

**MAINTENANCE / REPAIR TO FLAT NO.CB-09
APARTMENT TOWER BATHISLAND.**

**(Single Stage Single Envelop
Procedure)**



**KARACHI PORT TRUST
CIVIL WORKS DIVISION**

DAILY EXPRESS TRIBUNE

DATE :12-03-2026



KARACHI PORT TRUST

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TENDER NOTICE- Engineering Department

Tenders are invited through E-PADS by the Chief Engineer KPT, under PPRA Rule 36 (a) from Bidders registered with Government, Semi Government Department / Organizations or with any reputable client for the following work. The Intending Bidders may download the bidding documents and must submit their Bids online through E-PADS.

NAME & SCOPE OF WORK	DATE & TIME OF RECEIPT AND OPENING OF TENDER
MAINTENANCE/REPAIRS TO FLAT NO. CB-09 APARTMENT TOWER BATH ISLAND. The work mainly comprises of: <ul style="list-style-type: none">• Dismantling & Chiseling Tile / Marble• Providing & Fixing White/Colored Tiles.• Providing & Fixing Artificial Wood Kitchen Cabinets.• Providing & Fixing Plastic Coated.• Providing & Fixing Bathroom Accessories.• Coloring/Painting Works. <p>Bid Security amount Rs.95,000/- fixed (Refundable) & Tender Fee Rs. 5,000/- (Non Refundable) in form of Pay Order in the favour of Chief Accounts Officer KPT)</p>	31-03-2026 Receipt at 10:30 Hrs & Opening at 11:00 Hrs. Tender Fee Rs.5,000/- (Non Refundable)

The Mandatory requirement to be fulfill as mentioned below:

1. The intending Bidders must be registered with the Pakistan Engineering Council in Category C-6 and above with specialized code CE-10, valid on the date of opening of Tender.
2. The interested Bidders are requested to register to themselves on the E-PADS (<https://eprocure.gov.pk>) and submit their Bids on the same platform. The Prescribed Tender Fees amounting to Rs. 5,000/- (Non Refundable) and the Bid Security amounting to Rs. 95,000/- fixed (refundable) in Shape of Pay Orders, in favor of Chief Account Officer, KPT, alongwith an original hard copy of the Bids shall also submit in a sealed envelope at the time of Opening of Tenders.
 - a) Copy of latest Valid NTN, SRB Certificates
 - b) Copy of Online Tax verification (fresh copy of ATL)
 - c) Updated Company Profile for those participating first time in KPT.
 - d) Copy of Valid PEC Registration Certificate
 - e) Affidavit, that the firm is not defaulter in Income tax department nor blacklisted by any Organization over an E-stamp of Rs. 500/- in original.
 - f) a. The bidder must have a minimum annual turnover of at least 04 Million for last 03 years. In this regard, in case of companies and firms, The Bidder must submit Audited Financial Statements for the last 03 years, Prepared by the Recognized Auditor showing the company's ability to maintain profitability and sustain to complete large scale projects.

OR

- b. In case of individuals / sole proprietors, the bidder must submit last 3 years Tax returns filed/submitted with FBR. This ensures that the bidder has sufficient operational capability to handle a contract of this scale. The Bidder have to fulfill eligibility criteria as mentioned in the Bidding Documents.
 - g) The Bidder has to Submit Completed Bidding Documents duly Signed & Stamped on E-PADS and Hard Copy Format
3. Only the FBR & SRB Registered Bidders are eligible for bidding. Bidder has to quote their rates inclusive of all Govt. Taxes as applicable as per Standard Format.
 4. The Bid opening will take place on E-PADS in the Committee Room of the Civil Works / Engineering Department, at 2nd Floor, KPT Head Office Building, Karachi on given date & time.
 5. The KPT may reject all bids or proposals at any time prior to the acceptance of a Bid or Proposal. The KPT shall upon request communicate to any supplier or contractor who submitted a Bid or Proposal, the grounds for its rejection of all Bids or Proposals, but is not required to justify those grounds.
 6. The Bidder must read the instructions contained in Para 1-5 carefully especially the Para-2 in its true letter & Spirit.

CHIEF ENGINEER

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UAN 111-KPT-111 Ph: 99214318

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PID(K)2991/25

PART-A
BIDDING PROCEDURE & REQUIREMENTS

SECTION I: INVITATION FORBIDS

KARACHI PORT TRUST



BidNo.....

For

MAINTENANCE / REPAIR TO FLAT NO.CB-09 APARTMENT TOWER BATHISLAND.

Invitation For Bids

Date:

1. This Invitation for Bids follows the Procurement Notice (PN) or Procurement Advertisement (PA) No.PID K 201/25 of for the subject Project / Procurement which appeared in [Daily Business Recorder] vide dated [Daily Jung] and on EPADS.
2. The Procuring agency/Employer has reserved the funds for the procurement planned during the financial year 2025-2026. It is intended that part of the proceeds of the funds will be used to cover eligible payment under the contract for the Reconstruction of KPT Hut No. 16-N at Sandspit Manora Karachi.
3. The Karachi Port Trust now invites electronic bids from the eligible bidders for the reconstruction of Hut at Manora containing each aspect from the laying of foundation to erection of sub and super structure along with all the finishing works etc. as per latest techniques.
4. The bidding shall be conducted in line with the Single Stage Single Envelope procedure prescribed under Public Procurement Rules 2004, e-Pak Procurement Regulations, 2023 and any Regulations, Regulatory Guides, Procurement Guidelines or Instructions issued by the Authority (from time to time), and is open to all potential bidders registered in the EPADS.
4. All bids must be accompanied by a Bid Security in the shape of a pay Order in favour of the Chief Accounts Officer KPT in the amount of 1.5 Million Pak Rupees.
6. The electronic bids prepared in accordance with the instructions prescribed in the electronic bidding documents must be submitted through EPADS on or before 22-07-2025 at 1030 Hrs. Electronic bids will be opened by using EPADS on the same day at 1100 Hrs.

**CHIEF ENGINEER KARACHI
PORT TRUST**

2nd Floor KPT Head Office Building
Edujee Dinshaw Road Karachi
Ph: 021-

Table of Contents

A. INTRODUCTION	10
1. Scope of Bid.....	10
2. Source of Funds	10
3. Eligible Bidders	10
4. Eligible Material and Equipment	13
5. One Bid per Bidder	13
6. Cost of Bidding.....	14
B. BIDDING DOCUMENTS	14
7. Contents of Bidding Documents.....	14
8. Clarification of Bidding Document, Pre-bid Meeting	15
9. Amendment of Bidding Documents	16
C. PREPARATION OF BIDS	17
10. Language of Bid.....	17
11. Documents Establishing Eligibility of Material, Equipment and Works, their Conformity to Bidding Documents.....	17
12. Documents Establishing Eligibility and Qualification of the Bidder	18
13. Letter of Bid and Schedules	19
14. Letter of Bid.....	19
15. Bid Prices	19
16. Currencies of Bid and Payment	20
17. Documents Comprising the Technical Proposal.....	21
18. Bid Validity Period	21
19. Bid Security or Bid Securing Declaration	21
20. Alternative Bids by Bidders.....	23
21. Withdrawal of Bids.....	24
22. Format and Signing of Bid.....	24
D. SUBMISSION OF BIDS	25
23. Sealing and Marking of Bids	25
24. Deadline for Submission of Bids	26
25. Late Bids	26
26. Substitution and Modification of bids	26
E. OPENING AND EVALUATION OF BIDS.....	27
27. Opening of Bids	27
28. Confidentiality	29
29. Clarification of Bids.....	29
30. Preliminary Examination of Bids.....	30
31. Examination of Terms and Conditions; Technical Evaluation.....	32
32. Correction of Arithmetic Errors.....	33
33. Conversion to Single Currency.....	34
34. Evaluation of Bids.....	34
35. Domestic Preference	36
36. Determination of Most Advantageous Bid	36
37. Qualification of Bidder	36
38. Sub-Contractors	36
39. Abnormally Low Financial Bid	37

F. AWARD OF CONTRACT.....	39
40. Criteria of Award	39
41. Negotiations	39
42. Procuring agency/Employer’s Right to reject All Bids	39
43. Variations.....	40
44. Instructions for variations	40
45. Valuation of Variations.....	40
46. Notification of Award.....	41
47. Signing of Contract.....	41
48. Performance Security (or Guarantee)	42
49. Advance Payment	42
50. General Performance of the Bidders.....	43
51. Corrupt & Fraudulent Practices	43
F. GRIEVANCE REDRESSAL & COMPLAINT REVIEW MECHANISM.....	43
52. Constitution of Grievance Redressal	43
53. GRC Procedure	43
G. MECHANISM OF BLACKLISTING	45
54. Mechanism of Blacklisting	45
SECTION III: BID DATA SHEET Bid Data Sheet (BDS)	47
Section IV. Eligible Countries	53
SECTION V: WORKS REQUIREMENT, TECHNICAL SPECIFICATIONS, DRAWINGS, SUPPLEMENTARY INFORMATION AND BILL OF QUANTITIES	58
Scope of Works.....	59
Technical Specifications	Error! Bookmark not defined.
Drawings.....	Error! Bookmark not defined.
(Insert reference to the drawing of the Construction works to be carried out under this contract).....	Error! Bookmark not defined.
Supplementary Information	Error! Bookmark not defined.
Bill of Quantities.....	Error! Bookmark not defined.
Bill of Quantities	Error! Bookmark not defined.
SECTION VI: STANDARD BIDDING FORMS	66
Notification of Award.....	109
Performance Guarantee Form.....	112
Integrity Pact.....	116

SECTION II: INSTRUCTION TO BIDDERS (ITBs)

A.INTRODUCTION

1. Scope of Bid	1.1	The Procuring agency / Employer (PA), as indicated in the Bid Data Sheet (BDS) invites Bids for the execution of Works as specified in the BDS and SectionV- Works Requirements . The name, identification, and number of lots (contracts) of this National/International Competitive Bidding process are specified in the BDS.
2. Source of Funds	2.1	Source of funds as referred in Bid Data Sheet.
3. Eligible Bidders	3.1	A bidder may be natural person, company or firm or public or semi-public agency of Pakistan or any foreign country, or any combination of them with a formal existing agreement (on Judicial Papers) in the form of a joint venture or consortium. In the case of a joint venture or consortium, all members shall be jointly and severally liable for the execution of the Contract in accordance with the terms and conditions of the Contract. The joint venture or consortium shall nominate a Lead Member as nominated in the BDS, who shall have the authority to conduct all business for and on behalf of any and all the members of the joint venture or consortium during the Bidding process, and in case of award of contract, during the execution of contract. <i>(The limit on the number of members of JV or Consortium may be prescribed in BDS, in accordance with the guidelines issued by the PPRA).</i>
	3.2	The appointment of Lead Member in the joint venture or consortium shall be confirmed by submission of a valid Power of Attorney to the Procuring agency/Employer
	3.3	Verifiable copy of the agreement that forms a joint venture or consortium shall be required to be submitted as part of the Bid.
	3.4	Any bid submitted by the joint venture or consortium shall indicate the part of proposed contract to be performed by each party and each party shall be evaluated (or post qualified if required) with respect to its contribution only, and the responsibilities of each party shall not be substantially altered without prior written approval of the Procuring agency/Employer and in line with any instructions issued by the Authority.

	3.5	The invitation for bids is open to all prospective bidders subject to any provisions of incorporation or licensing by the respective national/ international incorporating agency or statutory body established for that particular trade or business.
	3.6 .	Foreign Bidders must be locally registered with the appropriate national incorporating body or the statutory body, before participating in the national/international competitive bidding with the exception of such procurements made by the foreign missions of Pakistan. For such purpose the bidder must have to initiate the registration process before the bid submission and the necessary evidence shall be submitted to the Procuring agency/Employer along with their bid, however, the final award will be subject to the complete registration process.
	3.7	<p>A Bidder shall not have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidders may be considered to have a conflict of interest with one or more parties in this Bidding process, if they:</p> <ul style="list-style-type: none"> a) are associated or have been associated in the past, directly or indirectly with a firm or any of its affiliates which have been engaged by the Procuring agency/Employer to provide consulting services for the preparation of design or technical specifications of the works that are the subject of the bid; or b) any of its affiliates has been hired (or is proposed to be hired) by the Procuring agency/Employer as Engineer for the Contract implementation; or c) The works to be executed are resulting from or directly related to consulting services for the preparation or implementation of the project that the bidder provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm; d) have controlling shareholders in common; or e) receive or have received any direct or indirect subsidy from any of them; or f) have the same legal representative for purposes of this Bid; or g) have a relationship with each other, directly or through common third parties, that puts them in a position to

		<p>have access to information about or influence on the bid of another bidder, or influence the decisions of the Procuring agency/Employer regarding this Bidding process; or</p> <p>h) Submit more than one bid in this bidding process.</p>
	3.8	<p>A Bidder may be ineligible if –</p> <p>(a) he is declared bankrupt or, in the case of company or firm, insolvent;</p> <p>(b) payments in favor of the bidder is suspended in accordance with the judgment of a court of law other than a judgment declaring bankruptcy and resulting (in accordance with the national laws) in the total or partial loss of the right to administer and dispose of its property;</p> <p>(c) legal proceedings are instituted against such bidder involving an order suspending payments and which may result, in accordance with the national laws, in a declaration of bankruptcy or in any other situation entailing the total or partial loss of the right to administer and dispose of the property;</p> <p>(d) the bidder is convicted, by a final judgment of a Court of Law or relevant Professional Statutory Body, of any offence involving professional conduct;</p> <p>(e) Thebidder is debarred/ blacklisted by a national level Procuring agency/Employerand hence debarred due to involvement in corrupt and fraudulent practices, or performance failure or due to breach of bid securing declaration.</p> <p>(f) The bidder is blacklisted or debarred bya foreign country, international organization, or other foreign institutions for the period defined by them.</p>
	3.9	<p>Bidders shall provide to the Procuring agency/Employer evidence of their eligibility, proof of compliance with the necessary legal requirements to carry out the contract effectively.</p>
	3.10	<p>Bidders shall provide such evidence of their continued eligibility to the satisfaction of the Procuring agency/Employer, as the Procuring agency/Employer shall reasonably request.</p>
	3.11	<p>Bidders shall submit proposal relating to the nature, conditions</p>

		and modalities of sub-contracting wherever the sub-contracting of any elements of the contract is envisaged.
4. Eligible Materialand Equipment	4.1	All the material and equipment to be mobilized under the contract shall have their origin in eligible source countries, and all expenditures made under the contract will be limited to such materials and equipment. For this purpose, ineligible countries are stated in the section-IV titled as “Eligible Countries”.
	4.2	For purposes of this Clause, “origin” means the place where the material, equipment is produced, manufactured, or processed, or through manufacture, procession, or assembly, another commercially recognized article results that differs substantially in its basic characteristics from its imported components or the place from where the services are/to be supplied.
	4.3	The nationality of the bidder shall not determine the origin of the material and equipment.
	4.4	To establish the eligibility of the materialand equipment, Bidders shall fill the country-of-origin declarations included in the Form of Bid.
5. One Bid per Bidder	5.1	A bidder shall submit only one bid, in the same bidding process, either individually as a bidder or as a member in a joint venture or any similar arrangement.
	5.2	No bidder can be a sub-contractor while submitting a bid individually or as a member of a joint venture in the same bidding process.
6 Cost of Bidding	6.1	The Bidder shall bear all costs associated with the preparation and submission of its bid, and the Procuring agency/Employer shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

