical alternatives to the requirements of the bidding documents must also submit a bid that complies with the requirements of the bidding documents, including the basic technical design as indicated in the specifications. In addition to submitting the basic bid, the bidder shall provide all information necessary for a complete evaluation of the alternative by the Procuring agency/Employer, including technical specifications, breakdown of prices, and other relevant details. Only the technical alternatives, if any, of the Most Advantageous Bidder conforming to the basic technical requirements (without altering the bid price) shall be considered by the Procuring agency/Employer.
21. Withdrawal of Bids	21.1	Before bid submission deadline, any bidder may withdraw, substitute, or modify its bid after it has been submitted by sending a written notice, duly signed by an authorized representative, and the corresponding must accompany the respective written notice.
	21.2	Bids requested to be withdrawn in accordance with **ITB 21.1** shall be returned unopened to the bidders.
22. Format and Signing of Bid	22.1	The Bidder shall prepare an original and the number of copies of the bid as indicated in the **BDS**, clearly marking each **"ORIGINAL"** and **"COPY"** as appropriate. In the event of any discrepancy between them, the original shall prevail: *Provided that except in Single Stage One Envelope Procedure, the bid shall include only the copies of technical proposal.*
	22.2	The original and the copy (ies) of the bid shall be typed or written in indelible ink and shall be signed by the bidder or a person or persons duly authorized to sign on behalf of the bidder. This authorization shall consist of a written confirmation as specified in the **BDS** and shall be attached to the bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the bid, except for un-amended printed literature, shall be initialed by the person or persons signing the bid.
	22.3	Any interlineations, erasures, or overwriting shall be valid only if they are signed by the person(s) authorized for signing the Bid.
D. Submission of Bids		
23. Sealing and Marking of Bids	23.1	In case of Single Stage One Envelope Procedure, the bidder shall seal the original and each copy of the bid in separate envelopes, duly marking the envelopes as **"ORIGINAL"** and **"COPY".** The envelopes shall then be sealed in an outer envelope securely sealed in such a manner that opening and resealing cannot be achieved undetected. **Note:** *The envelopes shall be sealed and marked in accordance with the bidding procedure adopted as referred in Rule-36 of Public Procurement Rules,2004.*
	23.2	The inner and outer envelopes shall: a) be addressed to the Procuring agency/Employer at the address given in the **BDS**; and b) bear the title of the subject procurement or project name, as the case may be as indicated in the **BDS**, the Invitation for Bids (ITB) title and number indicated in the **BDS**, and a statement: **"DO NOT OPEN BEFORE",** to be completed with the time and the date specified in the **BDS**, pursuant to **ITB 24.1.**
	23.3	In case of Single Stage Two Envelope Procedure, The Bid shall comprise two envelopes submitted simultaneously, one called the Technical Proposal and the other Financial

		Proposal. Both envelopes to be enclosed together in an outer single envelope called the Bid. Each Bidder shall submit his bid as under: a) Bidder shall submit his **TECHNICAL PROPOSAL** and **FINANCIAL PROPOSAL** in separate inner envelopes and enclosed in a single outer envelope. b) **ORIGINAL** and each copy of the Bid shall be separately sealed and put in separate envelopes and marked as such. c) The envelopes containing the **ORIGINAL** and copies will be put in one sealed envelope and addressed / identified as given in **ITB 23.2.**
	23.4	The inner and outer envelopes shall: a) be addressed to the Procuring agency/Employer at the address provided in the **BDS**; b) bear the name and identification number of the contract as defined in the **BDS**; and provide a warning not to open before the time and date for bid opening, as specified in the **BDS** pursuant to **ITB 24.1.** c) In addition to the identification required in **ITB 23** hereof, the inner envelope shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared "late" pursuant to **ITB 25.**
	23.5	If all envelopes are not sealed and marked as required by **ITB 23.2**, **ITB 23.3** and **ITB 23.4** or incorrectly marked, the Procuring agency/Employer will assume no responsibility for the misplacement or premature opening of bid.
24. **Deadline for Submission of Bids**	24.1	Bids shall be received to the Procuring agency/Employer no later than the date and time specified in the **BDS.**
	24.2	The Procuring agency/Employer may, under exceptional circumstances and at its discretion, extend the deadline for the submission of bids by amending the Bidding Documents in accordance with **ITB 9**, in which case all rights and obligations of the Procuring agency/Employer and bidders previously subject to the deadline will thereafter be subject to the new deadline.
25. **Late Bids**	25.1	The Procuring agency/Employer shall not consider for evaluation of any bid that arrives after the deadline for submission of bids, in accordance with **ITB 24**.
	25.2	Any bid received by the Procuring agency/Employer after the deadline for submission of bids shall be declared late, recorded, rejected and returned unopened to the bidder.
26. **Substitution and Modification of bids**	26.1	A bidder may substitute or modify his bid after it has been submitted, provided that written notice of the substitution or modification of the bid, is received by the Procuring agency/Employer prior to the deadline for submission of bids.
	26.2	Revised bid may be submitted after the substitution or modification made in the original bid in accordance with the provisions referred in **ITB 22.**
E. Opening and Evaluation of Bids		
27. **Opening of Bids**	27.1	The Procuring agency/Employer will open all bids, in public, in the presence of bidders' or their representatives who choose to attend, and other parties with a legitimate interest in the bid proceedings at the place, on the date and at the time, specified in the **BDS**. The bidders' representatives present shall sign a attendance sheet as a proof of their attendance.
	27.2	First, envelopes marked **"WITHDRAWAL"** shall be opened and read out and the envelope with the corresponding bid shall not be opened, but returned to the bidder. No bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at bid opening.
	27.3	Second, outer envelopes marked **"SUBSTITUTION**" shall be opened. The inner envelopes containing the Substitution Bid shall be exchanged for the corresponding Original Bid being substituted, which is to be returned to the bidder unopened. No envelope shall be substituted unless the corresponding Substitution Notice contains a valid authorization to request the substitution and is read out and recorded at bid opening.
	27.4	Next, outer envelopes marked **"MODIFICATION"** shall be opened. No Technical Proposal and/or Financial Proposal shall be modified unless the corresponding Modification Notice contains a valid authorization to request the modification and is read out and recorded at the opening of the bids. Any modification shall be read out along with the Original Bid except in case of Single Stage Two Envelope Procedure where only the

		Technical Proposal, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Financial Proposal, both Original and Modification, will remain unopened till the prescribed financial bid opening date.
	27.5	Other envelopes holding the bids shall be opened one at a time, in case of Single Stage One Envelope Procedure, the bidders' names, the bid prices, the total amount of each bid and of any alternative bid (if alternatives have been requested or permitted), the presence or absence of Bid Security, Bid Securing Declaration and such other details as the Procuring agency/Employer may consider appropriate, will be announced by the Procurement Evaluation Committee.
	27.6	In case of Single Stage Two Envelope Procedure, the Procuring agency/Employer will open the Technical Proposals in public at the address, date and time specified in the **BDS** in the presence of bidders' designated representatives who choose to attend and other parties with a legitimate interest in the bid proceedings. The Financial Proposals will remain unopened and will be held in custody of the Procuring agency/Employer until the specified time of their opening.
	27.7	The envelopes holding the Technical Proposals shall be opened one at a time, and the following read out and recorded: (a) the name of the bidder; (b) whether there is a modification or substitution; (c) the presence of a Bid Security or Bid Securing Declaration, if required; and (d) Any other details as the Procuring agency/Employer may consider appropriate.
	27.8	Bids not opened and not read out at the bid opening shall not be considered further for evaluation, irrespective of the circumstances.
	27.9	Bidders are advised to send in a representative with the knowledge of the content of the bid who shall verify the information read out from the submitted documents. Failure to send a representative or to point out any un-read information by the sent bidder's representative shall indemnify the Procuring agency/Employer against any claim or failure to read out the correct information contained in the bidder's bid.
	27.10	No bid will be rejected at the time of bid opening except for late bids which will be returned unopened to the bidder, pursuant to **ITB 25.**
	27.11	The Procuring agency/Employer shall prepare minutes of the bid opening. The record of the bid opening shall include, as a minimum: the name of the bidder and whether or not there is a withdrawal, substitution or modification, the bid price if applicable and the presence or absence of a Bid Security or Bid Securing Declaration.
	27.12	The bidders' representatives who are present shall be requested to sign on the attendance sheet. The omission of a bidder's signature on the record shall not invalidate the contents and affect the record. A copy of the record shall be distributed to all the bidders.
	27.13	A copy of the minutes of the bid opening shall be furnished to individual bidders upon request.
	27.14	In case of Single Stage -Two Envelop Bidding Procedure, after the announcement of technical evaluation report, the Procuring agency/Employer, shall at a time within the bid validity period, publicly open the financial proposals of the technically responsive bidder only. The financial proposal of bidders found technically non-responsive shall be returned un-opened to the respective bidders after seven days of the announcement of technical evaluation report, except those aggrieved bidder(s) whose complaints are pending before the Grievance Redressal Committee.
28. Confidentiality	28.1	Information relating to the examination, clarification, evaluation and comparison of bids and recommendation of contract award shall not be disclosed to bidders or any other persons not officially concerned with such process until the time of the announcement of the respective evaluation report.
	28.2	Any effort by a bidder to influence the Procuring agency/Employer processing of bids or award decisions may result in the rejection of its bid.
	28.3	Notwithstanding **ITB 28.2** from the time of bid opening to the time of contract award, if any bidder wishes to contact the Procuring agency/Employer on any matter related to the

		bidding process, it should do so in writing or in electronic forms that provides record of the content of communication.
29. **Clarification of Bids**	29.1	To assist in the examination, evaluation and comparison of bids, the Procuring agency/Employer may, ask any bidder for a clarification of its bid including breakdown of prices invariably in writing. Any clarification submitted by a bidder that is not in response to a request by the Procuring agency/Employer shall not be considered.
	29.2	The request for clarification and the response shall be in writing or in electronic forms that provide record of the content of communication. No change in the prices or substance of the bid shall be sought, offered, or permitted, except clarification for the correction of arithmetic errors discovered by the Procuring agency/Employer during the evaluation of bids which shall be sought in accordance with **ITB 32**.
	29.3	The alteration or modification in the bid which in any case affect the following parameters will be considered as a change in the substance of a bid: a) evaluation & qualification criteria; b) required scope of work; c) contract price; d) all securities requirements; e) tax requirements; f) terms and conditions of bidding documents. g) change in the ranking of the bidder
	29.4	From the time of bid opening to the time of Contract award if any bidder wishes to contact the Procuring agency/Employer on any matter related to the bid it should do so in writing or in electronic forms that provide record of the content of communication.
30. Preliminary Examination of Bids	30.1	Prior to the detailed evaluation of bids, the Procuring agency/Employer will determine whether each bid: a) meets the eligibility criteria defined in **ITB 3** and **ITB 4**; b) has been prepared as per the format and contents defined by the Procuring agency/Employer in the bidding documents; c) has been properly signed; d) is accompanied by the required securities; and e) is substantially responsive to the requirements of the bidding documents. The Procuring agency/Employer's determination of a bid's substantial responsiveness will be based on the contents of the bid itself.
	30.2	A substantially responsive Bid is one which conforms to all the terms, conditions, and specifications of the Bidding Documents, without material deviation or reservation. A material deviation or reservation is one that: - a) affects in any substantial way the scope, quality, or performance of the Works; b) limits in any substantial way, inconsistent with the bidding documents, the Procuring agency/Employer's rights or the bidders' obligations under the Contract; or c) if rectified, would affect unfairly the competitive position of other bidders presenting substantially responsive bids.
	30.3	The Procuring agency/Employer will confirm that the documents and information specified under **ITB 11, 12** and **13** have been provided in the bid. If any of these documents or information is missing, or is not provided in accordance with the Instructions to Bidders, the bid shall be rejected.
	30.4	The Procuring agency/Employer may waive-off any minor informality, nonconformity, or irregularity in a bid which does not constitute a material deviation, provided such waiver does not prejudice or affect the relative ranking of any Bidder. ***Explanation:*** *A minor informality, non-conformity or irregularity is one that is merely a matter of form and not of substance. It also pertains to some immaterial defect in a Bid or variation of a bid from the exact requirements of the invitation that can be corrected or waived without being prejudicial to other bidders. The defect or variation is immaterial when the effect on quantity, quality, or delivery is negligible when contrasted with the total cost or scope of the works. The Procuring agency/Employer either shall give the bidder an opportunity to cure any deficiency resulting from a minor informality or irregularity in a*

		bid or waive the deficiency, whichever is advantageous to the Procuring agency/Employer. Examples of minor informalities or irregularities include failure of a bidder to – (a) *Submit the number of copies of signed bids required by the invitation;* (b) *Furnish required information concerning the number of its employees;* (c) *the firm submitting a bid has formally adopted or authorized, before the date set for opening of bids, the execution of documents by typewritten, printed, or stamped signature and submits evidence of such authorization and the bid carries such a signature.*
	30.5	Provided that a Technical Bid is substantially responsive, the Procuring agency/Employer may request the bidder to submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities or omissions in the Technical Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any such aspect of the technical Proposal linked with the ranking of the bidders. Failure of the bidder to comply with the request may result in the rejection of its bid.
	30.6	Provided that a Technical Bid is substantially responsive, the Procuring agency/Employer shall rectify quantifiable nonmaterial nonconformities or omissions related to the Financial Proposal. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of the missing or nonconforming item or component.
	30.7	If a bid is not substantially responsive, it will be rejected by the Procuring agency/Employer and may not subsequently be evaluated for complete technical responsiveness.
31. **Examination of Terms and Conditions; Technical Evaluation**	31.1	The Procuring agency/Employer shall examine the bid to confirm that all terms and conditions specified in the **GCC** and the **SCC** have been accepted by the bidder without any material deviation or reservation. For this purpose: "Deviation" means departure from the requirements specified in the Bidding Document. "Reservation" means setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document.
	31.2	The Procuring agency/Employer shall evaluate the technical aspects of the bid submitted in accordance with **ITB 31,** to confirm that all requirements specified in **Section V – Works Requirement**, **Technical Specifications of** the Bidding Documents have been met without material deviation or reservation.
	31.3	If after the examination of the terms and conditions and the technical evaluation, the Procuring agency/Employer determines that the bid is not substantially responsive in accordance with **ITB 30,** it shall reject the bid.
32. **Correction of Arithmetic Errors**	32.1	Bids determined to be substantially responsive will be checked for any arithmetic errors. Errors will be corrected as follows: - a) if there is a discrepancy between unit prices and the sub-total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail, and the sub-total price shall be corrected, unless in the opinion of the Procuring agency/Employer there is an obvious misplacement of the decimal point in the unit price, in which the total price as quoted shall govern and the unit price shall be corrected; b) if there is an error in a total corresponding to the addition or subtraction of sub-totals, the sub-totals shall prevail, and the total shall be corrected; and c) where there is a discrepancy between the amounts in figures and in words, the amount in words will govern. d) Where there is discrepancy between grand total of price schedule and amount mentioned on the Form of Bid, the amount referred in Price Schedule shall be treated as correct subject to elimination of other errors.
	32.2	The amount stated in the Bid will, be rectified by the Procuring agency/Employer in accordance with the above procedure for the correction of errors and, with, the concurrence of the bidder, shall be considered as binding upon the bidder. If the bidder does not accept the corrected amount, its bid shall be rejected after forfeiture of Bid Security or execution of the Bid Securing Declaration, as the case may be, in accordance with **ITB 19.9.**

33. **Conversion to Single Currency**	33.1	The unit rates and the prices shall be quoted by the bidder entirely in Pak rupees. A bidder expecting to incur expenditures in other currencies for inputs to the Works from outside the Procuring agency/Employer's country (referred to as the "Foreign Currency Requirements") shall indicate the same in the letter of bid-financial proposal. The proportion of the Bid Price (excluding Provisional Sums) needed by him for the payment of such Foreign Currency Requirements either (i) entirely in the currency of the Bidder's home country or, (ii) at the bidder's option, entirely in Pak rupees provided always that a bidder expecting to incur expenditures in a currency or currencies other than those stated in (i) and (ii) above for a portion of the foreign currency requirements, and wishing to be paid accordingly, shall indicate the respective portions in his bid.
	33.2	To facilitate evaluation and comparison, the Procuring agency/Employer will convert all bid prices expressed in the amounts in various currencies in which the bid prices are payable. For the purposes of comparison of bids quoted in different currencies, the price shall be converted into a single currency specified in the bidding documents. The rate of exchange shall be the selling rate, prevailing on the date of opening of (financial part of) bids specified in the bidding documents, as notified by the State Bank of Pakistan on that day.
	33.3	The currency selected for converting bid prices to a common base for the purpose of evaluation, along with the source and date of the exchange rate, are specified in the **BDS**.
34. **Evaluation of Bids**	34.1	The Procuring agency/Employer shall evaluate and compare only the bids determined to be substantially responsive, pursuant to **ITB 30**.
	34.2	In evaluating the Technical Proposal of each Bid, the Procuring agency/Employer shall use the criteria and methodologies listed in the **BDS** and in terms of works requirement. No other evaluation criteria or methodologies shall be permitted.
	34.3	The Procuring agency/Employer's evaluation of a bid will take into account: a) the bid price, excluding provisional sums and the provision, if any, for contingencies in the summary bill of quantities, but including day work items, where priced competitively; b) price adjustment for correction of arithmetic errors in accordance with **ITB 32.1;** c) converting the amount resulting from applying (a) and (b) above, if relevant, to a single currency in accordance with **ITB 33**;
	34.4	The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in bid evaluation.
	34.5	If these bidding documents allow bidders to quote separate prices for different lots, and the award to a single bidder of multiple lots, the methodology of evaluation to determine the lowest evaluated lot combinations in the Form of Bid, is specified in the **BDS.**
	34.6	If the bid, which results in the Evaluated Bid Price (Most Advantageous Bid), is seriously unbalanced or front loaded in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, taking into consideration the schedule of estimated Contract payments, the Employer may require that the amount of the performance security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract. **Explanation:** *"Unbalanced" or "front-loaded" bids consist of deliberately submitting bids with artificially high prices or unit rates for the early stages of a construction project, offset by artificially low prices or unit rates for the later stages of the project, to improve the contractor's cash flow.*
35. Domestic Preference	35.1	If the **BDS** so specifies, the Procuring agency/Employer will grant a margin of preference to the domestic contractor in line with the rules, regulations, regulatory guides or instructions issued by the Authority from time to time.

36. Determination of Most Advantageous Bid	36.1	The Procuring agency/Employer shall compare the evaluated bids in accordance with the predefined bidding procedure, of all substantially responsive bids to determine the Most Advantageous bidder.
37. Qualification of Bidder	37.1	The Procuring agency/Employer shall determine to its satisfaction whether the bidder is substantially responsive and whose bid is declared as most advantageous bid either continues to meet (if prequalification applies) or meets (if post-qualification applies) the qualifying criteria specified in Evaluation and Qualification Criteria. *Note: In case of International bidding, the parameters for incorporation or licensing within Pakistan may be fulfilled as part of post qualification.*
	37.2	The determination shall be based upon an examination of the documentary evidence of the bidder's qualifications submitted by the bidder, pursuant to **ITB 12**.
	37.3	Prior to contract award, the Procuring agency/Employer will verify that the successful bidder (including each member of a JV) is not blacklisted/debarred. The Procuring agency/Employer will conduct the same verification for each sub-contractor proposed by the successful bidder.
38. **Sub-Contractors**	38.1	The bidder shall provide details regarding any specialized sub-contractor to the Procuring agency/Employer. In case change of sub-contractors, the bidder shall promptly notify the Procuring agency/Employer and obtain approval for replacement of sub-contractors.
	38.2	Bidders may propose sub-contracting up to the percentage of total value of contracts or the volume of works as specified in the **BDS.**
39. **Abnormally Low Financial Bid**	39.1	Where the bid price is considered to be abnormally low, the Procuring agency/Employer shall perform price analysis either during determination of Most Advantageous Bid or as a part of the post-qualification process. The following process shall apply: a) The Procuring agency/Employer may reject a bid if the Procuring agency/Employer has determined that the price in combination with other constituent elements of the bid is abnormally low in relation to the subject matter of the procurement (i.e. scope of the procurement or ancillary services) and raises concerns as to the capability and capacity of the respective Bidder to perform that contract; b) Before rejecting an abnormally low bid the Procuring agency/Employer shall request the bidder an explanation of the bid or of those sections which it considers contribute to the bid being abnormally low; take account of the evidence provided in response to a request in writing; and subsequently verify the bid or parts of the bid being abnormally low; c) The decision of the Procuring agency/Employer to reject a bid and reasons for the decision shall be recorded in the procurement proceedings and promptly communicated to the bidder concerned; d) The Procuring agency/Employer shall not incur any liability solely by rejecting abnormally bid; and e) An abnormally low bid means, in the light of the Procuring agency/Employer's estimate and of all the bids submitted, the bid appears to be abnormally low by not providing a margin for normal levels of profit. **Guidance for Procuring agency/Employer:** In order to identify the Abnormally Low Bid (ALB) following approaches can be considered to minimize the scope of subjectivity: (i) Comparing the bid price with the cost estimate; (ii) Comparing the bid price with the bids offered by other bidders submitting substantially responsive bids; and (iii) Comparing the bid price with prices paid in similar contracts in the recent past either government- or development partner-funded.
	39.2	The Procuring agency/Employer will determine to its satisfaction whether the bidder that is selected as having submitted the most advantageous bid is qualified to perform the contract satisfactorily, in accordance with the criteria listed in **ITB 12**
	39.3	The determination will take into account the bidder's financial and technical capabilities. It will be based upon an examination of the documentary evidence of the bidder's

		qualifications submitted by the bidder, pursuant to **ITB 12,** as well as such other information as the Procuring agency/Employer deems necessary and appropriate. Factors not included in these bidding documents shall not be used in the evaluation of the bidders' qualifications.
	39.4	Procuring agency/Employer may seek "Certificate for Independent Price Determination" from the bidder and the results of reference checks may be used in determining award of contract. ***Explanation:*** *The Certificate shall be furnished by the bidder. The bidder shall certify that the price is determined keeping in view of all the essential aspects such as raw material, its processing, value addition, optimization of resources due to economy of scale, transportation, insurance and margin of profit etc.*
	39.5	An affirmative determination will be a prerequisite for award of the contract to the bidder. A negative determination will result in rejection of the bidder's bid, in which event the Procuring agency/Employer will proceed to the next ranked bidder to make a similar determination of that bidder's capabilities to perform satisfactorily.
F. Award of Contract		
40. Criteria of Award	40.1	Subject to **ITB 36** and **37**, the Procuring agency/Employer will award the Contract to the bidder whose bid has been determined to be substantially responsive to the bidding documents and who has been declared as Most Advantageous Bidder, provided that such bidder has been determined to be: a) eligible in accordance with the provisions of **ITB 3;** b) is determined to be qualified to perform the Contract satisfactorily; and c) Successful negotiations have been concluded, if any.
41. Negotiations	41.1	The Committee of the Procuring agency/Employer may negotiate with the Most Advantageous Bidder relating to the following areas: (a) a minor alteration to the technical (drawings, design technical specifications) details of the statement of works; (b) Methodology, work plan, staffing in view to streamline the work; (c) a minor amendment to the special conditions of Contract; (d) finalizing payment arrangements; (e) clarifying details that were not apparent or could not be finalized at the time of Bidding;
	41.2	Where negotiation fails to result into an agreement, the Procuring agency/Employer may invite the next ranked bidder for negotiations. Where negotiations are commenced with the next ranked bidder, the Procuring agency/Employer shall not reopen earlier negotiations.
42. **Procuring agency/Employer's Right to reject All Bids**	42.1	Notwithstanding **ITB 37**, the Procuring agency/Employer reserves the right to reject all the bids, and to annul the bidding process at any time prior to acceptance of bid, without thereby incurring any liability to the affected bidder(s). However, the Authority (i.e. PPRA) may call from the Procuring agency/Employer the justification of those grounds.
	42.2	Notice of the rejection of all bids shall be given promptly to all bidders that have submitted bids.
	42.3	The Procuring agency/Employer shall upon request communicate to any bidder the grounds for its rejection of its bids, but is not required to justify those grounds.
43. Variations	43.1	The Engineer shall make any variation in the quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion, be appropriate, he shall have the authority to instruct 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 (but not if the omitted work is to be carried out by the Employer or by another contractor), c) change the character or quality or kind of any such work, d) change the levels, lines, position and dimensions of any part of the Works, e) execute additional work of any kind necessary for the completion of the Works, or f) change any specified sequence or timing of construction of any part of the Works.

		No such variation shall in any way vitiate or invalidate the Contract, but the effect, if any, of all such variations shall be valued in accordance with **ITB 15**. Provided that where the issue of an instruction to vary the Works is necessitated by some default of or breach of contract by the Contractor or for which he is responsible, any additional cost attributable to such default shall be borne by the Contractor.
44. Instructions for variations	44.1	The Contractor shall not make any such variation without an instruction of the Engineer. Provided that no instruction shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an instruction given under this Clause, but is the result of the quantities exceeding or being less than those stated in the Bill of Quantities.
45. Valuation of Variations	45.1	All variations and any additions to the Contract Price which are required to be determined in accordance with **ITB 15** (for the purposes of this Clause referred to as "varied work"), shall be valued at the rates and prices set out in the Contract if, in the opinion of the Engineer, the same shall be applicable. If the Contract does not contain any rates or prices applicable to the varied work, the rates and prices in the Contract shall be used as the basis for valuation so far as may be reasonable, failing which, after due consultation by the Engineer with the Procuring agency/Employer and the Contractor, suitable rates or prices shall be agreed upon between the Engineer and the Contractor. In the event of disagreement, the Engineer shall fix such rates or prices as are, in his opinion, appropriate and shall notify the Contractor accordingly, with a copy to the Employer. Until such time as rates or prices are agreed or fixed, the Engineer shall determine provisional rates or prices to enable on-account payments to be included in certificates issued in accordance with **ITB 15.**
46. **Notification of Award**	46.1	Prior to the award of contract, the Procuring agency/Employer shall issue a Final Evaluation Report giving justification for acceptance or rejection of the bids.
	46.2	Where no complaints have been lodged, the bidder whose bid has been accepted will be notified of the award by the Procuring agency/Employer prior to expiration of the bid validity period in writing or through electronic means that provide record of the content of communication. However, the Procuring agency/Employer shall not award any procurement contract atleast for fifteen (15) days after the acceptance of bid. The notification letter (herein after and in the condition of the contract and contract form called “Letter of Acceptance” will specify the sum that the Procuring agency/Employer will pay the successful bidder in consideration for the execution and completion of the works as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price).
	46.3	The notification of award will constitute the formation of the Contract, subject to the bidder furnishing the Performance Security (or guarantee) in accordance with **ITB 48** and signing of the contract in accordance with **ITB 47.**
	46.4	Upon the successful bidder’s furnishing of the performance security (or guarantee) pursuant to **ITB 48**, the Procuring agency/Employer will promptly notify each unsuccessful bidder, the name of the successful bidder and the Contract amount and will discharge the Bid Security or Bid Securing Declaration of the bidder(s) pursuant to **ITB 19**.
47. Signing of Contract	47.1	Promptly after notification of award, Procuring agency/Employer shall send the successful bidder the draft agreement, incorporating all terms and conditions as agreed by the parties to the contract.
	47.2	Immediately after the Redressal of grievance by the GRC, and after fulfillment of all conditions precedent of the Contract Form, the successful bidder and the Procuring agency/Employer shall sign the contract.
	47.3	Where no formal signing of a contract is required, work order issued to the bidder shall be construed to be the contract.
48. Performance Security (or Guarantee)	48.1	After the receipt of the Letter of Acceptance, the successful bidder, within the specified time, shall deliver to the Procuring agency/Employer a Performance Guarantee in the amount and in the form stipulated in the **BDS and SCC**, denominated in the type and

		proportions of currencies in the Letter of Acceptance and in accordance with the Conditions of Contract.
	48.2	If the Performance Guarantee is provided by the successful bidder and it shall be in the form specified in the **BDS** which shall be in any of the following: (a) certified cheque, cashier's or manager's cheque, or bank draft; (b) irrevocable letter of credit issued by a scheduled bank of Pakistan or in the case of an irrevocable letter of credit issued by a foreign bank, the letter shall be confirmed or authenticated by a scheduled bank of Pakistan; (c) bank guarantee confirmed by a reputable local bank or, in the case of a successful foreign bidder, bonded by a foreign bank; or (d) surety bond callable upon demand issued by any reputable surety or insurance company. Any Performance Guarantee submitted shall be enforceable in Pakistan.
	48.3	Failure of the Most Advantageous Bidder to comply with the requirement of **ITB 47** shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security or declare blacklisted (in case bid securing declaration is submitted) in which event the Procuring agency/Employer may make the award to the next most advantageous bidder or reinitiate the procurement process afresh (as a case may be).
49. Advance Payment	49.1	Advance payment will be provided to the bidder in percentage and in the manner as agreed by the both parties in terms of Conditions of the Contract.
	49.2	The Procuring agency/Employer will provide an advance payment as stipulated in the Conditions of Contract, subject to a maximum amount, as stated and/or Conditions of the Contract. The advance payment request shall be accompanied by an advance payment security (guarantee) in the form provided in Section X. For the purpose of receiving the advance payment, the bidder shall make and estimate of, and include in its bid, the expenses that will relate to the purchase of equipment, machinery, materials, and on the engagement of labor during the first month beginning with the date of the Procuring agency/Employer's "Notice to Commence" as specified in the **SCC.**
50. General Performance of the Bidders **51.**	50.1	The Procuring agency/Employer reserves the right to obtain information regarding performance of the bidders on their previously awarded contracts / works. The Procuring agency/Employer may seek information / report from the previous employer for consideration. However, the Procuring agency/Employer shall incorporate such parameters in the evaluation criteria and accordingly decide the fate of the bid submitted.
52. Corrupt & Fraudulent Practices	51.1	Procuring agencies (including beneficiaries of Government funded projects and procurement) as well as Bidders/Suppliers/Contractors under Government financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts, and will avoid to engage in any corrupt and fraudulent practices.
G. Grievance Redressal & Complaint Review Mechanism		
53. Constitution of Grievance Redressal	52.1	Procuring agency/Employer shall constitute a Grievance Redressal Committee (GRC) comprising of odd number of persons with proper power and authorization to address the complaint. The GRC shall not have any of the members of Procurement Evaluation Committee. The committee must have one subject specialist depending the nature of the procurement.
54. GRC Procedure	53.1	Any party can file its written complaint against the eligibility parameters or any other terms and conditions prescribed in the prequalification or bidding documents found contrary to provision of Procurement Regulatory Framework, and the same shall be addressed by the GRC well before the bid submission deadline.
	53.2	Any bidder feeling aggrieved by any act of the Procuring agency/Employer after the submission of his bid may lodge a written complaint concerning his grievances not later than seven days of the announcement of technical evaluation report and five days after issuance of final evaluation report.

	53.3	In case, the complaint is filed against the technical evaluation report, the GRC shall suspend the procurement proceedings.
	53.4	In case, the complaint is filed after the issuance of the final evaluation report, the complainant cannot raise any objection on technical evaluation of the report: Provided that the complainant may raise the objection on any part of the final evaluation report in case where single stage one envelope bidding procedure is adopted.
	53.5	The GRC, in both the cases shall investigate and decide upon the complaint within ten days of its receipt.
	53.6	Any bidder or the Procuring agency/Employer not satisfied with the decision of the GRC may file Appeal before the Appellate Committee of the Authority on prescribed format after depositing the Prescribed fee.
	53.7	The Committee, upon receipt of the Appeal against the decision of the GRC complete in all respect shall serve notices in writing upon all the parties to Appeal.
	53.8	The committee shall call the record from the concerned Procuring agency/Employer or the GRC as the case may be, and the same shall be provided within prescribed time.
	53.9	The committee may after examination of the relevant record and hearing all the concerned parties, shall decide the complaint within fifteen (15) days of receipt of the Appeal.
	53.10	The decision of the Committee shall be in writing and shall be signed by the Head and each Member of the Committee. The decision of the committee shall be final.
H. Mechanism of Blacklisting		
55. **Mechanism of Blacklisting**	54.1	The Procuring agency/Employer shall bar for not more than the time prescribed in Rule-19 of the Public Procurement Rules, 2004, from participating in their respective procurement proceedings, bidder or contractor who either: Involved in corrupt and fraudulent practices as defined in Rule-2 of Public Procurement Rules; i) Fails to perform his contractual obligations; and ii) Fails to abide by the id securing declaration;
	54.2	The show cause notice shall contain: (a) precise allegation, against the bidder or contractor; (b) the maximum period for which the Procuring agency/Employer proposes to debar the bidder or contractor from participating in any public procurement of the Procuring agency/Employer; and (c) the statement, if needed, about the intention of the Procuring agency/Employer to make a request to the Authority for debarring the bidder or contractor from participating in public procurements of all the procuring agencies.
	54.3	The Procuring agency/Employer shall give minimum of seven days to the bidder or contractor for submission of written reply of the show cause notice.
	54.4	In case, the bidder or contractor fails to submit written reply within the requisite time, the Procuring agency/Employer may issue notice for personal hearing to the bidder or contractor/ authorize representative of the bidder or contractor and the Procuring agency/Employer shall decide the matter on the basis of available record and personal hearing, if availed.
	54.5	In case the bidder or contractor submits written reply of the show cause notice, the Procuring agency/Employer may decide to file the matter or direct issuance of a notice to the bidder or contractor for personal hearing.
	54.6	The Procuring agency/Employer shall give minimum of seven days to the bidder or contractor for appearance before the designated officer of the Procuring agency/Employer for personal hearing. The designated officer shall decide the matter on the basis of the available record and personal hearing of the bidder or contractor, if availed.

	54.7	The Procuring agency/Employer shall decide the matter within fifteen (15) days from the date of personal hearing unless the personal hearing is adjourned to a next date and in such an eventuality, the period of personal hearing shall be reckoned from the last date of personal hearing.
	54.8	The Procuring agency/Employer shall communicate to the bidder or contractor the order of debarring the bidder or contractor from participating in any public procurement with a statement that the bidder or contractor may, within thirty (30) days, prefer a representation against the order before the Authority.
	54.9	Such blacklisting or barring action shall be communicated by the Procuring agency/Employer to the Authority and respective bidder or bidders in the form of decision containing the grounds for such action. The same shall be publicized by the Authority after examining the record whether the procedure defined in blacklisting and debarment mechanism has been adhered to by the Procuring agency/Employer.
	54.10	The bidder may file the review petition before the Review Petition Committee Authority within thirty (30) days of communication of such blacklisting or barring action after depositing the prescribed fee and in accordance with "Procedure of filing and disposal of review petition under Rule-19(3) Regulations, 2021". The Committee shall evaluate the case and decide within ninety (90) days of filing of review petition.
	54.11	The committee shall serve a notice in writing upon all respondent of the review petition. The notices shall be accompanied by the copies of review petition and all attached documents of the review petition including the decision of the Procuring agency/Employer. The parties may file written statements along with essential documents in support of their contentions. The Committee may pass such order on the representation may deem fit.
	54.12	The Authority on the basis of decision made by the committee either may debar a bidder or contractor from participating in any public procurement process of all or some of the procuring agencies for such period as the deemed appropriate or acquit the bidder from the allegations. The decision of the Authority shall be final.

SECTION III: BID DATA SHEET

The following specific data for the for the procurement of work shall complement, supplement, or amend the provisions in the Instructions to Bidders (ITBs). Whenever there is a conflict, the provisions herein shall prevail over those in ITBs.

BDS Clause Number	ITB Number	Amendments of, and Supplements to, Clauses in the Instruction to Bidders
A. Introduction		
1.	**1.1**	Name of Procuring Agency: **SBP Banking Services Corporation** The Description (as specified in ITB) of the Goods is: **Renovation Works for Establishment of RAAST Secretariat at 4th Floor, at SBP BSC House, Head Office Karachi** Period for Contract: **200 days**. Method/Procedure: **Single Stage - Two Envelope Procedure - Rule 36 (b)** of the open competitive bidding. Name and identification number of the Contract: **ED/PROC-HOK/1061508/2026/307** Commencement date for delivery: To be notified in work order.
2.	**2.1**	Financial year for the operations of the Procuring Agency: **[*2025-26*]** Source of Funding: **Own Funding**
3.	**3.1**	Joint Venture is **NOT Applicable**
B. Bidding Documents		
4.	**7.2**	Copy (in hard form) of bid is not required. Bid shall be submitted through EPADS.
5.	**8.1**	The Bidders may seek clarifications through EPADS. Clarifications of the bidding documents may be requested in writing through EPADS by any bidder up to seven days prior to the deadline for the submission of bids. Responses to requests for clarification shall be communicated to all bidders participating in the procurement proceedings through EPADS within three days prior to closing date of Bids.
6.	**8.5**	Pre-bid meeting shall be convened on **27-Jan-2026 at 11:30 AM.**
7.	**9.2**	Any addendum, in case issued, including the notice of any extension of the deadline shall be published on EPADS and on SBP Banking Services Corporation website [Website: www.sbp.org.pk] and shall be part of the Bidding Document pursuant to ITB 7.1
C. Preparation of Bids		
8.	**10.1**	The Language of all correspondences and documents related to the Bid is **English / Urdu.**
9.	**12.3 (c)**	The documents required under **'Eligibility Criteria / Qualification Criteria'**.
10.	**15.5**	The price shall be fixed.
11.	**16.1**	The currency of the Bid shall be *(Pak Rupees);*
12.	**18.1**	The Bid Validity period shall be **180** days.
13.	**19.1**	The amount of Bid Security shall be **Rs.3,000,000/-.** The currency of the Bid Security shall be: **Pakistani Rupees** The scanned copy of the Bids Security shall be uploaded in the EPADS while submitting bid, whereas the original forms of Bid Security shall be submitted to the procuring agency before the bid opening deadline. The bidder who failed to submit the original bid security shall be disqualified straightaway.
14.	**19.3**	The Bid Security shall be in favor of 'SBP Banking Services Corporation' in the form of: *either Payment Order/Bank Draft or an unconditional Bank Guarantee* enforceable in Pakistan and valid for twenty-eight (28) days beyond the end of the validity of the Bid. This shall also apply if the period for Bid Validity is extended.
15.	**19.3 (c)**	Other forms of Security: **Not Applicable.**
16.	**20.1**	Alternative and conditional Bids to the requirements of the Bidding Documents is not permitted and bid will be held non-responsive.
17.	**20.2**	If alternative scheduled for execution of work is explicitly invited **Not Applicable.**
18.	**22.1**	The bidder shall prepare and submit his bid with due diligence after carefully reading all the terms and conditions before submission through EPADS. Copy (in hard form) of bid is not required.
D. Submission of Bids		

19.	**23.1**	Bid shall be submitted online on EPADS as per the method / procedure Single Stage - Two Envelope Procedure - Rule 36 (b) of the open competitive bidding. Manual submission of Bids shall not be entertained.
20.	**24.1**	The Technical and Financial Bids as the case may be, shall be submitted in the due portion of the EPADS, before bid submission deadline i.e., **12-Feb-26 till 12:00 PM**. The bid submission option shall be automatically disabled once the deadline is over.
E. Opening and Evaluation of Bids		
21.	**27.1**	The Procuring Agency will open all bids on **12-Feb-26 at 12:30 PM** through EPADS, in the presence of bidders' or their representatives who choose to attend.
22.	**27.14**	Following the evaluation and approval of the technical proposals, the Procuring Agency shall, at a time within the bid validity period, open the financial proposals of only those bids that have been determined to be technically responsive, through the EPADS. Bids found to be technically non-responsive shall be rejected, and their financial proposals shall remain unopened.
23.	**29.1**	No bidder shall be allowed to alter or modify his bid after the bids have been opened however, the procuring agency may seek and accept clarification to the bid that do not change the substance of the bid, through EPADS.
24.	**33.2**	Bid is required to be quoted in Pak Rupees.
25.	**33.3**	The bids shall be quoted in Pak Rupees.
26.	**34.5**	Bid is required for complete scope of Works
27.	**35**	Domestic preference is not applicable.
28.	36	**Evaluation Techniques** **Least Cost Based Selection (LCBS)** After meeting the requirements of eligibility, qualification and substantial responsiveness, the bid in compliance with all the mandatory (drawings/ design/ technical specifications /requirements and/or requisite quality threshold (if any) and having lowest evaluated cost (or financial proposal) shall be considered highest ranked bid.
29.	**38.2**	Sub-contracting of the total value of the contract is not allowed. Sub-contracting for HVAC works is allowed.
F. Award of Contract		
30.	**48.1**	The amount of performance security (or guarantee), as a percentage of the Contract Price, shall be **10%** of the Contract Price state in the Letter of Acceptance / Award in favour of SBP-Banking Services Corporation. OR In case, the cost of the Contract is less than four million, the Bid Security of the successful bidder shall be retained as Performance Security.
31.	**48.2**	a. The Performance Security (Guarantee) shall be in in the form of Pay Order / Demand Draft / unconditional Bank Guarantee 28 days beyond the defect liability period enforceable in Pakistan as per Performance Security (Guarantee) form specified in the Bidding Documents. b. The Performance Security shall be valid till successful completion of Defect Liability Period / Warranty Period and will be released after successful expiry of Defect Liability Period / Warranty Period.
G. Review of Procurement Decisions		
32.	**53.6**	Any bidder feeling aggrieved may lodge complain through EPADS before Grievance Redressal Committee and deal in accordance with Public Procurement Rules 2004, E-Pak Procurement Regulations, 2023 etc.

