Issued to M/s: _____

Date : _____

Issued By : _____

PROJECT MANAGEMENT UNIT
SPECIAL INITIATIVE DEPARTMENT
GOVT. OF SINDH

DRINKING WATER HUBS- PAHSE-III

PROJECT:

DESIGN, PROCUREMENT, INSTALLATION, TESTING AND COMMISSIONING OF WATER FILTRATION PLANTS TO BE OPERATED ON SOLAR POWER OF THE PROJECT - DRINKING WATER HUBS- PAHSE-III

AS EPC/ TURNKEY CONTRACT, ON LUMP-SUM FIXED PRICE BASIS

BIDDING DOCUMENT
(Volume-I)

MAY, 2014

Project Management Unit
Drinking Water Hub, Phase III
Special Initiative Department

TENDER NOTICE

1. The Government of Sindh through Special Initiative Department is developing arid areas of Thar and for providing drinking water to the people of Arid Zone Areas. For Providing safe water, Special Initiative Department intend to install Solarized Reverse Osmosis Plants with desired capacities for brackish underground water in District Tharparkar and other Arid Zone Areas of Sindh. National Manufacturers or their authorized agents in Pakistan having adequate experience for following scope of work(s) as well as technical /manual force for job (s) and adequate experience of installation, commissioning and operation /maintenance of Solarized Reverse Osmosis Plants in Pakistan meeting the criteria under Sindh Public Procurement Rules 2010 and registered in the relevant category with Pakistan Engineering Council (PEC) can participate.

   - Supply , Installation and Commissioning of Reverse Osmosis Water Filter Plants to be operated by Solar Power of desired capacities including electrical , mechanical and plumbing works as well as complete operation and maintenance

2. The firms /companies having adequate experience /expertise and Registration in relevant category with PEC shall be required to carry out above scope of works to furnish Technical and Financial proposal as per tender document, separately in single stage two envelopes marked as TECHNICAL and FINANCIAL duly sealed. The technical proposal of firms which are found technically sound would only be considered for participation in financial bidding. The intending bidder through consortium of firms of relevant field (s) and meeting the criteria can also participate All intending firms shall also be required to furnish following additional information in Technical proposal. Non compliance will render the bidder ineligible.

   a) Company Profile with Financial Status of last three years.
   b) Proven Track record in the relevant fields.
   c) Reference of similar works along with execution certificates
   d) List of technical manpower /consultants on their payroll with relevant field experience for the execution of works viz. drilling/installation of tube well /lowering of submersible pumping units as well as installation and commissioning of and operation and maintenance of Reverse Osmosis Water Desalination Plants in the Arid Zone Areas.
   e) Details of Projects under execution ,negotiation /completed
   f) A certificate to the effect that firm has never been black listed or in litigation.
   g) Valid Registration certificate in relevant category in each scope of work from Pakistan Engineering Council should invariably be attached.
   h) All relevant documents/agreements having legal status proving relation of consortium with firms.

Tender Document containing detailed TOR, Job description and other information can be obtained from Office of the Project Director Drinking Water Hub Phase III located F-158/A-II , Block –V, Clifton Karachi, on written request on any working day during office hours upto 20th May , 2014, 4.00 pm against payment of prescribed fee of Rs 5000/= (non refundable) in shape of demand draft /pay order in favor of undersigned. In case of unscheduled holiday, tender will be opened on next working day.

The Technical proposals will be opened on same day, 20th May 2014, at 4:30pm in the presence of participating bidders.The documents beyond the scheduled date and time will not be entertained.

Technically qualified firms will be notified and such list will also be displayed on the Notice Board of PMU Drinking Water Hub. The date and time for opening of Financial bids of technically qualified firms will however be communicated separately. Financial bids under sealed cover should must accompany bid security @ 2% of total bid value in form of demand draft/pay order in favor of Project Director, Project Management Unit Drinking Water Hub. The competent authority reserve the right to accept or reject any or all bids subject to relevant provisions of Sindh Public Procurement Rules in vogue.

Project Director
Project Management Unit,
Drinking Water Hub, Phase III
Speciatial Initiative Department
Ph# 021 99251236 - 37

PROJECT MANAGEMENT UNIT
DRINKING WATER HUB, PHASE-III
SPECIAL INITIATIVE DEPARTMENT

TENDER NOTICE

CORRIGENDUM

The following corrigendum to above NIT already published in leading News papers and SPPRA web site is hereby issued

Para 3 last line "In case of unscheduled holiday, tender will be opened on the next working day" deleted and replaced with "In case of unscheduled holiday, the bids shall be submitted and opened as per given schedule on the next working day".

The Para 1 last line "in the relevant category with Pakistan Engineering council (PEC)" should read as

1. Valid Registration with Pakistan Engineering Council in Category C-1 or above necessarily having specialization in CE-09, CE-10, EE-03 and EE-04 in relevant categories and amount.

In case of JV / Consortium, the lead firm must fulfill the C-1 Category requirement with specialization codes of CE09, CE-10, EE-03 and EE-04 while other JV/ Consortium partners shall have at-least Category C-2 covering all remaining specialization codes)

The above mentioned requirement in the tender document wherever appeared should deemed to be read accordingly.

The last date for submission of bid is extended to **25-06-2014**.

All other requirement of NIT remains same.

Project Director (PMU)
Drinking Water Hub-SPG
Special Initiative Department
Govt. of Sindh
F-158/A-II BLOCK-5 CLIFTON
KARACHI.Tel: 021-99251236-7

PROJECT MANAGEMENT UNIT
DRINKING WATER HUB, PHASE-III
SPECIAL INITIATIVE DEPARTMENT

TENDER NOTICE

CORRIGENDUM

This is with reference to the corrigendum of this department published in leading Newspapers vide information Department Reference No. INF/KRYNO.1803/2014. The last date of submission of bid is read as 27-05-2014 instead of 25-06-2014.

All other requirement of NIT remain same.

Project Engineer (PMU)
Drinking Water Hub-SPG
Special Initiative Department
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F-158/A-II BLOCK-5 CLIFTON
KARACHI.Tel: 021-99251236-7

PROJECT MANAGEMENT UNIT, SID
GOVT. OF SINDH

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INSTRUCTIONS TO BIDDERS
AND
APPENDICES

INSTRUCTIONS TO BIDDERS AND APPENDICES

(A) GENERAL

IB.1 Scope of Bid and Source of Funds

1.1 Scope of Bid

PROJECT MANAGEMENT UNIT, SPECIAL INITIATIVE DEPARTMENT, GOVT. OF SINDH (hereinafter called the "Employer") wishes to receive Bids on EPC / Turnkey basis for the scope of work which includes, but shall not be limited to:

DESIGN, PROCUREMENT, INSTALLATION, TESTING AND COMMISSIONING OF WATER FILTRATION PLANTS TO BE OPERATED ON SOLAR POWER SYSTEM OF THE PROJECT- DRINKING WATER HUB - PHASE-III AS EPC / TURNKEY CONTRACT , ON LUMP-SUM FIXED PRICE BASIS.

A detailed scope of the work has been described elsewhere in these documents. The successful Bidder will be expected to complete the Works in all respect for making the plants functional / operational through solar power supply system within the stipulated period of 12 Months as specified in these Bidding Documents.

Bidders must quote prices for the complete scope of work. Any Bid covering partial scope of work will be non-responsive, pursuant to Clause IB.24.

1.2 Source of Funds

The Employer has received funds from the Government of Sindh under Annual Development Program and it is intended that part of the proceeds of the funds will be applied to eligible payments under the Contract for which these Bidding Documents are issued.

IB.2 Eligible Bidders

2.1 Bidding is open to all firms and persons meeting the following requirements as well as mentioned in the NIT.

a) Duly licensed by the Pakistan Engineering Council (PEC) in Category C-3 or above.

b) Foreign Bidders from eligible countries as per Appendix 'A' to Instructions to Bidders.

c) Prequalified, if such prequalification exercise has been conducted.

IB.3 Eligible Goods and Services

3.1 All Goods & ancillary Services to be supplied under this Contract shall have their origin in eligible countries as per Appendix 'A' to Instructions to Bidders and all expenditures made under the Contract will be limited to such Goods and Services.

3.2 For purpose of this Clause, "origin" means the place where the Goods are mined, grown or produced or from where the ancillary services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembling of components, a commercially recognized product results that is substantially different in basic characteristics or in purpose or utility from its components.

3.3 The origin of Goods and Services is distinct from the

IB.4 Cost of Bidding

4.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid and the Employer will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the Bidding process.

(B) BIDDING DOCUMENTS

IB.5 Contents of Bidding Documents

5.1 In addition to Invitation for Bids, the Bidding Documents are those stated below, and should be read in conjunction with any Addenda issued in accordance with Clause IB.7.

1. Instructions to Bidders (ITB) with Appendices to ITB
2. Letter of Technical Bid & Schedules to Bid
   Schedules to Bid are the following:
   - (i) Schedule A: Specific Works data
   - (ii) Schedule B: Proposed Organization for the Project
   - (iii) Schedule C: Method of Performing Works
   - (iv) Schedule D: Proposed Programme of Works
   - (v) Schedule E: Work to be Performed by Subcontractors
   - (vi) Schedule F: Deviations from Technical & Contractual Provisions
   - (vii) Schedule G: Specific Operation/Solar System and Equipment Details
   - (viii) Schedule H: Specimen JV Agreement
   - (ix) Schedule I: Past Performance and Present Commitments
3. Letter of Price Bid & Schedules to Bid
   Schedules to Bid are the following:
   - (i) Schedule J: Integrity Pact
   - (ii) Schedule K: Estimated Progress Payments
   - (iii) Schedule L: Lump Sum Cost Breakup for Major Cost Items
4. Schedule of Prices
5. Preamble to Conditions of Contract
6. General Conditions of Contract (GCC)
7. Particular Conditions of Contract (PCC)
8. Standard Forms
   Forms include the following:
   - (i) Form of Bid Security
   - (ii) Form of Contract Agreement
   - (iii) Form of Performance Security
   - (iv) Form of Bank Guarantee for Advance Payment
   - (v) Indemnity Bond for Secured Advance
9. Specifications - Special & Technical Provisions
10. Drawings

5.2 The Bidders are expected to examine carefully the contents of all the above documents. Failure to comply with the requirements of Bid submission will be at the Bidder's own risk. Pursuant to Clause IB.24, Bids which are not substantially responsive to the requirements of the Bidding Documents will be rejected.

IB.6 Clarification of Bidding Documents

6.1 A prospective Bidder requiring any clarification(s) in respect of the Bidding Documents may notify the Employer with a copy to the Project Manager/Engineer in writing or by fax at the address as provided under Sub-Clause 49.2 of GCC. Employer will examine the request for clarification of the Bidding Documents which it receives not later than fourteen (14) days prior to the deadline for the submission of bids and if needed will issue the clarification/amendment of the Bidding Documents at least ten (10) days before the date of submission of Bids (without identifying the source of enquiry) to all prospective Bidders who have purchased the Bidding Documents.

7.1 At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at his own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by issuing addendum.

7.2 Any addendum thus issued shall be part of the Bidding Documents pursuant to Sub-Clause 7.1 hereof, and shall be communicated in writing to all purchasers of the Bidding Documents. Prospective Bidders shall acknowledge receipt of each addendum in writing to the Employer. The Bidder shall also confirm in the Form of Bid that the information contained in such addenda have been considered in preparing his Bid.

7.3 To afford prospective Bidders reasonable time in which to take an addendum into account in preparing their Bids, the Employer may at its discretion extend the deadline for submission of Bids in accordance with Clause IB.19.

(C) PREPARATION OF BIDS

IB.8 Language of Bid

8.1 The Bid prepared by the Bidder and all correspondence and documents relating to the Bid, exchanged by the Bidder and the Project Manager/Engineer shall be written in the English language, provided that any printed literature furnished by the Bidder may be written in another language so long as accompanied by an English translation of its pertinent passages in which case, for purposes of interpretation of the Bid, the English translation shall govern.

IB.9 Documents Comprising the Bid

9.1 The Bid prepared by the Bidder shall comprise the following components:

(a) Covering Letter
(b) Letters of Bids duly filled, signed and sealed, in accordance with Clause IB.17.
(c) Schedules (A to L) to Bid duly filled and signed, in accordance with the instructions contained therein.
(d) Schedule of Prices completed in accordance with Clauses IB.11 and IB.12 in separate sealed envelope.
(e) Bid Security furnished in accordance with Clause IB.15.
(f) Power of Attorney in accordance with Clause IB 17.5.
(g) Joint Venture Agreement (if applicable). A foreign Bidder is entitled to bid only in a joint venture with a Pakistani constructor in accordance with the provisions of relevant PEC bye-laws.
(h) Documentary evidence established in accordance with Clause IB.13 that the Bidder is eligible to Bid and is qualified to perform the Contract if its Bid is accepted (past performance and present commitments to be filled in as per schedule I to Bid).
(i) Documentary evidence established in accordance with Clause IB.14 that the WFP operated upon Solar power System and ancillary Services to be supplied by the Bidder are eligible the WFP operated upon Solar power System and Services and conform to the Bidding Documents.
(j) Bidders applying for eligibility for domestic preference in bid evaluation shall supply all information & evidence to establish the claim for domestic preference required to satisfy the criteria for eligibility as described in Clause IB.27. The particulars for domestic Goods prescribed in Appendix C to these Instructions shall also be filled in to substantiate claim for domestic preference.
(k) Any other documents prescribed in Particular Conditions of Contract or Technical Provisions to be submitted with the Bid.

IB.10 Letters of Bids and Schedules

10.1 The Bidder shall complete, sign and seal the

10.2 For the purpose of granting a margin of domestic preference pursuant to Clause IB.27, the Employer will classify the Bids, when submitted in one of three groups as follows subject to change, if any, as per policy of the Federal Government as applicable on the date of bid opening:

(a) **Group 'A' Bid.** (i) For Goods for which labour, raw materials and components from within Pakistan account for at least 20% of the ex-factory Lump-Sum Fixed Price Bid of the products offered (ii) For Goods for which labour, raw materials and components from within Pakistan account for over 20% and up to 30% of the ex-factory Lump-Sum Fixed Price Bid of the products offered (iii) For Goods for which labour, raw materials and components from within Pakistan account for over 30% of the ex-factory Lump-Sum Fixed Price Bid of the products offered;

(b) **Group 'B' Bid.** For Goods manufactured in Pakistan for which the domestic value added in the manufacturing cost is less than 20% of the ex-factory Lump-Sum Fixed Price Bid; and

(c) **Group 'C' Bid.** For Goods of foreign origin.
In preparing their bids, the Bidders, whether local or foreign, shall enter in the Schedule of Prices, ex-factory price for indigenously manufactured products and CIF price as well as customs duty and sales tax and other import charges for products to be imported from outside Pakistan.

IB.11 Lump-Sum Fixed Price Bids

11.1 The Bidder shall fill up the Schedule of Prices attached to these documents indicating the unit rates and prices of the Works to be performed under the Contract. Prices on the Schedule of Prices shall be entered keeping in view the instructions contained in the Preamble to the Schedule of Prices.

11.2 The Bidder shall fill in rates and prices for all items of the Works described in the Schedule of Prices. Items against which no rate or price is entered by a Bidder will not be paid for by the Employer when executed and shall be deemed covered by rates and prices for other items in the Schedule of Prices.

11.3 The Bidder's breakup of price components in accordance with Sub-Clause 11.1 above will be solely for the purpose of facilitating the comparison of Bids by the Employer and will not in any way limit its right to contract on any of the terms offered.

11.4 Unless otherwise stipulated in the Conditions of Contract, prices quoted by the Bidder shall remain fixed during the Bidder's performance of the Contract and not subject to variation on any account. When the Bidders are required to quote only fixed price(s), a Bid submitted with an adjustable price quotation will be treated as non-responsive, pursuant to Clause IB.24.

11.5 Any discount offered shall be valid for at least the period of validity of the Bid. A discount valid for lesser period shall be considered null and void.

IB.12 Currencies of Bid

12.1 Prices shall be quoted in the following currencies:
(a) For Water Filtration Plants to be operated on Solar Power System/Goods and Services which the Bidder will supply from within Pakistan, the prices shall be quoted in the Pak. Rupees.
(b) For Water Filtration Plants to be operated on Solar Power System/Goods and Services which the Bidder will supply from outside Pakistan, the prices shall be quoted either in the U.S Dollars or in any other freely convertible currency.

12.2 Further, a Bidder ...

wishing to be paid accordingly, shall so indicate in its bid.

12.3 The currencies of payment shall be as stated in Particular Conditions of Contract.

IB.13 Documents Establishing Bidder's Eligibility and Qualifications

13.1 Pursuant to Clause IB.9, the Bidder shall furnish, as part of its Bid, documents establishing the Bidder's eligibility to Bid and its qualifications to perform the Contract if its Bid is accepted.

13.2 The documentary evidence of the Bidder's eligibility to Bid shall establish to the Employer's satisfaction that the Bidder, at the time of submission of its Bid is from an eligible source country as defined under Clause IB.2.

13.3 The documentary evidence of the Bidder's qualifications to perform the Contract if its Bid is accepted, shall establish to the Employer's satisfaction:

(a) that, in the case of a Bidder offering to water filter plants to be operated on solar power sysytem under the Contract which the Bidder did not manufacture or otherwise produce, the Bidder has been duly authorized by the manufacturer or producer to supply the Solar System to Pakistan;

(b) that the Bidder/Manufacturer has the financial, technical and production capability necessary to perform the Contract; and

(c) that, in the case of a Bidder not doing business within Pakistan the Bidder is or will be (if successful) represented by an agent in Pakistan equipped and able to carry out the Supplier's maintenance, repair and spare parts stocking obligations prescribed by the Conditions of Contract and / or Technical Provisions.

13.4 (a) Bidder/Manufacturer must possess and provide evidence of the following experience:-

i. has completed at least one (1) turnkey Contract with a minimum value of Rs.300 Million during the last five years.
ii. has designed, constructed, supplied and installed at least one similar facility during the last five years of Rs. 100 Million.
iii. Only those Bidder/Manufacturer are expected to participate who have ownership of the specific equipment / tools /machines specified in the Bidding Documents/ NIT for satisfactory performance of any specialized job as required under the Contract.

Documentation regarding the Bidder's experience on previous similar contracts must accompany with each Bid.
Bidder shall also submit proof of their financial capability to undertake the Contract.

In the event that the successful Bidder is a joint venture formed of two or more companies, the Employer requires that the parties to the joint venture accept joint and several liabilities for all obligations under the Contract.

Bidders shall furnish documentary evidence of qualification on the Form "Evidence of Bidder's Capability" (Appendix B to these Instructions).

(b) The Bidder should have an average annual turnover in the last five years equal to or more than Rs. 300 Million. Alternately, the Bidder should have successfully completed in the last five (5) years any specific project having value equal to or higher than Rs. 300 Million.

13.5 Joint Venture

In order for a Joint Venture to qualify:

(a) At least one of the partners of joint venture shall satisfy the relevant experience criteria specified in Sub-Clause 13.4(a).

(b) All firms comprising the joint venture shall be legally constituted and shall meet the eligibility requirement of Sub-Clause 2.1 hereof.

(c) All partners of the joint venture shall at all times and under all circumstances be liable jointly and severally to Employer for the execution of the entire Contract in accordance with the Contract terms and conditions and a statement to this effect shall be included in the authorization mentioned under Para (f) below as well as in the Form of Bid and Form of Contract Agreement (in case of a successful Bidder).

(d) The Form of Bid, and in the case of successful Bidder, the Form of Contract Agreement, shall be signed so as to be legally binding on all partners.

(e) One of the joint venture partners shall be nominated as being in-charge and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the joint venture partners.

(f) The partner-in-charge shall be authorized to incur liabilities, receive payments and receive instructions for and on behalf of any or all partners of the joint venture.

(g) A copy of the agreement entered into by the joint venture partners shall be submitted with the Bid stating the conditions under which it will function, its period of duration, the persons authorized to represent and obligate it and which persons will be directly responsible for due performance of the Contract and can give valid receipts on behalf of the joint venture, the proportionate participation of the several firms forming the joint venture, and any other information necessary to permit a full appraisal of its functioning. No amendments / modifications whatsoever in the joint venture agreement shall be agreed to between the joint venture partners without prior written consent of the Employer (Refer Schedule -H).

13.6 The Bidder shall propose, in order of his priority; water filter plants to be operated on Solar Power System, equipment or goods of not more than three (3) Manufacturers. Employer at his own jurisdiction will evaluate the WFP operated upon Solar power System , equipment or goods of only one of such Manufacturers.

IB.14 Documents Establishing the WFP operated upon Solar power System Eligibility and Conformity to Bidding Documents

14.1 Pursuant to Clause IB.9, the Bidder shall furnish, as part of its Bid, documents establishing the eligibility and conformity to the Bidding Documents of all Water Filtration Plant (WFP) operated upon Solar power System and Services which Bidder proposes to perform under the Contract.

14.2 The documentary evidence of the WFP operated upon Solar power System and Services eligibility shall establish to the Employer's satisfaction that they will have their origin in an eligible source country as defined under Clause IB.3. A certificate of origin issued at the time of shipment will satisfy the requirements of the said Clause.

14.3 The documentary evidence of the WFP operated upon Solar power System and Services' conformity to the Bidding Documents may be in the form of literature, drawings and data and shall furnish:

(a) A detailed description of the Solar System, essential technical and performance characteristics.

(b) Complete set of technical information, description data, literature and drawings as required in accordance with Schedule A to Bid, Specific Works Data. Drawings and data submitted must be in sufficient detail and clarity to permit the Employer to verify compliance with the provisions of the Bidding Documents. This will include but not be limited to the following:

(i) A sufficient number of drawings, diagrams, photographs, catalog

other relevant information about the WFP operated upon Solar power System to be furnished.

(ii) The approximate weight and dimension of the main components, a brief description of the principal materials and fabrication processes to be used and recommended methods of assembly.

(iii) Any other information which is required for evaluation purposes.

(c) A clause-by-clause commentary on Technical Provisions, provided with the Bidding Documents, demonstrating the WFP operated upon Solar power System and Service's substantial responsiveness to those Specifications or a statement of deviations and exceptions to the provisions of the Technical Provisions as required in Schedule F to Bid.

14.4 For purpose of the commentary to be furnished pursuant to Sub-Clause 14.3(c) above, the Bidder shall note that standards for workmanship, material and equipment, and references to brand names or catalogue numbers, designated by the Project Manager/Engineer in the Technical Provisions are intended to be descriptive only and not restrictive. The Bidder may substitute alternative standards, brand names and/or catalogue numbers in its Bid, provided that it demonstrates to the Project Manager/Engineer's satisfaction that the substitutions are substantially equivalent or superior to those designated in the Technical Provisions. Copies of the standards proposed by the Bidder other than those specified in the Bidding Documents shall be furnished.

IB.15 Bid Security

15.1 Each Bidder shall furnish, as part of his Bid, a Bid Security in an amount equal to 1% of the total project cost in Pak Rupees or an equivalent amount in any freely convertible currency.

15.2 The Bid Security shall be, at the option of the Bidder, in the form of Deposit at Call or a Bank Guarantee issued by a Scheduled Bank in Pakistan or from a foreign bank duly counter-guaranteed by a Scheduled Bank in Pakistan in favour of the Employer valid for a period twenty eight (28) days beyond the bid validity date.

15.3 The Bid Security is required to protect the Employer against the risk of Bidder's conduct which would warrant the security's forfeiture, pursuant to Sub-Clause 15.7 hereof.

15.4 Any Bid not accompanied by an acceptable Bid Security shall be considered by the Employer as non-responsive, pursuant to Clause IB.24.

15.5 The Bid securities of unsuccessful Bidders will be returned upon award of contract to the successful Bidder or on the expiry of validity of Bid Security whichever is earlier.

15.6 The Bid Security of the successful Bidder will be returned when the bidder has furnished the required Performance Security pursuant to Clause IB.34 and signed the Contract Agreement, pursuant to Clause IB.35.

15.7 The Bid Security may be forfeited:

(a) if a Bidder withdraws his Bid during the period of Bid validity;

(b) if a Bidder does not accept the correction of his Lump-Sum Fixed Price Bid, pursuant to Sub-Clause 24.2 hereof; or

(c) in the case of a successful Bidder, if he fails to:

(i) furnish the required Performance Security in accordance with Clause IB.34, or

(ii) sign the Contract Agreement, in accordance with Clause IB.35.

IB.16 Validity of Bids

16.1 Bids shall remain valid for 120 days after the date of Bid opening as prescribed in Clause IB.19.

16.2 In exceptional circumstances prior to expiry of original Bid validity period, the Employer may request the Bidders to extend the period of validity for a specified additional period which shall in no case be more than the original Bid validity period. The request and the responses thereto shall be made in writing. A Bidder may refuse the request without forfeiture of his Bid Security. A Bidder agreeing to the request will be required to extend the validity of his Bid Security for the period of the extension, and in compliance with Clause IB.15 in all respects in which case, the Employer will be obligated to compensate the Bidders, upon substantiation for their increase in costs (if it is a fixed price bid).

IB.17 Format and Signing of Bid

17.1 Bidders are particularly directed that the amount entered on the Form of Bid shall be for performing the Contract strictly in accordance with the Bidding Documents.

17.2 All Schedules to Bid (A to L) are to be properly completed and signed.

17.3 No alteration is to be made in the Form of Bid nor in the Schedules thereto except in filling up the blanks as directed. If any alteration be made or if these instructions be not fully complied with, the Bid may be rejected.

17.4 Each Bidder shall prepare one (1) Original and Three Copies, of the documents comprising the bid as described in Clause IB.9 and clearly mark them "ORIGINAL" and 'COPY" as appropriate. In the event of discrepancy between them, the original shall prevail.

17.5 The original and all copies of the Bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign (in the case of copies, Photostats are also acceptable). This shall be indicated by submitting a written Power of Attorney authorizing the signatory of the Bidder to act for and on behalf of the Bidder. All pages of the Bid and Schedules to Bid shall be initialed and stamped by the person or persons signing the Bid.

17.6 The Bid shall contain no alterations, omissions or additions, except to comply with instructions issued by the Employer, or as are necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

17.7 Bidders shall indicate in the space provided in the Form of Bid their full and proper addresses at which notices may be legally served on them and to which all correspondence in connection with their Bids and the Contract is to be sent.

17.8 Bidders should retain a copy of the Bidding Documents as their file copy.

(D) SUBMISSION OF BIDS

IB.18 Sealing and Marking of Bids

18.1 Each Bidder shall submit his Bid as under:

(a) ORIGINAL and Three COPIES of the original Technical Bid and Price Bid shall be separately sealed and put in separate envelopes and marked as such.

(b) The envelopes containing the ORIGINAL and COPIES of both Technical Bids and Price Bids will be put in one sealed envelope and addressed/identified as given in Sub-Clause 18.2 hereof.

(a) be addressed to the Employer at the address given in Sub-Clause 6.1 heretofore.

(b) bear the Project name, Contract No. and Date of opening of Bid.

(c) provide a warning not to open before the time and date for Bid opening.

18.3 The Bid shall be delivered in person or sent by registered mail at the address to Employer as mentioned in the Invitation to Bids.

18.4 In addition to the identification required in Sub-Clause 18.2 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 Clause IB.20.

18.5 If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the Bid.

IB.19 Deadline for Submission of Bids

19.1 (a) Bids must be received by the Employer at the address specified in Invitation for Bids not later than the time and date stipulated in the Invitation for Bids.

(b) Bids with charges payable will not be accepted, nor will arrangements be undertaken to collect the Bids from any delivery point other than that specified above. Bidders shall bear all expenses incurred in the preparation and delivery of Bids.

(c) Where delivery of a Bid is by mail and the Bidder wishes to receive an acknowledgment of receipt of such Bid, he shall make a request for such acknowledgment in a separate letter attached to but not included in the sealed Bid package.

(d) Upon request, acknowledgment of receipt of Bids will be provided to those making delivery in person or by messenger.

19.2 Bids submitted through telegraph, telex, fax or e-mail shall not be considered.

19.3 The Employer may, at his discretion, extend the deadline for submission of Bids by issuing an addendum in accordance with Clause IB.7, in which case all rights and obligations of the Employer and the Bidders previously subject to the original deadline will thereafter be subject to the deadline as extended.

IB.20 Late Bids

20.1 (a) Any Bid received by the Employer after the dead line for submission of Bids prescribed in Clause IB.19 will be returned unopened to such Bidder.

(b) Delays in the mail, delays of person in transit, or delivery of a Bid to the wrong office shall not be accepted as an excuse for failure to deliver a Bid at the proper place and time. It shall be the Bidder's responsibility to determine the manner in which timely delivery of his Bid will be accomplished either in person, by messenger, courier service or by mail.

IB.21 Modification, Substitution and Withdrawal of Bids

21.1 Any Bidder may modify, substitute or withdraw his Bid after Bid submission

21.2 The modification, substitution or withdrawal of any Bid shall be prepared, sealed, marked and delivered in accordance with the provisions of Clause IB.18 with the outer and inner envelopes additionally marked "MODIFICATION", "SUBSTITUTION" or "WITHDRAWAL", as appropriate.

21.3 Withdrawal of a Bid during the interval between the deadline for submission of Bids and the expiration of the period of Bid validity specified in the Form of Bid may result in forfeiture of the Bid Security pursuant to Clause IB.15.

(E) BID OPENING AND EVALUATION

IB.22 Bid Opening

22.1 A committee consisting of nominated members by the Employer and by the Project Manager/Engineer will open the Bids, including withdrawals, substitution and modifications made pursuant to Clause IB.21, in the presence of Bidders' representatives who choose to attend, at the time, date and location stipulated in the Invitation for Bids. Technical Bids will be opened first. At the end of the evaluation of the Technical Bids, the Employer will invite Bidders who have submitted substantially responsive Technical Bids and who have been determined as being qualified for award to attend opening of the Price Bids. The Bidders' representatives who are present shall sign in a register evidencing their attendance.

22.2 Envelopes marked "MOOIFICATION", "SUBSTITUTION" or "WITHDRAWAL" shall be opened and read out first and the name of the Bidder shall be read out. Bids for which an acceptable notice of withdrawal has been submitted pursuant to Clause IB.21 shall not be opened.

22.3 The Bidder's name, Lump-Sum Fixed Price Bids, unit rates, any discount offered, Bid modifications, substitutions and withdrawals, the presence or absence of Bid Security, and such other details as the Employer at its discretion may consider appropriate, will be announced by the Employer at the Bid opening. The Employer will record minutes of Bid opening.

Any Lump-Sum Fixed Price Bid or discount which is not read out and recorded at Bid opening will not be taken into account in the evaluation of Bid. Any discount offered by the Bidder on its quoted prices, shall only be considered if such discount is either shown on the duly filled-in, signed and stamped Form of Bid/Letter of price bid or on the Summary Page of the quoted amount for Lump sum contract/bill of quantities as applicable. In case of any discrepancy or difference in the rate or amount of discount mentioned in the Form of Bid/Letter of price bid (as duly filled-in and signed), and on the Summary Page of the Priced BOQ, the discount shown on the Priced BOQ shall prevail. Discount, if offered, through a separate letter of discount submitted with the Bid, will not be entertained and shall be considered null & void."

22.4 Discounts offered for lesser period than the Bid validity shall not be considered in evaluation.

IB.23 Clarification of Bids

23.1 To assist in the examination, evaluation and comparison of Bids, the Project Manager/Engineer may, at its discretion, ask the Bidder for a clarification of its Bid. The request for clarification and the response shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted.

IB.24 Preliminary Examination & Determination of Responsiveness of Bids

24.1 Prior to detailed evaluation pursuant to Clause IB.26, the Project M... determine the responsiveness of the Bi...

The Employer's/Project Manager/Engineer's determination of a Bid responsiveness will be based on the contents of the Bid itself without recourse to irrelevant evidence.

24.4 A Bid determined as substantially non-responsive will be rejected and will not subsequently be made responsive by the Bidder by correction of the non-conformity.

24.5 Any minor informality or non-conformity or irregularity in a Bid which does not constitute a material deviation may be waived by Employer, as long as the waiver does not prejudice or affect the relative ranking of any Bidder.

IB.25 Conversion to Single Currency

25.1 To facilitate evaluation and comparison, the Project Manager/Engineer will convert all Lump-Sum Fixed Price Bids, expressed in the amounts in various currencies in which Lump-Sum Fixed Price Bid is quoted, to Pak Rupees at the telegraphic Transfer and Over Draft (TT&OD) composite selling exchange rate published/authorized by the State Bank of Pakistan and applicable to similar transaction, on the date of bid opening.

IB.26 Detailed Evaluation of Bids

26.1 Only the Bids previously determined to be substantially responsive pursuant to Clause IB.24 will be evaluated and compared in detail by the Employer/Project Manager/Engineer as per the requirements given hereunder:

26.2 Evaluation and Comparison of Bids

(a) Bids will be evaluated for each item and/or complete scope of work.

(b) Basis of Price Comparison
The prices will be compared on the basis of the Evaluated Lump-Sum Fixed Price Bid pursuant to Para (e) herein below.

(c) Technical Evaluation

(i) It will be examined in detail whether the Solar System/facility offered by the Bidder comply with the Technical Provisions of the Bidding Documents. For this purpose, design offered by the Bidder will be reviewed for which the Bidder's data submitted with the Bid under Schedule A to Bid (Specific Works Data) will be compared with the technical features/criteria of the Solar System/facility detailed and prescribed by the Employer in these documents. Other technical information submitted with the Bid regarding the Scope of Work will also be reviewed including importations, if any, required.

(ii) The criteria for evaluation of technical bid shall be as per following details:

Sr. No.	General Screening of Technical Evaluation of various parameters		Minimum threshold details as per project type*	Pass/ fail
i	Experience	General Experience of the firm as per schedule I		
		Particular Experience of the firm as per schedule I		
ii	Competence	Design capacity as per IB 13.4 (a) (ii)		
		Construction Schedule / Work methodology / Resource scheduling plan as per schedule B,C and D		
		Available Resources of the firm i.e. Equipment and Manpower as per schedule G		
iii	Performance	Past perfor...		

		Current work commitments as per schedule I		
iv	Financial	Financial soundness as per IB 13.4 (b)		

A: Pass; B: Fail;
(>60%-Pass, <60%-Fail)

* To be specified by the Employer based on the project specific requirements.

(d) Commercial Evaluation

It will be examined in detail whether the Bids comply with the commercial/contractual conditions of the Bidding Documents. It is expected that no major deviation/stipulation shall be taken by the Bidders.

(e) Evaluated Lump-Sum Fixed Price Bid

In evaluating the Bids, the Employer will determine for each Bid in addition to the Lump-Sum Fixed Price Bid, the following factors (adjustments) in the manner and to the extent indicated below to determine the Evaluated Lump-Sum Fixed Price Bid:

(i) making any correction for errors pursuant to Sub-Clause 24.2 hereof.
(ii) excluding Provisional Sums, if any, but including priced Daywork.
(iii) making an appropriate adjustment for any other acceptable variation or deviation.

26.3 Evaluation Methods

Pursuant to Sub-Clause 26.2, Para (e)(iii) following evaluation methods for price adjustments will be followed in the financial evaluation:

(a) Price Adjustment for Completeness in Scope of Work
(b) Price Adjustment for Technical Compliance
(c) Price Adjustment for Commercial Compliance
(d) Price Adjustment for Deviations in Terms of Payment
(e) Price Adjustment for Completion Schedule

(i) Price Adjustment for Completeness in Scope of Work

In case of omission in the scope of work of a quoted item, no price adjustment for the omitted item(s) shall be applied provided that the Bidder has mentioned in his Bid that the same is covered in any other item.

The price adjustment shall not justify any additional payment by the Employer. The price(s) of omitted item(s) shall be deemed covered by other prices of the Schedule of Prices.

(ii) Price Adjustment for Technical Compliance

The cost of making good any deficiency resulting from technical non compliance will be added to the Corrected Total Lump-Sum Fixed Price Bid for comparison purposes only. The adjustments will be applied taking the average price quoted by other Bidders being evaluated in detail in their original Bids for corresponding item. In case of non availability of price from other Bidders, the price will be estimated by the Project Manager/Engineer.

(iii) Price Adjustment for Commercial Compliance

The cost of making good any deficiency resulting from any quantifiable acceptable variations and deviations from the Bid Schedules and Conditions of Contract, as determined by the Project Manager/Engineer will be added to the Corrected Total Lump-Sum Fixed Price Bid for comparison purpose only. Adjustment for commercial compliance will be based on Corrected Total Lump-Sum Fixed Price Bids.

(iv) Price Adjustment for Deviation in Terms of Payment

If a Bid deviates from the terms of payment/payment conditions as specified in the Conditions of Contract and if such deviation is considered acceptable to the Employer, mark-up earned for any earlier payments involved in the terms outlined in the Bid as compared to those stipulated in the Conditions of Contract shall be calculated at the mark-up rate of .....% per annum and shall be added to the Corrected Total Lump-Sum Fixed Price Bid for comparison purposes only.