B.BIDDING DOCUMENTS

<p>7. Contents of Bidding Documents</p>	<p>7.1</p>	<p>The scope of Works, bidding procedures, and terms and conditions of the contract are prescribed in the bidding documents. In addition to the Invitation for Bids, the bidding documents which should be read in conjunction with any addenda issued in accordance with ITB 9.2 include:</p> <p>Section I -Invitation for Bids Section II Instructions to Bidders (ITBs) Section III Bid Data Sheet (BDS) Section IV Eligible Countries Section V WorksRequirementsTechnical Specifications & Schedule of Requirements Section VI Standard BiddingForms Section VII General Conditions of Contract (GCC) Section VIII Special Conditions of Contract (SCC) Section IXContract Forms</p>
	<p>7.2</p>	<p>The number of copies to be completed and submitted with the Bid is specified in the BDS.</p>
	<p>7.3</p>	<p>The Procuring agency/Employer is not responsible for the completeness of the bidding documents and their addenda, if they were not obtained directly from the Procuring agency/Employer or the signed pdf version downloaded from the website of the Procuring agency/Employer or the Authority’s website or e-Procurement System as the case may be. However, Procuring agency/Employer shall place both the pdf and editable version of the same on its website and Authority’s website or e-Procurement System to facilitate the bidder for filling the standard bidding forms.</p>
	<p>7.4</p>	<p>The bidder is expected to examine all instructions, forms, specifications, terms and conditions prescribed in the bidding documents. Failure to furnish all the information required in the bidding documents will be at the bidder’s risk and may result in the rejection of his bid.</p>

<p>8. Clarification of Bidding Document, Pre-bid Meeting</p>	<p>8.1</p>	<p>A prospective bidder requiring any clarification of the bidding document may notify the Procuring agency/Employer in writing or in electronic form that provides record of the contents of communication at the Procuring agency/Employer's address indicated in the BDS.</p>
	<p>8.2</p>	<p>The Procuring agency/Employer will within three (3) working days after receiving the request for clarification, respond in writing or in electronic form to any request for clarification provided that such request is received not later than three (03) days prior to the deadline for the submission of Bids as prescribed in ITB 24.1. However, this clause shall not apply in case of alternate methods of procurement.</p>
	<p>8.3</p>	<p>Copies of the Procuring agency/Employer's response will be forwarded to all identified prospective bidders through an identified source of communication, including a description of the inquiry, but without specifying its source. In case of downloading of the bidding documents from the website of Procuring agency/Employer or e-Procurement System, the response of all such queries will also be available on the same platform available at the website.</p>
	<p>8.4</p>	<p>Should the Procuring agency/Employer deem it necessary to amend the bidding documents as a result of a clarification, it shall do so following the procedure as prescribed under ITB 09.</p>
	<p>8.5</p>	<p>If indicated in the BDS, the bidder's designated representative is invited at the bidder's cost to attend a pre-bid meeting at the place, date and time mentioned in the BDS. During this pre-bid meeting, prospective bidders may request clarification of the schedule of requirement, the evaluation criteria or any other aspects of the bidding documents.</p>
	<p>8.6</p>	<p>Minutes of the pre-bid meeting, if applicable, including the text of the questions asked by bidders, including those during the meeting (without identifying the source) and the responses given, together with any responses prepared after the meeting will be transmitted promptly to all prospective bidders who have obtained the bidding documents. Any modification to the bidding documents that may become necessary as a result of the pre-bid meeting shall be made by the Procuring agency/Employer exclusively through the use of an Addendum pursuant to ITB 9. Non-attendance at the pre-bid</p>

		meeting will not be a cause for disqualification of a bidder.
	8.7	The bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the bidder's own expense.
	8.8	The bidder and any of its authorized personnel will be granted permission by the Procuring agency/Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the bidder and its personnel will release and indemnify the Procuring agency/Employer from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.
9. Amendment of Bidding Documents	9.1	Before the deadline for submission of bids, the Procuring agency/Employer for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder or pre-bid meeting may modify the bidding documents by issuing addenda.
	9.2	Any addendum issued including the notice of any extension of the deadline shall be part of the bidding documents pursuant to ITB 7.1 and shall be communicated in a timely manner and on equal opportunity basis. Where notification of such change, addition, modification or deletion becomes essential, such notification shall be made in a manner similar to the original advertisement. <i>Provided that the bidder who had either already submitted their bid or handed over the bid to the courier prior to the issuance of any such addendum shall have the right to withdraw his already filed bid and submit the revised bid prior to the original or extended bid submission deadline.</i>
	9.3	To give prospective bidders reasonable time in which to take an addendum/corrigendum into account in preparing their bids, the Procuring agency/Employer may, at its discretion, extend the deadline for the submission of bids: <i>Provided that the Procuring agency/Employer shall extend the deadline for submission of bid, if such an addendum is issued within last three (03) days of the bid submission deadline.</i>

C. PREPARATION OF BIDS

<p>10. Language of Bid</p>	<p>10.1</p>	<p>The bid prepared by the bidder, as well as all correspondence and documents relating to the bid exchanged by the bidder and the Procuring agency/Employer shall be written in the English language unless specified in the BDS. Supporting documents and printed literature furnished by the bidder may be in another language provided they are accompanied by an accurate translation of the relevant pages in the English language unless specified in the BDS, in which case, for purposes of interpretation of the bidder, the translation shall govern.</p>
<p>11. Documents Establishing Eligibility of Material, Equipment and Works, their Conformity to Bidding Documents</p>	<p>11.1</p>	<p>The bid prepared by the bidder shall constitute the following components: -</p> <ul style="list-style-type: none"> a) Documentary evidence established in accordance with ITB 11 that the material, equipment and services to be provided by the Bidder are eligible material, equipment and services, and conform to the Bidding Documents; b) Documentary evidence established in accordance with ITB 12 that the bidder has been authorized to carry out the Construction works; c) Documentary evidence established in accordance with ITB 12 that the bidder is eligible and/or qualified for the subject bidding process; d) Form of Bid and Bid Prices completed in accordance with ITB 14 and 15; e) Completed schedules as required, including priced Bill of Quantities in accordance with ITB 13 & 15. f) Technical Proposal completed in all aspects in accordance with ITB-17. g) Bid security or Bid Securing Declaration furnished in accordance with ITB 19; h) Alternative bids, if permissible, in accordance with ITB 20; i) Duly Notarized Power of Attorney authorizing the signatory of the Bidder to submit the bid; and j) Any other document required in the BDS.

	11.2	In addition to the requirements, bids submitted by a JV shall include a copy of the Joint Venture Agreement entered into by all members. Alternatively, a letter of intent to execute a Joint Venture Agreement in the event of a successful bid shall be signed by all members and submitted with the bid, together with a copy of the proposed Agreement.
	11.3	The bidder shall furnish, as part of its bid, all those documents establishing the eligibility in conformity to the terms and conditions specified in the bidding documents for all material, equipment and works which the bidder proposes to execute.
	11.4	The documentary evidence of conformity of the material, equipment and works to the Bidding Documents may be in the form of literature, drawings, and data, and shall consist of: <ul style="list-style-type: none"> a) a detailed description of the work methodology, approach, schedule and resources to be mobilized at site; b) an item-by-item commentary on the Procuring agency/Employer's Technical Specifications demonstrating substantial responsiveness of the material, equipment and works to those specifications, or a statement of deviations and exceptions to the provisions of the Technical Specifications; c) any other procurement specific documentation requirement as stated in the BDS.
	11.5	The required documents and other accompanying documents must be in English. In case any other language than English is used the pertinent translation into English shall be attached to the original version.
12. Documents Establishing Eligibility and Qualification of the Bidder	12.1	The bidder shall furnish, as part of its bid, all those documents establishing the bidder's eligibility to participate in the bidding process and/or its qualification to perform the contract if its bid is accepted.
	12.2	The documentary evidence of the bidder's eligibility to bid shall establish to the satisfaction of the Procuring agency/Employer that the bidder, at the time of submission of its bid, is from an eligible country as defined in Section-IV titled as "Eligible Countries".
	12.3	The documentary evidence of the bidder's qualification to perform the contract if its bid is accepted shall establish to the satisfaction of Procuring agency/Employer that:

		<p>a) The bidder has the financial and technical capability necessary to perform the Contract, meets the qualification criteria specified in Section-V, Evaluation and Qualification Criteria and BDS.</p> <p>b) In the case of a bidder not doing business within Pakistan, the bidder is or will be (if awarded the contract) represented by a local bidder (Joint Venture) in accordance with the PEC works bylaws, and in case of award of works such foreign firm is required to participate in the execution of works to carry out its obligations as prescribed in the Conditions of Contract and /or Technical Specifications.</p> <p>c) That the bidder meets the qualification criteria listed in Section-V, Evaluation and Qualification Criteria and BDS.</p>
13. Letter of Bid and Schedules	13.1	The Letter of Bid (Technical or Financial as the case may be) and Schedules, including the Bill of Quantities, shall be prepared using the relevant forms furnished in Standard Bid Forms. The forms must be completed without any alterations to the text, and no substitutes shall be accepted except as provided under ITB 22 . All blank spaces shall be filled in with the information requested.
14. Letter of Bid	14.1	The bidder shall fill the Letter of Bid (Technical or Financial as the case may be) furnished in the bidding documents. The Standard Bid Forms must be completed without any alterations to its format and no substitute shall be accepted.
15. Bid Prices	15.1	The bid prices quoted by the bidder in the Standard bid Forms, Bill of Quantities and in the Price Schedules shall conform to the requirements specified below or exclusively mentioned hereafter in the bidding documents.
	15.2	The bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. If a Price Schedule shows items listed but not priced, their prices shall be construed to be included in the prices of other items in the Bill of Quantities and will not be paid for separately by the Procuring agency/Employer.
	15.3	Items not listed in the Price Schedule shall be assumed not to be included in the bid, and provided that the bid is still substantially responsive in their absence or due to their nominal nature, the corresponding average price of the respective item(s) of the remaining substantially responsive bidder(s) shall be construed to be the price of those missing item(s):

		<p>Provided that:</p> <ul style="list-style-type: none"> a) where there is only one (substantially) responsive bidder, or b) where there is provision for alternate proposals and the respective items are not listed in the other bids, <p>The Procuring agency/Employer may fix the price of missing items in accordance with market survey, and the same shall be considered as final price.</p>
	15.4	The Bid price to be quoted in the Form of Bid in accordance with ITB 15.1 shall be the total price of the bid.
	15.5	Unless otherwise specified in the BDS and the Contract, the rates and prices quoted by the bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract.
	15.6	If so specified in ITB 1.1 , bids may be invited for individual lots (contracts) or for any combination of lots (packages).
	15.7	Prices quoted by the Bidder shall be fixed during the bidder's performance of the contract and not subject to variation on any account. A bid submitted with an adjustable price will be treated as non-responsive and shall be rejected, pursuant to ITB 30 , unless otherwise price adjustment is permissible under Conditions of the Contract.
	15.8	All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date twenty-eight (28) days prior to the deadline for submission of bids, shall be included in the rates and prices and the total bid price submitted by the bidder.
16. Currencies of Bid and Payment	16.1	The currency(ies) of the bid and the currency(ies) of payments shall be as specified in the BDS .
	16.2	For the purposes of comparison of bids quoted in different currencies, the price shall be converted into a single currency specified in the bidding documents. The rate of exchange shall be the selling rate, prevailing on the date of opening of (financial part of) bids specified in the bidding documents, as notified by the State Bank of Pakistan on that day.
	16.3	Bidders shall indicate details of their expected foreign currency requirements in the Bid, if prescribed in the BDS .
	16.4	Bidders may be required by the Procuring agency/Employer to clarify their foreign currency requirements, if prescribed in the

		BDS and to substantiate that the amounts included in Lump Sum and in the SCC are reasonable and responsive to ITB 16.1 .
17. Documents Comprising the Technical Proposal	17.1	The bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section IV – Standard Bid Forms , in sufficient detail to demonstrate the adequacy of the bidder’s proposal to meet the work requirements and the completion time.
18. Bid Validity Period	18.1	Bids shall remain valid for the period specified in the BDS after the bid submission deadline prescribed by the Procuring agency/Employer. A bid valid for a shorter period shall be rejected by the Procuring agency/Employer as non-responsive. The period of bid validity will be determined from the complementary bid securing instrument i.e. the expiry period of bid security or bid securing declaration as the case may be.
	18.2	Under exceptional circumstances, prior to the expiration of the initial bid validity period, the Procuring agency/Employer may request the bidders’ consent to an extension of the period of validity of their bids only once, for the period not more than the period of initial bid validity. The request and the bidders’ responses shall be made in writing or in electronic forms that provide record of the content of communication. The Bid Security provided under ITB 19 shall also be extended 28 days beyond the deadline of extended bid validity period. A bidder may refuse the request for the extension of his bid without forfeiting his bid security or causing to be executed his Bid Securing Declaration. A bidder agreeing to the request will not be required nor permitted to modify its bid, but will be required to extend the validity of its Bid Security or Bid Securing Declaration for the period of the extension, and in compliance with ITB 19 in all respects.
19. Bid Security or Bid Securing Declaration	19.1	Pursuant to ITB 11.1 unless otherwise specified in the BDS , the bidder shall furnish as part of its bid, a Bid Security in form of fixed amount not exceeding five percent of the estimated value of procurement determined by the Procuring agency/Employer and in the amount and currency specified in the BDS or Bid Securing Declaration as specified in the BDS in the format provided in Section VI (Standard Bidding Forms) . In case Procuring agency/Employer is inviting bids in lots /

		packages, the bidder shall be required to submit his bid security against the respective lot/ package for which he is submitting his bid, which shall not exceed five percent of the estimated value of that particular lot/ package.
	19.2	The Bid Security or Bid Securing Declaration is required to protect the Procuring agency/Employer against the risk of Bidder's conduct before award of the contract to the most advantageous bidder which would warrant the security's forfeiture, pursuant to ITB 19.9 .
	19.3	The Bid Security shall be denominated in the local currency or in another freely convertible currency, and it shall be in the form specified in the BDS which shall be in any of the following: <ul style="list-style-type: none"> a) A bank guarantee, an irrevocable letter of credit issued by a Scheduled bank in the form provided in the Bidding Documents or another form acceptable to the Procuring agency/Employer and valid for twenty-eight (28) days beyond the end of the validity of the Bid. This shall also apply if the period for Bid Validity is extended. In either case, the form must include the complete name of the bidder; b) A cashier's or certified cheque; or c) Another security as indicated in the BDS.
	19.4	The Bid Security or Bid Securing Declaration shall be in accordance with the Form of the Bid Security or Bid Securing Declaration included in Section VI (Standard Bidding Forms) or another form approved by the Procuring agency/Employer prior to the bid submission.
	19.5	The Bid Security shall be payable promptly upon written demand by the Procuring agency/Employer in case any of the conditions listed in ITB 19.9 are invoked.
	19.6	Any bid not accompanied by a Bid Security or Bid Securing Declaration in accordance with ITB 19.1 or 19.3 shall be rejected by the Procuring agency/Employer and shall be declared as non-responsive bid, pursuant to ITB 30 .
	19.7	Unsuccessful bidders' Bid Security will be discharged or returned as promptly as possible, however in no case later than thirty (30) days after the expiration of the period of Bid Validity prescribed by the Procuring agency/Employer pursuant to ITB 18 . The Procuring agency/Employer shall make no claim to the

		<p>amount of the Bid Security, and shall promptly return the Bid Security document, after whichever of the following that occurs earliest:</p> <ul style="list-style-type: none"> (a) The expiry of the Bid Security; (b) The entry into force of a procurement contract and the provision of a performance security (or guarantee), for the performance of the contract if such a security (or guarantee), is required by the Bidding documents; (c) The rejection by the Procuring agency/Employer of all Bids; (d) The withdrawal of the bid prior to the deadline for the submission of bids, unless the bidding documents stipulate that no such withdrawal is permitted.
	19.8	<p>The successful bidder's Bid Security will be discharged upon the bidder signing the contract pursuant to ITB 47, or furnishing the performance security (or guarantee), pursuant to ITB 48.</p>
	19.9	<p>The Bid Security may be forfeited or the Bid Securing Declaration executed:</p> <ul style="list-style-type: none"> a) if a Bidder: <ul style="list-style-type: none"> i) Withdraws its Bid during the period of Bid Validity as specified by the Procuring agency/Employer, and referred by the bidder on the Form of Bid except as provided for in ITB 18.2; or ii) Does not accept the correction of errors pursuant to ITB 32; or b) In the case of a successful bidder, if the bidder fails: <ul style="list-style-type: none"> i) to sign the contract in accordance with ITB 47; or ii) to furnish performance security (or guarantee) in accordance with ITB 48.
	19.10	<p>In case of Bid Security issued by the foreign bank is allowed by the Procuring agency/Employer, the same should be counter guaranteed by a corresponding bank in Pakistan. Furthermore, in case of joint venture, it should be in the name of Joint venture to ensure joint responsibility.</p>
20. Alternative Bids by Bidders	20.1	<p>Bidders shall submit offers that comply with the requirements of the bidding documents, including the basic bidder's technical design as indicated in the specifications and Bill of Quantities. Alternatives will not be considered, unless specifically allowed for in the BDS. If so allowed, ITB 20</p>

		shall prevail.
	20.2	When alternative schedule for execution of works is explicitly invited, a statement of that effect will be included in the BDS as will the method for evaluating different schedule for execution of works.
	20.3	If so allowed in the BDS , bidders wishing to offer technical alternatives to the requirements of the bidding documents must also submit a bid that complies with the requirements of the bidding documents, including the basic technical design as indicated in the specifications. In addition to submitting the basic bid, the bidder shall provide all information necessary for a complete evaluation of the alternative by the Procuring agency/Employer, including technical specifications, breakdown of prices, and other relevant details. Only the technical alternatives, if any, of the Most Advantageous Bidder conforming to the basic technical requirements (without altering the bid price) shall be considered by the Procuring agency/Employer.
21. Withdrawal of Bids	21.1	Before bid submission deadline, any bidder may withdraw, substitute, or modify its bid after it has been submitted by sending a written notice, duly signed by an authorized representative, and the corresponding must accompany the respective written notice.
	21.2	Bids requested to be withdrawn in accordance with ITB 21.1 shall be returned unopened to the bidders.
22. Format and Signing of Bid	22.1	The Bidder shall prepare an original and the number of copies of the bid as indicated in the BDS , clearly marking each “ ORIGINAL ” and “ COPY ” as appropriate. In the event of any discrepancy between them, the original shall prevail: <i>Provided that except in Single Stage One Envelope Procedure, the bid shall include only the copies of technical proposal.</i>
	22.2	The original and the copy (ies) of the bid shall be typed or written in indelible ink and shall be signed by the bidder or a person or persons duly authorized to sign on behalf of the bidder. This authorization shall consist of a written confirmation as specified in the BDS and shall be attached to the bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the bid, except for un-amended printed literature, shall be initialed by the person or persons signing the bid.