SECTION IV: ELIGIBLE COUNTRIES, AND QUALIFICATION CRITERIA

Eligible Countries

All the bidders are allowed to participate in the subject procurement without regard to nationality, except bidders of some nationality, prohibited in accordance with policy of the Federal Government.

Following countries are ineligible to participate in the procurement process:

1. India
2. Israel

Evaluation and Qualification Criteria

1. Qualification Criteria

1.1. General

Qualification will be based on all the criteria given in succeeding para. Employer reserves the right to waive minor deviations, if these don't materially affect the capability of an applicant to perform the contract. Joint Venture or consortium is not allowed. The Employer reserves the right to seek further information and / or verify the information furnished by the applicants. In this regard, Employer reserve the right to have site visit to verify the previous installation /work experience etc. The Employer may reject any application for any misrepresentation knowingly made by any applicant in, or pursuant to, their application or for any statement furnished in connection therewith, and intended to be relied upon by the Employer, which is incorrect in any respect.

1.2. Parameters of Bid Evaluation & Qualification

SNO.	Description	Annexure / Page No. of attached Document
1.	**Bid Security** Bid Security in original is required to be submitted through sealed envelope before opening of Bid.	
2.	**ATL FBR** Bidder must be registered with FBR in Income Tax and sales tax and must be active taxpayer as per Federal Board of Revenue (FBR's) Data base i-e Active Taxpayer List. (NTN)	
3.	**Revenue Authority Registration** The Bidder should be registered with relevant / concerned Provincial Revenue Authority. If not registered, the 100% tax shall be deducted at source as per applicable law and credited to relevant account.	
4.	**PEC Valid Registration** The bidder should have valid registration with Pakistan Engineering Council at least in Category of C-3 or above with specialization in CE-10, EE-04 and ME-01.	
5.	**Bidding Documents** Volume-I of the Bidding document including all required Forms.	
6.	**Undertaking/Letter of Bid (As per Format attached)** The bidder is required to submit an undertaking/letter of bid as per format attached**.**	
7.	**Experience** The bidder has completed/ awarded/ in-hand at least 02 projects pertaining to building works (construction/ repair/ renovation) each of min. cost Rs. 90 M, during last five (05) years. (Copies of work orders/ completion certificates/ contract agreements or equivalent documents to be attached).	
8.	**Experience of Sub-Contractor for HVAC (if applicable)** The bidder has completed/ awarded/ in-hand at least 02 projects pertaining to HVAC works each of min. cost Rs. 40 M, during last five (05) years. Sub-contracting for HVAC works is allowed, and in this case, bidder must provide the sub-contractor names along with their experiences. (Copies of work orders/ completion certificates/ contract agreements or equivalent documents of the sub-contractors to be attached).	

9.	**Financial Capability/Liquid Assets** Annual Sales volume or Gross Turnover of at least Rs.250 M in any of the last five years. Attach Copy(s) of Audited Financial Statements or Income Tax return filed in FBR. OR Available Bank Credit Line facility Rs. 50 M or above during last one year or Liquid Assets etc.) OR Available Financial Capability of Rs. 50 M or above. (Submit Bank statement as evidence showing required balance at any one instant in the statement of last three months before date of publication of tender notice.)	

SECTION V: WORKS REQUIREMENT, SCHEDULE

Scope of Works

1. **Location of Site:**

"State Bank of Pakistan, I.I. Chundrigar road, Karachi"

2. **Major Items of Contract:**

Renovation Works for Establishment of RAAST Secretariat at 4th Floor, at SBP BSC House, Head Office Karachi but not limited to.

- Dismantling Works
- Masonry & Tile Works
- Steel Works
- Painting Works
- Glass Partition Works
- Wooden Works
- Quiet Pod Works
- Waterproofing Works
- Plumbing Works
- Electrical & UPS related Works
- Telephone related Works
- Fire Detection Works
- HVAC Works
- Audio Wireless Conference System Works

Construction Schedule

Completion / Delivery Time: 200 days

Bidder shall provide a program in a bar-chart showing the sequence of work items by which he proposes to complete the Works of the entire Contract. The program should indicate the sequence of work items and the period of time during which he proposes to complete the Works including the activities like designing, schedule of submittal of drawings, ordering and procurement of materials, manufacturing, delivering, construction of civil works, erection, testing and commissioning of Works to be supplied under the Contract. The proposed sequence of execution of various sections of the project shall be according to the given Key Performance Indicators (KPIs) as following.

Sr.	Description of Activity	Total Days	Start Date	Finish Date	Execution Scheduled Days			
					0-50	51-100	101-150	151-200
01	Dismantling Works	40						
02	Masonry & Tile Works	90						
03	Steel Works	30						
04	Paint Works	90						
05	Glass Partition Works	60						
06	Wood Works	30						
07	Quiet Pod Works	30						
08	Water proofing Works	70						
09	Plumbing Works	20						
10	Electrical & UPS related Works	50						
11	Telephone Related Works	40						
12	Fire Detection Works	40						
13	HVAC Works	160						
14	PA System Works	60						
13	Punch List works & Handing/Taking Over	40						

The above Key Performance Indicators should be taken into consideration by the bidder in order to execute the works.

If the above KPI is not acceptable to any bidder, the bidder will prepare its own Work Program along with detailed justification for its change. Bids without above given Work Program or bidder's own proposed Work Program without justification shall not be considered responsive.

Works will be executed in nights and during day time as well on weekends etc.

SECTION VI: STANDARD BIDDING FORMS

Letter of Bid – Technical Proposal

Date of this Bid submission: [_____]

RFB No.: [_____]

To: **[*SBP Banking Services Corporation*]**

We, the undersigned Bidder, hereby submit the first part of our Bid, the Technical Proposal

In submitting our Bid, we make the following declarations:

(a) **No reservations:** We have examined and have no reservations for the bidding document, including addenda issued in accordance with Instructions to Bidders (ITB 9);

(b) **Eligibility**: We meet the eligibility requirements and have no conflict of interest in accordance with ITB 3.

(c) **Bid/Proposal-Securing Declaration**: We have not been suspended nor declared ineligible by the Procuring Agency based on execution of a Bid Securing Declaration or Proposal Securing Declaration in the Procuring Agency's country in accordance with ITB 4.

(d) **Conformity:** We offer to supply in conformity with the bidding document and in accordance with the Delivery Schedules specified in the Schedule of Requirements.

(e) **Bid Validity Period**: Our Bid shall be valid for the period specified in **BDS 17.1** (as amended, if applicable) from the date fixed for the Bid submission deadline specified in **BDS 23.1** (as amended, if applicable), and it shall remain binding upon us, and may be accepted at any time before the expiration of that period.

(f) **Performance Security**: If our Bid is accepted, we commit to obtain performance security in accordance with the bidding document.

(g) **One Bid per Bidder**: We are not submitting any other Bid(s) as an individual Bidder, and we are not participating in any other bid(s) as a Joint Venture member or as a subcontractor, and meet the requirements, other than Alternative Bids submitted in accordance with **ITB 19**.

(h) **Suspension and Debarment**: We, along with any of our subcontractors, suppliers, consultants, manufacturers, or service providers for any part of the contract, are not subject to, and not controlled by, any entity or individual that is subject to, a temporary suspension or a debarment imposed by the Procuring Agency. Further, we are not ineligible under Pakistan laws.

1) We have not been declared in-eligible or debarred, blacklisted/sanctioned by any Federal or Provincial Government Department, National Counter Terrorism Authority (NACTA), Agency, Organization or Autonomous Body anywhere in Pakistan or fraudulent practices, or no failure to perform with the Procuring Agency.
2) We agree unconditionally that in case we, fail to abide by any of the terms of Contract, the Procuring Agency shall be at liberty to terminate the Contract without prejudice to any other rights / remedy available in the Contract.

(i) **State-owned enterprise or institution**: [*select the appropriate option*]

☐ - [*We are not a state-owned enterprise or institution*]

☐ - [*We are a state-owned enterprise or institution but meet the requirements of]*; _____

(j) **Binding Contract**: We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed.

(k) **Not Bound to Accept**: We understand that you are not bound to accept the Most Advantageous Bid or any other Bid that you may receive; and

(l) **Fraud and Corruption**: We hereby certify that we have taken steps to ensure that no person acting for us, or on our behalf, engages in any type of Fraud and Corruption.

IFB No:	ED/PROC-HOK/1061508/2026/307
Title:	Renovation Works for Establishment of RAAST Secretariat at 4th Floor, at SBP BSC House, Head Office Karachi
Bidder:	

UNDERTAKING

1. I/We hereby confirm and declare that I/We, has/have not been declared in-eligible or debarred, blacklisted/sanctioned by any Federal or Provincial Government Department, National Counter Terrorism Authority (NACTA), Agency, Organization or Autonomous Body anywhere in Pakistan or fraudulent practices, or no failure to perform with SBP.

2. I/We understand and agree unconditionally that in case I/We fail to abide by the above undertaking or any of terms of the Contract, the Client/ SBP BSC shall be at liberty to terminate the Contract without prejudice to any other rights / remedy available in the Contract.

Appendix-A
Form of Bid Security
(Bank Guarantee)

[The bank shall fill in this Bank Guarantee Form in accordance with the instructions indicated.]

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[Purchaser to insert its name and address]*

No.: *[Purchaser to insert reference number for the Request for Bids]*

Alternative No.*: [Insert identification No if this is a Bid for an alternative]*

Date: *[Insert date of issue]*

BID GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that _____ *[insert name of the Bidder, which in the case of a joint venture shall be the name of the joint venture (whether legally constituted or prospective) or the names of all members thereof]* (hereinafter called "the Applicant") has submitted or will submit to the Beneficiary its Bid (hereinafter called "the Bid") for the execution of _____ under Request for Bids No. _____ _ ("the RFB").

Furthermore, we understand that, according to the Beneficiary's conditions, Bids must be supported by a Bid guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of _____ (_____) upon receipt by us of the Beneficiary's complying demand, supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either the Applicant:

(a) has withdrawn its Bid during the period of Bid validity set forth in the Applicant's Letter of Bid ("the Bid Validity Period"), or any extension thereto provided by the Applicant; or

(b) having been notified of the acceptance of its Bid by the Beneficiary during the Bid Validity Period or any extension thereto provided by the Applicant, (i) has failed to sign the contract agreement, or (ii) has failed to furnish the performance security, in accordance with the Instructions to Bidders ("ITB") of the Beneficiary's bidding document.

This guarantee will expire: (a) if the Applicant is the successful Bidder, upon our receipt of copies of the Contract agreement signed by the Applicant and the performance security issued to the Beneficiary in relation to such Contract agreement; or (b) if the Applicant is not the successful Bidder, upon the earlier of (i) our receipt of a copy of the Beneficiary's notification to the Applicant of the results of the Bidding process; or (ii) twenty-eight days after the end of the Bid Validity Period.

Consequently, any demand for payment under this guarantee must be received by us at the office indicated above on or before that date.

_____

[Signature(s)]

Note: All italicized text is for use in preparing this form and shall be deleted from the final product.

Appendix-B

Form of Bid Securing Declaration

[The bidder shall fill in this form in accordance with the instructions indicated]

Not Applicable

Appendix-C

Formula for Price Adjustment

Not applicable

SECTION VII: GENERAL CONDITIONS (GC)

Red Book:

The Conditions of Contract are the "General Conditions" which form part of the "Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer ("Red book") Second edition 2017" published by the Federation Internationale Des Ingenieurs – Conseils (FIDIC) and the following "Particular Conditions" which shall complement the General Conditions of the Contract.

The prospective bidders may obtain copy of the above-mentioned Conditions of Contract directly from Head Office of FIDIC, on the address indicated below against payment of their usual charges. However, a copy of the aforesaid FIDIC Conditions of Contract is available in Engineering Department, which can be seen on any working day during office hours if so desired for ready reference.

International Federation of Consulting Engineers (FIDIC)

FIDIC Bookshop – Box- 311 – CH – 1215 Geneva 15 Switzerland
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Telephone: +41 22 799 49 01
E-mail: fidic@fidic.org
www.fidic.org
FIDIC code: ISBN13: 978-2-88432-084-9

SECTION VIII: SPECIAL CONDITIONS OF THE CONTRACT

The Special Conditions of Contract (SCC) complement the General Conditions of Contract (GCC) to specify data and contractual requirements of the Procuring agency/Employer/ Employer, the engineer, the sector, the overall project, and the works. In the event of a conflict, the provisions herein shall prevail over those in the GCC.

PART A – CONTRACT DATA

Contract data of the SCC, includes data to complement the GCC in a manner similar to the way in which the Bid Data Sheet complements the Instructions to Bidders.

PC Clause Number	GCC Clause Number	Amendments of, and Supplements to, Clauses in the GCC
General Provision (GCC 1)		
1.	1.1.27	**Defects Notification Period (DNP):** 365 days
2.	1.1.85	**Time for Completion:** 200 days
3.	1.3	**For Notices** Procuring agency/Employer/ Engineer's Authorized representatives name and address: Director Engineering, SBP Banking Services Corporation
4.	1.4	**Governing Law;** The Applicable Law shall be: Laws of the Pakistan
5.	1.4	**Communication Language:** The Communication Language shall be: Urdu / English
The Employer/ Procuring agency/Employer (GCC Clause 2)		
6.	2.1	Time for access to the Site: Immediately after Commencement Date
7.	2.2	Not Applicable
The Engineer (GCC Clause 3)		
8.	3.2	Engineer's Duties and Authority: Variations resulting in an increase of the Accepted Contract Amount in excess of 1 % shall require approval of the Procuring agency/Employer.
9.	3.7.5	Dissatisfaction with Engineer's determination: The contents of last paragraph of this clause are replaced as under; In the event that a Party fails to comply with an agreement of the Parties under this Sub-Clause 3.7 or a final and binding determination of the Engineer, the other Party may, without prejudice to any other rights it may have, refer the failure itself directly to arbitration under Sub-Clause 21.8 [Arbitration].
The Contractor (GCC Clause 4)		
10.	4.2	The amount of performance security (or guarantee), as a percentage of the Contract Price, shall be **10%** of the Contract Price state in the Letter of Acceptance / Award in favour of SBP-Banking Services Corporation. OR In case, the cost of the Contract is less than four million, the Bid Security of the successful bidder shall be retained as Performance Security.
11.	4.7.2(a)	Clause 4.7 Setting out Period for notification of errors in the items of reference "[3 days]
Sub-Contracting (GCC Clause 5)		
12.	5.1(a)	Maximum allowable accumulated value of work subcontracted (as a percentage of the Accepted Contract Amount)
13.	5.1 (b)	Sub-contracting is not permitted.
Staff and Labour (GCC Clause 6)		
14.	6.5	Normal working hours: As per applicable law
Plant, Material and Workmanship (GCC Clause 7)		
15.	7.2	Samples *[N/A]*
Commencement, Delays and Suspension (GCC Clause 8)		
16.	8.3	Number of additional paper copies of program *[N/A]*
17.	8.8	@ 0.1% of total work done/ day to a maximum of 10% of the total work done.
Measurement and Valuation (GCC Clause 12)		

18.	12.2	Method of measurement shall be net except otherwise provided in the Contract
19.	12.3	Percentage profit [specify]
		Variations and Adjustments (GCC Clause 13)
20.	13.4 (b)(ii)	Percentage rate to be applied to Provisional Sums for overhead charges and profit is : N/A
21.	13.7	Not applicable.
		Contract Price and Payment (GCC Clause 14)
22.	14.2	If requested by the Contractor, an interest-free Advance up to **15 %** of the Contract Price stated in the Letter of Acceptance shall be paid by the Employer to the Contractor in two equal parts upon submission by the Contractor of an Advance Guarantee for the full amount of the Advance in the specified form from a Scheduled Bank in Pakistan subject to approval of Director/Head Engineering Payments shall be made as per the following criteria; a) First part of the Mobilization Advance within twenty (20) days after verification of the approved/ legible Bank Guarantee from the issuing bank. b) Second part of the mobilization advance on arrival of required tools & plants and commencement of Works at site to the entire satisfaction of the Employer.
23.	14.2.3	Advance paid to the Contractor shall be recovered from the interim bills of the **Contractor @ 15%** of total amount of work done at site for the bill being processed till the time that whole of the amount of Mobilization Advance has been recovered.
24.	14.3(iii)	Percentage of retention: **10%** Limit of Retention Money : **10%** **<u>Retention Money</u>** 10% of the net payable amount from each bill (except Mobilization Advance) of the Contractor will be deducted as retention money. The retention money would be released as follows: i. 5% on Completion of the whole work, ii. Balance 5% after successful completion of the Defects Liability Period / Warranty Period.
25.	14.5(b)(i)	Plant and Materials: If Sub-Clause 14.5 applies: N/A
26.	14.5(c)(i)	Plant and Materials: Not Applicable.
27.	14.7(a)	Period of payment of Advance Payment to the Contractor **28days**
28.	14.7b(i)	Period for the Procuring agency/Employer to make interim payments to the Contractor under Sub-Clause 14.6 (interim Payment) **30days**
29.	14.7b(ii)	Period for the Procuring agency/Employer to make interim payments to the Contractor under Sub-Clause 14.13 (Final Payment) **60days**
30.	14.7(c)	Period for the Procuring agency/Employer to make final payment to the Contractor : **56days**
31.	14.8	N/A
32.	14.11.1(b)	Number of additional paper copies of draft Final Statement :1
33.	14.15	**Currencies of Payment** Pak Rupees
34.	14.15 (a)(i)	The proportions or amounts of the Local and Foreign Currencies, and the fixed rates of exchange to be used for calculating the payments, shall be as stated in the Contract Data, except as otherwise agreed by both parties.
35.	14.15 (c)	Pak Rupees.
36.	14.15 (f)	If no rates of exchange are stated in the Contract Data, they shall be those prevailing on the Base Date and published by the central bank of the Country.
		Insurance (GCC Clause 19)
37.	19.2.	From AA rated Insurance Company of PACRA/ JCR. **The Works** Amount of Cover: The sum stated in Letter of Acceptance plus fifteen percent 15%. **Contractor 's equipment** Amount of Cover: Full replacement Cost **Injury to Person and Damaged to Property including Third Party Insurance** Amount of Cover:

		I) As per workmen compensation act II) Contractor's all Risk including Third party III) damages to the Structure, stores if supplied by the Bank
Dispute Avoidance/ Adjudication Board (GCC Clause 21)		
38.	21.1	Time for appointment of DAAB **28** days. The DAAB shall comprise **Sole** member and Location for DAAB is Karachi.

PART B – SPECIAL PROVISIONS

Sr. No.	GCC Clause No.	Clause Description	Amendments of, and Supplements to, Clauses in the GCC
1.	**1.1**	**Definitions**	1.1.76 "Specification" Following is added at the end: "and consists of two parts i.e., i) "Part A - Specific Provisions"; and ii) "Part B - Technical Provisions"."
2.	**1.2**	**Interpretation**	"and" is deleted from the end of sub-paragraph (i) and added at the end of sub-paragraph (j). Sub-paragraph (k) is added: "(k) The word "tender" is synonymous with "bid" the word tenderer with "bidder", the words "tender documents" with "bidding documents" and "Schedule of Prices" with "Bill of Quantities", as applicable."
3.	**1.5**	**Priority of Documents**	The documents listed at (a) through (k) of this Sub-Clause aredeleted and substituted with the following: (a) the Contract Agreement; (b) the Letter of Acceptance; (c) the Letter of Bid; (d) the Special Conditions Part A - Contract Data; (e) the Particular Conditions Part B - Special Provisions; (f) the General Conditions; (g) The completed Appendices to Bid at Section-V (A to N), (excluding Appendix-K to Bid); (h) the completed Schedules to Bid including Bill ofQuantities; (i) the Drawings; (j) the Specification Part A - Special Provisions; (k) the Specification Part B - Technical Provisions; (l) Operation and Maintenance Services; (m) any other documents forming part of the Contract. The addenda/corrigenda, if any, shall be deemed to have been incorporated at the appropriate places in the documents forming the Contract.
4.	**1.6**	**Contract**	In the last line of the 1st paragraph the text "shall be borne by the Employer" is substituted by "shall be borne by the Contractor
5.	**1.9**	**Delayed Drawings or Instructions**	Contractor shall only be entitled to Extension of Time.
6.	**1.13**	**Compliance with Laws**	Contractor shall only be entitled to Extension of Time.
7.	**2.1**	**Right of Access to the Site**	Contractor shall only be entitled to Extension of Time.
8.	**2.2**	**Assistance**	This clause is not applicable
9.	**3.1**	**The Engineer**	In sub-paragraph (a) the text "as defined in the Pakistan Engineering Council Act, 1975 (Act No. V of 1976)" are added after the words "professional engineer".
10.	**3.2**	**Engineer's Dutiesand Authority**	The Engineer shall obtain the consent in writing of the Employer before taking action under the following Sub-Clauses of these Conditions: (a) (a)Consenting to the subcontracting of any part of the Works under Sub-Clause 5.1 [Subcontractors],5.2[Nominated Subcontractor (b) Any action under Sub-Clauses 8.9 [Employer's Suspension] and 8.12 [Prolonged Suspension] (c) Issuance of "Taking Over Certificate" under Sub-Clause 10.1 [Taking Over the Works and Sections]. (d) Issuing the "Performance Certificate" under Sub-Clause 11.9 [Performance Certificate]. (e) Sub-Clause 13.1 [Right to Vary]: instructing a Variation, except; i. in an emergency situation as determined by the Engineer, or ii. if such a Variation would increase the Accepted Contract Amount by less than the percentage specified in the Contract Data. (f) Sub-Clause 13.3 [Variation Procedure]: approving a proposal for Variation submitted by the Contractor in accordance with Sub-Clause 13.3.2 [Variation by Request for Proposal] or 13.2 [Value Engineering].

			(g) Certifying release of second half of the Retention Money under Sub-Clause 14.9 [Release of Retention Money]. (h) Issuing Final Payment Certificate under Sub-Clause 14.13 [Issue of FPC]. Any such requirement shall not be applied to any action by the Engineer under Sub-Clause 3.7 [Agreement or Determination], as stated in Sub-Clause 3.2 [Engineer's Duties and Authority] of the General Conditions. Notwithstanding the obligation, as set out above, to obtain approval, if, in the opinion of the Engineer, an emergency occurs affecting the safety of life or of the Works or of adjoining property, he may, without relieving the Contractor of any of his duties and responsibility under the Contract, instruct the Contractor to execute all such work or to do all such things as may, in the opinion of the Engineer, be necessary to abate or reduce the risk. The Contractor shall forthwith comply, despite the absence of approval of the Employer, with any such instruction of the Engineer. The Engineer shall determine an addition to the Contract Price, in respect of such instruction, in accordance with Clause 13 and shall notify the Contractor accordingly, with a copy to the Employer. Following is added after the words "the Employer's consent is required" in 4th paragraph: "stating that the Employer's consent has been obtained for that specified authority"
11.	**3.7**	**Agreement or Determination**	3.7.5 Dissatisfaction with Engineer's determination The contents of last paragraph of this clause are replaced as under; In the event that a Party fails to comply with an agreement of the Parties under this Sub-Clause 3.7 or a final and binding determination of the Engineer, the other Party may, without prejudice to any other rights it may have, refer the failure itself directly to arbitration under Sub-Clause 21.8 [Arbitration].
12.	**4.3**	**Contractor's Representative**	In second paragraph the text "professional engineer as defined in the Pakistan Engineering Council Act, 1975 (Act No. V of 1976) (having temporary licence in case of foreign engineer under Section 12 of the Pakistan Engineering Council Act, 1975 (Act No. V of 1976)" are added after the words "qualified, experienced". In 2nd line of 4th paragraph the text "or appoint a replacement" is substituted by "except appointment of a suitable temporary replacement is deployed at the Site"
13.	**4.4**	**Contractor's Documents**	4.4.2 As-Built Records First paragraph is deleted and the text in the last paragraph is substituted with the following: "The Contractor shall furnish to the Engineer 6 copies, one reproducible and one electronic copy (provided the Engineer has made available to the Contractor editable form of the Drawings) of all Drawings amended to conform to the Works as built. In case the Engineer does not make available to the Contractor editable form of the Drawings, the Contractor shall furnish to the Engineer as-built data for incorporation in the Drawings. Upon receipt of PDF versions of the as-built drawings prepared by the Engineer, the Contractor shall furnish to the Engineer 6 copies and one reproducible of these Drawings. The price of such Drawings shall be deemed to be included in the Contract Price Following Sub-Clause is added: <u>4.4.4 Shop Drawings</u> The Contractor shall submit to the Engineer for review 3 copies of all shop and erection drawings applicable to this Contract as per provision of relevant Sub-Clause of the Contract. Review and approval by the Engineer shall not exceed 21 days and be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory and the Engineer's review or approval shall not relieve the Contractor of any of his responsibilities under the Contract.
14.	**4.7.**	**Setting Out**	4.7.3 (c)ii. Contractor shall only be entitled to Extension of Time.

15.	**4.8**	**Health and Safety Obligations**	The following text is added at the end of this Sub-Clause: In the event of work being carried out outside the normal working hours and in the event of work being carried out at night, the Contractor shall at his own cost, provide and maintain such good and sufficient light as will enable the work to proceed satisfactorily and without danger. The approaches to the Site and the Works where the night work is being carried out shall be sufficiently lighted. All arrangement adopted for such lighting shall be to the satisfaction of the Engineer.
16.	**4.12.**	**Unforeseeable Physical Conditions**	4.12.4. Contractor shall only be entitled to Extension of Time.
17.	**4.15**	**Access Rout**	Contractor shall only be entitled to Extension of Time.
18.	**4.20**	**Progress Reports**	The words "one paper-original." In first paragraph is deleted and substituted with the "03 paper-original" At the end of sub-paragraph (g) the word "and" is deleted and at the end of sub-paragraph (h) the full stop (.) is replaced with ";", and the following new sub-paragraphs are added as: (i) planned programme for the execution of the Works for next 56 days to enable the Engineer to determine its programme of inspection and testing; (j) monthly summery of daily job record indicating weather conditions, deployment of Contractor's Equipment, labour employment, local material procurement and material import, if any; (k) salient contractual and project information
19.	**4.23**	**Archaeology and Geological Findings**	Contractor shall only be entitled to Extension of Time.
20.	**5.1**	**Subcontractors**	Add the following text at the end of paragraph (ii): "under Schedule to Bid" The following is added at the end of the last paragraph of Sub- Clause 5.1: "All subcontracts relating to the Works shall include provisions which entitle the Employer to require the subcontract to be assigned to the Employer under sub-paragraph (a) of Sub- Clause 15.2.3 [After Termination]. The Contractor shall give reasonable opportunity to contractors from Islamic Republic of Pakistan for subcontracts for the Works, and endeavour to employ such contractors as Subcontractors."
21.	**5.2**	**Nominated Subcontractors**	5.2.2 Objection to Nomination In sub-paragraph (c), "and" is deleted from the end of (i); "." at the end of (ii) is replaced with: ", and". The following is then added as (iii): "(iii) be paid only if and when the Contractor has received from the Employer payments for sums due under the Subcontract referred to under Sub-Clause 5.2.3 [Payment to nominated Subcontractors]."
22.	**6.1**	**Engagement of Staff and Labour**	The following paragraph is added at the end of the Sub-Clause: "The Contractor shall, to the extent practicable and reasonable, employ staff (100%) and labour (100%) with appropriate qualifications and experience from sources within the Islamic Republic of Pakistan."
23.	**6.7**	**Health and Safety of Personnel**	The existing text is substituted with the following: "In order to provide for the safety, health and welfare of persons, and for prevention of damage of any kind, all operations for the purposes of or in connection with the Contract shall be carried out in compliance with the Safety Requirements of the Government of Pakistan with such modifications thereto as the Engineer may authorize or direct and the Contractor shall take orcause to be taken such further measures and comply with such further requirements as the Engineer may determine to be reasonably necessary for such purpose. The Contractor shall also provide all other medical services and appoint a health and safetyofficer at Site if stated in the Specifications. In case of anyfatality or serious accident, the Contractor shall, in addition,notify the Engineer immediately by the quickest available means."
24.	**6.8**	**Contractor's Superintendence**	Insert at the end of sub-paragraph (a) of this Sub-Clause: "or, if not, the Contractor shall make competent interpretersavailable

			during all working hours, in a number sufficient for those persons to properly perform their superintendence duties" The following text is added at the end of this Sub-Clause: "The Contractor's authorized representative and his other engineers working at site shall possess valid registration with the Pakistan Engineering Council. The Contractor's authorized representative at Site shall be authorized to exercise adequate administrative and financial powers on behalf of the Contractor so as to achieve completion of the Works as per the Contract."
25.	**6.12**	**Key Personnel**	The following is inserted at the end of the last paragraph: "If any of the Key Personnel are not fluent in this language, the Contractor shall make competent interpreters available during all working hours in a number deemed sufficient by the Engineer."
	The following Sub-Clauses 6.13 to 6.26 are added at the end of Sub-Clause 6.12:		
26.	**6.13**	**Supply of Foodstuffs**	The Contractor shall arrange for the provision of a sufficient supply of suitable food as may be stated in the Specification at reasonable prices for the Contractor's Personnel for the purposes of or in connection with the Contract.
27.	**6.14**	**Supply of Water**	The Contractor shall, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of the Contractor's Personnel.
28.	**6.15**	**Measures against Insect and Pest Nuisance**	The Contractor shall at all times take the necessary precautionsto protect the Contractor's Personnel employed on the Site from insect and pest nuisance, and to reduce the danger to their health.The Contractor shall comply with all the regulations of the local health authorities, including use of appropriate insecticide.
29.	**6.16**	**Alcoholic Liquor or Drugs**	The Contractor shall not, otherwise than in accordance with the Laws of the Country, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter or disposal thereto by Contractor's Personnel.
30.	**6.17**	**Arms and Ammunition**	The Contractor shall not give, barter, or otherwise dispose of, to any person, any arms or ammunition of any kind, or allow Contractor's Personnel to do so.
31.	**6.18**	**Festivals and Religious Customs**	The Contractor shall respect the Country's recognized festivals, days of rest and religious or other customs
32.	**6.19**	**Funeral Arrangements**	The Contractor shall be responsible, to the extent required by local regulations, for making any funeral arrangements for any of its local employees who may die while engaged upon the Works.
33.	**6.20**	**Forced Labour**	The Contractor, including its Subcontractors, shall not employ or engage forced labour which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty, and includes any kind of involuntaryor compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements.
34.	**6.21**	**Child Labour**	The Contractor, including its Subcontractors, shall not employ or engage child labour in accordance with relevant law(s) in force in Islamic Republic of Pakistan.
35.	**6.22**	**Employment Records of Workers**	The Contractor shall keep complete and accurate records of the employment of labour at the Site. The records shall include the names, ages, genders, hours worked and wages paid to all workers. These records shall be summarized on a monthly basis and submitted to the Engineer. These records shall be included inthe details to be submitted by the Contractor under Sub-Clause 6.10 [*Contractor's Records*].
36.	**6.23**	**Workers' Organizations**	The Contractor shall comply with the relevant labour laws of Pakistan which recognize workers' rights to form and to join workers' organizations/Trade Union of their choosing and tobargain collectively without interference.

37.	**6.24**	**Non-Discrimination and Equal Opportunity**	The Contractor shall not make decisions relating to the employment or treatment of Contractor's Personnel on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment of Contractor's Personnel on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, and disciplinary practices. Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination. The Contractor shall provide protection and assistance as necessary to ensure non-discrimination and equal opportunity, including for specific groups such as women, persons with disabilities, migrant workers and children (of working age in accordance with Sub-Clause 6.22).
38.	**6.25**	**Epidemics**	In the event of any out-break of illness of epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government or the local medical or sanitary authorities for the purpose of overcoming the same.
39.	**7.4**	**Testing by the Contractor**	Contractor shall only be entitled to Extension of Time.
40.	**7.6**	**Remedial Work**	7.6 9(i) Contractor shall only be entitled to Extension of Time.
41.	**7.7**	**Ownership of Plantand Materials**	The following is added before the first paragraph: "Except as otherwise provided in the Contract," The following is added at the end of the Sub-Clause: "No Plant and/or Materials that is the property of the Employer shall be removed from the Site. If it becomes necessary to: (i) remove any item of such Plant from the Site for the purposes of repair, the Contractor shall give a Notice, with reasons, to the Engineer requesting consent to remove the defective or damaged item off the Site. This Notice shall clearly identify the item of defective or damaged Plant, and shall give details of: the defect or damage to be repaired; the place to which defective or damaged item of Plant is to be taken for repair; the transportation to be used (and insurance cover for such transportation); the proposed inspections and testing off the Site; and the planned duration required before the repaired item of Plant shall be returned to the Site. The Contractor shall also provide any further details that the Employer may reasonably require; or (ii) replace any item(s) of such Plant and/or Materials, the Contractor shall give a Notice, with reasons, to the Engineer clearly identifying the item(s) of Plant and/or Materials to be replaced, and giving details of the due date of delivery to the Site of the replacement item(s). Where any item of Plant and/or Materials has become the property of the Employer under this Sub-Clause before it has been delivered to the Site, the Contractor shall ensure that such an item is not moved except for its delivery to the Site. The Contractor shall indemnify and hold the Employer harmless against and from the consequences of any defect in title or encumbrance or charge (except any reasonable restriction arising from the intellectual property rights of the manufacturer or producer) on any item of Plant and/or Materials that has become the property of the Employer under this Sub-Clause."
42.	The following Sub-Clause 7.9 is added after Sub Clause 7.8:		
43.	**7.9**	**Use of Pakistani Materials and Services**	The Contractor shall, so far as may be consistent with the Contract, make the maximum use of materials, supplies, plant and equipment indigenous to or produced or fabricated in Pakistan and services available in Pakistan provided such materials, supplies, plant, equipment and services shall be of required standard.
44.	**8.1**	**Commencement of Works**	The following is added before the first paragraph: "After signing of the Contract Agreement by both Parties," and

			thereafter the word "The" is replaced with the word "the".
45.	**8.5**	**Extension of Timefor Completion**	The Contractor shall only be entitled for Extension of Time. The following is added after paragraph (c): "for last five years".
46.	**8.10**	**Consequences of Employer's Suspension**	The Contractor shall only be entitled for Extension of Time.
47.	**10.2**	**Taking Over Parts**	Contractor shall only be entitled to Extension of time.
48.	**10.3**	**Interference with Tests on Completion**	Contractor shall only be entitled to Extension of time.
49.	The following Sub-Clause 11.12 is added after Sub-Clause 11.11:		
50.	**11.12**	**Supervisory Assistance During DNP**	If provided under the Schedule of Prices, the Contractor shall provide supervisory assistance to the Employer during the DNP for the Works. Such supervisory assistance shall be as described in the Specification for the purpose of supporting the Employer'soperation and maintenance of the Plant for the period specifiedin the Schedule of Prices after the Date of Completion.
51.	**11.7**	**Right of Access after Taking Over**	Contractor shall only be entitled to Extension of time.
52.	**11.8**		Contractor shall only be entitled to Extension of time.
53.	**12.2**	**Method of Measurement**	The following paragraph is added at the end of the Sub-Clause: "Summary of measured quantity for payment shall be delineated item-wise under four heads namely; "Schedule of Prices Quantity", "Quantity Executed To-date", "Quantity Certified Previously" and "Net Quantity Executed under this Certificate". or as required by Engineer"
54.	**12.3**	**Valuation of the Works**	The text is deleted and replaced with following: Variations shall be valued as follows: a) at a lump sum price agreed between the Parties, or b) where appropriate, at rates in the Contract, or c) rates notified by the Government Departments/agencies, or d) in the absence of appropriate rates, the rates in the Contract shall be used as the basis for valuation, or failing which e) at appropriate new rates, as may be agreed or which the Engineer/Employer considers appropriate, Contractor's profit & overheads shall be up to 15% of the cost of labour & materials, cartage, etc. Taxes shall be considered as per actual rate while analyzing rates for any extra items. For valuation of variations and approval of rates for non-BOQ/extra items, the decision of the Director Engineering will be final & binding upon the parties. The approval / finalization of rates of all variations shall not relieve the Contractor of his obligations under the Contract. The Contractor shall neither stop the work nor slow down the progress of the Works in awaiting the approval of rates of all variations.
55.	**13.6**	**Adjustments for Changes in Laws**	Contractor shall only be entitled for extension of Time. Further, if the relevant delay has not already been taken into account in the determination of a previous extension of time.
56.	**14.2.4**	**Secure Advance on Material**	Add the following sub clause 14.2.4 after clause 14.2.3 The Employer at his sole discretion may provide to Contractor Secured Advance against an indemnity bond acceptable to the Employer of such sum as the Engineer in charge may consider proper in respect of non-perishable materials brought at the Site but not yet incorporated in the permanent Works subject to approval of Director/Head of Engineering, provided that: (a) The materials are in accordance with the Specifications for the permanent works; (b) Such materials have been delivered to the Site and are properly stored and protected against loss or damage or deterioration to the satisfaction of the Engineer in charge but at the risk to cost of the Contractor; (c) The Contractor's records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer in charge, and such records shall be available for inspection by the Engineer in charge;

			(d) The Contractor shall submit with his monthly statement the estimated value of the materials on Site together with such documents as may be required by the Engineer in charge for the purpose of valuation of materials and providing evidence of ownership and payment therefore; (e) Ownership of such materials shall be deemed to vest in the Employer and these materials shall not be removed from the Site or otherwise disposed of without written permission of the Employer. (f) 60% of the purchase price of the item/material or 50% of tender price of the item/material whichever is lesser, after measuring the quantity & verification of the quality of materials at site by the Employer may be paid The amount of Secured Advance against any item(s)/materials shall be recovered from the next three (03) bill of the Contractor in the form of three equal installments. The Employer reserves the right to recover all outstanding amount of the Secured Advance from very 1st bill of the Contractor submitted after release of the Secured Advance.
57.	**14.3**	**Application for Interim Payment**	**Imbalance Bid** Add following paragraph at end of sub-clause: In case of imbalanced bid (abnormally high/low rates than market/ Employer's Engineer's estimate) duly justified by the contractor, the payments against such running bills will be made by the employer up to 80% of the running bill after required deductions. The remaining amount will be settled at the time of final settlement upon completion of work to the satisfaction of the Employer.
58.	**14.8**	**Delayed Payment**	The clause is deleted in its entirety
59.	**15.2**	**Termination for Contractor's Default**	15.2.1 Notice Following text is added at the end of sub-paragraph (h) of this Sub-Clause: "For the purposes of this Contract, corrupt and fraudulent practices have been defined in Public Procurement Rules 2004." 15.2.4 Completion of Works The first paragraph is replaced with following After termination under this Sub-Clause, the Employer may complete the Works and/or arrange for any other entities to do so at the risk and cost of the Contractor. The Employer and/or these entities may then use any Goods and Contractor's Documents (and other design documents, if any) made by or on behalf of the Contractor to complete the Works.The following text is added at the end of this Sub-Clause
60.	**15.2.5**	**Blacklisting**	The Procuring agency/Employer shall bar for not more than the time prescribed in Rule-19 of the Public Procurement Rules, 2004, from participating in their respective procurement proceedings, bidder or contractor who either: (a) Involved in corrupt and fraudulent practices as defined in Rule-2 of Public Procurement Rules; (b) Fails to perform his contractual obligations; and Fails to abide by the id securing declaration
61.	**15.4**	**Payment after Termination**	"The Employer shall be entitled to sell any of the Contractor's Equipment, Temporary Works and unused materials and apply the proceeds of sale towards payment of any debt due from the Contractor to the Employer under this Clause
62.	**16.1**	**Suspension by Contractor**	c. Not applicable d. Not applicable Contractor shall only be entitled for extension of Time
63.	**16.2**	**Termination by Contractor**	e. Not applicable d. Not applicable e. Not applicable h. Not applicable 16.2.2 - Contractor shall only be entitled for extension of Time
64.	**16.3**	**Contractor's Obligations After Termination**	Sub-paragraph (c) is deleted and replaced with: "(c) deliver to the Engineer all Employer-Supplied Materials and/or Employer's Equipment made available to the Contractor in accordance with Sub-Clause 2.6 *[Employer-*