(v) Price Adjustment for Completion Schedule

Bids indicating completion in advance of the dates stated in

Bids indicating completion period later than the period set out in Preamble to Conditions of Contract shall be adjusted in the evaluation by adding a factor of 0.05% of the Corrected Total Lump-Sum Fixed Price Bid for each calendar day of completion later than specified period of the completion.
Bids indicating completion beyond ..... days later than the dates set out in Preamble to Conditions of Contract shall not be considered and rejected as non-responsive.

26.4 If the Bid of the successful Bidder is seriously unbalanced in relation to the Employer's estimate of the cost of work to be performed under the Contract, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Schedule of Prices to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require that the amount of the Performance Security set forth in Clause IB.34 be increased at the expense of the successful Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

IB.27. Domestic Preference

27.1 In the comparison of evaluated Bids, the Goods manufactured in Pakistan, will be granted a margin of preference in accordance with the following procedures, provided the Bidder shall have established to the satisfaction of Employer that the manufacturing cost of such Goods includes a domestic value addition equal to at least 20% of the ex-factory Lump-Sum Fixed Price Bid of such Goods. Bidders applying for domestic preference shall fill in Appendix C to these Instructions to substantiate their claim.

27.2 The Employer/Project Manager/Engineer will first review the Bids to determine, the Bid group classification in accordance with Sub-Clause 10.2 hereof.

27.3 The comparison shall be ex-factory price of the Goods to be offered from within Pakistan (such prices to include all costs as well as custom duties and taxes paid or payable on raw materials and components incorporated or to be incorporated in the Goods) and the DDP (CIF + Customs duty, sales tax and other import charges) Pakistan seaport price of the Goods to be offered from outside Pakistan.

27.4 The lowest evaluated Bid of each Group shall first be determined by comparing all evaluated Bids in each Group among themselves taking into account:

(a) In the case of Goods manufactured in Pakistan, sales tax, local body charges and other similar taxes which will be payable on the furnished Goods in Pakistan.

(b) In the case of Goods of foreign origin offered from abroad, customs duties, sales tax and other import charges which will be payable on furnished Goods in Pakistan.

(c) In the case of Goods of foreign origin already located in Pakistan, customs duty, sales tax and import charges on CIF price as applicable for Sub-Clause 27.4(b) here above.

27.5 The price preference to Group A bids will be:

(i) 15% of the ex-factory Lump-Sum Fixed Price Bid, if the value addition through indigenous manufacturing is at least 20%;

(ii) 20% of the ex-factory Lump-Sum Fixed Price Bid, if the value addition through indigenous manufacturing is over 20% and up to 30%; and

(iii) 25% of the ex-factory Lump-Sum Fixed Price Bid, if the value addition through indigenous manufacturing is over 30%.

27.6 The applicable price preference i.e., as per Sub-Clause 27.5 here above will be applied to Group A Bid by reducing the ex-factory Lump-Sum Fixed Price Bid.

27.7 The computation for the purpose of domestic preferenes under Sub-Clause/Rule

IB.28 Process to be Confidential

28. 1 Subject to Clause 23 heretofore, no Bidder shall contact Employer and/or Project Manager/Engineer on any matter relating to its Bid from the time of the Bid opening to the time the Bid evaluation result is announced by the Employer. The evaluation result shall be announced at least ten (10) days prior to award of Contract. The announcement to all Bidders will include table(s) comprising read out prices, discounted prices, price adjustments made, final evaluated prices and recommendations against all the Bids evaluated.

28.2 Any effort by a Bidder to influence Employer and/or Project Manager/Engineer in the Bid evaluation, Bid comparison or Contract Award decisions may result in the rejection of his Bid. Whereas any Bidder feeling aggrieved may lodge a written complaint not later than fifteen (15) days after the announcement of the Bid evaluation result; however, mere fact of lodging a complaint shall not warrant suspension of the procurement process.

(F) AWARD OF CONTRACT

IB.29. Post-Qualification

29.1 The Employer, at any stage of the bid evaluation, having credible reasons for or *prima facie* evidence of any defect in supplier's or contractor's capacities, may require the suppliers or contractors to provide information concerning their professional, technical, financial, legal or managerial competence whether already pre-qualified or not:

Provided that such qualification shall only be laid down after recording reasons therefore in writing. They shall form part of the records of that bid evaluation report.

29.2 The determination will take into account the Bidder's financial, technical and production capabilities. It will be based upon an examination of the documentary evidence of the Bidder's qualification submitted under Appendix B to Instructions to Bidders "Evidence of Bidder's Capability" by the Bidder pursuant to Clause IB.13, as well as such other information as required under the Bidding Documents.

29.3 An affirmative determination will be a pre-requisite for award of the Contract to the lowest evaluated Bidder. A negative determination will result in rejection of that Bidder's Bid in which event, Employer will proceed to undertake a similar determination of the next lowest evaluated Bidder's capabilities to perform the Contract satisfactorily.

IB.30 Award Criteria

30.1 Subject to Clause IB.32, the Employer will award the Contract to the Bidder whose Bid has been determined to be substantially responsive to the Bidding Documents and who has offered the lowest evaluated Lump-Sum Fixed Price Bid, provided that such Bidder has been determined to be qualified to satisfactorily perform the Contract in accordance with the provisions of Clause IB.29.

IB.31 Employer's Right to Vary Quantities

31.1 Employer reserves the right at the time of award of Contract to increase or decrease by up to 15% the quantity of Solar System and Services contained in the Schedule of Prices without any change in the unit price or other terms and conditions.

IB.32 Employer's Right to Accept any Bid and to Reject any or all Bids

32.1 Notwithstanding Clause IB.30, the Employer reserves the right to accept or reject any Bid, and to annul the bidding process and reject all Bids, at any time prior to award of Contract,

justification of grounds. Rejection of all Bids shall be notified to all Bidders promptly.

32.2 No negotiation with the Bidder having been evaluated as lowest responsive or any other Bidder shall be permitted. However, the Employer may have clarification meeting(s) to get clarified any item(s) in the Bid evaluation report.

IB.33 Notification of Award

33.1 Prior to expiration of the period of Bid validity prescribed by the Employer, the Employer will notify the successful Bidder in writing ("Letter of Acceptance") that his Bid has been accepted. This letter shall name the sum which the Employer will pay the Contractor in consideration of the design, execution and completion of the Works/facility by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract called the "Contract Price").

33.2 The Letter of Acceptance and its acceptance by the Bidder will constitute the formation of the Contract, binding the Employer and the Bidder till signing of the formal Contract Agreement.

33.3 Upon furnishing by the successful Bidder of a Performance Security, the Employer will promptly notify the other Bidders that their Bids have been unsuccessful and return their Bid securities.

IB.34 Performance Security

34.1 The successful Bidder shall furnish to the Employer a Performance Security in the form and the amount stipulated in the Conditions of Contract within a period of twenty eight (28) days after the receipt of Letter of Acceptance.

34.2 Failure of the successful Bidder to comply with the requirements of Sub-Clauses IB.34.1, IB.35 or Clause IB.44 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security.

IB.35 Signing of Contract Agreement

35.1 Within fourteen (14) days from the date of furnishing of acceptable Performance Security under the Conditions of Contract, the Employer will send to the successful Bidder the Form of Contract Agreement provided in the Bidding Documents, duly filled in and incorporating all agreements between the parties for signing and return it to the Employer.

35.2 The formal Agreement between the Employer and the successful Bidder shall be executed within fourteen (14) days of the receipt of such Form of Contract Agreement by the successful Bidder from the Employer.

(G) ADDITIONAL INSTRUCTIONS

IB.36 Instructions not Part of Contract

36.1 Bids shall be prepared and submitted in accordance with the above Instructions to Bidders including Additional Instructions which are provided to assist Bidders in preparing their Bids, and do not constitute part of the Bid or the Contract Documents.

IB.37 Contract Documents

37.1 The Documents which will be included in the Contract are listed in the Form of Contract Agreement set out in these Bidding Documents.

IB.38 Sufficiency of Bid

is otherwise expressly provided in the Contract, the rates and prices entered in the Schedule of Price shall cover all his obligations under the Contract and all matters and things necessary for the proper completion of the Works/facility.

IB.39 One Bid per Bidder

39.1 Each Bidder shall submit only one Bid either by himself, or as a partner in a joint venture. A Bidder who submits or participates in more than one Bid will be disqualified and Bids submitted by him shall not be considered for evaluation and award.

IB.40 Bidder to inform himself

40.1 The Bidder is advised to obtain for himself at his own cost and responsibility all information that may be necessary for preparing the Bid and entering into a Contract for execution of the Works/facility. This shall include but not be limited to the following:

(a) inquiries on Pakistani Income Tax to the Commissioner of the Income Tax and Sales Tax, ...

(b) inquiries on customs duties and other import taxes, to the concerned authorities of Customs and Excise Department.

(c) information regarding port clearance facilities, loading and unloading facilities, storage facilities, transportation facilities and congestion at Pakistan seaports.

(d) investigations regarding transport conditions and the probable conditions which will exist at the time the WFP operated upon Solar power System will be actually transported.

IB.41 Alternate Proposals by Bidder

41.1 Should any Bidder consider that he can offer any advantage to the Employer by a modification to the designs, specifications or other conditions, he may, in addition to his Bid to be submitted in strict compliance with the Bidding Documents, submit any Alternate Proposal(s) containing (a) relevant design calculations; (b) technical specifications; (c) proposed construction methodology; and (d) any other relevant details / conditions, provided always that the total sum entered on the Form of Bid shall be that which represents complete compliance with the Bidding Documents.

41.2 Alternate Proposal(s), if any, of the lowest evaluated responsive Bidder only may be considered by the Employer as the basis for the award of Contract to such Bidder.

IB.42 Site Visit and Local Conditions

42.1 Bidder must verify and supplement by his own investigations the information about site and local conditions. However, Employer will assist the Bidder wherever practicable and possible.

42.2 All Bidders are required to visit the site at their own expense to review the areas allocated for the Solar System and the interfacing facilities, if any. Bidders may also wish to study local conditions, available facilities, communications, craft wages, roads and other transport facilities. Bidders shall also acquaint themselves with the relevant laws, rules, and regulations of Pakistan.

42.3 The Bidders and any of their personnel or agents will be granted permission by the Employer to enter upon his premises and lands for the purpose of such inspection, but only upon the express condition that the Bidders, their personnel and agents, will release and indemnify the Employer, his personnel and agents 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 such inspection.

43.1 The Employer may, at his own or at the request of any prospective Bidder(s), hold a Pre-Bid meeting to clarify issues and to answer any questions on matters related to the Bidding Documents. The date, time and venue of Pre-Bid meeting, if convened, shall be intimated through letter for invitation.

All prospective Bidders or their authorized representatives shall be invited to attend such a Pre-Bid meeting.

IB.44 Integrity Pact

44.1 The Bidder shall sign and stamp the Integrity Pact provided in Schedule-J to Bid in the Bidding Documents for all Federal Government procurement contracts exceeding Rupees ten million. Failure to provide such Integrity Pact shall make the Bid non-responsive.

IB.45 General Performance of the Bidders

45.1 The Employer reserves the right to obtain information regarding performance of the Bidders on their previously awarded contracts/works (Schedule-I to bid). The Employer may in case of consistent poor performance of any Bidder as reported by the employers of the previously awarded contracts, interalia, reject his bid and/or refer the case to the Pakistan Engineering Council. Upon such reference, PEC in accordance with its rules, procedures and relevant laws of the land take such action as may be deemed appropriate under the circumstances of the case including black listing of such Bidder and debarring him from participation in future bidding for similar works.

(H) APPENDICES

The Appendices to ITB are as given below:

- Appendix-A: Name of Eligible Countries
- Appendix-B: Evidence of Bidder's Capabilities
- Appendix-C: Domestic Goods (value added in Pakistan)
- Appendix-D: variation in Invitation to Bidders.

Appendix A to
Instructions to Bidders

NAME OF ELIGIBLE COUNTRIES

All the WFP operated upon Solar power System shall be from renowned manufacturers of North American or Western European (EU) origin or equivalent, and the Contractor shall have to submit, manufacturing locations and shipment details to establish the same.

EVIDENCE OF BIDDER'S CAPABILITY

Note: Bidders to provide the following information with the Bid separately and indicate herein its references where this information is available.

Sr.No.		Information to be Supplied	Bid References
1.		Name of Bidder, business address and country of incorporation.	
2.		Type of firm whether individually owned, partnership, corporation or joint venture and the names of its owners or partners.	
3.	(a)	The annual reports giving general description of the firm, sortof business carried out, balance sheets, profit and loss statements, turn over and business done by the firm, duly authenticated, for the last three (3) years. Audited Balance Sheets for the preceding three (3) years and projected assets and liabilities for the next two (2) years shall be provided.	
		i. Total value of works in hand on bid opening/preparation date.	
		ii. Total value of works completed in last three years.	
4.		Bidder / Manufacturer	
	(a)	Has completed at least one (1) EPC / Turnkey Contract with a min. value of Rs.300 Million during the last five years.(Schedule-I to bid)	
	(b)	Has designed, supplied and installed at least one similar facility during the last five years of Rs.50 million. (Schedule-I to bid)	
5.		Location and address of manufacturing facilities as applicable.	
6.		Full description of factories owned and the annual manufacturing capacities of various items made therein.	
7.		Details of the facilities where the offered equipment is proposed to be manufactured. This description should include the facilities and capacities of the particular factories including testing facilities and the processes used in manufacturing and testing. Where parts or components are purchased from outside, the details of equipment purchased and the names and experience	

Sr.No.		Information to be Supplied	Bid References
8.		Detailed description of the quality control testing and research facilities. If the equipment is manufactured under license, the name of the licensee and details of the licensing arrangements, such as the duration of the license, the facilities provided to the Bidder by the licensee and whether future improvements are available or not etc. A copy of the license agreement may be attached. Quality Control/ Quality assurance plan must also be submitted.	
9.	(a)	Names, qualifications and experience of the key technical personnel along with Resumes.	
	(b)	(i) Nos. of total permanent Staff on roll of the company.	
		(ii) Nos. of total qualified engineers on roll of the company.	
10.		The time since the manufacturer has been in this business and the time since he has been doing work of similar nature.	
11.		The time since the particular equipment offered has been manufactured and the time for which it has been in service. The manufacturer shall have the experience stated in Sub-Clause IB 13.4(a).	
12.		Reference lists of similar works done by the Bidder in its country and abroad indicating the name of customer, description and quantity of product, year of supply and the approximate value. This is an important consideration and should be filled in with full details (attach separate sheet if needed)	
13.		Details of projects under execution and future contractual commitments (for each partner, in case of a joint venture).	
14.	(a)	Banking reference, names of banks and addresses may be given to whom reference regarding financial capability of the Bidder may be made, with authority to make inquiries from the Bidder's bankers and clients regarding any financial and technical aspects (for each partner, in case of a joint venture).	
	(b)	Detail of OD limit allowed to the firm by the bank for the business including amount and its validity period.	
15.		Health, Safety and emergency plan	

Sr.No.	Information to be Supplied	Bid References
16.	Detailed/ Integrated work plan alongwith methodology to complete the assignment.	
17.	Training and Employment plan of local work force for which contractor is to have a sufficient budget for incurring expenditures on arranging such trainings for Consultant/ Employer staff comprising of 04 person for the period of six months, who are to maintain and operate the facility after construction. This is not reimbursable and contractor has to consider this amount included in his over heads.	
18.	Information on any litigation or arbitration resulting from contracts completed or under execution by the Bidder over the last ten (10) years. The information shall indicate the parties concerned, the matter of dispute, the disputed amounts and the result thereof (for each partner, in case of a joint venture).	

Appendix C to
Instructions to Bidders

Domestic Goods (Value added in Pakistan)

[Bidders claiming eligibility for domestic preference should fill in for supply items only, all columns hereunder and provide necessary documentation to substantiate their claim].

Sr. No.	Description of Indigenous Goods	Unit	Qty	Total Price of Goods Ex-Factory (Pak Rs.)	Domestic value added in the manufacturing cost as percentage of Ex-Factory Price	Amount of value addition (Pak Rs.)
1	2	3	4	5	6	7
Total in columns 5 & 7						

Computations:

A. Total amount of Value Addition (from Col.7) Rs_____

B. Total Ex-Factory Price of Indigenous Goods (from Col.5) Rs_____

C. Total DDP Price of imported supply items Eqv. Rs_____

D. Total Price of supply items [B+C] Eqv. Rs_____

E. % of value addition = [(A/D)x100] _____%

F. Domestic Preference =(15,20 or 25)% of B Rs_____

VARIATION IN INSTRUCTIONS TO BIDDERS

IB 2 Eligible Bidders

Existing text replaced with the following para:

The Employer, invites sealed bids, under Single Stage-Two Envelope bidding procedure as per SPPRA Rules 2010 from PEC Licensed Contractor / Firms / JVs/ Consortium having relevant experience of similar works with valid PEC License in Category C-1 and above with specialization codes of CE09,CE-10 EE-03 and EE-04 (in case of JV/ Consortium, the lead firm must fulfill the C-1 Category requirement with specialization codes of either CE09,CE-10, EE-03 and EE-04 while other JV/ Consortium partners shall have at-least Category C-2 covering all remaining specialization codes)

2.1 (c) Not applicable.

IB 10.2 Not applicable.

IB 12 Currencies of Bid

12.1 (b) Existing text replaced with the following para:

For water filter plants to be operated on Solar Power System/Goods and Services which the Bidder will supply from outside Pakistan, the prices shall be quoted in Pak Rs.

12.2 Existing text replaced with the following para:

Further, a Bidder expecting to incur a portion of its expenditure in the performance of the Contract should be in Pak. Rs.

IB.13 Documents Establishing Bidder's Eligibility and Qualifications

13.3 (c) Existing text replaced with the following para:

that, in the case of a Bidder not doing business within Pakistan the Bidder is or will be (if successful) represented by an agent in Pakistan and shall establish necessary facility for subsequent post operation maintenance, repair and spare parts stocking obligations.

13.4(b) Existing text replaced with the following para:

The Bidder should have an average annual turnover in the last five years equal to or more than Rs. 500 Million. Alternately, the Bidder should have successfully completed in the last five (5) years any specific project having value equal to or higher than Rs. 300 Million.

IB.15 Bid Security

15.1 Existing text replaced with the following para:

Each Bidder shall furnish, as part of his Bid, a Bid Security of an amount equal to 1% of the total project cost in Pak Rupees or an equivalent amount in any freely convertible currency.

15.2 Existing text replaced with the following para:

The bid security shall be at the option of the bidder, in the form of deposit at call, Pay order or a bank guarantee issued by a Scheduled Bank in Pakistan or from a foreign bank duly counter guaranteed by a Scheduled Bank in Pakistan in favour of the Employer valid for a period of twenty eight (28) days beyond the bid validity date i.e. 148 days beyond the Bid submitted date and in case of award of the contract the bid security validity extended to twenty eight (28) days beyond the project completion date.

IB.17 Format and Signing of Bid

17.4 Existing text replaced with the following para:

Each Bidder shall prepare one (1) Original and two (2) Copies, of the documents comprising the bid as described in Clause IB.9 and clearly mark them "ORIGINAL" and 'COPY" as appropriate. In the event of discrepancy between them, the original shall prevail.

IB.19 Format and Signing of Bid

19.3 In line 2 "addendum" replace with "corrigendum"

IB.23 Clarification of Bids

In line 1 and 2 the text "The Project Manager/ Engineer" is replaced with "Procurement Committee".

IB 24 Preliminary Examination & Determination of Responsiveness of Bids

24.1 Existing text replaced with the following para:

Prior to detailed evaluation pursuant to Clause IB.26, the Procurement Committee will determine the responsiveness of the Bids as follows:

Existing text replaced with the following para:

24.1 (a) The text "Project Manager/ Engineer" is replaced with "Procurement Committee".

24.1 (a) (vi) Existing text replaced with the following para:

The Lump-Sum Fixed Price Bids are firm during currency of contract.

24.2 Existing text replaced with the following para:

The amount extended in Letter of Price Bid shall be considered as the Lump-Sum Fixed Price Bid irrespective of any arithmetical or any other errors in the Schedule of Prices. As such, if there is a discrepancy between the unit price and total price that is obtained by multiplying the unit price and quantity, the total price shall prevail and the unit price shall be corrected within the segment on prorata basis. Total price shall be considered final as quoted. If there is a discrepancy between the words and figures the amount in words shall prevail. If there is a discrepancy between the total Lump-Sum Fixed Price Bid entered in Form of Price Bid and the total shown in Schedule of Prices Summary, the amount stated in the Bid shall be considered as final and Schedule of Prices will be corrected/ adjusted preferably in the same segment of the work.

IB.25 Conversion to Single Currency

25.1 Not applicable.

IB.26 Detailed Evaluation of Bids

Only the Bids previously determined to be substantially responsive pursuant to Clause IB.24 and fulfilling following Mandatory requirements will be evaluated and compared in detail by the Procurement Committee to be nominated by the Employer.

a). The Employer, invites sealed bids, under Single Stage-Two Envelope bidding procedure as per SPPRA Rules 2010 from PEC Licensed Contractor/ Firms / JVs/ Consortium having relevant experience of similar works with valid PEC License in Category C-3 and above with specialization codes of CE09,CE-10 & EE-03 (in case of JV/ Consortium, the lead firm must fulfill the C-3 Category requirement with specialization codes of either CE09,CE-10 or EE-03 while other JV/ Consortium partners shall have at-least Category C-4 covering all remaining specialization codes)

b). Bid Security as mentioned in Instruction to Bidders Clause IB-15.

c). Documentary evidence of the year of establishment of the bidding firm.

d). Proposed maintenance strategy with manpower spare parts and all tools required, pursuant to Sub-Clause 13.3 of Instruction to Bidders.

e). Pursuant to Clause 13.3 of the Instruction to Bidders documentary proof of dealership and support letter confirming the requirements contained in the Sub-Clause.

f). Affidavit on the stamp paper (duly notarized) that the bidding firm is not black listed by any Procuring Agency, Govt. or Semi-Govt. Departments, Autonomous bodies, International Organization and any Client/ Employer, DHA or Cantonment in Pakistan.

g). List of any present or past litigation of the Bidding Firm with any Procuring Agency, Govt. or Semi-Govt. Departments, Autonomous bodies, International Organizations or any other Client/ Employer (If "No" write "Nil" and submit an affidavit on Stamp Paper in this regard). Litigation statement shall be provided in the following format:

Sr. No.	Name of person/ Entity	Litigation Nature	Name of Project	Litigation date	Litigation result In progress/ concluded	If concluded, mention result

h). A firm undertaking by the Bidder that his Lump-Sum Fixed Price Bid is inclusive of all user requirements, irrespective of any major or minor item being missed in his Technical Proposal all works shall be completed under the contract in his quoted lump-sum fixed price and no additional payment over and above the lump-sum fixed price quoted by him shall be claimed or admissible under any circumstances.

i). Valid workable design conforming to minimum design parameters/ guide lines attached with bidding documents.

26.2 Existing Clause is replaced with the following para:

Further evaluation of only those bidders will be carried out who have cleared all the above mentioned Mandatory requirements.

26.3 Evaluation Method (The heading is replaced with Technical Evaluation Criteria)

Existing Clause is replaced with the following paras:

Technical Qualification Requirements

Following documents shall be evaluated (only for those Bidders who clear all mandatory requirements) on the basis of points as detailed below. Financial proposal of only those bidders shall be opened whose Technical Proposal gets 50% in each of the four categories mentioned below and 70 overall qualifying points out of 100 maximum points. The following information shall be presented in an orderly manner and no extra/ additional information is required so as to facilitate efficient evaluation:-

1. General Experience — Max.Point 10

The General experience of the contractor for projects of Rs.500 million or above in last 05 years (02 point for each project up to maximum of 5 projects). The projects should be presented strictly in the following format and no additional information should be given:

Sr. No. +	Name of Work	Employer/ Client	Amount (Rs.)	Date		Documents enclosed (Y/N)	
				Start	Compl.	W-order	Completion
1							
2							
.							
5							

2 Present and Previous Specific Experience — Max. Point 40

a). Experience of similar nature works completed as prime contractor (02 points for each project in last 05 years upto a maximum of 05 such projects). Documentary proof (i.e. work order & completion certificate) be attached. The projects should be presented strictly in the following format and no additional information should be given: — Max. Point. 10

Sr. No.	Name of Work	Employer/ Client	Amount (Rs.)	Date		Documents enclosed (Y/N)	
				Start	Compl.	W-order	Completion
1							
2							
.							
5							

b). Experience of similar nature works in hand as prime contractor (05 points for each project up to a maximum of 02 such projects). Documentary proof (i.e. work order) be attached. The projects should be presented strictly in the following format and no additional information should be given: — Max. Point. 10

Sr. No.	Name of Work	Employer/ Client	Amount (Rs.)	Date		Documents enclosed (Y/N)
				Start	Compl.	W-order
1						
2						

c). Regional Experience (Sindh/ Karachi) of project completed in last 05 years (02 point per project, upto a maximum of 05 projects) — Max. Point

d). ISO-9001:2000 Valid Registration or better shall be evaluated. Max. Point. 10

3. **Proposed Work Schedule, Method Statement, & Organization Chart** **Max. Point. 20**

a). Proposed Detailed Work Schedule (inter-relating all the sub-heads of the works) Max. Point. 03

b). Detailed Method Statement (Inter-relating all the sub-heads of the works) Max. Point. 03

c). Organization Chart Max. Point. 02

d). Proposed Project Manager - Professional Engineer registered BE (Electrical / Energy Engineer) in PEC with at-least 15 years overall experience and 10 years experience in related works having completed at-least street Solar light projects (detailed CV alongwith PEC registration, to be submitted). Max. Point. 08

e). List of employed Engineers with at-least 05 years of experience with their qualification with documentary proof and PEC Registration Number (01 Point for each Engineer upto a maximum of 05 points) Max. Point. 04

4. **Documentary evidence of Financial Soundness** **Max. Point 30**

a). Comprehensive Audited Reports from Chartered Accountant of the firm for last 03 years. Max. Point. 10

b). Banker's Certificate of financial soundness issued in last 06 months. Max. Point. 05

c). Bank Statement for last 12 months. Max. Point. 05

d). Average Annual Turnover of last 05 years (to be ascertained from Audited Reports or Income Tax return dully accepted by CBR). Max. Point. 10

- Less than Rs. 100 million - 02 Points
- Rs. 100 million to Rs.200 million - 04 Points
- Rs. 200 million to Rs.300 million - 06 Points
- Rs. 300 million to Rs.400 million - 08 Points
- More than Rs. 500 million - 10 Points

Total of Max.Point 100

Note:
"Employer" will verify the validity of submitted documents from the respective Employers / Clients / Banks/ Auditors, etc. and if it is found out that any fake / misleading / un-verifiable document and / or information has been provided by the Bidder than take action regarding disqualification or black-listing of the bidder as per relevant SPPRA Rules.

26.4 Commercial Evaluation

Existing Clause is replaced with the following para:

Existing Clause is replaced with the following para:

of Prices to demonstrate the internal consistency of those prices with the construction methods and schedule proposed.

IB. 27 Domestic Preference

27.2 The text "The Project Manager/ Engineer" is replaced with "The Procurement Committee".

27.3 Not Applicable.

27.4 Not Applicable.

27.5 Not Applicable.

27.6 Not Applicable.

27.7 Not Applicable.

IB. 34 Performance Security

34.1 The text of Existing Clause is replaced with the following para:

The Bid Security of the successful Bidder will be retained as Performance Security with validity extended to twenty eight (28) days beyond the project completion date. pursuant to Clause IB.34 and signed the Contract Agreement, pursuant to Clause IB.35.
The Bid Security shall be, at the option of the Bidder, in the form of Deposit at Call or a Bank Guarantee issued by a Scheduled Bank in Pakistan or from a foreign bank duly counter-guaranteed by a Scheduled Bank in Pakistan in favour of the Employer.
The cost of complying with requirements of this Sub-Clause shall be borne by the Contractor.

Note. The total amount including performance security and retention money deducted from bills should not exceed 10% of the contract price.

LETTER OF TECHNICAL BID & SCHEDULE TO BID

LETTER OF TECHNICAL BID

Bid Reference No. : _____
Package No. : _____

DESIGN, PROCUREMENT, INSTALLATION, TESTING AND COMMISSIONING OF WATER FILTRATION PLANTS TO BE OPERATED ON SOLAR POWER SYSTEM OF THE PROJECT - DRINKING WATER HUBS-PAHSE-III

AS EPC/ TURNKEY CONTRACT, ON LUMP-SUM FIXED PRICE BASIS

To:
.....
.....
.....

Gentlemen.

1. Having examined the Bidding Documents including Instructions to Bidders, Conditions of Contract, Specifications, Drawings, Schedules to Bid, Schedule of Prices and Addenda Nos. ..... for the execution of the above-named Works, we, the undersigned. being a company doing business under the name of and address .....
..... and being duly incorporated under the laws of ..... hereby offer to execute and complete such Works and remedy any defects therein in conformity with the said documents including Addenda thereto.

2. We understand that all the Schedules attached hereto form part of this Bid.

3. As security for due performance of the undertakings and obligations of this Bid, we submit herewith a Bid Security in the amount of ..... drawn in the favor of, or made payable to the Employer, ... and valid for a period ..... days beyond the period of validity of Bid.

4. We undertake, if our Bid is accepted, to commence the Works and to deliver and complete the whole of the Works comprised in the Contract within the time(s) stated in Preamble to the Conditions of Contract.

5. We agree to abide by this Bid for the period of ..... days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

6. Unless and until a formal Agreement is prepared and executed, this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.

7. We undertake, if our Bid is accepted to execute the Performance Security referred to in Clause 10 of Conditions of Contract for the due performance of the Contract.

8. We do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other person or persons making a Bid for the Works.

9. We do hereby declare that our firm, including any subcontractors or suppliers for any part of the Contract, have nationalities from eligible countries *[insert the nationality of the Bidder, including that of all parties that comprise the Bidder if the Bidder is a consortium or association, and the nationality of each Subcontractor and Supplier]*.

11. We are not participating, as a Bidder or as a subcontractor, in more than one bid in this bidding process.

12. We confirm, if our Bid is accepted, that all partners of the joint venture shall be liable jointly and severally for the execution of the Contract and the composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer. (Please delete in case of Bid from a single firm).

Dated this _____day of_____2014

Signature: _____ in the capacity of _____duly authorized to sign Bids for and on behalf of _____

(Name of Bidder in Block Capitals)

(Seal)

Address: _____

_____

_____

Witness:

Signature: _____

Name: _____

Address: _____

_____

Occupation_____

SID

SPECIFIC WORKS DATA

The main technical data is prescribed in the relevant sections of the Technical Provisions. However, the Bidder may supplement the main technical data, for works under consideration to enable the Employer/Project Manager/Engineer to assess technical conformance of the proposed design / equipment and the means available with the contractor to do it.

Initials of Signatory to Bid: .....

SCHEDULE - B TO BID

PROPOSED ORGANIZATION FOR THE PROJECT

The Bidder shall provide in this Schedule Organization chart indicating the key personnel he will employ for Head office and for Site office involved in management, supervision and Project Manager/Engineering of the Works to be done under the Contract to direct and execute the Works, together with their names, qualifications, experience, positions held and their nationalities.

Designation	Name of Person	Summary of Qualifications, Experience, Present Position and Nationality

- Head Office:

- Site Office:
  Contractor's Representative
  Site Superintendent
  Supervising engineers
  Solar System Erectors
  Construction Supervisors
  Other Key Staff

Initials of Signatory to Bid: .....

METHOD OF PERFORMING THE WORKS

The Bidder is required to submit a narrative outlining the method of performing the Works. The narrative should indicate in detail and include but not be limited to:

- The sequence and methods in which he proposes to carry out the Works, including the number of shifts per day and hours per shift, he expects to work.

- A list of all major items of constructional and erection Solar System, tools and vehicles proposed to be used in carrying out the Works at Site, including number of each kind, make, type, capacity of all equipment, working condition, which shall be deployed by him for Civil Work and Erection, Testing and Commissioning of the Works, in sufficient detail to demonstrate fully that the equipment will meet all the requirements of the Specifications.

- The procedure for installation/erection of equipment and transportation of equipment and materials to the site.

- Details regarding mobilization in Pakistan, the type of facilities including personnel accommodation, office accommodation, provision for maintenance and for storage, communications, security and other services to be used.

- The Contractor shall provide description of his construction camp's facilities and staff housing requirements.

- The Contractor shall be responsible for pumps, electrical power, water and electrical distribution systems, and sewerage system including all fittings, pipes and other items necessary for servicing the Contractor's construction camp and staff housing facilities. The Bidder shall list or explain his plans for providing these facilities for the service of the Contract as follows:

    1. Site Preparation (clearing, land preparation, etc.).

    2. Provision of Services.

        a) Power (expected power load, etc.).
        b) Water (required amount and system proposed).
        c) Sanitation (sewage disposal system, etc.).

3. Construction of Facilities

   a) Contractor's Office, Workshop and Work Areas (areas required and proposed layout, type of construction of buildings, etc.).

   b) Warehouses and Storage Areas (area required, type of construction and layout).

   c) Housing and Staff Facilities (Plans for housing for proposed staff, layout, type of construction, etc.)

4. Construction Equipment Assembly and Preparation (detailed plans for carrying out this activity).

5. Other Items Proposed (Security arrangement, etc.).

Initials of Signatory to Bid: .....

SCHEDULE - D TO BID

PROPOSED PROGRAMME OF WORKS

Bidder shall provide a program of work in a bar-chart/CPM/PERT/ Primavera Level-3 form showing the sequence of work items by which he proposes to complete the Work of the entire Contract. The program of work should indicate the sequences 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 / procurement of materials, manufacturing, delivering, design & construction of associated civil works, installation/ erection, testing and commissioning of Works to be executed under the Contract. The Bidder should also submit procurement schedule for all local / imported items along with program of work upon the satisfaction of the Client before issue of letter of acceptance.

Initials of Signatory to Bid: .....

SCHEDULE - E TO BID

WORK TO BE PERFORMED BY SUBCONTRACTORS

The Bidder will do the work with his own work force except the part (s) of the Works listed below which he intends to sub-contract.

Items of Works to be Sub-Contracted	Name and address of Sub-Contractor	Statement of similar works previously Executed (attach evidence)

Note:

1. The sub-Contractor will be employed with approval of the Employer.
2. The truthfulness and accuracy of the statement as to the experience of Subcontractors is guaranteed by the Bidder. The Employer's judgment shall be final as to the evaluation of the experience of Subcontractors submitted by the Bidder.
3. Statement of similar works shall include description, location & value of work, year completed and name & address of the clients.
4. This may include manufacturer(s) who are proposed here and their relevant details to be provided accordingly including make, capacity and salient features to make it particularly suitable for the works. The technology used should also be detailed adequately.
5. The Sub-Contractor will be replaced on the direction of Employer, whenever replaced Contractor should be of equal experience and capability.
6. Complete profile of Sub-Contractor should be provided.

Initials of Signatory to Bid:.....

SCHEDULE - F-1 TO BID

DEVIATIONS
FROM TECHNICAL PROVISIONS

It is presumed that the Bidder shall not take any deviation. However, if he intends to take deviations to the specified technical provisions, those must be listed in the space provided below:

Sr. No.	Clause No. / Section No.	Deviations/Clarifications

Note: Attach additional sheets, if necessary

Initials of Signatory to Bid:.....

SCHEDULE - F-2 TO BID

DEVIATIONS
FROM CONTRACTUAL CONDITIONS

It is presumed that the Bidder shall not take any deviation. However, if he intends to take deviations to the specified Contractual/Commercial Conditions, those must be listed in the space provided below:

Sr. No.	Clause No. / Section No.	Deviations/Clarifications

Note: Attach additional sheets, if necessary

Initials of Signatory to Bid:.....

SCHEDULE - G TO BID

SPECIFIC OPERATIDN/SOLAR SYSTEM AND EQUIPMENT DETAIL

Note: Attach additional sheets, if necessary

Initials of Signatory to Bid:.....

JV AGREEMENT

[Employer to provide the standard form of Joint Venture Agreement]

Standard Form of PEC of JV/Consortium Agreement the same can be down loaded from www.pec.org.pk

(In the event that the successful Bidder is a joint venture formed of two or more companies, the Employer requires that the parties to the joint venture accept joint and several liabilities for all obligations under the Contract.)

SCHEDULE - I TO BID

PAST PERFORMANCE AND PRESENT COMMITMENTS

Past Performance

Sr. No.	Name of project(s)	Name of employer	completed cost	Start date	Planned completion date	Actual completion date	Satisfactory performance certificate from employer / Remarks regarding delays if applicable
1.							
2.							
3.							
4.							
5.							
6.							
7.							

Present Commitments

Sr. No.	Name of ongoing project(s)	Name of employer	Total cost	Start date	Planned completion date	%age of works completed	Award letter / Remarks regarding delays if applicable
1.							
2.							
3.							
4.							
5.							
6.							
7.							

Any Bidder showing projects outside Pakistan, the information provided on the project needs to be substantiated by certification of concerned country's embassy in Pakistan.