	22.3	Any interlineations, erasures, or overwriting shall be valid only if they are signed by the person(s) authorized for signing the Bid.
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D. SUBMISSION OF BIDS

23. Sealing and Marking of Bids	23.1	In case of Single Stage One Envelope Procedure, the bidder shall seal the original and each copy of the bid in separate envelopes, duly marking the envelopes as “ ORIGINAL ” and “ COPY ”. The envelopes shall then be sealed in an outer envelope securely sealed in such a manner that opening and resealing cannot be achieved undetected. Note: <i>The envelopes shall be sealed and marked in accordance with the bidding procedure adopted as referred in Rule-36 of Public Procurement Rules,2004.</i>
	23.2	The inner and outer envelopes shall: a) be addressed to the Procuring agency/Employer at the address given in the BDS ; and b) bear the title of the subject procurement or project name, as the case may be as indicated in the BDS , the Invitation for Bids (ITB) title and number indicated in the BDS , and a statement: “ DO NOT OPEN BEFORE ”, to be completed with the time and the date specified in the BDS , pursuant to ITB 24.1 .
	23.3	In case of Single Stage Two Envelope Procedure, The Bid shall comprise two envelopes submitted simultaneously, one called the Technical Proposal and the other Financial Proposal. Both envelopes to be enclosed together in an outer single envelope called the Bid. Each Bidder shall submit his bid as under: a) Bidder shall submit his TECHNICAL PROPOSAL and FINANCIAL PROPOSAL in separate inner envelopes and enclosed in a single outer envelope. b) ORIGINAL and each copy of the Bid shall be separately sealed and put in separate envelopes and marked as such. c) The envelopes containing the ORIGINAL and copies will be put in one sealed envelope and addressed / identified as given in ITB 23.2 .
	23.4	The inner and outer envelopes shall: a) be addressed to the Procuring agency/Employer at the address provided in the BDS ;

		<p>b) bear the name and identification number of the contract as defined in the BDS; and provide a warning not to open before the time and date for bid opening, as specified in the BDS pursuant to ITB 24.1.</p> <p>c) In addition to the identification required in ITB 23 hereof, the inner envelope shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared “late” pursuant to ITB25.</p>
	23.5	If all envelopes are not sealed and marked as required by ITB 23.2 , ITB 23.3 and ITB 23.4 or incorrectly marked, the Procuring agency/Employer will assume no responsibility for the misplacement or premature opening of bid.
24. Deadline for Submission of Bids	24.1	Bids shall be received to the Procuring agency/Employer no later than the date and time specified in the BDS .
	24.2	The Procuring agency/Employer may, under exceptional circumstances and at its discretion, extend the deadline for the submission of bids by amending the Bidding Documents in accordance with ITB9 , in which case all rights and obligations of the Procuring agency/Employer and bidders previously subject to the deadline will thereafter be subject to the new deadline.
25. Late Bids	25.1	The Procuring agency/Employer shall not consider for evaluation of any bid that arrives after the deadline for submission of bids, in accordance with ITB 24 .
	25.2	Any bid received by the Procuring agency/Employer after the deadline for submission of bids shall be declared late, recorded, rejected and returned unopened to the bidder.
26. Substitution and Modification of bids	26.1	A bidder may substitute or modify his bid after it has been submitted, provided that written notice of the substitution or modification of the bid, is received by the Procuring agency/Employer prior to the deadline for submission of bids.
	26.2	Revised bid may be submitted after the substitution or modification made in the original bid in accordance with the provisions referred in ITB 22 .

E. OPENING AND EVALUATION OF BIDS

27. Opening of Bids	27.1	The Procuring agency/Employer will open all bids, in public, in the presence of bidders' or their representatives who choose to attend, and other parties with a legitimate interest in the bid proceedings at the place, on the date and at the time, specified in the BDS . The bidders' representatives present shall sign a attendance sheet as a proof of their attendance.
	27.2	First, envelopes marked " WITHDRAWAL " shall be opened and read out and the envelope with the corresponding bid shall not be opened, but returned to the bidder. No bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at bid opening.
	27.3	Second, outer envelopes marked " SUBSTITUTION " shall be opened. The inner envelopes containing the Substitution Bid shall be exchanged for the corresponding Original Bid being substituted, which is to be returned to the bidder unopened. No envelope shall be substituted unless the corresponding Substitution Notice contains a valid authorization to request the substitution and is read out and recorded at bid opening.
	27.4	Next, outer envelopes marked " MODIFICATION " shall be opened. No Technical Proposal and/or Financial Proposal shall be modified unless the corresponding Modification Notice contains a valid authorization to request the modification and is read out and recorded at the opening of the bids. Any modification shall be read out along with the Original Bid except in case of Single Stage Two Envelope Procedure where only the Technical Proposal, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Financial Proposal, both Original and Modification, will remain unopened till the prescribed financial bid opening date.
	27.5	Other envelopes holding the bids shall be opened one at a time, in case of Single Stage One Envelope Procedure, the bidders' names, the bid prices, the total amount of each bid and of any alternative bid (if alternatives have been requested or permitted), the presence or absence of Bid Security, Bid Securing Declaration and such other details as the Procuring agency/Employer may consider appropriate, will be announced by the Procurement Evaluation Committee.

	27.6	In case of Single Stage Two Envelope Procedure, the Procuring agency/Employer will open the Technical Proposals in public at the address, date and time specified in the BDS in the presence of bidders' designated representatives who choose to attend and other parties with a legitimate interest in the bid proceedings. The Financial Proposals will remain unopened and will be held in custody of the Procuring agency/Employer until the specified time of their opening.
	27.7	The envelopes holding the Technical Proposals shall be opened one at a time, and the following read out and recorded: (a) the name of the bidder; (b) whether there is a modification or substitution; (c) the presence of a Bid Security or Bid Securing Declaration, if required; and (d) Any other details as the Procuring agency/Employer may consider appropriate.
	27.8	Bids not opened and not read out at the bid opening shall not be considered further for evaluation, irrespective of the circumstances.
	27.9	Bidders are advised to send in a representative with the knowledge of the content of the bid who shall verify the information read out from the submitted documents. Failure to send a representative or to point out any un-read information by the sent bidder's representative shall indemnify the Procuring agency/Employer against any claim or failure to read out the correct information contained in the bidder's bid.
	27.10	No bid will be rejected at the time of bid opening except for late bids which will be returned unopened to the bidder, pursuant to ITB 25 .
	27.11	The Procuring agency/Employer shall prepare minutes of the bid opening. The record of the bid opening shall include, as a minimum: the name of the bidder and whether or not there is a withdrawal, substitution or modification, the bid price if applicable and the presence or absence of a Bid Security or Bid Securing Declaration.
	27.12	The bidders' representatives who are present shall be requested to sign on the attendance sheet. The omission of a bidder's signature on the record shall not invalidate the contents and affect the record. A copy of the record shall be distributed to all the bidders.
	27.13	A copy of the minutes of the bid opening shall be furnished to individual bidders upon request.

	27.14	In case of Single Stage -Two Envelop Bidding Procedure, after the announcement of technical evaluation report, the Procuring agency/Employer, shall at a time within the bid validity period, publicly open the financial proposals of the technically responsive bidder only. The financial proposal of bidders found technically non-responsive shall be returned un-opened to the respective bidders after seven days of the announcement of technical evaluation report, except those aggrieved bidder(s) whose complaints are pending before the Grievance Redressal Committee.
28. Confidentiality	28.1	Information relating to the examination, clarification, evaluation and comparison of bids and recommendation of contract award shall not be disclosed to bidders or any other persons not officially concerned with such process until the time of the announcement of the respective evaluation report.
	28.2	Any effort by a bidder to influence the Procuring agency/Employer processing of bids or award decisions may result in the rejection of its bid.
	28.3	Notwithstanding ITB 28.2 from the time of bid opening to the time of contract award, if any bidder wishes to contact the Procuring agency/Employer on any matter related to the bidding process, it should do so in writing or in electronic forms that provides record of the content of communication.
29. Clarification of Bids	29.1	To assist in the examination, evaluation and comparison of bids, the Procuring agency/Employer may, ask any bidder for a clarification of its bid including breakdown of prices invariably in writing. Any clarification submitted by a bidder that is not in response to a request by the Procuring agency/Employer shall not be considered.
	29.2	The request for clarification and the response shall be in writing or in electronic forms that provide record of the content of communication. No change in the prices or substance of the bid shall be sought, offered, or permitted, except clarification for the correction of arithmetic errors discovered by the Procuring agency/Employer during the evaluation of bids which shall be sought in accordance with ITB 32 .
	29.3	The alteration or modification in the bid which in any case affect the following parameters will be considered as a change in the substance of a bid: <ul style="list-style-type: none"> a) evaluation & qualification criteria;

		<ul style="list-style-type: none"> b) required scope of work; c) contract price; d) all securities requirements; e) tax requirements; f) terms and conditions of bidding documents. g) change in the ranking of the bidder
	29.4	From the time of bid opening to the time of Contract award if any bidder wishes to contact the Procuring agency/Employer on any matter related to the bid it should do so in writing or in electronic forms that provide record of the content of communication.
30. Preliminary Examination of Bids	30.1	<p>Prior to the detailed evaluation of bids, the Procuring agency/Employer will determine whether each bid:</p> <ul style="list-style-type: none"> a) meets the eligibility criteria defined in ITB 3 and ITB 4; b) has been prepared as per the format and contents defined by the Procuring agency/Employer in the bidding documents; c) has been properly signed; d) is accompanied by the required securities; and e) is substantially responsive to the requirements of the bidding documents. <p>The Procuring agency/Employer's determination of a bid's substantial responsiveness will be based on the contents of the bid itself.</p>
	30.2	<p>A substantially responsive Bid is one which conforms to all the terms, conditions, and specifications of the Bidding Documents, without material deviation or reservation. A material deviation or reservation is one that: -</p> <ul style="list-style-type: none"> a) affects in any substantial way the scope, quality, or performance of the Works; b) limits in any substantial way, inconsistent with the bidding documents, the Procuring agency/Employer's rights or the bidders' obligations under the Contract; or c) if rectified, would affect unfairly the competitive

		position of other bidders presenting substantially responsive bids.
	30.3	The Procuring agency/Employer will confirm that the documents and information specified under ITB 11, 12 and 13 have been provided in the bid. If any of these documents or information is missing, or is not provided in accordance with the Instructions to Bidders, the bid shall be rejected.
	30.4	<p>The Procuring agency/Employer may waive-off any minor informality, nonconformity, or irregularity in a bid which does not constitute a material deviation, provided such waiver does not prejudice or affect the relative ranking of any Bidder.</p> <p>Explanation: <i>A minor informality, non-conformity or irregularity is one that is merely a matter of form and not of substance. It also pertains to some immaterial defect in a Bid or variation of a bid from the exact requirements of the invitation that can be corrected or waived without being prejudicial to other bidders. The defect or variation is immaterial when the effect on quantity, quality, or delivery is negligible when contrasted with the total cost or scope of the works. The Procuring agency/Employer either shall give the bidder an opportunity to cure any deficiency resulting from a minor informality or irregularity in a bid or waive the deficiency, whichever is advantageous to the Procuring agency/Employer. Examples of minor informalities or irregularities include failure of a bidder to –</i></p> <ul style="list-style-type: none"> (a) <i>Submit the number of copies of signed bids required by the invitation;</i> (b) <i>Furnish required information concerning the number of its employees;</i> (c) <i>the firm submitting a bid has formally adopted or authorized, before the date set for opening of bids, the execution of documents by typewritten, printed, or stamped signature and submits evidence of such authorization and the bid carries such a signature.</i>
	30.5	Provided that a Technical Bid is substantially responsive, the Procuring agency/Employer may request the bidder to submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial

		nonconformities or omissions in the Technical Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any such aspect of the technical Proposal linked with the ranking of the bidders. Failure of the bidder to comply with the request may result in the rejection of its bid.
	30.6	Provided that a Technical Bid is substantially responsive, the Procuring agency/Employer shall rectify quantifiable nonmaterial nonconformities or omissions related to the Financial Proposal. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of the missing or nonconforming item or component.
	30.7	If a bid is not substantially responsive, it will be rejected by the Procuring agency/Employer and may not subsequently be evaluated for complete technical responsiveness.
31. Examination of Terms and Conditions; Technical Evaluation	31.1	The Procuring agency/Employer shall examine the bid to confirm that all terms and conditions specified in the GCC and the SCC have been accepted by the bidder without any material deviation or reservation. For this purpose: “Deviation” means departure from the requirements specified in the Bidding Document. “Reservation” means setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document.
	31.2	The Procuring agency/Employer shall evaluate the technical aspects of the bid submitted in accordance with ITB 31 , to confirm that all requirements specified in Section V – Works Requirement, Technical Specifications of the Bidding Documents have been met without material deviation or reservation.
	31.3	If after the examination of the terms and conditions and the technical evaluation, the Procuring agency/Employer determines that the bid is not substantially responsive in accordance with ITB 30 , it shall reject the bid.