			Supplied Materials and Employer's Equipment]; and (d) remove all other Goods from the Site, except as necessary for safety, and leave the Site."
65.	**17.7**	**Use of Employer's Accommodation/ Facilities**	The following Sub-Clause 17.7 is added after Sub-Clause 17.6: The Contractor shall take full responsibility for the care of the items of the Employer's facilities and/or accommodation, if any, as detailed in the Specification, from the date of use and/or occupation by the Contractor until the date on which such use and/or occupation is re-vested in the Employer. If any loss or damage happens to any of the above items during time while the Contractor is responsible for its care, arising fromany cause other than a cause for which the Employer is responsible or liable, the Contractor shall promptly rectify the loss or damage at the Contractor's risk and cost.
66.	**18.1**	**Exceptional Events**	The words "or disorder" are replaced with "disorder or sabotage" in sub-paragraph (c) of the Clause.
67.	**18.4**	**Consequences of an Exceptional Event**	Contractor shall only be entitled for extension of Time
68.	**18.5**	**Optional Termination**	The sub clause is deleted in its entirety
69.	**19.1**	**General Requirements**	Following text is added at the end of first paragraph: "The Contractor shall immediately after the date of the Letter of Acceptance submit the draft of insurance policies for the Employer's consent." Following text is added at the end of third paragraph: "The Contractor shall, within the respective periods stated in the Contract Data submit to the Engineer and the Employer a) evidence that the insurances described in this Clause have been effected, and b) copies of policies of the insurances described in Sub-Clauses 19.2.1, 19.2.4 and 19.2.5."
70.	**20**	**Claims for Payment and/or EOT**	Contractor shall only be entitled for extension of Time
71.	**21.1**	**Constitution of the DAAB**	The DAAB will be constituted with mutual consent at the time of any dispute if arises between Employer and Contractor.
72.	**21.9**	**Arbitration**	The following Clause 21.9 is added Any dispute in respect of which the decision, if any, of the Engineer has not become final and binding pursuant to Sub-Clause 3.7 shall be finally settled, under the provisions of the Arbitration Act, 1940 as amended from time to time or any statutory modification or re-enactment thereof for the time being in force. The said arbitrator/s shall have full power to open up, review and revise any decision, opinion, instruction, determination, certificate or valuation of the Engineer related to the dispute. Neither party shall be limited in the proceedings before such arbitrator/s to the evidence or arguments put before the Engineer for the purpose of obtaining his said decision pursuant to Sub-Clause 3.7. No such decision shall disqualify the Engineer from being called as a witness and giving evidence before the arbitrator/s on any matter whatsoever relevant to the dispute. Arbitration may be commenced prior to or after completion of the Works, provided that the obligations of the Employer, the Engineer and the Contractor shall not be altered by reason of the arbitration being conducted during the progress of the Works. The place of arbitration shall be Karachi, Pakistan
73.	The following Clauses are added after Clause 21		
74.	**22**	**Electric Power Generating Set**	Water for construction purposes will be provided by the Employer. Electricity will be provided by the Employer for all minor equipment & tools. Expense regarding the required cables/wires and sub-meters,

			switches etc. shall have to be borne by the Contractor. The Contractor shall make his own arrangement at his own expenses for the telephone & fax etc. at the Site of Works. If these facilities are to be provided by the Employer at the request of the Contractor, the Contractor shall have to pay the bills/ expenses as per mutually agreed terms & conditions at that time. Hutting/ tenting etc. for the workers or storage of the materials of the contractor shall be the responsibility of the contractor.
75.	**23**	**Fire Protection and loss control**	The Contractor shall be aware of necessary precautions & controls concerning cutting, welding, and hot work, fire precautions and ensure compliance. The Contractor shall be responsible for the fire watch as necessary and meet the fire prevention / fighting practices. The Contractor shall, in his work plan, forecast any extra hazardous area or adjacent to the site of the work and provide curtains, shields, or any other specialized equipment to adequately shield flames and sparks from combustibles. Where the Contractor requires the utilization of flammable liquids, approved devices and containers for transfer or storage of the same shall be used. The Contractor is responsible for disposal of deleterious substances such as lubrication oil, solvents, diesel fuel etc. which shall be contained in suitable containers and be disposed of away from the site and in no case disposed in sewers or water course(s) or drains. The Contractor shall provide and maintain adequate fire protection in the form of barrels of water with buckets, fire bucket tanks, fire extinguisher, or other effective means ready for instant use, distributed around the project and in and about temporary inflammable structures during construction of the works. Gasoline and other flammable liquids shall be stored in and dispensed from safety containers approved by the Engineer and storage shall not be within building. Torch-cutting and welding operations performed by the Contractor shall have the approval of the Engineer before such work is started and a chemical extinguisher is to be available at the location where such work is in progress. The Contractor shall follow the instructions and specifications of the Civil Defense Department or any other local department concerned with such activities.
76.	**24**	**Safety Regulation**	1) **General**; It is the Contractors responsibility to assure that the safety regulations, are followed at all times and that all his employees at site have a thorough knowledge and understanding of the safety regulations and are complying with all the safety requirements. The Contractor must comply with all applicable accident prevention regulations and other safety work practices governed under any law of any local or provincial authority of Pakistan. The Contractor shall comply and enforce compliance by all his sub-contractors with the highest standards of safety and accident prevention in accordance with international standards and in compliance with all applicable laws, ordinances and statutory provisions. The Employer requires that all the Contractors' workers wear hard hats, safety shoes, and where necessary gloves, and shirts at all times while on site. All requisite barriers, fences, warning signs, lights and other safety precautions as required for the protection of persons and property on or adjacent to the site shall be provided at the Contractor's cost. All false work, scaffolding and handrails shall be well constructed and secured at all times. Where overhead work is being carried out, warning signs shall be installed at ground level clearly warning of the overhead work. All warning signs shall be in two languages, English and Urdu, and shall at all times be maintained in a clean and legible condition, to the satisfaction of the Engineer. Trash shall be removed at frequent intervals to the satisfaction of the Engineer. Netting shall be provided at all levels where work is in progress, all around the building.

77.			2) **Fire Protection Equipment** The Contractor is responsible to provide the required number of fire extinguishers as well as the necessary hose line for his area of work. The type and size of fire-fighting equipment have to be approved by the Engineer. i. Welding / burning requires permission from the Engineer Closing, sealed or locked walls of any fire system requires an impairment lock out notification from the Engineer.
78.			3) **Hazardous Area** Before entering any area, the Contractor must familiarize himself of the existing hazards and inquire from the Engineer necessary precautions to be taken for the protection of himself, other workers and equipment.
79.			4) **Waste Material Removal and environmental control** If the work requires the removal of any material hazardous to industrial or public / environment, then the Contractor shall remove it in compliance with industrial health and safety regulations.
80.	**25**	**Labour Conditions**	The Contractor acknowledges that some or all other Contractors or sub-contractors or suppliers or persons working at or delivering to or for the site or the work being carried out at or near the site may be union or non-union, Labour peace shall be maintained at the site. The Contractor shall carry out the work in a manner which ensures that there are no labour problems, work stoppages, or other labour disputes or disruptions which might affect the Contractors work, any other work at the Site or the Employers operations. The Contractor warrants and confirms that no agreement with its employees or trade unions representing his Employees or between his subcontractors. Suppliers sub-contractors and their employees or labour union representing those Employees will affect the Contractor's performance under the Contract, any other work at the site or the Employers operations. The Contractor acknowledges that the site is considered an open site, not exclusively union or non-union.
81.	**26**	**The Contractor Shall be Liable & Indemnify The Employer**	Contractor shall be exclusively liable for and shall indemnify and hold harmless the Employer, its agents and employees from: i. Making good all losses arising out of the Contractor's negligence or breach of the Contract. This may include damage to the paints/ polish works, false ceilings, wooden or metallic works, tiles, marbles, plants, wires, pipes, electrical and mechanical items, fixtures of any kind, antiques, glass items, window blinds, etc. The Employer shall determine the amounts of such losses/ damages and the Contractor hereby expressively waives his all or any right to change or challenge the same. The Contractor shall have to make good all such losses/ damages within time frame specified in the Notice, to the entire satisfaction of the Employer. ii. Any tax, government duties, insurance contributions and other taxes or social security contributions in respect of Contractor's employee(s) or sub-Contractor together in each case with any interest, fines or penalties thereon. iii. Any claims of Contractor / service provider's current employees or ex-employees, or associates, or their heirs whether against the Contractor, other Contractors working within the same premises or any other person, regarding deals made at personal level by the staff or personal matters or deals carried out as an Employer, in whatsoever form, manner or capacity. iv. Any Government Permits, Licenses, etc. that may be required for performing the services contemplated under the Contract. v. All claims of compensation by an employee of Contractor / Service Provider, his family or legal heirs or any other agency, autonomous body, any NGO or government department, arising from injury, disability, ill health or death of any of his employees during the currency or expiry of this Contract while performing any services under this Contract or any claim regarding the medical care or treatment expenses submitted by the employee or ex-employee of the Contractor / Service Provider or their legal heirs. Save for the willful or deliberate breach of its obligations under the

			Contract or, as set out above, neither party shall be liable for any consequential or indirect loss or damage.
82.	**27**	**Contractor's Warranties**	The Contractor undertakes and represents that at all times: i. It has the requisite power and authority to enter into and perform this Agreement; ii. It holds valid license and authority to carry out the Services; iii. It shall execute the services in professional manner through competent, skilled, qualified human resource. iv. Contractor shall not act in a way which is prejudicial to Employer's interests or business; v. The Services shall be fit for the express or implied purposes for which supplied. vi. The Contractor shall follow the instructions to be issued by the Employer when at Employer's premises, all rules and security policies and the Employer may exclude any person from its premises for any actual or anticipated breach of these policies. Any breach by Contractor of this Clause, constitutes a material breach of the Contract and may lead towards Termination of Contract. In addition to Employer's rights under the Contract, the Employer shall be entitled to require Contractor to (a) remedy the breach at its cost; (b) pay for it to be remedied; or / and (c) repay all amounts already paid for the defective Services.
83.	**28**	**Confidentiality**	Except with the consent in writing of the Employer, Contractor shall keep strictly confidential and not make use of any confidential information - supplied by the Employer other than to perform this Contract, and shall impose the same obligations on its employees and other third parties (including sub-service provider). Contractor may disclose confidential information if required to do so by law, court order, rules or regulation provided (to the extent permissible by law) it has notified the Employer in advance and agreed the scope of disclosure with the Employer.

SECTION IX: CONTRACT FORMS

Form of Contract

THIS AGREEMENT made the _____ day of _____ 20_____ between *[name and address of Procuring agency/Employer]* of Pakistan (hereinafter called "the Procuring agency/Employer") of the one part and *[name of Contractor]* of *[city and country of Contractor]* (hereinafter called "the ") of Contractor other part:

WHEREAS the Procuring agency/Employer desired that the works *[brief description of works]* should be executed by the contractor, and has accepted a Bid by the contractor for the execution and completion of these works and remedying of any defects therein, in the sum of *[contract price in words and figures]* (hereinafter called "the Contract Price").

NOW THIS CONTRACT WITNESSETH AS FOLLOWS:

1. In this Contract words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Contract, In the event of any ambiguity or conflict between the Contract Documents listed below, the order of precedence shall be the order in which the Contract Documents are listed below:-
   (a) This form of Contract;
   (b) Letter of Acceptance;
   (c) the Form of Bid and the Price Schedule submitted by the Bidder;
   (d) the Works Requirements;
   (e) the Technical Specifications;
   (f) the Drawings;
   (g) the General Conditions of the Contract
   (h) the Special Conditions of Contract,
   (i) the completed schedule including Bill of Quantities; and
   (j) [*add here: any other documents*]
3. In consideration of the payments to be made by the Procuring agency/Employer to the contractor as mentioned in this contract, the contractor hereby covenants with Procuring agency/Employer to execute the works to remedy defects therein in conformity in all respects with the provisions of the Contract.
4. The Procuring agency/Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, 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 to be executed in accordance with their respective laws the day and year first above written.

Signed, sealed, delivered by _____the _____ (for the Procuring agency/Employer)	Signed, sealed, delivered by _____the _____ (for the Contractor)
Witness to the signatures of the Procuring agency/Employer ……	Witness to the signatures of the Contractor ……

Performance Guarantee Form

Letter of Guarantee Ref. No: _____
Date of Issue: _____
Date of Expiry: _____
Amount of Guarantee: _____

To:
SBP Banking Services Corporation,
Proc. Unit, Engg. Dept., 1st Floor Bolton Market Building, MA Jinnah Road, Karachi

WHEREAS M/s <_____> (hereinafter called "the Supplier") has undertaken, in pursuance of Contract No. <_____> dated <_____> to delivery Renovation Works for Establishment of RAAST Secretariat at 4th Floor, at SBP BSC House, Head Office Karachi (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by SBP Banking Services Corporation (hereinafter called "the Procuring Agency") in the said Contract that the Supplier shall furnish to the Procuring Agency with a Bank Guarantee by a reputable bank for the sum specified therein as security for compliance with the Supplier's performance obligations in accordance with the Contract.

AND WHEREAS we <_____> (the Guarantor) have agreed to give the Supplier a guarantee.

THEREFORE, WE hereby affirm that we are Guarantors and responsible to the Procuring Agency, on behalf of the Supplier, up to a total of sum stated above, and we undertake to pay the Procuring Agency, upon your first written demand declaring the Supplier to be in default under the Contract and without cavil or argument, any sum or sums within the limits of amount of guarantee as aforesaid, without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

This guarantee is valid until the duration as stated above.

On behalf of Click or tap here to enter text.

Signature and seal of the Guarantors

_____
[name of bank or financial institution]

_____
[address]

_____
[date]

Advance Payment Security

Demand Guarantee

_____

Beneficiary: _____

Date: _____

ADVANCE PAYMENT GUARANTEE No.: _____

Guarantor: _____

We have been informed that [Inset name of the Contractor] (hereinafter called "the Contractor") has entered into Contract No. _____ dated _____ with the [insert name of the Procuring agency/Employer] (hereinafter called "the Procuring agency/Employer") for the execution of _____ (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum _____ (_____) is to be made against an advance payment guarantee.

At the request of the Contractor, we as Guarantor, hereby irrevocably undertake to pay the Procuring agency/Employer any sum or sums not exceeding in total an amount of _____ upon receipt by us of the Procuring agency/Employer's complying demand supported by the Procuring agency/Employer's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating either that the Applicant:

(a) has used the advance payment for purposes other than the costs of mobilization in respect of the Works; or

(b) has failed to repay the advance payment in accordance with the Contract conditions, specifying the amount which the Contractor has failed to repay.

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Procuring agency/Employer's bank stating that the advance payment referred to above has been credited to the Contractor on its account number _____ at _____.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor as specified in copies of interim statements or payment certificates which shall be presented to us.

The Guarantee 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 Certificates 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.

_____

[signature(s)]

Note: All italicized text is for use in preparing this form and shall be deleted from the final product.

Retention Money Security
Demand Guarantee

_____ *[Guarantor letterhead or SWIFT identifier code]*

Beneficiary: _____ *[Insert name and Address of Procuring agency/Employer]*

Date: _____*[Insert date of issue]*

RETENTION MONEY GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that _____ *[insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (hereinafter called "the Contractor") has entered into Contract No. _____ *[insert reference number of the contract]* dated _____ with the Procuring agency/Employer, for the execution of _____ *[insert name of contract and brief description of* Works*]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, the Procuring agency/Employer retains moneys up to the limit set forth in the Contract ("the Retention Money"), and that when the Taking-Over Certificate has been issued under the Contract and the first half of the Retention Money has been certified for payment, payment of *[*insert the second half of the Retention Money *or if the amount guaranteed under the Performance Guarantee when the Taking-Over Certificate is issued is less than half of the Retention Money,* the difference between half of the Retention Money and the amount guaranteed under the Performance Security and, if required, the ES Performance Security*]* is to be made against a Retention Money guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of _____ *[insert amount in figures]* (_____) *[amount in words]* upon receipt by us of the Procuring agency/Employer's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without your needing to prove or show grounds for your demand or the sum specified therein.

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Procuring agency/Employer's bank stating that the second half of the Retention Money as referred to above has been credited to the contractor on its account number _____ at _____ *[insert name and address of Contractor's bank]*.

This guarantee shall expire no later than the …. day of ……, 2…, and any demand for payment under it must be received by us at the office indicated above on or before that date.

_____
[signature(s)]

Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.

Integrity Pact

DECLARATION OF FEES, COMMISSION AND BROKERAGE ETC. PAYABLE BY THE SUPPLIERS OF GOODS, SERVICES & WORKS IN CONTRACTS WORTH RS.10.00 MILLION OR MORE

Contract Number: _____ Dated: _____
Contract Value: _____
Contract Title: _____

[Name of Contractor] hereby declares that it has not obtained or induced the procurement of any contract, right, interest, privilege or other obligation or benefit from Government of Pakistan or any administrative subdivision or agency thereof or any other entity owned or controlled by it (GOP) through any corrupt business practice.

Without limiting the generality of the foregoing [Name of Contractor] represents and warrants that it has fully declared the brokerage, commission, fee etc. paid or payable to anyone and not given or agreed to give and shall not give or agree to give to anyone within or outside Pakistan either directly or indirectly through any natural or juridical person, including its affiliate, agent, associate, broker, consultant, director, promoter, shareholder, sponsor or subsidiary, any commission, gratification, bribe, finder's fee or kickback, whether described as consultations fee or otherwise, with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or other obligation or benefit in whatsoever form from GOP, except that which has been expressly declared pursuant hereto.

[Name of Contractor] certifies that it has made and will make full disclosure of all agreements and arrangements with all persons in respect of or related to the transaction with GOP and has not taken any action or will not take any action to circumvent the above declaration, representative or warranty.

[Name of Contractor] accepts full responsibility and strict liability for making and false declaration, not making full disclosure, misrepresenting fact or taking any action likely to defeat the purpose of this declaration, representation and warranty. It agrees that any contract, right interest, privilege or other obligation or benefit obtained or procured as aforesaid shall, without prejudice to any other right and remedies available to GOP under any law, contract or other instrument, be voidable at the option of GOP.

Notwithstanding any rights and remedies exercised by GOP in this regard, [Name of Contractor] agrees to indemnify GOP for any loss or damage incurred by it on account of its corrupt business practices and further pay compensation to GOP in an amount equivalent to ten time the sum of any commission, gratification, bribe, finder's fee or kickback given by [Name of Contractor] as aforesaid for the purpose of obtaining or inducing the procurement of any contract, right, interest, privilege or other obligation or benefit in whatsoever form from GOP.

_____ _____
[Procuring agency/Employer] [Contractor]

SECTION X - TECHNICAL SPECIFICATIONS & DRAWINGS

TECHNICAL SPECIFICATIONS FOR ELECTRICAL WORKS

The bidder shall provide technical brochures of equipment complying with technical specifications.

1. Brand Names

Equipment and materials specified with brand names have been provided to establish a standard of performance and do not necessarily indicate a preference for a particular manufacturer or material.

The names of manufacturers given below are to indicate the level of quality and performance anticipated by the Employer / Procuring Agency. Other makes may be accepted provided that the quality and performance of such equipment, in the sole opinion of the Employer / Procuring Agency, are at least equal to or better than the equipment offered by the recommended manufacturer listed hereunder.

List of Manufacturers Recommended

The acceptance of equipment/ materials offered by these manufacturers will be subject to compliance with offered models/ materials with the specifications, capacity and/ or performance requirements.

All other items not included in the list hereunder will be approved by the Employer / Procuring Agency in accordance with their compliance with the specifications, capacity and/ or performance requirements.

Onus lies with the Contractor / supplier for establishing the genuineness of any material/ product.

Following are the specifications of material. Bidder can also offer equivalent products, however, adequate documentation in the form of technical data sheets and type test certificates from independent laboratories stating the standards to which the product complies shall be furnished in the support of their being equivalent. The Employer reserves the right to ask the bidder of additional documentation in this regard.

Product	Standards	Recommended Manufacturers
Telephony Cables (CAT-6 and 100 pair multicore cables)	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ)	Vivanco, Clipsal, 3M, Systemax, or approved equivalent,
Analogue Telephone Set	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ)	Panasonic, Alcatel, Uniden or approved equivalent
IP Telephone Sets	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ) Compatible with HIPATH 4000, V8 PABX	Unify, Cisco, Avaya Panasonic Or approved equivalent
LV Panels, Distribution Boards	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ)	Hussain and Co. Unique Engineering HRA Switchgears RA Engineering OR approved equivalent
LV Circuit Breakers: ACB, MCCB & MCB	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ)	ABB Schneider GE OR approved equivalent
LV Cables	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ) KEMA Certified	Pakistan Cables Fast Cables New Age Cables Pioneer Cables OR approved equivalent

Product	Standards	Recommended Manufacturers
Telephony Cables (CAT-6 and 100 pair multicore cables)	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ)	Vivanco, Clipsal, 3M, Systemax, or approved equivalent,
Analogue Telephone Set	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ)	Panasonic, Alcatel, Uniden or approved equivalent
IP Telephone Sets	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ) Compatible with HIPATH 4000, V8 PABX	Unify, Cisco, Avaya Panasonic Or approved equivalent
PVC Conduits and Accessories	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ)	Galco Dadex Jeddah Polymer Civic OR approved equivalent
Lighting Fixture	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ)	Fast LED Lights Philips COARTS Britlite OR approved equivalent
Wireless Audio Conference System	As per standards and specifications mentioned in technical specifications and the Bill of Quantities (BOQ)	TOA Bosch Rest moment or approved equivalent

Section – E-01: General Electrical Requirements

FOREWORD:

This document is to describe the minimum requirements for the equipment and installations and to ensure that the Contractor is fully aware of his duties to perform the required works, in accordance with the terms of the Contract.

1.01 SCOPE OF WORK

The works related to the electrical system, which are included in the scope of this Contract, are shown in Bill of Quantities and explained in these specifications. The works shall broadly include but not limited to the following:

All material and equipment supplied by the Contractor shall be new and, in all respects, conform to the high standards of Engineering design, workmanship, performance and function as here in specified and fully meet the quality level and rugged requirements of the specifications.

The Contractor shall also be responsible to supply any other equipment not specifically mentioned in these documents but which is necessary for proper operation of the works / system, shall be considered to have been so specified and accordingly shall be provided by the Contractor as part of the Contract.

The Contractor shall be solely responsible for ensuring proper functional requirements of various equipment and shall also be responsible for furnishing any additional piece of equipment and for making modification in the equipment as desired and / or approved by the Owner or his representative, to achieve proper coordination with various equipment offered in the bid and also those installed by others.

Approval of the Contractor's supplied equipment / installation works shall not relieve the Contractor of any of his obligations or liabilities under the Contract, except insofar as provided under the conditions of the Contract.

1.02 RULES AND REGULATIONS

The entire electrical installation / work shall be carried out by licensed contractor, authorized to undertake such work under the provisions of Electricity Act 1910 and The Electricity Rules 1937 as adopted and modified up to date by the Government of Pakistan.

All works shall be carried out in accordance with the latest edition of the Regulations of the Electrical Equipment of Buildings issued by the Institute of Engineering and Technology (IET), the Contract documents, the Electricity Rules 1937 and bye-laws that are in force from time to time. Any discrepancy between these specifications and any other rules and regulations shall be brought to the notice of Owner or his representative, and his decision shall be final and conclusive.

The Contractor shall be responsible for completing all formalities and submitting the test certificates as per prevailing rules and regulations and shall have the installation passed by the Government Electric Inspector of that region. All requirements of the Electric Inspector and the Electric Company shall be complied with.

1.03 STANDARDS

The specification recommended practices, official standards and codes the non - restrictive List of which is given below.

- International Electro-technical Commission (IEC)
- British Standards (BS)
- National Electric Code (NEC)
- National Standards
- Local Electric / Utility Supply Company standards
- EN Standards for PAVA System
- NFPA 72
- EIA/TIA Standards for ICT System

In the event of conflict between standards, the most stringent shall prevail.

Whenever the electrical equipment to be installed, does not hold national standards, the Contractor shall take into account the specific standards chosen by the Owner and make sure that the equipment he has to install, meets these standards.

In addition, even if no mention is stipulated in this specification, it is implied that the equipment be tropicalized, if required, by the conditions of the site of installation.

In any case, the standards and codes to be taken into consideration are those in force at the date of delivery.

1.04 INSTALLATION AND SERVICE CONDITIONS:

1.04.1 Site Conditions:

All material and equipment supplied and installed shall be designed, manufactured and tested to meet the following ambient conditions unless specifically stated otherwise for any material / equipment:

a.	Maximum outdoor ambient temperature	:	45 degree C
b.	Minimum Indoor ambient temperature	:	0 degree C
c.	Maximum relative humidity	:	90 %
d.	Minimum relative humidity	:	26 %

1.04.2 Service Conditions:

Equipment shall be designed and built for continuous service with a minimum of supervision and maintenance.

1.05 DOCUMENTS TO BE SUBMITTED:

The contractor shall submit following documents at the time of approval biding or as per instruction of the Engineer:

1. Documents and certificate to be submitted for approval, including:
2. Warranty
3. Packing and delivery
4. Marking
5. Testing, including:
   - Type tests.
   - Routine Tests.
   - Special test.
6. Technical data sheet
7. Maintenance and operation manual
8. Training Program

- END OF SECTION -

Section – E-02: Main Distribution Board

1.1. SUMMARY

Metal-enclosed, low-voltage, power circuit-breaker switchgear rated 1000V and less for use in ac systems.

1.1 Purpose

This section together with its appending document covers the minimum requirement for the design, construction and performance of factory built assemblies of LV switchboard.

1.2 Scope of Work

The work under this scope consists of supplying, installation, testing, connecting and commissioning of all material and services of the complete switchboard as specified herein and/ or shown in the Bill of Quantities.

The Contractor shall discuss the electrical layout with the Engineer and coordinate at site with others for exact route, location and positions of electrical lines and equipment.

1.2. STANDARDS

Particular reference shall be made to:

IEC 60027	Letter symbols to be used in Electrical technology.
IEC 60051	Direct setting electrical measuring instruments.
IEC 60073	Color for indicator lights and push bottoms
IEC 60158	LV Switch gear and control gear.
IEC 60185	Current Transformers.
IEC 60186	Voltage Transformers.
IEC 60269	LV fuses.
IEC 60439	Factory built assemblies of LV switch gear and control gear.
IEC 60529	Degree of protection provided by enclosures.
IEC 60617	Graphic symbols for diagrams.
IEC 60947-2	LV Switch gear and Control gear.
BS 951	Earthing Clamps
BS 1433	Hard drawn bare copper conductor for earthing.
BS 2874	Nuts, Bolts, Washers and Rivets for use on copper.
BS 6346	PVC Insulated Cables.
CP 1013	Earthing

Any other standard referred to in above standards or these specifications.

1.3. PRODUCTS

A Ratings:

(a) Nominal System Voltage: 415 V, 3 phase
(b) Fabrication: Factory assembled and tested and complying with IEEE C37.20.1.
(c) Indoor Enclosure: Steel.
(d) Outdoor Enclosure: Galvanized steel.

- Isolators.
- Louvers for air circulation.
- Hinged front door, interior light, and duplex receptacle.
- Weatherproof internal aisle construction, with aisle access doors, space heaters, lights, and duplex receptacles.

(a) Section barriers between main and tie circuit-breaker compartments.
(b) Bus isolation barriers.
(c) Circuit-breaker compartments.
(d) Removable, hinged, rear covers panels.
(e) Auxiliary Compartments:

- Utility metering compartment.
- Bus transition sections.
- Incoming-line pull sections.
- Hinged front panels

1.4. COMPONENTS

A Instrument Transformers:

- Potential transformers.
- Current transformers.

(a) Instruments: Multifunction digital-metering monitor.
(b) Relays.
(c) Surge arresters.
(d) Control Power Supply: Dry-type transformer, 120 V.
(e) Circuit Breakers:
(f) Operating Mechanism: Mechanically and electrically trip-free, stored-energy type.

- Normal closing speed.
- Slow closing speed.
- Stored-Energy Mechanism: [Manually] [Electrically] charged.
- Operation counter.
- Solid-state trip devices.
- Auxiliary contacts.
- Padlocking provisions.
- Operating handle.
- Electric close button.
- Mechanical interlocking.
- Key interlocks.
- Under voltage Trip Devices: [Instantaneous] [Adjustable].
- Shunt-trip devices.
- Fused circuit breakers.
- Indicating lights.

B Circuit-Breaker Removal Apparatus:

- Portable, floor-supported, roller-base carriage.
- Identification: system power riser diagrams.

1.5. FIELD QUALITY CONTROL

Testing: [Contractor].

1.6. Installation and Service Conditions

For general site conditions refer to Section - E- 1, Clause 4.

Switchboard shall be installed indoor. The equipment shall be capable of operation under the prevailing ambient conditions without any deleterious effect of any kind. Switchboard shall be suitable for continuous operation at full load rating under combined variation of both voltage and frequency as stated in Section - E-1, Clause 5.1.

Transient voltage depression down to 80% of rated voltage shall not affect the performance of the equipment and dip voltage must be within permissible limit.

2. MAIN ELECTRICAL CHARACTERISTICS

2.1. Power Supply System

Main characteristics of power supply system applicable to all switchboards are:

- Voltage 400 V $\pm$ 10%
- Phase 3 ϕ, 4 Wire
- Frequency 50 Hz $\pm$ 1 Hz
- Neutral system Solidly grounded
- Peak asymmetrical SCC To be specified by the bidders
- RMS symmetrical SCC To be specified by the bidders

Main characteristics of auxiliary supply system are:

- Control / Command system 24 VDC
- Space heater system 230 VAC

2.2. Ratings

The equipment shall be capable of carrying the specified current on a continuous basis of 24 hours / day, without exceeding the permitted temperature.

The current ratings of all equipment must be guaranteed at the specified design temperature. Equipment shall be fully rated and constructed for withstanding, making and breaking the specified short circuit duty.

3. GENERAL REQUIREMENTS

3.1. Concept

The Switchboard shall be of standard, prefabricated metal clad cubicle(s), floor mounting type, totally enclosed, dead front, dust tight and vermin proof requiring front access only. It shall complete in all respects with material and accessories, factory assembled, tested and finished all according to the specifications and to normal requirements. For indoor installations the international classification shall be IP42.

The Switchboard with all components and accessories shall be suitable for front operation only and shall:

- have a rated service short service breaking capacity, $\mathbf{I_{cs}}$ at 400 VAC, conforming to IEC 60947-2 unless otherwise stated in BOQ
- be provided with adequate clearance from live parts so that flash over cannot be caused by switching, vermin, pests, etc.
- have all components rated for insulation class 600-volt minimum.
- be designed for flush mounting of all instruments on the front side.
- have all incoming or outgoing connections from the top or bottom as required. Have the components mounted so as to facilitate ease of maintenance from the front. Have common lamp test facility for all lamps.
- have wiring diagram on the inside of door of the switchboard. Be labeled with nameplate on the front side of door.
- have arrangements for extension of switchboard in future.

3.2. Accessibility

Switchboard shall preferably be arranged for bottom cable entries. Adequate space must be provided for cable entries and termination. It shall be possible to work easily and safely on cable of a main or control outgoing circuit in OFF position with the remainder of the board alive.

Adequate system shall be provided for installation and clamping of cables inside the cable compartment. Position of terminals and cables shall allow use of clamp ammeter.

Power and Control cable termination shall avoid obstruction to other cable termination and provide easy access for terminating cables. Cable supports shall be provided to avoid undue strain on cable termination. Easily accessible locations shall be reserved in the compartment for measuring transformers.

3.3. Name plates

On the front side, a name plate shall be provided at the top to indicate the name of manufacturer, system voltage and frequency and the current carrying capacity of switchboard.

Each breaker shall have a circuit identification label fitted below the breaker aperture or as suitable.

Drawing indicating the branch circuit names, breaker elements, cable sizes and connecting services shall be placed in a clear plastic pocket provided at the back of the front access.

Labels described shall have block letters 7 mm high on a white back ground, to be made from Traffolite and be fixed with screws.

Each incoming and outgoing circuit shall also be labeled with name plate 75 mm x 15 mm, as described above on the front side of door.

4. MECHANICAL DESIGN

4.1. General Construction

The switchboard shall be fabricated, welded; grinded, finished with angle iron framework and cladded with 14 SWG MS sheet, to form a rigid, free standing, flush mounting fronted assembly.

It shall be suitably divided into panels and compartments for accommodating the required number of circuit components, instruments and accessories. Each compartment shall be fully partitioned from its neighbor both horizontally and vertically, allowing safe cable routing / termination without shutting the switchboard down.

All live parts within cubicles, compartments or modules, which have to accessible during normal maintenance operations, shall be adequately protected and / or barried to ensure protection of works and to avoid accidental contact. Barriers may be rigid, transparent, insulating material fitted with warning labels.

The doors shall be provided with hinges on the left-hand side and locking handles on the right hand side for fastening the door. The front assembly shall be fastened to the enclosure by means of self-locating fasteners for quick and easy fixing. The front and back door will not exhaust fan/louvered, since the main door of electrical room have louvered door so internal room temperature would be maintained.

All holes, cutouts shall be tool or jib manufactured and free from burrs and rough edges. All structural components shall be of standardized design to provide complete uniformity and inter change ability of common parts. Removable gland plated shall be provided at top and / or bottom as required.

The switchboard shall be supplied complete with foundation bolts and other installation materials as recommended by the manufacturer. Proper size cable clamping channels with galvanized steel clamps and brass cable clamps respectively for unarmored and armored cables shall be provided.

The cabling inside the Switchboard shall be suitably numbered and harnessed by means of straps or cords. Wiring to door mounted components shall be in flexible PVC conduit. All indicating, control and selecting equipment shall be suitably arranged and clearly labeled with indelible labels indicating the rating of fuses, switches, etc.

All metal work of the switchboard shall be cleaned down to bare shining metal, phosphate and the surfaces chemically prepared for powder coating. Then these shall be coated with powder of color RAL 7032 and then baked in oven. The thickness of powder coating shall not be less than 120 microns.

4.2. Bus Bars

Bus bars and droppers supported on non - hygroscopic material are to be high conductivity electrolytic tinned copper, completely isolated and mechanically braced and rated to withstand the specified short circuit currents for one second duration.

Bus bars and droppers shall be housed in a separate compartment and shall be clearly marked with their respective colors. Bus bars shall be provided for three phases, neutral and multi - terminal earth. The temperature rise shall not exceed 50 degree centigrade at rated current. Neutral bus assembly shall consist of outgoing screw terminals with one terminal for every MCCB / MCB.

Neutral Bus bar should be of same ampere rating as phase bar.

Removable metal covers on the bus bar chamber shall be provided with suitably sized labels at regular intervals, fixed with self-tapping screws and warning of live metal work.

All bus connectors shall be tinned plated connections and joints. Horizontal bus bars shall be of the same current rating throughout their length.

4.3. Earthing

A copper earth bar of suitable section for the specified fault level shall extend the entire length of the Switchboard. Provisions shall be made for possible future extensions at both ends.

Earthing facilities shall be provided on each incoming and outgoing unit to permit earthing of the connections.

All metallic non-current carrying parts of the Switchboard shall be bonded together and connected to the Switchboard's earth bar.

Each circuit wiring shall be green / yellow color. Earthing mass continuity between withdrawable parts and fixed frame shall be correctly ensured whatever the withdrawable part position.

Provision shall be made adjacent to cable termination for earthing cable armor to the earth bus bar.

Earthing switch shall be provided wherever mandatory as per rules and regulations / codes and standards and shall be manually operated. An interlocking system shall provide the following locking and safety functions:

- Impossibility of closing the earth switch if the switching device is closed.
- Visual check of earthing switch positions to be possible.
- Possibility of locking the earthing switch operating handle in open and closed position.
- The earthing of the bus bar shall be done manually by the operator without provision of general earthing system.

5. DISTRIBUTION BOARDS

The enclosure of the LV Distribution Board shall be Surface Mounted, fabricated from electro-galvanized / zinc coated sheet steel.

The LV Distribution Board shall be fabricated with 16 SWG sheet steel recess mounting. All components shall be installed on a common component mounting plate made of 14 SWG sheet steel inside the enclosure and protected from the front with screwed sheet steel front plate. The door and dead front covers shall be made of 14 SWG sheet steel. The door shall be fully gasket with hinges on the left hand side and locking handle on the right hand side for fastening the door. The locking handle should be detachable. The dead / front assembly shall be fastened to the enclosure by means of self - locating fasteners for quick and easy fixing.

The distribution board shall be supplied complete with all installation materials as recommended by the manufacturer. The incoming and outgoing cable connections shall be according to the wiring requirements. If

required, an adapter box for accommodating the cables and conduits may be provided. The box shall be of the same material and finish as the Distribution Boards.

An earth bar or terminal strips shall be provided for connection of incoming and outgoing earth conductors. The earth bar or terminals shall be permanently connected to the body of Distribution Boards at two points. Flexible copper strip shall be provided for earthing of the door of Distribution Board.

Neutral bus assembly shall consist of outgoing screw terminals with one terminal for each MCB. All holes, cutouts, etc., shall be tool or jib manufactured and free from burrs and rough edges. Removable gland plates shall be provided at both the top and / or bottom, as required.

The cabling inside the distribution board shall be suitably numbered and harnessed by means of straps or cords. Wiring to door mounted components shall be in flexible PVC conduit. All indicating, control and selecting equipment shall be suitably arranged and clearly labeled with indelible labels indicating the rating of fuses, switches, etc.

All metal work of the distribution board shall be cleaned down to bare shining metal, phosphate and the surfaces chemically prepared for powder coating. Then these shall be coated with powder of color RAL 7032 and then baked in oven. The thickness of powder coating shall not be less than 120 microns.

6. COMPONENTS

The switchboards shall be provided with all components as specified in BOQ as necessary for the satisfactory operation of the Switchboard and of the electrical system. All components should comply with IEC 60947-2. Typical specifications are given hereunder:

6.1. Air Circuit Breaker (ACB)

Air circuit breaker should be three poles / four poles as mentioned in drawing suitable for making and breaking a fault condition. Operating mechanism shall be manually or motor operated charged spring with front drive grip handle. These shall be locally operative. Mechanically operative ON-OFF-OFF indicators positively driven in both directions shall be provided to indicate the position of the unit.

Overload and over current features / relays shall be of an adjustable, manually resettable type, according to manufacturer's standard range.

Each ACB shall have built in tester with the selection of Trip or Non-Trip Functions. Also with the facility of testing the ACB in field from single phase (220VAC) supply only. Each of the above function shall have separate LED Indicators and Alarm switches for trip monitoring of Overload, Short circuit, Pre trip alarm and Ground Fault. ACB shall be having Trip Memory.

The Breaking Capacity of ACB shall be 65KA. ACB breaking capacity shall be; $I_{cu}=I_{cs}=I_{cw}$.

The circuit breaker shall have two normally open and two normally closed auxiliary contacts rated for 10 Amps. 230 VAC. The circuit breaker shall also provide for ON-TRIP-OFF indicating lamps. The circuit breaker shall have specified rupturing capacity without the use of back-up fuses. Auxiliary release and trip coils shall be provided for desired operation and / or interlocking as shown and / or stated on to in BOQ

6.2. Molded Case Circuit Breaker

These shall be three pole 400 / 500 volts rating shown in BOQ. The breakers shall have both time delay over current and instantaneous short circuit protection.

The MCCBs shall be installed such that their switching levers are accessible through the dead front plate for operation. Circuit numbers / designation on all circuits shall be conspicuously marked to facilitate connection and maintenance.

The breaker shall have quick make - quick break toggle mechanism with positive 'ON', 'OFF' and intermediate ' Tripped ' positions.

Trip mechanism shall be trip free on overload or short circuit ensuring that the breaker will not close / remain close even if the close command is given while the circuit breaker has tripped due to short circuit or continuing overload.