LETTER OF PRICED BID & SCHEDULE TO BID

LETTER OF PRICE BID

Bid Reference No. : _____
Package No. : _____

DESIGN, PROCUREMENT, INSTALLATION, TESTING AND COMMISSIONING OF WATER FILTRATION PLANTS TO BE OPERATED ON SOLAR POWER SYSTEM OF THE PROJECT - DRINKING WATER HUBS - PAHSE-III

AS EPC/ TURNKEY CONTRACT, ON LUMP-SUM FIXED PRICE BASIS

To:

.....
.....
.....

Gentlemen,

1. Having examined the Bidding Documents including Instructions to Bidders, Conditions of Contract, Specifications, Drawings, Schedules to Bid, Schedule of Prices and Addenda Nos. ..... for the execution of the above-named Works, we, the undersigned, being a company doing business under the name of and address .... and being duly incorporated under the laws of ..... hereby offer to execute and complete such Works and remedy any defects therein in conformity with the said Documents including Addenda thereto for the Total Lump-Sum Fixed Price Bid comprising of Local Currency Component of Lump-Sum Fixed Price of Pak Rupees ..... (Rs. .....).

2. We understand that all the Schedules attached hereto form part of this Bid.

3. We undertake, if our Bid is accepted, to commence the Works and to deliver and complete the whole of the Works comprised in the Contract within the time(s) stated in Preamble to the Conditions of Contract.

4. We agree to abide by this Bid for the period of 120 days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

5. Unless and until a formal Agreement is prepared and executed, this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.

6. We undertake, if our Bid is accepted to execute the Performance Security referred to in Clause 10 of Conditions of Contract for the due performance of the Contract.

7. We understand that you are not bound to accept the lowest or any Bid you may receive.

8. We do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other person or persons making a Bid for the Works.

9. We confirm, if our Bid is accepted, that all partners of the joint venture shall be liable jointly and severally for the execution of the Contract and the composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer. (Please delete in case of Bid from a single firm).

Dated this _____day of_____2014

SID

Signature: _____ in the capacity of _____duly authorized to sign Bids for and on behalf of _____

(Name of Bidder in Block Capitals)

(Seal)

Address: _____

_____

_____

Witness:

Signature: _____

Name: _____

Address: _____

_____

Occupation_____

SCHEDULE - J TO BID

Integrity Pact

[To be filled and signed by the Bidder]

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

Contract No._____ Dated _____
Contract Value: _____
Contract Title: _____

..... [Name of Supplier] 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 (GoP) or any administrative subdivision or agency thereof or any other entity owned or controlled by GoP through any corrupt business practice.

Without limiting the generality of the foregoing, [name of Supplier] represents and warrants that it has fully declared the brokerage, commission, fees 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 consultation 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 Supplier] 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, representation or warranty.

[name of Supplier] accepts full responsibility and strict liability for making any false declaration, not making full disclosure, misrepresenting facts 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 rights 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 Supplier] 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 Supplier] 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.

Name of Buyer: .....
Signature: .....
[Seal]

Name of Seller/Supplier: .....
Signature: .....
[Seal]

The words "by arbitration" appearing at the end of the Sub-Clause 28.7(c) are deleted and substituted by the words "by the Engineer".

Sub-Clause 30.4 Extension of Defects Liability Period

At the end of 4th paragraph of Sub-Clause the following is added:
"or a mutually agreed period."

Sub-Clause 30.5 Failure to Remedy Defects

In first line after the words "reasonable time" the following is added:
"fixed by the Engineer".

Sub-Clause 30.5 (b) is deleted.

Sub-Clause 30.9 Defects in Employer's and Engineer's Designs

Deleted in its entirety as the project is as Design-built Basis.

Sub-Clause 30.10 Contractor to Search

The text of Sub-Clause 30.1 is deleted and substituted by the following:
"The Contractor shall, if required by the Engineer in writing, search for the cause of any defects, under the direction of the Engineer".

The following new Sub-Clause 30.13 is added:

Sub-Clause 30.13 Unfulfilled Obligations

"After the Defects Liability Certificate has been issued, the Contractor and the Employer shall remain liable for the fulfillment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of any such obligation, the Contract shall be deemed to remain in force."

Sub-Clause 31.1 Project Manager/Engineer's Right to Vary

The following is added at the end of second paragraph:

"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 Clause 31. Provided that whether 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".

Sub-Clause 31.5 Records of Costs

The word "Engineer" in 4th line of Sub-Clause is deleted and substituted by "Engineer/Employer".

The following new Sub-Clauses 31.6 and 31.7 are added:

Sub-Clause 31.6 Daywork under Variation Order

A Variation Drder may provide that work done pursuant thereto shall be executed as Daywork, if applicable in the opinion of the Engineer. In such case the

Contractor shall be paid for such work under the conditions and the rates and prices set out in the Day Work Schedule.

Sub-Clause 31.7 Value Engineering

The Contractor may, at any time, submit to the Engineer a written proposal which in the Contractor's opinion will reduce the cost of constructing, maintaining or operating the works, or improve the efficiency or value to the Employer of the completed Works or otherwise be of benefit to the Employer. Any such proposal shall be prepared at the cost of the Contractor. However Employer is not bound to accept such proposal."

Sub-Clause 33.1 Terms of Payment

The text of Sub-Clause 33.1 is deleted and substituted by the following:

"The EPC/Turnkey Contract as Lump-Sum fixed Price shall be payable as per the Approved schedule of payment attached in the Technical Bid and Section Schedules.

Secured Advance

Employer may opt either "Secured Advance on Materials" if applicable shall be given after the Contractor has provided indemnity bond for secured advance as per standard format.

Advance Payment Security

The text is deleted and replaced with following:

(a) Mobilization advance up to 10% of the Contract Price may be paid by the procuring agency to the Contractor:

i). on submission by the Contractor of a mobilization advance guarantee for the full amount of the advance in the specified form, from a Scheduled Bank in Pakistan, acceptable to the procuring agency;

ii). contractor shall pay interest on the mobilization advance at the rate of 10% per annum on the advance; and.

(b) This Advance including the interest shall be recovered in 5 equal installments from the 5 R.A bills (Interim Payment Certificates) and in case the number of bills is less than 5 then 1/5 of the advance inclusive of the interest thereon shall be recovered from each bill and the balance together with interest be recovered from the final bill. It may be insured that there is sufficient amount in the final bill to enable recovery of the Mobilization Advance.

The following new Sub-Clauses 33.1.1 to 33.1.5 are added:

Sub-Clause 33.1.1 Retention of Payment

"If at any time any payment would fall due for Works or part of Works and, if there shall be any defect in part of such Works in respect of which such payment is proposed, the Employer may retain the whole or any part of such payment. Any sum retained by the Employer pursuant to the provisions of this Clause shall be paid to the Contractor after the said defect is removed."

Sub-Clause 33.1.2 Payment Where Taking-Over Certificate Issued for Section or Part of Works

"If any section or part of the Works shall be taken-over separately under Clause 29 (Taking Over) hereof, the payments herein provided for on or after Taking-Over shall be made in respect of the section or part taken-over and reference to the price shall mean such part of the price as shall, in the absence of agreement, be apportioned thereto by the Engineer."

Sub-Clause 33.1.3 Extra Payment

No extra payment in respect of overtime, additional materials, or special conditions or hardship shall be claimed by the Contractor unless otherwise provided in the Contract or such payments have been previously authorized in writing by the Engineer or the Employer.

Sub-Clause 33.1.4 Breakdown of Lump Sum Items

For the purposes of statements to be submitted in accordance with Sub-Clause 33.1 hereof, the Contractor shall submit to the Engineer, within twenty eight (28) days after the receipt of the Letter of Acceptance, a breakdown for each of the lump sum items contained in the Bid. Such breakdowns shall be subject to the approval of the Engineer."

Sub-Clause 33.2 Method of Application

The following paragraphs are added:

"The Contractor shall submit to the Employer/Engineer six (6) copies of the Application for Certificate of Payment (invoices) each signed by the Contractor and in such form as the Employer/Engineer may from time to time prescribe.

The Employer/Engineer shall examine such invoices within the times stated in Sub-Clauses 33.3 and 33.5. After such time each invoice will be deemed to have been accepted. If the invoice amount is not accepted by the Employer/ Engineer, the disputed amount which is retained, shall be communicated, giving the reasons in writing, to the Contractor within the same time. If the objections of the Employer/ Engineer are not acceptable to the Contractor he will justify his claims with necessary documentation and include left over amounts / items in the next invoice. However, the portions of such invoices accepted by the Employer/ Engineer shall be paid as per Sub-Clause 33.5."

Sub-Clause 33.5 Payment

The text of Sub-Clause 33.5 is deleted and substituted by the following:

"The amount due to the Contractor under any Interim Payment Certificate issued by the Engineer pursuant to this Clause, or to any other term of the Contract, shall, subject to Clause 27, be paid by the Employer to the Contractor within thirty (30) days after such Interim Payment Certificate has been jointly verified by Employer and Contractor, or, in the case of the Final Certificate (referred to in Sub-Clause 33.10) within sixty (60) days after such Final Payment Certificate has been jointly verified by Employer and Contractor; Provided that the Interim Payment shall be

caused in thirty (30) days and Final Payment in forty two (42) days in case of foreign funded project.

Deduction shall be made from the net amounts payable to the Contractor of any sum(s) in accordance with the prevalent Federal and/or Provincial laws, provided that no such deduction shall be made from those payments in respect of which the Contractor has obtained exemption under the Law.

All payments to the Contractor shall be subject to withholding of Retention Money @ 10% of each IPC upto a maximum of a total of 8% of Contract Price. 50% of 5% Retention Money shall be released to the Contractor on Handing-over of Project and balance 50% of 5% Retention money shall be released to the Contractor after successful completion of Defect Liability Period."

Sub-Clause 33.6 Delayed Payment

The text of Sub-Clause 33.6 is deleted and substituted by the following:

"In the event of the failure of the Employer to make payment within the times stated in Sub Clause 33.5, the Employer shall pay to the Contractor compensation at the rate of KIBOR + 2 percent for local currency per annum upon all local currency sums unpaid from the date by which the same should have been paid. The provisions of this Sub-Clause are without prejudice to Contractor's entitlement under Sub-Clause 46.1."

Sub-Clause 33.8 Payment by Measurement

The work shall be measured for the units mentioned in the Payment Yard Stick according to the Contract as determined by the Engineer from approved drawings, Specifications and Contract Documents.

Sub-Clause 33.11 Issue of Final Certificate of Payment

The following paragraph is added at the end:

"The final certificate of payment is also subject to the production of "As-Built Drawings" by the Contractor as per Sub-Clause 6.10 of particular Conditions of Contract.

The following Sub-Clauses 33.12 and 33.13 are added:

Sub-Clause 33.12 Withholding of Payment

If the Works or any parts thereof are not being carried out to the Engineer's satisfaction and in order to protect the Employer from loss on account of:

i). defective work not rectified
ii). guarantees not met
iii). claims filed against the Contractor
iv). failure of the Contractor to make payments due for procured or labour employed by him
v). damage to any other contractor employed by the Employer
vi). Contractor's non–compliance with the Contract
vii). any Government dues recoverable from the Contractor if notified by the Government

The Engineer may notify withholding of such payments or part thereof as may, in his opinion, be related to the aforesaid reasons/grounds. When the reasons/grounds for withholding the payment are removed by the Contractor, the Engineer shall upon being satisfied to that effect issue Certificate of Payment in respect of withheld amounts.

Sub-Clause 33.13 Payment Schedule

The Payment shall be made according to following schedule:-

a.	submission of Approved design	10%
b.	procumbent of equipment at ware house Karachi	55%
c.	installation of equipment	15%
d.	testing installation	10%
e.	Commissioning / Handing over	10%

Sub-Clause 35.1 Payment in Foreign Currencies

The text of Sub-Clause 35.1 is deleted

Sub-Clause 35.2 Currency Restrictions

The text of Sub-Clause 35.2 is deleted.

Sub-Clause 35.3 Rates of Exchange
The text of Sub-Clause 35.3 is deleted
Sub-Clause 36.4 Payment Against Provisional Sums

The text of Sub-Clause 36.4 is deleted and substituted by the following:

"Provisional Sums, if any will be expended on the direction of the Engineer through Variation Orders which would be valued in accordance with the provisions of Clause 31 Conditions of Contract."

Sub-Clause 37.2 Employer's Risks

The text of Sub-Clause 37.2 is deleted and substituted by the following:
"The Employer's Risks are:

(a) (Insofar as they relate to Pakistan) war and hostilities (whether war be declared or not), invasion, act of foreign enemies;
(b) (Insofar as they relate to Pakistan) rebellion, revolution, insurrection, military or usurped power or civil war;
(c) ionizing radiation or contamination by radioactivity from any nuclear fuel, radio-active toxic explosives or other hazardous properties of any explosive nuclear assembly or nuclear components thereof;
(d) pressure waves caused by aircraft travelling at sonic or supersonic speed;
(e) (Insofar as they relate to Pakistan) riot, commotion or disorder, unless solely restricted to the employees of the Contractor or of his Subcontractors.
(f) use or occupation of the Work or any part thereof by the Employer;
(g) fault, error, defect or omission in the design of any part of the Works by the Engineer, Employer or those for whom the Employer is responsible for which the
    i). Contractor has disclaimed responsibility in writing within a reasonable time after the receipt
    ii). of such design;

(h) the use or occupation of the Site by the Works or any part thereof, or for the purposes of the Contract: or interference, whether temporary or permanent with any right of way, light, air or water or with any easement, wayleaves or right of a similar nature which is the inevitable result of the construction of the Works in accordance with the Contract;
(i) the right of the Employer to construct the Works or any part thereof on, over, under, in or through any land;
(j) damage (other than that resulting from the Contractor's method of construction) which is the inevitable result of the construction of the Works in accordance with the Contract; and
(k) the act, neglect or omission or breach of contract or of statutory duty of the Engineer, the Employer or other contractors engaged by the Employer or of their respective employees or agents."

Sub-Clause 39.2 Loss or Damage Before Risk Transfer Date

The words "by arbitration under Clause 50" are deleted and substituted "by the Engineer".
The following new Sub-Clause 39.4 is added:

Sub-Clause 39.4 Duty to Minimize Delay

Each Party shall at all times use all reasonable endeavors to minimize any delay in the Performance of the Contract as a result of Risks.

The Contractor shall give notice to the Employer and vice versa the Employer shall give notice to the Contractor in case of foreseeable delay by the Risks."

Sub-Clause 40.2 Employer's Liability

The text of Sub-Clause 40.2 from the words "death or personal injury" to the end of the Sub- Clause, is deleted and substituted by the following:

"..... (other than the Works) or of death or personal injury to the extent caused by those of the Employer's Risks listed in paragraphs (f), (g), (h), (i), (j), and (k) of Sub-Clause 37.2 but not otherwise."

Sub-Clause 42.2 Maximum Liability

The words "the sum stated in the Preamble to Conditions of Contract or if no such sum is stated" appearing in 2nd line of Sub-Clause are deleted.

Sub-Clause 42.6 Foreseen Damages

Sub-Clause 42.6 is deleted in its entirety.

Sub-Clause 43.1(a) The Works (Insurance)

The other risks to be insured are:

i). Fire, smokes, explosion, falling objects, earthquake, perils of the sea, tempest, impact by aircraft or land vehicle, aircraft and other aerial devices or articles dropped therefrom, lightning, strike, riot, civil commotion, escape of water, inundation, rain, snow, landslides, flood, act of God, vandalism or malicious damage, windstorm or hail storm.

ii). Collision, upset, overturn, derailment, stranding or sinking of an automobile or any conveyance of a common carrier by land, water or air in which the Solar System or any part thereof is being carried including overland transportation in Pakistan from port of entry to the Site.

iii). Theft, burglary or attempted theft or burglary.

iv). Any loss or damage during pre-erection storage.

v). Faults in construction and erection, lack of skill, lack of experience, negligence, malicious act.

vi). any other sudden and unforeseen event such as loss or damage due to collapse etc. on site, transport of items to be erected.

vii). Actions of the Employer in the operation of Solarized water filtration System or part thereof on behalf of the Contractor.

The following further Sub-Clauses are 43.1.1, 43.1.2 and 43.1.3 are added:

Sub-Clause 43.1.1 Marine Insurance of Solarized water filtration System

(1) The Contractor shall in the joint names of the Contractor and the Employer, obtain Marine Cargo All Risks Insurance to cover loss or damage to the Solarized water filtration System or part thereof during transport.

(2) The insurance for each consignment of Solarized water filtration System or part thereof shall attach from the time the Solarized water filtration System or part thereof leave the warehouse or place of storage and terminate after ninety (90) days on its completion of unloading at the Site or until insurance survey whichever occurs first. Upon arrival of each consignment at the Site, the Contractor shall, immediately arrange insurance survey by the insurance company.

(3) The sum insured for imported Solarized water fitration System or part thereof shall be for its full replacement value at the Site i.e. 100 % CIF value at the Site for each consignment of the Solarized water filtration System or part thereof plus not less than 30 % of CIF value at the Site to cover any additional costs resulting from loss or damage thereof.

(4) The Insurance Policy for imported etc. shall be on "All Risks" basis and shall not be limited to the attachment/endorsement of following clauses:

(a) Institute Cargo Clauses (A)
(b) Institute War Clauses (Cargo)
(c) Institute Strikes Clauses (Cargo)
(d) Institute Cargo Clauses (Air) excluding sending by Post
(e) Institute War Clauses (Air Cargo) excluding sending by Post.
(f) Institute Strikes Clauses (Air Cargo)
(g) Special Replacement Clauses (Air)
(h) Institute Theft, Pilferage and Non-delivery Clauses

Sub-Clause 43.1.2 Erection/Construction All Risks Insurance

(1) The Contractor shall insure the Works or part thereof in the joint names of the Contractor and the Employer.

(a) from the date following the completion of the first unloading at the Site of the Solarized water filtration System or part thereof and other materials (to be used for construction or erection) and from commencement of Works at Site until the Risk Transfer Date against any loss or damage caused by any of the Contractor's risks and any other risks specified in Sub-Clause 43.1.(a) above and

(b) during the Defects Liability Period against any loss or damage which is caused either:
  (i) by the Contractor in completing any outstanding work or complying with his obligations under Clause 30, or

  (ii) by any of the Contractor's risks and any other risks specified in Sub-Clause 43.1(a) above, which occurred prior to the Risk Transfer Date.

(2) The sum insured shall be the full replacement value at the Site, which includes:

(a) (i) FOB value of imported Solarized water filtration System to be erected
  (ii) Ex-factory value of Indigenous Solar System to be erected, if any
(b) freight and insurance including local transport
(c) customs duties and taxes etc.
(d) cost of erection / installation
(e) cost of civil engineering work including escalation
(f) clearance of debris, maximum @ 5 % of minimum amount of Third Party Liability Insurance Plus 30% to cover any additional costs resulting from loss or damage thereof.

Sub-Clause 43.1.3 General

Should a loss be sustained, the Contractor shall replace or repair any loss or damage at his own cost and complete the Works in accordance with the Contract as soon as possible after occurrence of such loss or damages, without waiting for the settlement of the insurance claim."

Sub-Clause 43.2 Contractor's Equipment

The text of Sub-Clause 43.2 is deleted and substituted by the following:

"The Contractor shall insure the Contractor's Equipment for its full replacement value while on the Site against all loss or damage caused by any of the Contractor's Risks."

Sub-Clause 43.7 Remedies on the Contractor's Failure to Insure

In 3rd line after the word, "purpose", the expression "and reasonable costs including the manhours costs of Employer's Personnel" is added.

The following new Sub-Clauses 43.9 to 43.12 are added:

Sub-Clause 43.9 Currency of Insurance

All policies of Insurance of the shall provide for payment of indemnity to be made in such amounts as will allow making good of loss of or damage to the whole or any part of the Works.

Sub-Clause 43.10 Contractor to Notify

It shall be the responsibility of the Contractor to notify the insurance company of any changes in nature and extent of the Works and to ensure the adequacy of the insurance coverage at all times in accordance with the provisions of the Contract.

Sub-Clause 43.11 Procurement of Insurance Policies

The Contractor shall procure and submit the insurance cover under this Clause within a period of twenty eight (28) days from the date of receipt of Letter of Acceptance from the Employer.

Sub-Clause 43.12 Insurance Company

The policies of marine insurance and all other insurances with respect to Contractor's operations in Pakistan shall be effected with any of the insurance company acceptable to the Employer operating in Pakistan with financial strength rating of AA approved by Pakistan Credit Rating Agency (PACRA) or JCR including National Insurance Corporation (NIC) of Pakistan."

Sub-Clause 44.6 Damage Caused by Force Majeure

At the end of the Sub-Clause 44.6 the following is added:

"However the Contractor shall put up his claim to the Employer / Engineer with full details and justification."

Sub-Clause 44.8 Payment on Termination for Force Majeure

Text in sub-Para (c) is deleted and Paras (d) and (e) are re-numbered as (c) and (d).

Sub-Clause 44.10 Force Majeure Affecting Project Manager/Engineer's Duties

Sub-Clause 44.10 is deleted in its entirety.

Sub-Clause 45.2 Contractor's Default

The following paragraph is added at the end of Sub-Clause 45.2.

"The Employer or such other contractor may use for such completion any Contractor's Equipment which is upon the Site as he or they may think proper, and the Employer shall pay the Contractor a reasonable compensation for such use".

Sub-Clause 45.4 Payment after Termination

The text of Sub-Clause 45.4 is deleted and substituted by the following:

"The Employer shall not be liable to make any further payments to the Contractor until the Works have been completed. When the Works are so complete, the Engineer shall certify the total cost of such completion of Works.

The Employer may recover the extra cost of such completion, as certified by the Engineer, from any sums otherwise due and payable to the Contractor and/or by disposing of the Contractor's Equipment and stores taken over by the Employer

under this Clause or as otherwise provided by law. If there is no such extra cost the Employer shall pay any balance due to the Contractor."

The following new Sub-Clause 45.6 is added:

Sub-Clause 45.6 Integrity Pact

If the Contractor, or any of his Subcontractors, agents or servants is found to have violated or involved in violation of the Integrity Pact signed by the Contractor as Schedule-J to his Bid, then the Employer shall be entitled to:

(a) recover from the Contractor an amount equivalent to ten times the sum of any commission, gratification, bribe, finder's fee or kickback given by the Contractor or any of his Subcontractors, agents or servants;

(b) terminate the Contract; and

(c) recover from the Contractor any loss or damage to the Employer as a result of such termination or of any other corrupt business practices of the Contractor or any of his Subcontractors, agents or servants.

The termination under Sub-Para (b) of this Sub-Clause shall proceed in the manner prescribed under Sub-Clauses 45.2 to 45.5 and the payment under Sub-Clause 45.4 shall be made after having deducted the amounts due to the Employer under Sub-Paras (a) and (c) of this Sub166 Clause.

Sub-Clause 46.1 Employer's Default

The comma and the word "or" at the end of paragraph (d) of Sub-Clause 46.1 are deleted and substituted by period (.) Paragraph (e) of Sub-Clause 46.1 is deleted.

Sub-Clause 46.3 Payment on Termination for Employer's Default

The words "including loss of profit" in the second paragraph of Sub-Clause 46.3 are deleted.

Sub-Clause 47.1 Labour, Materials and Transport

The amounts payable to the Contractor, pursuant to Sub-Clause 60.1, shall be adjusted in respect of the rise or fall in the cost of labor, materials, and other inputs to the Works, by applying to such amount the formula prescribed in this Sub-Clause.

(a) Other Changes in Cost

To the extent that full compensation for any rise or fall in costs to the Contractor is not covered by the provisions of this or other Clauses in the Contract, the unit rates and prices included in the Contract shall be deemed to include amounts to cover the contingency of such other rise or fall of costs.

(b) Adjustment Formula

The adjustment to the monthly statements in respect of changes in cost shall be determined from the following formula:-

$$Pn = A + b\frac{Ln}{Lo} + c\frac{Mn}{Mo} + d\frac{En}{Eo} + \ldots\ldots\ldots\ldots\ldots$$

Where:

Pn is a price adjustment factor to be applied to the amount for the payment of the work carried out in the subject month, determined in accordance with Paragraph 60.1 (a), and with Paragraphs 60.1 (b) and (e), where any variations and daywork are not otherwise subject to adjustment;

A is a constant, specified in Appendix-C to Bid, representing the nonadjustable portion in contractual payments;

b, c, d, etc., are weightages or coefficients representing the estimated proportion of each cost element (labour, cement and reinforcing steel etc.) in the Works or Sections thereof, net of Provisional Sums and Prime Cost; the sum of A, b, c, d, etc., shall be one;

Ln, Mn, En, etc., are the current cost indices or reference prices of the cost elements for month "n", determined pursuant to Sub-Clause 70.1(d), applicable to each cost element; and

Lo, Mo, Eo, etc., are the base cost indices or reference prices corresponding to the above cost elements at the date specified in Sub-Clause 70.1(d).

(c) Sources of Indices and Weightages

The sources of indices shall be those listed in Appendix-C to Bid, as approved by the Engineer. As the proposed basis for price adjustment, the Contractor shall have submitted with his bid the tabulation of Weightages and Source of Indices if different than those given in Appendix-C to Bid, which shall be subject to approval by the Engineer.

(d) Base, Current, and Provisional Indices

The base cost indices or prices shall be those prevailing on the day 28 days prior to the latest date for submission of bids. Current indices or prices shall be those prevailing on the day 28 days prior to the last day of the period to which a particular monthly statement is related. If at any time the current indices are not available, provisional indices as determined by the Engineer will be used, subject to subsequent correction of the amounts paid to the Contractor when the current indices become available.

(e) Adjustment after Completion

If the Contractor fails to complete the Works within the Time for Completion prescribed under Clause 43, adjustment of prices thereafter until the date of completion of the Works shall be made using either the indices or prices relating to the prescribed time for completion, or the current indices or prices,

whichever is more favorable to the Employer, provided that if an extension of time is granted pursuant to Clause 44, the above provision shall apply only to adjustments made after the expiry of such extension of time.

(f) **Weightages**

The weightages for each of the factors of cost given in Appendix-C to Bid shall be adjusted if, in the opinion of the Engineer, they have been rendered unreasonable, unbalanced, or inapplicable as a result of varied or additional work executed or instructed under Clause 51. Such adjustment(s) shall have to be agreed in the variation order.

Sub-Clause 48.1 Local Taxation-Custom and Import Duties

The rates and prices quoted by the Contractor in the Schedule of Prices shall be deemed to have included (i) business taxes, income tax, super tax, customs, import duties and other taxes on income, and (ii) fees charged for services provided under this Contract. The taxation is leviable as per income tax ordinance 2001 issued by FBR Government of Pakistan including adjustment in prices as per clause 47.

The following Sub-Clause 48.3 is added:

Sub-Clause 48.3 Port Charges and Port Congestion

"The Contractor shall be deemed to have obtained all the information regarding facilities and charges, in respect of port clearance, loading and unloading, storage, transportation, congestion and confirmed the requirements thereof at his own responsibility and all such costs and charges are deemed to be included in the rates and prices of the Schedule of Prices."

Sub-Clause 49.1 Notices to Contractor

The following paragraph is added at the end of Sub-Clause 49.1:
"For the purposes of Sub-Clause 49.1, the Contractor shall, immediately after receipt of Letter of Acceptance, intimate in writing to the Employer and the Engineer by registered post, the address of his principal place of business or any change in such address during the period of the Contract."

Sub-Clause 50 Disputes & Arbitration

Clause 50 is deleted and in its place the following Sub-Clauses 50.1 to 50.5 are inserted:

"50.1 If a dispute of any kind whatsoever arises between the Employer and the Contractor in connection with, or arising out of, the Contract or the execution of the Works, whether during the execution of the Works or after their completion and whether before or after repudiation or other termination of the Contract, including any dispute as to any opinion, instruction, determination, certificate or valuation of the Engineer, the matter in dispute shall, in the first place, be referred in writing to the Engineer, with a copy to the other party. Such reference shall state that it is made pursuant to this Clause. No later than the fifty sixth (56) day after the day on which he received such reference, the Engineer shall give notice of his decision to the Employer and the Contractor. Such decision shall state that it is made pursuant to this Clause.

Unless the Contract has already been repudiated or terminated, the Contractor shall, in every case, continue to proceed with the Work with all due diligence, and the Contractor and the Employer shall give effect forthwith to every such decision of the Engineer unless and until the same shall be revised, as hereinafter provided in an amicable settlement or in an arbitral award.

In any case where the Conditions of Contract provide that the decision of the Engineer is to be final and conclusive, such decision shall not be referable to arbitration under this Clause nor shall the same be questioned in any other form of proceedings whatsoever.

50.2 If either the Employer or the Contractor be dissatisfied with a decision of the Engineer or if the Engineer fails to give notice of his decision on or before the fifty sixth (56) day after the day on which he received the reference, then either the Employer or the Contractor may, on or before the twenty eighth (28) day after the day on which the said period of fifty six (56) days expired, as the case may be, give notice to the other party to commence arbitration, as hereinafter provided, as to the matter in dispute. Such notice shall establish the entitlement of the party giving the same to commence arbitration, as hereinafter provided, as to such dispute and, subject to Sub-Clause 50.5, no arbitration in respect thereof may be commenced unless such notice is given.

If the Engineer has given notice of his decision as to a matter in dispute to the Employer and the Contractor and no notification of intention to commence arbitration as to such dispute has been given by either the Employer or the Contractor on or before the twenty eighth (28) day after the day on which the parties received notice as to such decision from the Engineer the said decision shall become final and binding upon the Employer and the Contractor.

50.3 Where notice of intention to commence arbitration as to a dispute has been given in accordance with Sub-Clause 50.2, arbitration of such dispute shall not be commenced unless an attempt has first been made by the parties to settle such dispute amicably through mutual negotiation within ninety (90) days from the date of notification of Engineer's decision.

50.4 Any dispute in respect of which:

(a) the decision, if any, of the Engineer has not become final and binding pursuant to Sub-Clause 50.1 and

(b) amicable settlement has not been started/reached within the period stated in Sub-Clause 50.3 shall be finally settled, unless otherwise specified in the Contract, under the Rules of Pakistan Arbitration Act, 1940 (Act No. X of 1940) and Rules made thereunder as amended, by one or more arbitrators appointed under such Rules.

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 for the purpose of obtaining said decision pursuant to Sub-Clause 50.1.

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. The venue of arbitration proceedings shall be the place in Pakistan as mentioned in the Preamble to Conditions of Contract.

50.5 Where neither the Employer nor the Contractor has given notice of intention to commence arbitration of a dispute within the period stated in Sub-Clause 50.1 or 50.2 and the related decision has become final and binding, either party may, if the other party fails to comply with such decision, and without prejudice to any other rights it may have, refer the failure to arbitration in accordance with Sub-Clause 50.4. The provisions of Sub-Clauses 50.1 to 50.2 shall not apply to any such reference."

Additional Conditions

52. Liens

Each contractor, for himself and for any persons directly or indirectly responsible to him, and for his or their material, equipment and employees, and for all other persons performing any labor or furnishing any labor or material for any/or all of the Work covered by his Contract, will be required to release or waive, to the full extent permitted by law, all mechanical and other liens, for or on account of the Work done or equipment and material furnished hereunder and the improvements or structures herein same may be incorporated, and the land to which they are appurtenant shall at all times be free and clear of all such liens.

53.1 Payment of Income Tax, Etc.

The Contractor shall be responsible for the payment, if any is required, of all Pakistani Income Tax, Super Tax, and other taxes on income arising out of the Contract, and the rates and prices stated in the priced Schedule of Prices shall be deemed to cover all such taxes.

53.2 Personnel, Taxes and Duties

The Contractor or his personnel shall pay all personal income tax or other taxes due in Pakistan, if any, for the personnel employed by the Contractor for implementing the work or any other activity required by the Contract. The Contractor shall obtain, at his own cost, work permits from competent authorities to enable any foreign personnel to work in Pakistan. The Contractor shall be responsible for all formalities in connection with passports, obtaining visas, police permits, and expenses for customs duties, if any, related to personal goods of foreign personnel employed on the Project. However, the Employer will, if requested, assist the Contractor in obtaining visas and work permits.

53.3 Income Taxes Provisions in Subcontracts

Provisions to the like effect as those contained in this Clause shall be incorporated in Subcontracts.

54. Liability of the Contractor

The Contractor or his Subcontractors or assigns shall follow strictly, all relevant labour laws including the Workmen's Compensation Act and the Employer shall be fully indemnified for all claims, damages etc. arising out of any dispute between the Contractor, his Subcontractors or permitted assigns and the labour employed by them.

55. Joint and Several Liability

If the Contractor is a joint venture of two or more persons, all such persons shall be jointly and severally bound to the Employer for the fulfillment of the terms of the Contract and shall designate one of such persons to act as leader with authority to bind the joint venture.

The composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer.

56. Details to be Confidential

The Contractor shall treat the details of the Contract as private and confidential, save in so far as may be necessary for the purposes thereof, and shall not publish or disclose the same or any particulars thereof in any trade or technical paper or elsewhere without the prior consent in writing of the Employer or the Engineer. If any dispute arises as to the necessity of any publication or disclosure for the purpose of the Contract, the same shall be referred to the decision of the Engineer whose award shall be final.

FORMS

BID SECURITY

PERFORMANCE SECURITY

CONTRACT AGREEMENT

MOBILIZATION ADVANCE GUARANTEE

INDEMNITY BOND FOR SECURED ADVANCE

FORM OF BID SECURITY
(Bank Guarantee)

Guarantee No._____
Executed on _____
Expiry date _____

Name of Guarantor (Bank) with address: _____

Name of Principal (Bidder) with address: _____

_____

Penal Sum of Security (express in words and figures):_____

_____

Bid Reference No._____ Date of Bid Opening_____

KNOW ALL MEN BY THESE PRESENTS, that in pursuance of the terms of the Bid and at the request of the said Principal, we the Guarantor above-named are held and firmly bound unto the _____, (hereinafter called the "Employer") in the sum stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the accompanying Bid numbered dated as above for _____ (Particulars of Bid) to the said Employer; and

WHEREAS, the Employer has required as a condition for considering the said Bid that the Principal furnishes a Bid Security in the above said sum to the Employer, conditioned as under:

(1) that the Bid Security shall remain valid for a period 28 days beyond the period of validity of the Bid,

(2) that in the event of;

(a) the Principal withdraws his Bid during the period of validity of Bid, or

(b) the Principal does not accept the correction of his Lump-Sum Fixed Price Bid, pursuant to Sub-Clause 24.2 of Instructions to Bidders, or

(c) failure of the successful Bidder to

(i) furnish the required Performance Security, in accordance with Clause 34 of Instructions to Bidders, or

(ii) sign the proposed Contract Agreement, in accordance with Clause 35 of Instructions to Bidders,

then the entire sum be paid immediately to the said Employer as liquidated damages and not as penalty for the successful Bidder's failure to perform.

NOW THEREFORE, if the successful Bidder shall, within the period specified therefor, on the prescribed form presented to him for signature enter into a formal Contract with the said Employer in accordance with his Bid as accepted and furnish within twenty eight (28) days of his being requested to do so, a Performance Security with good and sufficient surety, as may be required, upon the form prescribed by the said Employer for the faithful performance and proper fulfilment

of the said Contract or in the event of non-withdrawal of the said Bid within the time specified for its validity then this obligation shall be void and of no effect, but otherwise to remain in full force and effect.

PROVIDED THAT the Guarantor shall forthwith pay to the Employer the said sum stated above upon first written demand of the Employer without cavil or argument and without requiring the Employer to prove or to show grounds or reasons for such demand notice of which shall be sent by the Employer by registered post duly addressed to the Guarantor at its address given above.

PROVIDED ALSO THAT the Employer shall be the sole and final judge for deciding whether the Principal has duly performed his obligations to sign the Contract Agreement and to furnish the requisite Performance Security within the time stated above, or has defaulted in fulfilling said requirements and the Guarantor shall pay without objection the sum stated above upon first written demand from the Employer forthwith and without any reference to the Principal or any other person.

IN WITNESS WHEREOF, the above bounden Guarantor has executed the instrument under its seal on the date indicated above, the name and seal of the Guarantor being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

_____
Guarantor (Bank)

Witness:

Signature _____

1. _____

Name _____

_____
Corporate Secretary (Seal)

Title _____

2. _____

_____

_____
(Name, Title & Address)

_____
Corporate Guarantor (Seal)

FORM OF CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT (hereinafter called the "Agreement") made on the ____ day of ____(month) 2013 between _____ (hereafter called the "Employer") of the one part and _____ (hereafter called the "Contractor") of the other part.