<p>32. Correction of Arithmetic Errors</p>	<p>32.1</p>	<p>Bids determined to be substantially responsive will be checked for any arithmetic errors. Errors will be corrected as follows: -</p> <ul style="list-style-type: none"> a) if there is a discrepancy between unit prices and the sub-total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail, and the sub-total price shall be corrected, unless in the opinion of the Procuring agency/Employer there is an obvious misplacement of the decimal point in the unit price, in which the total price as quoted shall govern and the unit price shall be corrected; b) if there is an error in a total corresponding to the addition or subtraction of sub-totals, the sub-totals shall prevail, and the total shall be corrected; and c) where there is a discrepancy between the amounts in figures and in words, the amount in words will govern. d) Where there is discrepancy between grand total of price schedule and amount mentioned on the Form of Bid, the amount referred in Price Schedule shall be treated as correct subject to elimination of other errors.
	<p>32.2</p>	<p>The amount stated in the Bid will, be rectified by the Procuring agency/Employer in accordance with the above procedure for the correction of errors and, with, the concurrence of the bidder, shall be considered as binding upon the bidder. If the bidder does not accept the corrected amount, its bid shall be rejected after forfeiture of Bid Security or execution of the Bid Securing Declaration, as the case may be, in accordance with ITB 19.9.</p>

<p>33. Conversion to Single Currency</p>	<p>33.1</p>	<p>The unit rates and the prices shall be quoted by the bidder entirely in Pak rupees. A bidder expecting to incur expenditures in other currencies for inputs to the Works from outside the Procuring agency/Employer’s country (referred to as the “Foreign Currency Requirements”) shall indicate the same in the letter of bid-financial proposal. The proportion of the Bid Price (excluding Provisional Sums) needed by him for the payment of such Foreign Currency Requirements either (i) entirely in the currency of the Bidder’s home country or, (ii) at the bidder’s option, entirely in Pak rupees provided always that a bidder expecting to incur expenditures in a currency or currencies other than those stated in (i) and (ii) above for a portion of the foreign currency requirements, and wishing to be paid accordingly, shall indicate the respective portions in his bid.</p>
	<p>33.2</p>	<p>To facilitate evaluation and comparison, the Procuring agency/Employer will convert all bid prices expressed in the amounts in various currencies in which the bid prices are payable. For the purposes of comparison of bids quoted in different currencies, the price shall be converted into a single currency specified in the bidding documents. The rate of exchange shall be the selling rate, prevailing on the date of opening of (financial part of) bids specified in the bidding documents, as notified by the State Bank of Pakistan on that day.</p>
	<p>33.3</p>	<p>The currency selected for converting bid prices to a common base for the purpose of evaluation, along with the source and date of the exchange rate, are specified in the BDS.</p>
<p>34. Evaluation of Bids</p>	<p>34.1</p>	<p>The Procuring agency/Employer shall evaluate and compare only the bids determined to be substantially responsive, pursuant to ITB 30.</p>
	<p>34.2</p>	<p>In evaluating the Technical Proposal of each Bid, the Procuring agency/Employer shall use the criteria and methodologies listed in the BDS and in terms of works requirement. No other evaluation criteria or methodologies shall be permitted.</p>
	<p>34.3</p>	<p>The Procuring agency/Employer’s evaluation of a bid will take into account:</p> <ul style="list-style-type: none"> a) the bid price, excluding provisional sums and the provision, if any, for contingencies in the summary bill

		<p>of quantities, but including day work items, where priced competitively;</p> <p>b) price adjustment for correction of arithmetic errors in accordance with ITB 32.1;</p> <p>c) converting the amount resulting from applying (a) and (b) above, if relevant, to a single currency in accordance with ITB 33;</p>
	34.4	The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in bid evaluation.
	34.5	If these bidding documents allow bidders to quote separate prices for different lots, and the award to a single bidder of multiple lots, the methodology of evaluation to determine the lowest evaluated lot combinations in the Form of Bid, is specified in the BDS .
	34.6	<p>If the bid, which results in the Evaluated Bid Price (Most Advantageous Bid), is seriously unbalanced or front loaded in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, taking into consideration the schedule of estimated Contract payments, the Employer may require that the amount of the performance security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.</p> <p>Explanation: <i>“Unbalanced” or “front-loaded” bids consist of deliberately submitting bids with artificially high prices or unit rates for the early stages of a construction project, offset by artificially low prices or unit rates for the later stages of the project, to improve the contractor’s cash flow.</i></p>

35. Domestic Preference	35.1	If the BDS so specifies, the Procuring agency/Employer will grant a margin of preference to the domestic contractor in line with the rules, regulations, regulatory guides or instructions issued by the Authority from time to time.
36. Determination of Most Advantageous Bid	36.1	The Procuring agency/Employer shall compare the evaluated bids in accordance with the predefined bidding procedure, of all substantially responsive bids to determine the Most Advantageous bidder.
37. Qualification of Bidder	37.1	<p>The Procuring agency/Employer shall determine to its satisfaction whether the bidder is substantially responsive and whose bid is declared as most advantageous bid either continues to meet (if prequalification applies) or meets (if post-qualification applies) the qualifying criteria specified in Evaluation and Qualification Criteria.</p> <p><i>Note: In case of International bidding, the parameters for incorporation or licensing within Pakistan may be fulfilled as part of post qualification.</i></p>
	37.2	The determination shall be based upon an examination of the documentary evidence of the bidder's qualifications submitted by the bidder, pursuant to ITB 12 .
	37.3	Prior to contract award, the Procuring agency/Employer will verify that the successful bidder (including each member of a JV) is not blacklisted/debarred. The Procuring agency/Employer will conduct the same verification for each sub-contractor proposed by the successful bidder.
38. Sub-Contractors	38.1	The bidder shall provide details regarding any specialized sub-contractor to the Procuring agency/Employer. In case change of sub-contractors, the bidder shall promptly notify the Procuring agency/Employer and obtain approval for replacement of sub-contractors.
	38.2	Bidders may propose sub-contracting up to the percentage of total value of contracts or the volume of works as specified in the BDS .

<p>39. Abnormally Low Financial Bid</p>	<p>39.1</p>	<p>Where the bid price is considered to be abnormally low, the Procuring agency/Employer shall perform price analysis either during determination of Most Advantageous Bid or as a part of the post-qualification process. The following process shall apply:</p> <ul style="list-style-type: none"> a) The Procuring agency/Employer may reject a bid if the Procuring agency/Employer has determined that the price in combination with other constituent elements of the bid is abnormally low in relation to the subject matter of the procurement (i.e. scope of the procurement or ancillary services) and raises concerns as to the capability and capacity of the respective Bidder to perform that contract; b) Before rejecting an abnormally low bid the Procuring agency/Employer shall request the bidder an explanation of the bid or of those sections which it considers contribute to the bid being abnormally low; take account of the evidence provided in response to a request in writing; and subsequently verify the bid or parts of the bid being abnormally low; c) The decision of the Procuring agency/Employer to reject a bid and reasons for the decision shall be recorded in the procurement proceedings and promptly communicated to the bidder concerned; d) The Procuring agency/Employer shall not incur any liability solely by rejecting abnormally bid; and e) An abnormally low bid means, in the light of the Procuring agency/Employer's estimate and of all the bids submitted, the bid appears to be abnormally low by not providing a margin for normal levels of profit. <p>Guidance for Procuring agency/Employer:</p> <p>In order to identify the Abnormally Low Bid (ALB) following approaches can be considered to minimize the scope of subjectivity:</p> <ul style="list-style-type: none"> (i) Comparing the bid price with the cost estimate; (ii) Comparing the bid price with the bids offered by other bidders submitting substantially responsive bids; and (iii) Comparing the bid price with prices paid in similar contracts in the recent past either government- or development
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		partner-funded.
	39.2	The Procuring agency/Employer will determine to its satisfaction whether the bidder that is selected as having submitted the most advantageous bid is qualified to perform the contract satisfactorily, in accordance with the criteria listed in ITB 12
	39.3	The determination will take into account the bidder's financial and technical capabilities. It will be based upon an examination of the documentary evidence of the bidder's qualifications submitted by the bidder, pursuant to ITB 12 , as well as such other information as the Procuring agency/Employer deems necessary and appropriate. Factors not included in these bidding documents shall not be used in the evaluation of the bidders' qualifications.
	39.4	<p>Procuring agency/Employer may seek "Certificate for Independent Price Determination" from the bidder and the results of reference checks may be used in determining award of contract.</p> <p><i>Explanation: The Certificate shall be furnished by the bidder. The bidder shall certify that the price is determined keeping in view of all the essential aspects such as raw material, its processing, value addition, optimization of resources due to economy of scale, transportation, insurance and margin of profit etc.</i></p>
	39.5	An affirmative determination will be a prerequisite for award of the contract to the bidder. A negative determination will result in rejection of the bidder's bid, in which event the Procuring agency/Employer will proceed to the next ranked bidder to make a similar determination of that bidder's capabilities to perform satisfactorily.

F. AWARD OF CONTRACT

<p>40. Criteria of Award</p>	<p>40.1</p>	<p>Subject to ITB 36 and 37, the Procuring agency/Employer will award the Contract to the bidder whose bid has been determined to be substantially responsive to the bidding documents and who has been declared as Most Advantageous Bidder, provided that such bidder has been determined to be:</p> <ul style="list-style-type: none"> a) eligible in accordance with the provisions of ITB 3; b) is determined to be qualified to perform the Contract satisfactorily; and c) Successful negotiations have been concluded, if any.
<p>41. Negotiations</p>	<p>41.1</p>	<p>The Committee of the Procuring agency/Employer may negotiate with the Most Advantageous Bidder relating to the following areas:</p> <ul style="list-style-type: none"> (a) a minor alteration to the technical (drawings, design technical specifications) details of the statement of works; (b) Methodology, work plan, staffing in view to streamline the work; (c) a minor amendment to the special conditions of Contract; (d) finalizing payment arrangements; (e) clarifying details that were not apparent or could not be finalized at the time of Bidding;
	<p>41.2</p>	<p>Where negotiation fails to result into an agreement, the Procuring agency/Employer may invite the next ranked bidder for negotiations. Where negotiations are commenced with the next ranked bidder, the Procuring agency/Employer shall not reopen earlier negotiations.</p>
<p>42. Procuring agency/Employer's Right to reject All Bids</p>	<p>42.1</p>	<p>Notwithstanding ITB 37, the Procuring agency/Employer reserves the right to reject all the bids, and to annul the bidding process at any time prior to acceptance of bid, without thereby incurring any liability to the affected bidder(s). However, the Authority (i.e. PPRA) may call from the Procuring agency/Employer the justification of those grounds.</p>
	<p>42.2</p>	<p>Notice of the rejection of all bids shall be given promptly to all bidders that have submitted bids.</p>
	<p>42.3</p>	<p>The Procuring agency/Employer shall upon request communicate to any bidder the grounds for its rejection of its bids, but is not required to justify those grounds.</p>

<p>43. Variations</p>	<p>43.1</p>	<p>The Engineer shall make any variation in the quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion, be appropriate, he shall have the authority to instruct the Contractor to do and the Contractor shall do any of the following:</p> <ul style="list-style-type: none"> a) increase or decrease the quantity of any work included in the Contract, b) omit any such work (but not if the omitted work is to be carried out by the Employer or by another contractor), c) change the character or quality or kind of any such work, d) change the levels, lines, position and dimensions of any part of the Works, e) execute additional work of any kind necessary for the completion of the Works, or f) change any specified sequence or timing of construction of any part of the Works. <p>No such variation shall in any way vitiate or invalidate the Contract, but the effect, if any, of all such variations shall be valued in accordance with ITB 15. Provided that where the issue of an instruction to vary the Works is necessitated by some default of or breach of contract by the Contractor or for which he is responsible, any additional cost attributable to such default shall be borne by the Contractor.</p>
<p>44. Instructions for variations</p>	<p>44.1</p>	<p>The Contractor shall not make any such variation without an instruction of the Engineer. Provided that no instruction shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an instruction given under this Clause, but is the result of the quantities exceeding or being less than those stated in the Bill of Quantities.</p>
<p>45. Valuation of Variations</p>	<p>45.1</p>	<p>All variations and any additions to the Contract Price which are required to be determined in accordance with ITB 15 (for the purposes of this Clause referred to as "varied work"), shall be valued at the rates and prices set out in the Contract if, in the opinion of the Engineer, the same shall be applicable. If the Contract does not contain any rates or prices applicable to the varied work, the rates and prices in the Contract shall be used as the basis for valuation so far as may be reasonable, failing which, after due consultation by the Engineer with the</p>

		Procuring agency/Employer and the Contractor, suitable rates or prices shall be agreed upon between the Engineer and the Contractor. In the event of disagreement, the Engineer shall fix such rates or prices as are, in his opinion, appropriate and shall notify the Contractor accordingly, with a copy to the Employer. Until such time as rates or prices are agreed or fixed, the Engineer shall determine provisional rates or prices to enable on-account payments to be included in certificates issued in accordance with ITB 15 .
46. Notification of Award	46.1	Prior to the award of contract, the Procuring agency/Employer shall issue a Final Evaluation Report giving justification for acceptance or rejection of the bids.
	46.2	Where no complaints have been lodged, the bidder whose bid has been accepted will be notified of the award by the Procuring agency/Employer prior to expiration of the bid validity period in writing or through electronic means that provide record of the content of communication. However, the Procuring agency/Employer shall not award any procurement contract at least for fifteen (15) days after the acceptance of bid. The notification letter (herein after and in the condition of the contract and contract form called "Letter of Acceptance" will specify the sum that the Procuring agency/Employer will pay the successful bidder in consideration for the execution and completion of the works as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price).
	46.3	The notification of award will constitute the formation of the Contract, subject to the bidder furnishing the Performance Security (or guarantee) in accordance with ITB 48 and signing of the contract in accordance with ITB 47 .
	46.4	Upon the successful bidder's furnishing of the performance security (or guarantee) pursuant to ITB 48 , the Procuring agency/Employer will promptly notify each unsuccessful bidder, the name of the successful bidder and the Contract amount and will discharge the Bid Security or Bid Securing Declaration of the bidder(s) pursuant to ITB 19 .
47. Signing of Contract	47.1	Promptly after notification of award, Procuring agency/Employer shall send the successful bidder the draft agreement, incorporating all terms and conditions as agreed by the parties to the contract.
	47.2	Immediately after the Redressal of grievance by the GRC, and

		after fulfillment of all conditions precedent of the Contract Form, the successful bidder and the Procuring agency/Employer shall sign the contract.
	47.3	Where no formal signing of a contract is required, work order issued to the bidder shall be construed to be the contract.
48. Performance Security (or Guarantee)	48.1	After the receipt of the Letter of Acceptance, the successful bidder, within the specified time, shall deliver to the Procuring agency/Employer a Performance Guarantee in the amount and in the form stipulated in the BDS and SCC , denominated in the type and proportions of currencies in the Letter of Acceptance and in accordance with the Conditions of Contract.
	48.2	<p>If the Performance Guarantee is provided by the successful bidder and it shall be in the form specified in the BDS which shall be in any of the following:</p> <ul style="list-style-type: none"> (a) certified cheque, cashier's or manager's cheque, or bank draft; (b) irrevocable letter of credit issued by a scheduled bank of Pakistan or in the case of an irrevocable letter of credit issued by a foreign bank, the letter shall be confirmed or authenticated by a scheduled bank of Pakistan; (c) bank guarantee confirmed by a reputable local bank or, in the case of a successful foreign bidder, bonded by a foreign bank; or (d) surety bond callable upon demand issued by any reputable surety or insurance company. <p>Any Performance Guarantee submitted shall be enforceable in Pakistan.</p>
	48.3	Failure of the Most Advantageous Bidder to comply with the requirement of ITB 47 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security or declare blacklisted (in case bid securing declaration is submitted) in which event the Procuring agency/Employer may make the award to the next most advantageous bidder or reinstate the procurement process afresh (as a case may be).
49. Advance Payment	49.1	Advance payment will be provided to the bidder in percentage and in the manner as agreed by the both parties in terms of Conditions of the Contract.
	49.2	The Procuring agency/Employer will provide an advance payment as stipulated in the Conditions of Contract, subject to a maximum amount, as stated and/or Conditions of the Contract.

		The advance payment request shall be accompanied by an advance payment security (guarantee) in the form provided in Section X. For the purpose of receiving the advance payment, the bidder shall make and estimate of, and include in its bid, the expenses that will relate to the purchase of equipment, machinery, materials, and on the engagement of labor during the first month beginning with the date of the Procuring agency/Employer's "Notice to Commence" as specified in the SCC.
50. General Performance of the Bidders	50.1	The Procuring agency/Employer reserves the right to obtain information regarding performance of the bidders on their previously awarded contracts / works. The Procuring agency/Employer may seek information / report from the previous employer for consideration. However, the Procuring agency/Employer shall incorporate such parameters in the evaluation criteria and accordingly decide the fate of the bid submitted.
51. Corrupt & Fraudulent Practices	51.1	Procuring agencies (including beneficiaries of Government funded projects and procurement) as well as Bidders/Suppliers/Contractors under Government financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts, and will avoid to engage in any corrupt and fraudulent practices.