6.3. Miniature Circuit Breaker (MCB)

The MCBs with current rating from 3 to 80 amperes shall be conforming to BS EN 60-898 or IEC 60947-2. The circuit breakers shall be suitable for DIN-rail mounting, maintenance-free and fully tropicalized.

The MCBs shall be designed for horizontal or vertical mounting, or reverse feeding, without any adverse effect on electrical performance.

The operating mechanism shall be quick make, quick break type, trip free, with all poles opening and closing simultaneously (except for the neutral pole, which if required shall be of the advance-closing and late-opening type). The operating toggle shall clearly indicate the ON and OFF/TRIP positions.

The individual operating mechanism of each pole of a multiple MCB shall be directly linked within the MCB casing and not by the operating handle.

Each pole of the MCBs shall be provided with bimetallic thermal element for overload protection and a magnetic element for short circuit protection.

6.4. Load Break Switches

Load Break Switches and contractors shall be of AC3 type for motor loads. Air circuit breakers above 630A shall be housed in separate cubicles. Aluminum plate shall be provided for cable entry to ACBs / MCCBs cubicles of 630A and above rating.

7. PARTICULAR COMPONENT REQUIREMENTS

7.1. Current Transformers

Current transformers shall comply with the requirements of IEC 60185 (or equivalent).

Current Transformers shall be polyester resin insulated, ring type, air cooled having transformation ratio as indicated in BOQ. The Current Transformers shall be of suitable burden having accuracy class 1.0. The Current Transformers shall have rated secondary current as per the drawing as required.

Current Transformers shall mechanically and thermally withstand the specified short circuit capacity. Test terminal blocks shall be provided for current Transformer secondary circuits having short circuiting provisions to allow portable apparatus to be connected.

7.2. Voltage Transformers

Voltage transformers shall comply with the requirements of IEC 60186 (or equivalent) and shall be of the same accuracy class as Current Transformers.

Voltage Transformers shall be equipped with primary fuses with an interrupting capacity of the incoming circuit breakers. Test terminal block shall be provided for each Voltage Transformer system.

7.3. Ammeters and Voltmeters

Indicating instruments shall be semi-flush Switchboard type, digital. The front dimensions shall be 144 x 144 mm for instruments on incoming side and 96 x 96 mm on all outgoing circuits.

Indicating instruments shall be 1.0 class percent of full scale basic accuracy class in accordance with IEC 60051.

The ammeter shall be suitable for connection to 5 Amp. Secondary of Current Transformer or directly through shunt.

7.4. Selector Switches

Ammeter and voltmeter selector switches shall be complete with front plate, grip handle, R-Y-B and OFF position for ammeter and RY-YB-BR-RN and OFF positions for voltmeters.
The selector switches for controls shall be rotary cam type and shall be provided complete with knob and front plate, showing all positions as required.

7.5. Push Buttons

The push buttons shall be momentary make / break contact type (normally open / normally close) and suitable for flush mounting. The push button for ON and OFF switching shall be red and green respectively.

7.6. HRC Fuses

HRC Fuses shall be provided complete with fuse bases, fuse, etc. The fuses shall have a fusing factor as specified for class Ql in accordance with BS 88.

7.7. Pilot Lamps

Switchboard shall be provided with LED type phase indicating pilot lamps. The lamps shall be rated for 250 volts supply and suitable for flush mounting. The front of the lamps shall have colored rosettes for identification of phases.

7.8. Secondary Wiring

All wiring shall be copper conductor, thermoplastic insulated, at least 1.5 sq. mm flexible, neatly arranged and clipped in groups.

Each conductor and its termination are to be identified and marked with numbered ferrules. All live terminals are to be shrouded.

Secondary wiring for Current Transformers shall be carried out with not less than 2.5 sq. mm. Terminals shall be specially marked to avoid opening of the circuit by accident.

8. INSTALLATION

The LV Switchboard shall be installed at location shown on the drawing. The Contractor shall ensure coordination with civil works for providing any openings, holes, etc. to avoid any breakage to completed works. In case the provisions in civil works for the installation of electrical equipment are not made or made incorrect the same shall be rectified by the Contractor at his own cost and to the satisfaction of the Engineer In-charge The Contractor shall provide foundation bolts and grout them in cement concrete floor using non-shrinkable material with the approval of Engineer In-charge

All installation material for physically erecting the Switchboard, such as bolts, nuts, washers, supporting steel, etc., shall be provided and installed by the Contractor. The Switchboard shall be installed upright and in level and shall be firmly and rigidly bolted to the floor and concrete supports.

The switchboard shall be completely erected as per manufacturer's instructions and as approved by the Engineer In-charge Loose parts dispatched by the manufacturer shall be installed and connected as per assembly drawing provided by the manufacturer. Any safety locking provided by the manufacturer for safe transportation shall be released only after the switchboard is erected in position. The incoming and outgoing cables shall be connected as recommended by cable manufacturer. The cable armor shall be connected effectively to ground.

The Switchboard body shall be connected to earth as per instructions given in section “Earthing “of these specifications. The Switchboard shall be tested and commissioned in the presence of the Engineer In-charge The tests to be carried out shall be tested before energizing as per instructions contained in the article " Testing " of General Specifications of Electrical Works, of these specifications.

Note: Shop drawings of Distribution Boards should be submitted for review and approval prior to proceed further.

Section – E-03: Distribution Boards

1. SUMMARY

Service and distribution switchboards rated 600 V and less.

2. PRODUCTS

A. Manufactured Units: front connected, front accessible with panel-mounted / fixed / individually mounted main device and panel-mounted branches.
B. Manufactured Units: front and side accessible with fixed, individually mounted main device and panel mounted branches.
C. Manufactured Units: front and rear accessible.

i. Main Devices: Fixed, individually, Draw out mounted.
ii. Branch Devices: Panel, individually, fixed and individually compartmented
iii. Nominal Voltage: 230/ 400V
iv. Main-Bus Continuous: 600A
v. Enclosure: Steel, NEMA Compliant
vi. Barriers: Between adjacent switchboard sections.
vii. Insulation and Isolation: Main bus of main section and main and vertical buses of feeder sections.
viii. Isolator.
ix. Utility metering compartment.
x. Bus transition and incoming pull sections.
xi. Removable, hinged rear doors and compartment covers.
xii. Hinged front panels.
xiii. Pull box on top of switchboard.
xiv. Buses and Connections: Three phase, four wire; Copper, Tin plated Copper / Aluminum
xv. Future device provisions.
xvi. Bus-bar insulation.

D. Over current Protective Devices:

1) Molded-Case Circuit Breaker: NEMA Compliant; thermal-magnetic adjustable / instantaneous-trip, electronic trip, current-limiting and integrally fused types.

i. Lugs: Mechanical, Compression style.
ii. Ground-Fault Protection: Integrally, Remote mounted.
iii. Communication Capability: Circuit-breaker-mounted, Universal-mounted, Integral, Din-rail-mounted, communication module.
iv. Shunt Trip: Set to trip at 55 / 75 percent of rated voltage.
v. Under voltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional (field-adjustable 0.1- to 0.6-second) time delay.
vi. Key interlock kit.
vii. Zone-selective interlocking.

2) Enclosed, Insulated-Case Circuit Breaker: Fixed mounting.
i. Two-step, stored-energy closing.
ii. Microprocessor-based trip units.
iii. Remote trip indication and control.
iv. Integral communication module.
v. Key interlock kit.
vi. Zone-selective interlocking.
vii. Control Voltage: 250V |AC, 110V DC

3) Bolted-Pressure Contact Switch: Rotary-mechanical-bolting action, with auxiliary switches, ground-fault relay, and open-fuse trip device.
4) High-Pressure, Butt-Type Contact Switch: Butt-type contacts, with auxiliary switches, ground-fault relay, and open-fuse trip device.
5) Fused Switch: NEMA Compliant
6) Instrumentation:
7) Instrument Transformers: NEMA and IEEE Compliant
    i. Potential transformers.
    ii. Current transformers.
    iii. Control-power transformers.
    iv. Current transformers for neutral ground and ground-fault current sensing.
    v. Multifunction digital-metering monitor.
    vi. Ammeters, voltmeters, and power-factor meters.
    vii. Instrument switches.
    viii. Feeder ammeters.
    ix. Watt-hour meters.
    x. Recording demand meter.
8) Control Power: 230 V with electrically / mechanically interlocked main and tie circuit breakers].
9) Accessories:
    i. Accessory set including tools.
    ii. Portable test set.
    iii. Circuit-Breaker Removal Mechanism: Portable elevating carriage, Overhead, mounted at top / front of switchboard.
    iv. Spare-fuse cabinet.
    v. Fungus proofing.
10) Identification: internally affixed schematic diagrams.

3. FIELD QUALITY CONTROL

Testing: Certifications by Principal, Contractor engaged agency, Factory acceptance testing

- END OF SECTION –

Section – E-04: Internal Lighting

1.0 SCOPE OF WORK

The work under this section consists of supplying, installation and commissioning of all material and services of the complete light fixtures as specified herein and given in the Bill of Quantities.

The Contractor shall discuss the electrical layout with the Engineer and coordinate at site with other services for exact route, location and positions of light fixtures.
The light fixtures with accessories shall also comply with the General Specifications for Electrical Works, and with other relevant provisions of the Tender document.

2.0 GENERAL

The description of light fixtures in given Bill of Quantities, and stated in the BOQs, and relevant material are described in this section. The determination of quality is based on certified photo-metric data covering the coefficient of utilization, light distribution curves, construction material, shape, finish, operation, etc.

The Contractor shall submit two samples of each and every light fixture specified and obtain approval of the Owner before purchasing. The quality and finishes of local make light fixtures (if mentioned in BOQ) shall be same as that of standard manufacturer.

All fixtures shall be finished in standard color schemes as mentioned in the manufacturer's catalogue for respective fixtures, unless specifically stated in the Specifications, or Bill of Quantities or directed by the Engineer In-charge

3.0 STANDARDS

In compliance to following standards where applicable

- IEC 60598 Luminaries.
- IEC 62031 LED modules for general lighting-Safety requirements.
- IEC 62384 DC or AC supplied electronic control gear for LED modules performance requirements.
- BSEN 1838 Emergency Lighting

Any other standard referred in this specification.

4.0 LED Light Fixtures

The light fixture shall be as stated in bill of quantities. The light fixture shall be finished in standard colors unless otherwise stated or directed by Engineer In-charge All LED light fixtures shall be of international standard and quality. The type of fixtures with manufacturer catalogue reference is given on the fixture schedule and in Bill of Quantities. Equivalent fixture may be acceptable provided that the Contractor submits for review all necessary data indicating photo-metric curves to show that the fixture proposed are of the same type, construction and quality.

The lamps for light fixtures shall be Light Emitting Diodes with driver and shall be supplied and installed according to the wattage as indicated in BOQ. The guaranteed life expectancy and performance of all LED lighting fixtures shall conform to L70B20 requirements at 50,000 hours or better. The Color Rendering Index (CRI) shall be Ra >80 or better.

Weather proof light fixture shall comprise of cast aluminum body and gasketed clear glass cover secured to the body by means of galvanized nuts / screws to give a weather proof and water tight fit. The gasket shall be weather resistance type.

The LED light fixtures shall be supplied complete with driver and all accessories as per light fixture schedule and shall be installed in accordance with manufacturer’s recommendations and sound engineering practice.

5.0 INSTALLATION

5.1 General

The mounting heights of light fixtures are indicated in the BOQs, and position of fixtures according to the mentioned scale.

The Contractor must ensure that the light fixtures are installed uniformly with respect to the dimensions of the area. Any modifications due to site conditions may be made with the approval of Engineer In-charge All fixtures shall be carefully aligned before fixing in position. All fixing accessories such as ceiling rose, flexible cord, lamp holder, suspension rod; pipe or chain with suitable canopy, etc., shall be provided and installed.

The wiring between terminal box and the fixture shall be carried out with 3 core 0.75 sq. mm and I sq. mm copper conductor, PVC / PVC cable respectively for circuits protected by 10 amps and 15 / 20 amps MCBs. The wiring inside light fixture body shall be done with heat resistant cables or PVC insulated cable in heat resistant sleeves as approved by the Engineer In-charge

Glasses, shades, reflectors, diffuses, etc., must be in a clear condition after installation.

All light fixtures shall be earthed by an earth wire connected to the earth terminal in the fitting.

5.2 Indoor Light Fixtures

The indoor light fixture shall be installed on the surface of ceiling or wall by means of nylon plugs and galvanized steel screws, such that their back finish flush with the surface for exposed conduits and flush with outlet box for concealed conduit system. Wherever convenient, screws for fixing light fixtures shall be screwed into the holes of the outlet box. The light on false ceiling shall be installed in accordance with manufacturer's recommendations and in coordination with ceiling installation.

5.3 Outdoor Lighting

For illumination around buildings during dark hours, light fittings in various arrangements shall be provided in accordance with these specifications.

The Contractor shall essentially use the standard products of a manufacturer, regularly engaged in the manufacturer of the product and shall meet the requirement of the specifications.

- END OF SECTION –

Section – E-05: Conduits and Pipes

1.01 SUMMARY

The Contractor shall ensure exact location and route of conduit and pipes in coordination with as per site requirements and as directed by the Engineer In-charge
The quality and material for the accessories of conduits and pipes such as sockets, elbows, bushings, bends, inspection / pull boxes, round boxes, etc., necessary for the completion shall be similar to that of conduit or pipes. All the accessories shall be supplied by the Contractor without any extra cost and deemed to have been included in the price of conduits / pipes.
Note: The Contractor shall ensure exact location and access panel in coordination with other services as per site requirements and as directed by the Engineer In-charge

1.02 STANDARDS

In compliance to following standards where applicable

BS 31	Steel Conduit and accessories
BS 1378	Galvanized Iron Pipes and accessories.
BS 3595	PVC Pipes and accessories.
BS 4607	PVC Conduits and accessories.

Any other standard referred to in above standards or these specifications.

- END OF SECTION –

Section – E-06: Low Voltage Cables and Wires

1.01 SCOPE OF WORK

The work under this scope consists of supplying, installation, testing, connecting and commissioning of all material and services of low voltage cables and wires and the accessories as specified herein or and given in the Bill of Quantities.

1.02 GENERAL

All multicore and single core wires for light circuits, socket outlets and circuits operating upto 250 volts shall be 300 / 500 volts grade. All single core sheathed cables shall be of 450 / 750 volt grade and upto 50sqmm and above shall be of 600/1000V. Power cables for main feeders, main to sub main feeders, power equipment, etc. shall be of 600 / 1000 volts grade. Armouring of cables shall be done with appropriate size galvanized steel wire as per codes. Cable should be capable of running 125% of full load current without any damage.

1.03 STANDARDS

Any other standard referred to in above standards or these specifications. Latest editions and amendments of the below mentioned standards and codes:

- IEC 227 : Power and Lighting PVC insulated cable.
- IEC 228 : Conductors of insulated cables
- IEC 502 : Extruded solid dielectric insulated power cables for rated voltages from 1 kV up to 30 kV.
- IEC 331 : Fire resisting characteristics of electrical cables (where specified)
- IEC 332 : Tests on electric cables under fire conditions.
- IEC 811 : Common test methods for insulating and sheathing of electrical cable.
- IEC 287 : Calculation of the continuous current rating of cables.
- BS 4066 : Test on electric cables under fire conditions.
- BS 6346 : PVC insulated cables for electricity supply.
- BS 6004 : PVC insulated cables (non armoured) for electric power and lighting.
- BS 801 : Composition of lead and lead alloy sheaths of electric cables.
- EEMUA 133 : Underground cable protected against solvent penetration and corrosive attack.
- BS 5467 : XLPE insulated armoured cables for electrical supply.
- BS 6724 : XLPE insulated armoured Single Core PVC Insulated Copper Conductor sheathed cables.
- BS 7211 : Single Core PVC Insulated Copper Conductor non armoured cables / wires.

1.04 MATERIAL

A. Conductors and Cables:

Conductors: Copper (or Aluminium - only when specifically mentioned in BoQ).

- **Conductor Insulation:**
  - Multi-core cables – XLPE
  - Single-core cables – XLPE (PVC – only when specifically mentioned in BoQ).
  - Single-core building wires up to 6 sq. mm - PVC
- **Single and Multi-conductor Cable:**

Armoured/ Unarmoured cable, Type AC, Metal-clad cable, Type MC, Mineral-insulated, metal-sheathed cable, Type MI, Nonmetallic-sheathed cable, Type NM, Type SO and Type USE with ground wire.

A. Connectors and Splices: Factory fabricated.

B. Sleeves for Raceways and Cables:

1. Steel pipe sleeves.
2. Cast-iron pipe sleeves.
3. PVC and uPVC sleeves
4. Sleeves for rectangular openings.

D. Sleeve Seals: EPDM, NBR sealing elements, plastic, carbon-steel, stainless/steel pressure plates, and carbon, stainless/steel connecting bolts and nuts.

B. CONDUCTOR MATERIAL APPLICATIONS

Feeders: Copper, Solid for 4.0 sq. mm and smaller; stranded for 6.0 sq. mm and larger. Branch Circuits: Copper, Solid for 4.0 sq. mm and smaller; stranded for 6.0 sq. mm and larger.

1.05 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Single conductors in raceway, Mineral-insulated, metal-sheathed cable, multi-conductor cable in raceway.

B. Exposed Feeders: Single conductors in raceway, Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable, Nonmetallic-sheathed cable.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Single conductors in raceway, Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable, Nonmetallic-sheathed cable.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and underground: Single conductors in raceway, Underground feeder cable.

E. Feeders in Cable Tray: Single conductors in raceway, Armored/Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable, Nonmetallic-sheathed cable.

F. Exposed Branch Circuits, Including in Crawlspaces: Single conductors in raceway, Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable, Nonmetallic-sheathed cable

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Single conductors in raceway, Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable, Nonmetallic-sheathed cable.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Single conductors in raceway, Underground branch-circuit cable.

I. Branch Circuits in Cable Tray: Single conductors in raceway, Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable.

J. Cord Drops and Portable Appliance Connections: Hard service cord with strain relief device at terminations to suit application.

K. Class 1 Control Circuits: In raceway.

L. Class 2 Control Circuits: In raceway, Power-limited cable, concealed in building finishes and in raceway/cable tray.

1.06 FIELD QUALITY CONTROL

A. Testing: Contractor is responsible to perform all testing as per applicable standards, mentioned in Testing and Commissioning or required by the Engineer or utility company (K-Electric).

B. Cables for Conduit Wiring: All cables / wiring in concealed or surface mounted PVC Class-D or steel conduits shall be single core PVC insulated of specified grade and size, unless specifically shown in BOQ.

C. Cables on Surface: Cables for distribution system to be installed on surface, in cable ducts, in concrete trenches or on trays shall be single or multicore PVC insulated and PVC sheathed of specified voltage grade and size, unless specifically shown in BOQ.

D. Underground installation: Cables for laying directly underground shall be PVC insulated, PVC sheathed and armoured with galvanized steel wire. Cables fully installed in underground ducts / pipes and mechanically protected from end to end shall be PVC insulated and PVC sheathed unless specifically shown in BOQ.

- END OF SECTION –

TECHNICAL SPECIFICATIONS FOR WIRELESS AUDIO CONFERENCE SYSTEM

S.No	Description	Specifications
1	Audio Conference Controller/Central Unit (Wireless)	Fully digital; wireless or infrared system; Connects wireless/wired units;; Individual ID assignment; Supports up to 60 units; multiple mic management modes; External mic input; IEC 60065 compliant.
2	Wireless Chairman Unit	All features of Wireless Delegate microphones; Includes Chairman priority control; IEC 60065 compliant.
3	Wireless Delegate Unit	Cordless system; 2.4GHz+/Infrared technology; battery powered, Individual gain/sensitivity control; Independent ID address and setting; Zero interference from mobile/Bluetooth; IEC 60065 compliant.
4	Power Amplifier	Power rating ≥120W; at least Min. 3 mic inputs (phantom power); Min. 2 Aux/line outputs; Individual mic level controls; Master volume,.
5	Wireless Transmitter/Receiver	Signal range > 6 m; Frequency ~2.4GHz/infrared; 360-degree directional communication; Secure/digitally protected transmission.
6	Battery Charging Unit	Charges at least 6 batteries simultaneously; Easy installation/removal; LED charging indicators. Charging time not more than 5 hours, Voltage 100-240V AC input and 24V DC output with LED indicators
7	Distributor Signal Distributor	Distributor Signal distributor used to expand the number of connectable transmitter/ receiver units For 2-branch distribution
8	Batteries	DC battery, at least 2000mAh, chargeable, maximum charging time 6 hours as per international standards
9	Dual Channel Cordless Microphone	Supply of Dual Channel Cordless Microphone Set with adjustable frequencies at least 2 channels. At least 100m range Includes one dual-channel receiver and two wireless transmitters with RF carrier power management. Causes no interference to Active Mobile Phones & Video Conferencing System
10	Handheld Wireless Microphone	Supply of Handheld Wireless Microphone. Professional wireless handheld microphone with tuner, with power/battery status indicators. No interference from active mobile phones & video conferencing system
11	Ceiling Speaker	Ceiling mounted, PA/BGM use, Rated power: wide frequency 20kHz -80kHz or higher range; 70V/100V; Sensitivity 89±6dB; flush mount design
12	Audio Rack	Size to accommodate all equipment; Front mirror-locking door; Cooling fan and ventilation; Moveable mechanism.

TECHNICAL SPECIFICATIONS FOR HVAC WORKS

Following are the specifications of material. Bidder can also offer equivalent products, however, adequate documentation in the form of technical data sheets and type test certificates from independent laboratories stating the standards to which the product complies shall be furnished in the support of their being equivalent. **Bidder must submit the technical submittal of each item to the Engineer In-charge for approval before delivery of any material.** The Employer reserves the right to ask the bidder of additional documentation in this regard.

Technical Specification Sheet for AHU

		AHU-1	AHU-2
Placement Location		ROOF TOP	4TH FLOOR
FLOW RATE (CFM)		7200	18000
AIR ON (^{O}F)	DBT	75	75
	WBT	62.5	62.5
AIR OFF (^{O}F)	DBT	55	55
	WBT	54.3	54.3
MINIMUM COOLING COIL CAPACITY	TOTAL MBH	170	443
	SENSIBLE MBH	205.1	515.6
WATER TEMP. ^{O}F	IN	44	44
	OUT	56	56
WATER FLOW	GPM	44.3	103.12
MAX FACE VELOCITY	FPM	500	500
ESP	Pa	500	500
MAX OUTLET VELOCITY	FPM	1,500	1,500
MOTOR WITH VFD	kW	400/3/50	400/3/50

Technical Specification Sheet for Floor Standing Fan Coil Units

FLOW RATE (CFM)			1400
COOLING COIL	AIR ON (^{O}F)	DBT	75.00
		WBT	62.50
	AIR OFF (^{O}F)	DBT	55.00
		WBT	54.30
	COOLING COIL CAPACITY	TOTAL MBH	48.00
		SENSIBLE MBH	42.00
	WATER TEMP. ^{O}F	IN	44.0
		OUT	56.0
	WATER FLOW	GPM	9.60
	MAX FACE VELOCITY	FPM	500
FAN	ESP	in	0.25
	MAX OUTLET VELOCITY	FPM	1,000
	MOTOR	kW	
	ELECTRICAL CHARACTERISTICS		220/1/50

NOTES:

1) Contractor to calculate actual external static pressure as per site conditions and submit for engineer's approval
2) All Air Handling Units shall be AHRI /AMCA /Eurovent certified. Provide Proof of certification along with submittals.
3) Room Dimensions for AHU # 02 are 16x9x11 ft. AHU selection must be in compliance with the room dimensions so that the AHU may easily fit in the room keeping the considerations for Ducting and Operation and Maintenance Requirements in view.

Identification for MEP Systems and Equipment

1.1 EQIPMENT IDENTIFICATION PLATES:

1.1.1 The Contractor shall provide engraved signs with screws or adhesive backing, for equipment identification, in colors and sizes approved by the Owner and MEP Works Consultant.

1.1.2 The nameplate shall be 2.5 mm thick 90 mm by 40 mm high with black face and white centre. 5.5 mm high lettering in white.

1.1.3 The terminology should be matched to schedules as closely as possible for equipment designation but capacities shall be as per actual equipment. The following data must be included

- Equipment type,
- Equipment service
- Area/zone served
- Design capacity
- Other design parameters like pressure drop, entering and leaving conditions, speed etc.

1.1.4 Equipment markers shall be installed on or near major mechanical equipment including but not limited to:

- Water softeners, condensate return units, etc.
- Main control and operating valves, including safety devices and hazardous units such as gas outlets.
- Fire department hose valves and hose stations.
- Control System equipment panels.
- Meters, gauges, thermometers, transmitters, and similar units.
- Pumps, compressors, chillers, condensers, and similar motor-driven units.
- Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
- Fans, blowers, primary balancing dampers, and mixing boxes.
- Packaged HVAC central-station and zone-type units, air handlers and condensing units.
- Tanks and pressure vessels.
- Strainers, filters, humidifiers, water-treatment systems, air separators and similar equipment.

1.2 PIPE IDENTIFICATION DEVICES

1.2.1 The Contractor shall provide pre printed snap on type, wrap around or adhesive type pipe markers that shall indicate the service by system and zone, the line contents as well as have arrows indicating the direction of flow.

1.2.2 Pipe identification markers shall be provided in all occupied and unoccupied rooms as well as in all other spaces (such as shafts) in which piping may be viewed.

1.2.3 There should be one set of identification band per pipe in each space.

1.2.4 Pipe markers shall be located in a conspicuous manner at a minimum distance of every 12 mas follows:

- Upstream of each control valve and pressure regulating valve station.
- Downstream of every pressure regulating valve station.
- Near each branch.
- On both sides of a wall, floor, ceiling, or roof within 4 feet of the barrier.
- Near all origination and termination points of all equipment (tanks, pumps, etc.).
- Near the inside and outside of concealed points.
- Outdoors at each major elevation.

1.2.5 The band shallbe printed in black letters of the following sizes:

- For 80 mm pipes and larger : 50 mm high letters
- For 65 mm pipes and smaller : 25 mm high letters

1.2.6 Bands shall have backgrounds of different colours for the various service groups as follows:

	Colour	**Stripe**

Water, Air Cond. Chilled	Blue	Green
Water, Air Cond. Tower, Condensor.	Green	Blue
Condensate (steam) Returns	Green	Orange
Boiler Blow down	Green	Yellow & White
Steam, Low Pressure - (under 137.6 kPa/20 psi)	Orange	White
Steam, Medium Pressure - (137.6 688 kPa/20 100 psi)	Orange	Green
Steam, High Pressure - (over 688 kPa/100 psi)	Orange	Black
Refrigerants	Purple	
Fuel Oils No. 3 to 6	Yellow	
Fuel Oil, Diesel, Kerosene, No. 2	Yellow	Black
Gasoline	Yellow	Orange & Black

1.3 DUCT IDENTIFICATION DEVICES

- The contractor shall provide engraved laminated plastic markers that shall include te direction and quantity of airflow and duct device (supply, return etc.)
- Stamped Letters shall be a minimum of 50mm high

1.3.1 ELECTRCIAL SYSTEM IDENTIFICATION DEVICES

1.3.1.1 Identify and label all electrical, lighting, power telephone/data and security equipment" and wiring. Circuit references shall be provided on all equipment including light fixtures, power sockets, fire alarm and security devices and controllers, etc.

1.3.1.2 Nameplates for distribution boards shall indicate the panel designation and the mains voltage, phase and location of feed.

1.3.1.3 Nameplates for transformers shall indicate the transformer designation, primary and secondary voltages and power sources.

1.3.1.4 Nameplates for disconnect switches, motor Starters and contactors shall indicate the equipment being controlled, the voltage and rating.

1.3.1.5 Nameplates shall be engraved black lamicoid with white letters, at least 19 mm high for switchboards, switchgear, MCC's, transformers and panel boards, and 6 mm high for switches, motor starters, contactors and panel board branch circuits.

1.3.1.6 Nameplates shall be mechanically attached to the equipment with round head screws. Adhesive labels shall not be accepted. All equipment on or in the panels, cabinets, switch gears, controllers, racks and consoles shall be identified by lamicoid nameplates with white letters on a black background.

1.3.1.7 Use labels for feeder conduits, power security, and telephone/data cables and conductors, and telephone/data outlets to indicate their full circuit number or identification.

1.3.1.8 Labels shall be PVC cable markers in carrier types as follows:

- Black lettering on white background, for power, lighting and security conduit and cables.
- Green lettering on white background for telephone/data distribution cables.
- Blue lettering on white background for telephone/data riser cables.

1.3.1.9 Labels shall be located at each end of the run at all junctions and pull boxes and in each termination point/block from panels, controllers, devices, etc.

1.3.1.10 Use colored paint dabs on the inside of outlet boxes and paint interior side of the panel C covers as they are installed. In ceiling spaces, provide color to outside of boxes. Paint color to match system colors as defined in "Finishes". Paint color code shall be as follows:

- Red - Life Safety System
- Pink - Intercom and Public Address System
- Black - Annunciator and Buzzer System
- Green - 220V, 1 PH Circuits
- Purple - Telephone/data Communication System
- Blue - 220 V/380 V Circuits
- Orange - Security Alarm System

1.3.1.11 Use Plastic self-adhesive tape to identify incoming utility sources, feeders, sub-feeders and busbars in each switchboard.

1.3.1.12 Unless otherwise specified, tape color code shall be as follows:
- Red - Red Phase
- Yellow- Yellow Phase
- Blue - Blue Phase
- Black - Neutral
- Green - Earth

1.3.1.13 Complete all panel board and security directories with neat, type written lists of circuit numbers and items controlled. Directories shall be typed in Word or Excel, or similar, to the approval of the Engineer, after review, submit a copy of all directories on disk to the Engineer, in addition to the copies included with the manuals and installed on site.

1.3.1.14 For direct buried cables and duct runs under paved or grassed areas, identify location with concrete markers, flush with grade on 30 m centres, and at changes in direction.

1.3.1.15 All controllers for fire alarm, security intercom lighting completed with connection drawing and riser

PART THREE EXECUTION

2.1 Where identification is to be applied to surfaces that require insulation, painting, acoustical ceiling concealment or other covering or finish, install identification after completion of covering and painting. In addition, provide pipe markers only after each line has been completed, erected, purged, tested, and/or painted.

2.2 Marking shall be placed at each side of any wall, partition or floor, at 10m intervals on all exposed piping and ductwork and at each access panel or door. Marking shall be located so as to be in full view.

2.3 Marking shall be stencilled. Use black stencils on light coloured surfaces, yellow stencils on dark coloured surfaces except for fire lines, which shall be stencilled in accordance with Civil Defence requirements. Stencils shall have distinct edges. Blurred stencils are not acceptable. The name of the service shall be stencilled fully or with abbreviations standard to the industry. Non-standard abbreviations are not acceptable. All markings shall be clearly legible from 1.5m above the adjacent floor or platform.

2.4 Access doors for fire dampers shall be clearly identified.

2.5 As an alternate to stencil, approved type markers by Industrial Safety Supply Co. or approved equivalent shall be acceptable subject to review by the Engineer In-charge

2.6 Clean faces of mechanical identification devices.

MATERIAL

Material for painting shall be of high-grade products of well-known manufacturers, and when approved, shall be delivered to the site in original unbroken packages, bearing the maker's name and brand. Paints of approved colour only shall be used for each application.

SERVICE CONDITIONS

All finish painting will be done under this Section, except where such pieces of equipment or material are specified to be shop painted or finished by the manufacturer. Clean and leave surfaces ready for Painting.

All exposed piping and equipment to be colour coded painted.
All plants, equipment's, pumps and motors shall be provided with three coats of enamel paint in the

factory and shall be carefully cleaned and oiled after installation. In case the original paint has been damaged, fresh coats of enamel paint to match the original shall be given.

Where equipment is delivered with the final paint or finish applied by the manufacturer, repaint or refinish surfaces damaged during erection of shipment, so as to match the original surface and be unobtrusive.

Pre-painted equipment by manufacturer shall be to colors selected by the Engineer from standard finishes.

Equipment items, including pumps, air moving units, un-insulated pressure vessels, unit ventilators and convectors, shall have prime and final paint factory applied. Heat resistant paint shall be used where the conditions require this.

All pumps, motors, fans and all other factory manufactured and assembled apparatus shall be factory coated with one coat of primer and one coat of machinery enamel, and after installation shall be cleaned and touched up to repair any damage incurred during construction.

Coat interior of each outdoor air chamber with two coats of odorless, rust resisting, non-scaling paint**.**

The Contractor shall paint all plants, equipment, ducting, piping, hangers, bracing and other surfaces exposed to air as specified and he shall also be responsible for all finish painting. The minimum numbers of coats are specified herein under but sufficient coats shall be given to achieve desired finish.

All structural steel including hangers, brackets, supports and other ferrous metals shall be shop or factory prime painted. Wherever structural steel including brackets, supports, and other ferrous metal cannot be shop or factory prime painted, wire brush to remove all traces or rust, clean off air traces of dirt, oil and grease, apply one coat of an approved rust inhibiting primer and leave ready to receive finish paint.

All galvanized black iron steel pipe work and steel fittings shall be delivered to site undamaged and free from dirt and rust, and protected by factory applied varnish, lacquer or shop/factory applied prime paint.

Touch up all bolt heads, nuts, threads and previously unpainted connections. Touch up all damaged and abraded areas on pipe work and steel after erection, and wire brush all welds and cut ends. Apply one coat of approved rust inhibiting primer and leave ready to receive finish paint.

Do not prime paint galvanized steel, except in visible locations. Treat all damaged and unprotected surfaces of galvanized steel with a zinc rich paint to a minimum of 50 micron thickness.

Provide a heavy field coat of black asphaltum paint on all steel pipe, cradles, vibration isolating mounts, and the like, that will be encased or partially encased in building construction, set in cement or fill, before items are built into the general construction.

SUBMITTALS

The Contractor shall provide manufacturer's application directions, performance guarantee, literatures and MSDS (Material Safety Data Sheets)

ELECTRIC MOTORS

Unless otherwise specified all motors shall be high efficiency, IE3, squirrel cage induction type with standard drip proof enclosure. Motors installed exposed to the outside shall have IP65 rating. Motors exposed to the outside shall be totally enclosed fan cooled motors. All motors in non-air-conditioned space shall be suitable for 50°C operation.
Unless noted otherwise, all motors shall have Class B (130°C) Insulation and shall be designed for continuous operation at 50°C. Motors with drip-proof enclosure shall have 1.15 service factor, totally enclosed fan cooled motors shall have 1.0 service factor.
Motor connection boxes shall be located on side of motor most easily accessible for maintenance and remote from belts, gears or driven equipment, If boxes are located on, wrong side of motor they shall be relocated.
Each multi-speed motor and associated switching device shall be circuited such that the overload device in the starter protects the motor on each step of the multi-speed switch. As an alternative to this requirement the motor may have integral overload protection.

Material submissions for all electric motors shall be in accordance with the section and article 'Shop drawings' and shall also incorporate the following information.

Horsepower

Voltage
Frequency
Speed
Starting Current and Torque Characteristics
Full Load Current
Class of Insulation
Enclosure Type
Service Factor
Ambient Temperature Reference
Type of Bearings
Locations of Connection Box

Motors 15 hp and larger shall have heat detector protection embedded in the windings for connection into the motor control circuit. Protection shall be Siemens Thermistor: 3UN7 or approved equal. Motors up to 1 hp shall have integral thermal overload protection.

Each electric motor shall be complete with a lamacoid name plate securely fastened in a conspicus place on the motor. The name plate shall be 2.5mm thick laminated phenolic plastic 90mm long x 40mm wide with black face and white center, 5.5mm high letters shall be engraved through to the white lamination with the following:

Motor No.
Mechanical Equipment Driven
Circuit No.
Panel No.

Clean thoroughly all fixtures and equipment from grease, dirt, plaster or any other foreign material. Chrome-plated fittings, piping and trimmings shall be polished upon completion.
The leakage testing of medium pressure ductwork shall comply with the following:
Air testing during erection shall include separate leakage air tests of each complete air riser, each completed horizontal distribution system, and, after all ductwork is installed and the central station apparatus is erected, leakage testing of the pressure side of the whole system up to the inlet of the variable air volume boxes.

The leakage test of the rectangular and conduit ductwork shall be made with pressure in the ductwork maintained at approximately 0.015kg/cm.^{2} (6in), obtained by operation of the air supply fan or, if the fan cannot be operated, by use of the test blower.

OPERATION AND MAINTENANCE INSTRUCTIONS

Three (3) copies (binded) of complete operating and maintenance instructions for all mechanical \ equipment and systems, bound in hard covered manuals, shall be supplied.

Operating instructions shall include:

A general description of the system. Equipment included, and control operation.

Instructions on how to start and stop the plant, noting any safety and/or, sequencing arrangements.

A 'trouble-shooting' table, showing where to look for trouble under various conditions of malfunction.

Operating temperatures at critical points in the systems.

Maintenance schedule shall include:

A list of all bearings with type and period of lubrication.

Equipment manufacturer's printed data of care and maintenance of bearings.

System wiring and control diagrams and detailed descriptions of the operation of control systems.

The Operating and Maintenance Instructions shall be handed to the Engineer not later than at the end of the commissioning period.

FINAL REPORT

General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing Engineer In-charge Include a list of instruments used for procedures, along with proof of calibration.

Final Report Contents: In addition to certified field-report data, include the following:

Pump curves.
Fan curves.
Manufacturers' test data.
Field test reports prepared by system and equipment installers.
Other information relative to equipment performance; do not include Shop Drawings and product data.

General Report Data: In addition to form titles and entries, include the following data:

Title page.
Name and address of the TAB team.
Project name.
Project location.
Engineer's name and address.
Engineer's name and address.
Contractor's name and address.
Report date.
Signature of TAB supervisor who certifies the report.
Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
Summary of contents including the following:

a. Indicated versus final performance.

b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

Nomenclature sheets for each item of equipment.
Data for terminal units, including manufacturer's name, type, size, and fittings.
Notes to explain why certain final data in the body of reports vary from indicated values.

Test conditions for fans and pump performance forms including the following:

a. Settings for outdoor-, return-, and exhaust-air dampers.

b. Conditions of filters.

c. Cooling coil, wet- and dry-bulb conditions.

d. Face and bypass damper settings at coils.

e. Fan drive settings including settings and percentage of maximum pitch diameter.

f. Inlet vane settings for variable-air-volume systems.

g. Settings for supply-air, static-pressure controller.

h. Other system operating conditions that affect performance.

System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

Quantities of outdoor, supply, return, and exhaust airflows.
Water and steam flow rates.
Duct, outlet, and inlet sizes.
Pipe and valve sizes and locations.
Terminal units.
Balancing stations.
Position of balancing devices.

Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

Unit Data:

a. Unit identification.

b. Location.

c. Make and type.

d. Model number and unit size.

e. Manufacturer's serial number.

f. Unit arrangement and class.

g. Discharge arrangement.

h. Sheave make, size in inches, and bore.

i. Center-to-center dimensions of sheave, and amount of adjustments in inches.

j. Number, make, and size of belts.

k. Number, type, and size of filters.

Motor Data:

a. Motor make, and frame type and size.

b. Horsepower and rpm.

c. Volts, phase, and hertz.

d. Full-load amperage and service factor.

e. Sheave make, size in inches, and bore.

f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.

b. Total system static pressure in inches wg.

c. Fan rpm.

d. Discharge static pressure in inches wg.

e. Filter static-pressure differential in inches wg.

f. Preheat-coil static-pressure differential in inches wg.

g. Cooling-coil static-pressure differential in inches wg.

h. Heating-coil static-pressure differential in inches wg.

i. Outdoor airflow in cfm.

j. Return airflow in cfm.

k. Outdoor-air damper position.

l. Return-air damper position.

m. Vortex damper position.

Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.

b. Location.

c. Coil type.

d. Number of rows.

e. Fin spacing in fins per inch o.c.

f. Make and model number.

g. Face area in sq. ft..

h. Tube size in NPS.

i. Tube and fin materials.

j. Circuiting arrangement.

Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.

b. Average face velocity in fpm.

c. Air pressure drop in inches wg.

d. Outdoor-air, wet- and dry-bulb temperatures in deg F.

e. Return-air, wet- and dry-bulb temperatures in deg F.

f. Entering-air, wet- and dry-bulb temperatures in deg F.

g. Leaving-air, wet- and dry-bulb temperatures in deg F.

h. Water flow rate in gpm.

i. Water pressure differential in feet of head or psig.

j. Entering-water temperature in deg F.

k. Leaving-water temperature in deg F.

l. Refrigerant expansion valve and refrigerant types.

m. Refrigerant suction pressure in psig.

n. Refrigerant suction temperature in deg F.

o. Inlet steam pressure in psig.