WHEREAS the Employer is desirous that certain Works, viz _____ should be executed by the Contractor and has accepted a Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents after incorporating addenda, if any except those parts relating to Instructions to Bidders shall be deemed to form and be read and construed as part of this Agreement, viz:

   (a) The Contract Agreement
   (b) The Letter of Acceptance
   (c) The completed Form of Bid
   (d) The Preamble to Conditions of Contract
   (e) The Particular Conditions of Contract
   (f) The General Conditions of Contract
   (g) The priced Schedule of Prices
   (h) The completed Schedules to Bid (A to L)
   (i) The Specifications
   (j) The Drawings

3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy defects therein in conformity and in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor, in consideration of the execution and completion of the Works as per provisions of the Contract, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

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

Signature of the Contractor	Signature of Employer
_____	_____
(Seal)	(Seal)

Signed, Sealed and Delivered in the presence of:

Witness:	Witness:
_____	_____
(Name, Title and Address)	(Name, title and Address)

FORM OF PERFORMANCE SECURITY
(Bank Guarantee)

Guarantee No._____
Executed on _____
Expiry date _____

Name of Guarantor (Bank/) with address: _____
_____

Name of Principal (Contractor) with address:_____
_____

Penal Sum of Security (express in words and figures)_____
_____

Letter of Acceptance No. _____ Dated _____

KNOW ALL MEN BY THESE PRESENTS, that in pursuance of the terms of the Bidding Documents and above said Letter of Acceptance (hereinafter called the Documents) and at the request of the said Principal we, the Guarantor above named, are held and firmly bound unto the _____ (hereinafter called the "Employer") in the penal sum of the amount stated above for the payment of which sum well and truly to be made to the said Employer, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has accepted the Employer's above said Letter of Acceptance for _____ (Name of Contract) for the _____ (Name of Project).

NOW THEREFORE, if the Principal (Contractor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the Employer, with or without notice to the Guarantor, which notice is, hereby, waived and shall also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of said Documents that may hereafter be made, notice of which modifications to the Guarantor being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue till all requirements of Clause 30, Defects after Taking Over, of Conditions of Contract are fulfilled.

Our total liability under this Guarantee is limited to the sum stated above and it is a condition of any liability attaching to us under this Guarantee that the claim for payment in writing shall be received by us within the validity period of this Guarantee, failing which we shall be discharged of our liability, if any, under this Guarantee.

We, _____ (the Guarantor), waiving all objections and defences under the Contract, do hereby irrevocably and independently guarantee to pay to the Employer without delay upon the Employer's first written demand without cavil or arguments and without requiring the Employer to prove or to show grounds or reasons for such demand any sum or sums up to the amount stated above, against the Employer's written declaration that the Principal has refused or failed to perform the obligations under the Contract which payment will be effected by the Guarantor to Employer's designated Bank & Account Number.

PROVIDED ALSO THAT the Employer shall be the sole and final judge for deciding whether the Principal (Contractor) has duly performed his obligations under the Contract or has defaulted in fulfilling said obligations and the Guarantor shall pay without objection any sum or sums up to the amount stated above upon first written demand from the Employer forthwith and without any reference to the Principal or any other person.

IN WITNESS WHEREOF, the above-bounden Guarantor has executed this Instrument under its seal on the date indicated above, the name and corporate seal of the Guarantor being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body

_____
Guarantor
(Bank)

Witness.
1. _____

_____
Corporate Secretary (Seal)

2. _____

_____
Name, Title & Address

Signature _____

Name _____

Title _____

_____
Corporate Guarantor (Seal)

FORM OF BANK GUARANTEE FOR ADVANCE PAYMENT

Guarantee No._____
Executed on_____
Expiry date _____

WHEREAS the _____ (hereinafter called the Employer) has entered into a Contract for _____ _____ (Particulars of Contract), with _____ (hereinafter called the Contractor).

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

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

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

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

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

This guarantee shall come into force as soon as the advance payment has been credited to the account of the Contractor.

This guarantee shall expire not later than _____ by which date we must have received any claims by registered letter, telegram, telex or telefax.

It is understood that you will return this Guarantee to us on expiry or after settlement of the total amount to be claimed hereunder.

_____
Guarantor (Bank)

Witness:

1. _____

_____
Corporate Secretary (Seal)

Signature _____

Name _____

Title _____

2. _____

_____
Name, Title & Address

_____
Corporate Guarantor (Seal)

INDEMNITY BDND FOR SECURED ADVANCE
AGAINST MATERIALS BROUGHT AT SITE
(ON RS.40 NONJUDICIAL STAMP PAPER)

This Deed of Indemnity is issued by M/s. _____ *(Name of the Contractor)* in favour of M/s._____ *(Name of the Employer).*

Whereas _____ (hereinafter called the Employer) has agreed to pay the Secured Advance against the cost of material through any Bank or like agency by any other method by virtue of the terms of the contract existing between the parties. The details of the material and their price for which secured advance is being sought for the period _____till consumption of the material is as under :-

1. _____ at Rs._____ per _____ = Rs.
2. _____ at Rs._____ per _____ = Rs.
3. _____ at Rs._____ per _____ = Rs.
4. _____ at Rs._____ per _____ = Rs.

THEREFORE THIS DEED OF INDEMNITY WITHNESSETH AS FOLLOWS:

I/We _____ of M/s. _____ do hereby indemnify M/s _____ for all losses due to thefts, arson, pilferage, loss due to flood and inundation, shortage, deterioration and depreciation etc. through any act of Man or God or slump in the Market of any or all the materials financed or paid by the Employer on our request for financing payment against material.

I/We_____ shall indemnify _____ against any or all claims, action damages arising out of or resulting to the said material.

I/We _____ further declare that we will faithfully abide by the above declaration and solemnly affirm that we will not remove, sell, pilferage any of the materials against which M/s _____ has paid us such a secured advance and will not pledge the same with any Bank, Finance Corporation, Firm, Company, Individual or the like agency or create any change whereon in any form what so ever.

I/We _____ do hereby also declare that in the event of my/our infringement of the declaration made above _____ will be entitled to forfeit all such material and also proceed against me/us according to the relevant clause pertaining to breach of contract and further invoke the power or seek any remedies secured of _____ under the contract Agreement signed with us or otherwise available under law.

Place_____ Dated _____

Contractor _____

SCHEDULE OF PRICES

PROJECT MANAGEMENT UINT,SPECIAL INITIATIVE DEPARTMENT ,GOS

DESIGN, PROCUREMENT ,INSTALLATION,TESTING AND COMMISSIONING OF WATER FILTRATION PLANT TO BE OPERATED ON SOLAR POWER OF THE PROJECT -DRINKING WATER HUSB-PHASE-III AS EPC / TURN KEY CONTRACT ON LUMP SUM FIXED PRICE BASIS

ITEM ND	ITEM DESCRIPTION	UNIT	QTY	RATES IN (RS)		AMOUNT (Rs.)
				IN FIGURE	IN WORDS	
A	IMPDRTED SOLAR REVERSE OSMOSIS / WATER DESALINATION PLANT US / European Technology					
1	Solar Reverse Dsmosis / Desalination Plant Plant Capacity : 500 Liters Per Hr **Feed Water** Feed TDS : up to 5,000 ppm Feed PH : 6.5 to 10 Feed Turbidity : < 15 NTU **Product Water** TDS : <500ppm Feed PH : 6.5 to 8.5	Nos	100			
2	Solar Reverse Dsmosis / Desalination Plant Plant Capacity : 500 Liters Per Hr **Feed Water** Feed TDS : up to 10,000 ppm Feed PH : 6.5 to 10 Feed Turbidity : < 15 NTU **Product Water** TDS : <500ppm Feed PH : 6.5 to 8.5	Nos	250			
3	Solar Reverse Dsmosis / Desalination Plant Plant Capacity : 500 Liters Per Hr **Feed Water** Feed TDS : up to 15,000 ppm Feed PH : 6.5 to 10 Feed Turbidity : < 15 NTU **Product Water** TDS : <500ppm Feed PH : 6.5 to 8.5	Nos	150			
4	Solar Reverse Dsmosis / Desalination Plant Plant Capacity : 1000 Liters Per Hr **Feed Water** Feed TDS : up to 10000 ppm Feed PH : 6.5 to 10 Feed Turbidity : < 15 NTU **Product Water** TDS : <500ppm Feed PH : 6.5 to 8.5	Nos	150			

5	**Solar Reverse Osmosis / Desalination Plant** Plant Capacity : 1000 Liters Per Hr **Feed Water** Feed TDS : up to 15000 ppm Feed PH : 6.5 to 10 Feed Turbidity : < 15 NTU **Product Water** TDS : <500ppm Feed PH : 6.5 to 8.5	Nos	100			
B	**Containerized / Prefabricated Plant Room** to house the solar RO Plants, Feed water Storage tanks Clear Water storage tank	Nos	75D			
C	**SOLAR POWER GENRATION SYSTEM FDR RD** Solar PV Panels power generation equipment, complete with supporting structure, foundation, junction boxes and all accessories as specified below. **Solar Photovoltaic Module** Min Life 20 Years (Minimum 80% Power Guarantee) Type : Poly or Mono Certifications CE, VDE Model Efficiency >16% The Number of Solar Panels per set should be sufficient to operate the RO Plant in the day time. **INVERTER :** Each set of inverter should comprise of necessary number of inverters to run the Pump, Feed Pump Bore Pump, Dosing Pumps, Control Panel etc. the inverter ratings should be sufficient to operate all the equipments of RO Plant. **SUPPDRT STRUCTURE & CABLE** Foundations and Support structure for Modules with flexible setting and cables for Solar Modules and Inverters **JUNCTION BOX** Junction Box and all other accessories needed to make the plant fully functional	Nos	75D			
D	**INSTALLATION TESTING & COMMISSIOING**	Jobs	750			
E	**OPERATION & MAINTINANCE** 3 Years Operation & Maintenance of the complete system.	NO5	75D			
F	**DRILLING & BORING FOR SOURCE WATER** Drilling and development of tubewell, depth 300ft to 600 ft for obtaining feed water for Solar RO plant. along with appropriate machinery / pumps.	NDS	75D			
	GRAND TDTAL					

Issued to M/s: _____
Date : _____
Issued By : _____

PROJECT MANAGEMENT UNIT
SPECIAL INITIATIVE DEPARTMENT
GOVT. OF SINDH

DRINKING WATER HUBS- PAHSE-III

PROJECT:

DESIGN, PROCUREMENT, INSTALLATION, TESTING AND COMMISSIONING OF WATER FILTRATION PLANTS TO BE OPERATED ON SOLAR POWER SYSTEM OF THE PROJECT - DRINKING WATER HUBS PAHSE-III

AS EPC/ TURNKEY CONTRACT, ON LUMP-SUM FIXED PRICE BASIS

BIDDING DOCUMENT
(Volume-II)

MAY, 2014

STEEL REINFORCEMENT

1. SCOPE

The work under this section of specifications consists of furnishing, cutting, fabricating, bending and placing steel reinforcement and Welded wire, fabric of the type, size, shape and grade required in accordance with these specifications, in concrete structures or elsewhere as shown on the drawings and special provisions or as directed by the Engineer.

2. APPLICABLE STANDARDS

Latest editions of the following Pakistan, British and ASTM Standards are relevant to these specifications wherever applicable.

Pakistan Standard

PS 241	Tensile Testing of Steel
PS 244	Bend test for Steel
PS 580	Rolled deformed Steel bars (intermediate grade) for concrete reinforcement.
PS 605	Rolled deformed steel bars (hard grade) for concrete reinforcement.
PS 606	Rolled formed Steel bars (structural grade) for concrete reinforcement.
PS 607	General technical delivery requirement for steel

British Standard

BS 693	General requirements for Oxy-acetylene welding of mild steel
BS 785	Hot rolled bars and hard drawn wire for the reinforcement of concrete
BS 1856	General requirement for the metal arc welding of mild steel
BS 4449	Hot rolled steel bars for reinforcement of concrete
BS 4461	Cold worked steel bars for reinforcement of concrete
BS 4466	Bending dimensions and scheduling of bars for the reinforcement of concrete

ASTM Standard

A 305	Minimum requirement for the deformations of deformed steel bars for concrete reinforcement
A 615	Deformed billet steel bars (Grades 40 and 60) for concrete reinforcement – AASHTO M-30.

In addition to the above, the latest editions of other Pakistan Standards, British standards, American Concrete Institute Standards, American Society for Testing and Materials Standards and other standard as may be specified by the Engineer for Special Material and construction are also relevant.

3. MATERIAL AND SIZE OF BARS

a). Reinforcement for concrete shall conform to the respective Pakistan, British, ASTM, or other Standards as specified in the Drawings and in the Contract Documents or as may be specified by the Engineer.

b). Unless otherwise specified, all plain reinforcing bars shall comply with the requirements of BS 4449 for plain mild steel bars and shall have a minimum characteristic strength of 280 MPa (40000 psi)

c). Unless otherwise specified, all deformed reinforcing bars shall comply with the requirements of BS 4461 for deformed cold worked new stock billet steel bars and shall have minimum characteristic strength of 460 MPa (60000 psi).

d). If the reinforcement is supplied by the Employer, the Contractor should inform the Employer of his requirements much before its use in construction.

e). Reinforcement of all types is to be stored at on site in an approved manner so as to avoid damage.

f). If the reinforcement is supplied by the Employer, the Contractor should report immediately on receipt of any consignment, any deviation from the standard of three enforcement bars beyond those allowed in respective standards. If the Engineer directs, the Contractor shall test the samples of reinforcement at his cost and submit to him the test report.

g). Steel wire mesh reinforcement shall conform to requirements of ASTM Designation A 185 - 64 or BS 4483, 1969: Standard Specifications for Welded Steel Wire Fabric for concrete reinforcement. It shall be used where shown on the Drawings.

h). Reinforcement shall be free from all loose or flaky rust and mill scale, or coating, including ice, and any other substance that would reduce or destroy the bend. Reduced sections steel reinforcement shall not be used.

4. DELIVERY & STORAGE

Steel reinforcement bars shall be kept in bundles firmly secured and tagged. Each bar or bundle of bars shall be identified by marks stamped on hot or cold or painted on or by any other means, The identifying marks shall contain the following information:

- Name of the producer or his trade.
- Standard to which the bars have been manufactured.
- The class type and strength
- The diameter
- The number of the test certificate

The method of storage shall be approved by the Engineer. Reinforcing bars shall be stored in racks or platforms above the surface of ground and shall be protected free from scaling, rusting, oiling, coatings, damage, contamination and structural defects prior to placement in works. Bars of different diameters and grades of steel reinforcement shall be kept separately.

5. BAR BENDING SCHEDULES

The Contractor shall prepare bar bending schedules of all the reinforcing steel bars and these bar bending schedules shall be submitted to the Engineer for his approval. The Contractor shall obtain approval of the bar bending schedules atleast one month prior to the actual execution of the works at site.

6. FABRICATING, BENOING & PLACING

a). All metal reinforcement shall be free from loose mill scale, loose rust, mud, oil, grease, or other harmful matter immediately before the concrete is placed.

b). Reinforcement is to be accurately placed as shown in the drawings, and secured against displacement by using 16 gauges GI wire ties or suitable slips at intersections and supported from the formwork by using concrete, metal or plastic chairs and spacers or hangers of an approved pattern. Where concrete blocks are used for ensuring the cover, they shall be made of mortar not leaner than 1 part of cement to 2 parts of sand.

c). Bars used for concrete reinforcement shall be fabricated in accordance with the dimensions

shown in the bar bending schedule approved by the Engineer.

d). The cutting tolerance for all bars shall be ± 1 inch.

e). Where an overall or an internal dimension of a bent bar is specified in the schedule, the bending tolerance, unless otherwise stated, shall be as in Table - 1.

f). Bent bar reinforcement shall cold bent to the shapes shown on the drawings bars shall be bent around a pin having the following diameters (D) in relation to the diameter of the bar (d):

Strips & columns tie bars D = 4 x d
Other bars having D = 5 x d D = 10 x d

d < 3.5 cm (1-3/8") (No. 11 bars)
d > 3.5 cm (1-3/8")

Table
Bending Tolerances

Dimensions of bent bars		Tolerance	
Over	Up to & including	Plus	Minus
Inch	Inch	Inch	Inch
--	36	2	2
36	72	2	4
72	--	2	10

g). Vertical bars in columns shall be offset at least one bar diameter at lapped splices. To ensure proper placement, templates shall be furnished for all column dowels.

h). Reinforcement shall not be bent or straightened in a manner that will injure the material.

i). No bars shall be bent twice in the same place, nor shall they be straightened after bending.

j). Unless permitted, by Engineer, reinforcement shall not be bent after being partially embedded in hardened concrete.

k). Bars which depend for their strength on cold working shall not be heated for any reason. Other kinds of reinforcement larger than 40 mm in dia: may be bent by the use of heat at cherry - red heat (not exceeding 840 Bars) bent shall not be cooled by quenching.

l). No splice of reinforcement shall be made except as shown on the working drawings.

m). Welding shall be permitted for bars only under suitable conditions and with suitable safeguards in accordance with BS 693, BS 1856, or AWS D 12.1, provided the type of reinforcement bar has the required welding properties. Tack welding may be used to fix in position bars that cross each other, only with prior approval of the Engineer.

n). Exposed reinforcement intended for bonding with future extensions is to be effectively protected from corrosion. Protection is also to be provided to reinforcement partly built into concrete where the exposed pat is to be built into later concrete.

o). No concreting is to be carried out until the reinforcement has been checked and approved by the Engineer.

p). All detailing shall be done as per ACI standards ACI - 315 and ACI - 318.

q). Minimum Concrete clear cover for reinforcing steel shall be as follows:

Structural Members	Minimum Cover, inch
a) Concrete cast against and permanently exposed to earth	3 inch
b) Concrete exposed to earth or weather:-	
Bar Dia > 20 mm	2 inch
Bar Dia > 16 mm	1.6 inch
c) Concrete not exposed to weather or in contact with ground	
Slabs, Walls	0.8 inch
Beams, Columns (Primary Reinforcement)	1.6 inch

All reinforcing steel shall be held firmly in place before and during the placing of concrete by means of wires and supports adequate to prevent displacement during the course of construction.

7. MEASUREMENT & PAYMENT

7.1 General

Except otherwise specified herein or elsewhere in the Contract Documents, no separate measurement and payment will be made for providing and installing chairs, supports, hooks, spacers, binding wires and laps not shown on Drawings including wastage and rolling margin, the cost of which shall be deemed to have been included in the quoted unit rate of the respective items of the Bill of quantities.

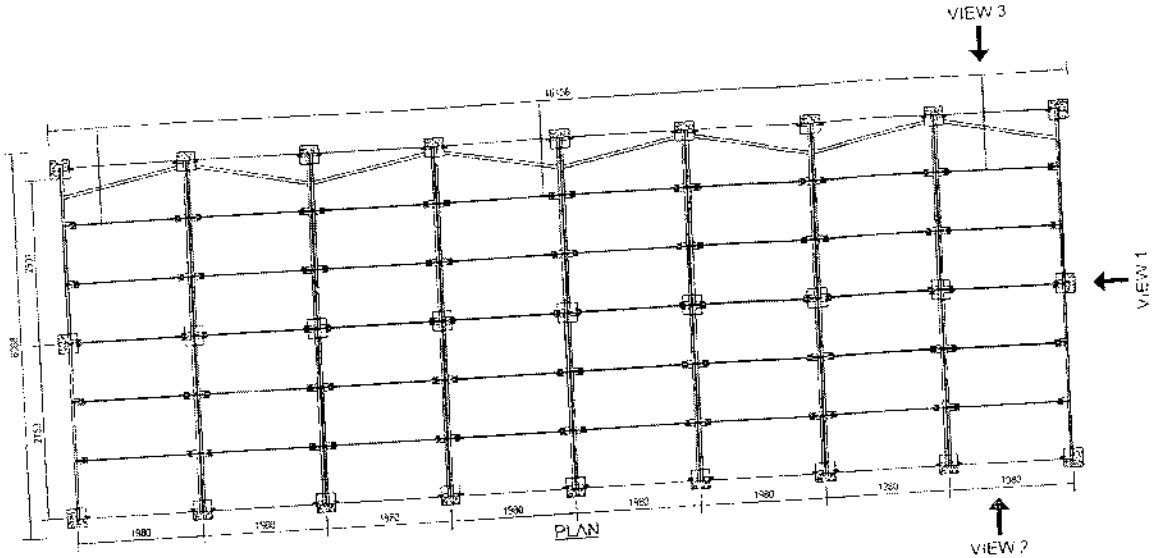
7.2 Measurement

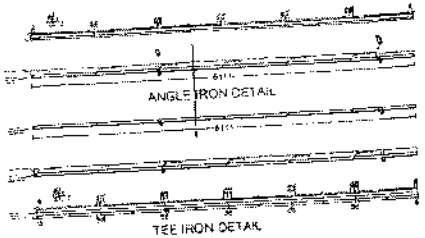
All measurements of acceptably completed works of reinforcement shall be made in linear dimensions end to end according to the cut lengths shown in bar bending schedules approved by the Engineer and converted into theoretical weight as per schedules.

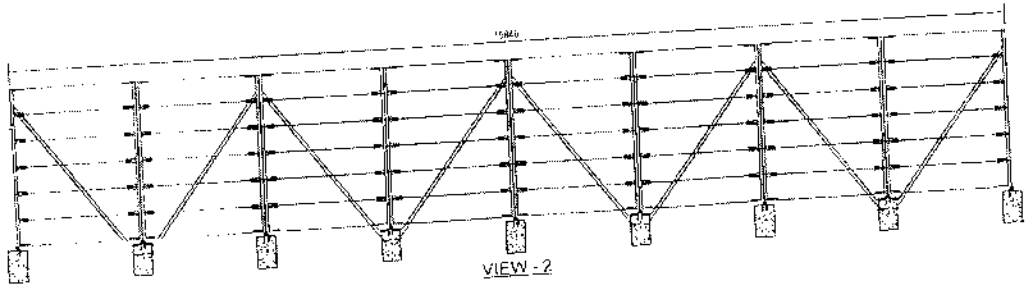
7.3 Payment

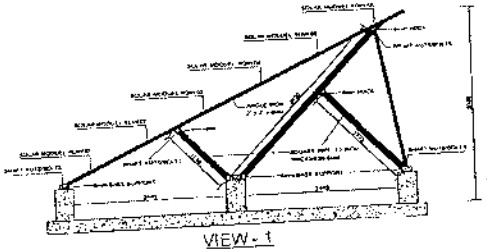
Payment will be made for acceptable measured quantity of reinforcement on the basis of unit rate per kg quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

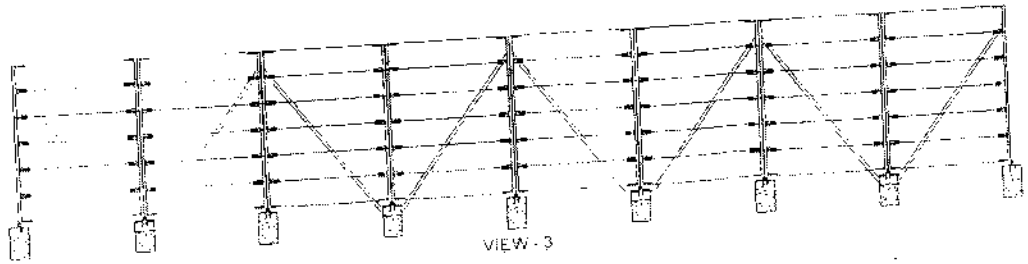
CONCEPTUAL BIDDING DRAWINGS



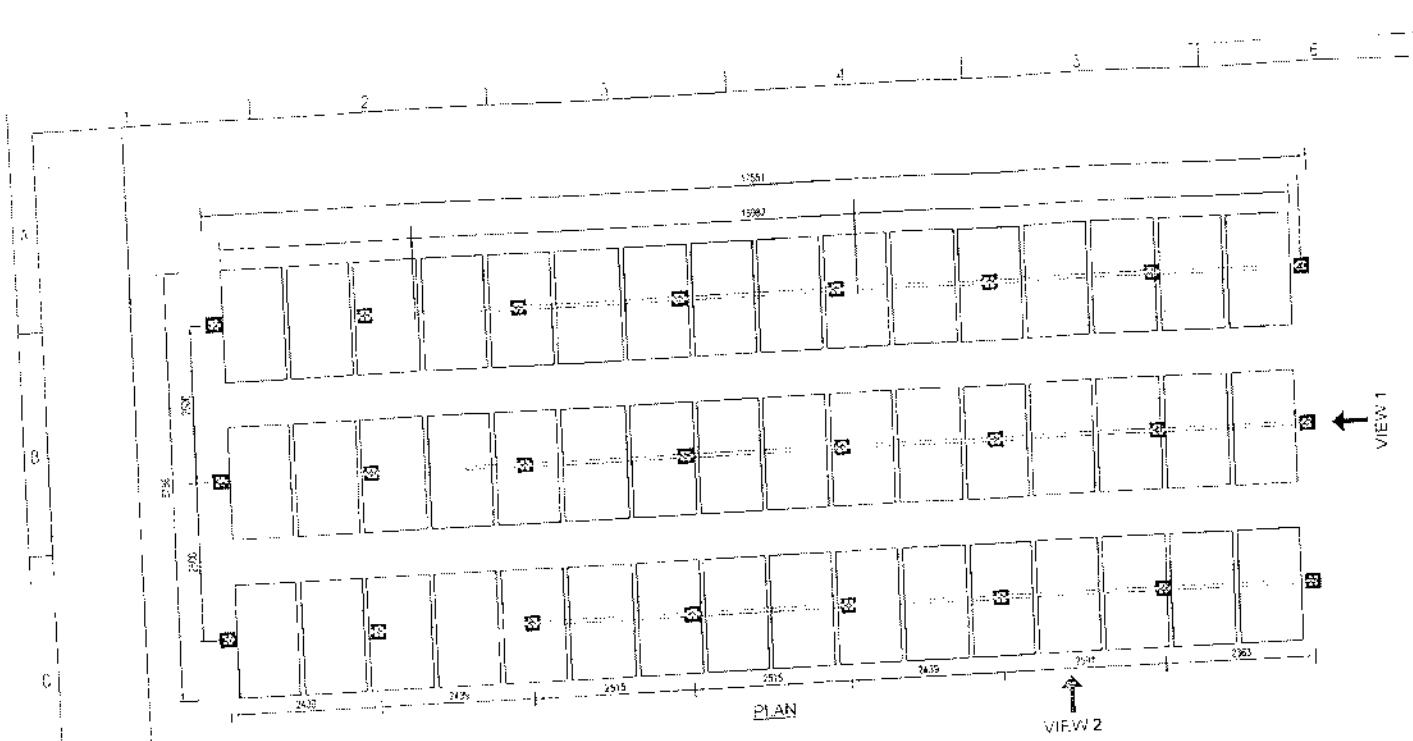


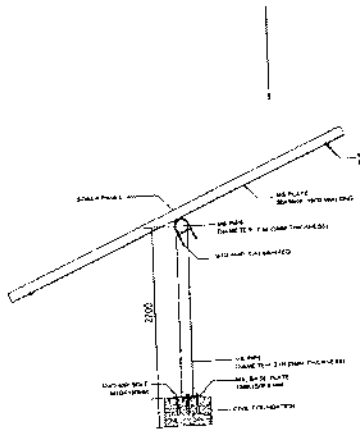




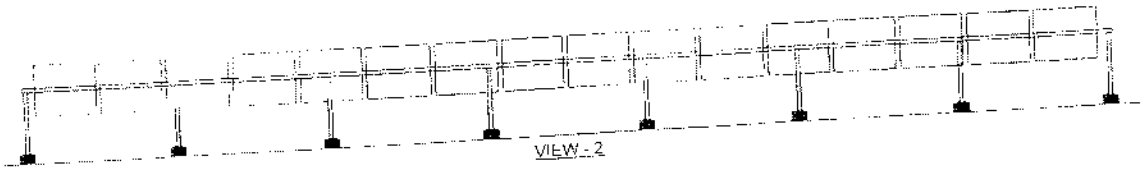


NOTE: ALL METAL STRUCTURE ARE MILD STEEL WITH GALVANIZED OR PROTECTIVE COATING
ALL DIMENSIONS ARE IN MM

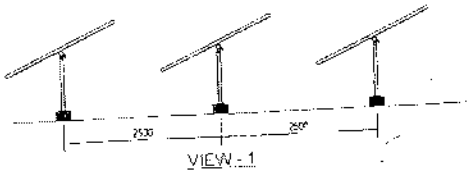




SOLAR FRAMES DETAILS

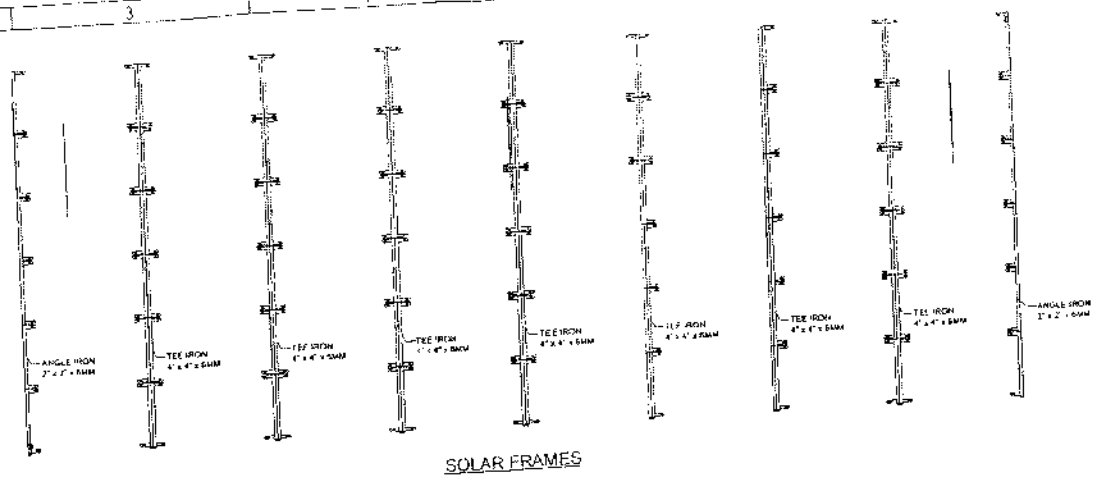


VIEW - 2

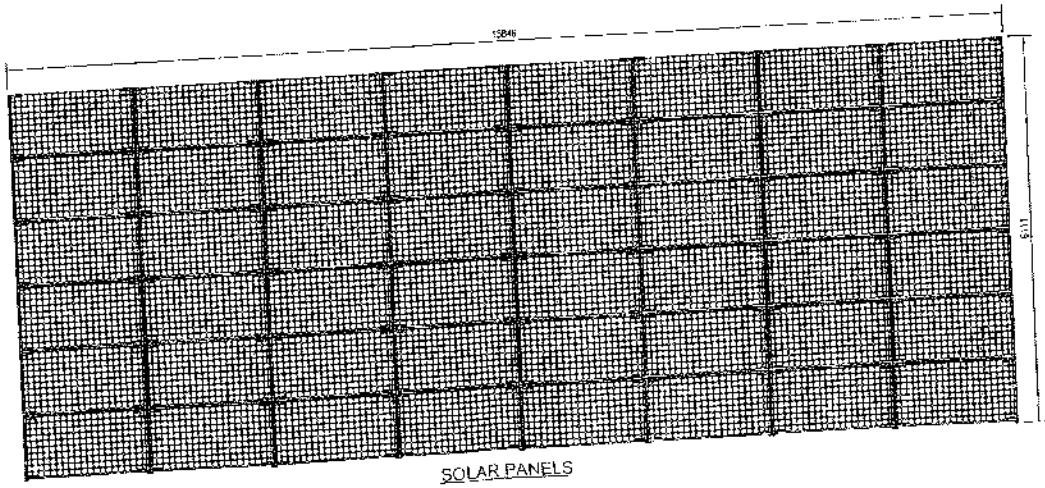


VIEW - 1

NOTE ALL METAL STRUCTURE ARE MILD STEEL WITH GALVANIZED OR PROTECTIVE COATING



SOLAR FRAMES

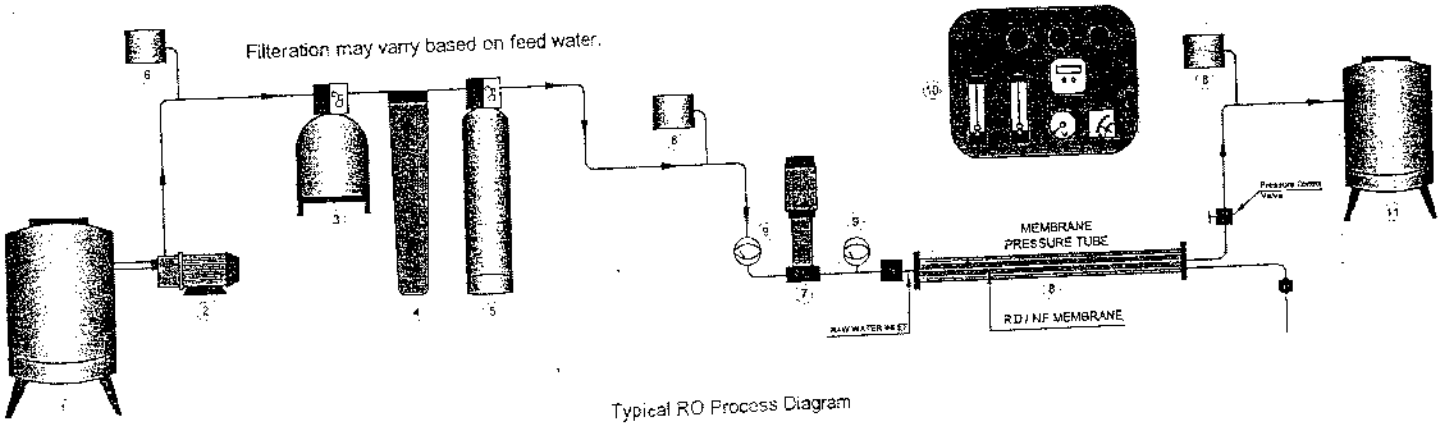


SOLAR PANELS

NOTE. ALL METAL STRUCTURE ARE MILD STEEL WITH GALVANIZED OR PROTECTIVE COATING
ALL DIMENSIONS ARE IN MM

RO / NF WATER FILTRATION SYSTEM

Filteration may varry based on feed water.



Typical RO Process Diagram

1 - Raw water storage tank
2 - Feed water pump
3 - Multimedia (sand / carbon)
4 - Cartrige filter 5 micron
5 - Bag filter 5 micron
6 - Dozing system
7 - High pressure pump
8 - Pressure tube with RO / NF membrane
9 - Pressure Gauge
10- Control pannel with amp meter, volt meter, flow meter, TDS meter etc.
11- Pure water storage tank

ISSUED FOR CONSTRUCTION

Client :

PROJECT MANAGEMENT UNIT
DRINKING WATER HUBS - 750 UNITS
SPECIAL INITIATIVES DEPARTMENT Govt.

Project :

DRINKING WATER HUBS

Drawing Title :

FILTER UNIT
SCHEMATIC DIAGRAM OF
RO / NF FILTRATION SYSTEM

Date : July, 2012

Scale :

Drg No : CDWH-SD-002

Revision

ELECTRICAL WORKS REQUIREMENTS

Chapter E1 – Electrical General Requirements

E1.1 General

E1.1.01 Summary

This chapter addresses the work related to furnishing and installing all supervision, labor, materials and equipment in the work to provide complete electrical systems as specified in other chapters of the specifications.

E1.1.02 Submittals

Submit all relevant shop drawings and manufacturers data for this chapter.

E1.1.03 Codes and Standards

A. In general, the electrical systems should use standard manufactured materials and equipment normally used in industrial facilities. This project's electrical systems should be designed in general compliance with the applicable portions of the following codes and standards, or equivalent as related:

1. ANSI (American National Standards Institute)
2. NEMA (National Electrical Manufacturers Assoc.)
3. NFPA 70 (National Electrical Code)
4. NFPA 79 (Electrical Standard for Industrial Machinery (JIC))
5. NFPA 820 (Standard for Fire Protection in Wastewater Treatment and Collection Facilities)
6. ICEA-IPCEA (Insulated Cable Engineers)
7. IEEE (Institute of Electrical and Electronics Engineers)
8. IES (Illumination Engineers Society)
9. ISA (Instrument Society of America)
10. UL-Underwriter s Laboratories
11. IEE (Institute of Electrical Engineers)
12. BS (British Standards)
13. Electricity Act of Pakistan
14. Applicable Local Codes

Materials shall comply with the standards and codes mentioned here, however, equivalent ISO/USA/British Standards are acceptable with Engineer's approval.

B. Electrical materials and equipment should be specified to withstand the corrosive and hazardous conditions associated with wastewater treatment systems with a normal life expectancy of 20 years.

C. All electrical connections, receptacles, etc. that have the potential to be negatively affected by moisture, dust, and extreme temperatures shall be protected as necessary.

D. The electrical systems should be designed to be cost and energy efficient, maintainable and operable.

E1.1.04 Specifications

A. It is the intention of these specifications to fully cover all work and materials for a complete, first-class electric installation, and any devices such as pull boxes and disconnect switches, usually employed in the class of work, though not specifically mentioned in this specification, but which may be necessary for the satisfactory completion of the work, shall be furnished and installed by the CONTRACTOR as a part of his total work. Cooperate and coordinate with other CONTRACTORS to furnish complete workable systems.

B. In case of conflicting information on the drawings and/or in the specifications, the ENGINEER shall make the proper interpretation.