F. GRIEVANCE REDRESSAL & COMPLAINT REVIEW MECHANISM

52. Constitution of Grievance Redressal	52.1	Procuring agency/Employer shall constitute a Grievance Redressal Committee (GRC) comprising of odd number of persons with proper power and authorization to address the complaint. The GRC shall not have any of the members of Procurement Evaluation Committee. The committee must have one subject specialist depending the nature of the procurement.
53. GRC Procedure	53.1	Any party can file its written complaint against the eligibility parameters or any other terms and conditions prescribed in the prequalification or bidding documents found contrary to provision of Procurement Regulatory Framework, and the same shall be addressed by the GRC well before the bid submission deadline.
	53.2	Any bidder feeling aggrieved by any act of the Procuring agency/Employer after the submission of his bid may lodge a written complaint concerning his grievances not later than seven days of the announcement of technical evaluation report

		and five days after issuance of final evaluation report.
	53.3	In case, the complaint is filed against the technical evaluation report, the GRC shall suspend the procurement proceedings.
	53.4	In case, the complaint is filed after the issuance of the final evaluation report, the complainant cannot raise any objection on technical evaluation of the report: Provided that the complainant may raise the objection on any part of the final evaluation report in case where single stage one envelope bidding procedure is adopted.
	53.5	The GRC, in both the cases shall investigate and decide upon the complaint within ten days of its receipt.
	53.6	Any bidder or the Procuring agency/Employer not satisfied with the decision of the GRC may file Appeal before the Appellate Committee of the Authority on prescribed format after depositing the Prescribed fee.
	53.7	The Committee, upon receipt of the Appeal against the decision of the GRC complete in all respect shall serve notices in writing upon all the parties to Appeal.
	53.8	The committee shall call the record from the concerned Procuring agency/Employer or the GRC as the case may be, and the same shall be provided within prescribed time.
	53.9	The committee may after examination of the relevant record and hearing all the concerned parties, shall decide the complaint within fifteen (15) days of receipt of the Appeal.
	53.10	The decision of the Committee shall be in writing and shall be signed by the Head and each Member of the Committee. The decision of the committee shall be final.

G. MECHANISM OF BLACKLISTING

54. Mechanism of Blacklisting	54.1	The Procuring agency/Employer shall bar for not more than the time prescribed in Rule-19 of the Public Procurement Rules, 2004, from participating in their respective procurement proceedings, bidder or contractor who either: Involved in corrupt and fraudulent practices as defined in Rule-2 of Public Procurement Rules; i) Fails to perform his contractual obligations; and ii) Fails to abide by the bid securing declaration;
	54.2	The show cause notice shall contain: (a) precise allegation, against the bidder or contractor; (b) the maximum period for which the Procuring agency/Employer proposes to debar the bidder or contractor from participating in any public procurement of the Procuring agency/Employer; and (c) the statement, if needed, about the intention of the Procuring agency/Employer to make a request to the Authority for debarring the bidder or contractor from participating in public procurements of all the procuring agencies.
	54.3	The Procuring agency/Employer shall give minimum of seven days to the bidder or contractor for submission of written reply of the show cause notice.
	54.4	In case, the bidder or contractor fails to submit written reply within the requisite time, the Procuring agency/Employer may issue notice for personal hearing to the bidder or contractor/ authorize representative of the bidder or contractor and the Procuring agency/Employer shall decide the matter on the basis of available record and personal hearing, if availed.
	54.5	In case the bidder or contractor submits written reply of the show cause notice, the Procuring agency/Employer may decide to file the matter or direct issuance of a notice to the bidder or contractor for personal hearing.
	54.6	The Procuring agency/Employer shall give minimum of seven days to the bidder or contractor for appearance before the designated officer of the Procuring agency/Employer for personal hearing. The designated officer shall decide the matter on the basis of the available record and personal hearing of the bidder or contractor, if availed.

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

SECTION III: BID DATA SHEET

Bid Data Sheet (BDS)

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

BDS Clause Number	ITB Number	Amendments of, and Supplements to, Clauses in the Instruction to Bidders
A. Introduction		
1.	1.1	Name of Procuring agency/Employer: <i>KARACHI PORT TRUST.</i> The subject of procurement is: <u>MAINTENANCE / REPAIR TO FLAT NO.CB-09 APARTMENT TOWER BATHISLAND.</u> Period for completion of the works: 03 Months. Type of Procurement: National Bidding
2.	2.1	Financial year for the operations of the Procuring agency/Employer: 2025-26 Name of Project the MAINTENANCE / REPAIR TO FLAT NO.CB-09 APARTMENT TOWER BATHISLAND. Name of financing institution: Karachi Port Trust Name and identification number of the Contract: <u>MAINTENANCE / REPAIR TO FLAT NO.CB-09 APARTMENT TOWER BATHISLAND.</u>
3.	3.1	JV is not Allowed.

B. Bidding Documents

4.	7.2	The number of copies to be completed and returned is one original Bid containing all the original duly signed documents as submitted on E-PADS along with Original Pay Order of Bid Security.
5.	8.1	The clarification of bidding documents shall only be carried out through E-PADS only atleast 05 days prior to the opening of the bid.
	8.5	Pre-bid meeting will not be held.

C. Preparation of Bids

6.	10.1	The Language of all correspondences and documents related to the Bid is: English
7.	11.1 (i)	In addition to the documents stated in ITB 11 , the following documents must be included with the Bid: <ul style="list-style-type: none"> a. Copy of Valid PEC License b. Copy of FBR NTN and ATL (Latest) c. Copy of SRB Certificate and its ATL (Latest) d. Original affidavit that the firm is Not Declared Defaulter from Income Tax Authorities and is Not Blacklisted by any Reputable Organization / Authority. e. Last three years Audited Financial Statements showing a minimum turnover of Rs. 40 Million on average. f. All the documentary proof of the desired information in the Qualification criteria as stipulated in Annexure-A.
8.	15.5	The bid price shall be adjusted in accordance with Appendix C – Formula for Price Adjustment.
9.	15.6	Name of the works <u>MAINTENANCE / REPAIR TO FLAT NO.CB-09 APARTMENT TOWER BATHISLAND.</u>
10.	16.1	The currency of the Bid shall be Pak Rupees only.
11.	18.1	The Bid Validity period shall be 180 days.
12.	19.1	The amount of Bid Security shall be Rs.95,000/= The currency of the Bid Security shall be Pak Rupees only.
13.	19.3	The Bid Security shall be in the form of Pay Order in favour of the Chief Accounts Officer KPT.
14.	20.1	Alternative Bids to the requirements of the Bidding Documents (Not Applicable)
15.	20.2	If alternative scheduled for execution of work is explicitly invited (Not Applicable)
16.	22.1	The number of copies of the Bid to be completed and returned shall be 01 Original Hard Copy with Original Pay Order of Bid Security.

17.	22.2	The written confirmation of authorization to sign on behalf of the Bidder shall consist of: Either head of the Company or a designated Authorized rep and the same must have due rights conveyed through the Letter of the Owner / CEO etc of the Firm.
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D. Submission of Bids

18.	23.2 (a)	Bid shall be submitted online through EPADS and 01 Original Hard Copy shall be sent to the following address: The Chief Engineer KPT 3 rd Floor Engineering Department Karachi Port Trust Head Office Edujee Dinshaw Road Karachi Ph: +92-21-99214318
19.	23.2 (b)	Title of the subject Procurement or Project name: <u>MAINTENANCE / REPAIR TO FLAT NO.CB-09</u> <u>APARTMENT TOWER BATHISLAND.</u> ITB Title: Submission of Technical and Financial Bids (Do not open before 31-03-2026 @10:30 Hrs. Time and date for submission: 31-03-2026 @10:30 Hrs.
20.	24.1	The deadline for Bid submission is a) Day: <i>Tuesday</i> b) Date: <i>31-03-2026</i> c) Time: <i>10:30 Hrs.</i>

E. Opening and Evaluation of Bids

21.	27.1	The Bid opening shall take place at: The Committee Room of Civil Works Division, 2 nd Floor KPT Head Office, Karachi. Day: <i>Tuesday</i> Date: <i>31-03-2026</i> Time: <i>10:30 Hrs.</i>
22.	33.2	No any Foreign Currency is applicable. Bids shall only be in Pak Rupees.
23.	33.3	The bids shall be quoted in Pak Rs only.

24.	34	<p>Evaluation Techniques Least Cost Based Selection (LCBS) After meeting the requirements of eligibility, qualification and substantial responsiveness, the bid in compliance with all the mandatory (drawings/ design/ technical specifications /requirements and/or requisite quality threshold (if any), and having lowest evaluated cost (or financial proposal) shall be considered highest ranked bid.</p>
25.	34	Specific criteria in case evaluating the bids submitted by JVs and consortium to be used in the evaluation and their evaluation method or reference to the Technical Specifications. JVs are not allowed
26.	34	In case of award to a single Bidder of multiple lots; the methodology of evaluation to determine the lowest evaluated Lot combinations, in the Form of Bid is [<i>insert the methodology</i>]N/A
27.	35	<p>Preference to domestic or national suppliers or contractors shall be provided in accordance with policies of the Federal Government and/or in accordance with the regulations issued by the Authority.</p> <p><i>The percentage for the domestic preference along with calculation formula is provided in the evaluation and qualification criteria.</i></p>
28.	38.2	Sub-contracting (please insert percentage) of the total value of the contract. Not Allowed
F. Award of Contract		
29.	48	The Performance Security (or guarantee) shall be <i>10 percent Of the Contract Price.</i>
30.	48	The Performance Security (or guarantee) shall be in the form of the Pay Order in favour of the Chief Accounts Officer KPT.

G. Review of Procurement Decisions

31.	53.6	The Address of PPRA to submit a copy of appeal:
		Grievance Redressal Appellate Committee,
		Public Procurement Regulatory Authority
		1 st Floor, G-5/2, Islamabad, Pakistan
		Tel: +92-51-9202254

Section IV. Eligible Countries

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

Following countries are ineligible to participate in the procurement process:

1. India
2. Israel

Section V. Evaluation and Qualification Criteria

The Procuring agency/Employer shall evaluate the bids in accordance with predefined evaluation and qualification criteria mentioned in this document. No other factors, methods or criteria shall be used. The Bidder shall provide all the information requested in the forms included in the Bidding Forms.

Wherever a Bidder is required to state a monetary amount, Bidders should indicate the currency prescribed in the BDS. In case of foreign currency, the exchange rates shall be taken from State Bank of Pakistan on that bid opening day. Any error in determining the exchange rates in the Bid may be corrected in accordance with **ITB 32** (Correction of Arithmetic Errors)

1. Domestic Preference

If allowed in the BDS, a 7.5 % margin of preference shall be granted to domestic contractors, in accordance with policy of the Federal Government and guidelines issued by the Authority, and subject to, the following provisions:

- (a) Contractors applying for such preference shall provide, as part of the data for qualification, such information, including details of ownership, as shall be required to determine whether, according to the classification established by the Procuring agency/Employer, a particular contractor or group of contractors qualifies for a domestic preference. The bidding documents shall clearly indicate the preference and the method that will be followed in the evaluation and comparison of bids to give effect to such preference.
- (b) After bids have been received and reviewed by the Procuring agency/Employer, responsive bids shall be classified into the following groups:
 - (i) Group A: bidder eligible for the domestic preference.
 - (ii) Group B: other bidder.
- (c) All evaluated bids in each group shall, as a first evaluation step, be compared to determine the most advantageous bid, and the most advantageous bids in each group shall be further compared with each other. If, as a result of this comparison, a bid from Group A is the most advantageous, it shall be selected for the award. If a bid from Group B is the most advantageous, as a second evaluation step, all bids from Group B shall then be further compared with the most advantageous bid from Group A. For the purpose of this further comparison only, the percentage of price preference of the respective bid price corrected for arithmetical errors, shall be added to the evaluated price offered in each bid from Group B. If the bid from Group A is the most advantageous, it shall be selected for award. If not, the most advantageous bid from Group B based on the first evaluation step shall be awarded the contract.

Evaluation

In addition to the criteria listed in **ITB 34.3** the following criteria shall be applied for the evaluation of bids:

2.1 Assessment of adequacy of Technical Proposal with Requirements

Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated in Section V Works Requirements.

Qualification Criteria

Eligibility and Qualification Criteria				
No.	Subject	Requirement	Single Entity	Submission Requirements
1.1	Nationality	Nationality in accordance with ITB 4.3	Must meet requirement	Forms ELI – 1.1 and 1.2, with attachments
1.2	Conflict of Interest	No conflicts of interest in accordance with ITB 3.7	Must meet requirement	Letter of Bid
2.1	History of Non-Performing Contracts	Non-performance of a contract did not occur as a result of contractor default since. Affidavit shall be on E-Stamp Paper.	Must meet requirement	Form CON-2
2.2	Pending Litigation	Affidavit regarding No Litigation shall be on E-Stamp Paper.	Must meet requirement	Form CON – 2
2.3	Litigation History	No consistent history of court/arbitral award decisions against the Bidder since 1 st January 2015	Must meet requirement	Form CON – 2
3.2	Average Annual Construction Turnover	The audited financial statements showing a minimum turnover of Rs. 40 Million on average for last three years.	Must meet requirement	Form FIN – 3.2
4.1 (a)	General Construction Experience	The Firm must have possess experience of atleast 10 years and the year of establishment for the same must indicate a time span of establishment of firm atleast 10 yrs ago.	Must meet requirement	Form EXP – 4.1
4.2 (a)	Specific Construction & Contract Management Experience	Having successfully completed atleast 01 Project of Civil Works having worth of atleast Rs. 20 Million completed in last 10 years.	Must meet requirement	Form EXP 4.2(a)

Contractor’s Representative and Key Personnel

The Bidder must demonstrate that it will have a suitably qualified Contractor’s Representative and suitably qualified (and in adequate numbers) Key Personnel, as described in the Specification.

The Bidder shall provide details of the Representative and Key Personnel and such other Key Personnel that the Bidder considers appropriate to perform the Contract, together with their academic qualifications and work experience. The Bidder shall complete the relevant Forms in the Bidding Forms.

Equipment

The Bidder must demonstrate that it has access to the key equipment listed hereafter:

[Specify requirements for each lot as applicable]

No.	Equipment Type and Characteristics	Minimum Number required
1		
2		
3		
4		
5		

The Bidder shall provide further details of proposed items of equipment using Form EQU in Section V.

**SECTION V: WORKS REQUIREMENT, TECHNICAL
SPECIFICATIONS, DRAWINGS, SUPPLEMENTARY INFORMATION
AND BILL OF QUANTITIES**

Scope of Works

MAINTENANCE / REPAIR TO FLAT NO.CB-09 **APARTMENT TOWER BATHISLAND.**

- Dismantling & Chiseling Tile / Marble.
- Providing & Fixing White / Colored Tiles.
- Providing & Fixing Artificial Wood Kitchen Cabinets.
- Providing & Fixing Plastic Coated.
- Providing & Fixing Bathroom Accessories.
- Coloring / Painting Works.

Technical Proposal

- **Site Organization**
- **Method Statement**
- **Mobilization Schedule**
- **Construction Schedule**
- **Equipment**

Site Organization

Method Statement

Mobilization Schedule

In accordance with the Particular Conditions, Sub-Clause 4.1, the Contractor shall not carry out mobilization to Site unless the Engineer gives consent.

Construction Schedule

Form EQU: Equipment

The Bidder shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in Section III, Evaluation and Qualification Criteria. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.

Item of equipment		
Equipment information	Name of manufacturer	Model and power rating
	Capacity	Year of manufacture
Current status	Current location	
	Details of current commitments	
Source	Indicate source of the equipment <input type="checkbox"/> Owned <input type="checkbox"/> Rented <input type="checkbox"/> Leased <input type="checkbox"/> Specially manufactured	

Omit the following information for equipment owned by the Bidder.