Fan Test Reports: For supply, return, and exhaust fans, include the following:

Fan Data:

a. System identification.

b. Location.

c. Make and type.

d. Model number and size.

e. Manufacturer's serial number.

f. Arrangement and class.

g. Sheave make, size in inches, and bore.

h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

Motor Data:

a. Motor make, and frame type and size.

b. Horsepower and rpm.

c. Volts, phase, and hertz.

d. Full-load amperage and service factor.

e. Sheave make, size in inches, and bore.

f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

g. Number, make, and size of belts.

Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.

b. Total system static pressure in inches wg.

c. Fan rpm.

d. Discharge static pressure in inches wg.

e. Suction static pressure in inches wg.

Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

Report Data:

a. System and air-handling-unit number.

b. Location and zone.

c. Traverse air temperature in deg F.

d. Duct static pressure in inches wg.

e. Duct size in inches.

f. Duct area in sq. ft..

g. Indicated air flow rate in cfm.

h. Indicated velocity in fpm.

i. Actual air flow rate in cfm.

j. Actual average velocity in fpm.

k. Barometric pressure in psig.

J. Air-Terminal-Device Reports:

Unit Data:

a. System and air-handling unit identification.

b. Location and zone.

c. Apparatus used for test.

d. Area served.

e. Make.

f. Number from system diagram.

g. Type and model number.

h. Size.

i. Effective area in sq. ft..

Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.

b. Air velocity in fpm.

c. Preliminary air flow rate as needed in cfm.

d. Preliminary velocity as needed in fpm.

e. Final air flow rate in cfm.

f. Final velocity in fpm.

g. Space temperature in deg F.

K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

Unit Data:

a. System and air-handling-unit identification.

b. Location and zone.

c. Room or riser served.

d. Coil make and size.

e. Flowmeter type.

Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.

b. Entering-water temperature in deg F.

c. Leaving-water temperature in deg F.

d. Water pressure drop in feet of head or psig.

e. Entering-air temperature in deg F.

f. Leaving-air temperature in deg F.

INSPECTIONS

Initial Inspection:

After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.

Check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.

b. Measure water flow of at least 5 percent of terminals.

c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.

d. Verify that balancing devices are marked with final balance position.

e. Note deviations from the Contract Documents in the final report.

Final Inspection:

After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Engineer In-charge

The TAB team's test and balance engineer shall conduct the inspection in the presence of Engineer In-charge

Engineer shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.

If the second final inspection also fails, Engineer may contract the services of another TAB team to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB team's final payment.

Prepare test and inspection reports.

OPERATION AND MAINTENANCE CHARTS

The Contractor shall supply four copies (also provide in soft copies) each of charts indicating schedule of:

- Daily start-up and shut down
- Emergency shut down
- Servicing and Maintenance, As well as charts listing
- Equipment model and serial Nos.
- Conditions of operation
- Normal settings of automatic and safety controls
- Data of accessories
- Motors manufacturer's name and address
- Reference No. of technical and spare part catalogues.

Air Handling Units (AHU)

PART ONE GENERAL

1.1 REFERENCE

1.1.1 Conform to General Requirements and Conditions for MEP Works, Division 1 Section 01 00 00.

1.1.2 Conform to Special Instructions for Mechanical Works Section 23 05 01.

All air handling units shall be ARI, AMCA or Eurovent certified. Provide Proof of certification along with submittals.

PART TWO PRODUCTS

2.1 QUALITY ASSURANCE

Furnish Double skin Central Station Modular Air Handling Units of type, size and capacity as set forth and called for in the equipment schedules. Units shall be constructed to comply with the requirements of material and workmanship according to the latest ASME Codes or equivalent. Units shall be tested before despatch and ready for installation, and their performance certified in accordance with ARI standard 430 or equivalent.

2.2 COMPONENTS

The units shall be complete with insulated casings, water proof insulated drain pan(s), coil(s), fan(s), motor and starter, adjustable motor and fan drives, V-belts, belt guards, filters, dampers as required, access doors, mixing box(es), vibration isolators and all other items necessary for satisfactory operation.

2.3 COORDINATION

The Contractor shall verify and confirm that the dimensions of the units offered by him are suitable for installation in the space available and he shall be responsible for ensuring that the units are capable of being installed in the available space.

2.4 DELIVERY, STORAGE AND HANDLING

Units shall be delivered factory assembled with protective crating and covering and their delivery coordinated in sufficient time to allow movement into building. The unit base shall be supplied with painted lifting lugs located to suit optimum hoisting stability. Units are to be handled as per manufacturer=s written rigging and installation instructions for unloading and moving to final location. Units shall be shipped fully assembled (within freight limitations) on a minimum 10-gauge galvanized steel base rail/ housekeeping pad.

2.5 EXTRA MATERIALS

Furnish extra materials described below that match products offered/installed, are packaged with protective covering for storage, and are identified with labels describing contents.

Fan Belts:	One set for each belt-drive fan.
Filters:	One set of filters(as specified) for each unit.
Fan Bearing:	One set for each AHU.

2.6 COMPONENT FEATURES

2.7 UNIT CASING

2.9.1 GENERAL CONSTRUCTION

Unit shall be constructed of a complete frame with removable panels. Removal of side panels must not affect the structural integrity of each module. The casing must be able to withstand up to 6 in. positive or 4 in. negative static pressure. All exterior wall panels shall be made of minimum 18 gauge G90 galvanized

steel. Closed- cell foam gasketing shall be provided where modules are joined to ensure that no thermal bridge occurs.

2.9.2 BASE AND FRAME

The unit base and upper frame shall be hot dipped galvanized.

2.9.3 WALL CONSTRUCTION

Units shall be double-wall constructed to prevent fiberglass erosion into the airstream and to allow cleaning of the unit interior. Interior wall shall be a minimum of 1 inch. thick of either 20-gauge solid plate galvanized steel.

Double-wall units shall be factory insulated with insulation of minimum density 12 lb/ft^3 (48 kg/m^3) insulation. The insulation thickness and density is to be selected by the manufacturer to ensure that the following minimum criteria are met:

Heat Transfer Coefficient: 0.20 Btu/h ft^2 ^{o}F (1.15 W/m^2 K)

Noise Attenuation Characteristics: As per table below

Frequency (Hz)	63	125	250	500	1 k	2 k	4 k	8 k	Overall
SPL (dB)	11	11	15	25	26	27	27	27	<30

No condensation to occur on unit

Exterior when air around unit is at: 100^{o}F and 65% RH

All connecting channels shall be so designed and to insulated create thermal bridge to prevent sweating.

2.10 DRAIN PAN

Units shall have an insulated, double wall stainless steel pan under cooling coil section(s) for drainage of condensate. Minimum insulation requirements for the drain pan are as detailed in the section on >Wall Construction=. Drain connections are to be provided on both sides of the unit.

2.11 ACCESS DOORS AND PANELS

Full sized hinged removable double-wall access doors with two step safety handles shall be provided for quick access to the interior of the unit casing. Doors attached by screws or doors not continuously gasketed are not acceptable. All doors/panels shall be sealed with closed- cell foam gasketing.

2.12 SPACER

Each unit shall be provided with a 6” spacer section installed where scheduled.

2.13 VIEW WINDOW

An 8 x 10 in. view window shall be provided on modules where scheduled.

2.14 MARINE LIGHT

A marine light shall be provided on fan and access modules where scheduled.

2.15 PAINT

Units shall be finished with two coats of baked enamel/powder coating.

2.16 FANS

2.16.1 GENERAL

Fan(s) shall be rated in accordance with AMCA Standard 210. Fan(s) shall be indirectly connected with V-belt drive and selected to produce the capacity required at the static pressure indicated.

2.16.2 TYPE

Fan(s) shall be of the fully enclosed centrifugal type, double width, double inlet, forward curved, Class I; or backward inclined, Class I or II; or airfoil, Class I or II. Fan(s) shall be statically and dynamically balanced.

2.16.3 HOUSING

Fan housing shall be constructed of heavy gauge steel equipped with intake cones designed for smooth air flow. Fan discharge shall be connected to cabinet through a 6 in. deep canvas flexible connection

Housed fan performance shall be certified as complying with ARI Standard 430-89. Centrifugal fans shall be dynamically balanced at the factory as a complete fan assembly (fan wheel, motor, drive and belts). Fan shafts shall not exceed 75 percent of their first critical speed at any cataloged rpm.

2.16.4 DRIVE

Drive assembly shall consist of a solid steel turned, ground, polished and greased shaft with heavy duty, self-aligning, re-lubricatable ball bearings. Bearing grease zerks shall be extended to fan drive side.

V-belt drives shall be designed for not less than 150 percent of the connected driving capacity. Sheaves shall have at least two grooves, selected to drive the fan(s) at the specified RPM. Motor sheave shall be of the fixed (or adjustable) type.

Units of over 20,000 CFM (34,000 m3/h)shall be provided with a totally enclosed galvanized expanded metal belt guard. The belt guard shall be rigidly attached to the bearing support structure and have a two-piece removable front panel. A tach hole shall be provided opposite the fan shaft. The belt guard shall be a universal size to accommodate any applicable drive.

2.16.5 BEARINGS

Fans shall be equipped with self-aligning, anti-friction pillow block bearings with a minimum life of L-50 200,000 hours. Bearings shall be equipped with grease lines allowing for lubrication from one side of the fan.

2.16.6 MOTORS

Fan motors shall be Totally Enclosed Fan Cooled (TEFC) motors, foot mounted (B3) 4 pole, protection class IP54, insulation Class >F= , rated for temperature rise of 176oF,3 phase. Motor terminals to be arranged for DOL starting upto and including 5.5 KW and Star Delta start for sizes 7.5 KW and above.

2.16.7 ACOUSTIC PERFORMANCE

Minimum acceptable fan/AHU acoustic performance shall be as indicated in table below:

Frequency (Hz)	63	125	250	500	1 k	2 k	4 k	8 k	Overal
Fan Lw (dBA)	55	67	75	80	80	78	74	67	85
AHU Lw (dBA)	54	65	69	72	71	65	54	44	76
SPL* (dBA)	43	54	58	61	60	54	43	33	65

* Sound Pressure computed at 3.28 feet (1.0 m), in free field space

2.17 COILS

2.17.1 GENERAL

Coils shall be designed with aluminum plate fins and copper tubes.

Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall be mounted in the unit casing to be accessible for service and can be removed from the unit either through the side or top. Capacities, pressure drops and selection procedure shall be certified in accordance with ARI Standard 410.

2.17.2 WATER COOLING COILS

Water Cooling Coils shall be supplied where scheduled and shall conform to the following minimum specifications:

Coils shall be designed to operate at 250 psig (17.5 bar) design working pressure and up to 300°F Coils shall be tested with 325 psig (22.75 bar) compressed air underwater.

Coil circuiting shall provide free draining and venting when installed, counter flow of air and water, with water velocities not to exceed 7FPS (128 m/min) and without exceeding the water pressure drops scheduled.

All coils shall be enclosed in a coil section. Coil headers and U-bends shall not be exposed.

All coils must have same end connections regardless of the number of rows deep.

Coils shall have a supply header to ensure distribution of cold water to each tube of coil. Headers shall be either round copper or cast iron. Steel pipe headers are not acceptable.

Tubes shall be 2 in. or 5/8 in. OD.

2.18 HEAT PIPE /REHEAT COILS

2.18.1 GENERAL

Furnish and install the heat recovery units of the heat pipe air-to-air type as shown in the schedules.

Heat recovery units shall transfer heat between out-going and incoming air streams in counter flow arrangement.

2.18.2 HEAT PIPE HEAT EXCHANGER

Tube core shall be ID seamless, integrally finned aluminum tube with .166 inch (.42 cm) wall thickness.

Fin surface should be integral to the tube wall and should have a minimum of .017 inch (.043 cm) between fin thickness. Fin density is 11, 9, 7 or 5 fins per inch. Fin surface from root to the tip of the fin should have a minimum of .437 inch (1.11 cm) between fin height.

Circumferential capillary wick structure shall be integral to the inside wall of the tube. Capillary structure shall not interfere with the integrity of the wall of the tube.

Working fluid used shall be selected on the basis of heat pipe operating temperature and compatibility with tube and wick materials. Tubes shall be individually processed, charged, hermetically sealed and factory tested.

The exchanger frame shall be fabricated from minimum of 14 gauge galvanized steel. The frame shall be supplied with minimum 2 inches (5.1 cm) wide flanges on all four sides. Intermediate tube supports shall be furnished as required.

A partition shall be provided to isolate the outgoing and incoming air streams; there shall be no cross contamination. The partition shall be at the center unless specified. Partition shall be fabricated from a minimum 18 gauge galvanized steel and shall extend beyond the finned surface with 4 inches (10.2 cm) flanges [2 inches (5.1 cm) to supply side and 2 inches (5.1 cm) to exhaust side]. Both front and back to be flush with the frame.

End covers shall be provided to protect tube ends. Covers shall be fabricated in 18 gauge galvanized steel.

Each individual heat pipe shall be charged and tested at the actual maximum design air temperature before being installed within the frame.

2.18.3 INSTALLATION

2.18.3.1INSTALLATION OF THE UNIT

The unit should be installed so that both fluids will be drawn up through the recovery cell.

2.18.3.2LEVELING EXCHANGER

The heat exchangers could be installed with a slight slope, according to the manufacturers specifications..

2.18.3.3SUPPORTING STRUCTURE

The exchangers should be secured rigidly, not to allow more than 1/8 inch (.32 cm) total deflection. The supply duct must never be fixed directly to the frame.

A support structure could be made to slide the unit for lceaning and installation purposes.

2.18.3.4ACCESS DOORS:

Access doors should be provided to allow periodic inspection of the exchanger and to facilitate cleaning when necessary.

2.18.3.5DRAIN PANS:

Sloped drain pans are recommended under the entire exchanger both as a condensed collection system and for cleaning purposes.

2.18.3.6CODE REQUIREMENTS:

The installation of the exchanger should conform to all codes, laws and regulations applying at the job site.

2.19 FILTERS

2.19.1 GENERAL

Air handling units are to be supplied complete with filters as scheduled, and having the following minimum specifications:

2.19.2 PERMANENT FILTERS

These filters shall be 2 in. thick, efficiency upto 35% all metal viscous imprisonment type, capable of operating up to 600 FPM (182.9) face velocity without loss of filter efficiency and holding capacity. Filter media shall be layers of cleanable wire maze. Filter frame shall be constructed of galvanized steel.

2.19.3 BAG FILTERS

These filters shall be fine fiber, all glass media with spun backing to keep glass fibers from eroding downstream. Stitching method shall permit bag to retain pleat shape without the use of wire basket support. Bag filters to be furnished with pre-filter to extend life of bag filter. Manufacturer shall supply side access filter rack capable of holding bag filters and 2 in. pre-filters.

Bag Filters are to be provided of 85% efficiency. Efficiency of filter to be determined by ASHRAE Standard 52-76. Filters shall be rated UL Class 2.

2.20 DAMPERS, MIXING BOXES AND PLENUMS

2.20.1 OUTSIDE AIR/RETURN AIR DAMPERS

Outside air/return air dampers shall be provided to modulate the volume of outside and return air. Dampers shall be of airfoil design and shall be either parallel or opposed blade type with

metal compressible jamb seals and extruded vinyl blade edge seals on all blades. Blades shall rotate on stainless steel sleeve bearings. Maximum damper blade length shall be 60 in. Leakage rate shall not exceed 5 CFM/ft2 at 1 in. wg and 9 CFM/ft2 at 4 in. wg

2.20.2 FACE AND BYPASS DAMPERS

Face and bypass dampers shall be of airfoil design opposed blade type. Dampers shall have metal compressible jamb seals and extruded vinyl blade edge seals. Both dampers shall rotate on stainless steel sleeve bearings. Dampers shall be jackshaft driven, with both dampers mechanically linked together. Leakage rate shall not exceed 5 CFM/ft2 (0.79 m3/h$m2) at 1 in. wg (25.4 mm Aq.) and 9 CFM/ft2 (1.42 m3/h$m2) at 4 in. wg (101.6 mm Aq.).

2.20.3 MULTI-ZONE DAMPERS

Multi-zone damper section is to be designed as a single assembly with airfoil type blades. Dampers shall have metal compressible jamb seals and extruded vinyl blade edge seals. Dampers shall rotate on stainless steel bearings. Leakage rate shall not exceed 9 CFM/ft^2 (1.42 $m^3/h\ m^2$) at 1 in. wg (25.4 mm Aq.).

2.20.4 MIXING BOX

A Mixing Box module as scheduled, shall be provided by the manufacturer engineered to be used with the unit. The mixing box shall meet or exceed cataloged mixing capabilities.

2.20.5 AIR PLENUMS

Air Plenums as scheduled, shall be provided by the manufacturer engineered to be used with the unit. Plenum sections shall be provided for:

Providing an empty spacer section of scheduled length.

Providing an access into the Air handling unit complete with access door on either or both sides as scheduled.

Providing a conversion of the air supply and return configuration from front to bottom.

2.21 HEAT PIPES

Heat Pipes shall be provided to control the humidity (50 – 55 %) of FAHU'S leaving air .

Each individual heat pipe shall be charged and tested at the actual maximum design air temperature before being installed within the frame.

End covers shall be provided to protect tube ends. Covers shall be fabricated in18 gauge galvanized steel.

Working fluid used shall be selected on the basis of heat pipe operating temperature and compatibility with tube materials. Tube shall be individually processed, charged, hermetically sealed and factory tested as per above section 2.17.3.

2.22 COMMISSIONING & TESTING

The unit shall be commissioned and tested as per the Manufacturer's recommendations. Drives shall be adjusted to provide the required air flow rate and valves shall be adjusted for the proper water flows, etc. This Contractor shall be required to carry out tests, on forms to be supplied later by the Consultants, and obtain the Consultant's approval. Suppliers representative to be present during commissioning and testing to certify that units are commissioned as per manufacturers recommendations.

PART THREE EXECUTION

3.1 INSTALLATION

Install equipment in accordance with manufacturers written instructions. Provide letter from manufacturer certifying acceptance of installation.
Provide air-handling units in accordance with air handling unit's schedule.
Submit external static pressure calculations based on actual shop drawings for review before final selection or ordering of units.

Provide neoprene isolators between base of unit and concrete supports.
Pipe condensate pan drain outlet to floor drain complete with minimum 75mm deep seal trap.

Manufacturers authorized representative to certify installation is as per manufacturer's recommendation and assist in testing, balancing and commissioning.

HVAC Ducts and Specialties

PART ONE GENERAL

1.1 REFERENCE

1.1.1 Conform to General Requirements for MEP Works, Division 1 Section 01 00 00.

1.1.2 Conform to Special Instructions for Mechanical Works Section 23 05 01.

1.2 SUMMARY

1.2.1 Metal Ductwork applicable to all indoor supply, return, toilet exhaust, kitchen exhaust, parking exhaust, smoke exhaust and all duct work on roof and in shafts (including supply air, return air, exhaust air and fresh air).

1.3 SUBMITTALS

1.3.1 Shop Drawings: Submit duct fabrication drawings indicating:

- Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
- Duct layout, indicating sizes in plan view.
- Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.
- Manufacturer's Installation Instructions: Submit special procedures for glass fiber ducts.

1.3.2 Record actual locations of ducts and duct fittings. Record changes infitting location and type. Show additional fittings used.

1.4 QUALITY ASSURANCE

1.4.1 Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.
1.4.2 Construct ductwork to NFPA 90A and NFPA 96 standards.
1.4.3 For Pre-insulated Ducts, no relevant reduction of insulation, chemical or physical characteristics of the panels to be measurable, when conveying air in the temperature range of –35ºC to +110ºC and pressure of 1.75kPa.

1.5 ENVIRONMENTAL REQUIREMENTS

1.5.1 Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
1.5.2 Maintain temperatures during and after installation of duct sealant.
1.5.3 Protect all duct openings from dust and debris during construction.

PART TWO PRODUCTS

2.1 GENERAL

2.1.1 Access doors of adequate size and proper design shall be provided in all ductwork and air chambers to permit inspection and maintenance of valves, controls, dampers, coils, filters and bearings and must be shown on drawings. Access doors to be provided at 3 metre centres in Kitchen exhaust ducts to allow access for regular cleaning.No access ducts or hatches are acceptable in the Lobby area.

2.1.2 Manual volume dampers shall be provided in each branch duct for balancing and must be shown on the drawings.

2.1.3 Instrument test holes shall be provided for balancing.

2.2 MATERIAL

2.2.1 Ducts shall be constructed of galvanised iron unless specifically noted otherwise. conforming to ASTM A-525 and having a minimum coating of 0.275kg/m² z-27. The galvanizing shall be carefully done and the sheets shall be of such quality that they may bend flat on themselves with no fracture to the coating or the base metal.

2.2.2 The recommendations of ASHRAE/SMACNA shall be used as a guide for sizing, minimum gauges, bracing and construction details.

2.2.3 Fibreglass ducts, bearing the UL label and constructed in accordance with SMACNA standards, may be considered for use in low pressure systems.

2.2.4 Duct work exposed in B.O.T.H. areas shall be galvanised and not fibreglass.

2.2.5 GI duct work will be applicable for exhaust duct work for parking area.

2.2.6 Provide Welded non-corrosive exhaust ducts in steam areas.

2.2.7 Where duct is acoustically lined, duct dimensions shown are net, clear internal dimensions.

2.2.8 All round ductwork shall be shop or factory fabricated conduit "consisting of helically wound galvanized iron strips with spiral lock seam. Each duct section and fitting shall have a plain end and a belled or swaged end to permit a sliding fit with overlap not less than 100mm. Ninety degrees elbows shall have smooth center line -radius of 1.5 times duct diameter. Alternatively, they may be of five pieces construction. Forty-five degree elbows shall be of three piece construction.

2.2.9 All kitchen exhaust ductwork is welded steel, pitched back toward the hood with cleaning access doors every ten feet and at each elbow. No turning vanes or dampers are allowed. Fire insulation, not less than two-hour rated (or the minimum required by code), is applied to ductwork. Provide the cooking exhaust fan housing with a drain connection at the bottom to allow the cleaning solution to manually drain.

2.2.10 Kitchen range hood duct work shall be constructed of black iron with welded seams and liquid-tight joints. The system shall be designed in full compliance with NFPA-96 and the applicable local codes having jurisdiction.Provide 50 mm foil faced mineral woof solution around all grease exhaust ducts with 0.8 mm aluminum jacketing and as per Ashrae/NFPA/SMACNA codes. Cleanouts and access shall be provided as per NFPA 96.

2.2.11 Branch duct work from moisture emitting equipment, e.g., dishwashers, pot sinks, etc., and indoor swimming pools, shall be constructed of copper, stainless steel or aluminium, with water-tight joints, pitched back toward the equipment. Electrolytic isolation shall be provided at connections to iron duct work. Fire dampers shall be provided in branches where connections are made to the Kitchen hood exhaust duct work.

2.2.12 Fire dampers shall be installed where required by NFPA-90A and the applicable local codes having jurisdiction and must be shown on the drawings. A schedule of fire dampers is to be provided as part of the maintenance manuals.

2.2.13 Flexible ducts

- Flexible Ducts shall be used as shown on drawings.
- They shall not pass through floors or fire walls and shall not exceed 1.5 m in length. Flexib1e ducts shall not be installed in inaccessible locations, such as above gypsum board ceilings without prior approval from the consultant.
- The flexible duct shall have a flame spread not exceeding 25 and smoke development not exceeding 50 per UL 723 test method.
- Thermal resistance of duct shall be more than R-1.06
- The flexible duct shall have an air leakage not exceeding 0.00151l/s at 11.94kPa static pressure
- The duct shall be rated for a maximum air velocity of 12.5 m/s.
- Flexible insulated ducts shall be UL 181 listed. Exterior jacket shall be metalized polyester vapor barrier with 2 ply black polyester core with aluminium foil exterior finish. Insulation shall be fiberglass, R-0.74 Core shall be double ply polyester laminated with carbon steel wire helix. The flexible duct shall have an inner air barrier factory applied insulation equal

40 mm thick flat insulation

PART THREE EXECUTION

3.1.1 All sheet metal ducts shall be as per size and location on drawings. If changes of size or location of ducts are found necessary because of building construction, these may be done with prior submission to and approval by the consultant.

3.1.2 All laps shall be in the direction of air flow and all edges and slips hammered down so as to leave smooth finished surface inside the ducts.

3.1.3 All ducts shall be braced and stiffened and shall be tight so that they will not breathe, rattle, vibrate or sag. Cross-break or transverse bead all rectangular ducts with heights or widths of 300mm or larger.

3.1.4 Duct sealant by an approved manufacturer shall be used. Brush joints with the compound before and again after assembly. Exposed ducts shall be sealed on the inner surfaces only.

3.1.5 Flexible duct connections shall be by an approved manufacturer andshall be provided at each building expansion joint, air handling unit and fan duct connection. Connections shall be 20 oz. minimum fire retardant canvas. For fan discharge connections in excess of 1000 Pa or where located outdoors, provide connections of fire retardant glass fibre cloth with a neoprene coating. Connection material shall be reviewed by the Engineer before installation.

3.1.6 Flexible duct connections shall be Class 1, corrugated aluminum flexible duct suitable for 120°C and 1.5 kPa and shall be Underwriters Laboratories listed. Flexible duct connections shall be insulated with 25mm insulation complete with vapor barrier.

3.1.7 Bends in flexible ducts shall have centre line radius of not less than 10 x diameter. Collars to which flexible ducts are attached shall be a minimum of 50mm in depth. Insulation and vapour barriers on factory-fabricated ducts shall be fitted over cone connection and supplementally secured with a drawband.

3.1.8 Where ductwork passes through a wall or floor, other than when a fire damper is required, pack around the duct using a fire resistant material to ensure a sound and air tight joint.

3.1.9 Access ports (32 mm round) at convenient locations in all main ducts and main branch take offs, complete airtight covers and extension sleeves through insulation shall be provided to allow air meter readings.

3.1.10 Manual duct dampers as shown and as required for proper balancing of the system shall be provided and installed. Dampers shall be of galvanized steel 18 U.S. ga: or heavier. Dampers for ducts up to 300mm deep shall be single blade carried on a 10mm square steel rod mounted inside the duct. Dampers for ducts of greater depth than 300mm shall be multi-blade, opposed-acting type and shall have blades mounted in 40mm channel frame, and interconnected for operation from one locking type hand quadrant.

3.1.11 Splitter dampers as shown and as required for proper balancing of the system shall be provided. The splitter shall be made of at least the same thickness of galvanized steel as the duct in which it is installed, down to a minimum of 20 U.S. gauge, and shall be securely hinged at the air leaving edge, and made of two thicknesses, so that the entering edge presents a round nose to the air flow. The length of the splitter shall be at least 1.0 times the width of the smaller branch duct, but in no case less than 300mm long. Splitter hinge shall be attached and hinged to the splitter near the air entering edge, and shall pass through a clamp on the side of the duct which is most accessible far adjustment, to permit positioning and anchoring of the damper.

3.1.12 Gravity backdraft dampers shall be multi-blade louver type, constructed of light grade aluminum. Blades shall be joined with a tie bar and have rust-proof shafts rotating in oil impregnated bronze or plastic bushings.

3.1.13 Motorized dampers for control operation are specified under specification Division 25,Building Management System.

3.1.14 Fire dampers shall be UL listed. Unless otherwise permitted by the Engineer all curtain-type

fire dampers shall be Type B with curtain completely clear of the air stream. Fire dampers shall be installed the manner in which they were twisted and shall meet all applicable codes. Fusible links shall be rated for 100°C unless otherwise damper shall have the same fire rating as the wall in which they are installed Fire dampers installed in duct where air flow may still exist during a fire shall be dynamic type.

3.1.15 Access panels as shown on drawings and as required for convenient access shall be provided at all fire dampers, gravity dampers, motorized dampers, coils, fan' bearings or similar equipment requiring occasional maintenance or inspection. Panels shall be 600mm x 450mm or full width of duct if less than 450mm width. Panels shall be of double wall construction shall be internally insulated on insulated ducts. Frame shall be of structural angle welded corners, gasketted to receive the panel. Panel shall be held in place with 4 win o sash locks. All access doors for fire dampers shall be labeled "Fire Damper and their location shall be indicated on “shop” and "as-built" drawings.

3.1.16 All ductwork shall be installed securely and in a rigid manner with hangers provided as per schedules below:

1.1.1. **HORIZONTAL RECTANGULAR DUCT**	
Max. Duct Dimension (mm)	**Hanger Construction Dimensions (mm)**
Up to 500	two 25 x 16 U.S. ga. straps on 2400 mm centers with, two screws on side of duct, one on bottom
501 to 1500	25 x 25 x 6 trapeze hanger with two 10 mm rods on 2400 mm centers.
1501 to 3000	50 x 50 x 6 trapeze hanger with two 10 mm rods on -2400 mm centers.
3001 to 6000	63 x 63 x 5 trapeze hanger with two 10 mm rods on 1200 mm centers.

1.1.2. **HORIZONTAL ROUND DUCT if any**	
1.1.3. **Duct Diameter, 41 (mm)**	***1.1.4.*** **Hanger Construction Dimensions (mm)**
up to 150	one 25 x 16 U.S. ga. hanger ring supported from one 25 x 16 U.S. ga hanger strap on 2400 mm centers.
151 to 450	one 25 x 14 U.S. ga. hanger ring supported from one 25 x 14 ga. hanger strap on 2400 mm centers.
451 to 900	one 25 x 12 U.S. ga. hanger ring supported from one 25 x 12 U.S. ga hanger strap on 2400 mm centers
901 to 1200	one 38 x 12 U.S. ga. hanger ring supported from one 38 x 12 U.S. ga. Hanger strap on 2400 mm centers
1201 to 2100	two 38 x 12 U.S. ga. hanger connected to the 32 x 32 x 3 mm angle girth reinforcing of duct, hangers on, 2400 mm centers

3.1.17 All vertical ducts shall be supported at each floor with angles, riveted to the ducts.

3.1.18 Construct low pressure rectangular duct as follows:

Low pressure ducts: duct velocities less than 0.944m³/s and static Pressures in duct 5.97 kPa or less.

Dimension Longest Side (mm)	Sheet Metal all 4 sides (U.S. g.a.)	Reinforcing Between Joints (Angle)	Joints and Reinforcing at Joints	Height of Standing Leg (mm)
0 to300	24	None	Drive slip(sides only) Plain "S" Slip	25
301-450	24	None	as above	25
451-760	24	25 x 25 x 3 at 1500 centers	Hemmed "S" Slip Bar Slip3040 centres	25
761-1060	22	25 x 25 x 3 at 1500 centers	Alternate or reinforced 25x3 Bar Slip 3040 centres	25
1061-1370	22	38 x 38 x 3 at 1200 centers	Alternate or reinforced 38x3 Bar Slip2400 centres	38
1371-1520	20	38 x 38 x 3 at 1200 centers	Reinforced 38x3 Bar Slip 2400 centres	38
1521-2130	20	38 x 38 x 3 at 600 centers	Reinforced 38x3 Bar slip 1200 centres	38
2131-2430	18	38 x 38 x 3 at 600 centers angles	Companion 38x38x3 at 1200 centres	38
2431-3040	18	50 x 50 x 4 at 600 centers angles	Companion 50x50x4 at 1200 centers	50

3.1.19 Bracing spacing shown above shall be maximum spacing between two bracings or between bracing and joint. Locate bracings mid-way between joints.

3.1.20 Pre insulated Ductwork shall be installed, using supports, as described in DW144 & according to manufacturer's requirements. Maximum distance between supports shall not exceed:

- 4000 mm for ducts with section not exceeding 1200 x 1000 mm.
- 2000 mm for ducts with section exceeding 1200 x 1000 mm.

3.1.21 Longitudinal joints shall be Pittsburgh lock seam at edge of duct and grooved seam on face of duct.

3.1.22 Construct medium pressure rectangular ducts as follows:

Max Duct Dimension (mm)	**Sheet Metal (U.S. ga.)**	**Transverse Join Connection and Bracing Dimensions (mm)**
up to 300	24	25 standing seam, 16 welded flange, 1 pocket lock no bracing
301 to 450	24	25 standing seam, 22 welded flange, 1 pocket lock, bracing 25 x 25 x 16 U.S. ga. at 1200
451 to 600	22	38 standing seam, 35 welded flange, 28 pocket lock, bracing 25 x 25 x 3 at 1200
601 to 900	22	38 standing seam, 38 pocket lo'1k, bracing 25 x 25 x at 800
901 to 1200	22	50 standing seam or 50 flanged joint, bracing 12 x 3 at 760
1201 to 1500	20	38 standing seam or 38 flanged joint with tie rod in centre, bracing and 50 x 50 x 3 at 600
1501 to 1800	20	50 standing seam or 38 flanged joint with tie rod in centre, bracing 63 x 63 x 5 at 600
1801 to 2100	18	50 standing seam or 38 flanged joint with tie rod in centre, bracing 63 x 63 x 5 at 600
2101 to 2400	18	50 standing seam or 38 langed joint with tie rod In centre, bracing 38 x 38 x 3 at 600, with tie rod in centre
Over 2400	18	50 standing seam or 50 langed joint with tie rod at 1200, bracing 50 x 50 x 3 at 600 with rod in centre

3.1.23 Bracing spacing shown above shall be maximum spacing between two bracing or between bracing and joint. Bracings shall be located mid-way between joints.

3.1.24 Longitudinal joints shall be Pittsburgh lock seam at end of duct and grooved seam on face of duct.

3.1.25 The joints between the pre insulated ducts shall be using aluminum invisible flanges and slide-in-channel and to be connected by special cover corners, having a holding pin, which goes inside the flange and the insulation, to avoid any field connection and to give the system more strength.

3.1.26 All ductwork, exposed to view wilt be painted as per Division 1, Section 099000.

HVAC Insulation

PART ONE GENERAL

1.1. REFERENCE

1.1.1. Conform to General Requirements and Conditions for MEP Works, Division 1 Section 01 00 00.

1.1.2. Conform to Special Instructions for Mechanical Works Section 23 05 01.

1.1.3. Refer to detail sheet in the drawing package.

1.2. REFERENCE STANDARDS

1.2.1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

1.2.2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

1.2.3. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

- ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- ASTM C168 - Terminology Relating to Thermal Insulation Materials.
- ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- ASTM C553 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
- ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
- ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
- ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
- ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
- ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- ASTM E84 - Surface Burning Characteristics of Building Materials.
- ASTM E96 - Water Vapor Transmission of Materials.
- ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- NFPA 255 - Surface Burning Characteristics of Building Materials.
- SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

- UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.
- UL 723 - Surface Burning Characteristics of Building Materials.
- ASTM E2336 - Standard for Grease Ducts.
- ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay

1.3. QUALITY ASSURANCE

1.3.1. All HVAC items requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

1.3.2. All insulation required for the work shall be new, of first-class quality and shall be furnished, delivered, erected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality is specified, a first-class standard article as approved by the Architect shall be provided.

1.3.3. All piping and Ductwork Insulation shall be Rigid Insulation, and must meet Greenhouse Gas and Ozone Depletion Potential: Only use CFC- and HCFC- free products.

1.3.4. Flame Retardants: must be PBDE-free products.

1.3.5. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement. Certificates to this effect shall be submitted along with Contractor's submittal data for this Section of the Specifications. No material may be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

1.3.6. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

1.3.7. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, or sloppy Work will not be acceptable.

1.4. SUBMITTALS

1.4.1. Product Data:

Provide product description, list of materials, "k" value, "R" value, mean temperature range, and thickness for each service and location.

1.4.2. Operation and Maintenance Data:

Samples: When requested, submit three (3) samples of any representative size illustrating each insulation type.

Manufacturer's Installation Instructions: Indicate procedures that ensure acceptable standards will be achieved. Submit certificates to this effect.

1.5. DELIVERY, STORAGE AND HANDLING

1.5.1. Deliver, store, protect, and handle products to the Project Site under provisions of Division 01.

1.5.2. Deliver materials to Site in original factory packaging, labeled with manufacturer's identification including product thermal ratings and thickness.

1.5.3. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.

1.5.4. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART TWO PRODUCTS

2.1. INSULATION SCHEDULE

Insulation shall be as per following schedule:

2.1.1. CHILLED & HOT WATER

Piping below 50mm∅	Elastomeric Foam Insulation 40mm thickness.
Piping above 50mm∅	Elastomeric Foam Insulation 50mm thickness.

2.1.2. CONDENSATE PIPING

Cold Condensate	Elastomeric Foam Insulation 25mm thickness
FCU Condensate	Elastomeric Foam Insulation 25mm thickness

2.1.3. STEAM AND STEAM CONDENSATE PIPING

Piping below 1-1/2" ∅	Glass fiber Insulation 38mm thickness
Piping above 2" ∅	Glass fiber Insulation 75mm thickness

2.1.4. SHEET METAL DUCTWORK

Indoor	Closed Cell Elastomeric Insulation 25mm thickness.
Exposed cold air ducts	Closed cell elastomeric Insulation 50 mm thick.
Outdoor	Closed Cell Elastomeric Insulation 25 mm thick.
Fire Ducts	Rockwool Blanket with GI wire mesh 96 Kg/m^3 density finished insulating cement and painted.
Kitchen Hood Ducts	Calcium silicate block insulation wire mesh and finished with insulating cement and painted.

2.1.5. EQUIPMENT

Material and Finishes

Hot water converters and hot water expansion tanks	50mm thick, 96 kg/m^3 density, rigid board, fibreglass insulation.
Expansion tanks,	25mm thick, Elastomeric Insulation.
Emergency generator exhaust gas flue piping and generator muffler.	50mm thick asbestos free, calcium silicate block insulation.

2.2. ACOUSTIC DUCT LINER

2.2.1. Fibre glass duct liner with fabric on air side, to ASTM C1071 type 2 rigid board type, 48kg / m³ density; 121°C maximum service temperature: maximum face velocity on fabri side 20.3m/s; non combustible; 25mm thick.

2.2.2. Application: 25mm thick where shown on drawings.

2.3. GLASS FIBER INSULATION

2.3.1. Insulation: ASTM C547; rigid molded, noncombustible.

- 'k' ((btu*in)/(hr*ft^2*deg F)) value : ASTM C335

Temperature (degrees F)	Maximum 'k' value (btu*in)/(hr*ft^2*deg F))
75	0.23
100	0.24
150	0.25
200	0.28
300	0.34
400	0.42
500	0.51

- Minimum Service Temperature: 0 degrees F.
- Maximum Service Temperature: 1000 degrees F.
- Maximum Moisture Absorption: 0.2% by volume.

2.3.2. Vapor Barrier Jacket

- ASTM C1136, White kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
- Moisture Vapor Transmission: ASTM E96; 0.02 perms.
- Secure with self-sealing longitudinal laps and butt strips.
- Secure with outward clinch expanding staples and vapor barrier mastic.

2.3.3. Vapor Barrier Lap Adhesive: MIL-A-3316C, Class 2, Grade A compliant. Compatible with insulation. VOC Limit 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3.4. Insulating Cement: ASTM C195; hydraulic setting on mineral wool. VOC Limit 70 g/L (multipurpose construction adhesive).

2.3.5. Fibrous Glass Fabric: Cloth, untreated; 9 oz/sq yd weight with 1.0 lb/cu ft density blanket.

2.3.6. Indoor Vapor Barrier Finish: Vinyl emulsion type acrylic, compatible with insulation, white color. VOC Limit 50 g/L.

2.4. CELLULAR ELASTOMERIC FOAM

2.4.1. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.

- 'k' ((btu*in)/(hr*ft2*deg F)) value: ASTM C177 or C518; 0.22 to 0.28 at 60 degrees F.
- Minimum Service Temperature: -20 degrees F.
- Maximum Service Temperature: 180 degrees F.
- Maximum Moisture Absorption: ASTM C209; 0.2 percent by volume.
- Moisture Vapor Transmission: ASTM E96; 0.08 perm inches.
- Maximum Flame Spread: ASTM E84; 25.
- Maximum Smoke Developed: ASTM E84; 50.
- Connection: Waterproof vapor barrier adhesive.
- Provide documentation indicating that product contains no urea formaldehyde.
- Fittings: Pre-fabricated closed cell fittings of like material and thickness as adjacent pipe insulation.

- In all exposed finished areas without jacketing, provide white insulation, otherwise use black.

2.4.2. Elastomeric Foam Adhesive:

- MIL-A-24179A, Type II, Class I, compliant. Air dried, contact adhesive, compatible with insulation. VOC Limit: 50 g/L or less when calculated according to 40 CFR 59, Subpart D.