C. Carefully check space requirements to insure that equipment, pipes, conduits, etc. can be installed in the spaces allotted for them. Where interference occurs and work must be relocated, relocate without additional cost.

D. Changes and additions to scope of work under this contract shall be submitted to the ENGINEER and his written approval obtained before proceeding with the changed work.

E. During construction, the CONTRACTOR shall keep an accurate record of all deviations between the work as shown on the contract drawings and that which is actually installed. He shall secure a set of construction drawings for this purpose, and note changes thereon in red ink, in a neat and accurate manner, thus making a complete record of all changes and revisions in the original design, which exist in the completed work. The cost of furnishing above prints and preparing these record drawings shall be borne by the CONTRACTOR, and shall be included in the contract price. When all revisions have been shown on these prints to indicate the work as finally installed, the prints shall be delivered to the ENGINEER, before final payment.

E1.1.05 Services, Inspection and Tests

A. CONTRACTOR shall show evidence that credible local service organization is in existence to service and furnish spare and replacement parts of all equipment.

B. The right is reserved to inspect and test any portion of the equipment during the progress of its installation. The CONTRACTOR shall test all wiring for continuity and ground before connecting any fixtures or devices. The

CONTRACTOR shall test the entire system, when the work is finally completed, to insure that all portions are free from short circuits and grounds. All equipment necessary to conduct the above tests shall be furnished by the CONTRACTOR at its expense.

C. Secure and pay for all required permits and inspections. Inspection certificates from local authorities having jurisdiction shall be delivered to the EMPLOYER before final payment.

E1.2 Products

E1.2.01 Manufacturing Standards

A. Materials shall be new and approved and labeled by the UL or equivalent wherever standards have been established by that agency. Materials to be furnished under this specification shall be the standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer s latest standard design. All items of the same type and rating shall be identical. Defective equipment or equipment damaged in the course of installation or testing shall be replaced or repaired in a manner meeting the approval of the ENGINEER.

E1.2.02 Trade Names and Criteria and Substitutions

A. Manufacturers' names and catalog numbers indicated herein are not intended to be proprietary designations. They are used for convenience and indicate general type and quality of materials and equipment required. Equipment and materials by other manufacturers, which in the opinion of the ENGINEER are of equal quality and which will produce the same result with regard to both their ability to perform the required technical functions as well as to their appearance in the specific location on this project, will be considered.

B. Approval for equipment specified herein will not be given merely upon the submission of manufacturer's name. Notwithstanding, anything to be contrary in the specifications, approvals for equipment will be given only after the receipt of complete and satisfactory performance data in tabular and/or graphical form, as required by the ENGINEER. Complete and satisfactory information shall also be furnished relative to equipment dimensions, weight and other physical characteristics.

C. Wherever detailed operating features or a definite make and size of apparatus are specified, for which such quantities are readily determinable, the make and size of apparatus, which is proposed for use, must conform substantially to the equipment specified. The same shall apply to important dimensions of the apparatus in relation to the rest of the system to properly fit it into the available space proposed by

the CONTRACTOR. Any additional costs whatsoever that result from any approved substitution shall be borne by the CONTRACTOR.

E1.2.03 Color Code

A. All cables, wiring and busbars shall comply with the following color code, including single core wiring, sleeves of mineral insulated metal sheathed cable, identification tape on the cores of paper insulated and similar cables and on short lengths of single core cable used to interconnect electrical apparatus:

B. TP, TPN, DC 2 wire, DC 3 wire, in accordance with Tables 51A and 51B of the IEE regulations (16th edition).

C. SPN - Main or sub-main cables, single core interconnections on switchgear and the like, busbars and risers - Red or Yellow or Blue, Black.

D. SPN - Final sub-circuit wiring - Red, Black (irrespective of phase).

E1.3 Execution

E1.3.01 Schedule of Work

A. The schedule of the electrical work shall be arranged to suit the progress of the overall work.

B. Cutting and patching shall be done in an approved manner. Cutting shall not endanger structural integrity or function of the building. Patching shall exactly match contiguous work. Costs of such cutting and patching shall be borne by the CONTRACTOR. Cutting shall be carefully done and damage to the building, piping, wiring or equipment, as a result of cutting, shall be repaired by skilled mechanics of trade involved. Cutting of masonry block and brick shall be done with masonry saw.

E1.3.02 Labeling of Equipment

A. All motor disconnect switches, motor controllers, motor control center, panel board, transformer, etc., shall be identified by designation plates permanently attached thereto. All component parts of each item of equipment or device shall bear the manufacturer's nameplate, giving name of manufacturer, description, size, type, serial and model number and electrical characteristics in order to facilitate maintenance or replacement. The nameplate of a CONTRACTOR, subcontractor or distributor will not be acceptable.

E1.3.03 Clearance from Other Services

A. Electrical services shall be kept at least 150 mm clear of water, steam, condensate and other mechanical services.

E1.3.04 Wall Fixings and Steelwork Supports

A. The CONTRACTOR shall be responsible for installing all rag bolts, expansion shields, and the like and for all additional steelwork required for supporting cables, fuse gear, isolators, starters, lighting fittings and the like.

E1.3.05 Painting

A. Paint all exposed conduit as well as cabinets and related items, etc. not supplied with a factory finish. Touch up all factory finishes damaged during installation or by adjacent construction work.

E1.3.06 Outlets, Equipment Connection and Standards

A. Disconnect switches and power wiring, up to and including motor connections for all equipment provided under other Chapters of this specification, shall be included in this Chapter unless specifically excluded.

B. No conduit, outlet box, conduit stub-up, controller, etc. shall be installed until exact location has been determined by the coordinated effort of all Subcontractors concerned. Any relocating of outlet boxes, etc., or cutting or patching, which becomes necessary due to improper coordination between trades, shall be done at the CONTRACTOR'S expense.

C. Determine electrical requirements of other sections in order to fully understand wiring, and provide as required for the complete and satisfactory operation of the project. Make connections for other sections where indicated or required.

D. The CONTRACTOR will prepare the relevant Drawings and submit them to the ENGINEER for approval.

E. The CONTRACTOR will obtain approved shop drawings showing wiring diagrams, connection diagrams, rough-in and hook-up details, for all equipment from the ENGINEER and comply therewith.

MECHANICAL WORKS REQUIREMENTS

Chapter M1 – General Mechanical Specification

M1.1 General

M1.1.01 Summary

A. The following Clauses shall apply to all relevant materials and procedures throughout the Mechanical Specification, unless other instructions are given in specific clauses of other Sections of this Specification.

B. The following clauses of this Chapter of the Specification set out the minimum standards for Plant and workmanship to be used by the CONTRACTOR for the mechanical services Works. All component parts of the Works shall, unless otherwise specified, comply with the provisions of this section.

C. Reference to any specific equipment or material does not necessarily imply that such material or equipment is to be included in the Works.

M1.1.02 Submittals

A. Submit all relevant shop drawings and manufacturers data.

B. Shop Drawings including detailed layout drawings shall be submitted to the ENGINEER for approval; and shall include dimensioning, methods, and locations of supports, and all other pertinent technical specifications for all works to be furnished.

M1.2 Products

M1.2.01 Pipe Work and Ancillaries

A. General

1. All materials used shall be suitable for the use for which they are intended, including being tested.
2. Materials shall comply with all relevant British Standards and Codes of Practice. British standards are mentioned here, however, equivalent ISO/ USA Standards are acceptable with ENGINEER's approval.

B. Steel Pipe Work & Fittings

1. Steel pipework shall be fabricated from tube complying with BS 1387 'Black Heavy Tube'.
2. Screwed steel pipework shall have external taper thread, to be used with parallel/taper threaded sockets.
3. Steel pipework for welding shall have plain square ends, bevelled for butt welding.

4. Galvanised steel pipework shall be fabricated from tube complying with BS 1387 'Galvanised Heavy Tube'.
5. Galvanised steel pipework shall be assembled using galvanised fittings equal in quality to fittings specified for steel pipework.

C. Screwed Joints and Fittings

1. Where threads are cut on site, metal exposed shall immediately be protected by one coat of primer.
2. Joints shall be made using suitable jointing compound. The use of hemp is not permitted.
3. All pipe fittings shall be of malleable cast iron, beaded or banded, with parallel/taper threads to BS 21 to suit taper threaded tube.
4. Bends shall be medium or long radius, tees easy sweep in the direction of circulation or square for drains and vents and the like.
5. Fire-made, or cold-pulled sets or bends shall be used wherever possible on 64 mm nominal bore and larger tubes up to a bend of 45° from the straight, but for larger angles, fittings shall be used. On 54 mm nominal bore and smaller pipes, the maximum use of bending is preferred irrespective of the angle of deviation. In either case the bends must be carefully formed so that there is no distortion of the true section of the tube, no thinning of the tube wall and no damage to the metallic structure of the tube.

D. Flanged Joints

1. Flanged joints shall be provided on all pipework size 65 mm and above, and on all pipework at working pressures of 7 bar and over, and shall be installed at maximum intervals of 12 m on pipework up to 100 mm and 6 m on pipework over 100 mm. All flanges, unless to items of Plant, shall be of the slip-on type for welding. Care shall be taken to ensure that the pipe does not protrude beyond the face of the flange. On completion of welding, the tube shall be expanded into the flange by a mechanical expander. Flanged joints shall be made by the use of corrugated brass 'Taylor's' rings and approved quality jointing compound.
2. Nuts, bolts and washers shall be suitable for the pressure and temperature conditions.
3. When fully tightened bolt shanks shall extend beyond the face of the nut by a minimum of one and a maximum of three threads. Where long bolts have been used for cold draw these shall be replaced with bolts of a normal length.

E. Unions

1. Union joints shall be provided on all pipework size 50 mm and below and at working pressures below 7 bar and shall be installed at maximum intervals of 12 m and to items of Plant not having flanged connections. Unions shall be installed in strategic locations of the pipework to ensure that removal of Plant for maintenance and dismantling of sections of pipework for future amendment or rectification can be carried out with the minimum of effort.

2. Unions shall be of the conical ground bronze-to-bronze seat type.

F. Welded Joints

1. Welding may be by either the oxy-acetylene or electric process. All welds shall be in accordance with the recommended practices published by the Association of Heating Ventilating and Domestic Engineering Employers or the recommendations of the Heating and Ventilating Contractors Association or equal, as appropriate. When an oxy-acetylene flame is used for cutting, the flame shall be used by a qualified operative, care being taken to avoid damage to the metallic structure of the tube.

2. All welding and brazing shall be carried out by skilled operatives and tests shall be in accordance with the recommendation issued by the Association of Heating Ventilating and Domestic Engineering Employers or equal. Tack welds must be performed by fully qualified operatives and must fully penetrate the pipe walls. The use of properly constructed welding clamps to ensure correct alignment for welding shall be considered essential. Pipework for welding shall be supplied with plain ends, joints being made with butt welds on site.

3. All welded joints shall be made by an approved welding process, each joint being of sufficient strength to withstand the stress imposed by internal pressure, thermal expansion and the weight of tube, fittings and thermal insulation. Joints shall have ends properly chamfered, correctly aligned with a suitable gap and welded by the electric arc or oxy-acetylene process as specified previously.

4. All welded tees, branches, reducers and the like, shall have bevelled mitred joints, fused by a penetration weld and finished off with a filler weld of ample dimensions. Care shall be taken to ensure that the welding metal or flux does not project into the bore of the pipe. All welds shall be of good clean metal, free from slag inclusions and porosity, of even thickness and regular

contour, well fused with the parent metal annealed and hammered on completion and finished smooth.

5. All cuts from standard lengths of pipe shall be made by means of hacksaw and trimmed to a fair-faced joint for welding. After cutting, the ends must be hand-dressed with a file until smooth and square and thereafter chamfered for welding. The ends of the pipe, when cut, shall be well reamed or filed to remove all burrs to provide an unrestricted bore.

6. Upon completion, all welded joints shall be thoroughly cleaned with a stiff wire brush and painted two coats red oxide paint. Mill scale and any dirt in the piping system when all welding is completed shall be flushed out.

7. Branches of equal or one size less than the main shall be formed by the use of forged seamless tee pieces to the above specification. Branches of two or more sizes below the main may be formed by the use of branch bends.

8. Reduction in size on pipework shall be formed by the use of forged steel butt-welding fittings to the above specification eccentric or concentric as required.

9. Welding of a bench test specimen shall be performed and witnessed in accordance with BS 1639 or equal shall be passed as satisfactory for each welder employed before the welder commences work. Each man so tested and approved shall be allocated an identification mark or number that shall be stamped by metal punch adjacent to each weld he performs. Approved mark weld test specimens shall be kept on site. Welded joints may be selected to be cut out and examined. In the event of the welded joint in question proving unsatisfactory, the whole of the cost of cutting out, testing and replacing shall be borne by the CONTRACTOR.

G. Copper Pipework & Fittings

1. Copper pipework shall be fabricated from copper tube to BS 2871 & BS EN 1057 - Table 'X'.

2. Copper fittings for pipework 54 mm nominal bore and under shall be of the capillary type manufactured to BS 864 with end feed soldering or internal solder rings. All water services shall be assembled using fittings free of solder containing lead.

H. Soldered and Brazed Joints

Soldered and brazed joints shall be made in accordance with the relevant HVCA Code of Practice. Solder shall be suitable for the temperature conditions pertaining to that service.

I. Flanged Joints

Flanges shall be brass, bronze or gunmetal machined full face and brazed or bronze welded to the tubes. Joints shall be made as described under 'Flanged Joints - Steel Pipework and Fittings'.

J. Compression Joints

Compression joints shall be made in accordance with the manufacturer's instructions.

K. Dissimilar Metals

1. Where dissimilar metals are used joints shall be arranged to prevent galvanic corrosion.
2. Copper pipes up to and including 54 mm diameter shall be connected to steel or iron pipes with a screwed female boss on the steel side and a copper-to-iron union adapter.
3. Copper pipelines over 54 mm diameter on pressurised systems shall be connected to steel or iron by means of a flanged joint.
4. Copper pipe connections to galvanised tanks shall be made using at least 600 mm length of galvanised pipe between the tank and the copper pipe, and a copper-to-iron union adapter.

L. Unplasticised Poly-Vinyl-Chloride Pipework

1. Unplasticised Poly-Vinyl-Chloride pipework (PVC-U) for cold potable water shall conform to BS 3505 and CP 312: Part 2 installed in accordance with the manufacturer's instructions. All pipes shall be Class 'D'.
2. Joints shall generally be of the push fit type complying with BS 4346 having an elastomeric sealing ring. Joints to flanged steel pipes shall be made with slip-on type flange adapters.
3. Fittings shall be injection moulded in PVC-U to the requirements of BS 4346. Fabricated fittings or fittings manufactured in other materials will only be permitted when the material and method of manufacture are approved by the ENGINEER.

M. Connections to Plant and Terminal Units

1. Pipework shall be installed such that no lateral or longitudinal stress is transferred from or to it or to or from the plant.
2. Provision shall be made for bypasses round items that may be subject to damage during flushing, testing or commissioning.
3. Final connections shall be made by means of a union or flange as appropriate, with isolating valves on the line side of the joints and facilities for draining and venting.
4. Further suitable joints shall be left to enable items to be removed and replaced easily.

N. Inspection

Joints may be selected to be broken out for inspection. Should the joint be satisfactory, the cost of this work will be paid at day work rates. If the joint is unsatisfactory, costs for this work and similar tests on five further joints will not be reimbursed. Should any of these joints also be unsatisfactory the whole system shall be taken down and re-installed.

O. Valves

Valves shall be in accordance with the following:

1. Isolating valves:

   a. Isolating valves for all water services shall be quarter turn ball valves of in-line design with full bore, straight through flow with their body, seat retainer, ball, stem and gland nut constructed of dezincification resistant brass with PTFE seat and gland packing.

   b. Isolating valves for all gas services shall be quarter turn ball valves of in-line design with full bore, straight through flow with their body, seat retainer, ball, stem and gland nut constructed of dezincification resistant brass with PTFE seat and gland packing.

   c. Isolating valves for underground mains cold water services shall be bitumen coated cast iron wedge type gate valve to BS 5150 and BS 5163 type A category CF classification.

2. Stopcocks:

   Stopcocks shall be constructed in accordance with BS 1010: Part 2, be resistant to dezincification and suitable for potable water.

3. Drain-cocks:

   Drain-cocks shall be hose union draw off ball valves with their body, seat retainer, ball, stem and gland nut constructed of dezincification resistant brass with PTFE seat and gland packing.

4. Service valves:

   a. Service valves shall be quarter turn ball valves of in-line design with full bore, straight through flow with their body, seat retainer, ball, stem and gland nut constructed of dezincification resistant brass with PTFE seat and gland packing.

   b. Service valves shall be fitted to all draw-offs.

5. Non-return valves:

   Non-return (or check) valves shall be bronze swing pattern with screwed bonnet, metal to metal seat, pressure rating PN 25 and comply with BS 5154 Series 'B'.

6. Float operated ball valve:

   a. Ball valves up to, and including 25 mm nominal bore shall be 'Portsmouth' pattern to BS 1212 Part 1, pressure rating 14 bar with brass body and phosphor bronze seat and complete with copper float to BS 1968.

   b. Ball valves above 25 mm nominal bore shall be 'equilibrium' type with gunmetal (BS 1400 LG2) body and nitrile washer, pressure and temperature rating 10.3 bars and 71 °C.

7. Foot valve and strainer:

   a. Foot valves shall consist of an in-line vertical lift check valve incorporating a mushroom shaped disc with central guide pillar to BS 5154 Series 'B' with bronze (BS 1400 LG2) body and disc and close coupled to an end-of-line coarse strainer.

   b. Valves for regulation and isolation shall be provided to all items of Plant or ranges of sanitary fittings.

   c. In general all valves required for isolation shall be of wheel pattern and all valves required for regulation shall be provided for key operation.

P. Strainers

1. Strainers up to 50 mm nominal bore shall be bronze 'Y' pattern of pressure rating 32 bar at −10 to 120 °C with perforated copper sheet screens having 0.84 mm diameter x 54 holes per cm^2.

2. Strainers of 50 mm nominal bore and above shall be cast iron 'Y' pattern of pressure rating 17 bar at 100 °C with bolted cap and perforated stainless steel screen having 0.75 mm diameter x 61 holes per cm^2.

Q. Pressure Gauges

Pressure gauges shall be mounted such that they can be read easily from ground or access platform level. Gauges shall be fitted using a female screwed outlet on the pipe.

R. Sleeves

1. Where pipes pass through elements of the building structure, i.e. ceiling, partitions and the like, they shall be in all cases enclosed concentrically within purpose made sleeves cut from pipes of the same material one or two sizes larger as may be required to provide reasonable clearance. Such sleeves shall

be cut square at the ends, clean and flush with the finished wall and ceiling surfaces. Sleeves shall in no case be used as pipe supports, a free annular space being always provided which shall be packed with a fire resistant material that shall finish flush with the sleeve face.

2. The sleeve shall not impede thermal movement of the pipe.

S. Wall-plates

Wall-plates shall be fitted where pipes pass through floors, ceilings, walls, partitions and the like within occupied areas. They shall be split pattern, chromium plated and secured by grub screws.

T. Pipeline Support Materials

The diameter of rod from which 'U' bolts are made shall be:

Pipe diameter (mm)	Rod diameter (mm)
Up to 65	9.5
Over 65	12.7

The sizes of flat bar from which 'U' clips are made shall be:

Pipe diameter (mm)	Bar Size (mm)
Up to 28	25 x 4.8 flat
35 to 65	38 x 4.8 flat
Over 65	50 x 4.8 flat

The sizes of drop rods and flat bar from which band clips are made shall be:

Pipe diameter (mm)	Rod diameter (mm)	Bar Size (mm)
Up to 28	9.5	38 x 4.8 flat
Over 65	12.7	50 x 4.8 flat

All brackets for use on copper pipe shall be of brass or copper, or have brass, copper or lead bearing surfaces. All bracket components liable to corrosion shall be painted one coat of red oxide paint.

U. Installation of Supports

1. Care shall be taken to ensure that the axis of the pipe is parallel with the axis of the pipe ring or hanger. Structural steel shall not be drilled for the passage of pipes nor welded to without prior approval.

2. Pipes shall not be supported from items of plant.

V. Spacing of Supports

Pipe supports shall be positioned at intervals not more than those listed below:

1. Steel Pipe work

Pipe size	Horizontal		Vertical
(mm)	Bare (m)	Lagged (m)	(m)
15	1.8	1.8	2.4
20	2.4	2.4	3.0
25	2.4	2.4	3.0
32	2.7	2.4	3.0
40	3.0	2.4	3.7
50	3.0	2.4	3.7
65	3.7	3.0	4.6
80	3.7	3.0	4.6
100	4.0	3.0	4.6
125	4.5	3.7	5.5
150	5.5	4.5	5.5
200	6.0	6.0	
250	6.0	6.0	6.0
300	6.0	6.0	6.0

2. Copper Pipe work

Pipe size	Horizontal		Vertical
(mm)	Bare (m)	Lagged (m)	(m)
15	1.2	1.2	1.8
22	1.2	1.2	1.8
28	1.8	1.5	2.4
35	2.4	1.8	3.0

42	2.4	1.8	3.0
54	2.7	1.8	3.0
65	3.0	2.4	3.7
76	3.0	2.4	3.7
108	3.0	2.4	3.7
133	3.7	3.0	3.7
159	3.7	3.7	3.7

3. Thermoplastic Pipe work

Pipe size (mm O/D)	Horizontal (m)	Vertical (m)
16	0.6	0.9
20	0.7	1 0
25	0.8	1.2
32	0.9	1.3
40	1.0	1.5
50	1.1	1.5
63	1.2	1.8
75	1.4	2.0
90	1.6	2.0
110	1.8	2.0
125	2.0	2.0
225	2.0	2.0

Supports for plastic pipe work shall be at intervals shown above or as recommended by the manufacturers, whichever interval is the shortest.

Where different sized pipes are supported from common bars intervals shall suit the pipe requiring the closest support spacing.

W. Pipeline Installation

1. All exposed pipe runs shall be arranged to present a neat appearance, generally following the building structure.
2. Vertical pipes shall be plumb and all pipes shall be installed to facilitate natural draining and venting.

X. Spacing and Clearance

1. Pipes shall be spaced in relation to one another and to the building structure to allow for the required thickness of thermal insulation and the fitting of wall plates where appropriate. The combined insulation of two or more pipes will not be permitted.
2. Minimum spacing are:
   a. 50 mm between pipes (or pipe insulation), and between pipe and wall. Where pipes are flanged the clearance is to the edge of the flange.
   b. 150 mm between pipe (or pipe insulation) and floor.
   c. 50 mm between pipe (or pipe insulation) and ceiling.
3. These clearances may need to be increased to allow for valves, branches, and the like.

Y. Grading, Venting, and the like

1. All pipe work shall be installed to gradients to allow for drainage and/or release of air, according to the service concerned.
2. All plant and sections of pipe work must be capable of being completely drained with the sectionalising or isolating valves closed. Drain points shall be provided at all isolating valves in the form of a right angle branch from the main fitted with a drain cock of a suitable type for the service concerned.
3. Generally pipes shall be graded thus:

   Carrying liquids under pressure 17 mm/m

   Carrying liquids by gravity flow 4 mm/m

   Carrying gases Level
4. Automatic air eliminators shall be installed at high points on hot water heating and domestic hot water systems.

Z. Dther works

1. Joint Location

   Joints shall not be made within the thickness of walls, floors or ceilings.

2. Tools

The correct tools shall be used for the assembly of pipe work, and any protective coatings marked shall be made good.

3. Cleanliness

Pipe work and fittings shall be inspected and foreign matter removed before installation.

As the installation of pipe work proceeds all open ends shall be sealed with plugs, caps or blank flanges to avoid ingress of foreign matter. Under no circumstances shall paper or wood be used for this purpose.

At the completion of all or sections of the Works the pipe work or sections of pipe work shall be flushed out until all loose material has been completely removed. This flushing shall be in addition to any subsequent cleansing requirement.

4. Pipe Cutting

Pipes shall be cut clean and square with the axis, and all burrs removed.

5. Anti-vibration Couplings

Suitable anti-vibration couplings shall be provided to all moving machinery, and shall be installed such that they do not transmit any transverse stresses to or from the plant.

The couplings shall be installed without twisting, misalignment, stretching or compression.

Stool pieces shall be fitted during any testing that produces conditions outside those recommended for the couplings.

6. Vibration Isolation

All dynamic machinery shall be isolated from the building structure by vibration isolators or material designed and selected to suit the machinery.

Isolation components shall be installed in accordance with the manufacturer's instructions.

M1.2.02 Foul Drainage above Ground

A. Pipe work and Fittings

1. Soil and Vent Systems

Pipes, fittings and accessories shall be PVC-U to BS 4514, coloured grey or white.

Fittings and accessories shall include bends, branches, vent terminals and reducers. All jointing shall be by the solvent weld method in accordance with the manufacturer's instructions and

recommendations. Proprietary wall and suspension brackets shall be used for fixing pipe work.

2. Waste Systems

Pipes, fittings and accessories shall be Polypropylene to BS 5254 or BS 5255, coloured white and generally 32 mm, 40 mm and 50 mm nominal bore.

All jointing shall be by the push-fit method in accordance with the manufacturer's instructions and recommendations. Proprietary wall and suspension brackets shall be used for fixing pipe work.

Waste pipe work in laboratories and other locations where noxious or corrosive effluent is being discharged shall be in acid resistant plastic pipe. The pipe work shall be installed strictly in accordance with the manufacturer's requirements.

B. Pipework Installation

1. The method of installing pipework, fittings and accessories shall comply with the design, performance requirements and recommendations of BS 5572 Code of Practice for Sanitary Pipework to give a watertight pipework system.

2. All necessary pipework, fittings and accessories shall be installed to ensure that:

   a. Appliances drain quickly, quietly and completely at all times without nuisance or risk to health.

   b. Discharge is conveyed without crossflow, backfall, leakage or blockage.

   c. Air from the drainage system does not enter the building.

   d. Pressure fluctuations in the pipework do not vary by more than ± 38 mm water gauge and traps retain a water seal of not less than 25 mm water gauge.

   e. The system can be adequately tested, cleaned and maintained.

3. All components for each type of pipework shall be of the same manufacturer. Cut ends of pipe shall be clean and square with all burrs removed. Pipework shall be installed to accommodate thermal and building movement when jointing and fixing. Junctions shall be formed using fittings intended for the purpose ensuring that jointing material does not project into bore of pipes, fittings and appliances. Contact between dissimilar metals and other materials that would result in electrolytic corrosion shall be avoided. Access covers and cleaning eyes, as necessary, shall be provided in convenient locations to permit adequate testing and cleaning of pipework.

Entry of foreign matter into any part of system during the construction stage shall be prevented by fitting all access covers and cleaning eyes and by sealing all openings as the work proceeds.

4. Pipe routes to be the shortest practical, with as few bends as possible and no bends in wet proportion of soil stacks. The connection of plastic pipe work to pipe work of other materials shall produce a watertight joint and be carried out using approved connectors and methods in accordance with the plastic pipe work manufacturer's recommendations.

C. Pipe work Supports

Pipe work supports shall be fixed at the spacing indicated hereunder.

Pipe diameter (mm)	Horizontal (m)	Vertical (m)
32 to 40	1.2	0.5
50	1.2	0.6
75 to 100	1.8	0.9
150	1.8	1.2

Provide additional supports as necessary at junctions and changes of direction.

M1.2.03 Pumps & Pumping Plant

A. Electric Motors

1. All motors shall comply with the appropriate parts of BS 4999 and BS 5000 and shall be of such a size and type to adequately drive the Plant under all normal conditions of service without overloading. Motors of 1 kW and greater shall be 3 phase.

2. All fan, pump, stoker and burner motors shall be continuously rated. The insulation shall comply with BS 2757 excluding Classes Y and A.

3. Motor enclosures shall comply with BS 5490. Fan, pump, and similar motors larger than 1 kW shall be screen protected and drip-proof except in solid fuel fired boiler houses. Motors of less than 1 kW and all motors in solid fuel fired boiler houses shall be totally enclosed. Motors positioned remotely from their starters shall be provided with load-breaking isolating switches fitted adjacent to them.

4. Motors arranged for automatic restart shall have a label of durable material fixed permanently to them in a prominent position and having, in clearly inscribed characters, the legend:

   DANGER: THIS MOTOR IS AUTOMATICALLY CONTROLLED AND MAY START WITHOUT WARNING. ISOLATE BEFORE INSPECTION.

5. Direction of rotation shall be clearly indicated.

B. Water Pressure Boosting Sets

1. Sets shall comprise a number of pumps, a sealed vessel, control panel, manifolds with isolating and non-return valves, pressure switches, gauge and relief valve, and all other necessary equipment mounted on a common bedplate.
2. The sets shall be sized such that in the event of one pump failing the remaining unit(s) will provide the full duty.
3. Pumps shall be constructed of close-grained cast iron with cast iron or gunmetal impellers and stainless steel shafts.
4. Bearings shall be heavy-duty sealed-for-life ball type. Seals shall be tungsten carbide faced mechanical type.
5. Motors shall be direct driven totally enclosed fan cooled type.
6. Vessels shall be fabricated from mild steel. The interior shall be grit-blasted and painted with at least three coats of epoxy resin anti-corrosion paint. The exterior shall be de-scaled and painted with one coat of primer and two of gloss paint.
7. The vessel shall be complete with manhole cover, air pressure relief valve, air charging valve, butyl rubber bag, drain valve and tappings for gauges and control switches.
8. Cold water booster sets shall operate in accordance with the following:
   a. With the control switches set to automatic a small demand shall be met from the system. As the demand increases and the pressure drops further the 'run' pump shall start and continue to operate while there is a demand. When the demand ceases the system shall re-pressurise and the pump shall stop.
   b. To obviate the possibility of hunting on relatively small demand minimum run relays shall be included. A duty/standby switch shall be fitted to enable any pump to be the duty pump.
   c. Prevention of dry running shall be by means of a break tank level switch or a suction manifold low pressure switch.
9. The control panel shall also include:

a. Pressure gauge indicating system pressure.

b. Test/Off/Auto switches for each pump.

c. Run/Trip lamps for each pump.

d. Low water warning lamp.

e. Panel 'live' lamp.

M1.2.04 Ductwork and Ancillaries

A. General

1. Ductwork shall be as shown on the drawings and constructed in accordance with HVCA Specification DW 142 except where stated below.

2. Leakage limits shall be as defined in DW 142 with the added provison that leakage shall not be audible.

3. Sharp edges and corners shall be avoided both internally and externally. Self-tapping screws shall not be used.

B. Flexible Ducts

1. Flexible ducts shall be metal or plastic coated metal.

2. Flexible ductwork between rigid ductwork sections and Plant shall have matching internal diameters with external diameters of the rigid duct and Plant spigot with minimum clearance to achieve a close fit. Flexible ductwork shall be kept to a minimum. The maximum length of any individual flexible duct shall not exceed 2 m and shall not be used between sections of rigid ductwork to change direction.

3. Flexible ductwork shall consist of flexible corrugated metal tubing of stainless steel, aluminium, tin-plated steel or aluminium coated steel. The metal surface(s) may be coated with a plastics material.

4. Flexible duct shall have a liner and a cover of tough tear-resistant fabric equal in durability and flexibility to glass fibre fabric. The fabric shall be impregnated and coated with plastic. It shall be reinforced with a bonded galvanised spring steel, stainless steel or other approved wire helix between the liner and the cover. An outer helix of glass fibre cord or equal shall be bonded to the cover to ensure regular convolutions. Flexible ductwork without a liner may be used, subject to compliance with all other appropriate requirements of this Specification.

5. Joints between flexible ducts shall be made with a sealant that permanently retains adhesion and elasticity through the design working temperature range. The sealant and method of application shall be in accordance with the manufacturer's recommendations. Flexible ductwork up to and including 140 mm diameter shall be secured with a worm drive type hose clip.

Flexible ductwork over 140 mm diameter shall be secured with a band clip.

6. Frictional resistance to air flow per unit length of flexible duct shall not exceed 150% of that of galvanised steel duct of similar diameter. The radius ratio R/D for bends shall be not less than 2 where R is the centre line radius and D is the diameter of the flexible duct. Flexible ducts shall be supported in such a way that kinking of the duct is avoided.

7. Leakage from any section of flexible duct shall meet the requirements of air-tightness applicable to rigid ductwork for the pressure classification indicated.

8. Flexible ductwork shall be suitable for an operating temperature range of –5°C to +90°C and shall comply with the following:

   BS 476: Part 5, Rating Class P.

   BS 476: Part 6, Index of performance not to exceed 12 of which 6 should derive from the initial period of test.

   BS 476: Part 7, Class 1 (surface of very low flame spread).

9. Test holes shall not be made in flexible ducting.

C. Flexible Joints

1. Flexible joints shall be provided on all fan inlet and outlet connections and elsewhere on ductwork. Joints shall be the same cross-sectional area as the mating fan inlet, outlet or duct section. Centre lines of flexible joint connections shall be coaxial. Flexible joints must not be used to cover for poor alignment of ductwork.

2. Flexible joints shall consist of, or be externally protected by, material having a fire penetration time of not less than 15 minutes when tested in accordance with BS 476: Parts 20 to 23 and shall comply with BS 476: Part 7, Section 2, Clause 2.8 (Class 1: surface of very low flame spread).

D. Steel Ductwork, Galvanised after Manufacture

Where galvanised-after-manufacture steel ductwork is specified, it shall comply with HVCA Specification DW 142.

E. Dampers - General

1. Dampers shall comply with HVCA Specification DW 142 and the following requirements.

2. Manually and automatically operated dampers shall have, on each of the shafts carrying the damper blades, a groove made on each end parallel to the blades. Manual dampers shall include a device for positioning and locking the blades. The

positions of all dampers as set after final regulation shall be indelibly marked at the adjusting device.

3. Removable panels, located to facilitate inspection and maintenance and incorporating purpose made air seals, shall be provided adjacent to all dampers. Subject to limitations of duct size the dimensions of access openings shall not be less than 300 mm x 300 mm.

F. Self-Closing (non-return) Dampers

Self-closing dampers shall present minimum resistance to air flow under running conditions and take up a stable position in operation. Maximum resistance shall be presented under reverse air flow conditions. Resilient strips or other purpose made devices shall be provided to prevent the damper rattling and for air sealing under reverse flow.

G. Fire Dampers

1. Fire dampers used singly or in combination shall have an overall fire rating of not less than 2 hours. Evidence of fire rating in accordance with BS 476: Parts 20-23 shall be provided by an approved independent testing organisation.

2. Fire dampers shall be constructed of either a corrosion resistant material such as stainless steel or be galvanised or otherwise treated to minimise corrosion. The dampers shall be housed in a corrosion resistant casing constructed to avoid distortion due to stress in fire conditions. Provision shall be made to accommodate expansion of the damper blade within the casing in fire conditions. A fire damper installation frame shall also incorporate provision for expansion within the surrounding structure, together with lugs for building in to the structure.

3. Fire damper assemblies for ductwork in corrosive environment shall be fabricated from materials or be coated with a protective finish resistant to corrosion.

4. Each fire damper casing shall be clearly marked with a permanent indication of the correct fixing attitude of the damper, the direction of air flow and the side at which the access/maintenance opening shall be located.

5. The folded continuous interlocked blade type of damper may be used for vertical or horizontal duct applications. The closing force shall be provided by a stainless steel spring or springs. An automatic locking device shall be provided to ensure the blades are held in the closed position after release.

6. Spring actuated pivoted single blade or multi-bladed dampers may be used for vertical or horizontal duct applications. Multi-

bladed dampers shall be provided with a means to ensure all blades close simultaneously.

7. Hinged dampers should close in the direction of air flow.
8. Gravity operated single blade dampers may be used for both vertical and horizontal ducts, provided means are incorporated which ensure reliable and positive closure, when operating in maximum air flow rate conditions. Gravity operated multi-bladed fire dampers shall not be used.
9. Where gravity acting off-centre pivoted dampers incorporate spindle bearings, long term corrosion effects shall be minimised by choice of materials. Bearings shall be sealed or capped to exclude dirt and dust. Blades shall close to comply with the stability and integrity requirements of BS 476: Parts 20-23.
10. Each fire damper shall be held in the open position by a corrosion resistant retaining device incorporating a fusible element. The fusible element shall operate at a temperature of 72°C.
11. Fire dampers shall be of a type that facilitates periodic manual release and re-setting for test purposes.
12. Adequate access shall be provided for checking and re setting of dampers. The re-setting procedure on each fire damper shall be demonstrated as requested.

H. Air Terminal Devices

1. Testing and rating of air terminal devices shall be in accordance with BS 4773: Parts 1 and 2.
2. Sizes of all air terminal devices shall provide the air volume flow rate, air diffusion and comply with other requirements as specified. The indicated sound power levels shall not be exceeded.
3. Materials of construction shall be steel, aluminium or plastic. All items shall be protected against corrosion and provided in fully finished condition.
4. Surfaces that are visible in the completed project shall be perfectly formed and correctly shaped, clearly finished and free from cracks.
5. Where air terminal devices are located on wall or ceiling surfaces the perimeter shall be effectively sealed to prevent pattern staining.