Owner	Name of owner	
	Address of owner	
	Telephone	Contact name and title
	Fax	Telex
Agreements	Details of rental / lease / manufacture agreements specific to the project	

SECTION VI: STANDARD BIDDINGFORMS

Table of Forms

Letter of Bid - Technical Proposal	67
Letter of Bid - Financial Proposal	69
Bidder Information Form	71
Bidder's JV Members Information Form	72
Personnel	73
Financial Situation	79
EXPERIENCE	84
Form of Bid Security	90
Form of Bid-Securing Declaration	92
Appendix-A	93
The Base Date Prices and Current Date Prices of the specified elements shall be obtained from the sources specified in the contract.	97
.....	

Letter of Bid – Technical Proposal

Date of this Bid submission: *[insert date (as day, month and year) of Bid submission]*

RFB No.:

Alternative No.: N/A

To:

**The Chief Engineer
Karachi Port Trust**

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

In submitting our Bid we make the following declarations:

- (a) **No reservations:** We have examined and have no reservations to the bidding document, including addenda issued in accordance with Instructions to Bidders (**ITB 9**);
- (b) **Eligibility:** We meet the eligibility requirements and have no conflict of interest in accordance with ITB 3;
- (c) **Bid/Proposal-Securing Declaration:** We have not been suspended nor declared ineligible by the Procuring agency/Employer based on execution of a Bid Securing Declaration or Bid Securing Declaration in the Procuring agency/Employer's country in accordance with **ITB 3**;
- (d) **Conformity:** We offer to execute works in conformity with the bidding document and in accordance with the works requirements: **MAINTENANCE / REPAIR TO FLAT NO.CB-09 APARTMENT TOWER BATHISLAND** comprising all the sub structure, super-structure and finishing works in all respects;
- (e) **Bid Validity Period:** Our Bid shall be valid for the period specified in **BDS 18.1** (as amended, if applicable) from the date fixed for the Bid submission deadline specified in **BDS 24.1** (as amended, if applicable), and it shall remain binding upon us, and may be accepted at any time before the expiration of that period;
- (f) **Performance Security:** If our Bid is accepted, we commit to obtain a performance security in accordance with the bidding document;
- (g) **One Bid per Bidder:** We are not submitting any other Bid(s) as an individual Bidder, and were not participating in any other bid(s) as a Joint Venture member or as a subcontractor, and meet the requirements, other than Alternative Bids submitted in accordance with **ITB 20**;
- (h) **Suspension and Debarment:** We, along with any of our subcontractors, suppliers, consultants, manufacturers, or service providers for any part of the contract, are not subject to, and not controlled by any entity or individual that is subject to, a temporary suspension or a debarment imposed by the Procuring agency/Employer. Further, we are not ineligible under Pakistan laws;
- (i) **State-owned enterprise or institution:** *[select the appropriate option and delete the other] [We are not a state-owned enterprise or institution] / [We are a state-owned enterprise or institution];*

- (j) **Binding Contract:** We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed;
- (k) **Not Bound to Accept:** We understand that you are not bound to accept the Most Advantageous Bid or any other Bid that you may receive; and
- (l) **Fraud and Corruption:** We hereby certify that we have taken steps to ensure that no person acting for us, or on our behalf, engages in any type of Fraud and Corruption.

Name of the Bidder: *[insert complete name of Bidder]

Country of Origin of the Bidder: [insert country of origin, in case of JV country of origin of lead member]

Name of the person duly authorized to sign the Bid on behalf of the Bidder: ** [insert complete name of person duly authorized to sign the Bid]

Title of the person signing the Bid: [insert complete title of the person signing the Bid]

Signature of the person named above: [insert signature of person whose name and capacity are shown above]

Date signed [insert date of signing] **day of** [insert month], [insert year]

*: In the case of the Bid submitted by a Joint Venture specify the name of the Joint Venture as Bidder.

** : Person signing the Bid shall have the power of attorney given by the Bidder. The power of attorney shall be attached with the Bid Schedules.

Letter of Bid - Financial Proposal

Date of this Bid submission: *[insert date (as day, month and year) of Bid submission]*

Request for Bid No.:

Name of Project.: MAINTENANCE / REPAIR TO FLAT NO.CB-09 APARTMENT TOWER BATHISLAND.

Alternative No.: N/A

To:

The Chief Engineer

Karachi Port Trust

We, the undersigned Bidder, hereby submit the second part of our Bid, the Financial Proposal

In submitting our Financial Proposal we make the following additional declarations:

- (a) **Bid Validity Period:** Our Bid shall be valid for the period specified in **BDS 18.1** (as amended, if applicable) from the date fixed for the bid submission deadline specified in **BDS 24.1** (as amended, if applicable), and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (b) **Total Price:** The total price of our Bid is:

In case of only one lot, the total price of the Bid is *[insert the total price of the bid in words and figures, indicating the various amounts and the respective currencies]*;

- (c) **Commissions, gratuities and fees:** We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract: *[insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount and currency of each such commission or gratuity]*.

Name of Recipient	Address	Reason	Amount

(If none has been paid or is to be paid, indicate “none.”)

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

Name of the Bidder:**[insert complete name of the Bidder]*

Name of the person duly authorized to sign the Bid on behalf of the Bidder: ** *[insert complete name of person duly authorized to sign the Bid]*

Title of the person signing the Bid: *[insert complete title of the person signing the Bid]*

Signature of the person named above: *[insert signature of person whose name and capacity are shown above]*

Date signed *[insert date of signing]* **day of** *[insert month]*, *[insert year]*

*: In the case of the Bid submitted by a Joint Venture specify the name of the Joint Venture as Bidder.

** : Person signing the Bid shall have the power of attorney given by the Bidder. The power of attorney shall be attached with the Bid Schedules.

FORM ELI 1

Bidder Information Form

[The Bidder shall fill in this Form in accordance with the instructions indicated below. No alterations to its format shall be permitted and no substitutions shall be accepted.]

Date: *[insert date (as day, month and year) of Bid submission]*

RFB No.: *[insert number of Bidding process]*

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

Page _____ of _____ pages

1. Bidder's Name <i>[insert Bidder's legal name]</i>
2. In case of JV, legal name of each member : <i>[insert legal name of each member in JV]</i>
3. Bidder's actual or intended country of registration: <i>[insert actual or intended country of registration]</i>
4. Bidder's year of registration: <i>[insert Bidder's year of registration]</i>
5. Bidder's Address in country of registration: <i>[insert Bidder's legal address in country of registration]</i>
6. Bidder's Authorized Representative Information Name: <i>[insert Authorized Representative's name]</i> Address: <i>[insert Authorized Representative's Address]</i> Telephone/Fax numbers: <i>[insert Authorized Representative's telephone/fax numbers]</i> Email Address: <i>[insert Authorized Representative's email address]</i>
7. Attached are copies of original documents of <i>[check the box(es) of the attached original documents]</i> <input type="checkbox"/> Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above. <input type="checkbox"/> In case of JV, JV agreement, in accordance with ITB 3.3. <input type="checkbox"/> Establishing that the Bidder is not under the supervision of the Procuring agency/Employer[in case of subsidiaries]
8. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

ELI2

Bidder's JV Members Information Form

NOT APPLICABLE

[The Bidder shall fill in this Form in accordance with the instructions indicated below. The following table shall be filled in for the Bidder and for each member of a Joint Venture]].

Date: *[insert date (as day, month and year) of Bid submission]*

RFB No.: *[insert number of RFB process]*

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

Page _____ of _____ pages

1. Bidder's Name: <i>[insert Bidder's legal name]</i>
2. Bidder's JV Member's name: <i>[insert JV's Member legal name]</i>
3. Bidder's JV Member's country of registration: <i>[insert JV's Member country of registration]</i>
4. Bidder's JV Member's year of registration: <i>[insert JV's Member year of registration]</i>
5. Bidder's JV Member's legal address in country of registration: <i>[insert JV's Member legal address in country of registration]</i>
6. Bidder's JV Member's authorized representative information Name: <i>[insert name of JV's Member authorized representative]</i> Address: <i>[insert address of JV's Member authorized representative]</i> Telephone/Fax numbers: <i>[insert telephone/fax numbers of JV's Member authorized representative]</i> Email Address: <i>[insert email address of JV's Member authorized representative]</i>
7. Attached are copies of original documents of <i>[check the box(es) of the attached original documents]</i> <input type="checkbox"/> Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above.
8. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Personnel

Form PER -1

Contractor's Representative and Key Personnel Schedule

Bidders should provide the names and details of the suitably qualified Contractor's Representative and Key Personnel to perform the Contract. The data on their experience should be supplied using the Form PER-2 below for each candidate.

Contractor' Representative and Key Personnel

1.	Title of position:	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
2.	Title of position:	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
3.	Title of position:	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>

	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
4.	Title of position:	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
5.	Title of position:	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
6.	Title of position: <i>[insert title]</i>	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>

**Form PER-2: Resume
and Declaration
Contractor's Representative and Key Personnel**

Name of Bidder

Position [#1]: [title of position from Form PER-1]											
Personnel information	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">Name:</td> <td style="width: 50%; padding: 5px;">Date of birth:</td> </tr> <tr> <td style="padding: 5px;">Address:</td> <td style="padding: 5px;">E-mail:</td> </tr> <tr> <td colspan="2" style="padding: 5px;">Professional qualifications:</td> </tr> <tr> <td colspan="2" style="padding: 5px;">Academic qualifications:</td> </tr> <tr> <td colspan="2" style="padding: 5px;">Language proficiency:<i>[language and levels of speaking, reading and writing skills]</i></td> </tr> </table>	Name:	Date of birth:	Address:	E-mail:	Professional qualifications:		Academic qualifications:		Language proficiency: <i>[language and levels of speaking, reading and writing skills]</i>	
Name:	Date of birth:										
Address:	E-mail:										
Professional qualifications:											
Academic qualifications:											
Language proficiency: <i>[language and levels of speaking, reading and writing skills]</i>											
details	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="padding: 5px;">Address of Procuring agency/Employer:</td> </tr> <tr> <td style="width: 50%; padding: 5px;">Telephone:</td> <td style="width: 50%; padding: 5px;">Contact (manager / personnel officer):</td> </tr> <tr> <td style="padding: 5px;">Fax:</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">Job title:</td> <td style="padding: 5px;">Years with present Procuring agency/Employer:</td> </tr> </table>	Address of Procuring agency/Employer:		Telephone:	Contact (manager / personnel officer):	Fax:		Job title:	Years with present Procuring agency/Employer:		
Address of Procuring agency/Employer:											
Telephone:	Contact (manager / personnel officer):										
Fax:											
Job title:	Years with present Procuring agency/Employer:										

Summarize professional experience in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

Project	Role	Duration of involvement	Relevant experience
<i>[main project details]</i>	<i>[role and responsibilities on the project]</i>	<i>[time in role]</i>	<i>[describe the experience relevant to this position]</i>

Declaration

I, the undersigned [*insert either "Contractor's Representative" or "Key Personnel" as applicable*], certify that to the best of my knowledge and belief, the information contained in this Form PER-2 correctly describes myself, my qualifications and my experience.

I confirm that I am available as certified in the following table and throughout the expected time schedule for this position as provided in the Bid:

Commitment	Details
Commitment to duration of contract:	[<i>insert period (start and end dates) for which this Contractor's Representative or Key Personnel is available to work on this contract</i>]
Time commitment:	[<i>insert period (start and end dates) for which this Contractor's Representative or Key Personnel is available to work on this contract</i>]

I understand that any misrepresentation or omission in this Form may:

- (a) be taken into consideration during Bid evaluation;
- (b) result in my disqualification from participating in the Bid;
- (c) result in my dismissal from the contract.

Name of Contractor's Representative or Key Personnel: [*insert name*]

Signature: _____

Date: (day month year): _____

Countersignature of authorized representative of the Bidder:

Signature: _____

Date: (daymonthyear): _____

Form CON – 2

Historical Contract Non-Performance, Pending Litigation and Litigation History

Bidder's Name: _____

Date: _____

JV Member Name _____

ICB/NCB No. and title: _____

Page _____ of _____ pages

Non-Performed Contracts in accordance with Qualification Criteria			
<input type="checkbox"/> Contract non-performance did not occur January [<i>insert year</i>] <input type="checkbox"/> Contract(s) not performed since [<i>insert year</i>]			
Year	Non-performed portion of contract	Contract Identification	Total Contract Amount (current value, currency, exchange rate and PKR equivalent)
		Contract Identification: Name of Procuring agency/Employer(PA): Address of PA: Reason(s) for nonperformance:	
Pending Litigation, in accordance with Qualification Criteria			
<input type="checkbox"/> No pending litigation <input type="checkbox"/> Pending litigation			

Year of dispute	Amount in dispute (currency)	Contract Identification	Total Contract Amount
		Contract Identification: _____ Name of PA: _____ Address of PA: _____ Matter in dispute: _____ Party who initiated the dispute: _____ Status of dispute: _____	
Litigation History in accordance with Section III, Evaluation and Qualification Criteria of the Prequalification document			
<input type="checkbox"/> No Litigation History <input type="checkbox"/> Litigation History			
Year of award	Outcome as percentage of Net Worth	Contract Identification	Total Contract Amount (currency), PKR Equivalent (exchange rate)
<i>[insert year]</i>	<i>[insert percentage]</i>	Contract Identification: <i>[indicate complete contract name, number, and any other identification]</i> Name of PA: <i>[insert full name]</i> Address of PA: <i>[insert street/city/country]</i> Matter in dispute: <i>[indicate main issues in dispute]</i> Party who initiated the dispute: <i>[indicate "Procuring agency/Employer" or "Contractor"]</i> Reason(s) for Litigation and award decision <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>

Financial Situation

Form FIN – 3.1:

Financial Situation and Performance NOT APPLICABLE

Bidder's Name: _____

Date: _____

JV Member's Name _____

ICB No. and title: _____

Page _____ of _____ pages

1. Financial data

Type of Financial information in (currency)	Historic information for previous _____ years, (amount in currency, currency, exchange rate*, PKR equivalent)				
	Year 1	Year 2	Year 3	Year 4	Year 5
Statement of Financial Position (Information from Balance Sheet)					
Total Assets (TA)					
Total Liabilities (TL)					
Total Equity/Net Worth (NW)					
Current Assets (CA)					
Current Liabilities (CL)					
Working Capital (WC)					
Information from Income Statement					
Total Revenue (TR)					
Profits Before Taxes (PBT)					
Cash Flow Information					
Cash Flow from Operating Activities					

*Refer to ITB 16 for the exchange rate

2. Sources of Finance

Specify sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments.

No.	Source of finance	Amount (PKR)
1		
2		
3		

2. Financial documents

The Bidder and its parties shall provide copies of financial statements for _____ years pursuant to Evaluation and Qualifications Criteria, Sub-factor 3.1. The financial statements shall:

- (a) reflect the financial situation of the Bidder or in case of JV member, and not an affiliated entity (such as parent company or group member).
- (b) be independently audited or certified in accordance with local legislation.
- (c) be complete, including all notes to the financial statements.
- (d) correspond to accounting periods already completed and audited.

Attached are copies of financial statements for the _____ years required above; and complying with the requirements

Form FIN – 3.2:

Average Annual Construction Turnover

Bidder's Name: _____

Date: _____

JV Member's Name _____

ICB/NCB No. and title: _____

Page _____ of _____ pages

		Annual turnover data (construction only)	
Year	Amount Currency	Exchange rate	PKR equivalent
<i>[indicate year]</i>	<i>[insert amount and indicate currency]</i>		
Average Annual Construction Turnover *			

* See Section III, Evaluation and Qualification Criteria.

Form FIN – 3.3:

Financial Resources

Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total construction cash flow demands of the subject contract or contracts as specified in Section (Evaluation and Qualification Criteria)

Financial Resources		
No.	Source of financing	Amount
1		
2		
3		

Form FIN – 3.4:

Current Contract Commitments / Works in Progress

Bidders and each member to a JV should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.