2.4.3. Foam Hangers:

- Closed-cell, lightweight polymeric rigid, high-compressive strength foam insulating pipe support, that is lined with closed-cell EPDM foam rubber, and encased in a zero-perm, weather-proof, corrosion-proof, EPDM polymer membrane with a high-performance pressure-sensitive closure system.
- Insulation will not compress or crush under loads imposed by active piping systems and their contents resting on the insulation material between the pipe and the pipe hanger.
- Shall provide an anti-abrasion surface for contact with all types of piping materials, and absorb the vibrations associated with operational pipe systems.
- Shall be UV and moisture resistant.

2.4.4. Outdoor Duct Insulation;

- Service temperature range from –60 degrees F to 180 degrees F.
- Meets ASTM C 177 or C 518 and shall have minimum ‘k’ value of 0.27 Btu-in. / hr-ft2- degrees F at minimum density measurement of 3 lb/cu ft.
- The insulation and outside surface must be protected with a flexible clad/membrane system like white Thermo Plastic Rubber Membrane or as approved by consultant, that must be formulated to:
  - Be resistant to UV, and ozone, acid rain, and physical elements produced from outdoor weather per ASTM E 96 Procedure A.
  - Have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.
  - Show no evidence of continued erosion, delaminating, cracking, flaking, or peeling when tested in accordance with the test method for erosion resistance in UL181. Be resistant to mold growth resistance, ASTM G 21/C 1338 resistant to fungi, and resistant to bacteria growth per ASTM G 22.

2.5. INSULATION BLANKETS FOR STEAM AND CONDENSATE FLANGED VALVES AND EXPANSION JOINTS

2.5.1. Insulation: Tight-fitting, reusable insulation blanket consisting of high-density insulation (fiberglass, mineral wool, ceramic fiber) covered on outside with coated glass fabric having heavy adjustable straps with buckles. Inside of blanket shall be covered with fabric suitable to specified temperature of stainless steel square mesh woven wire cloth. Insulation shall be a minimum of 1-1/2” thick and shall be suitable for temperatures up to 500 Deg. F.

2.6. JACKETS AND FACINGS

2.6.1. PVC Plastic

2.6.1.1 Jacket: ASTM C921, One piece molded type fitting covers and sheet material, white color.

- Minimum Service Temperature: 0 degrees F.
- Maximum Service Temperature: 150 degrees F.
- Moisture Vapor Transmission: ASTM E96; 0.002 perm inches.
- Maximum Flame Spread: ASTM E84; 25.
- Maximum Smoke Developed: ASTM E84; 50.
- Thickness: 20 mil.

- Connections: Brush on welding adhesive or pressure sensitive color matching vinyl tape.

2.6.1.2 Covering Adhesive Mastic: Compatible with insulation and PVC jacket. VOC Limit 50 g/L according to 40 CFR 59, Subpart D (EPA Method 24).

- Aluminum Jacket: ASTM B209.
- Thickness: 0.040 inch.
- Finish: Smooth.
- Joining: Longitudinal slip joints and 2 inch laps.
- Fittings: PVC pre molded fittings.
- Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART THREE EXECUTION

3.1. EXAMINATION

3.1.1. Verify that piping and ducting has been tested before applying insulation materials.

3.1.2. No installation shall be applied to any surface, until all foreign matter has been removed from the surface to be installed. All insulations shall be applied in a manner consistent with good practice and method.

3.2. INSTALLATION

3.2.1. Install materials in accordance with manufacturer's instructions.

3.2.2. Painting of cellular foam insulation is not allowed.

3.2.3. On exposed piping, locate insulation and cover seams in least visible locations. For cellular foam insulation tape ALL visible seams with tape matching insulation color.

3.2.4. Insulation shall be continuous through floors, walls, partitions, etc. except when otherwise indicated or specified. Where space will not permit application of insulation in wall or slab chase, the chase shall be packed full of 85% magnesium mineral wool asbestos rope, or fiber glass and protected with covers plates as approved by the consultants.

3.2.5. For cold air ducts, fiberglass insulation shall have vapour barrier jacket with approved quality adhesive as specified in Section 2.4 above. Care shall be taken such that vapour barrier is not damage / pierced during installation, and any damage will be repaired with the same quality of vapour barrier. The installation shall be firmly fixed on the ducting / plenums with approved quality adhesive compound recommended by the installation manufacturer’s or as specified aboive. Adhesive to be approved by Consultant. The adhesive shall cover at least 25% duct area on the side and top, and 50% area at the bottom. All circumferential and longitudinal joints shall be lapped at least 50 mm and fully sealed with adhesives. Where rectangular ducts are 600 mm in width or greater, the insulation shall further mechanically secured to the ducts, and at least 25 mm wide metal bands shall be applied at the corners so that the mechanical fastener does not pierce the insulation and vapour barrier.

3.2.6. The insulation shall be applied to the full length of the ducts, including portions where internal sound absorber liner etc is fixed.

3.2.7. All access doors and removable panels shall be insulated and jacketed separately. The insulation jacket ends on the duct and door or panel shall be sealed with 50 mm wide PVC vapour seal self-adhesive type tape to prevent damage to the insulation due to use and servicing. External and weather exposed insulated ducting shall be insulated as specified and then protected with a jacket of 20 kg roofing felt, all joints sealed with hot bitumen PBS PB4 or approved equal. The jacket shall be further mechanically secured to the duct with 6 mm wide soft aluminum bands, generally spaced at 450 mm. Indigenous coarse cloth, canvas roofing felt and asphalt impregnated kraft paper of approved quality are to be used.

3.2.8. All cements and adhesives shall be as recommended by the manufacturer of the insulation. Insulation, insulation jacket, canvas and adhesive shall be fire retardant with a flame spread not larger than 25 and a smoke developed rating not larger than 50 11 when tested in accordance with standard E 84-61 of the ASTM. All adhesives must meet the acceptable VOC limits <50 g/L.

3.2.9. Insulation shall be installed in accordance with the manufacturer's printed installation instructions.

3.2.10. Valves and fittings shall be insulated with the same material as the pipe.

3.2.11. At each hanger or support for chilled water piping, the contractor shall install a section of high-density insulation between the pipe protection saddle and the pipe. Only the lower half of insulation, at hanger, will be replaced by an insert of high-density material so the top of pipe insulation and vapour barrier can be continuous. The high-density insulation shall be calcium silicate or a polymeric rigid EPDM foam rubber. Seal with vapour barrier mastic.

3.2.12. Insulation for diesel or gas engine exhaust pipe and muffler shall be 50mm (2") thick calcium silicate. Do not insulate expansion bellows. Insulation shall be protected with 1.0mm aluminum cladding.

3.2.13. Where pipes are exposed to outside or unconditioned exposed spaces, they shall be covered with 0.8 mm thick Aluminium cladding.

3.2.14. Insulation for pipes, duct and other equipment in mechanical rooms and where exposed to weather; shall be enclosed in 0.8mm thick aluminum cladding with all joints sealed and arranged to shed water.

3.2.15. Where thermal insulation is applied to the outside, equipment and plant used to convey, store or generate fluids or gases at temperatures lower than the design ambient dew point temperature a water vapour barrier shall be provided. The vapour barrier shall be applied such that it is continuous and gives protection to the whole surface of the insulation, which it protects. It shall not be pierced or otherwise, damaged by supports or by the application of external cladding. At points of support, means of load distribution shall be provided as necessary.

3.2.16. Apply insulation in strict accordance with manufacturer’s recommendation including all seals and adhesive taking care of compatibility of such adhesives with the insulation. Submit manufacturer’s data and compatibility recommendations for review.

3.2.17. Fiberglass insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:

- Provide vapor barrier jackets, factory applied or field applied.
- Insulate fittings, joints, flanges, unions, strainers, flexible connectors, and valves with molded insulation of like material and thickness as adjacent pipe. PVC or aluminum covers are required in all exposed locations as in mechanical rooms.
- Finish with glass cloth and vapor barrier adhesive.
- Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
- Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

3.2.18. Cellular foam insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:

- Insulate fittings, joints, flanges, unions, strainers, flexible connectors, and valves with molded insulation of like material and thickness as adjacent pipe. PVC or aluminum covers are required in all exposed locations as in mechanical rooms.
- Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
- Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- Provide rigid foam hangers as specified above between hanger and pipe.

3.2.19. Fiberglass insulated pipes conveying fluids above ambient temperature:

- Provide vapor barrier jackets, factory applied or field applied.

- Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. PVC covers are required in all exposed locations.
- Finish with glass cloth and adhesive.
- Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
- For hot piping conveying fluids, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- For steam and condensate piping, insulate flanges and unions.

3.2.20. Finish insulation at supports, protrusions, and interruptions.

3.2.21. For pipe exposed below 10 feet above finished floor, finish with PVC jacket and PVC fitting covers.

3.2.22. For piping exposed in mechanical rooms below 10 feet above finished floor, finish with aluminum jacket and aluminum fitting covers.

3.2.23. All valves in insulated systems shall have valve stem extensions. Insulation installer shall notify the contractor and Owner if valves without stem extensions are encountered. All valves without stem extensions in areas where stem extensions are required shall be replaced.

3.2.24. Install insulation blanket on steam and condensate valves.

3.2.25. Provide insulation clearance and access to valves and fittings in hangers and from structure and other equipment. Insulation shall be continuous through all hangers and supports.

Foam or closed cell insulation on black or galvanized iron pipe operating below ambient temperature is not permitted.

Pipes, Fittings and Valves

PART ONE GENERAL

- All chilled water & condenser water piping shall be Seamless Black Steel Schedule 40 conforming to ASTM A53 and shall be provided as per List of Approved Manufacturer.

- Fittings for steel pipes through 2 inches shall be screwed conforming ANSI B16.3 and larger than 2 inches shall be flanged conforming ANSI B 16.9. Welded fittings shall be seam-less, butt welding type, compatible to the schedule of the pipes.

- Flanges shall be slip on type and shall conform to ANSI16.5. All fittings & flanges shall be suitable for 300 psi (20.7 bar) working pressure.

- Condensate drain piping shall be uPVC class E ASTM D1785 or BS3505 with solvent welded fitting for installation inside the building and GI pipe class B (medium) BS1387 with threaded fittings for roof and outside the building installation. Pipe shall be provided as per List of Approved Manufacturer.

- Copper piping shall be seamless pipe ASTM B88 type K plain ends with wrought copper fitting ANSI B16.22

PIPE SUPPORTS:

General: pipe hangers, brackets, saddles, inserts, clamps and pipe rolls including rods, bolts, turn buckles, bases and protection shields shall conform to standard recommended engineering practice, using stock or production parts wherever possible. Chain, wire, strap or other makeshift devices will not be permitted as hangers or supports.

a) Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and pipe weight load at each equipment connection. Pipe hangers shall be capable of supporting the pipe in all conditions of operations. They shall allow free expansion and contraction of the piping and prevent extra stress resulting from transferred weight being included in the pipe or connected equipment. Hangers shall be supported from beams, clamps, concrete inserts Phillips concrete fasteners, and power actuated drive pins. Concrete inserts when used shall be installed in the exact location prior to the pouring of the concrete.

b)

(a) Suspended Horizontal Piping: shall be supported by adjustable hangers or supports, which shall provide a means of vertical adjustment after erection. Unless otherwise indicated on drawings maximum spacing between pipe supports for straight runs of pipe shall be in accordance with recommended spacing shown in accordance with recommended spacing shown in the table given below:

c)

Nominal Pipe Size	0.5	0.75	1	1.5	2	2.5	3	4	5	6	8	10
Inches (mm)	13	20	25	40	50	65	75	100	125	150	200	250
Maximum Span Feet	5	6	7	9	10	11	12	14	16	17	19	22
(Meters)	1.5	1.8	2.1	2.7	3	3.3	3.6	4.2	4.8	5.2	5.8	6.7
Rod Size dia. mm.	10	10	10	10	10	13	13	16	16	19	22	22

d)

e) Pipe hangers and supports shall be spaced not over 5 feet (1.5m) apart at heavy fittings and valves.

f)

g) A hanger shall be installed not over 1 foot (0.3m) from each change in direction of piping. Where necessary to prevent vibration transmission, the support closest to the sources of vibration shall be spring cushion, or other approved type of isolation hanger. Where the piping system is subject to shock loads, such as thrusts imposed by the actuation of safety valves, hanger design shall include provision of shock absorbing devices of approved design. Hangers shall be designed so that they cannot become disengaged by movements of the supported pipe.

h)

(c) Vertical Piping: shall be guided or supported in the center of each riser but not over 15 feet on center and shall be supported at the base of the riser on a base elbow or tee with a pipe stand only where required. For un-insulated brass or copper pipe or tubing, the riser clamp shall be compatible nonferrous or electrolytically coated steel as for hangers.

(d) Piping in trenches: Pipes shall rest on suitable wall floor supports with rollers.

(e) Pipe Sleeves: Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction or afterwards if necessary. Each sleeve shall extend through its respective wall, floor or roof and shall be cut flush with each surface. Sleeves shall be of such size as to provide a minimum of 1/4" all around clearance between bare pipe and sleeve or between jacket over insulation and sleeve. Sleeves in bearing walls shall be steel or cast iron pipe. Sleeves in non-bearing walls, floors, or ceiling may be steel pipe, cast iron pipe or G.I. sheet metal gauge 14, with lock type longitudinal seam. Sleeves in bearing walls shall be steel or cast iron pipe.

INSTALLATION:

(a) General: Chilled water piping shall include all piping and connections between water chillers, pumps and terminal units.

i)

j) All stop valves, check valves, globe valves, (calibrated balancing valves) control valves, drain cocks, expansion joints, compensators, automatic air vents, thermometers, pressure gages, strainers and other specialties required for proper operation of the whole system shall be provided, even if not indicated on the drawings.

Pipes shall be cut accurately to measurements established at the job site and worked into place without springing or forcing, properly clearing all windows, doors and other openings. Excessive cutting or other weakening of the building structure to facilitate piping insulation will not be permitted without written approval. Layout drawings required under the title of "APPROVAL OF MATERIAL AND EQUIPMENT" shall show locations of all supports, the load imposed on each fastening or anchor, typical details for special anchorage, and details for special anchorage for supports attached to metal roof decking, for suspended piping, valves, tank, pumps, converters, and other mechanical equipment. Supports shall be attached to metal decking. Where supports are required between structural framing shall be provided and detailed. Pipe shall have burrs removed by reaming and shall be installed to permit free expansion and contraction without damage to joints and hangers. Changes in direction shall be made with fittings, except that bending of pipe bender is used and wide sweep bends are formed. The centerline radius of bends shall not be less than 6 diameters of the pipe. Bent pipe showing kinks wrinkles, flattening or other mal-formations will not be accepted. All piping shall be installed with sufficient pitch to ensure adequate drainage and venting. Piping connections to equipment shall be provided with unions or flanges. Open ends of pipelines or equipment shall be properly capped or plugged during installation to keep dirt and other foreign matters out of the system.

(b) Screwed joints shall be used on pipes of diameter 2" and below. Screwed joints shall be made with tampered threads properly cut. Joints shall be made tight with a stiff

mixture of litharge and glycerin, or polytetrafluoroethylene tape, or approved thread joint compound applied to the male thread only. Not more than three threads shall show after the joint is made up.

(c) Welded joints shall be used on pipes of diameter above 2" Welded joints shall be fusion-welded by metal arc welding method unless otherwise required. Changes in direction of piping shall be made with welding fittings only. Mitering or notching pipe to form elbows and tees or other similar construction will not be permitted. Branch connections shall be made with welding tees or forged welding tees or forged welding outlets.

k) Field and shop bevels shall be in accordance with the recognized standards and shall be done mechanically by means of flame cutting. Where beveling is done by flame cutting, surfaces shall be cleaned of scale and oxidation prior to welding.

Before welding, the component parts to be welded shall be aligned so that no strain is placed on the weld when finally positioned. Height shall be so aligned that no part of the pipe wall is offset by more than 29% of the wall thickness. Flanges and branches shall be set true. This alignment shall be preserved during the welding operation.

Removing and replacing defective welds shall be at no additional cost to the Owner. Repairing of defective welds by adding new material over the defects or by penning will not be permitted. Electrodes shall be stored in a dry heated area and shall be kept free of moisture or dampness during fabrication operations. Electrodes that have lost part of their coating shall be discarded.

(d) Flanges and Unions shall be faced true. Flanges shall be provided with compressed fibre gasket, and made square and tight. Except where copper tubing is used, unions or flanged joints shall be provided in each line immediately preceding the connection to each piece of equipment such as coils, pumps, control valves and other similar items.

(e) All Anchors, nuts, bolts, screws, fasteners and rivets shall be of from approve manufacturer's list.

VALVES:

GATE VALVES:

Gate valves upto 2 inches shall be with threaded ends, bronze body, with union bonnet, non-rising stem and wedge disc. Hand wheel nut, packing nut, gland, stuffing box, bonnet, bonnet ring, disc and body shall be of bronze. Hand wheel shall be of malleable iron. Packing shall be graphited asbestos. Stem shall be manganese bronze.

Gate valves 2.5 inches and above shall be cast iron body bronze mounted with flanges ends.

These shall be of solid wedge disc type, with outside screw and yoke. Body and bonnet shall be of cast iron. Wedge shall be of cast iron with bronze disc. Seat rings shall be bronze. Packing gland shall be cast iron. Yoke shall be of cast iron and yoke nuts shall be of bronze. Hand wheel shall be of cast iron.

All valves shall be rated for ANSI 150 Lbs., 300 psig & 200^{o}F working pressure and temperature, shall be provided as per List of Approved Manufacturer.

GLOBE VALVES:

Globe valves up to 2 inches shall be bronze with threaded ends. Body, bonnet, disc holder, stems lock nut; packing nut and disc lock nut shall be of bronze. Hand wheel shall be malleable iron with stem of manganese bronze. Renewable composition disc shall be provided suitable for water & steam. Packing shall be graphited asbestos.

Globe valves 2.5 inches and above shall be cast iron body; bronze faced disc and yoke bonnet, and shall be flanged. Hand wheel, gland, bonnet and body shall be of cast iron. Stem shall be of manganese bronze. Packing shall be graphited asbestos. Stem lock nut, disc and seat ring shall be of bronze. Disc shall be renewable composition type.

All valves shall be rated for ANSI 150 Lbs. 300 psig & 200°F working pressure and temperature, shall be provided as per List of Approved Manufacturer.

SWING CHECK VALVES:

Check valves up to 2 inches shall be with threaded ends Cap, hinge pin, body, hinge, disc nut and disc shall be of bronze.

Check valves larger than 2 inches shall be of cast iron body, including valve cap and disc. Hinge pin, seat ring and disc ring shall be of bronze. Ends shall be flanged.

All valves shall be rated for ANSI 150 Lbs. 300 psig & 200°F working pressure and temperature, and shall be provided as per List of Approved Manufacturer.

BALANCING VALVES:

Calibrated Balancing Valves: shall be furnished & installed where shown on the drawings. The valves shall have NPT connections (Internal Threads) suitable for 362 psig (25 bar) for pipe size 50 mm or below, or flanged connections suitable for 300 psig (20.7 bar) for pipe size 65 mm or above, as required. The Valves shall be suitable sized between 3.0 to 6.0 Pa at fully open position. The balancing valves shall have measuring points for connecting a direct flow rate read-out meter. The measuring points shall be self-sealing type to prevent system fluid loss during balancing/monitoring. The measuring points shall be easily accessible for measuring purpose, especially on the flanged valves; it should be located on the flanged. Each balancing valve shall have a calibrated digital hand wheel for easy determination of location of the hand wheel by directly reading the number of turns on the top of the hand wheel. Each balancing valve shall have a nameplate to assure specific value settings and shall be constructed with internal spindle seals (EPDM O-rings) to prevent leakage around the rotating element.

Balancing Valves shall be provided as per List of Approved Manufacturer.

Y-STRAINERS:

Strainers shall be "Y" types, with bronze body and threaded ends up to 2 inches. Screen shall be of 20 mesh monel.

Strainers above 2 inches shall have cast iron body with flanged ends. Screen cover shall be provided with blow off taping. Screen shall be of perforated stainless steel, 233 holes per sq. inch, with 0.045 inch diameter holes and 0.016 inch thick screen.

All strainers shall be rated for ANSI 150 Lbs. 300 psig & 200°F working pressure and temperature, shall be provided as per List of Approved Manufacturer.

Fan Coil Units (FCU)

PART 1 – GENERAL

1.1. **Section Includes**

A. Vertical Fan Coil Units.

1.2. **Reference Standards**

A. All referenced standards and recommended practices in this section pertain to the most recent publication thereof, including all addenda and errata.
B. AHRI 260 – Standard Sound Rating of Ducted Air Moving and Conditioning Equipment.
C. AHRI 350 – Standard Sound Rating of Non-Ducted Air Moving and Conditioning Equipment.
D. AHRI 410 – Standard for Forced-Circulation Air-Cooling and Air-Heating Coils.
E. AHRI 440 – Standard for Performance Rating of Room Fan-Coils.
F. ASHRAE 62.1 – Standard for Ventilation for Acceptable Indoor Air Quality.
G. ASHRAE 79 – Standard Method of Test for Fan-Coil Units
H. ASTM C1338 – Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
I. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
J. ASTM E488/E488M – Standard Test Methods for Strength of Anchors in Concrete Elements.
K. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
L. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.
M. UL 181 – Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.

1.3. **Submittals**

N. Product Data shall be provided with data indicating configuration, general assembly, and materials used in fabrication, including catalog performance ratings that indicate airflow, static pressure, sound power levels, electrical characteristics, and connection requirements.
O. Shop Drawings shall indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
P. Manufacturer shall include schedules listing sound power level for each of second through eighth octave bands at the specified static pressures.
Q. Certificates shall be issued to certify that the airflow, coil capacities, pressure drops, and selection procedures meet or exceed specified requirements or fan coils are tested and rated in accordance with AHRI 440.
R. Manufacturer's Installation Instructions shall indicate support and mounting details, installation instructions, recommendations, and service clearances required.
S. Project Record Documents shall record actual locations of units and controls components and locations of access doors.
T. Operation and Maintenance Data shall include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists.
U. Manufacturer’s warranty shall be submitted and ensure forms have been completed in Owner's name and registered with manufacturer.
V. Maintenance Materials shall be furnished for the Owner's use in maintenance of the project.

1.4. **Quality Assurance**

W. Manufacturer Qualifications shall be specified in this section, with minimum ten years of documented experience.

X. Product Listing Organization Qualifications: The manufacturer shall be listed with an organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and be acceptable to authorities having jurisdiction.

1.5. **Warranty**

Y. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
Z. Provide 18 month manufacturer warranty from date of shipment for air fan coil units, integral sound attenuators, integral heating coils, and integral controls.

PART 2 – PRODUCTS

2.1. **General**

AA. Basis of Design: Price Industries, Inc.
1. Vertical Fan Coil Unit, Concealed: FCVC.
2. Vertical Fan Coil Unit, Exposed, Flat-Top: FCVE
3. Vertical Fan Coil Unit, Exposed, Slope-Top: FCVS

BB. Performance Requirements:
1. Units shall have published sound power level data per AHRI 260 or AHRI 350 depending on production configuration.
2. Unit shall be performance certified with the latest edition of AHRI 440.
3. Units shall be ETL listed in compliance with UL 60335 standards.

2.2. **Vertical Fan Coil Units, Exposed**

CC. General:
1. Furnish and install Price FCVE Fan Coil Units where indicated on the plans and in the specifications.
    a. (**Optional**) Furnish and install Price FCVS Fan Coil Units where indicated on the plans and in the specifications
2. Units shall be completely factory assembled, tested and shipped as a single piece.
3. All units shall be capable of meeting AHRI performance for the scheduled capacities for cooling, heating and air delivery.
4. All unit dimensions for each model and size shall be considered maximums.

DD. Construction:
1. Unit Casing:
    a. The unit casing shall be fabricated of 18-gauge galvanized steel panels with powder coating.
    b. All units shall have a stamped louver discharge.
        ii. (**Optional**) All units shall have a Price 610 series single deflection grille
        iii. (**Optional**) All units shall have a Price LBP linear bar grille
    a. All exterior panels will be uninsulated
    b. All panels of the interior unit downstream of the forward curve fans shall be insulated with 1/2-inch thick insulation.
3. Blower:
    a. The blower shall be a dynamically balanced, forward curved, double width/double inlet (DWDI) centrifugal type, constructed of zinc coated galvanized steel for corrosion resistance.
4. Motor:
    a. The unit shall be supplied with an electronically commutated motor (ECM), complete with a single phase integrated controller/inverter that operates the wound stator and senses motor position to electronically commutate the stator.
    b. The motor rotor shall be permanent magnet type with near zero rotor losses.

c. The motor shall be permanently lubricated with ball bearings, maintaining a minimum of 70% efficiency over its entire operating range.
d. The ECM shall be furnished with factory programming:
    1. High Turndown Flow Program
        a. A modulating high turndown flow program shall be provided to allow the ECM to operate with constant torque to vary the airflow with fluctuations in external static pressure

5. Motor Controller:
    e. (**Optional**): The motor shall be supplied complete with a manual fan speed controller for field adjustment of fan air flow set-point.
        1. The speed controller shall accept as standard a [0-10VDC], or [4-20mA] signal for remote fan adjustment from a building automation system.
    f. (**Optional**): The motor shall be supplied complete with a 3-speed fan speed controller for field adjustment of fan air flow set-point.
        1. The speed controller shall accept as standard low voltage 3-speed thermostat signal [24 VAC] for energizing one of the three speeds.
6. Drain Pans:
    a. All units shall be supplied with primary and auxiliary condensate drain pans with single wall, galvanized steel for corrosion resistance.
    b. The primary drain pan shall extend under the entire cooling coil
    c. The auxiliary drain pan shall be mounted to for condensate from the primary drain pan and optional piping packages. The
    d. Drain pans shall be of one-piece construction and be positively sloped for condensate removal.
    e. Drain pans shall be externally insulated with fire retardant foam insulation. The insulation shall carry no more than a 25/50 Flame Spread and Smoke Developed Rating per ASTM E84 and UL 723 and an Antimicrobial Performance Rating of zero with no observed growth per UL 181.
    f. (**Optional**): Provide primary and auxiliary drain pan with type 304 stainless steel construction for superior corrosion resistance. Stainless steel drain pans shall be externally insulated and meet or exceed the requirements stated above.
    g. (**Optional**): Provide a secondary drain connection on the auxiliary drain pan for condensate overflow.
7. Filters:
    i. All units shall be furnished with a minimum two inch thick nominal pleated filter.
    ii. The filter shall have a Minimum Efficiency Reporting Value (MERV) of MERV8.
    iii. (**Optional**): The units shall be furnished with a two inch pleated [MERV13] filter.
8. Electrical:
    a. Units shall be furnished with single point power connection.
    b. Units shall be furnished with a NEMA 250, Type 1 electrical enclosure.
9. Unit Options and Accessories:
    b. Water Cooling and Heating Coils:
        1. All water coils shall be tested with the assembly, rated and certified in accordance with the current edition of AHRI 440 and AHRI 410, and shall bear the AHRI seal on the unit casing.
        2. All cooling and heating coils shall optimize rows and fins per inch to meet the specified capacity.
        3. Coils shall have seamless copper tubes and shall be mechanically expanded to provide an efficient, permanent bond between the tube and fin.
        4. Fins shall have high efficiency aluminum surface optimized for heat transfer, air pressure drop and carryover.

5. All water coils shall be hydrostatically tested to a minimum 390 pounds per square inch, with a minimum burst pressure of 1800 pounds per square inch at ambient temperature. All water coils are rated for a maximum of 300 pounds per square inch working pressure at 200 degrees Fahrenheit.

c. Liners (**select one**):
   1. Fiberglass Liner – FG:
      a. Insulation shall comply with the requirements of UL 181 (erosion), ASTM C1338 (fungi resistance), ASHRAE 62.1, and ASTM C1071, having a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84 and NFPA 90A. The insulation shall comply with Antimicrobial Performance Rating of 0 with no observed growth, per UL181.
         1. The insulation shall be secured with adhesive.
         2. Insulation edges exposed to the airstream shall be coated with NFPA approved sealant.
   2. Closed Cell Polymeric Foam Insulation – FF
      a. Insulation shall conform to UL 181 (erosion) and NFPA 90A for fire, smoke and melting, and comply with a 25/50 Flame Spread and Smoke Developed Index per ASTM E84 or UL 723.
      b. The insulation shall be secured with adhesive.

a. Unit Mounting:
   1. The unit shall be mounted with the use of wall anchors supplied by others. The manufacturer shall supply anchor holes on the 20-gauge zinc coated back panel

PART 3 – EXECUTION

3.1. **Installation**

EE. Install the fan coil units in accordance with the manufacturer's instructions.
FF. See drawings for the size(s) and duct location(s) of the fan coil units.
GG. Support the fan coil units individually from the structure.
HH. Embed anchors in concrete in accordance with ASTM E488/E488M.
II. Do not support the fan coils from the ductwork.
JJ. Install heating coils in accordance with Section 23 82 00.
KK. Verify that electric power is available and of the correct characteristics.

List of Approved Manufacturers/Sources of Mechanical Equipment

* All Equipment shall be procured from Principal Authorized agents / distributors / resellers

Bidder must submit the technical submittal of each item to the Engineer In-charge for approval before delivery of any material. The Bidder shall fill the name of only one manufacturer for each equipment/material on which the tender is based. He shall be bound to supply the equipment from the same manufacturer. In case, the Bidder gives names of more than one manufacturer against any equipment, the Engineer / Owner can ask the Bidder supply the equipment from any one of them.

During the execution stage if the material from any supplier is found defective / substandard the Engineer / Owner reserves the right to ask the successful bidder to replace his choice of manufacturer / supplier for that particular equipment.

Any change in manufacturer / supplier shall only be entertained if there is sufficient reason that adhering to the original choice of manufacturer / supplier shall be detrimental to either the project quality or project timeline. Proper approval shall have to be sought for change in the choice manufacturer / supplier at least 1 month before the equipment is to be procured.

S.NO.	EQUIPMENT / MATERIAL	RECOMMENDED MANUFACTURERS
1	Thermometers / Pressure Gages	Trerice, Weksler, Weiss (USA)
2	Air Handling Units	Carrier, York, Samsung, LG, Daikin, Trane
3	Gate Valves, Globe Valves, Strainers, Check Valves, Ball Valves	Kitz Japan Crane UK Tour Andersson USA Hattersley UK
4	GI SHEET FOR DUCTS	a) PAKISTAN STEEL, PAKISTAN b) ISL, PAKISTAN
5	FLEXIBLE DUCT CONNECTOR	a) DURODYNE b) DUCTMATE
6	XLPE FOAM INSULATION SHEET	a) AEROFOAM b) GULF-O-FLEX c) DURKFLEX d) INCOFLEX - WEITINAM
7	AIR DISTRIBUTION OUTLETS	a) MEHRAN b) THERMEC c) STEEL CRAFT d) ENGINEERING AIR PRODUCTS (EAP)
8	VOLUME DAMPERS	a) MEHRAN b) THERMEC c) STEEL CRAFT e) ENGINEERING AIR PRODUCTS (EAP)
9	FIRE DAMPERS	a) MEHRAN b) THERMEC c) STEEL CRAFT e) ENGINEERING AIR PRODUCTS (EAP)
10	CLOSED CELL FOAM INSULATION (NBR)	a) AEROFLEX b) GULF-O-FLEX c) DURKFLEX d) INCOFLEX - WEITINAM
11	HANGERS & SUPPORTS	a) HILTI

		b) INKA c) SIKLA d) INDEX
12	MOTOR CONTROL CENTER (MCC), DISTRIBUTION BOARD (DB)	HUSSAIN AND CO. UNIQUE ENGINEERING HRA SWITCHGEARS RA ENGINEERING TAJ ENGINEERING, PAKISTAN A TO ZEE, PAKISTAN KARIMI ELECTROMECH SYSTEM OR APPROVED EQUIVALENT
13	ELECTRIC POWER CABLES	PAKISTAN CABLES FAST CABLES NEW AGE CABLES PIONEER CABLES OR APPROVED EQUIVALENT
14	Chilled Water Piping	a) Huffaz Pakistan b) Lontrin China c) Protek China d) Hebei China
15	UPVC PIPING FOR CONDENSATE	a) NEPRO, UAE b) COSMOPLAST, UAE c) JEDDAH POLYMER
16	PVC CONDUIT FOR ELECTRICAL WORKS (POWER, CONTROL & COMMINUCATION WIRING – CONCEALED / RECESSED APPLICATION) GI CONDUIT FOR ELECTRICAL WORKS (POWER, CONTROL & COMMUNICATION WIRING – SURFACED / EXPOSED / ABOVE FALSE CEILING APPLICATION)	GALCO DADEX JEDDAH POLYMER OR APPROVED EQUIVALENT
17	VIBRATION ISOLATOR	a) KINETICS, USA b) MASON, USA
18	ADHESIVE AND SEALENT	a) ZAHABIYA b) CLARIANT c) DUCTMATE
19	REINFORCED UL LISTED FSK FACING ALUMINIUM FOIL TAPE	a) ABRO b) 3M c) NASHUA d) SCAPA
20	SHUTT OFF VALVE	a) DANFOSS, DENMARK

DRAWINGS

RAAST SUBSIDIARY - 4TH FLOOR BSC BUILDING

STATE BANK OF PAKISTAN
SBP BSC (BANK)

ISSUED FOR TENDER SUBMISSION

GENERAL NOTES

THE CONTRACTOR OF THE PROPOSED HVAC WORKS AT 4TH FLOOR RAAST SECTION STATE BANK OF PAKISTAN SHALL OBSERVE ADHERENCE TO THE GENERAL PROVISION OF THE BUILDING REGULATION AND COMPLIANCE WITH THE FOLLOWING NOTES :

1- THE CONTRACTOR SHALL COMPLY WITH THE CURRENT BS (*OR RELEVANT ASTM,AS) WITH RESPECT TO ANY MATERIALS OR WORK NOT SPECIFIED IN DETAIL IN THE CONSULTANT'S SPECIFICATIONS OR DRAWINGS.

2- THE HVAC SYSTEM DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE CORRESPONDING ARCHITECTURAL, FIRE PROTECTION, ELECTRICAL, SANITARY, PLUMBING AND STRUCTURAL DRAWINGS.

3- IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE LOCATION OF ALL HVAC EQUIPMENT DUCTING AND PIPING etc. FORMING PART OF THIS CONTRACT IS COORDINATED WITH:
a) ALL ARCHITECTURAL & REFLECTED CEILING PLANS
b) ALL OTHER MEP SERVICES.
c) STRUCTURAL MEMBERS

4- DO NOT SCALE THE DRAWINGS. ALL DIMENSIONS SHALL BE READ FROM THE DRAWINGS OR COMPUTED.

5- ALL EQUIPMENT AND DEVICES SHALL BE UL APPROVED (OR HAVE AN EQUIVALENT CERTIFICATION,WHERE REQUIRED)

6 ALL DIMENSIONS SHOWN ARE FOR GUIDANCE & FROM FINISHED FLOOR/WALL. MAKE NECESSARY DIMENSIONAL ALLOWANCES.

7- ALL WORK SHALL COMPLY WITH ALL APPLICABLE LOCAL, STATE AND HEALTH CODES.

8- LEAVE PROVISION FOR ALL A.C CONDENSATE DRAINS AND (FOR MAINTENANCE PURPOSES) TO BE CONNECTED AT CONDENSATE DRAIN RISER AS PER DRAWING TO BE COORDINATED AT SITE

9- ALL DIMENSIONS ARE IN IPI. UNITS UNLESS OTHERWISE INDICATED.

10- A MINIMUM OF 500mm IS REQUIRED BETWEEN ANY TWO ITEMS PENETRATING RETAINING WALLS/SLABS.

11- REFER TO SHEETS D01.01 FOR EQUIPMENT SCHEDULES.

12- NO WORK SHOULD BE DONE AT SITE WITHOUT APPROVED ``SHOP DRAWING`` ANY SUCH WORK IS AT THE CONTRACTORS RISK & COST.

13- ``SHOP DRAWINGS`` TO INCLUDE AT LEAST B.O.P. LEVELS, B.O.D LEVELS, PIPE AND EQUIPMENT INVERTS, DOUBLE LINE PIPING, TIE DIMENSIONS VALVES/FITTINGS TO SCALE ETC, SECTIONS, INSTALLATION DETAILS ETC. & TO BE WITH ALL TRADES.

14- CONTRACTOR MUST ESTABLISH THAT ALL EQUIPMENT OFFERED/SUPPLIED ARE ABLE TO FIT INTO SPACES INTENDED.

15- WHEREVER PIPING RUNS ACROSS A BUILDING EXPANSION JOINT PROVIDE A FLEXIBLE EXPANSION COUPLING. (AND AS SHOWN ON DRAWINGS)

16- THE CONTRACTOR TO COORDINATE WITH OTHER TRADES TO ENSURE SUFFICIENT SPACE AVAILABLE FOR ACCESS TO PIPING, VALVE & ETC.

17- ALL EQUIPMENT TO BE INSTALLED AS PER MANUFACTURER'S RECOMMENDATION.

18- VALVES TO BE INSTALLED SUCH THAT THEY ARE EASILY OPERABLE AND SERVICEABLE AND SUCH THAT ACCESS PANELS ARE MINIMIZED.

19- ALL EQUIPMENT MUST BE AS PER SPECIFICATIONS AND CONFORM TO RELEVANT CODES AND STANDARD.

20- ALL SYSTEMS SHALL BE INSTALLED & SUPPLIED IN CONFORMANCE WITH RELEVANT AUTHORITIES RULES, REGULATIONS & REQUIREMENTS.