I. Grilles and Registers

1. Each supply air grille and register shall have two sets of separately adjustable blades, one set horizontal and one set vertical. Each supply air register shall, in addition, be provided

with an air flow rate controller of the opposed blade multi-leaf or rhomboidal type. All blades and air flow rate controllers shall be adjustable from the front of the grille or register by key or screwdriver.

2. Each exhaust air grille may have either a single set of blades or bars (either vertical or horizontal) or a lattice or egg crate front. Each exhaust air register shall, in addition, be provided with an air flow rate controller of the opposed blade multi-leaf type operable from the front of the register by key or screwdriver.
3. For up to ten grilles or registers one set of any tools required for adjusting shall be provided; from eleven to twenty-four, two sets; twenty-five and over, three sets.
4. Grilles and registers shall be provided with means of removal to facilitate easy cleaning.

J. Diffusers

1. All diffusers mounted on ceilings shall have anti-smudge surrounds. Pan type diffusers may be provided except where cone type diffusers are used. Steel diffusers shall be protected against corrosion and shall be stove enamelled.
2. Each diffuser shall be provided with an airflow rate controller and a means of altering the discharge airflow pattern. All controllers shall be adjustable from the front of the diffuser. Where a diffuser is directly connected to a stub duct that has a straight length of less than two equivalent diameters an equalising deflector shall be used.
3. Linear diffusers shall be of the fixed blade type or shall include means of independently adjusting the direction of the air jets; the means of adjustment shall be operable from the front of the diffusers. Where linear diffusers are mounted in a continuous line, there shall be provision for ensuring alignment between consecutive diffusers and each diffuser shall be provided with means to ensure relatively uniform air flow distribution along the diffuser.
4. Diffusers shall be provided with means of removal to facilitate easy cleaning.

K. Attenuators

1. Attenuator casings shall be fabricated from lock formed pre-galvanised steel sheet with flanges of rolled steel angle hot dip galvanised drilled for duct connection or formed flanges of pre-galvanised steel strip suitable for clamp fixing.
2. Splitters shall be of absorbent resin bonded mineral fibre in slab form or other materials which are inorganic, non-hygroscopic, flame, moisture and vermin proof with erosion resistant facing

and impervious moisture resistant lining. Splitter frames shall be formed from pre-galvanised steel sheet.

3. All materials used shall have adequate strength, cohesion and shall not produce dust. In water saturated conditions the acoustic fill shall be further protected by a secure non-porous membrane capable of attaining Class 1 spread of flame when tested to BS 476.

4. Materials in contact with the air stream shall be corrosion resistant.

M1.2.05 Ventilation & Air Conditioning

A. Fans – General

1. Fans shall be type tested to BS 848 type A/B/C/D as indicated and selected to give the air flow volume rate specified.

2. All fans shall be capable of withstanding the pressures and stresses developed during continuous operation at the selected duty, starting, stopping and/or speed and duty changes. Additionally, all belt driven fans shall be capable of being uprated to run continuously at 10% in excess of the selected duty speed. Fan motors, fan drives and fan starters shall be rated for the selected duty speed.

3. Fans shall be installed using bolts, nuts and washers with all nuts properly locked and secure. All 'as cast' bearing surfaces for bolt heads and washers shall be counterfaced. Holding-down bolts for fans and motors shall be provided with means to prevent the bolts turning when the nuts are tightened. Fans heavier than 20 kg shall be provided with eyebolts or other purpose made lifting facilities.

4. Fan casings and impellers shall be constructed such as to prevent drumming or vibration.

5. The shaft and impeller assembly of all centrifugal, axial flow and mixed flow fans shall be statically and dynamically balanced where the impeller diameter is 750 mm or greater. Vibration severity shall not exceed the limits given in BS 7854: Part 1.

6. Fan bearings shall be of a type suitable for the size, speed, load and discharge angle of the fan. Bearings shall be grease/oil ball and/or roller type or oil lubricated sleeve type. All bearing housings shall be precision located in position and arranged so that bearings may be replaced without the need for realignment. Bearing housings shall be protected against ingress of dust and, where fitted with greasing points, shall be designed to prevent damage from over-greasing. For grease lubricated systems the bearings shall be provided with grease in amount and quality recommended by the bearing

manufacturer. For oil lubricated systems the housings shall provide an adequate reservoir of oil, include a filling plug and be oil tight and dust proof. Systems, other than total loss types, shall include an accessible drain plug. All bearing lubricators shall be located to facilitate maintenance.

7. All kitchen extract fans shall have an access panel fitted to the fan casing. The panel shall be the full width of the impeller and located to facilitate cleaning and maintenance.

B. Centrifugal Fans

1. Centrifugal fans consuming more than 7.5 kW at the fan shaft shall be backward bladed type having a fan total efficiency not less than 75%.

2. Fan casings shall be constructed to permit withdrawal of the fan impeller after fan installation. Fans, other than those in air handling units, shall be provided with flanged outlet connections and spigoted inlet connections, except that for negative pressures greater than 500 Pa inlet connections shall be flanged. A plugged drain point shall be fitted at the lowest point in fan casings. Permanent indication shall be provided to show the correct direction of rotation of the fan impeller. Removable access panels, sized to facilitate cleaning and maintenance of the impeller and incorporating purpose made air seals, shall be provided in the fan casing.

3. Impellers shall be of mild steel or aluminium alloy of riveted, welded or other approved construction, with spiders or hubs of robust design.

4. Where fans are fitted with variable inlet guide vanes they shall be matched to the fan performance to give stable control. Vanes shall be closely interlocked to ensure movement in unison. Positive locking in at least five different positions shall be provided for manually controlled variable inlet guide vanes. Vane blades shall not vibrate or flutter throughout their movement. Linkage construction shall minimise friction and lost motion.

5. Where fans are fitted with variable inlet vanes a copy of the fan manufacturer's characteristic operating curves which detail performance over the complete range of inlet vane positions shall be provided in the Operating and Maintenance Manuals.

C. Axial Flow Fans

1. Axial flow fan casings shall be provided with mounting feet where necessary for bolting to a base or supports. Inlet and outlet connections shall be flanged. For in-duct mounting fans the length of the fan casing shall be greater than the combined length of the impeller(s) and motor(s). Electrical connections to

motors shall be through an external terminal box secured to the casing.

2. Impellers shall be of steel, aluminium or plastic and the hub shall be keyed to the shaft. Blades shall be aerofoil section and capable of pitch adjustment.

3. Where motors are mounted external to casings drives and guards shall be provided. A guard is not required for any part of a drive that is inside the fan casing. A removable access panel, sized to facilitate maintenance and incorporating purpose made air seals, shall be provided in the fan casing.

4. Axial flow fans of the bifurcated type shall have the motors out of the air stream. Motors may be placed between the two halves of the casing in external air or may be within the casing provided motors are effectively ventilated.

5. Where axial flow fans having variable pitch impeller blades are used the fans shall be stable in performance over the required range of operation. Impeller pitch shall be variable by manual adjustment prior to fan operation or shall be continuously adjustable during operation by automatic means.

6. Where fans are fitted with variable inlet vanes a copy of the fan manufacturer's characteristic operating curves which detail performance over the complete range of inlet vane positions shall be provided in the Operating and Maintenance Manuals.

D. In-line Centrifugal and Mixed Flow Fans

Mixed flow fan casings shall be provided with mounting feet where necessary for bolting to a base or supports. Inlet and outlet connections shall be flanged. Stator vanes shall be of mild steel or aluminium alloy. The unit shall be designed to facilitate access to the impeller. Where motors are mounted external to casings drives and guards shall be provided. A removable access panel, sized to facilitate maintenance and incorporating purpose made air seals, shall be provided in the fan casing.

E. Mechanical Roof Extract Units

Cowls and bases shall be of materials resistant to weather and solar radiation, and shall be appropriate to the fan location. Casings shall be formed to facilitate a weatherproof fitting to the building structure. Adequate access to electrical supply terminals and lubrication points shall be provided. Back-draught dampers shall be provided. Bird guards of not greater than 25 mm mesh shall be provided as an integral part of the unit.

F. Air Handling Units

1. Individual components forming part of the air handling units shall comply with the other appropriate parts of this Specification.

2. Air handling units shall be of rigid construction, corrosion resistant and strengthened as necessary to minimise distortion and drumming in operation. Individual components and sections shall be assembled using proprietary and approved fastening techniques. Locking devices shall be used with all fastenings subject to vibration. Material thicknesses and methods of strengthening and fastening shall ensure that air handling assemblies are no less rigid in operation than the distribution ductwork to which they connect.

3. Readily removable panels or doors with air seals shall be provided to facilitate access to upstream and downstream faces and internal parts of all sections in the air handling plant. Access panels shall be secured with a minimum number of fastenings consistent with effective air sealing. These fastenings shall be of the spring-loaded quick-release knob-operated type. All access panels shall be sized for the full height of the unit or section but need not exceed 1 800 mm.

4. Alternatively, and subject to approval of the ENGINEER, slide-in arrangements of coils and other components may be used to achieve access for inspection and maintenance.

5. Sections of packaged units shall be arranged to promote even air distribution across the face of all components.

6. Where a fan and its drive motor(s) are contained within a common casing they shall be mounted on a frame or support base and the complete assembly shall be isolated from the casing to prevent the transmission of vibration.

7. Dampers shall be of the opposed aerofoil bladed type running in self- lubricated bearings.

G. Air Filters – General

Filter assemblies shall operate at not less than the efficiencies or values of arrestance specified. Filter medium or wetting agent shall not be carried over in the air stream. All filter assemblies shall be arranged to facilitate access for cleaning, removal and refitting.

H. Filter Cell Holding Frames

1. Filter cell holding frames shall be constructed of metal (protected against corrosion) of adequate strength and stiffened as required to prevent distortion in use. Holding down frames shall be capable of retaining air filters, constructed within the

dimensional tolerances stated, in a rigid manner and without edge leakage.

2. The entire framework shall be securely fixed in position with all edges and joints effectively sealed to prevent air leakage. Purpose made seals shall be provided to minimise air leakage around filters. The effectiveness of the seals shall not be impaired by periodic removal and refitting of the filter cells. Gasket material shall be fitted in the holding frames, except for holding frames for HEPA type air filters.

3. The retaining clips or other securing device shall be capable of pulling the filter cell on to its seating and exerting equal pressure on all faces. Where holding down bolts are provided for HEPA filters, a minimum of four bolts are to be provided. For HEPA filters in side withdrawal frames fixing should be over-centre cam operation or by holding down bolts.

4. The overall efficiency of filters mounted in a frame shall not be less than that specified for the individual filter cells.

I. Instrumentation

A differential pressure gauge of the inclined manometer type, with a scale length of at least 200 mm or mechanical dial gauge of at least 100 mm diameter, shall be provided for each filter bank and fixed in such a position that it is readily accessible and easily read. The gauge shall incorporate a graduated scale on which the reading of maximum pressure drop shall occur in not less than 70% of the total scale length. 'Filter Dirty' and 'Filter Clean' positions shall be clearly marked.

J. Performance Certification

1. A copy of a Type Test Certificate, issued by a BSI or HEVAC/EUROVENT approved independent air filter testing station, shall be submitted for each type of filter offered up to and including Grade 9. Certification of HEPA filters shall be as detailed below.

2. The CONTRACTOR shall arrange for two samples of the filter offered to be submitted and for the samples to be tested to the standard specified in the contract documents.

3. Random samples from the filters supplied may be redrawn against this Contract for test and on failure to meet the specified standard all of the type of filters failing the test may be rejected.

K. Fire Properties

Air filter medium shall be self-extinguishing and no material used in construction shall evolve significant quantities of smoke or toxic matter when exposed to a flame.

L. Filter Grades

Filters specified in terms of a Filter Grade shall relate to the average atmosphere dust spot efficiency or arrestance in accordance with specification Eurovent 4/5. It shall apply to the air volume, dust holding capacity and final resistance conditions as stated in this Specification.

1. The following grades shall apply:

   Grade 2 filters average arrestance: not less than 65%

   Grade 3 filters average arrestance: not less than 80%

   Grade 4 filters average arrestance: not less than 90%

   Grade 5 filters ave. atmospheric dust spot efficiency: not less than 40%

   Grade 6 filters ave. atmospheric dust spot efficiency: not less than 60%

   Grade 7 filters ave. atmospheric dust spot efficiency: not less than 80%

   Grade 8 filters ave. atmospheric dust spot efficiency: not less than 90%

   Grade 9 filters ave. atmospheric dust spot efficiency: not less than 95%

2. Minimum dust holding capacities to be as required by the relevant clause.

M. Bag or Extended Surface Type Filters

1. Filters shall be fully self-supporting without external ties or stiffening frames. They shall inflate fully, shall not sag or flutter, or have effective medium area reduced by obstruction due to contact with other filter faces or housing surfaces, when operating between 60% and 110% of design air volume flow rate for fixed volume systems, or between minimum and maximum air volume for VAV systems. Air velocity at the filter face shall not exceed 2.5 m/s.

2. The following face dimensions shall apply:

   595 + 3 mm high x 595 + 3 mm wide

   595 + 3 mm high x 493 + 3 mm wide

   595 + 3 mm high x 290 + 3 mm wide

   290 + 3 mm high x 595 + 3 mm wide

   290 + 3 mm high x 290 + 3 mm wide

3. Front flange of filter shall be 21 mm + 2 mm thickness.

4. Filter length shall not exceed 760 mm.

5. The dust holding capacity based on tests carried out on 595 mm x 595 mm air filters at an air flow rate of 0.94 m3/s shall comply with the following:

Grade 3 filters: not less than 450 g at 250 Pa final resistance.

Grade 4 filters: not less than 425 g at 250 Pa final resistance.

Grade 5 filters: not less than 400 g at 250 Pa final resistance.

Grade 6 filters: not less than 500 g at 350 Pa final resistance.

Grade 7 filters: not less than 400 g at 350 Pa final resistance.

Grade 8 filters: not less than 350 g at 380 Pa final resistance.

6. Pre-filters of this type shall conform to Grade 3 and main filters to Grade 5 where combinations of bag type pre-filters and bag type main filters are used.

7. Sufficient spare filters shall be provided to replace the complete filter bank.

N. Panel Filters

1. The filter medium shall be glass, natural or synthetic fibre or fabric. The 50 mm deep replaceable type panel filters shall operate at a face velocity not exceeding 1.75 m/s, 100 mm deep panels shall operate at a face velocity not exceeding 2.5 m/s.

2. The dust holding capacity as achieved by test on a 595 x 595 mm air filter at a face velocity as stated above shall comply with the following:

Grade 2 filters: not less than 300 g at 170 Pa final resistance

Grade 3 filters: not less than 250 g at 170 Pa final resistance

Grade 4 filters: not less than 400 g at 250 Pa final resistance

3. The following dimensions shall apply:

Grades 2 and 3 filters:

595 mm x 595 mm: Tolerances + 3 mm

595 mm x 493 mm: Tolerances + 3 mm

595 mm x 290 mm: Tolerances + 3 mm

593 mm x 493 mm: Tolerances + 3 mm

Depth of filter 48 mm + 2 mm in each case

Grade 4 filters:

595 mm x 595 mm + 3 mm with a depth of 97 mm + 2 mm

4. Cardboard filter frames shall not be used unless adequately stiffened to prevent distortion in handling or when fitted.

5. Filter pads in permanent frames shall meet the requirements for Grade 2 filters stated above. Pads shall conform to all requirements for replaceable type panel filters; frames shall conform to the dimensions given above. Sufficient spare filter cells or pads shall be provided to replace the complete filter bank.

O. Identification of Services

1. Services and plant shall be identified in accordance with this specification, BS 1710 and HVCA codes with priority in that order.

2. Identification shall clearly show the type of service, direction of flow and line size. Tapes shall be self-adhesive, non-water soluble, two-ply comprising a printed vinyl substrate and polypropylene protective laminate.

3. All plant room valves and every circuit control valve shall be provided with a brass, ivorine or approved plastics label 75 x 50 mm and 1.6 mm thick, stamped or engraved with a number cross referenced to the Operating and Maintenance Manual and As-Installed Drawings.

4. All plant items shall be provided with securely fixed brass labels engraved to clearly show a reference number (relating to Operation and Maintenance Manuals and As-Installed Drawings), capacity, output, makers name, serial number, electrical details and any other relevant information.

M1.2.06 Controls & Instrumentation

A. Extent of Work

1. The extent of controls and instrumentation shall include all electrical, electronic or pneumatic actuators and sensing devices, motor starting equipment, control panels and control wiring and tubing serving items of Plant.

2. The installation of the controls shall be carried out by a control specialist, who shall also commission the system, provide record drawings and manuals, and guarantee the system.

B. General Requirements

The following requirements shall be met:

a. Basic adjustments for original setting, such as slope of characteristic, sensitivity, etc shall be concealed within a lockable panel. Remaining controls shall be accessible but tamper-proof.

b. All time switches shall have easy to operate over-ride facility, and shall have self winding spring reserve of not less than 30 hours.

c. All instructions and other writing shall be in English.

d. All control valves, dampers and the like shall have position indicators clearly marked 'open' and 'shut'.

e. All hot water systems shall include high temperature protection to prevent water temperatures rising above pre-set limits.

f. All tempered air supply systems shall have low limit protection to prevent freezing of heater batteries or discharge of cold air.

g. All control valves and dampers shall fail safe.

h. The frequency of starts for all items of Plant shall be automatically limited to that recommended by the Plant supplier.

i. The sequence of start-up of items of plant shall be automatically controlled to avoid excessive electrical load at any time.

C. Control Panels

1. As far as is practicable all controls, indicator lamps and instruments elsewhere described shall be grouped and mounted together in a floor or wall-mounted panel. Oil burner and boiler automatic control units may be mounted upon or near the Plant to be controlled where this is the manufacturer's standard practice. The panel itself and all items on the outside face shall be identified by means of attached white laminated plastic labels engraved with black cyphers.

2. A drawing of the layout of the control panel shall be submitted for approval before manufacture. A neat and orderly arrangement is required. Plant shall not be fixed to panels removable for maintenance and not, as far as is practicable, to opening doors.

3. The control panel shall, as far as practicable, be manufactured, equipped, wired and tested before delivery to Site.

4. The manufacturer of the control panel shall commission the completed controls installation on Site.

5. Panels shall be totally enclosed and internally wired with no live terminals or components exposed. Complete access to the interior of panels shall be provided by means of lockable hinged doors or covers at the front and/or back as necessary. A front or side-mounted integral and interlocking isolating switch shall be provided, with ON/OFF indication, amperage rating shown, and an internal earth connection. Panels of above 60 A capacity shall contain a fully insulated DP busbar with copper cable or solid copper and clamp connections. Where a panel contains both pneumatic and electric Plant they shall be contained in separate sections with doors to each section.

6. Control panels shall be constructed in accordance with the following:

a. Construction

Panels shall be constructed of folded mild steel sheet of minimum thickness 2.5 mm, or of mild steel angle frame which supports sheets of mild steel of minimum thickness 1.25 mm, or of an approved proprietary system of construction. No sharp edges or corners will be allowed, and all exposed screws, bolts or other fixings shall have rounded heads with protective and decorative plating. Panels shall be adequately stiffened and reinforced as necessary to ensure rigidity. A metal plinth shall be provided with provision for bolting down the cubicle. Lifting eyes shall be provided for convenience of handling.

Doors shall have gaskets for dust protection and be fitted with matt chrome plated lockable handle and catch. Hinges and front of panel screws shall be rustproofed and plated.

Ventilation openings shall be covered with galvanised mesh and vermin proof.

Panels shall be finished externally with a semi-gloss stoved or cellulose enamel finish of an approved BS colour. All surfaces shall be properly prepared before final finishing and the external appearance shall be of a high standard.

b. Internal Wiring, and the like

All indicating lamps, instruments and controls shall be, as far as is practicable, of the same manufacturer and style to provide uniformity of appearance and to facilitate maintenance. Externally visible equipment shall be flush mounted, with minimum projection and fixed securely to the front panels or other members. Internal equipment shall be secured to purpose-made rails or mounting bars. All fixings shall incorporate shake-proof washers or other vibration resistant fastenings.

Circuit protection shall be by means of SP circuit breakers where circuit protection does not exceed 60 A. Where a circuit exceeds 60 A protection shall be with HRC fuses.

Indicator lamps shall be 8 V, 2.4 W MES clear and shall be supplied from a 6 V output transformer complying with BS 3535. Glasses of not less than 25 mm diameter shall be fitted. Where indicator lamps are not immediately adjacent to their associated switches they shall be clearly labelled.

Internal wiring shall be coded and in general shall be neatly bunched and run on trays or in purpose-made slotted non-combustible cable trunking. Positive fixing of cable ends shall be ensured by purpose-made clamps, or pinch-type terminals,

or by the use of crimped cable tags or other approved termination devices. All cable ends shall be permanently identified.

Wiring shall be not less than 240 V insulated and shall be rated in accordance with the IEE Regulations but with a minimum of 10 A.

Grouped terminal blocks of adequate capacity with pressure bar contacts and permanent labels shall be provided for all wires leading to equipment outside the panel. Removable covers or other facility shall be provided for the entry of incoming cables, conduits, trunking, and the like, with means for effective earthing to the panel chassis.

If main power terminals are incorporated within the control panel, soldered socket type terminals shall be provided.

Fuses shall be grouped and mounted so as to be readily accessible without danger. Fuses, terminal blocks and all items of equipment shall be readily identified by means of clearly visible labels secured to them by screws or by other approved methods.

c. Cable Entry

Removable plates shall be provided at the top or elsewhere as specified for entry of cables or pneumatic tubes. Non-ferrous plates shall be used for copper tubing or MICC cables.

All entries shall be sealed to prevent ingress of dirt or moisture.

D. Instrumentation

1. All instruments, gauges and devices that have indicating scales shall be mounted such that they are accessible and can be easily read without the need for portable or temporary means of access.

2. Scale ranges shall be appropriate within the extremes that will be indicated when the plant is running and at rest. The design maximum operating condition shall be indicated at not less than 75% of the total scale length. Pressure gauges and dial thermometers shall be accurate to 1% of total scale reading.

E. System Static Pressure Gauges

1. System static pressure gauges shall be provided for all fan systems (not including cooling towers and evaporative or air cooled condensers) where the main fan power exceeds 3.75 kW. The gauges shall be single limb inclined manometer type. Two gauges shall be provided for each fan and arranged to indicate system static pressure on the suction and delivery side.

2. The gauges shall be connected into the system at points in the plant room where the static pressures are steady and, on completion of commissioning, the suction and delivery static pressures indicated by the gauges shall be indelibly marked adjacent to them to serve as system reference points.

F. Pressure Gauges

1. Pressure gauges shall have dials not less than 100 mm diameter and the cases shall be of polished brass or chromium plated mild steel or of approved enamelled metal or of plastic. Pressure gauges shall be fitted with lever handle cocks and, where appropriate, siphon pipes.

2. The gauges shall be graduated in kPa and the scale ranges shall not exceed 1.5 times the maximum design working pressure.

3. Where gauges are provided in association with pumps, an adjustable red pointer shall mark the static head with the system normally full and the pumps at rest.

G. Self Sealing Test Points

Plugs shall be fitted with captive caps for sealing them when not in use and the plugs shall have internal self-sealing devices. The plugs and probes shall be of materials suitable for the application.

M1.2.07 Thermal Insulation

A. General

1. Thermal insulation shall be as scheduled and shall comply with the requirements of BS 5422 and BS 5970.
2. Insulation materials and finishes shall be inherently proof against rotting, mould and fungal growth and attack by vermin, be non-hygroscopic and in all respects be suitable for continuous use throughout the range of operating temperatures and within the environment indicated.
3. All thermal insulating materials used within any building shall, when tested in accordance with BS 476: Part 4, be classified non-combustible. Alternatively, all thermal insulation materials used within any building shall be non-combustible with a facing of combustible material providing the facing is not more than 0.8 mm thick and it has a Class 1 Surface Spread of Flame when tested in accordance with BS 476: Part 7. Thermal insulating materials used within any building shall be free from substances which, in the event of a fire, would generate appreciable quantities of smoke, noxious or toxic fumes. Evidence of fire classification, obtained from an approved testing laboratory, shall be provided in order to certify that materials comply with this clause.
4. Insulation materials and their finishes shall be free from asbestos. Where any work is carried out on existing insulation material or finish which contains asbestos in any form the provisions of the Asbestos Regulations 1969 must be adhered to.
5. Thermal insulation shall be applied to air distribution ductwork and to components within distribution systems such as fans, heater and cooler casings which convey conditioned air within plant rooms and to ductwork (including recirculation air ductwork) conveying warmed or chilled air through unconditioned spaces or the open air. Distribution systems conveying conditioned, warmed or chilled air through conditioned spaces shall not be insulated. Distribution systems conveying fresh air and exhaust air shall be insulated.
6. Thermal insulation shall be applied to chilled water, hot water, steam, condensate, and domestic hot and cold water pipework distribution systems and to components within distribution systems such as boilers, valves and storage vessels. Condenser water pipework, cold water pipework and cold water vessels shall be provided with means of frost protection. Type and thicknesses of insulation shall be as scheduled.

B. Insulating Materials

1. Mineral Fibre Insulation

Mineral fibre shall consist of either glass or volcanic rock manufactured in accordance with BS 3958: Parts, 3, 4 and 5 as scheduled, free of shot and coarse fibres and used in the following forms:

a. Resin bonded slab having a density of about 50 kg/m^3 and a thermal conductivity not exceeding 0.036 W/m.K at a mean temperature of 50°C; with an impermeable Class 'O' facing continuously bonded to the insulant.

b. Resin bonded rigid pipe sections (unfaced) to BS 3958: Part 4 having a density of about 80 kg/m3 and a thermal conductivity not exceeding 0.037 W/m.K at a mean temperature of 50°C.

c. As (ii) above but with an impermeable Class 'O' facing securely bonded to the insulant and forming a hinge between the segments on one side and a longitudinal overlap on the other.

d. As (ii) above but with a woven glass cloth securely bonded to the insulant and forming a hinge between the segments on one side and a longitudinal overlap on the other.

e. Flexible duct insulation having a minimum density of about 16 kg/m^3 and a thermal conductivity not exceeding 0.042 W/m.K at a mean temperature of 25°C; with an impermeable Class 'O' facing continuously bonded to the insulant.

2. Flexible Foam Insulation

Flexible foam shall be of the Class 'O' flexible closed cell type in sheet or tubular form having a density of approximately 90 kg/m^3 and a thermal conductivity of 0.044 W/m.K at a mean temperature of 20°C.

C. Insulation Types & Finishes

1. Ductwork - Impermeable Class 'O' Finish

Insulation shall be fixed by adhesive and finished with Class '0' laminate securely bonded to the insulant. Joins shall be made with 50 mm laps or 100 mm wide Class 'O' adhesive tape.

Where the Class 'O' finish is site applied galvanised ties may be used, four being required per section.

2. Ductwork - Aluminium Finish

As Class 'O' finish but with the addition of 0.8 mm thick stucco embossed aluminium sheeting finish secured by 20 mm wide aluminium bands at 300 mm centres.

D. Painting

1. Ferrous sheet metal work not galvanised shall be cleaned to remove all grease and rust and have a protective coat of paint or other approved material applied before despatch from the works. Other ferrous materials shall receive a protective coating at works, or alternatively, be treated in accordance with the manufacturer's approved corrosion resisting metal finishing process. Any deterioration or damage to manufacturer's protective coating during storage and following installation shall be made good. Damaged areas shall be made good as if they were bare metal.
2. The surfaces of all ferrous metal work, including pipework, brackets, hangers, steelwork and the like, which are not protected by galvanising, works-applied primer or protective paint or insulation, shall be cleaned to remove all grease and rust and then given one coat of primer and finished with two coats of approved quality non-metallic paint. The surfaces of all ferrous pipework that is to be insulated shall be given one coat of primer and finished with one coat of approved quality paint. Where the surfaces will be subjected to temperatures above 100°C the finishing coat(s) shall be heat resisting paint and the primer omitted.
3. Those parts of the Works required to be left unpainted (e.g., brasswork) shall be so left.

M1.2.08 Public Health

A. Cold Water Storage Tank

Cold water storage tanks shall be moulded in one piece from top quality, polyester resin/glass fibre with loose lid. Deflection when full shall be less than 0.5 % of the side wall length.

The tank shall also be provided with the following:

- Screened air inlet.
- Float operated ballvalve.
- Hose-union draincock.
- Overflow pipe.
- Warning pipe.

M1.2.09 Testing and Commissioning

A. General

1. All systems shall be fully commissioned and tested in accordance with the requirements of this specification.
2. Works test certificates, where required, shall be provided in duplicate for approval.

3. A full record of all site tests shall be provided, in duplicate, for approval and further copies subsequently included in the O & M Manuals. The installation shall be demonstrated to confirm the installation is properly commissioned, operates in the correct manner and is capable of functioning satisfactorily to accomplish the design intention.
4. All certified instruments, equipment, labour and materials, electric power, fuel and water for all testing and commissioning shall be provided.
5. Notice, in writing, shall be given 48 hours prior to any portion of the Works being pressure tested.
6. In the event of any item of Plant or any section, or sections, of the Works not satisfying the prescribed tests, all faults shall be remedied and re-testing carried out until such items or sections are satisfactory and approved.
7. Details of all hydraulic tests and all tests on Plant or automatic controls made on site shall be recorded. No paint, insulation or non-conducting composition shall be applied to pipework or items of Plant until all testing and witnessing of tests has taken place.
8. All test details shall include the following particulars:
    a. Apparatus or pipework section under test.
    b. Makers Nr (where appropriate).
    c. Nature, duration and condition of tests.
    d. Result of tests.
    e. Date.
9. Where climatic conditions preclude the proper final adjustment of systems at the time, such adjustments shall be carried out during appropriate conditions within the Period of Maintenance. All testing and commissioning shall be carried out in accordance with the with British Chartered Institute of Building Services Engineers (CIBSE) Codes.

B. Cleanliness

1. All necessary precautions shall be taken to protect the system during the period of the Contract.
2. The entire system shall be flushed through (or gas services blown through) on completion of appropriate sections.
3. After flushing, heating and cooling water systems shall be chemically cleaned to prevent corrosion and scale formation.

4. After flushing hot, drinking and cold water services they shall be sterilised to the DHSS and Local Water Authority requirements.

5. After sterilising, samples from draw-off selected points shall be taken and tested for bacterial contamination by an independent laboratory. Test certificates shall then be provided.

C. Pipework Tests

1. Upon completion of each length of pipework the section of pipework shall be subjected to a pressure test and demonstrated and witnessed to ensure the section is sound and tight.

2. The whole of the testing gear required including all plugs, caps, tees and drain fittings shall be provided.

3. The tests shall be applied by filling the sections to be tested with air or water as appropriate and raising their pressure to a figure equal to twice the working head or 3.5 bars (gauge), whichever is the greater, after making safe all items of equipment that may be damaged by such tests.

4. The section shall then be left without further pressurisation and all joints must remain tight for a period of at least two hours.

5. All necessary precautions against freezing shall be taken and the pipework sections emptied down after testing except those for which a Certificate of partial Completion in respect of the Works has been issued and for which responsibility has been accepted by the Employer.

6. Any pipework or plant damaged by frost or damage caused to the building structure by flooding during the contract period shall be reinstated as new.

7. All drainage pipework shall be blanked off at the point at which it discharges into the main drains and shall be filled with water and hydraulically raised to not less than 345 mbar and checked for leaks over a two hour period.

8. Soil pipes and vents shall be plugged and tested to an air pressure of 5 mbar. This pressure shall be maintained and witnessed for a 15 minute period.

9. All gas service pipelines shall be tested to an air pressure of 30 mbar or in the case of high pressure gases to twice the working pressure maintained for a period of 24 hours.

D. Vibration Testing

All plant and equipment provided shall be free from excessive vibration. Any minor vibration that may occur shall not be

transmitted from the plant or equipment into or through the supporting or enclosing structure.

E. Performance Tests

1. It shall be demonstrated that the Works is adjusted and regulated correctly to fulfil the functions for which it has been designed, e.g., room temperatures to be maintained, air change, water temperature and outflow of water from taps, and the like. Adjustments shall be made to balance and regulate the systems as necessary until the required conditions are attained.
2. Room temperatures shall be measured by mercury-in-glass thermometers located 1.5 m above floor level at points away from the influence of draughts, adjacent heaters or direct radiation from hot or cold surfaces.
3. No demonstration of room temperatures shall be carried out when the weather conditions are abnormal as to wind or rain or at times when the external air temperature is changing at a rate exceeding 2°C per hour.
4. The CONTRACTOR shall provide all instruments, equipment and labour required for the conduct of these demonstrations together with up-to-date calibration certificates for the instruments used in the tests.
5. Not less than 7 days notice shall be given prior to the performance tests being carried out.

F. Testing of Sanitary Appliances

All necessary tests and demonstrations to indicate conclusively that the outflow from taps at sinks and wash-hand basins is acceptable without excessive splashing,. Where splashing occurs restrictors shall be fitted to the tap inlets.

G. Testing of Sanitary Installations

All sections of the pipework systems shall be securely fixed and free from obstruction and debris and all traps filled with clean water before any tests are carried out.

The completed sanitary systems shall be tested for water tightness using the following methods:

a. Soundness test (air test)

Smoke tests shall not be used for leak detection.

b. Water tests

To be applied as recommended in BS 5572.

The completed sanitary systems shall be tested for the following performance criteria:

a. Self-siphonage and induced siphonage in branch discharge pipes.

b. Induced siphonage and back-pressure in discharge stacks.

All testing shall be carried in accordance with the methods detailed in BS 5572.

H. Automatic Controls and Instrument Testing

1. All automatic controls and instruments shall be tested and commissioned by the manufacturer's representative in order to demonstrate that they are capable of meeting the demands specified and they shall be adjusted to suit the characteristics of the building and the system.

2. All valves, switches, controls and the like shall be regulated and capable of proper adjustment to conform with the design conditions.

3. A signed certificate from the control or instrument manufacturer's representative.

4. Confirming that the systems for control of the Plant are operating to their satisfaction shall be provided.

I. Ductwork

1. Air systems shall be commissioned n accordance with British Chartered Institute of Building Services Engineers (CIBSE) Commissioning Code A and tested in accordance with HVCA specifications DW 142, DW 143 and DW 151 as appropriate.

2. All test holes shall be sealed with removable plugs on completion of testing.

J. Plant Dperation

1. The plant shall be operated for a period of one week using any skilled personnel necessary to ensure its safe and satisfactory operation for this period. During this period of plant operation, instruction shall be provided to all members of the employer's staff.

2. Who will be responsible for the future day to day operation of the plant, equipment and automatic controls.

K. Post-Commissioning Checks

Upon completion of the testing and commissioning, the system shall be checked to ensure that all valves, dampers and automatic controls and the like are correctly set for normal operation.

Chapter W10 – Water Tube Wells

W10.0 General

W10.0.1 Equipment and Plants

W10.0.1.1 Drilling Rig Type

Straight circulation rotary is the preferred drilling method through the Sand and Clay beds. To reduce the time for aquifer development and to have highly efficient production bores it is important to minimise the exposure of aquifer to any drilling mud fluid. The Bidder should indicate the method of construction and types of mud, if any, that will be used.

Any of the drilling rig should be verified by third party/PMU, SID, GOS to install a 300mm ND hole to the depth required (300m) and have sufficient rods to reach this depth. Bidders are welcome to suggest modifications for use of drilling rig types, based on their experience elsewhere.

PMU, SID, GOS have reserve the rights to verify all rigs and equipments required for drilling for operation. Bidder who has less than 3 owned Rigs would not be qualified.

W10.0.1.2 Drilling Fluids (Muds)

Drilling of holes which are to be converted into Tubewells can be drilled using bentonite, however the quality of the bentonite should be checked to confirm it is high yield, high gel pure bentonite. Bentonite that does not meet specification should be rejected. Poor quality bentonite contains other clays which break down quickly in saline water, do not aid in maintaining viscosity and add weight to the fluid and do not allow formation of a filter cake. With a lack of filter cake the fluid can penetrate the formation and clog it. Water usage should be monitored to gauge fluid loss.

W10.0.1.3 Drilling Equipment

Drill string - A range of bit sizes should be available, starting from 150mm up to 450mm. A range of bit types and styles should be available for drilling clay, silt, sand, gravel and weathered bed rock. Starter rods and stabilisers are to be used to help maintain adequate rod weight to start the hole and maintain hole plumb (verticality).

Mud pumps - The mud pump(s) should be capable of drilling up to a depth of 300m.

Mud Pits - Digging and preparation of mud pits will be sole responsibility of the Bidder.

Gravel packing - Gravel should be of uniform size meeting the desired specification. It is envisaged that one size of gravel will be sufficient for all gravel packing and should be 3mm to 6mm with <5% passing 3mm sieve and >90% passing 6mm sieve or as suited as per lithology. Gravel should be able to be added in one continuous stream and may be added via tremi pipe.

Development tools – The Bidder should have on site a compressor capable of lifting a head of around 300m of water and delivering sufficient air to keep water moving to lift water from the bore at the rate the bore makes water. The minimum requirement would be 100 PSI 500 cfm.