Current Contract Commitments					
No.	Name of Contract	Procuring agency/Employer's Contact Address, Tel, Fax	Value of Outstanding Work [PKR Equivalent]	Estimated Completion Date	Average Monthly Invoicing Over Last Six Months [PKR/month]
1					
2					
3					
4					
5					

EXPERIENCE

Form EXP - 4.1

General Construction Experience

Bidder's Name: _____

Date: _____

JV Member's Name _____

ICB/NCB No. and title: _____

Page _____ of _____ pages

Starting Year	Ending Year	Contract Identification	Role of Bidder
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of PA: _____ Address: _____	
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of PA: _____ Address: _____	
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of PA: _____ Address: _____	

Form EXP - 4.2(a)

**Specific Construction and Contract Management
Experience**

Bidder's Name: _____

Date: _____

JV Member's Name _____

ICB/NCB No. and title: _____

Page _____ of _____ pages

Similar Contract No.	Information			
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor <input type="checkbox"/>	Member in JV <input type="checkbox"/>	Management Contractor <input type="checkbox"/>	Sub-contractor <input type="checkbox"/>
Total Contract Amount			PKR Equivalent	
If member in a JV or sub-contractor, specify participation in total Contract amount				
PA's Name:				
Address:				
Telephone/fax number				
E-mail:				

Form EXP - 4.2(a) (cont.)
Specific Construction and Contract Management
Experience (cont.)

Similar Contract No.	Information
Description of the similarity in accordance with Sub-Factor 4.2(a) of Section III:	
1. Amount	
2. Physical size of required works items	
3. Complexity	
4. Methods/Technology	
5. Construction rate for key activities	
6. Other Characteristics	

Form EXP - 4.2(b)

Construction Experience in Key Activities

Bidder's Name: _____

Date: _____

Bidder's JV Member Name: _____

Sub-contractor's Name¹ (as per ITB 34.2 and 34.3): _____

ICB/NCB No. and title: _____

Page _____ of _____ pages

All Sub-contractors for key activities must complete the information in this form as per ITB 38 and Qualification Criteria and Requirements, Sub-Factor 4.2.

1. Key Activity No One: _____

Information				
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor <input type="checkbox"/>	Member in JV <input type="checkbox"/>	Management Contractor <input type="checkbox"/>	Sub-contractor <input type="checkbox"/>
Total Contract Amount	PKRequivalent			
Quantity (Volume, number or rate of production, as applicable) performed under the contract per year or part of the year	Total quantity in the contract (i)	Percentage participation (ii)		Actual Quantity Performed (i) x (ii)
Year 1				
Year 2				
Year 3				
Year 4				

¹ If applicable

	Information
PA's Name:	
Address:	
Telephone/fax number	
E-mail:	

2. Activity No. Two

3.

	Information
Description of the key activities in accordance with Section III:	

Form EXP - 4.2 (c) NOT APPLICABLE

Specific Experience in Managing ES aspects

[The following table shall be filled in for contracts performed by the Bidder, and each member of a Joint Venture]

Bidder's Name: *[insert full name]*
 Date: *[insert day, month, year]*
 Joint Venture Member Name: *[insert full name]*
 ICB/NCB No. and title: *[insert ICB/NCB number and title]*
 Page *[insert page number]* of *[insert total number]* pages

1. Key Requirement no 1 in accordance with 4.2 (c): _____

Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor <input type="checkbox"/>	Member in JV <input type="checkbox"/>	Management Contractor <input type="checkbox"/>	Subcontractor <input type="checkbox"/>
Total Contract Amount			PKR	
Details of relevant experience				

2. Key Requirement no 2 in accordance with 4.2 (c): _____

3. Key Requirement no 3 in accordance with 4.2 (c): _____

4. ...

Appendix-A

Form of Bid Security

(Bank Guarantee) **NOT APPLICABLE**

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

[Guarantor letterhead or SWIFT identifier code]

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

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

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

Date: *[Insert date of issue]*

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

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

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

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

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

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

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

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

[Signature(s)]

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

Appendix-B

Form of Bid-Securing Declaration

NOT APPLICABLE

[The Bidder shall fill in this Form in accordance with the instructions indicated.]

Date: *[date (as day, month and year)]*

No.: *[number of bidding process]*

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

To: *[complete name of Procuring agency/Employer]*

We, the undersigned, declare that:

We understand that, according to your conditions, Bids must be supported by a Bid-Securing Declaration.

We accept that we will be blacklisted and henceforth cross debarred for participating in respective category of public procurement proceedings for a period of (not more than) six months, if fail to abide with a bid securing declaration, however without indulging in corrupt and fraudulent practices, if we are in breach of our obligation(s) under the Bid conditions, because we:

- (a) have withdrawn our Bid during the period of Bid validity specified in the Letter of Bid; or
- (b) having been notified of the acceptance of our Bid by the Procuring agency/Employer during the period of Bid validity, (i) fail or refuse to sign the Contract; or (ii) fail or refuse to furnish the Performance Security (or guarantee), if required, in accordance with the ITB.

We understand this Bid Securing Declaration shall expire if we are not the successful Bidder, upon the earlier of (i) our receipt of your notification to us of the name of the successful Bidder; or (ii) twenty-eight days after the expiration of our Bid.

Name of the Bidder* _____

Name of the person duly authorized to sign the Bid on behalf of the Bidder** _____

Title of the person signing the Bid _____

Signature of the person named above _____

Date signed _____ day of _____, _____

*: In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder

** : Person signing the Bid shall have the power of attorney given by the Bidder attached to the Bid

[Note: In case of a Joint Venture, the Bid-Securing Declaration must be in the name of all members to the Joint Venture that submits the Bid.]

Appendix-C

Formula for Price Adjustment

[Note to Procuring agency/Employer: It is recommended that in the case of very large and/or complex works contracts, it may be necessary to specify several families of price adjustment formulae corresponding to the different works involved. **When finalizing the contract document, ensure that the finalized Schedule of Cost Indexation is attached to the Contract Agreement.**]

S. No.	Items	Weightage
1	Fixed Portion	0.25
2	Skilled Labour	0.15
3	Cement	0.10
4	Steel	0.10
5	Aggregates	0.10
6	Blocks	0.10
7	Pavers	0.05
8	Bitumen	0.10
9	HSD	0.05
	Total	1.00

- a) Price Adjustment/ escalation shall not be applicable on Civil, Mechanical and Electrical projects /contracts having contract life less than 365 days from the date of the signing of the contract.
- b) Procuring Agency/Employer is advised not to change any provisions hereof unless otherwise stated by the Authority.

- c) No method, other than given in this formula will be applicable to compute the price adjustment.
- d) This document will be applicable only for Price Adjustment in local currency (Pak. Rs.). Price Adjustment in foreign currency is not allowed.
- e) Price Adjustment formula and corresponding references to be inferred for price adjustment shall be agreed and firmed up before signing of the contract. Procuring agency and contractor shall firm up the weightages and co-efficient for respective items before signing of the contract and there shall be no change permissible in the weightages after signing of the contract.
- f) For imported plant/ equipment and materials quoted in local currency (Pak. Rs.), foreign currency, exchange rates shall be fixed at the respective interbank currency exchange rates, 28 days prior to the tender opening date. The change in foreign currency exchange rate will be applicable to the foreign currency component stated in the Letter of Credit established by the Contractor or his Vendor.
- g) This procedure is to assist the Procuring agency/Employer and bidder for the preparation of provisions for price adjustment in their bidding / contract documents. All the coefficients of the price adjustment formula shall be specified in the bidding document at the time of advertisement.

[The formulae for price adjustment shall be of the following general type:]

$$P_n = A + b \frac{L_n}{L_o} + c \frac{M_n}{M_o} + d \frac{E_n}{E_o} + \dots$$

where,

“**P_n**” is the Price Adjustment factor for the work carried out in the period “n”.

“**A**” is a constant or the Non-Adjustable Portion of the Price Adjustment Factor to be specified in Appendix-C to Bid, representing the Non-Adjustable Portion of the Contract Price.

“**b,c,d,.....**” are Coefficients or weightages of the order of 0.xx (i.e., fractions rounded off to two decimals) for each specified element of adjustment in the Contract. The sum of **A, b, c, d, etc.**, shall be one.

“**L_n**”, “**E_n**”, “**M_n**”, ... are the current cost indices or reference prices for period “n”, expressed in the relevant currency of payment, each of which is applicable to the relevant

tabulated cost element on the date 28 days prior to the last day of the period (to which the particular Payment Certificate relates); and

“Lo”, “Eo”, “Mo”, ... are the base cost indices or reference prices, expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the Base Date.

1. Construction schedule should be provided by the contractor as required in the Contract. Price Adjustment shall be applicable as payable in full for the original scheduled completion period.
2. In the event the completion of contract exceeds the original scheduled period:
 - 2.1 In case of default on the part of the contractor causing delay in original scheduled completion, the rate of Price Adjustment will be frozen at the original scheduled date of completion; however Price Adjustment will be applicable till actual completion. While computing Price Adjustment beyond the scheduled completion period, in the event the rate is reduced, then that reduced rate will be applied.
3. The Price Adjustment will be payable in full for the extended period if the contractor has been granted an extension of time for no fault on the part of the contractor, duly approved by the Employer.
4. Unless specifically stated otherwise in the contract, the basis for compensation will be only those elements, which are specifically listed as specified items in the tender documents. This list will specify the elements for Civil, Electrical, Mechanical, Sanitary, HVAC, etc., separately.
5. Formula for Price Adjustment provided herein will be applicable for all the contracts such as Civil, Electrical, Mechanical, etc.
6. There shall be no Price Adjustment for the elements which the Employer has either supplied free of cost or at fixed prices as well as for those elements for which an umbrella *exgratia* or escalation cover is provided by the Government through an Executive Order or Statutory Regulatory Order (SRO).

Weightages of Specified Items

Each of the cost elements, having cost impact of five (05) percent or higher can be selected for adjustment.

In determining the weightages, the following procedure shall be adopted:

- a) Base Date Price alone of an element based on market rate shall be considered excluding cost of construction/ installation, overheads and profit.
- b) Engineer's Estimate shall be prepared for complete project.
- c) Appropriate Rate Analysis of the Engineer's Estimate shall be made to determine costs of the basic elements.
- d) For such cost elements having various types of a particular element, individual cost of such family of the element used in the project to be determined and added to work out the element cost. (Grade-40 and Grade-60 steel shall be treated under same category).
- e) Each cost element determined as above, shall be divided by the total amount of Engineer's Estimate to determine various weightages.

Weightage of Fixed Portion

Weightage of fixed portion (Non-adjustable portion of the estimated cost of the contract), shall be determined as under:

- a) First the weightages of all the cost elements having value of five (5) percent or more to be added up to see whether the total is 75 percent or less. In that case the total is to be subtracted from one (01) to determine the weightage of the fixed portion,
- b) In case total weightage of the cost elements including HSD and labour exceeds 75 percent, the element(s) having lowest weightage(s) other than HSD and labour, shall be excluded in considering the adjustable costs elements.
- c) Fixed portion shall be 25 percent and in case the fixed portion exceeds 25 percent it shall be supported by calculations attached with the bidding documents.
- d) Sum of fixed portion and weightages b, c, d, ...etc., of the adjustable portion shall always be one (01).

Base Date Price

The base date price (or base date index) of any element shall be the price of the element for the month on the day falling 28 days prior to the last day for submission of bids.

Current Date Price

The current date price (or current date index) of any element shall be the price of the element for the month falling on the day 28 days prior to the last day of the period to which the particular Payment Certificate relates.

Sources of Prices

The prices of elements subject to Price Adjustment shall be to the extent possible as given in the Statistical Bulletins published by Federal Bureau of Statistics (FBS), Statistical Division Government of Pakistan. Statutory notifications and official price from public sector organizations, where available, may be used at the option of the Employer. The source for prices of High Speed Diesel (HSD) shall be either Statistical Bulletins or Pakistan State Oil (PSO) or Oil and Gas Regulatory Authority (OGRA). However, for a particular adjustable element, the same source should be used throughout the currency of contract as also stipulated in the tender documents before issuing the tender documents.

The Base Date Prices and Current Date Prices of the specified elements shall be obtained from the sources specified in the contract.

Method for payment of bills

The billed amount of the Works for each calendar month will be obtained from the checked bills submitted by the Contractor. In case the billed amount is for more than one month, the amount of the bill shall be segregated for actual work done in each month.

Coefficient or Weightages

- a) The coefficient for each specified element shall be calculated and given in the bidding/tender documents. The coefficient for each specified adjustable element shall be determined by the user proportionate to its ratio in the total amount of the Engineer's Estimate, in accordance with the prescribed procedure. The sum of these coefficients shall form the adjustable portion of the Contract, which shall not exceed 0.75.
- b) Coefficients for each adjustable item shall be agreed by both parties and shall be fixed and locked at the time of the signing of the contract and shall remain constant during the currency of the contract.

Section VIII. General Conditions (GC)

Red Book:

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

An original copy of the above FIDIC publication i.e. “*Conditions of Contract for Building and Engineering Works Designed by the Employer*” must be obtained from FIDIC.

International Federation of Consulting Engineers (FIDIC)

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Section IX. Special Conditions of the Contract

Special Conditions of the Contract

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

Part A – Contract Data

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

SCC Clause Number	GCC Clause Number	Amendments of, and Supplements to, Clauses in the GCC
General Provision (GCC 1)		
1.	1.3	<p>For notices</p> <p>Procuring agency/Employer/ Engineer’s Authorized representatives name and address: The Chief Engineer Karachi Port Trust 2nd Floor Engineering Department, KPT Head Office, Karachi.</p> <p>Contractors Authorized representatives name and address:</p>
2.	1.4	<p>Governing Law;</p> <p>The Applicable Law shall be: Local / Municipal Laws of the Pakistan</p>
3.	1.4 1.1.27	<p>Communication Language:</p> <p>The Communication Language shall be: English</p> <p>The Defects Notification period shall be 365 days from the date of completion of the works.</p>
4.	1.5	<p>Documents forming the contract listed:</p> <ol style="list-style-type: none"> 1. Form of Agreement 2. ITB and BDS 3. Letter of Bid 4. General Conditions of the Contract 5. Particular Conditions of the Contract 6. Special Provisions 7. Technical Specifications 8. BOQ 9. Drawings etc.