ABBREVIATIONS

ABBREVIATION	DESIGNATION
FAD	FRESH AIR DUCT
RAD	RETURN AIR DUCT
EAD	EXHAUST AIR DUCT
SAD	SUPPLY AIR DUCT
TE	TOILET EXHAUST
SP	SPLIT UNIT
CU	CONDENSING UNIT
SAG	SUPPLY AIR GRILLE
RAG	RETURN AIR GRILLE
SALSD	SUPPLY AIR LINEAR SLOT DIFFUSER
RALSD	RETURN AIR LINEAR SLOT DIFFUSER
VD	VOLUME CONTROL DAMPER

EQUIPMENT LEGENDS

SYMBOL	DESIGNATION
	SUPPLY AIR DIFFUSER
	RETURN AIR DIFFUSER
	SUPPLY AIR GRILLE
	RETURN AIR GRILLE
	SUPPLY LINEAR SLOT DIFFUSER
	RETURN LINEAR SLOT DIFFUSER
	TOILET EXHAUST DIFFUSER
	INLINE EXHAUST FAN
	WALL MOUNTED EXHAUST FAN
	INDOOR SPLIT UNIT
	CONDENSING UNIT
VD	VOLUME CONTROL DAMPER
	FLEXIBLE DUCT

PIPE LEGENDS

SYMBOL	DESIGNATION
	CHILLED WATER SUPPLY
	CHILLED WATER RETURN
	CONDENSATE DRAIN
	BMO WITH WIRE MESH

S#	DRAWING NO.	DRAWING TITLE
LIST OF DRAWINGS		
1	SBP-M-00	MECHANICAL LEGENDS NOTES AND SCHEDULE
2	SBP-M-01	MECHANICAL STANDARD DETAIL
3	SBP-M-02	HVAC LAYOUT FOR 4TH FLOOR

AIR HANDLING UNIT

S.NO	EQUIPMENT NO	Qty	LOCATION	FLOW RATE (CFM)	COOLING COIL										FAN			ELECTRICAL CHARACTERISTICS	REMARKS
					AIR ON (^{O}F)		AIR OFF (^{O}F)		COOLING COIL CAPACITY		WATER TEMP. ^{O}F		WATER FLOW	MAX FACE VELOCITY	ESP	MAX OUTLET VELOCITY	MOTOR		
					DBT	WBT	DBT	WBT	TOTAL MBH	SENSIBLE MBH	IN	OUT	GPM	FPM	Pa	FPM	kW		
1	AHU-1	1	ROOF	7200	75.00	62.50	55.00	54.30	170.20	205.10	44.0	56.0	44.30	500	500.00	1,500	10.00	400/3/50	VFD TO BE INCLUDED
2	AHU-2	1	4TH FLOOR	18000	75.00	62.50	55.00	54.30	443.40	515.60	44.0	56.0	103.12	500	500.00	1,500	20.00	400/3/50	

NOTES:
1- CONTRACTOR TO CALCULATE ACTUAL EXTERNAL STATIC PRESSURE AS PER SITE CONDITIONS AND SUBMIT FOR ENGINEER'S APPROVAL

VAV SCHEDULE

S.NO	EQUIPMENT NO	Qty	LOCATION	MAX FLOW RATE (CFM)	MIN FLOW RATE (CFM)	FAN			REMARKS
						ESP	MAX OUTLET VELOCITY	MOTOR	
						in	FPM	kW	
1	VAV-1	2	RECEPTION AREA	600	0	0.25	500.00	0.24	RECTANGULAR TYPE EQUIPED WITH THERMOSTAT AND CONTROL WIRE

NOTES:
1- CONTRACTOR TO SELECT VAV FROM MANUFACTURER AND SUBMIT THE SELECTION. DUCT SIZE AFTER VAV SHALL BE AS PER VAV OPENING CONNECTION

STATE BANK OF PAKISTAN
SBP BSC (BANK)

EXISTING 4th FLOOR OF SBP.BSC SUBSIDIARY HOUSE KARACHI AT SBP MAIN BUILDING. KARACHI

CAD BY : HVAC LAYOUT FOR 4TH FLOOR

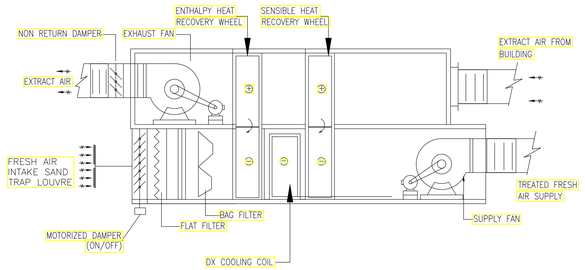
CHEKED BY : ISSUED FOR TENDER SUBMISSION

SCALE: 3/32"=1'

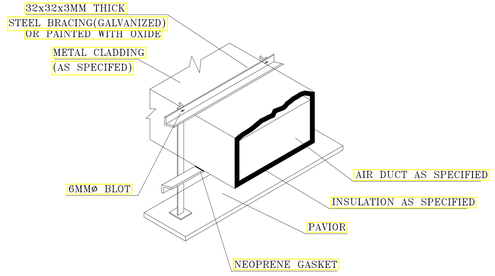
DATE: OCT-25

JOB:NO. SFK

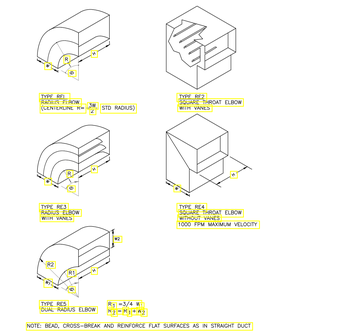
DRG:NO. SBP-M-00



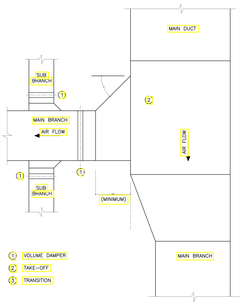
01 M TYPICAL AIR HANDLING UNIT
SCALE N.T.S.



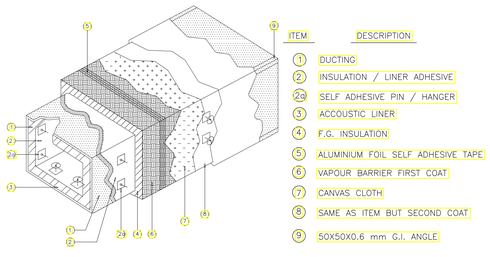
02 M DUCT SUPPORT AT ROOF
SCALE: N.T.S



03 M RECTANGULAR DUCT TRANSITION DETAILS
SCALE N.T.S.

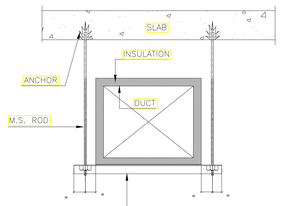


04 M RECTANGULAR BRANCH DUCT TAKE-OFF
SCALE: N.T.S.



NOTES:
1) 25mm THICK SOUND LINER INSIDE DUCT FOR DISTANCE UP 3M. FROM THE FAN DISCHARGE OF AHU's.
2) WHERE SOUND LINER IS APPLIED DUCT SIZE INDICATED ON PLANS IS INSIDE FINISHED SIZE.

05 M DETAIL OF SOUND LINER AND THERMAL INSULATION ON AIR DUCTS
SCALE: N.T.S



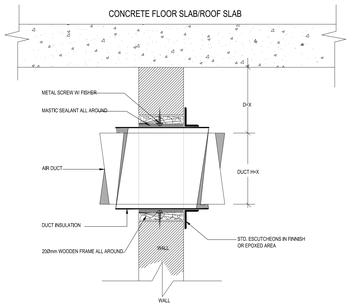
DUCT SIZE (mm)	ROD DIA SIZE (mm)	ANGLE IRON SIZE (mm)	DISTANCE BETWEEN SUPPORT (mm)
UPTO 300	6	25x25x3	3000
325–450	6	25x25x3	3000
475–750	6	25x25x3	3000
775–1065	6	40x40x3	2700
1090–1370	8	40x40x3	2700
1400–1500	10	40x40x3	2700
1525–2130	10	50x50x5	2400
2160–2440	10	50x50x5	2400

06 M DUCT HANGERS SCHEDULE
SCALE N.I.S

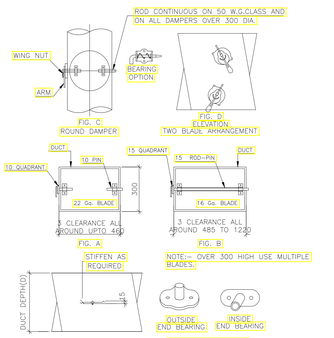
G.I DUCT WORK SCHEDULE

LARGER DIMENSION	SHEET METAL GAUGE	REINFORCEMENT SPACING	TRANSVERSE JOINT REINFORCEMENT	INTERMEDIATE BRACING	DIST. OF BRACING TRANSVERSE JOINT
UPTO 12"	24 SWG	4'-0"	DRIVE SLIP 24 SWG	NIL	NIL
13" - 24"	24 SWG	4'-0"	STANDIND SLIP 1"X24 SWG	NIL	NIL
26" - 48"	22 SWG	4'-0"	REINFORCED BAR SLIP 1"xl/8"	NIL	NIL
50" - 60"	20 SWG	4'-0"	COMPANION ANGLES L 1.25"xl.25"x3/16"	NIL	NIL
62" - 84"	20 SWG	4'-0"	COMPANION ANGLES L 1.50"xl.50"x3/16"	L 1.50"xl.50"x3/16"	2'-0"
-	-	-	-	-	-

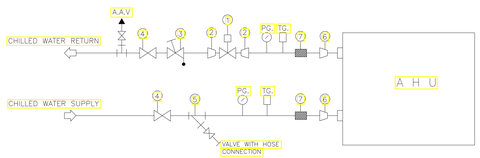
07 M GI DUCT WORK SCHEDULE
SCALE N.T.S.



08 M DUCT PENETRATION THROUGH WALL
SCALE: N.T.S



10 M VOLUME DAMPER DETAILS
SCALE: N.T.S



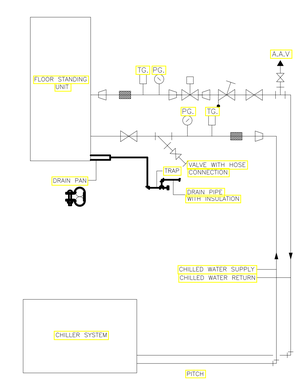
LIST OF VALVES AND FITTINGS FOR AHU

ITEM No.	DESCRIPTION	QTY.
1	3-WAY CONTROL VALVE	
2	REDUCER (SIZE TO SUIT 2-WAY CONTROL VALVE)	
3	ORV WITH MEASURING STATION – FLANCE FOR 2-1/2"DIA. & ABOVE (ORV = DOUBLE REGULATING VALVE) – THREADED, 2"DIA FOR 2"DIA & BELOW	
4	GATE FOR PIPE SIZE 2-1/2"DIA. & ABOVE VALVE, FOR PIPE SIZE 2"DIA & BELOW – THREADED	
5	Y STRAINER – FLANGE FOR 2-1/2"DIA & ABOVE (WITH BLOW-OFF VALVE) – THREADED FOR 2"DIA & BELOW	
6	REDUCERS (SIZE TO SUIT UNIT CONNECTION)	
7	FLEXIBLE CONNECTION	

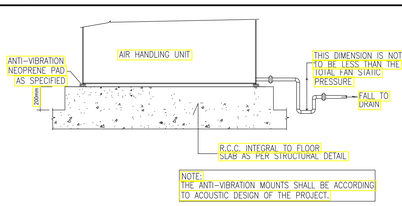
09 M AHU CONNECTION SCHEMATIC
SCALE: N.T.S.

GAUGE	THICKNESS, mm		NOMINAL MASS, KG/m²
	NOMINAL	MINIMUM	
30	0.399	0.319	3.20
28	0.475	0.395	3.81
26	0.551	0.471	4.42
24	0.701	0.601	5.64
22	0.853	0.753	6.86
20	1.006	0.906	8.08
18	1.311	1.181	10.52
16	1.613	1.463	12.96
14	1.994	1.784	16.01
13	2.372	2.162	19.07
12	2.753	2.523	22.12
11	3.132	2.902	25.16
10	3.510	3.280	28.21

10 M SHEET METAL THICKNESS DETAIL
SCALE: N.T.S



11 M FLOOR STANDING UNIT DETAILS
SCALE: N.T.S



11 M AIR HANDLING UNIT BASE
SCALE N.T.S.

STATE BANK OF PAKISTAN
SBP BSC (BANK)

EXISTING 4th FLOOR OF SBP.BSC SUBSIDIARY HOUSE KARACHI AT SBP MAIN BUILDING. KARACHI

CAD BY : HVAC LAYOUT FOR 4TH FLOOR

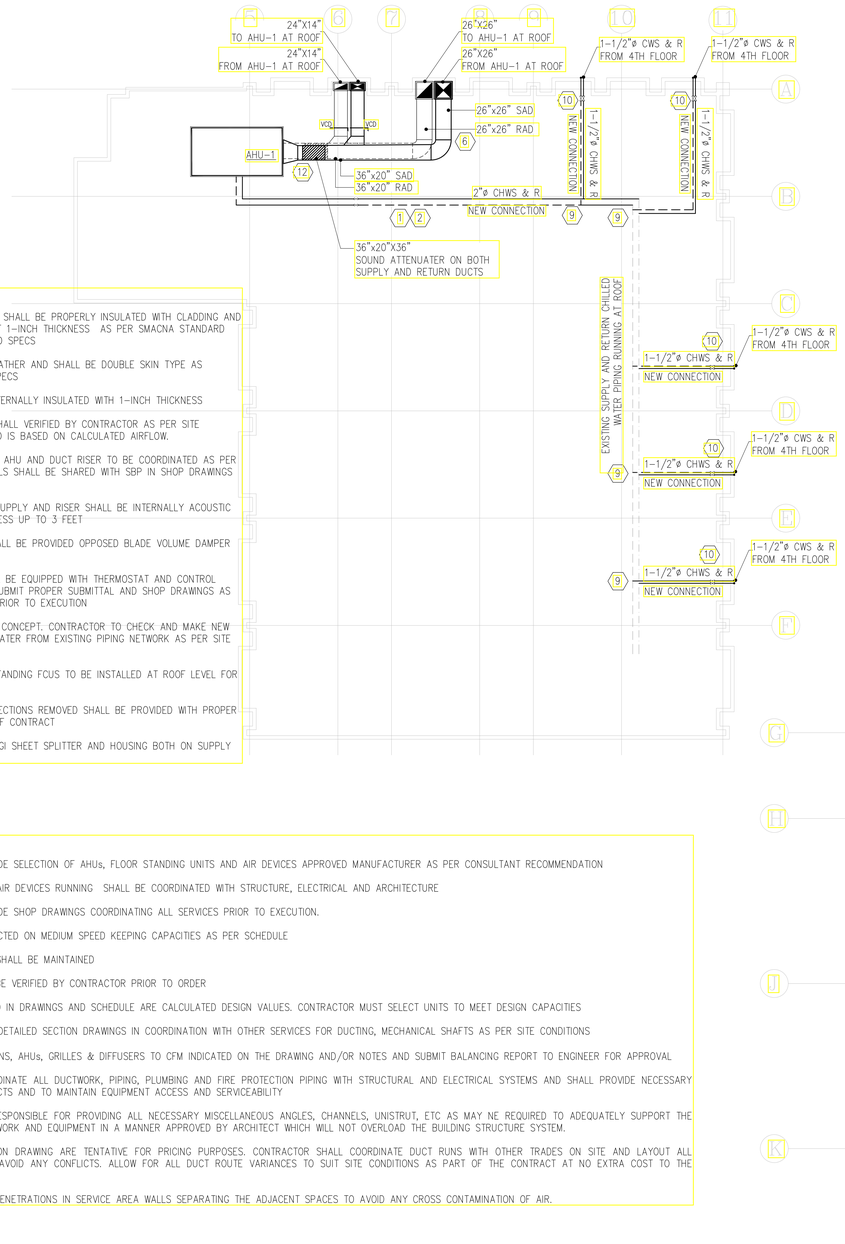
CHEKED BY : ISSUED FOR TENDER SUBMISSION

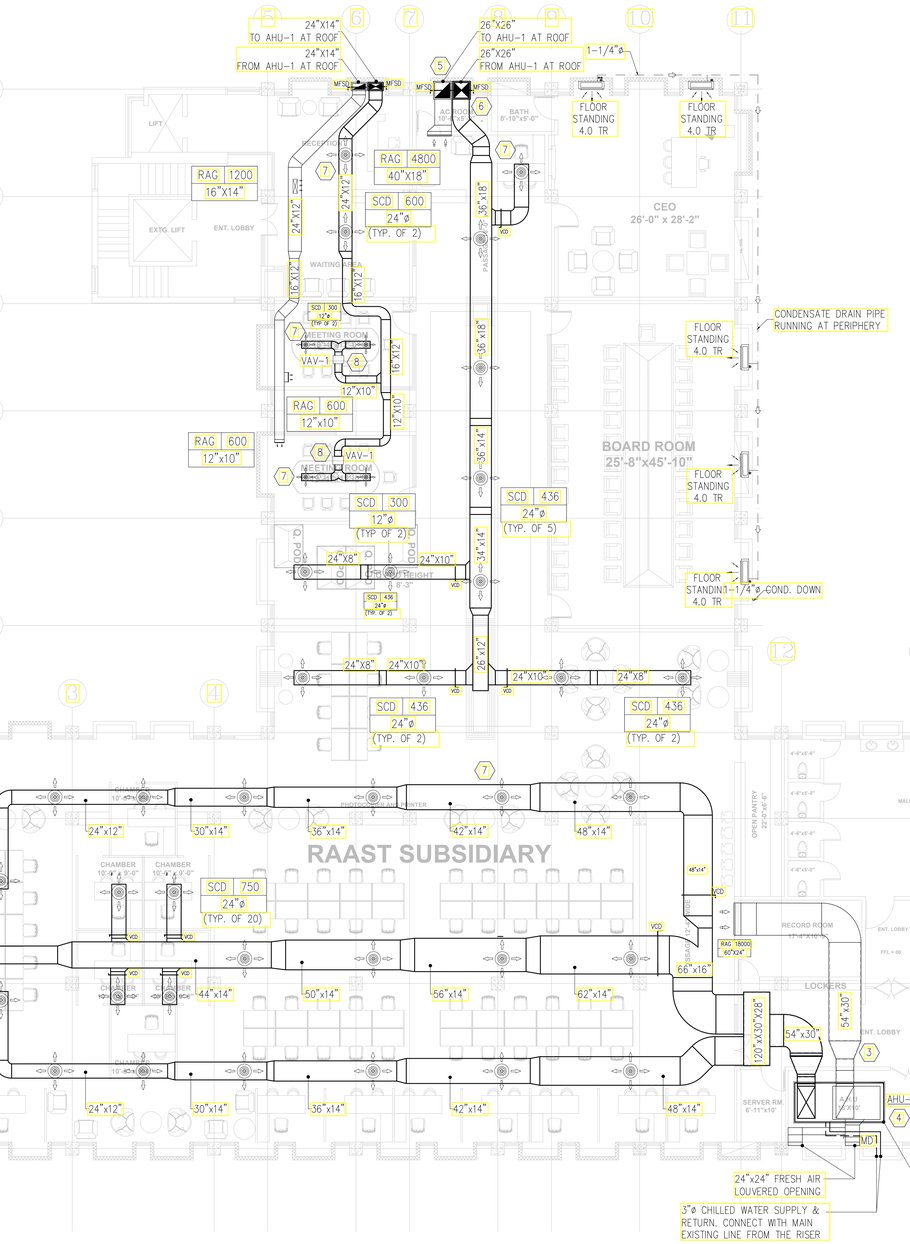
SCALE: 3/32"=1'

DATE: OCT-25

JOB:NO. SFK

DRG:NO. SBP-M-01





DRAWING NOTES:

1. ALL DUCTING FROM AHU-1 SHALL BE PROPERLY INSULATED WITH CLADDING AND INTERNAL SOUND LINING OF 1-INCH THICKNESS AS PER SMACNA STANDARD AND SPECIFIED IN BOQ AND SPECS
2. AHU-1 IS EXPOSED TO WEATHER AND SHALL BE DOUBLE SKIN TYPE AS MENTIONED IN BOQ AND SPECS
3. AHU-2 SHALL DUCTING INTERNALLY INSULATED WITH 1-INCH THICKNESS
4. MIXING BOX FOR AHU-2 SHALL VERIFIED BY CONTRACTOR AS PER SITE CONDITION. SIZE MENTIONED IS BASED ON CALCULATED AIRFLOW.
5. THE ACTUAL POSITION FOR AHU AND DUCT RISER TO BE COORDINATED AS PER SITE CONDITION AND DETAILS SHALL BE SHARED WITH SBP IN SHOP DRAWINGS PRIOR TO EXECUTION
6. ALL DUCTING FROM MAIN SUPPLY AND RISER SHALL BE INTERNALLY ACOUSTIC LINED WITH 1 INCH THICKNESS UP TO 3 FEET
7. ALL ROUND DIFFUSERS SHALL BE PROVIDED OPPOSED BLADE VOLUME DAMPER AS MENTIONED IN BOQ
8. VAV BOX PROPOSED SHALL BE EQUIPPED WITH THERMOSTAT AND CONTROL WIRING. CONTRACTOR TO SUBMIT PROPER SUBMITTAL AND SHOP DRAWINGS AS PER ACTUAL CONDITIONS PRIOR TO EXECUTION
9. ALL PIPING SHOWN IS FOR CONCEPT. CONTRACTOR TO CHECK AND MAKE NEW CONNECTION OF CHILLED WATER FROM EXISTING PIPING NETWORK AS PER SITE CONDITIONS
10. ALL VALVES FOR FLOOR STANDING FCUS TO BE INSTALLED AT ROOF LEVEL FOR MAINTENANCE PURPOSE
11. ALL EXISTING PIPING CONNECTIONS REMOVED SHALL BE PROVIDED WITH PROPER DEAD FLANGES AS PART OF CONTRACT
12. SOUND ATTEUNATOR WITH GI SHEET SPLITTER AND HOUSING BOTH ON SUPPLY AND RETURN MAIN DUCT

NOTES TO CONTRACTOR:

- CONTRACTOR SHALL PROVIDE SELECTION OF AHUs, FLOOR STANDING UNITS AND AIR DEVICES APPROVED MANUFACTURER AS PER CONSULTANT RECOMMENDATION
- ALL PIPING DUCTING AND AIR DEVICES RUNNING SHALL BE COORDINATED WITH STRUCTURE, ELECTRICAL AND ARCHITECTURE
- CONTRACTOR SHALL PROVIDE SHOP DRAWINGS COORDINATING ALL SERVICES PRIOR TO EXECUTION.
- ALL UNITS SHALL BE SELECTED ON MEDIUM SPEED KEEPING CAPACITIES AS PER SCHEDULE
- NC LEVEL LESS THAN 30 SHALL BE MAINTAINED
- ESP FOR DUCTING SHALL BE VERIFIED BY CONTRACTOR PRIOR TO ORDER
- ALL CAPACITIES MENTIONED IN DRAWINGS AND SCHEDULE ARE CALCULATED DESIGN VALUES. CONTRACTOR MUST SELECT UNITS TO MEET DESIGN CAPACITIES
- CONTRACTOR TO PROVIDE DETAILED SECTION DRAWINGS IN COORDINATION WITH OTHER SERVICES FOR DUCTING, MECHANICAL SHAFTS AS PER SITE CONDITIONS
- BALANCE ALL EXHAUST FANS, AHUs, GRILLES & DIFFUSERS TO CFM INDICATED ON THE DRAWING AND/OR NOTES AND SUBMIT BALANCING REPORT TO ENGINEER FOR APPROVAL
- CONTRACTOR SHALL COORDINATE ALL DUCTWORK, PIPING, PLUMBING AND FIRE PROTECTION PIPING WITH STRUCTURAL AND ELECTRICAL SYSTEMS AND SHALL PROVIDE NECESSARY OFFSETS TO AVOID CONFLICTS AND TO MAINTAIN EQUIPMENT ACCESS AND SERVICEABILITY
- CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY MISCELLANEOUS ANGLES, CHANNELS, UNISTRUT, ETC AS MAY NE REQUIRED TO ADEQUATELY SUPPORT THE MECHANICAL PIPING, DUCTWORK AND EQUIPMENT IN A MANNER APPROVED BY ARCHITECT WHICH WILL NOT OVERLOAD THE BUILDING STRUCTURE SYSTEM.
- ALL DUCT RUNS SHOWN ON DRAWING ARE TENTATIVE FOR PRICING PURPOSES. CONTRACTOR SHALL COORDINATE DUCT RUNS WITH OTHER TRADES ON SITE AND LAYOUT ALL DUCTWORK PROPERLY TO AVOID ANY CONFLICTS. ALLOW FOR ALL DUCT ROUTE VARIANCES TO SUIT SITE CONDITIONS AS PART OF THE CONTRACT AT NO EXTRA COST TO THE OWNER.
- SEAL ALL GAPS AROUND PENETRATIONS IN SERVICE AREA WALLS SEPARATING THE ADJACENT SPACES TO AVOID ANY CROSS CONTAMINATION OF AIR.

STATE BANK OF PAKISTAN
SBP BSC (BANK)

EXISTING 4th FLOOR OF SBP.BSC SUBSIDIARY HOUSE KARACHI AT SBP MAIN BUILDING. KARACHI

CAD BY : HVAC LAYOUT FOR 4TH FLOOR

CHEKED BY : ISSUED FOR TENDER SUBMISSION

SCALE: 3/32"=1'

DATE: OCT-25

JOB:NO. SFK

DRG:NO. SBP-M-03

STATE BANK OF PAKISTAN
SBP BANKING SERVICES CORPORATION
HEAD OFFICE KARACHI

VOLUME-II: FINANCIAL PROPOSAL

RENOVATION WORKS FOR ESTABLISHMENT OF RAAST SECRETARIAT AT 4TH FLOOR, AT SBP BSC HOUSE, HEAD OFFICE KARACHI

Volume-II

Financial Proposal

Jan-26

VOL-II: FINANCIAL PROPOSAL
Preamble

1. The Bill of Quantities shall be read in conjunction with the Conditions of Contract, Specifications and Drawings.
2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work executed and measured by the Contractor and verified by the Engineer and valued at the rates and prices entered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix as per the Contract.
3. The rates and prices entered in the priced Bill of Quantities shall, except insofar as it is otherwise provided under the Contract include all costs of Contractor's labour, supervision, materials, execution, insurance, profit, taxes, GST, Provincial tax and duties, together with all general risks, liabilities and obligations set out or implied in the Contract. Furthermore, all duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to deadline for submission of Bids, shall be included in the rates and prices and the total Bid Price submitted by the Bidder.
4. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor will have failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.
5. Prices quoted by the Supplier will remain fixed during the contact period. Except otherwise mentioned in the Contract, the Supplier shall NOT be entitled for price adjustment on account of any change in wages, material prices, POL prices, tax rates etc. whatsoever on any other account.
6. The Supplier hereby irrevocably and unconditionally waives all claims, direct, indirect or consequential arising out of price escalations, decrease or increase in quantities etc. in connection with the Agreement.
7. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related items of the Works.
8. General directions and description of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the priced Bill of Quantities.
9. Where 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, and the line total will be corrected accordingly.
10. Each cutting should be signed by the authorized person.
11. The brand names have been provided in order to establish a standard of performance and reliability. However, it does not indicate a preference for a particular brand. The bidder may propose other brands which can be accepted subject to necessary tests to establish equivalency.
12. Where packaging size of a sachet/packet/can/pack etc. is included in the description of item of BOQ, this packaging size is only for reference and does not indicate preference for any specific brand. The bidder may offer another packaging size with a margin or tolerance of no more than 15% of the specified size. However, the total quantity to be supplied must be equal to the cumulative quantity required in the BOQ item.
13. The rates of all the items quoted should be calculated considering technical specifications, drawings, nature of work/item used its shape, angle, curve, bends, size etc. to be made at any depth and height with the use of all formwork/ scaffolding or lift to the project work location/floor properly supported as required and as directed by the Engineer to the entire satisfaction of the Engineer In-charge
14. The contractor shall submit submittals along with an adequate number of samples for the items to be used in the project, as required by the Engineer In-charge with relevant brochures, technical specifications, and shop drawings for approval by the Engineer In-charge prior to the commencement of work at the site.
15. Works with risk of noise or dust/smoke emissions will be carried out after office hours and on weekends & holidays.

Bill of Quantities (BOQ)

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
A. CIVIL & PLUMBING WORKS					
A1. Civil Works					
1.	Dismantling of existing masonry/dry wall of any thickness including removal of dado tiles, wooden cladding, plaster, windows, ventilators, electrical conduits, lights, etc. and disposal of debris away from the Bank premises, complete in all respects as per site requirements and as directed by the Engineer In-charge	1210	Sft		
2.	Removal of existing glass doors including floor hinge machine very carefully and stacking the same at designated place within the Bank premises.	09	Each		
3.	Dismantling of false ceiling of any type very carefully including the suspension system, lights, smoke detectors, cameras etc. and stacking of useable materials at designated location within the Bank premises, handing over of removed fixtures to the Bank under proper receipt, and disposal of debris away from the Bank premises, complete in all respects as per site requirements and as directed by the Engineer In-charge	4177	Sft		
4.	Dismantling of existing tiles flooring carefully along with the base mortar and disposal of debris away from the Bank premises, stacking of useable materials within the premises, complete in all respects as per site requirements and as directed by the Engineer In-charge	12730	Sft		
5.	Removal of existing work stations of size approximately (5'-6"x5'-8") & shape including careful removal of file cabinets, disconnection of wiring for existing connections of telephone/raw power/UPS/networking etc., removal of allied wiring, fixtures over the work stations etc. and stacking of serviceable/useable materials at designated location and disposal of debris away from the Bank premises, complete in all respects as per site requirements and as directed by the Engineer In-charge	128	Each		
6.	Removal of existing Glazed Aluminum partitions carefully and stacking the removed materials at designated place within the Bank premises, complete in all respects as per site requirements and as directed by the Engineer In-charge	3290	Sft		
7.	Removal of existing wooden cabinets, handing over the serviceable removed materials to the Bank and stacking the same at designated location within the Bank premises and disposal of debris away from the Bank premises, complete in all respects as per site requirements and as directed by the Engineer In-charge (Measurement for payment shall be made based on surface area measured at front side of the cabinets).	1700	Sft		
8.	Complete dismantling of existing toilet including dismantling of all floor, false ceiling, doors, windows, ventilators, sanitary fittings/fixtures,	207	Sft		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	electric fittings/fixtures, sub-flooring up to the level of sub-floor of adjacent hall, removal & plugging of existing water supply & sewerage lines, stacking of serviceable materials at designated location within the Bank premises and disposal of debris away from the Bank premises, complete in all respects as per site requirements and as directed by the Engineer In-charge				
9.	Providing & fixing in position A-grade Supreme quality/finish full body polished porcelain scratch resistant tiles of Neolith Spain or approved equivalent in 1.2m x 2.6mx6mm minimum size on floor using tile bond of Stile or other approved equivalent including cutting of tiles where required, cost of required base mortar bed, grouting with matching color pigment, disposal of debris from the Bank premises, complete in all respects as per site requirements and as directed by the Engineer In-charge	13800	Sft		
10.	Same as above Item No-9 but in 6" high skirting, complete in all respects as per site requirements and as directed by the Engineer In-charge	700	Sft		
11.	Only supply of A-grade Supreme quality/finish full body polished porcelain scratch resistant tiles of Neolith Spain or approved equivalent in 1.2m x 2.6m floor complete in all respects as per site requirements and as directed by the Engineer In-charge	672	Sft		
12.	Providing & fixing in position A-grade Supreme quality/finish full body matt porcelain scratch resistant tiles of Master, Shabbir, Orient or approved equivalent in 30/60cm x 60/80cm or other approved size on floor using tile bond of Stile or other approved equivalent including the cost of cutting of tiles where required, grouting with matching color pigment, disposal of debris from the Bank premises, complete in all respects as per site requirements and as directed by the Engineer In-charge	45	Sft		
13.	Providing & fixing in position A-grade Supreme quality/finish full body polished porcelain scratch resistant tiles of Master, Shabbir, Orient or approved equivalent in 30/60cm x 60/80cm or other approved size on walls using tile bond of Stile or other approved equivalent including the cost of cutting of tiles where required, grouting with matching color pigment, disposal of debris from the Bank premises, complete in all respects as per site requirements and as directed by the Engineer In-charge	224	Sft		
14.	Providing, fabricating and fixing in position about 10.25ft high glass wall partition using powder coated minimum 2mm thick glazed aluminum sections at bottom, top and at junction of 8ft high glass panels with smaller glass panels, all approved quality aluminum sections of Pakistan Cables/ Alum-Ex or other approved equivalent make, including the cost of providing & fixing of 12mm thick plate glass panels of Ghani/Tariq Float or other approved equivalent make, cost of approved quality rubbers,	2486	Sft		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	gaskets/EPDM, tapes, silicone and other hardware/materials required for proper making & erection and stability of about 10.25ft high glass partition, complete in all respects as per approved pattern and sample as per site requirements, specifications, drawings, instructions of the manufacturer and as directed by the Engineer In-Charge				
15.	Providing & pasting of PE type frosting paper of 100 Micron thickness approved make on glass door/panes, glass partitions including cleaning of glass door, cutting of frost paper where required, disposal of debris away from the premises, etc., complete in all respects as per site requirements and as directed by the Engineer In-charge	2486	Sft		
16.	Providing, fabricating and fixing of wooden strips on walls in approved quality OAK wood in 1"x1" size with 1"distance between two adjacent strips, termite proofing, polishing and fixing in position including the cost of nails/screws, glues, cutting, joining etc., complete in all respects as per site requirements and as directed by the Engineer In-charge	2429	Rft		
17.	Providing, fabricating and fixing in position floor standing & wall mounted kitchen cabinets, 30" high x 21" deep, with back boxes made from 10mm thick HDF board of approved quality & make, and front side and doors etc. made from approved quality scratch resistant tactile type MDF board 17mm thick of approved colour and design, matt finish SS edge banding at exposed surfaces, cost of approved quality SS hydraulic hinges, SS handles, magnetic catchers, and all adhesives & hardware required for fabrication and fixing of the cabinets, complete in all respects as per site requirements and as directed by the Engineer In-charge (Measurement for payment hall be made on the surface area of the front side of the cabinets only)	288	Sft		
18.	Providing, fabricating and fixing in position, shelves made from well sanded 1.5" thick solid planks of approved quality OAK wood including the cost of polishing in approved colour, making of holes for passing of vertical pipes, fixing to the walls at both ends with powder coated concealed type brackets, complete in all respects as per site requirements and as directed by the Engineer In-charge	212	Sft		
19.	Providing & fixing of glass doors of sizes 3'x7' made from 12mm thick plate glass of Ghani/Tariq Float or other approved equivalent make with round edges including the cost of SS brackets/assembly for pivots at top and bottom, cost of approved quality SS D-Lock or other approved type lock, cost of providing & fixing of hydraulic type floor hinge machines of New star or other approved equivalent make, including cutting of existing floor and repairing the same after fixing of the machine & Providing & fixing of 1.5”x1.5" size 36"long door handles in approved shape & design made of stainless steel of minimum 16 SWG, etc., complete in all respects as	15	Nos		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	per site requirements and as directed by the Engineer In-charge				
20.	Providing & fixing in position first class OAK wood paneled door, 2" thick door panel, 2" thick door frame made from same quality OAK with width as per wall thickness, including the cost of providing & fixing of 2" wide 3/8" thick OAK wood beading with beveled edges on inner & outer sides of the door, termite proofing of the door, one lever type brass handle lock of Yale or approved equivalent, 4 nos. 5" long stainless steel hinges for each panel, 12" long brass tower bolt, lacquer polishing of the entire door, , complete in all respects, as per site requirements and as directed by the Engineer In-charge (Door panel size = 7ftx4ft)	70	Sft		
21.	Same as above but door panel size 3ft x 7ft.	21	Sft		
22.	Providing & fixing of fireproof metal door with heavy duty steel frame of Naffco or other approved equivalent make, UL listed, with fire rating up to 120 minutes, painted with fire resistant paint in dark red color, including the cost of providing & fixing of heavy duty door closer, 4" x 12" size fire glass panel in upper half of the door panel, panic bar on inner side, locking arrangement, etc. , cutting of existing masonry walls very carefully, grouting of frame with 1:2:4 cement concrete and approved quality hold fasts, repairing the wall area as per original finish, etc. complete in all respects as per site requirements and as directed by the Engineer In-charge (Door Size = 3.5ft x 7ft)	2	Each		
23.	Providing & laying block masonry using solid pre-cast concrete blocks of approved quality set in 1:4 cement-sand mortar i/c curing, making of joints, providing & fixing of 15" long ½" dia. steel bar dowels (one for each course of pre-cast blocks on both ends of wall) about 4" length epoxy grouted in adjacent existing wall/column, complete in all respects as per site requirements and as directed by the Engineer In-charge	1210	Cft		
24.	Providing and applying plaster of walls with about ¾" thick 1:4 cement-sand mortar plaster including curing with spray pumps, complete in all respects as per site requirements and as directed by the Engineer In-charge	7310	Sft		
25.	Providing, mixing, laying, vibrating and curing of 3" thick Reinforced Cement Concrete for vanities 1:2:4 ratio, including the cost providing, cutting, bending and binding 3/8" dia steel bars @ 6"c/c both ways of Grade-40 deformed steel and making cut/grooves & drilling the bars in the existing masonry wall for proper fixing of slab, including cost of providing, fixing & removal of required water tight form work, making of holes for under counter type vanity basins, smooth trowel finished, complete in all respects as per site requirements and as directed by the Engineer In-charge (Measurements for payment shall be taken after deduction of all openings/holes etc.)	215	Sft		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
26.	Providing & laying of supreme quality/ A-Grade pre-polished granite tiles of about 24" x 48" size about 20mm thick Galaxy Black or other approved colour over counter tops including the cost of approved quality tile bond, cutting of granite where required, grouting with matching/approved colour approved quality tile grout, cost of all labour/materials, adhesives etc., cleaning the surface, complete in all respects as per site requirements and as directed by the Engineer In-charge	200	Sft		
27.	Providing and laying 1" to 1-1/2" rounded white pebbles in planters including the cost of cartage, labor for washing, laying, etc. cleaning the surface, complete in all respects as per site requirements and as directed by the Engineer In-charge Layer Thickness = 2"	287	Sft		
28.	Providing and applying 03 coats of plastic emulsion paint of ICI, Berger or approved equivalent make on internal walls/ceiling of approved colour and shade at any height on smooth surface prepared with the help of filling with approved wall putty, cleaning the surface with sand papering after removal of all existing paint including the cost of material, labor, scaffolding etc. at any height complete in all respects and as per the directions of Engineer In-charge(Before application of the paint, scrapping & surface preparation will have to be got approved by the Engineer In-charge)	22500	Sft		
29.	Providing and laying brick face work using burnt clay 1st class gutka of size (9"x2-1/4"x1-1/2") of approved quality at any height, laid in cement sand and surkhi mortar 1:3 ratio, making trapezoidal grooves of 1/4" depth during fresh masonry work including, providing & fixing of 3" long steel nails in every 4th course vertically at an interval of 2 ft. c/c horizontally, including the cost of surface preparation by removal of paint, chiseling/hacking of existing surface etc., complete in all respects as per site and as directed by Engineer In-charge (The contractor shall prepare samples at site and the facing brick- work shall be carried out as per approved sample).	3013	Sft		
30.	Providing, mixing, laying, vibrating and curing, reinforced cement concrete in 1:2:4 for lintels ratio by volume of size 5"x8" with 4 bars of 3/8" size bars with 3/8" dia. bar rings provided @ 6" c/c, using OP cement, approved quality clean sand and crush, including the cost of required water tight form work, screening/washing of aggregates if required, complete in all respects as per drawings, specifications, site conditions and as directed by the Engineer In-charge	15	Rft		
31.	Providing & fixing in position 2”x2”x1/8" thick powder coated MS seamless tube section, fixed in vertical position with powder coated MS collars at top & bottom, and fixed in horizontal position with the help of powder coated/ anodized chains of approved quality provided @ about 4ft distance from	968	Rft		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	each other fixed with the MS tube at one end and hanged with the approved quality rawl hook at top with RCC slab, making of holes/openings in MS tube for fixing of lights before powder coating of the sections as per the layout given in the drawing, complete in all respects as per site requirements and as directed by the Engineer In-charge				
32.	Providing & fixing in position false ceiling comprising of 600 mm x 600 mm size 7.5 mm thick Gypsum tiles of DFB or other approved equivalent make with PVC lamination at front and metallic foil pasted at back side, with approved quality powder coated suspension system of CKM or other approved equivalent make, with 14SWG GI wires at every junction of the main Tee runner and lateral Tee sections, hanging with the RCC slab with the help of approved quality rawl bolts/fixing anchors (3" long) provided @ approximately 4ft both ways including cutting of sheets, etc. where required, making of holes for fixtures, complete in all respects as per site requirements and as directed by the Engineer In-charge	45	Sft		
33.	Providing and fixing pigeon hole lockers each of size 15"x15"x18" (LxWxD) using 1"x1"x1/8" MS angle iron as main frame and lockers body made from 18SWG MS sheet on all sides, openable door made from same sheet, including the cost of concealed locks of KHAS or other approved equivalent make each with three (03) keys, including cutting, welding, hinges, handles, nut bolts and other hardware required for proper manufacturing and hanging of the lockers assembly with wall, applying one coat of red oxide primer of approved make & quality and spray painting of approved make & quality enamel paint, complete in all respects as per site requirements and as directed by the Engineer In-charge	70	Nos		
34.	Providing & fixing of planters, 2ft dia at bottom 3ft dia at mid height and 2.5ft dia at top x and 2.5ft high made from matt finish anodized stainless steel sheet of 18SWG with 3/4" dia. collar at top made by bending of the sheet, complete in all respects as per drawings, specifications and as directed by the Engineer In-charge	25	Nos		
35.	Same as above Item no-34 but planters of 1.5ft x 1.5ft size and 2.5ft high	120	Nos		
36.	Office Quiet Pods of 6' width x 4' depth x 7.5' height made in partal wooden frame and 15mm thick MDF body PVC or deco painted from outside, Styrofoam filling, foam cushioning and approved quality acoustic fabric fixed over inner layer of 10mm thick plain MDF sheet of Al-Noor or other approved equivalent make, with carpet flooring, sofa type seats for two persons, wall hung type small center table, electric points for laptop chargers, one roof mounted soundless exhaust fan of 10"x10" size of Voldam or other approved equivalent make, two 4ft long, one multi-plug and LED lights one ventilation duct near	05	Nos		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	bottom of appropriate size, full height aluminum doors with 8mm thick plain tempered glass, including door lock, including the cost of required hardware, adhesives, etc. and external main switch for connection with the external electric supply, switch/buttons for lights and fan etc. complete in all respects as per site requirements and as directed by the Engineer In-charge				
37.	Grinding & polishing of existing marble/granite floor using papers of different numbers required to attain smooth glossy surface, including disposal of sludge etc. complete in all respects as per site requirements and as directed by the Engineer In-charge	1575	Sft		
38.	Replacement of all existing Corian of vanity counters (tops, sides and doors under the counter) with new same thickness Corian of DuPont or other approved equivalent make, complete in all respects as per existing style and pattern.	90	Sft		
39.	Providing & fixing of 5mm thick imported looking mirror of Belgium or other approved origin with beveled edges, fixed 2" away from the wall with the help of SS studs and caps etc. complete in all respects and as directed by the Engineer In-charge	16	Sft		
40.	Dismantling of existing water proofing membrane, through cleaning of the slab surface, disposal of debris away from the Bank premises, complete in all respects as per site requirements and as directed by the Engineer In-charge	3500	Sft		
41.	Leveling of roof surface by laying average 1" thick layer of 1:4 cement-sand slurry mixed with approved quality latex based bonding agent (SBR) @ 3 liters per bag of cement, by marking of levels before the start of work, curing using wet jute cloth, etc. complete in all respects as per site requirements and as directed by the Engineer In-charge	3500	Sft		
42.	Providing and fixing of torch applied 4mm thick slated type bituminous waterproofing membrane of Roofgrip or other approved equivalent make with 3" wide properly sealed overlaps, cost of required primer, complete in all respects as per site requirements and as directed by the Engineer In-charge	3500	Sft		
43.	Providing and fixing acrylic type Wallpapers in approved design and pattern on walls complete in all respect as per site conditions and instructions of Engineer In-charge	729	Sft		
44.	Providing and laying of river run stone boulders of different colours and sizes ranging from approximately 1cft to 2 cft, complete in all respects as per site requirements and as directed by the Engineer In-charge (Measurement for payment shall be made on the basis of total volume occupies by the stockpile of the stones)	60	Cft		
45.	Providing and fixing of expansion joint in tile flooring comprising of 2 nos. aluminum alloy angles sections of about ¾" x ¾" x 2mm thick laid with a gap of about 12mm clear distance back to back, filling	250	Rft		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	the gap with thermopre sheet with a top 10mm thick layer of approved quality poly sulphide sealant, complete in all respects as per site requirements and as directed by the Engineer In-charge.				
46.	Providing and laying structural cement concrete of mix proportions not leaner than (1:2:4) by volume and of, including formwork and its removal, placing, vibrating, compacting, finishing and curing, complete but excluding the cost of steel reinforcement in, complete in all respects as per site requirements and/or as directed by Engineer In-charge.	25	Cft		
47.	Providing and fixing steel reinforcement Grade 60 deformed steel bars including cleaning, cutting, bending, placing, binding etc. including provision and cost of spacers and binder wire, cost of chairs, over-laps not shown on drawings etc. in any kind of R.C.C works as specified, complete in all respects as per site requirements and directed by Engineer In-charge.	200	Kg		
				Sub Total (A1)-Civil Works	
	A2. Plumbing Works				
48.	Providing and fixing 25mm dia. PPR-C pipe of Turkplast of PN-20 or approved equivalent make including the cost of required sockets, elbows, plug elbows, Tees, bushes, reducers, sockets, threaded fittings, cutting, jointing etc. including connections to existing water supply lines complete in all respect as per site requirements and as directed by the Engineer In-charge.	50	Rft		
49.	Providing and fixing 1" dia. heavy duty brass body handle valve Kitz or other approved equivalent make, complete in all respect as approved and directed by the Engineer In-charge.	1	Nos		
50.	Providing & laying Sch.40 uPVC pipe of AGM (Jeddah)or approved make & quality for waste water in floors/outer wall, including the cost of required sockets, elbows, plug elbows, Tees, Y-Tees, Four way Tees, bushes, reducers, sockets & jointing solutions etc including termination of pipes to nearest Manhole outside Building , making of holes in walls where required and repairing of the same after laying of pipes as per original look etc, including connections with existing vent pipes/manholes/sewer pipes etc. complete in all respects as per site requirements and as directed by the Engineer In-charge.				
(a)	4”	40	Rft		
(b)	3”	50	Rft		
51.	Providing & fixing one piece commode , HD-131A of Porta or other approved equivalent make, with S-trap & heavy duty plastic type hydraulic seat cover, approved quality CP T-stop cock of Master/Sonex/Faisal or approved equivalent, CP connection pipe of approved quality & make,	01	Nos		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	complete in all respects as per site requirements and as directed by the Engineer In-charge.				
52.	Making of vanity including providing & fixing under counter type wash basin of Porta (HDLU-008) or approved equivalent make, with approved quality bottle trap (D08 of Porta or other approved make), cost of 4'-9" x 2'-0" size 18mm thick Galaxy Black or other approved colour & type granite with half round open edges, 6" wide 12mm thick of same granite fixed vertically at front side of the vanity counter, including cutting of holes for fixing of wash basin, cost of precast RCC slab 3" thick 4'-9"x1'-11" size, including cost of required adhesives, waste pipes etc. complete in all respects as per site requirements and as directed by the Engineer In-charge.	01	Nos		
53.	Providing & fixing in position, Double Bib cock of Master, Sonex, Faisal or other approved equivalent make of approved shape/design, complete in all respects as per site requirements and as directed by the Engineer In-charge.	01	Nos		
54.	Providing and fixing CP T-Stop Cocks with crustal head (as per approved sample) of Master, Sonex or approved equivalent make, including the cost of approved quality connection pipes, complete in all respects as per site requirements and as directed by the Engineer In-charge.	03	Nos		
55.	Providing & fixing in position approved quality plastic body Muslim Shower of Master, Sonex, Faisal or other approved equivalent make of approved shape/design including the cost of plastic type flexible connection pipe of approved quality, complete in all respects as per site requirements and as directed by the Engineer In-charge.	01	Nos		
56.	Providing and fixing of single lever type CP Basin Mixer of Master, Sonex, Faisal or other approved equivalent make of approved shape/design complete in all respects as per site requirements and as directed by the Engineer In-charge.	01	Nos		
57.	Providing & fixing of electric hand dryer of Siemens/ Berkley or other approved equivalent make, sensor type, hands under the dryer type, complete in all respects as per site requirements and as directed by the Engineer In-charge.	01	Nos		
58.	Providing & fixing in position, 5mm thick imported approved quality looking mirror of 2' x 4' size approx. with approved quality & colour PVC edging all around the glass, fixing approximately 3” away from the wall with the help of stainless steel studs, etc. Complete in all respects as per site requirements and as directed by the Engineer In-charge.	01	Nos		
59.	Providing & fixing in position, heavy duty Soap Dispensers of approved quality of Master, Sonex, Faisal or other approved equivalent make, complete in all respects as per site requirements and as directed by the Engineer In-charge.	01	Nos		
60.	Providing & fixing in position, stainless steel tissue paper holder of Master, Sonex, Faisal or other	01	Nos		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	approved equivalent, complete in all respects as per site requirements and as directed by the Engineer In-charge.				
61.	Providing & fixing in position uPVC floor traps of 6"x6" size with heavy duty Stainless Steel floor trap jali/ strainer of approved quality, complete in all respects as per site requirements and as directed by the Engineer In-charge.	02	Nos		
				Sub Total (A2)-Plumbing Works	
	B. ELECTRICAL WORKS				
	B1. Telephone Works				
62.	Supply, Installation, testing, and commissioning of telephone backbone cable of 100 pair multicore using appropriate size of PVC conduit as per the site condition from main telephone DB to sub DB. The job includes cost of interconnection of existing and new cable in main DB and termination of new cable in new sub DBs with all types of civil work, accessories including cost of PVC pipes, termination with proper dressing complete in all respects as directed by Engineer In-charge	100	Meter		
63.	Supply & Installation of size 40" x 30" x 8" (LxWxD) telephone distribution board with mounting on U frames for interconnection of 02 main telephone cables of 100 pairs,16 SWG (1.5 mm) MS sheet fabricated, 120-micron powder coated, color RAL7032, surface mounted or concealed on the wall of designated location with locking arrangements size. Complete in all respects as per site conditions and as directed by engineer in charge	02	Jobs		
64.	Supply, installation, testing and commissioning of 4 pair CAT-6 UTP voice cables in suitable dia. size PVC pipe/channel including labelling, termination and testing at both ends, make Vivanco, Clipsal, 3M, Systemax, or approved equivalent, Insulation Solid PVC color coded in accordance with telephone Industry standards. The cost includes supply, laying, and installation of cables, PVC Conduit/channel with all necessary installation material, chiseling, running on walls and make good as per the original condition, complete in all respects as per standard Industry practice to the satisfaction of the Engineer In-charge.	4500	Meter		
65.	Supply of Analogue Telephone Set with CLI and loud speaker with at least 6 direct dialing keys complete in all respects with at least one year warranty	90	Nos		
66.	Supply of Executive IP Telephone Sets with at-least 5 programmable keys with ability to add key expansion module, Compatible with HIPATH 4000, V8 PABX or approved equivalent and approved with PTA with recommended power adapter, LAN CAT-6 Cable of at least 2m length with RJ-45 connectors at both ends with at least one year warranty complete in all respect	03	Nos		
67.	Supply of Standard IP Telephone Sets with at-least 4 x programmable keys fully Compatible with HIPATH 4000, V8 PABX or approved equivalent	06	Nos		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	and approved with PTA with recommended power adapter, LAN CAT-6 Cable of at least 2m length with RJ-45 connectors at both ends with at least one year warranty complete in all respect				
68.	Supply Installation Testing and commissioning of Dual Face plate RJ-11 socket outlet with I/O's and PVC/MS back box complete in all respects as directed by Engineer In-charge	150	Jobs		
69.	Supply Installation Testing and commissioning of 12"x12" GI floor mounted box complete in all respects as directed by Engineer in charge	20	Jobs		
70.	Supply and Installation of RJ-6/11 wiring for Cable TV system in appropriate size of conduits with connectors at both end including installation material and necessary civil works, complete in all respect as directed by Engineer In-charge	200	Meter		
71.	Supply of installation of wooden stand for mounting of TV box along with installation material and necessary civil works, complete in all respect as directed by Engineer In-charge	05	Nos		
72.	Supply and Installation of HDMI cable of at least 25ft length for connection from multimedia projector to laptop/PC in appropriate size of conduits with connectors at both end including installation material and necessary civil works, complete in all respect as directed by Engineer In-charge	05	Nos		
				Sub Total (B1) - Telephone Works	
B2. Lighting Works					
73.	Supply of Linear Pendent LED lights fixtures 30-40W, Complete with Hanging accessories and Connectors, with following specifications: 4ft length with Dimmable Driver (Dali, 0 -10V, DMX or TRIAC) Minimum lumens: 3200 Minimum luminous efficacy:100 lm/W Minimum Power Factor = 0.85 Color Rendering Index (CRI) > = 80 Color Temperature: 4000K Beam angle: 120 lifespan of 50,000 hours @L70 Light should be dimmed to 450 Lumens per 4 ft IP20, Compliant with IEC 62031, and IEC 62778 Die-cast Aluminium housing material Warranty: 3 Years	300	Nos		
74.	Supply of Cylindrical surface mounted LED lights fixtures 10-18W, Complete with Hanging accessories and Connectors, with following specifications: Minimum lumens: 1080 Minimum luminous efficacy:100 lm/W Minimum Power Factor = 0.85 Color Rendering Index (CRI) > = 80 Color Temperature: 3000K lifespan of 50,000 hours @L70	150	Nos		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	Powder coated, Alumunium housing material IP20, Warranty: 3 Years				
75.	Supply of Decorative Pendent LED Light fixtures as per samples available with Bank, Dome diameter: 12-15 inches, E27 connector thread type, Alba Bulb, 3000K Temperature, bulb diameter: 3.5-4 inches, 165-265V, Outer color: Black, Alumunium housing, complete in all respect as directed by Engineer In-charge	25	Nos		
76.	Providing fabricating & fixing of new 2-1/2" x 2-1/2" x 1/8" MS tube section, conforming to ASTM A36 welded with each other using E70XX welding rods, cost of scaffolding required for working at height, cost of one coat of red oxide and required coats of matt enamel paint, complete in all respects as per site requirements and as directed by the Engineer In-charge.	1200	Rft		
77.	Providing & fixing of new 1-1/4" x 1-1/4" x 1/8" MS tube section, conforming to ASTM A36 welded with each other using E70XX welding rods and min. 2 Nos 3" long 10mm dia. epoxy type/chemical type rawl bolts on each vertical support with ceiling, cost of scaffolding required for working at height, cost of one coat of red oxide and required coats of matt enamel paint, complete in all respects as per site requirements and as directed by the Engineer In-charge.	600	Rft		
78.	Installation of following LED Fixtures :				
(a)	Linear Pendent LED lights fixtures	280	Jobs		
(b)	Cylindrical surface mounted LED lights fixtures	130	Jobs		
(c)	Decorative Pendent LED Light	25	Jobs		
79.	Supply, installation, testing, and commissioning of following LED Lights wiring, Electrical wiring must be compliant with IEC 60364 or BS 7671 and type tested certification from KEMA/RAWAT/ PQSIR) and PVC pipe of 25 mm dia of class C (Electrical PVC pipe must be in compliant with BS 6099-1 or PS 1905-87 or equivalent standards) The cost includes supply, laying, and installation of wires in PVC conduit pipe with all necessary installation material and redressing as per original condition, complete in all respects as per standard industry practice to the satisfaction of the Engineer In-charge.				
(a)	Circuit Wiring from DB to Gang Switches using 2 x 2.5mm sqr. & 1.5mmsqr. as ECC copper/PVC wire	500	Meter		
(b)	Point to Point Wiring from Gang Switches to LED lights and looping using 2 x 1.5mm sqr. & 1.5mmsqr. as ECC copper/PVC wire	350	Meter		
80.	Supply and installation of following Gang switch sheets/face plates for LED lights of with metallic powder coated back box/PVC back box 3"x3" with fixing material by observing beauty and proper level				