W10.0.2 Electrical Resistivity Survey

Each designated location should be verified by ERS survey (minimum 3 probes per location) and reports containing all important parameters should be included in way that drilling of investigation hole should not failed to produce minimum 100,000 US GPD.

W10.0.2.1 Design, preparation of all Electrical Resistivity Survey of location designate by PMU, SID, GOS.

Lithological column and relevant logs and drawings and water quality and quality parameters should be submitted for obtaining PMU, SID, GOS approvals,

W10.0.2.2 Location of Bore Holes

Location of boreholes shall be established in the field as directed by the PMU, SID, GOS Representative.

W10.0.3 Investigation Hole

W10.0.3.1 The boreholes shall be drilled by rotary method straight and plumbs so that the pump and Tubewell casing subsequently installed are concentric with the hole and within the tolerance for plumpness of the casing. Waste material (water & cuttings) from drilling operation shall be disposed off at the place designated by the PMU, SID, GOS in the approved manner.

W10.0.3.2 The Bidder shall keep an accurate drilling log of each borehole, including drilling progress and materials encountered.

W10.0.3.3 Representative soil samples or cuttings of the material penetrated shall be taken at 1 meter interval and change in lithology encountered. Immediately upon obtaining soil sample, the same shall be placed in an approved container, in order of depth, properly marked for identification and labeled with depth of the top and bottom of the section of the borehole represented. Selected samples may be sent to lab for sieve analysis.

W10.0.3.4 For determining the quantity and quality of ground water in the investigation boreholes the suitable compressor for airlifting. Each naked drilled hole is tested by compressor to determine the quantity of water. The compressor should be operated minimum 6 hours. The results along with logs should be submitted to PMU, SID, GOS representative for approvals.

W10.0.3.5 Air shall be pumped under pressure till the water is clear, sand free and discharge is constant.

W10.0.3.6 Geophysical logging should be carried out in order to confirm exact aquifer location and designing of wells. Probes SP and SPR, Magnetic probes, Dual Density and Gamma Gamma far and near probes in uncased and cased hole should be used for logging and recommending the design of Tubewell.

W10.0.3.7 Standard Production Bore Design

The components of design are:

- 200mm ND test hole, reaming to 450 mm ND;

  use of 200mm nominal diameter (ND) PVC or Fibre Glass screen and Casing of appropriate pressure rating and salinity tolerance as desired.
- centralisers;
- filter pack;
- bentonite plug in annulus above filter pack; 20 meters
- surface completion –cemented plinth, pad lock. If artesian (flowing) pressure encountered, a rubber gasket between surface casing and top cap to seal in pressure is required. Alternative artesian control can be suggested.
- Usually 10m precollar will be required having +350 mm ND.

Bidder will ensure that each hole has a number which will be clearly marked on the cemented plinth.

W10.0.4 Reaming of Investigation Hole

Every Hole should be drilled by 200 mm diameter for investigation purpose and after verifying the quantity should be enlarged by 300 mm to 450 mm diameter as per design approved.

W10.0.4.1 Drilling investigation hole and reaming of specified diameter upto the specified depth.

W10.0.4.2 Pilot holes are to be of diameter of 200 mm (8") for geophysical logging. Samples are to be collected for logging every 2m. The Bidder is responsible for logging penetration Rates and mud pressures for assessing formation compaction.

W10.0.4.3 The drilling Bidder is expected to have the required equipment on site, know how to properly use the equipment and understand when to change equipment, and how to maintain mud condition to keep the hole stable and maintain acceptable penetration. The reports will be clear concise and will clearly document all drilling, construction and development related activities, including consumables used (water cartage, muds, casing, etc).

W10.0.4.4 The Rates per metre for drilling are to cover all the work involved in drilling, including water carting, mud mixing, hammer and bit maintenance, cleaning and conditioning, and all operating costs such as accommodation and messing, communications, corporate overheads, and other hire equipment.

W10.0.4.5 No additional payments will be made for slower penetration, Rates resulting from the nature of the strata, high hydrostatic head, lost circulation, excessive water and caving formation.

W10.0.5 Installation

The Rates shall cover all costs associated with the installation of the items detailed in accordance with the Tender Documents, including the uplifting and cartage from

storage areas (such as from filter pack heap piles), installation of bore casings, centralisers, end caps and screens, running and pulling of temporary casing, and supply, delivery and construction of the borehead completion.

The rate for installation of the permanent casing and the running and pulling of any temporary casing which may be required by the drilling conditions shall not include the installation / running of casing into bores declared lost or in which the casing cannot be set into position due to misalignment or other operational problems.

Rates for bore head completion shall cover all costs associated with the fabrication, supply, transport, construction and installation of all materials.

W10.0.5.1 Blind Pipe/Strainer

The depth of the well casing will be established by the PMU, SID, GOS Representative . PVC Class-E / Stainless Steel / Fibre Glass blind pipes and strainer 200 mm diameter will be extended in the borehole as directed by the PMU, SID, GOS Representative . Necessary adjustments in the setting depth of blind pipes and strainer may have to be made as per actual Lithological conditions encountered at each well point.

- **Strainer:** The strainer shall be PVC Class 'E' (approved make) / Stainless Steel / Fibre Glass suitable for gravel pack Tubewells. The strainers shall have minimum open area of 6 percent, with standard length and slot size of about 1.0 mm. The actual slot size will be decided after drilling of borehole & sieve analysis of soil samples. The openings shall be free from jagged edges, irregularities or anything that will accelerate or contribute to clogging of the screen. **Bidder should must specify the name of manufacturer for Casing supplies. Details specification must be submitted alongwith the bid.**
- The strainers shall be installed in water yielding formations and blind pipe section in non-water yielding formations as directed by the PMU, SID, GOS Representative.
- Installation: The Bidder shall install the entire pump housing and Tubewell casing assembly straight, plumb and concentric in the drilled hole to permit the installation of the pump so that it can be handled satisfactorily.

W10.0.5.2 Filter Gravel And Grouting

The coarse sand / gravel (shrouding) shall be clean, washed, water worn, calcium free, hard well rounded and without thin and flat particles. The gravel (approved make) supplied shall be subject to inspection and screening in the field to ensure proper gradation suitable for the formation.

Gravel shall be placed at constant rate using tremie pipe hoppers or other similar devices or pouring through gravitational flow to provide a continuous and uniform gravel flow so as to minimize segregation of particle sizes. When tremie pipe or hoppers are used, gravel shall be introduced in the annular space between the pump-housing and the edge of the hole at two points located 180° apart. The tremie pipe, when used, shall be of suitable size and lowered to the bottom of the well on two opposite sides of the borehole and a calculated quantity of gravel shall be poured in the pipe through a funnel and the pipe shall be raised by 1.5m intervals. In all the cases water shall be circulated

steadily during gravel placement by inserting the drilling rod into pump-housing and operating the circulation pump on the drilling rig. The water level in the annular space outside the pump-housing shall be maintained at or above natural ground surface level by return flow from the cutting pit.

Temporary casing, if used, shall be carefully withdrawn in 1.5 to 3.0 metres interval during placement of gravel shrouding and the gravel shall be introduced so that each stage of the hole above bottom of the casing is completely filled before the casing is withdrawn to next stage.

The annular space between the borehole and the blind pipe shall be filled with cement sand grout (1:2) in the upper portion (~10 m) and with sand in the lower portions in non-yielding formations.

W10.0.5.3 CASING HANDLING AND STORAGE

It will be the Supplier's entire responsibility to ensure that all necessary precautions are taken during transportation to avoid damage to any of the equipment.

W10.0.6 Development

Development should be a continuous and ongoing system using a combination of techniques in succession. This should continue until discharge is clear of sand / silt and in clarity and no further gains in yield can be made. No silt / sand should be made during over pumping or surging. At the completion of development the hole should be clean to the full depth of the hole. Bidder should specify anticipated time for development works, based on equipment to be supplied for such works.

Development and Testing (D&T) shall consist of all work required in connection with the development of each Tubewell to produce the design capacity of sand free water with a minimum drawdown, and the testing of each Tubewell to determine the effectiveness of the development operations as specified herein or as directed by the PMU, SID, GOS Representative . Development and testing shall include, but not limited to surging backwashing, and testing the Tubewell for specific capacity, sand content and degree of development; and sterilization and sealing each Tubewell.

The development procedures and methods used for the development of the Tubewells shall be established by the Bidder subject to approval by the PMU, SID, GOS Representative. The development operations shall be witnessed by the PMU, SID, GOS Representative from their initiation to their completion. The Bidder shall maintain a complete record of the development operations and shall make regular periodic measurements of discharge rates, sand content and water level measurement.

W10.0.6.1 By Compressor Air.

The details are given below:

Initial Development with Compressor by Pumping & Surging

The initial development of the Tubewell shall be performed with compressed air by using a compressor, capable of developing a maximum pressure necessary for complete development operation at specified

discharge rates for each section of the screen by pumping and surging. Development with air compressor shall be carried out for at least four (4) hours or more till the water is clear and discharge is uniform.

After the development of the entire length, the well shall be sounded. If any material has accumulated at the bottom, it shall be removed.

Testing

The Bidder shall test each Tubewell under the PMU, SID, GOS Representative 's direction as described herein. Upon completion of the development operations the Tubewell shall be permitted to recover for minimum period of one hour.

W10.0.6.2 By Submersible Pump

Following the recovery period, the Tubewell shall be pumped at the sustainable discharge, determined during development for a period of 24 hour.

Tubewell, including pump capable of delivering required discharge at all stages of the tests, a valve for fine adjustment of the discharge, an electric measuring device to determine the drawdown during each stage of the test.

W10.0.6.3 Testing Procedure

The Bidder shall take drawdown and discharge measurements of long pumping test and make computer model for pumping results and with actual and projected data.

W10.0.6.4 Installation and Commissioning of Pump

Installation and commissioning of Pumping set including electrical panel etc. shall carried out as per recommendations of the manufacturer.

All Tubewells after washing should be pump tested for 24 hours and recovery recording upto 24 hours. Data should be recorded in intervals of one hour and every 5 minutes in 1st hour of pumping and recovery. However, a detail procedure is required or approval by PMU, SID, GOS .

W10.0.6.5 Disinfection and Sanitary Sealing

The holes should be sealed 1st 10 meters by MS casing (approved make) +350 mm pipes in order to infiltration of highly contaminated water. The purpose of construction of Tubewell is to give raw water to RO plants contamination free. In order to remove BOD Disinfection is required after the washing of Tubewell by the compressor and before pumping.

W10.0.6.6 Chemical Analysis

After pumping test samples should be drawn in cool box and tested for RO parameters including BOD and COD and 20 chemicals or more analyses of chemicals is mandatory or as directed by the PMU, SID, GOS Representative.

W10.0.7 Others

W10.0.7.1 Operational Hours

Drilling and aquifer testing will operate 24 hours/day, 7 days a week.

W10.0.7.2 Experience of Personnel

The Bidder will nominate site personnel. The groundwater drillers must have significant experience in operation of the nominated drilling rig in groundwater exploration and development.

W10.0.7.3 Site Establishment

A lump sum is allowed in the Schedule for one mobilisation. This is to cover the cost of establishment on site of the Bidder's plant, equipment, buildings, personnel and supervision and shall include the cost of services the Bidder may require during construction. If the drilling rig and associated equipment is to be on-site for other purposes, mobilisation should only reflect the additional costs of bring in the additional groundwater related items.

This sum will be paid upon mobilisation of all itemised equipment and personnel, and subject to their satisfactory performance.

W10.0.7.4 Disestablishment

A lump sum is allowed in the Schedule to cover the cost of removal from the site of the Bidder's plant, equipment and buildings, and shall include the cost of services the Bidder may require during cleaning up. If the drilling rig and associated equipment is to remain on-site for other purposes, then the disestablishment should only relate to items to be removed from site that relate to the groundwater study.

The sum shall also include the cost of clearing and restoration of all areas used for construction purposes, including stockpile areas and any areas disturbed by construction. This lump sum will not be paid until the completion of making good all areas used by the Bidder to the satisfaction of the Superintendent.

Appropriate insurance cover as protection for this equipment will be supplied by the Bidder.

Mud pit digging and filling will be the sole responsibility of the Bidder.

The Bidder shall provide with his Tender a detailed itemised breakdown of the lump sums provided for Establishment and Disestablishment.

W10.0.7.5 Moving Bore Site

A lump sum is allowed to cover the movement of rig, crew and all ancillary equipment from one bore site to the next.

W10.0.7.6 Supply and Delivery of Materials and Drilling Consumables

The Rates shall cover all costs associated with the manufacture, factory testing, transport, delivery to site, unloading and storage on-site of materials for construction of the bores, including bore casing, end caps, screens, cement, bentonite, gravel pack,

protective surface casing and drilling consumables, all in accordance with the Tender Documents. All construction material should be used of approved make or company which has track record supplies of Tubewell material.

Payment will be made only for materials which have been permanently installed in the constructed works, withdrawn under the instruction of the PMU, SID, GOS representative and for drilling consumables used during drilling.

No additional payment will be made for any materials because of unavailability, inferior quality, delays in delivery or because of omission in calculating the tendered rate.

W10.0.7.7 Data, Records and Final Report

The Bidder shall keep accurate record of drilling history indicating, lithologic log of each borehole including description of all materials encountered and their location in the borehole.

The fact that PMU, SID, GOS Representative or his representative may be present and keeping a separate record shall not relieve the Bidder from his responsibility. All records and data shall be kept by the Bidder on forms approved by the PMU, SID, GOS Representative. The Bidder shall deliver to the PMU, SID, GOS Representative the original of all records and all such records shall become the property of the PMU, SID, GOS .

Computer Modelling of each pump test should be submitted in accordance with international practice.

Final report should be submitted according to the deliverables mentioned in this section and must have photographs showing activities of each Tubewell. Each Tubewell coordinates must be presented in the report and should be marked on the toposheet 1:50,000.

W10.0.7.8 Time Rates

No time rates are applicable

W10.0.7.9 Geophysical Borehole Logging

The Bidder is to supply the geophysical logging equipment for the test holes. This includes the supply of Probes SP and SPR, Magnetic probes, Dual Density and Gamma Gamma far and near probes in uncased and cased hole. The cost to apply here is the cost of executing, reporting of Geo physical logging all data should be submitted in LAS format. In case PMU, SID, GOS extend is own equipment for Geo Physical logging the cost of geo physical logging will be deducted on per hole basis.

W10.0.7.10 Technical Provision

- The final depth of hole will depend on the geological condition encountered.
- Mobilization and demobilization of all plant, equipment, tools etc transportation of casing.
- Mobilization and Hole to Hole shifting for each site and each location is responsibility of Driller.

- Installation of Sanitary Seal where required and Disinfection to control BOD and COD. The methodology for that should be submitted, A detail procedure is required or approval by PMU, SID, GOS
- Drilling investigation hole and reaming of specified diameter borehole upto the specified depth.
- Providing, lowering and centering of strainer, blind pipe and bail plug in the borehole.
- Providing and placing of silica coarse sand / gravel pack (shrouding) around strainer.
- Development of well.
- Long Pumping and recovery test of Tubewell.
- Computer Modeling
- Geophysical Logging and Geological logging
- Disinfection and Sanitary Sealing
- Designing and Reporting
- It is the responsibility of the Bidder to keep the samples in the proper continuer.
- Hole location(s) may change as per suitability of Drilling activities, any inaccessible or non-drillable location may be shifted to new accessible location as per mutual agreement.
- Bidder should ensure that Tubewell must be sustain for 15 years and should produce more than 50000 USGPD.

W10.0.7.11 Measurement and Payment

Measurements:

Measurements of various items of works shown in the Bill of Quantities will be made on the basis of unit measurement against each item quoted in the Bill of Quantities of acceptably completed work.

Payment:

Payment will be made for the acceptably measured quantity on the basis of unit rate quoted in Bill of Quantities and shall constitute full compensation for all works related to the item or acceptable mutual agreement for advances.

W10.1 Pump Installation

W10.1.1 Submersible Pumps

A submersible pump is a turbine pump close-coupled to a submersible electric motor. Both pump and motor are suspended in the water, thereby eliminating the long drive shaft and bearing retainers required for a deep well turbine pump. Because the pump is located above the motor, water enters the pump through a screen located between the pump and motor.

The submersible pump selected should be enclosed impellers because the shaft from the electric motor expands when it becomes hot and pushes up on the impellers.

Submersible motors are smaller in diameter and much longer than ordinary motors. Because of their smaller diameter. Submersible motors are generally referred to as wet motors must be water filled. The maximum diameter allowed is six inches for pumps and motor

If there is restricted or inadequate circulation of water past the motor, it may overheat and burn out. Therefore, the length of riser pipe must be sufficient to keep the bowl assembly and motor completely submerged at all times. In addition, the well casing must be large enough to allow water to easily flow past the motor.

Three phase electrical power motor are required to install, electrcial wiring from the pump to the surface must be watertight and all connections sealed. The electrical line should be attached to the column pipe every 10 feet to prevent it from wrapping around the column pipe. Voltage at the motor leads must be within plus or minus 10 percent of the motor nameplate voltage. If there is a 5 percent voltage drop in the submersible pump cable, voltage at the surface must not be less than 95 percent of rated voltage. Because the pump is located in the well, lightning protection should be wired into the control box. Lightning hits on wells with submersible pumps is a leading cause of pump failures.

European origin manufacturers make submersible booster pumps are allowed. All pumps should have Motor Control Unit with all approved safety devices including water levels.

W10.1.2 Riser Pipes

Stainless Steel 316L or equivalent Riser pipe and Plastic lined and Fibre Glass Coated which was tested and used in Tubewell (approved Riser pipe) except MS/GI riser pipes. The diameter of riser pipes should not be less then 3 inches. Each riser pipe should be in 10 ft length. Bidder has to maintain significant water level above the pumping unit. Top bend and bottom nipple are allowed only in Stainless Steel material. Clamps were made of MS and Electrical cable 3 core minimum 16 mm flat submersible cable. Gaskets are made of with good rubber and nut bolts are made of SS 304. Water probes for water level detection with wire would also be installed.

The Riser pipes should be clamped on Bore Plate specifically designed to cover bore with the opening of riser pipes in Stainless material.

W10.1.3 Discharge

Any discharge below the approved quantity of 100,000 USGPD (approved after 72 hours Long Pumping Test) is not allowed, Bidder has to change the pump or motor or both or other at its own cost and arrangement. The Pump should be install in approved manner by capable staff.

CHAPTER W9 – WASTE RESIDUALS

W9.0 GENERAL

Provisions must be made for proper disposal of water treatment plant waste such as sanitary, laboratory, clarification sludge, softening sludge, iron sludge, filter backwash water, and brines. All waste discharges are governed by regulatory agency requirements. The requirements outlined herein must, therefore, be considered minimum requirements as state water pollution control authorities may have more stringent requirements. In locating waste disposal facilities, due consideration must be given to preventing potential contamination of the water supply. Alternative methods of water treatment and chemical use should be considered as a means of reducing waste volumes and the associated handling and disposal problems. Appropriate backflow prevention must be provided on waste discharge piping as needed to protect the public water supply.

W9.1 SANITARY WASTE

The sanitary waste from water treatment plants, pumping stations, and other waterworks installations must receive treatment. Waste from these facilities must be discharged directly to a sanitary sewer system, when available and feasible, or to an adequate on-site waste treatment facility.

W9.2 BRINE WASTE

Waste from ion exchange plants, demineralization plants, or other plants that produce a brine, may be disposed of by controlled discharge to a stream if adequate dilution is available. Surface water quality requirements will control the rate of discharge. Except when discharging to large waterways, a holding tank of sufficient size must be provided to allow the brine to be discharged over a twenty-four hour period. Where discharging to a sanitary sewer, a holding tank may be required to prevent the overloading of the sewer and/or interference with the waste treatment process. The effect of brine discharge to sewage lagoons may depend on the rate of evaporation from the lagoons.

Brine from desalination plants should not be directly discharged into municipal sanitary sewer.

W9.3 PRECIPITATIVE SOFTENING SLUDGE

Sludge from plants using precipitative softening varies in quantity and in chemical characteristics depending on the softening process and the chemical characteristics of the water being softened. Recent studies show that the quantity of sludge produced is much larger than indicated by stoichiometric calculations. Methods of treatment and disposal are as follows:

a. Lagoons

   1. Temporary storage lagoons which must be cleaned periodically must be designed on the basis of 0.7 acres per million gallons per day per 100 milligrams per liter of hardness removed based on usable lagoon depth of five feet. This should provide about 2 1/2 years storage. At least two but preferably more lagoons must be provided in order to give flexibility in operation. An acceptable means of final sludge disposal must be provided. Provisions must be made for convenient cleaning.

2. Permanent lagoons must have a volume of at least four times the volume of temporary lagoons.
3. The design of both temporary lagoons and permanent lagoons must provide for:
    i. location free from flooding,
    ii. dikes, deflecting gutters or other means of diverting surface water must be provided so that it does not flow into the lagoons,
    iii. a minimum usable depth of five feet,
    iv. adequate freeboard of at least two feet,
    v. adjustable decanting device,
    vi. effluent sampling point,
    vii. adequate safety provisions,
    viii. parallel operation, and
    ix. subsurface infiltration may be acceptable if approved by ENGINEER.

b. The application of liquid lime sludge to farm land can be considered as a method of ultimate disposal. Approval from the ENGINEER must be obtained. When this method is selected, the following provisions must be made:
    i. Transport of sludge by vehicle or pipeline must incorporate a plan or design, which prevents spillage or leakage during transport.
    ii. Interim storage areas at the application site must be kept to a minimum and facilities must be provided to prevent wash-off of sludge or flooding.
    iii. Sludge must not be applied at times when wash-off of sludge from the land could be expected.
    iv. Sludge must not be applied to sloping land where wash-off could be expected unless provisions are made, for suitable land, to immediately incorporate the sludge into the soil.
    v. Trace metals loading must be limited to prevent significant increases in trace metals in the food chain, phytotoxicity or water pollution.
    vi. Each area of land to receive lime sludge must be considered individually and a determination made as to the amount of sludge needed to raise soil pH to the optimum for the crop to be grown.

c. Discharge of lime sludge into sanitary sewers should be avoided since it may cause both liquid volume and sludge volume problems at the sewage treatment plant. This method must only be used when the sewerage system has the capability to adequately handle the lime sludge, and the

applicant has obtained written approval from the owner of the sewerage system before final designs are made.

d. Mixing of lime sludge with activated sludge waste may be considered as a means of co-disposal.

e. Disposal at the landfill can be done as either a solid or liquid if the landfill can accept such waste, depending on individual state requirements.

f. Mechanical dewatering of sludge may be considered. Pilot studies on a particular plant waste are required.

g. Calcination of sludge may be considered. Pilot studies on a particular plant waste are required.

h. Lime sludge drying beds are not recommended.

W9.4 ALUM SLUDGE

Lagoons may be used as a method of handling alum sludge. Lagoon size can be calculated using total chemicals used plus a factor for turbidity. Mechanical concentration may be considered. A pilot plant study is required before the design of a mechanical dewatering installation. Freezing changes the nature of alum sludge so that it can be used for fill. Acid treatment of sludge for alum recovery may be a possible alternative. Alum sludge can be discharged to a sanitary sewer.

W9.4.1 Lagoons

Lagoons must be designed to produce an effluent satisfactory to the ENGINEER and must provide for:

a. location free from flooding,

b. dikes, deflecting gutters or other means of diverting surface water must be provided so that it does not flow into the lagoon,

c. a minimum usable depth of five feet,

d. adequate freeboard of at least two feet,

e. adjustable decanting device,

f. effluent sampling point,

g. adequate safety provisions, and

h. a minimum of two cells each with appropriate inlet/outlet structures to facilitate independent filling/dewatering operations.

W9.4.2 Mechanical Dewatering

a. The successful use of mechanical dewatering depends on the characteristics of the alum sludge produced, as determined by site specific studies.

b. Mechanical dewatering must be preceded by sludge concentration and chemical pre-treatment.

W9.4.3 Land Application

Alum sludge may be disposed of by land application either alone, or in combination with other wastes where an agronomic value has been determined and disposal has been approved by the ENGINEER.

W9.5 "RED WATER" WASTE

Waste filter wash water from iron and manganese removal plants can be disposed of as follows:

W9.5.1 Sand filters

Sand filters must have the following features:

a. Total filter area, regardless of the volume of water to be handled, must be no less than 100 square feet. Unless the filter is small enough to be cleaned and returned to service in one day, two or more cells are required.

b. The "red water" filter must have sufficient capacity to contain, above the level of the sand, the entire volume of wash water produced by washing all of the production filters in the plant, unless the production filters are washed on a rotating schedule and the flow through the production filters is regulated by true rate of flow controllers. Then sufficient volume must be provided to properly dispose of the wash water involved.

c. Sufficient filter surface area must be provided so that, during any one filtration cycle, no more than two feet of backwash water will accumulate over the sand surface.

d. The filter may not be subject to flooding by surface runoff or flood waters. Finished grade elevation must be established to facilitate maintenance, cleaning and removal of surface sand as required. Flash boards or other non-watertight devices may not be used in the construction of filter side walls.

e. The filter media must consist of a minimum of twelve inches of sand, three to four inches of supporting small gravel or torpedo sand, and nine inches of gravel in graded layers. All sand and gravel must be washed to remove fines.

f. Filter sand must have an effective size of 0.3 to 0.5 mm and a uniformity coefficient not to exceed 3.5.

g. The filter must have an adequate under-drainage collection system to permit satisfactory discharge of filtrate.

h. Provision must be made for the sampling of the filter effluent.

i. Overflow devices from "red water" filters are not permitted.

j. Where freezing is a problem, provisions must be made for covering the filters during the winter months.

k. "Red water" filters must comply with the common wall provisions contained in Sections 7.1.3 and 8.10.1, which pertain to the possibility of contaminating treated water with an unsafe water.

l. The ENGINEER must be contacted for approval of any arrangement where a separate structure is not provided.

W9.5.2 Lagoons

Lagoons must have the following features:

a. be designed with volume 10 times the total quantity of wash water discharged during any 24-hour period,

b. a minimum usable depth of three feet,

c. length four times width, and the width at least three times the depth, as measured at the operating water level,

d. outlet to be at the end opposite the inlet,

e. a weir overflow device at the outlet end with weir length equal to or greater than depth,

f. velocity to be dissipated at the inlet end, and

g. subsurface infiltration lagoons may be acceptable if approved by the ENGINEER.

W9.5.3 Discharge to community sanitary sewer

Red water can be discharged to a community sewer. However, approval of this method will depend on obtaining approval from the owner of the sewerage system as well as the ENGINEER before final designs are made. A holding tank must be provided to prevent overloading the sewers. Design must prevent cross connections and there must be no common walls between potable and non-potable water.

W9.5.4 Recycling "Red Water" Wastes

Recycling of supernatant or filtrate from "red water" waste treatment facilities to the head end of an iron removal plant are not allowed except as approved by the ENGINEER.

W9.6 WASTE FILTER WASH WATER

Waste filter wash water from surface water treatment or lime softening plants must have suspended solids reduced to a level acceptable to the ENGINEER before being discharged. Many plants have constructed holding tanks and returned this water to the inlet end of the plant. The holding tank must be sized to contain the anticipated volume of waste wash water produced by the plant when operating at design capacity. A plant that has two filters must have a holding tank that will contain the total waste wash water from both filters calculated by using a 15-minute wash at 20 gallons per minute per square foot. In plants with more filters, the size of the holding tank will depend on the anticipated hours of operation. It is recommended that waste filter wash water be returned at a rate of less than 10 percent of the raw water entering the plant. Filter backwash water must not be recycled when the raw water contains excessive algae, when finished water taste and odor problems are encountered, or when trihalomethane levels in the distribution system exceed allowable levels.

W9.7 RADIOACTIVE MATERIALS

Radioactive materials include, but are not limited to, GAC used for radon removal; ion exchange regeneration waste from radium removal; and manganese greensand backwash solids from manganese removal systems, precipitive softening sludges, and reverse osmosis concentrates where radiological constituents are present. The

TECHNICAL SPECIFICATIONS

CIVIL WORKS

EXCAVATION, TRENCHING AND BACKFILLING

1. SCOPE

The work covered by this section of the specifications consists of furnishing all plant, labour, equipment, appliances and materials and performing all operations in connection with excavation, trenching and back-filling for sewer and water supply lines and all other structures including all incidental works necessary for excavation to the required depth and dimensions in accordance with the applicable drawings, or as directed by the Engineer. The work shall be carried out in complete conformity with the specifications, set-forth hereunder.

2. SETTING OUT

Lines and levels will be set out by the Contractor who shall be responsible for maintaining all stakes and witness points set-up by the Engineer for the execution of work in strict accordance with them.

3. CLEARING AND GRUBBING

The sites of all excavations shall be cleared of all shrubs, plants, bushes, large roots, rubbish and other objectionable materials. All such materials shall be removed from site of work or otherwise disposed off at no extra cost in a manner satisfactory to the Engineer. All trees and shrubbery that are designated by the Engineer to remain shall be adequately protected and preserved in an approved manner.

4. EXCAVATION

4.1 General

The contractor shall remove the whole of the vegetation, top soil, concrete, flagging, paving, curbing, road metalling and other materials from the site of any excavation and shall keep separately and preserve the same for re-use where applicable. The ground shall be excavated for the permanent and temporary works to the required depths, width and levels so that the dimensions of the permanent work shall not be less than as shown on the Drawings, or as may be directed.

All rubbish, filth and matter of an offensive nature taken out of any excavation shall be disposed off at once and not left on the surface within the site.

4.2 Earth Excavation for Sewers

Unless otherwise directed or permitted by the Engineer not more than 500 ft of any trench in advance of the end of the pipeline already laid shall be opened at any time. Trenches shall be excavated to the dimensions and depths shown on the drawings or ordered by the Engineer or in such a position or to such dimensions and depths as shall allow for the proper construction of the relevant structure or construction or proper excavation of the relevant operation. For excavation the width of trench allowable for payment shall be the external diameter of pipes plus 12 inches on both sides, for pipes up to 15 inches diameter. For diameters exceeding 15 inches, the width of trenches shall be external diameter plus 18 inches on both sides. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches. The Contractor shall make allowance for the additional excavation required for

making joints and, where necessary, for concrete bedding or surround in the price tendered for trench excavation. These shall not be separately measured or paid.

The banks of the pipe trench shall be as nearly vertical as practicable. Bell holes and depressions for joints shall be dug after the trench bottom has been prepared. The pipe, except for joints, shall rest on the prepared bottom for its full length. Bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joints stones shall be removed to avoid point bearing. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe as determined by the Engineer is encountered in the bottom of the trench, such material shall be removed to the depth required and the trench backfilled to the proper grade with coarse sand, or other suitable approved granular material. Such replacement of unsuitable material will be paid for at the contract unit price for that item of work as shall be agreed upon, before execution of this work, with the Employer.

Where the Contractor has excavated to depths in excess of the requirements, from his neglect or from causes within his control, he shall refill and compact the excess excavation with suitable material approved by the Engineer, up to corrected level, at his own expense.

Excavation for appurtenances shall be sufficient to leave at least 12 inches but not more than 24 inches between the outer surface and the embankment or timber that may be used to hold and protect the banks. Any over-depth excavation below such appurtenances that has' not been directed by the Engineer, will be considered un-authorized and shall be refilled with compacted sand, gravel or concrete, as directed by the Engineer and at no additional cost to the Employer.

4.3 Earth Excavation for Water Supply Lines

For excavation the width of trench allowable for payment shall be the external diameter of pipes plus 18" for pipes up to 12" diameter. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches. The Contractor shall make allowance for the additional excavation required for making joints and, where necessary, for concrete bedding or surround in the price tendered for trench excavation. These shall not be separately measured or paid.

4.4 Excavations For Trenches / Drains

The Contractor shall excavate trenches / drains in straight lines between the tangent points of bends or changes of cross section and in smooth curves to the radius shown on the drawings or ordered by the Engineer. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches.

The side slopes and beds of trenches / drains shall be constructed and neatly trimmed equal to the best practicable finish. The area of the finished excavation at any cross-section shall not be less than that shown on the Drawings or ordered by the Engineer for that cross-section. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches.

When rock has to be excavated, the lower surface of the trenches shall be made as level and true as possible in accordance with the plans, drawings and instructions of the Engineer.

If the surface at the bottom of a trench be of rock which is sloping it shall be made level by chiseling. If the slope is considerable and is in the direction of the longitudinal axis of the trench it shall be cut and divided into horizontal terraces at different levels. Filling-in with concrete of any pockets or other trifling inequalities which it might be difficult or expensive to level shall be done only after the pockets have been measured and the measurements signed by the contractor in token of his acceptance. In the even of any dispute regarding the volume of the pockets the decision of the Engineer will be final and binding on the contractor.

4.5 Excavations for Reservoirs / Tanks and Foundations

The Contractor shall excavate tanks/ reservoirs and foundations to the lines and levels shown in the Drawings. As for as is practicable excavation shall be carried out in uniform layers over the full areas. The excavation shall be kept clear of water at all times. Bulk excavation may be carried out by machine or other approved methods to within 6 inches of the final surface. The final 6 inches of excavation shall be carefully carried out by hand. Embankment slopes shall be trimmed to the side slopes shown in the Drawings. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches.

4.6 For Pipelines

a). The excavation shall be carried out to the required alignment, levels, slopes or gradients as per drawings or described in the specifications and bill of quantities taking into account bedding required below pipes or to such other dimensions and slopes as the Engineer may direct in writing to facilitate laying of pipes for sewerage network (both shallow and deep). The Contractor shall provide masonry pillars of suitable size and fix temporary benchmarks at intervals to be determined by the Engineer or his representative(s). No trench excavations shall be commenced without prior approval of the Engineer. Excavation shall proceed at the same rate as laying, jointing, testing and backfilling.

b). The quantity of excavation shall be the volume of materials removed from below the original surface of the ground to the limits of excavation specified or shown on the drawings. For soft and unstable soils, the Contractor shall provide all necessary site supports including timbering or sheet piling to support the sides of trenches. The cost of supply of all material, plant and labour that may be necessary for site clearance, excavation, over break, timbering, sheet piling, shoring, strutting, refilling, watering and ramming, etc., shall be included in the Contract Rates for excavation. In all cases, the quantity of excavation measured shall be the in- site volume of the undisturbed material with in allowable limits mentioned in the specification. In case sides or ends of any excavation collapse under self-weight or due to any other reason, the contractor shall at his own cost remove all disturbed material. Should sides or ends of any excavation give way, the contractor shall at his own cost remove all disturbed material. No additional payment due to side slopes of pipe trenches if carried out by Contractor shall be allowable.

c). Where the Contractor has excavated to depths in excess of the requirements, he shall refill and compact the excess excavation with 1:4:8 cement concrete upto the correct level at his own expense. Any excavation done in excess of specified width due to any reason, what so ever shall not be payable.

d). For excavation above ground water table, the width of the trench shall be equal to the external diameter of the pipe plus 18"dia. not exceeding 12" dia. For sewers of internal diameter exceeding 12" dia. The width of trench payable shall be equal to external diameter of pipe plus 30"dia. The depth shall be as per longitudinal section of sewers and shall include for sewer bedding, to give minimum 30"of the earth cushion over the pipe or to the depth of existing pipe where required to be connected.

e). For excavation below ground water table up to a depth of 10ft, the width of trench allowable for payment shall be the external diameter of pipes plus 24" for pipes up to 12" diameter. For diameters exceeding 12", the width of trenches shall be external diameter plus 3ft.

f). For excavation below ground water table and depths exceeding 10ft, the width of trench allowable for payment shall be the external diameter of pipe plus 3'-6".

g). Additional excavation will be necessary at all manholes, valve chambers and pipe joints to facilitate the making of joint. Additional excavation for construction of manholes, valve chambers and joint holes shall be of such dimensions, so as to give clear working space. The Contractor shall make allowance for the additional excavation required for the manholes and valve chambers in the price tendered for trench excavation. These shall not be separately measured or paid.

h). The length of the trench shall be measured along the centre line of the trench and the depth shall be measured vertically from original ground levels to the average bed level.

i). The maximum length of trench to be left open shall be the length between manholes or not more than 160ft of jointed pipe line, whichever is the lesser, and shall remain visible for the purpose of inspection and testing. In exceptional circumstances where the nature of the ground or locality renders it necessary to reduce this distance, the contractor shall inform the Engineer, immediately. In the case of pressure pipelines, partial backfilling shall be carried out before testing.

j). Where pipes are laid through rock or extra hard strata, the trench shall be excavated to depths below the barrel of the pipes specified in "Schedule for pipe bedding & surrounds". The space below the pipe barrel shall be refilled with specified granular bedding material.

4.7 Trial / Test Pits

The Contractor may be required to excavate trial pits and trial trenches upto about 10% of the total quantity of excavation specified in the contract at appropriate locations to determine the actual level of the existing water table, and position of existing conduits, water mains, gas mains, cable ducts and sewers etc. This excavation work shall be done carefully with due precaution, so as not to damage any existing services. The Contractor may be precluded from carrying out any permanent work until this information is obtained and may have to adopt his program in accordance with the information so obtained by the Contractor.