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	on wall from floor level. Complete in all respects as directed by Engineer In-charge.				
(a)	6 Gang Sheets	15	Jobs		
(b)	4 Gang Sheets	15	Jobs		
(c)	2 Gang Sheets	15	Jobs		
				Sub Total (B2) - Lighting Works	
	B3. Power Wiring and Distribution Boards				
81.	Dismantling of all types of electrical DB, lights, wiring, telecom wiring and outlets, power switch sockets/telephone face plates/gang switch sheets carefully and hand over the healthy ones to the engineering store in charge and as per direction of Engineer In-charge	13500	Sq.ft		
82.	Supply, Installation, Testing and Commissioning of Main Electric Distribution Board **(MDB)** , wall mounted, finished 14 SWG MS sheet, front and back doors, drawing pocket, transparent sheet, powder coated paint of RAL 7032 approved color, moveable & lockable handles of suitable brand, flush type hinged door with Earthling braid consisting of danger plate with handle, complete internal power and control wiring, Breakers Safety Plates as per DB Gauge, fixing material nut bolts, Lugs, glands, suitable height, width & depth as per standards and with following components:- **Incoming Side** • 01 No. 160 Amp (Adjustable) MCCB Icu=25kA Ics=100% of Icu Three Pole • 03 Nos. Indication Lights **Outgoing Side** • 03 Nos. 60 Amp (Adjustable) MCCB Icu=25kA Ics=100% of Icu Three Pole • suitable copper busbars between incoming & outgoing breakers All cable links/bus bar links must be as per outgoing load. All Circuit Breakers must be compact size, as per specifications and complying with standards, complete in all respect as directed by Engineer In-charge	1	Jobs		
83.	Supply, Installation, Testing and Commissioning of Electric Distribution Board **(SMDB)** , wall mounted, finished 14 SWG MS sheet, front and back doors, drawing pocket, transparent sheet, powder coated paint of RAL 7032 approved color, moveable & lockable handles of suitable brand, flush type hinged door with Earthling braid consisting of danger plate with handle, complete internal power and control wiring, Breakers Safety Plates as per DB Gauge, fixing material nut bolts, Lugs, glands, suitable height, width & depth as per standards and with following components: **Incoming Side** • 01 No. 60 Amp (Adjustable) MCCB Icu=25kA Ics=100% of Icu Three Pole	2	Jobs		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	• 03 Nos. Indication Lights **Outgoing Side** • 15 Nos. 10 Amp SP MCB 6kA • 12 Nos. 16Amp SP MCB 6kA • 3 Nos. 20Amp SP MCB 6kA All cable links/bus bar links must be as per outgoing load. All Circuit Breakers must be compact size, as per specifications and complying with standards, complete in all respect as directed by Engineer In-charge				
84.	Supply, Laying, testing & commissioning of 1 x 4-C 25 sq.mm Al/XLPE/PVC Electric power cable + 1 C 10sq.mm cable as ECC to be laid in appropriate size of PVC conduits as per the site condition. The job includes cost of all accessories including cost of lugs (metallic, bi metallic, copper etc), glands, lugs, cable ties, nut bolts, taping etc. complete in all respects as directed by Engineer In-Charge	250	Mtr		
85.	Supply, Laying, testing & commissioning of 1 x 4-C 16 sq.mm Cu/PVC/PVC Electric power cable to be laid in appropriate size of PVC conduits as per the site condition. The job includes cost of all accessories including cost of lugs (metallic, bi metallic, copper etc), glands, lugs, cable ties, nut bolts, taping etc. complete in all respects as directed by Engineer In-Charge	140	Mtr		
86.	Supply and Installation of 60A TP MCCB Circuit Breaker, with short circuit ratings of 25kA in AC Plant room along with dismantling of old circuit breaker and termination of cables using busbar links. complete in all respects as directed by Engineer In-Charge	1	Nos.		
87.	Supply, installation, testing, and commissioning of power circuits for switch sockets from DB to power point/point to point using: 2 x 2.5mm sqr. & 1.5mmsqr. as ECC copper/PVC wire (Electrical wiring must be compliant with IEC 60364 or BS 7671 and type tested certification from KEMA/RAWAT/PQSIR) and PVC pipe of 25 mm dia of class C (Electrical PVC pipe must be in compliant with BS 6099-1 or PS 1905-87 or equivalent standards) The cost includes supply, laying, and installation of wires in PVC conduit pipe with all necessary installation material and redressing as per original condition, complete in all respects as per standard industry practice to the satisfaction of the Engineer In-charge .	700	Mtr		
88.	Supply and installation of Power switch socket/ Multi sheet 13 Amps with metallic powder coated back box with fixing material by observing beauty and proper level on wall from floor level with necessary fitting, fixing material, drilling, chipping, wall cutting, paint work and repairing as per original, connections	150	Jobs		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	complete in all respects as directed by engineer-in-charge.				
89.	Supply & Installation of wall mounted type Metal Body Hand Dryer Make Siemens or approved equivalent with power capacity not less than 1.5KW, along with allied accessories i.e. mounting brackets, screws etc. complete in all respect.	2	Jobs		
90.	Supply, installation of 12" square shaped, plastic body false ceiling mounted inline exhaust fans make GFC, Voldam, Pak Fans or approved equivalent	15	Jobs		
91.	Supply, fabricating, erecting, fixing and installing of size 4"x12" having three partition of depth 4" with base perforated Cable Tray with cover, fabricated with 16 SWG MS Sheet steel powdered coated and 16 SWG MS Sheet steel powdered coated cover, including all installation accessories such as appropriate sizes and lengths of imported threaded MS rod, C-channel with complete accessories, angle iron supports and anchor Bolts including cutting, welding, jointing and necessary required hardware etc. for installation at ceiling and wall mounted both. Complete in all respect as shown in drawings and specification or as directed by the Engineer.	150	Mtr		
92.	Supply, fabricating, erecting, fixing and installing of size 3"x3" of base perforated Cable Tray with cover, fabricated with 14 SWG MS Sheet steel powdered coated and 16 SWG MS Sheet steel powdered coated cover, including all installation accessories such as appropriate sizes and lengths of imported threaded MS rod, C-channel with complete accessories, angle iron supports and anchor Bolts including cutting, welding, jointing and necessary required hardware etc. for installation at ceiling and wall mounted both. Complete in all respect as shown in drawings and specification or as directed by the Engineer.	150	Mtr		
93.	Supply and Installation of table mounted technology box, metal with rust proof coating with at least 2 x power outlet, technology box to be installed on wooden tables with all installation accessories, carpentry work, complete in all respect as directed by Engineer In-charge	4	Nos.		
	Sub Total (B3) - Power Wiring and Distribution Boards				
	B4. Wireless Audio Conference System				
94.	**Central Unit** Supply of Central Control Unit for Wireless/Infrared Conference System. Unit shall support up to 60 units and be compliant with IEC 60065 international standards. Features include built-in input/output digital volume adjustment, bass cut, and automatic gain control. Equipped with LCD menu display and RS-232/TCP-IP ports for PC control and system upgrades. Make: TOA / Bosch / Rest moment or approved equivalent with 1 year warranty	1	Nos.		
95.	**Chairman's Unit** Supply of Chairman's Wireless/Infrared Conference Unit. Compact desktop design featuring a priority	2	Nos.		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	switch to override delegate units with an activation chime with LED indicator ring, integrated loudspeaker with auto-mute function to prevent feedback, and independent volume gain adjustment. Make: TOA / Bosch / Rest moment or approved equivalent with 1 year warranty				
96.	**Delegate's Unit** Supply of Delegate's Wireless/Infrared Conference Unit. Ergonomic desktop unit with a removable high-sensitivity microphone. Includes a "Press to Speak" button, internal loudspeaker, and. Must feature strong anti-interference capability against mobile phones and signal encryption. Make: TOA / Bosch / Rest moment or approved equivalent with 1 year warranty	30	Nos.		
97.	**Power Amplifier** Supply of Professional Power Amplifier. High-performance amplifier featuring a minimum of 3 Microphone inputs and 2 Auxiliary inputs. Includes individual volume controls, master volume, and Bass/Treble tone adjustments for sound reinforcement. Make: TOA / Bosch / Rest moment or approved equivalent with 1 year warranty	1	Nos.		
98.	Wireless Transmitter/Receiver Supply of Infrared/Wireless Transmitter & Receiver Unit. Designed for high-fidelity communication between central unit and microphones. Supports various mounting options (ceiling, wall, or stand) and is optimized for ceiling heights between 2.5m to 4.5m with 1 year warranty Make: TOA / Bosch / Rest moment or approved equivalent with 1 year warranty	4	Nos.		
99.	Battery Charger Dedicated battery charger for the Rechargeable Lithium-Ion Battery Permits up to 8 batteries to be simultaneously charged within up to 5 hours with 1 year warranty	2	Nos.		
100.	Supply of Spare Rechargeable Lithium-Ion Battery. High-capacity battery packs compatible with the conference units, ensuring long operational life (approx. 08 hours) and stable power output with 1 year warranty	10	Nos.		
101.	Distributor Signal distributor used to expand the number of connectable transmitter/ receiver units: For 2-branch distribution with 1 year warranty	4	Nos.		
102.	Supply of Dual Channel Cordless Microphone Set. Includes one dual-channel receiver and two wireless transmitters with RF carrier power management with 1 year warranty	1	Nos.		
103.	Supply of Handheld Wireless Microphone. Professional wireless handheld microphone with tuner, featuring 142 dB SPL maximum input level and power/battery status indicators with 1 year warranty	1	Nos.		
104.	Supply and commissioning of Ceiling Speakers integrated transformer, featuring a sensitivity of for clear speech reproduction.	6	Nos.		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
105.	Supply and Laying of Coaxial Cable Cost includes tagging and testing of end-to-end connections.	100	Mtr		
106.	Supply and Laying of 2-Core 1.5mm Flexible Speaker Cable. For connection of ceiling speakers to the power amplifier. Cost includes all accessories, and complete testing	200	Mtr		
107.	Supply of 9U Wall Mount Rack. Standard equipment rack for housing the central unit, amplifier, and distributors, including all necessary mounting hardware.	1	1		
108.	Installation, Testing, and Commissioning Services, Complete job including programming, software configuration, sound setting, and on-site training for personnel. Work to be performed by authorized personnel in coordination with the Engineer In-charge.	1	1		
	Sub Total (B4) - Wireless Audio Conference System				
	C. HVAC Works				
109.	**AIR HANDLING UNIT** Supply, Lifting, Shifting, Installation, Testing & Commissioning of Horizontal Double Skin Floor Mounted Air Handling Unit with Chilled water Coil, motorized damper, Pre-installed flange type Flexible Duct Connector, Inspection Windows, Inspection Doors, vibration isolators. Complete in all respect as specified in equipment schedule and technical specifications and to the satisfaction of Engineer In-charge.				
(a)	AHU - 01 (7200 CFM, 500 Pascal) with VFD built-in	1	Nos.		
(b)	AHU - 02 (18000 CFM, 500 Pascal)	1	Nos.		
110.	**FAN COIL UNIT - FLOOR STANDINGTYPE** Supply, installation, testing and commissioning of Chilled Water Based Floor Standing Unit constructed from heavy gauge galvanized steel housing, insulated internally with acoustic and thermal insulation, complete with double-skin casing, centrifugal forward-curved fan, fan motor with variable speed control, washable air filter, chilled water cooling coil, drain pan, copper tubes with aluminum fins, necessary control valves, flexible connections, and all other required accessories for proper operation. complete in all respect and to the satisfaction of Engineer In-charge FCU - 01 to 05 (4.0 TR. Nominal Cooling Capacity)	5	Nos.		
111.	**VAV BOXES** Supply, Installation, Testing & Commissioning of Variable Air Volume with thermostat, as shown on the drawings, as specified in equipment schedule and as per technical specification, complete in all respect and to the satisfaction of Engineer In-charge VAV - 01 (1200 MAX CFM ~ MIN 0 CFM)	2	Nos.		
112.	**DUCT WORKS** Supply, Fabrication, installation, testing and commissioning of G.I. Sheet Metal Medium Pressure				

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	Machine Made Duct Work as shown on the drawings and as per technical specification including all labour, material, accessories, tees, plenum, transition pieces, splitter dampers, plenum boxes for grills/diffusers, special duct test holes, duct access doors, air deflector, 22 Gauge Duct Sleeves, Hanger & Supports of Hilti, fischer, sikla and INKA complete in all respect and to the satisfaction of Engineer In-charge				
(a)	20 Gauge	4500	Sft		
(b)	22 Gauge	5350	Sft		
(c)	24 Gauge	600	Sft		
113.	**DUCT INSULATION**				
(a)	Supply, Installation & Commissioning of NBR elastomeric Insulation (XLP) of 20mm thickness for Internal ducts with low density elastomeric thermal insulation. Complete in all respect as mentioned in the specifications.	11500	Sft		
(b)	Supply, Installation & Commissioning of NBR elastomeric Insulation (XLP) of 25mm thickness for MER ducts with low density elastomeric thermal insulation. Complete in all respect as mentioned in the specifications.	2200	Sft		
114.	**FLEXIBLE DUCT CONNECTORS** Supply & Installation of rubber impregnated canvas Flexible Duct Connector (imported type) between AHU's and Duct Work as shown on the drawings and as specified in technical specification, complete in respect and to the satisfaction of Engineer In-charge	1	Job		
115.	**DUCT SOUND LINER** Supply, Installation & Commissioning of Duct Sound Liner 25mm thick, 48kg/m3 density as shown in drawings and specifications	2000	Sft		
116.	**CLADDING** Supply, Fabrication & installation of 26 gauge G.I.Sheet Metal Cladding over all ducting & piping on MER, as shown on the drawings and as specified in technical specification, complete in all respect and to the satisfaction of Engineer In-charge	2200	Sft		
117.	**AIR DEVICES** Supply, installation, testing and commissioning of Aluminum Constructed Air Devices included with back opposed blade volume controller with accessible key operated, as shown on the drawings and as specified in technical specification, including all opening for Air Devices should be sealed with Fire Retardant Sealant, with all labour, material and accessories, complete in all respect and to the satisfaction of Engineer In-charge				
(a)	Supply Ceiling Diffuser - SCD 12" Dia	4	Nos.		
(b)	Supply Ceiling Diffuser - SCD 24" Dia	38	Nos.		
(c)	Return Air Grill - RAG - 60" x 24"	2	Nos.		
(d)	Return Air Grill - RAG - 16" x 14"	1	Nos.		
(e)	Fresh Air Louver - FAL - 12" x 10"	2	Nos.		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
(f)	Fresh Air Louver - FAL - 24" x 24"	1	Nos.		
118.	**CHILLED WATER PIPING** Supply, Rigging, Lifting, Shifting, Installation, testing and commissioning of Seamless black steel schedule 40, Chilled water piping confirming ASTM - A53, as shown on the drawings and as specified in technical specification complete including elbows, tees, unions, reducers, flanges, nuts, bolts, Gaskets, identification signs, M.S.Sch.40 Pipe Sleeves (MS sheet for Puddle sleeves, hanger/supports of Hilti, Fischer, sikla, INKA, Link, Including the cost of all cleaning, painting with corrosion resistant paint, jointing and welding, guides / anchors sleeves, Clevis, Hangers & Supports with Wooden Saddles, including all labour, material and accessories, complete in all respect and to the satisfaction of Engineer In-charge				
(a)	3" dia	50	Rft		
(b)	2" dia	500	Rft		
(c)	1 1/2" dia	500	Rft		
119.	**CHILLED WATER PIPE INSULATION** Supply, Installation, testing & Commissioning of Closed Cell based elastomeric Foam Insulation of 25mm thickness, 50kg/m3 density for chilled water piping with low density elastomeric thermal insulation. Complete in all respect as mentioned in the schedule & specifications.				
(a)	3" dia	50	Rft		
(b)	2" dia	500	Rft		
(c)	1 1/2" dia	500	Rft		
120.	**VALVES & FITTINGS** Supply, Installation, testing and commissioning of Valves with matching flanges and gasket including G.I. cladding of all valves and filled with glass wool, as shown on the drawings and as specified in technical specification including all labour, material and accessories, complete in all respect and to the satisfaction of Engineer In-charge.				
	Gate Valves				
(a)	3" dia	1	Nos.		
(b)	2" dia	1	Nos.		
(c)	1 1/2" dia	10	Nos.		
	Strainer				
(d)	3" dia	1	Nos.		
(e)	2" dia	1	Nos.		
(f)	1 1/2" dia	5	Nos.		
	CFRV				
(g)	3" dia	1	Nos.		
(h)	2" dia	1	Nos.		
(i)	1 1/2" dia	5	Nos.		
121.	**INSTRUMENTS** Supply, installation, testing and commissioning of Pressure Gauges, Thermometers and air vent as				

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	shown on the drawings and as specified in technical specification including all labour, material and accessories, complete in all respect and to the satisfaction of Engineer In-charge				
(a)	Automatic Air Vent with Isolation Valve	7	Nos.		
(b)	Temperature Gauge with Brass Well	14	Nos.		
(c)	Pressure Gauge with Syphon	14	Nos.		
122.	**CONDENSATE DRAIN PIPING** Supply and installation of U-PVC piping Class- B, with closed cell elastomeric 1/2" thick Insulation for condensate drain including all cutting, fixing fitting, laying, cleaning, making good and supports complete in all respect as per drawings and specifications.				
(a)	1" dia	200	Rft		
(b)	1 1/4" dia	750	Rft		
(c)	1 1/2" dia	400	Rft		
123.	**VOLUME CONTROL DAMPERS** Supply and installation of Volume Control Dampers with PVC gear, multi-leaf opposed blade type with a maximum blade width of 200 mm. Dampers shall be constructed from sheet metal, two gauges heavier than the duct gauges, as shown on the drawings and as specified in specifications, complete in all respect and as directed by the Engineer In-charge	40	Sft		
124.	**MOTORIZED FIRE SMOKE DAMPER** Supply and installation of Motorized Fire Smoke Damper with sensor interlocked with FACP as per size mentioned in drawings and specification complete in all respect and as directed by the Engineer In-charge				
(a)	26"x26"	1	Nos.		
(b)	24"x12"	1	Nos.		
125.	**ELECTRICAL WORKS** Supply, installation, testing and commissioning of Motor Control Centre. Complete in all respect and to the satisfaction of Engineer In-charge.				
(a)	A.H.U # 1	1	Nos.		
(b)	A.H.U # 2	1	Nos.		
126.	Supply, installation, testing and commissioning of all Electrical Works for operation of AHU's, as per technical specifications, including Power / Control cables, conduits, cable tray, dis-connect switches, wiring in accordance with Pakistan Electrical Codes, including cost of all labour and material, complete in all respect and to the satisfaction of Engineer In-charge from MCC to AHU's.	1	Job		
127.	**SOUND ATTEUNATOR** Supply Installation and Commissioning of Sound Attenuator 36"x28"x30" as mentioned in drawings	2	Nos.		
128.	**TESTING,BALANCING & COMMISSIONING** Testing, Balancing and commissioning of entire HVAC system complete to deliver the designed air and water flow rates through each equipment, air inlets and outlets control setting, as specified in the technical specifications, and drawings including the cost of all labour, material, replacements, repair and	1	Job		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	repeating balancing till the desired results achieves without any additional cost etc. required to be carried out by a separate specialist agency approved by consultant / client and the result and test data to be submitted to the Engineer In-charge for approval prior starting maintenance period, complete in all respect and as directed by the Engineer In-charge / employer.				
129.	**SHOP DRAWINGS & AS-BUILT DRAWINGS** Providing Shop Drawings and As Built Drawings in A1 size (03 sets + CD) with Electronic Copies, as specified in specifications, complete in all respect and as directed by the Engineer In-charge	1	Job		
130.	**DISMANTLING WORKS** Dismantling of AHU & Equipment installed in the building, as per demolition drawings, complete in all respect including transferring dismantled equipment to designated site. All the associated accessories such as Ducting, chilled water piping, Valves, condensate drain pipes, Cold & Hot water piping, drain piping, gauges, thermostat, power and control wiring/conduits etc. should also be demolished accordingly. The contractor to make proper arrangement for placement for dead flanges on piping as per site condition	1	Job		
131.	Air Balancing of AHU's, Ducting and Water Balancing of AHU's as specified in specifications, complete in all respect and as directed by the Engineer In-charge**.**	01	Job		
				Sub Total (C)-HVAC Works	
	D. Network & UPS Works				
132.	Supply, installation & testing of of Cat6 UTP 23 AWG PVC solid cable (4-pair), having specification 250 MHz, ANSI/TIA-568.2-D & ISO/IEC 11801 Class E compliant; solid bare copper, PVC (CM) indoor jacket, impedance 100 ±15 Ω, NVP ~67%, DC resistance ≤9.38 Ω/100 m, 305 m pull-box; RoHS/REACH, through channeling open / concealed (cutting / chipping whatever involved) with PVC pipe and duct. Job complete in all respect as per site requirement and as directed by the Engineer In-charge	4000	Rft		
133.	Supply, installation & testing of Dual Shutter Network Faceplate loaded with Modular I/O, flush mount, RJ45 keystone jack compatible, with concealed back box. Complete in all respect as per site requirement and as directed by the Engineer In-charge	11	Nos		
134.	Supply, installation & testing of branded Communication Rack 15U, 600mm x 600mm (w x D), made of metal with powder coating, front glass door, back & side doors of metal, fins in the body and fan at the top for cooling, able to open BACK (Toten or equivalent brand). Complete in all respect as per site requirement and as directed by the Engineer In-charge	01	Nos		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
135.	Supply of 1U, 24-port loaded fiber patch panel, 19″ EIA-310, steel, labeled 1–24, rear strain-relief & splice tray(s) included, bend-radius compliant, chassis earthing kit, UL94 V-0, RoHS.	01	Nos		
136.	Supply, installation & testing of of 24-port 1U loaded patch panel (with modular I/O), 19″ EIA-310, black coated steel (RAL 9005, 1.2–1.6 mm), accepts standard UTP Cat6 keystone jacks, front numbered 1–24 with label, international standard compliant. Complete in all respect as per site requirement and as directed by the Engineer In-charge	01	Nos		
137.	Supply, installation & testing of 19″ 1U horizontal metal cable management bar with cover EIA-310 rack-mount, c black powder coat (RAL 9005). Complete in all respect as per site requirement and as directed by the Engineer In-charge	01	Nos		
138.	Supply, installation & testing of Cat6 UTP round patch cord, 1 meter	12	Nos		
139.	Supply, installation & testing of Cat6 UTP round patch cord, 3 meter	12	Nos		
140.	Supply of 8-core multimode (50/125 µm) OM4 10G unitube armoured outdoor cable, water blocking, CST armour for rodent/direct-burial protection, black UV-resistant HDPE sheath, central FRP strength member; bandwidth ≥2000 MHz·km @850 nm, attenuation ≤3.5 dB/km @850 nm, ≤1.5 dB/km @1300 nm, tensile ≥1500 N, crush ≥1000 N/100 mm; compliant with IEC 60794, ITU-T G.651.1, RoHS.	50	Meter		
141.	Installation & relocatation Multimode fiber optic cables with jointing kit , including splicing at both ends (splice tray installation, fusion splicing, and termination). Laying of cables (as already supplied & mentioned above) through PVC conduit or trunking; ensure correct bending radius during installation to prevent cable damage. Terminate fiber at both ends. Perform fusion splicing using splicing trays, and provide splice protection with heat shrink sleeves or inline connectors. Perform optical loss testing (OTDR, Power Meter) for attenuation, fiber continuity tests. Complete in all respect as per site requirement and as directed by the Engineer In-charge	01	Job		
142.	Supply, installation and testing of 3x2.5 mm² Single-Core Power Cable through open/concealed chasing (cutting/chiseling), with PVC conduit/duct identification/labeling and termination at both ends (faceplate & UPS Power DB). Complete in all respects per site requirements directed by engineer	1000	Rft		
143.	Supply, installation and testing of 3x4 mm² Single-Core Power Cable through open/concealed chasing (cutting/chiseling), PVC conduit/duct, labeling and termination at both ends (industrial socket & UPS Power DB), with tests (continuity, insulation, polarity and functional run). Complete in all respects per site requirements directed by Engineer In-charge	500	Rft		
144.	Supply, installation and testing of 32A industrial socket with high-impact, UV-resistant housing, rated	02	Nos		

Item No.	Description	Qty.	Unit	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	for single phase 230 V AC, providing secure, heavy-duty power connections in harsh environments.				
145.	Supply, installation and testing of Dual 3-Flat pin Power Face Plate with Back Box & accessories: 13A, 230V AC, UK-style (BS 1363), IP20 rated. Complete in all respects per site requirements directed by Engineer In-charge	12	Nos		
146.	Supply, Installation and testing of concealed UPS Distribution Board, 3φ+N, 230 V AC, 50/60 Hz, TN-S, continuous busbar rating ≥100 A (tinned copper). Incomer: 1× 30 A,3-pole MCCB, thermal-magnetic, Icu ≥10 kA @ 415 V; .Outgoing ways: 9× 16 A, 2-pole MCBs, C-curve, Icn ≥6 kA @ 240 V;. 3× 20A, 2-pole MCBs, C-curve, Icn ≥ 6 kA @ 240 V; lockable toggles; spare ways labeled phase indication.Bars & wiring: Dedicated neutral and earth bars; factory-terminated copper links; internal wirings and circuit ID labels. powder-coated steel, IP54, lockable door with safety cover. Complete in all respect as per site requirement and as directed by the Engineer In-charge Complete in all respect as per site.	01	Nos		
147.	Supply, laying, installation & termination and testing of 10 mm² 4-Core Power & Earth Cable (230V) through open/concealed routes, with PVC pipe and ducting, with proper cutting/chipping, cables to be terminated at both DB ends with proper lugs, with continuity testing, insulation resistance (≥1 MΩ). Complete in all respect as per site requirement and as directed by the Engineer In-charge	170	Rft		
148.	Supply & installation of of PVC 1" conduilt for the provision of UPS power & network cabling from Communication room to every location other than as mentioned above. Complete in all respect as per site requirement and as directed by the Engineer In-charge	1000	Rft		
				Sub Total (D)-Network & UPS Works	
	E. Fire Detection Works				
149.	Supply & Installation of two wired photoelectric smoke detector with Operating voltage: 12-30 V DC Operating temperature: -10 to 55 degree Celsius. Compliant with EN 54 complete in all respects	30	Nos		
150.	Supply and installation of Fire Resistant Cable in conduit of suitable size in compliance to BS 76291-1 (Standard 30) BS EN 50200 – 30 minutes Flame retardant in accordance with BS EN 60332-1-2 complete in all respects	300	Meter		
				Sub Total (E)-Fire Detection Works	

PRICE SUMMARY		
A1	Civil Works	
A2	Plumbing Works	
B1	Telephone Works	
B2	Lighting Works	
B3	Power Wiring and Distribution Boards	
B4	Wireless Audio Conference System	
C	HVAC Works	
D	Network & UPS Works	
E	Fire Detection Works	
	GRAND TOTAL	
	Rebate if any	
	Amount after rebate	

In words (Rs.): _____

_____Only