Trial test pits will be required to be dug before or during the execution of work at locations directed by the Engineer for determining the condition of soil, checking the location of utility services water levels etc. The size of individual trial pits may be kept 5ft x 5ft up to the required depth. The dimensions may be varied depending upon the site condition and as per instruction of the Engineer. The Contractor shall obtain prior permission from Engineer in writing before start of work on trial pits. No separate payment shall be made for trail pits required to be dug by the Contractor.

The cost incurred by the Contractor on the trial / test pits shall be deemed to be included by the Contractor in his rates for excavation.

4.8 Classification of Soils

Excavation shall include the removal of all materials in all kinds of soils or stratas of every name and nature. The sub- soil in the project area mostly comprises of clay with fine sand and silt and high sub-soil water level. A considerable amount of dewatering and supports for the sides of excavation will be essential including bore holes, well point system and side supports comprising of shuttering, bracing, strutting and sheet piling. However the Contractor shall make his own assessment after detailed study of the area and digging the required trial / test pits as required in this regard. No claim shall be allowed on account of any omission or error in such data trial / test pits.

If rock is encountered it shall be removed carefully and without excessive noise and vibration. Blasting shall not be allowable. The quantities of earthwork for each category of excavation i.e. soil, and rocks are provisional. The Engineer shall do the classification of soil during actual excavation. In case the Contractor meets rock during the excavation, the contractor shall request the Engineer in writing for a joint inspection for classification of soil. The Engineer shall visit the site during

excavation and give his opinion in writing about classification of soil for the particular site or alignment.

The excavation payable shall be limited to the dimensions and elevations as indicated on the drawings. Foundations on made up ground shall be taken down to nascent soil as per direction and approval of the Engineer. Excavation shall extend to a sufficient distance away from walls and footings to allow for placing and removal of forms, installation of services and for inspection. No payment shall be made for this extra excavation. The Contractor's rate for excavation shall be deemed to include for such extra excavation.

In the event of any excavation being carried out deeper than specified, the same shall be filled in by the Contractor at his own cost to the required level with lean concrete if beneath footing or with proper compacted local river sand if beneath slab.

4.9 Mechanical Diggers and Other Appliances

The Contractor shall not use mechanical excavation in gardens or plantation areas unless approval in writing has been obtained from Employer and tenants.

In addition to the above, if the Engineer shall reasonable consider it unsuitable that any excavator, mechanical digger or other machine or appliances employed, or proposed to be employed by the contractor should not be used or that any such machine or appliance as aforesaid is unsuitable for use on the works or on any part of the works, the Engineer may order the Contractor not to use and / or to immediately remove from the works such machine or appliance.

5. PRECAUTIONARY AND REMEDIAL MEASURES

5.1 Protection of Existing Facilities and Structures

The Contractor shall take every necessary precaution not to endanger the safety, occupation or operation of any property, structures, installations or services in the vicinity of his operations and shall observe any restrictions imposed by authority concerned / Engineer to this end. Should any such property, structures, installations or services be endangered or damaged as a result of the Contractor's operations, he shall immediately report any such danger or damage to the Engineer's Representative and any authority concerned and shall forthwith undertake remedial measures to the satisfaction of the Engineer or the appropriate authority.

5.2 Planking and Strutting

The Contractor shall provide, if required, at his own expense to the satisfaction of the Engineer all times support effectively the sides of the pipe trenches and other excavation by suitable timbering, sheet piling, sheeting, bracing, strutting etc. Where required the contractor shall use close timbering in all loose or sandy or unstable stratas both above or below ground level, if found necessary by the Engineer and accord approval. It is intend that all timbering and side supports for sewer trenches shall be removed as the work proceeds. The Contractor shall ensure that the removal of timbering and side supports is done gradually and carefully to avoid any damage to existing or new structures, roads, pavements or any other private or public property. All timbering, sheeting and their supports shall be of adequate strength and dimension and fully braced and strutted so that no collapse, subsidence or any damage to public or private property shall take place. The Contractor shall be solely responsible for the sufficiency of all timbering, sheet piling and their supports to be used and all damages to persons or property resulting from the improper quality, strength, placing, maintaining or removal of the same shall be payable by him under all circumstances.

In removing timbering, shoring and strutting and all other supports from excavation and trenches etc., special care shall be taken to avoid bringing pressure to beat on any concrete or other work until it has hardened sufficiently to resist such pressure.

5.3 Removal of Water

The Contractor shall build all drains and do ditching, pumping and all other work necessary to keep the excavation clear of sewage, storm water and water from any source during the progress of the work and until the finished work is safe from injury. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the Engineer and necessary precautions against flooding shall be taken. The contractor should submit the Methodology of dewatering for approval. It may also be noted that any approval of the methodology will not relieve the contractor from any of his responsibilities / obligations.

The Contractor shall be required to arrange well point equipment and / or adequate number of tube wells or both and pumping machinery for dewatering and lowering the existing water table for construction purposes in the areas where sub-soil water or any sewage and water from any other sources are encountered. The system shall be capable of working non-stop 24 hours a day for the entire duration of the work without break during excavation, and for laying of sewer, pipes and bedding, construction of manhole, construction of structures, testing of sewers/ pipes and backfilling. The system of dewatering proposed to be adopted shall be submitted by the contractor with sufficient details along with the tender for approval of the Engineer. The Contractor is required to visit the site before submitting his tender and investigate the available mean of disposal of pumped water including laying of temporary pipeline for transmission of water during the period of excavation providing bedding, laying & jointing of sewer, pipes and construction of any structure up to ground level. The cost of all such works required for pumping and disposal of water from trenches/ pits shall be considered to be included in the BOQ rates for excavation.

5.4 Maintenance of Excavation

All excavation shall be properly maintained with while they are opened land exposed. Sufficient suitable barricades, warning lights, flood lights, signs, and similar items shall be provided by the Contractor. The Contractor shall be responsible for any damage due to his negligence.

5.5 Surplus Materials

All surplus materials shall be disposed off at locations approved by the Engineer. The disposal of surplus material shall not interfere with other works and shall not damage or spoil other material. When it is necessary to haul earth or rock material over street or pavement, the Contractor shall prevent such materials from falling on the street or pavement.

5.6 Cutting Pavement

In cutting or breaking street surfacing, the Contractor shall not use equipment which will damage the adjacent pavement. Existing paved surface shall be cut back beyond the edge of trenches to form neat square cuts. The road ballast and other materials shall be placed on one side and shall be preserved for re-installment when the trench is filled. Wherever necessary or required for the convenience of the public or individual residents, at street crossings and at private driveways, the Contractor shall provide suitable temporary bridges over unfilled excavations. All such bridges shall be maintained in service until backfilling has been completed. The Contractor shall keep the road crossings manned 24 hours per day. During night time, enough red lights shall be provided to warn traffic. If detour is necessary, the Contractor shall make proper detour for the traffic and shall install signs 3 ft x 4 ft in size indicating the detour.

6. FILL, BACKFILLING AND RESTORING OF GROUND TO ORIGINAL CONDITION

6.1. Fill, where required to raise the sub-grade for concrete slabs, shall be clean, unadulterated local river sand and shall be free from wood, stones and other debris. Excavated material shall only be used for fill if approved by the Engineer or his representative.

All fill backfilling or earthwork in embankment shall be compacted by mechanical rammer, or other approved equipment in layers not more than 150 mm thick. Each layer shall be uniformly spread and fully compacted and shall have proper moisture content for the required degree of compaction which shall be done by mechanical tampers as approved by Engineer.

After completion and final approval of the work of sewers and other construction as shown on drawings and prior to backfilling, forms shall be removed carefully and excavation shall be cleaned of stones and debris. Backfill shall be brought to a suitable elevation above ground to provide for anticipated settlement and shrinkage thereof.

Backfill shall not be placed against walls etc., prior to the water proofing treatment if provided and approved by the Engineer. Backfill shall be brought up evenly on each side of walls as far as practicable. Heavy equipment for spreading and compacting backfill shall not be operated closer to the wall than distance equal to the height of the backfill above the top of base slab footing. No back filling shall be done before the new structure has been cured for atleast two weeks.

6.2. Backfilling and Restoring of Ground to Original Condition

The back filling of the trench shall be allowed after the sewer pipe has been laid and jointed over the specified bed, inspected, checked, tested and approved by the Engineer. Backfilling of the trenches shall be carried out by filling to depth up to half pipe level. The filling shall then be thoroughly rammed more filling shall be carried out and rammed again until the consolidated filling reaches pipe top level. Only selected, dry materials free from stones or debris shall be used for backfilling, which shall be spread and rammed evenly across the trench. Thereafter, the trench shall be filled in layers not exceeding 150 mm in depth, each layer being properly rammed before the next layer is placed so that 95-100% compaction is obtained as per AASHTO Standard.

On completion of backfilling, the Contractor shall level all grounds disturbed by him in the course of the work, spread topsoil where necessary as directed by the Engineer.

6.3. Backfilling for Structures

Backfilling operations for structures shall be performed as part of the Contractor's work under the payment items for earth excavation and at no cost to the Employer. It would comprise returning and filling the selected excavated material around foundations, and at back of walls etc., upto finished levels shown on the Drawings or as required in layers not exceeding 6 inches, carefully rammed and consolidated (With addition of water if required so as to achieve a minimum relative density of 85 or 90 as directed by the Engineer. No filling shall be made until the concrete foundations and footings etc., have been inspected and approved by the Engineer. Earth to be used for filling must be free of all the organic impurities, debris or any other foreign matter. Earth which contains more than 1% of salts particularly sulphates will not be used in filling.

6.4. Backfilling of Trenches

The trenches shall not be completely backfilled until all required pressure tests are performed and until the lines as installed conform to the requirements of specifications. Where in the opinion of the Engineer, damage is likely to result from withdrawing sheeting, shoring the same shall be left in place and cut off at a level 1 ft. below ground surface. Sheeting left in place shall be paid for at the approved rate for the item of Trenches shall be backfilled to the ground surface with selected excavated material or other material that is suitable for proper compaction. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted to the specified density. The surface shall be restored to its original or better condition. Pavement and base course disturbed by trenching operations shall be replaced.

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SPECIFICATIONS - SPECIAL PROVISIONS

1. DESCRIPTION OF PROJECT

1.1. General

The Employer intends to install, test, commission and maintain Solarized water filtration plants to be operated on solar power system with maintenance free life of 20-25 year for the project Drinking Water Hubs Phase-III

2. THE SITE

2.1. Site of Works

The Site of the Works is the area for construction lying within the right-of-way lines, boundaries and limits shown on the Drawings and any such additional areas adjacent thereto as may be designated by the Engineer subject to approval of Employer from time to time for the construction to be performed under the Contract, and all such areas and additional areas shall be comprised in the Site as defined in Clause 1 of the Conditions of Contract.

The Employer will give to the Contractor possession of the area designated and defined as the Site and shown on the drawing as may be required to implement as much of the Works, when the Engineer's Notice to Commence the Works is given.

3. THE WORKS UNDER THE CONTRACT

3.1. General Description

The Contract comprises the execution and completion of the Works, remedying of any defects therein, maintenance of utility services, and the provisions of all labour, materials, equipment, Solarized water filter plants and everything whether of a temporary or permanent nature required in and for such execution, completion, remedying and maintenance so far as the necessity for providing the same is specified or can reasonably be inferred from the Contract.

The following description of the Works to be performed under this Contract is general in nature and is not intended to describe all of the facilities to be provided under this Contract.

THE WORKS UNDER THIS CONTRACT AS DEFINED IN BIDDING DATA

4. GENERAL RULES OF SPECIFICATIONS

4.1 Specification or as Specified

Specification" or "as specified" refers to the specifications outlined in these Documents and where no specifications are available for any work or where the same are found not applicable then the relevant applicable ASTM or BSS specifications or equivalent standards shall apply in the same order.

Any item for which no specifications are outlined but which are identified on drawings, shall be completed according to the standards as per ASTM / BSS, these include items that may be added in the future. The Employer / Employer's Representative may supplement such specifications during the progress of work. All materials and processes used for these items shall be subjected to standard testing and, if found below the pertinent ASTM / BSS standards, shall be removed from the site immediately at Contractor's expense.

4.2 Standards and Codes

Wherever reference is made in the specifications to the respective standards and codes in accordance to which goods and materials are to be furnished, and work is to be performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly set forth in the Contract.

4.3 Materials and Processes

All goods and materials to be incorporated in the Works shall be new, unused, of the most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract.

4.4 Equivalent Materials, Processes, etc.

Where specific materials, processes, etc. are specified and the same are not available other alternative materials and processes which ensure an equal or higher quality than those specified will be accepted subject to the Employer / Employer's Representative's prior review and written approval. Differences between those specified and the proposed alternatives must be fully described in writing by the Contractor and submitted to the Employer / Employer's Representative at least 30 days prior to the date when the Contractor desires the Employer / Employer's Representative's approval who may give such approval after determining that the alternative proposed ensures equal or higher quality.

4.5 Approved, Directed, Instructed

Approved, directed, instructed means the approval, etc. of the Employer / Employer's Representative unless otherwise stated.

4.6 Alternatives

Where alternative materials, processes etc., are specified the selection will depend on local conditions and discretion rests with the Employer / Employer's Representative whose decision shall be final and binding.

4.7 Catalogues / Standards / Manufacturer's Instructions, etc.

Wherever the manufacturer's/supplier's instructions, manuals, guarantees and ASTM/BSS Standards are referred to in the specifications and details of Bills of Quantities; all such literature shall be submitted by the Contractor to the Employer / Employer's Representative for due checking, approval and record.

4.8 Applicability

Unless stated or specified else-where to the contrary these General Rules shall apply to all sections of work irrespective of their sequence, location and description.

5. DRAWINGS

5.1. Bid Drawings

Bid Drawings issued with the Bid Documents, called the Bid Drawings, show scope of the work to be performed by the Contractor. The Drawings are generally in sufficient detail so as to be used as a basis for construction, fabrication and for placing orders for materials subject to corrections based on the future issue of supplementary Drawings as provided under Sub-Clause 5.2 hereof.

5.2. Construction Drawings, Supplementary Drawings

After award of Contract, the Contractor shall carry out "Joint Survey" at Site of Works in pursuance to Sub-Clause 6.4, Specifications - Special Provisions. The Contractor shall submit to the Engineer "Joint Survey", duly signed, dated and stamped by the representatives of the Employer, Consultant and Contractor.

Simultaneously, the Contractor shall submit to the Engineer detailed "Work Programme" in terms of Sub-Clause 14.1 Conditions of Contract.

After receipt of "Joint Survey" and "Work Programme" from the Contractor, the Engineer will start issuing Construction Drawings to the Contractor. The Engineer shall have authority to issue to the Contractor, from time to time, such Supplementary Drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and completion of the Works and the remedying of any defects therein. The Contractor shall follow these Drawings.

The Contractor shall give notice to the Engineer regarding the part of the Drawings which in his opinion contain discrepancies or are not clear. The Engineer shall issue necessary clarifications or Supplementary Drawings in greater details as required to execute the Works. These Supplementary Drawings showing changes from the Bid Drawings, in the opinion of the Contractor, shall be reviewed by the Engineer for his determination of adjustment of the Contract Price under Clause 51 and 52 of the Conditions of Contract

5.3. Definition of Term Drawings

The term Drawings as used in the Specifications means the Drawings referred in Clauses 5.1 and 5.2 hereof.

5.4. Checking of Drawings

The Contractor shall check all Drawings carefully as soon as practicable after receipt thereof, and shall promptly notify the Engineer of any errors discovered.

5.5. Copies of Drawings

Drawings will be issued to the Contractor and the Employer as described below.

5.5.1. Bid Drawings

One (1) set each of the Bid Drawings will be issued to the Contractor and Employer along with Bid Documents. Additional sets will be provided at cost of reproduction upon written request of the Contractor.

5.5.2. Construction Drawings / Supplementary Drawings

One (1) print of each Construction Drawings / Supplementary Drawing will be issued to the Contractor and Employer free of charge. Additional sets will be provided at cost of reproduction upon written request of the Contractor.

5.6. Drawings to be furnished by the Contractor / As-Built Drawings

The Contractor shall submit to the Engineer for review of such drawings as required under the Contract, sufficiently in advance of the work intended to be executed.

The Contractor shall, at all times, keep on Site a separate set of prints on which all significant changes between the work shown on the Drawings and that which is actually constructed, shall be noted neatly, accurately and promptly as the work progresses. The Subcontractor(s) for plumbing, mechanical and electrical shall, at all times, keep on Site, a separate set of prints of the drawings (showing their parts of the Works) on which all significant changes between the work shown on the Drawings and that which is actually constructed, shall be noted neatly, accurately and promptly as the work progresses. Such drawings shall show the exact physical location and configuration of the works as actually installed.

The Contractor shall, within fourteen (14) days of issuance Taking-Over Certificate for whole of the Works, furnish to the Engineer for his approval two (2) copies of such marked up drawings. One (1) copy of each of the marked up drawings approved by the Engineer shall be returned to the Contractor by the Engineer and these shall be used for the preparation of the As - Built Drawings.

The Contractor shall furnish to the Engineer six (6) complete sets of all As -Built Drawings as well as AutoCAD soft copy within thirty (30) days of receipt of drawings stated above, from the Engineer.

6. SETTING OUT OF WORK AND SURVEY

6.1. Reference Points, Lines

The Contractor shall establish bench marks and / or reference line at the Site in accordance with the instructions of the Engineer. The Contractor shall set out its work from these bench marks and / or lines.

6.2. Verification

The Engineer may make checks as the work progress to verify lines and grades established by the Contractor and to determine the conformance of the work as it progresses with the requirements of the Drawings and Specifications. Such checking by the Engineer shall not relieve the Contractor of his responsibility to perform all work in accordance with the Drawings and Specifications and the lines and grades given therein.

6.3. Survey Instruments

The Contractor shall maintain at the Site the requisite surveying instruments in perfect working conditions for the use of the Engineer's Representative to check levels and lines of the work at all times. These instruments shall include (but not limited to) One Total Station, Adequate nos. of Levels, theodolites, Tapes, etc.

6.4. No work without Joint Survey

The Contractor shall not start the excavation and / or embankment works until the Joint Survey has been done to establish the existing ground levels.

7. APPROVAL OF MATERIALS AND SOLARIZD WATER FILTRATION SYSTEM

7.1. Quality of Materials

All materials, fixtures, fittings, supplies and Solarized water filtration System furnished under the Contract shall be new and unused, standard first grade quality and of the best workmanship and design. No inferior or low-grade materials, supplies or articles will be either approved or accepted, and all work of assembly and construction shall be done in a first-class and workmanlike manner. In asking for prices for materials intended for delivery to the Site and incorporation in the Works under any portion of these Specifications, the Contractor shall provide the manufacturer or supplier with complete information as may be necessary to secure compliance to this Clause and, in every case, he shall quote this Clause in full to each such manufacturer or supplier.
All solar panels, inverters etc. shall be from renowned manufacturers of North American or Western European (EU) origin, manufactured in and shipped from the North American or Western European locations and the Contractor shall have to submit work/ procurement orders, manufacturing location and shipment details to establish the same.

The Contractor shall submit at least three names of independent laboratories of international repute for testing of the equipment in nearest international location for the approval of Employer/ Engineer. All the equipment ordered by the Contractor shall be shipped only after the testing, by the manufacturer and the independent third party inspection agency, has been completed.

The Employer will select the manufacturer of his choice and approval will be conveyed to the Engineer and Contractor.

7.2. Submission of Samples and Data

As soon as practicable after award of Contract, the Contractor shall submit for the approval of the Engineer drawings, catalogues, diagrams and other descriptive data for all mechanical, electrical, architectural and such other materials and Solar System designated by the Engineer, which the Contractor proposes for use under this Contract. For certain materials and Solar System, data may be required to be submitted in accordance with a detail form furnished by the Engineer. Samples of materials (2 sets) shall be submitted by the Contractor to the Engineer at Contractor's cost for approval sufficiently in advance of the materials intended to be incorporated in the Works.

7.3. Testing

The Contractor will ensure quality control testing as and when required.

The quality control testing shall be performed by the Contractor's competent personnel in accordance with a site testing as approved by the Engineer. The Contractor shall keep a complete record of all quality tests programme performed on Site.

7.4. Testing Laboratory Certificates

The Engineer may accept a certificate from a commercial testing laboratory, satisfactory to him, certifying that the product has been tested within a period acceptable to the Engineer and that it conforms to the requirements of these Specifications.

7.5. Inspection

All material and Solarized water filtration System furnished and all work performed under this Contract will be subject to inspection by the Engineer at all times and in all states of completion both off-Site and on-Site. The Contractor shall furnish promptly without additional charge, all facilities,

labour and materials reasonably needed for performing such inspection and testing as may be required by the Engineer.

7.6. Approved Sample at Site

The Contractor shall, at all times, keep on the Site approved samples. All such samples shall be made available to the Engineer/ Employer as and when required.

7.7. Site Laboratory

The Contractor shall establish a site laboratory for the purpose of necessary testing. The cost of equipment and salaries of the manpower required will be borne by the Contractor.

8. CONSTRUCTION SCHEDULE

8.1. Submittal Date

The program of Works submitted by the Contractor in accordance with Clause 12 "Program to be Submitted", of the Conditions of Contract shall be submitted in the form of a detailed schedule based on a computerized network analysis covering all construction activities indicating critical activities with critical path, resource scheduling for Contractor's Equipment, material and labour, within the period stated in the Appendix A to Bid. All the milestone shall be clearly identified.

8.2. Requirements

The detailed submittal shall consist of schedules, network analysis tabulations and narrative descriptions of the proposed construction program.

Each summary or detailed schedule shall consist of a bar chart and a time-scaled network. The scheduled start and finish times for all activities on the bar chart shall agree with those on the network. All inter-relationships and inter-dependencies between structures shall be clearly indicated on the schedules.

The network shall show the order and interdependence of activities planned by the Contractor, and shall be time-scaled according to calendar dates.

8.3. Monthly Reports

Each month, the Contractor shall submit a report consisting of:

- Copies of the bar charts for the current phase with both actual progress and scheduled progress shown.
- Network analysis tabulations as in Sub-Clause 8.3 above, reflecting actual start and finish dates where applicable.
- A narrative report discussing any significant deviations from the schedule and, if necessary, explaining the steps proposed to be taken to maintain the approved schedule.

9. NOT USED

10. SITE OFFICE AND TEMPORARY FACILITIES PROVIDED BY THE CONTRACTDR

10.1. Contractor's Office, Facilities etc.

The Contractor shall responsible to establish and maintain a Site office. The Contractor shall provide all facilities in connection with the execution, completion, of the Works, remedying defects therein and maintenance of the utilities services. The facilities shall, not be limited to, the Contractor's Site Office, labour camps, workyard and storage areas, temporary water supply, waste water disposal, temporary electricity, medical unit, temporary roads, fire protection and firefighting equipment etc. The Contractor shall be solely responsible for arranging the facilities.

The Contractor shall arrange his labour camp, work yard, storage area, site office within the area available at the Site.

10.2. Sign Board

The Contractor shall erect and maintain at the Site in a location to be approved by the Engineer, 3 Sign Boards 4.45M height and 2 M wide for writing the name of Work, name of Employer, name of Consultants, name of Contractor and Project Cost. The notice board shall comprise of the following;

- Frame of 3" dia GI Pipe properly painted as per the direction of the Consultants/ Engineer and as per drawing.
- 2 Nos. Posts of 3" dia GI Pipe 4.45M above ground and 1M below ground embedded in 1:2:4 CC 2'x2'x4' with proper arrangements of anchorage and brasses. Pipes painted with anti-rust as directed by the Engineer.
- 4 Nos. Steel Sheets 0.6M high and 2M wide fixed on both sides with 50mm gap between each. The background of plates is of white color whereas the writing would be black or red color (as approved by the Engineer)
- White imported 3M sheet used as background. The color of monogram would be, green, red or black etc. (as approved by the Engineer)
- Alphabets of appropriate size as approved by the Engineer in 3M reflective sheet in blue/ black color.

The Contractor shall maintain the display of the notice boards at his own cost throughout the length of the project.

11. FACILITIES FOR ENGINEER'S PERSONNEL PROVIDED BY THE CONTRACTOR

7.1. Engineer Facilities

a). The Contractor shall arrange fully air-conditioned office accommodation of the Engineer for a total area of around 30 Sq.M. on monthly rental basis (within Project/ District Headquarter sites) including all costs of Electricity, telephone, water supply, sewerage, janitorial services, provision of stationery/consumable/supplies (as per the requirement of the Engineer), 01 No. messenger, 01 No. tea boy (including tea making items) and 02 Nos. Security Guards etc. All appointments shall be made by the Engineer and Contractor shall be responsible for all salaries, benefits etc. of the appointed people.

b). 01 No. Desktop Dell or equivalent Computer each configured with latest generation intel Core i7 Processors, 8GB DDR-3 RAM, 1GB Dedicated Graphic Card, 32GB Solid Drive + 750GB SATA Hard Drive, 15.6" HD Screen, Camera, Biometric Reader, Bluetooth, Giga bit Ethernet LAN, Card Reader, WIFI 802.11b/g, touch & type alongwith genuine/ licensed Microsoft Windows 8 operating system and Microsoft Dffice Professional Edition latest version and 01 No. USB Flash Drive (16 GB each).

c). 08 Nos. Digital Camera (16 Mega Pixel) built-in GPS along with 4 GB Card, Rechargeable Cell (04 Nos.), Battery charger, Pouch, Tripod etc. NIKON Coolpix S800c or equivalent.

d). The Contractor shall provide an average cost of Rupees Twenty-Five thousand only (Rs. 25,000/-) per month pertaining to mobile telephone use in shape of Prepaid Mobile Cards.

In case of non-provision of above facilities, the same shall be arranged by the Employer / Engineer and be deducted from any monies due / becoming due to the Contractor by the Employer along with 10% overheads till these facilities are provided satisfactorily to the Engineer.

The Cost of all above facilities are deemed to be included in the contract price and no additional payment shall be made by the Engineer to the Contractor under any circumstances.

7.2. Furnishing and Maintaining Transportation Facilities for the Engineer / Engineer's Supervision Team

a). The Contractor shall cause to furnish, operate and maintain independent transportation facility to the Engineer by way One Toyoto Corolla and Two Nos. Suzuki Cultus VXRi Cars both comprehensively insured and with drivers for the exclusive use of the Engineer / Engineer's supervision team to meet their transportation needs. The use of such transportation facilities shall be exclusively under the control of the Engineer and the contractor shall be wholly responsible for furnishing at all times above said facilities. The said facility shall be provided within one week of Engineer's issue of commencement letter and shall continue un-interrupted till the completion of works. The said vehicles shall be handed-over back to the contractor on issue of completion certificate of the contract.

b). The Contractor shall furnish, supply and provide, without specific direction of the Engineer all lubricants, tyres, other supplies, regular service and maintenance at all times for the above vehicles till the issue of the Completion Certificate of the contract.

c). The Contractor shall provide an amount equivalent to 900 Litres (400 for Toyota corolla and 250 for each Suzuki Cultus) of Hi-Super Petrol / Diesel per month to the Engineer by 5th of each month in advance for complete duration of work including any extended period.

In case of non-provision of above facilities, the same shall be arranged by the Employer / Engineer and be deducted from any monies due / becoming due to the Contractor by the Employer along with 10% overheads till these facilities are provided satisfactorily to the Engineer.

Cost of all above facilities are deemed to be included in the Contract price and no additional / separate payment shall be made by the Employer to the Contractor under any circumstances.

12. SAFETY

12.1. Accident Prevention, Protective Equipment

The Contractor shall comply and enforce compliance by all his Subcontractors with the highest standards of safety and accident prevention in compliance with all applicable laws, ordinance and statutory provisions. 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.

If, safety precautions/ warning signs are not installed by the Contractor, Employer will charge an amount of Rs. 10,000/- per site per day for the period.

13. PAYMENT FOR WORK REQUIRED BY SPECIAL PROVISIONS

Unless otherwise specifically stated in the Contract, the price of all work required by the Special Provisions shall be considered to be included in the Contract Price.

14. The Bided Rates shall be inclusive of all lead and lift.

15. The Contractor's rates shall include all incidental charges in connection with the work such as the cost of removing trees, shrubs, grass, etc., which interfere with the execution of the work as well as the cost of Natural Ground Compaction (NGC) which will be carried out by the Contractor up to the satisfaction of the Engineer prior to the earthwork.

16. No alterations or additions shall be made by the Contractor in the Bill of Quantities and rates must be filled in ink or typed out both in figures and words clearly and legibly in the columns provided in the schedule of quantities. All corrections must be initialed by the contractors. Any Tender which does not comply with this condition will be liable to be summarily rejected and not taken into account when preparing comparative statement.

17. Materials obtained from excavations will be the property of the Employer. Serviceable materials are to be stacked in places pointed out by Engineer. The Contractor undertakes to have the site clean and free from rubbish to the satisfaction of the Engineer. All surplus materials, rubbish, etc., will be removed to places to be fixed by the Engineer and nothing extra will be paid for this.

18. On completion of the work or earlier as directed by the Engineer, the Contractor shall remove all temporary structure (Godowns, site offices, etc.), erected by him at the site of work. He shall fill tanks dug out by him at site, remove all debris and other materials like surplus sand, stone ballast, rubbish, etc.; and in short, shall leave the site in a neat and tidy condition.

19. The contractors in the course of their works should understand that all material (e.g., stone and other materials) obtained in the work or dismantling, excavation, etc., will be considered as Employer's property and issued to the contractors (if they require the same for their own use) at rates approved by the Engineer. If the materials are not required by them they will be disposed off in the interest of Employer.

20. The contractor shall inspect the site of works and acquaint himself with the nature and requirements of the work, facilities of access for materials, removal of rubbish, cost of carriage, nature of strata, etc., before submitting his Bid.

21. The contractor shall have to make temporary approach roads, etc., at his own cost to facilitate movement of materials, such approach roads shall be aligned in a manner approved by the Engineer.

22. The contractor shall have to make proper arrangements for road crossing barriers during working hours in the day time as well as in the night when danger lights will have to be provided on either ends at his own cost and no extra cost will be paid. Sufficient barricades and red lights will be provided by the Contractor where required to avoid the chances of accidents. In case an accident occurs for failure on the part of the contractor, he shall be entirely responsible for the consequences.

23. The Contractor shall have to make arrangements for diversions for traffic wherever necessary and shall have to provide diversion and caution boards as per directions of the Engineer at his own cost for which no extra cost will be paid. The diversion shall be watered and consolidated as per directions of the Engineer.

24. No material shall be removed from the site without the written permission of the Engineer.

25. Dewatering including shoring wherever so required for any foundation area, pumping, bailing out water, drainage of water within plot areas if any shall be deemed to have been included in the rates quoted by the bidders and no extra payment will be made.
The rates shall be deemed inclusive of such incidental charges.

26. The Contractors shall execute all works at their own cost for diversion of water away from the plot as per site requirements to have full satisfaction of Engineer and no additional payment will be made on this account.

27. The Engineer, subject to approval of the Employer, reserves the right to select all materials and the type, grade, heating capacity and quantity of proportion of any or all materials as required for a particular work. The decision of Employer in this respect shall be final and binding on the Contractor. The rejects on materials must be carted at his own cost. If the rejected materials are not removed within one month of its rejection the materials will become the property of the Employer or will be removed at Contractors cost.

28. ATTENDANCE OF MEETINGS

The Contractor shall attend and shall cause his Sub-Contractors to attend any or all meetings when called by the Employer or the Engineer or his Representative to discuss progress of the work and other matters related to the work and the Contract, without any compensation from the Employer.

(a). The Contractor shall bear all expenses of the Employer and his agents and representatives and the Engineer, his agents and representatives if requested by the Contractor for any meetings, instructions and approvals away from the Site.

(b). The proceedings of the meetings shall be recorded by the Engineer which shall be circulated to all the participants including those of the Contractor. All decisions taken in the meetings shall be binding on the Contractor and shall form part of the Contract.

29. DOCUMENTS NOT TO BE ALTERED OR MUTILATED

No alteration or mutilation (other than filling in all the blanks intended to be filled in) shall be made in the form of Bid or in any of the documents attached to it. Any comments which it is desired to make shall not be placed on any of the documents attached hereto, but shall take the form of a separate statement which shall be as brief as possible and referenced to items, clauses and pages of the annexed documents.

Such statements shall not qualify the acceptance of the Bid based upon a proposed change or changes in the annexed documents, nor shall be binding upon the Employer in any way in making the award. Alterations of already written prices must be signed in the place of alteration by the Bidder or his legally authorized representative.

30. PERSONAL LIABILITY OF PUBLIC OFFICIALS OR ENGINEER

In carrying out any of the provisions of these specifications, or in exercising any power of authority granted to them by or within the scope of the Contract, there shall be no liability upon the Employer or his authorized representatives or the Engineer or his authorized representatives their personally or in their official capacity, it being understood that in all matters they act solely as agents and representatives of the Employer.

31. ACCESS AND EXISTING ROADS

If the Contractor finds it necessary or elects to use existing roads, the Contractor shall make all necessary arrangements and obtain all permits from the relevant departments for travel over and use of such roads. The Contractor shall observe all rules regulations of the concerned department regarding the use of said roads. The cost of maintaining all necessary safety measures and temporary structures and making any necessary repairs, replacements or similar operations and all or any other costs required by reason of his use of such roads shall be borne by the Contractor and the Contractor shall save harmless and indemnify the Employer in respect of all claims, demands

proceedings, damages, costs, charges and expenses whatsoever arising out of or in relation to any such operation or interference.

32. FIRST AID FACILITIES

The Contractor shall provide and maintain adequate First Aid Facilities at all times, convenient to the Site to the approval of the Employer.

33. WITNESSING OF FACTORY ACCEPTANCE TESTS

The Contractor shall arrange at-least Two (2) pre-shipment visit(s) of manufacturing Solar System/ factory by at-least but not limited to Two (02) officers of Employer and Two (02) officers of Engineer per trip. These visits shall be scheduled as per the work schedule of the Contractor and the Contractor shall notify the timing of these visits in advance. The pre-shipment visits shall be made after the independent inspection by the approved third party inspection agency is completed in a satisfactory manner. The Contractor shall arrange for the visit of Laboratory selected by the Representatives of Employer and Engineer prior to its approval.

The Contract price shall be deemed to include all the expenses of the above arrangements with and including the arrangement of the relevant visas for designated officers of the Employer and the Engineer, their visa fees, Air Tickets (Business Class), boarding, lodging, local transport costs in independent vehicles aboard etc., as well as cost of testing and third party inspection.

34. HANDING OVER OF THE PROJECT/ START OF DEFECT LIABILITY PERIOD

On completion of the Warranty Period of 03 years, the Contractor shall hand-over the project in perfect working condition to the Employer or any agency designated by the Employer in writing.

Defect Liability Period shall start after the handing-over i.e. after 04 years (Installation of Street Lights = 01 Year and Warranty Period = 03 years).

35. FINAL HAND-OVER

At the end of the Defect Liability Period stipulated in the Contract, the Employer on application of the Contractor, shall decide the members of the Final Hand Over Committee and announce the same to the Contractor. The Committee, after inspection of Works, if satisfied that there are no deficiencies or defects due to Works of the Contractor shall certify the final hand-over, and then a final Certificate of Completion of Work within thirty (30) calendar days will be issued by the Employer.

36. EMPLOYER AND ENGINEER NOT PERSONALLY LIABLE

No member or officer of the Government or the Employer or the Employer's Representative or the Engineer or his representatives or any one of their respective staffs or their employees shall be in anyway personally bound or liable for the acts or obligations of the contractor under the contract or answerable for any default or omission in the observance or performance of any of the acts, matters or things which are herein, contained.

37. PROGRESS PHOTOGRAPHS

The contractor shall furnish to the Employer and to the Engineer every two weeks at least six photographs to clearly show the progress of construction. The photographs shall be submitted in glossy prints 20 cm x 20 cm. Each print shall be marked on the back with the date and serial number. There shall be no writing, lettering or marking on the face of the photographs. The set of photographs of the Engineer should accompany respective negatives.

38. SITE ORDER BOOK

a) Measurement

Concrete shall be measured as executed but no deduction shall be made for the following:-

- Volume of any steel embedded in the concrete
- Volume occupied by water pipes, conduits etc. not exceeding 25 sq.cm. each in cross sectional area.
- Voids not exceeding 0.10 Sq.M. in work given in Sq.M. If any void exceeds 0.10 Sq.M. total void shall be deducted.
- Void, which are not to be deducted as specified above, refer only to opening or vents which are wholly within the boundary of measured areas. Openings or vents which are at the boundary, measured areas shall always be subject to deductions irrespective of size.

Concrete work shall be classified and measured separately as listed under items of Bills of Quantities.

Measurement of acceptably completed works of plain and reinforced cement concrete will be made on the basis of concrete placed and compacted in position within the neat lines of the structure as shown on the drawings or as directed by the Engineer.

b) Payment

Payment will be made for the acceptable measured quantity of plain and reinforced cement concrete on the basis of unit rate quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the items.