The Employer/ Procuring agency/Employer (GCC Clause 2)		
5.	2.1	Time for access to the Site: 05 days after Commencement Date
The Engineer (GCC Clause 3)		
6.	3.2	Engineer's Duties and Authority: Variations resulting in an increase of the Accepted Contract Amount in excess of <u>15 %</u> shall require approval of the Procuring agency/Employer.
The Contractor (GCC Clause 4)		
7.	4.2	Performance guarantee/ security will be in the form of a pay order in favour of the Chief Accounts Officer KPT in the amount of 10% of the Contract Price.
8.	4.7.2(a)	Clause 4.7 Setting out Period for notification of errors in the items of reference <i>28 days</i>
9.	4.22	Contractor's Operations on site On Site as per the requirements of BOQ.
Sub-Contracting (GCC Clause 5)		
10.	5.1(a)	Maximum allowable accumulated value of work subcontracted (as a percentage of the Accepted Contract Amount)
11.	5.1 (b)	Deleted in its entirety
Staff and Labour (GCC Clause 6)		
12.	6.5	Normal working hours 8 Hrs per day. 06 days a week.
Plant, Material and Workmanship (GCC Clause 7)		
13.	7.2	Samples as per requirement prior to testing
Commencement, Delays and Suspension (GCC Clause 8)		
14.	8.3	Number of additional paper copies of program 04 copies.
15.	8.8	Delay damages shall be payable for each day of delay shall be 0.1 % of the Contract Price per day, in the currency and proportions in which the Contract Price is payable. Maximum amount of delay damages is 10% of the Contract Price
Measurement and Valuation (GCC Clause 12)		
16.	12.2	Method of measurement shall be as per BOQ. Except as otherwise stated in the Contract, measurement shall be made of the net actual quantity of each item of the Permanent Works and no allowance shall be made for bulking, shrinkage or waste]
17.	12.3	Percentage profit NOT APPLICABLE
Variations and Adjustments (GCC Clause 13)		

18.	13.4 (b)(ii)	Percentage rate to be applied to Provisional Sums for overhead charges and profit is 15%.
19.	13.7	Adjustments for Changes in Cost: The Contract Price shall be fixed during Contract Execution.
Contract Price and Payment (GCC Clause 14)		
20.	14.2	Advance Payment Deleted in its Entirety
21.	14.2.3	Repayment of Advance payment: Deleted in its Entirety
22.	14.3(iii)	Percentage of retention: 5% Limit of Retention Money 10%
23.	14.5(b)(i)	Plant and Materials: If Sub-Clause 14.5 applies: Plant and Materials for payment when shipped NOT APPLICABLE.
24.	14.5(c)(i)	Plant and Materials: Plant and Materials for payment when delivered to the Site shall be done in accordance with the BOQ.
25.	14.6.2	Withholding (amounts in) an IPC 05% of the Accepted Contract Amount.
26.	14.7(a)	Period of payment of Advance Payment to the Contractor Deleted in its entirety.
27.	14.7b(i)	Period for the Procuring agency/Employer to make interim payments to the Contractor under Sub-Clause 14.6 (interim Payment) 30 days.
28.	14.7b(ii)	Period for the Procuring agency/Employer to make interim payments to the Contractor under Sub-Clause 14.13 (Final Payment) 60days
29.	14.7(c)	Period for the Procuring agency/Employer to make final payment to the Contractor 60days

30.	14.8	financing charges for delayed payment (percentage points above the average bank short-term lending rate as referred to under subparagraph (a)) %DELETED IN ITS ENTIRITY
31.	14.11.1(b)	Number of additional paper copies of draft Final Statement 04 copies
32.	14.15	Currencies of Payment The Contract Price shall be paid in the local currency only (Pak Rupees.)
33.	14.15 (a)(i)	The proportions or amounts of the Local and Foreign Currencies, and the fixed rates of exchange to be used for calculating the payments, shall be as stated in the Contract Data, except as otherwise agreed by both parties.
34.	14.15 (c)	Payment of Delay Damages shall be made in the currencies and proportions specified in the Contract Data.
35.	14.15 (f)	If no rates of exchange are stated in the Contract Data, they shall be those prevailing on the Base Date and published by the central bank of the Country.
36.	17.2 (d)	Liability for Care of the Works Any operation of the forces of nature (other than those allocated to the Contractor in the Contract Data) which is Unforeseeable or against which an experienced contractor could not reasonably have been expected to have taken adequate preventative precautions.
Insurance (GCC Clause 19)		
37.	19.1	Permitted deductible limits insurance required for the Works: Note: The sum stated in Letter of Acceptance plus fifteen percent 15%. insurance required for Goods:N/A insurance required for liability for breach of professional duty: N/A insurance required against liability for fitness for purpose (if any is required): not required insurance required for injury to persons and damage to property: a) As per workmen compensation act b) Contractor's all Risk including Third party c) Damages to the Structure, stores if supplied by the Bank
38.	19.2.1(b)	Additional amount to be insured 15%

39.	19.2.1(iv)	List of Exceptional Risks which shall not be excluded from the insurance cover for the Works N/A
40.	19.2.2	Extent of insurance required for Goods: upto Full replacement Cost Amount of insurance required for Goods: as stated above
41.	19.2.3(a)	amount of insurance required for liability for breach of professional duty N/A
42.	19.2.3(b)	Insurance required against liability for fitness for purpose No
43.	19.2.3	Period of insurance required for liability for breach of professional duty N/A
44.	19.2.4	Amount of insurance required for injury to persons and damage to property: (19.1) Note: a) As per workmen compensation act b) Contractor's all Risk including Third party c) Damages to the Structure, stores if supplied by the Bank
45.	19.2.6	Insurance <u>Other insurances required by Laws and by local practice</u> The contractor shall provide all other insurances required by the Laws of the countries where (any part of) the Works are being carried out, at the Contractor's own cost. Other insurances required by local practice (if any) shall be detailed in the Contract Data and the Contractor shall provide such insurances in compliance with the details given, at the Contractor's own cost.
Dispute Avoidance/ Adjudication Board (GCC Clause 21)		
46.	21.1	Time for appointment of DAAB shall be within 28 days from arising of dispute
47.	21.1	The DAAB shall comprise 05 members

48.	21.1	List of proposed members of DAAB - Proposed by Employer/ Procuring agency/Employer 1. 2. 3. - Proposed by Contractor 1. 2. 3.
49.	21.2	Appointing entity (official) for DAAB members

Part-B Special Provisions

The Procuring agency/Employer shall be required to draft the special provisions (particular conditions Part-B) by referring the concerned clauses as stipulated in the General Conditions of the Contract. These provisions should be drafted by keeping following guidelines in consideration:

- i. Particular conditions must be drafted clearly and without any ambiguity;
- ii. Party's duties, rights, obligations, roles and responsibilities shall be clearly described in line with General Conditions of the Contract, requirements as specified in the bidding document;
- iii. While drafting special provisions realistic timelines must be provided for completion of the project / assignment;
- iv. All disputes must be settled either through arbitration act 1940 or through International Chamber of Commerce.
- v. It shall be the responsibility of the Contractor to provide transportation facility to Engineer or any rep. of the Engineer / Employer for access towards the Site.
- vi. All the applicable taxes and fees of the Cantonment Board Manora that is to be incurred for NOCs and Approvals of Drawing and Approvals for Construction of Hut shall be paid by the Contractor himself.
- vii. The Contractor shall provide to the employer 02 Nos laptop Latest Model atleast core i5 13th Generation or Equivalent and 01 no Printer cum Copier machine of latest model and reputable brand (this shall remain property of Employer upon successful completion of the works)

Note: Special Provisions shall always over rule and supersede the respective provisions of General Conditions of the Contract. In order to conveniently trace the respective clause, reference of the concerned GCC clause must be provided.

Table: Summary of Sections (if any)

Description of parts of the Works that shall be designated a Section for the purposes of the Contract (Sub-Clause 1.1.73)	Value: Percentage ² of Accepted Contract Amount (Sub-Clause 14.9)	Time for Completion (Sub-Clause 1.1.84)	Delay Damages (Sub-Clause 8.8)

²These percentages shall also be applied to each half of the Retention Money under Sub-Clause 14.9

SECTION VIII: CONTRACT FORMS

Form of Contract

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

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

NOW THIS CONTRACT WITNESSETH AS FOLLOWS:

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

IN WITNESS whereof the parties hereto have caused this Contract to be executed in accordance with their respective laws the day and year first above written.

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

Performance Guarantee Form

NOT APPLICABLE

To: *[name of Procuring agency/Employer]*

WHEREAS *[name of Contractor]* (hereinafter called “the contractor”) has undertaken, in pursuance of Contract No. *[reference number of the contract]* dated *[insert date]* for the execution of *[insert name of the works and its brief description]* (hereinafter called “the Contract”).

AND WHEREAS it has been stipulated by you in the said Contract that the contractor shall furnish you with a Bank Guarantee by a reputable bank for the sum specified therein as security for compliance with the Contractor’s performance obligations in accordance with the Contract.

AND WHEREAS we have agreed to give the Contractor a guarantee:

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

This guarantee is valid until the: *[insert date]*

Signature and seal of the Guarantors

[name of bank or financial institution]

[address]

[date]

**Advance Payment Security
Demand Guarantee**

NOT APPLICABLE

Beneficiary: _____

Date: _____

ADVANCE PAYMENT GUARANTEE No.: _____

Guarantor: _____

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

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

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

- (a) has used the advance payment for purposes other than the costs of mobilization in respect of the Works; or
- (b) has failed to repay the advance payment in accordance with the Contract conditions, specifying the amount which the Contractor has failed to repay.

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

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

The Guarantee shall remain valid up to the aforesaid date and shall be null and void after the aforesaid date or earlier if the advance made to the Contractor is fully adjusted against payments from Interim Payment Certificates of the Contractor provided that the Guarantor agrees that the aforesaid period of validity shall be deemed to be extended if on the above mentioned date the advance payment is not fully adjusted.

[signature(s)] _____

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

**Retention Money Security
NOT APPLICABLE
Demand Guarantee**

_____ [Guarantor letterhead or SWIFT identifier code]

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

Date: _____ [Insert date of issue]

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

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

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

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

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

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

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

[signature(s)]

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

Integrity Pact

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

Contract Number: _____

Dated: _____

Contract Value: _____

Contract Title: _____

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

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

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

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

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

[Procuring agency/Employer]

[Contractor]

TECHNICAL SPECIFICATIONS FOR CIVIL WORKS

SPECIFICATIONS

TECHNICAL PROVISIONS

CONTENTS

SECTION 01: SPECIFICATIONS (GENERAL)	120
SECTION 02.1: COMMON BUILDING MATERIALS	121
SECTION 04.1: EARTHWORK (GENERAL).....	130
SECTION 04.2: EARTHWORK FOR BUILDINGS AND STRUCTURES.....	133
SECTION 04.3: EARTHWORK FOR ROADS.....	136
SECTION 04.4: EARTH WORK FOR PIPES TRENCHES	142
SECTION 05.1: ASPHALTIC PAVEMENTS (GENERAL)	145
SECTION 05.2: SUBBASE AND BASE COURSES	147
SECTION 05.3: PAVEMENT SURFACE TREATMENT	152
SECTION 05.4: ASPHALTIC CONCRETE SURFACING	156
SECTION 05.5: PAVEMENT EDGING, CURBS AND GUTTERS	163
SECTION 08.1.1: CONCRETE WORK.....	165
SECTION 08.2.1: STEEL REINFORCEMENT	185
SECTION 08.3.1: POLYVINYLCHLORIDE WATER STOP	190
SECTION 09.1: MASONRY - GENERAL.....	191
SECTION 09.4: BLOCK MASONRY.....	194
SECTION 09.5: STONE PITCHING.....	197
SECTION 10.1: THERMAL AND MOISTURE PROTECTION (GENERAL)	199
SECTION 10.2: DAMP PROOF COURSES	201
SECTION 11.1.1: PLASTER AND POINTING (GENERAL).....	203
SECTION 11.1.3: PLAIN PLASTER WORK	205
SECTION 11.1.4: SPECIAL PLASTER WORK.....	208
SECTION 11.2.5: CERAMIC TILE FINISHES.....	210
SECTION 11.2.6: GLASS AND GLAZING.....	212
SECTION 11.3: PAINTING AND POLISHING	215
SECTION 11.4: PROTECTIVE COATING OF CONCRETE SEWER.....	221
SECTION 12.1: METAL WORK (GENERAL)	226
SECTION 12.2: STEEL WORK IN BUILDINGS.....	230
SECTION 12.3: ALUMINUM DOORS AND WINDOWS	233
SECTION 12.4: METAL GALVANIZING	235
SECTION 13.0: WATER-PROOFING, BUILT-UP ROOFING, INSULATED	238
ROOFING AND FALSE CEILING.....	238
SECTION 13.1: WOOD WORK (GENERAL)	244
SECTION 13.2: WOOD WORK IN BUILDINGS.....	249

SECTION 01: SPECIFICATIONS (GENERAL)

1. GENERAL

- a. These technical specifications are part of the Tender-Contract Documents, for the Contract and shall be read and interpreted, in conjunction, with other parts of the Tender-Contract Documents including Tender-Contract Drawings, Conditions of Contract and Bill of Quantities.
- b. The provisions of this Section 01 shall apply to all the technical specifications, laid down in this document.

2. STANDARDS

Except where specifically called for, the specifications, laid down in the latest versions of applicable British Standards (BS), British Codes of Practices (CP), American Society for Testing and Materials (ASTM), American Iron and Steel Institute (AISI), American Society of Mechanical Engineers (ASME) and American Welding Society (AWS) shall be followed.

3. MATERIALS AND EQUIPMENTS

All the materials and the equipment used shall be new and, in all respects, shall conform to the applicable specifications and standard.

4. SAMPLES AND TESTS

- a. The samples of all the materials, to be used, shall be approved by the Engineer and same type of material shall be used during the work.
- b. Each supply shall be accompanied by a mill test certificate indicating the mechanical characteristics of the materials.
- c. If the Engineer desires to get any material tested, this shall be carried out by the Contractor, at his own cost and expense, from a laboratory approved by Engineer.

5. SHOP DRAWINGS

- a. Where called for in the drawings or directed by the Engineer, the Contractor shall prepare and submit, for the approval of the Engineer, shop drawings, for the execution of certain work, showing all details, in accordance with the instructions of the Engineer.
- b. Shop drawings shall show the design details, the method of construction, erection data and list of materials.

- c. The shop drawings, where to be modified or revised as required by the Engineer, shall be resubmitted, until approved.

6. SETTING OUT OF WORK

The Contractor shall set out the Work himself and if any discrepancy is found, he shall report the matter to the Engineer and shall act as directed. The Contractor shall rectify or make it good, at his own cost and expense, any defective setting out, carried out by him.

7. EMPLOYER'S SUPPLIED MATERIALS AND EQUIPMENT

- a. Materials and equipment, where supplied by the Employer, shall be made available at site store to the Contractor for installation. Any lead and lift up to and within the site of Work shall be the responsibility of the Contractor, at his own cost and risk.
- b. The Contractor shall ensure safe handling and proper protection, after the material and equipment are issued to him at site store and shall provide and maintain required plant and equipment for handling, proper protection and installation, at his own cost.

8. PROTECTION

The Contractor shall take care to protect the work from any damage, of whatsoever nature, during the construction period. In case of any damage done, to the work, the Contractor shall remove, replace, or rectify such work at his own cost, without any additional compensation.

9. AS-BUILT DRAWINGS

- a. The Contractor shall, during the progress of work, keep a careful record of all changes and revisions where the actual installation differs from that shown on the construction drawings. These changes and revisions shall be incorporated in the construction drawings and submitted to the Engineer for approval.
- b. After approval, these updated and approved construction drawings, depicting clearly all changes and revisions at site, shall be called As-Built Drawings. Reproducible tracings of all these As-Built Drawings shall be handed over to the Engineer.

SECTION 02.1: COMMON BUILDING MATERIALS

1. SCOPE

Unless otherwise specified, the common building materials, to be used, shall comply with the specifications, laid down in this section.

2. BURNT CLAY BRICKS AND BRICK TILES

2.1 General

- a. They shall be manufactured from well prepared clay and may be either hand moulded or machine moulded.
- b. They shall be well burnt throughout, without being vitrified.
- c. They shall be of uniform color, regular in shape and size with sharp and square corners and parallel faces.
- d. They shall be homogeneous in texture, without any flaws and cracks.
- e. They shall show a clean fracture when broken.

2.2 Size

The sizes of the bricks and brick tiles shall be as follows:

- a. Brick
 - i. Nominal Size 9"x4-3/8"x2-11/16"
 - ii. Minimum Size 8-5/8-5/8"x4-1/8"x2-5/8"
- b. Brick Tile
 - i. Nominal Size 9" x 4-1/2" x 1-1/2"

2.3 Clay Characteristics

- a. The concentration of soluble salts, sulfates and organic contents, in the clay, used for bricks and brick tiles, shall not exceed 0.5%, 0.2% and 4%, respectively.
- b. The clay used shall not contain any granular material or plants.

2.4 Water Absorption

- a. Average water absorption rates, in terms of percentage of weight of water absorbed to the weight of dry bricks/tiles, after soaking period of one hour, shall not exceed the following:
 - i. Bricks 20.0%
 - ii. Brick Tiles 16.7%
- b. After the specified soaking, the bricks and brick tiles shall show no signs of efflorescence, on drying.

2.5 Strength

- a. Bricks: The compressive strength of brick, tested in flat position, shall not be less than 1.4 kg/mm² (2000 psi).
- b. Brick Tiles: The average breaking load applied along the width of the tile midway between the supports shall not be less than 78.75 kg (175 lbs).

3. PORTLAND CEMENT

3.1 General Requirements

- a. Portland Cement shall be indigenous stuff unless otherwise approved by the Engineer.
- b. Unless otherwise permitted, cement from not more than two plants shall be used and in general, the product of only one plant shall be used in any particular section of the work.

3.2 Specification

These specifications cover five types of Portland cement, as follows:

No	Applicable Specifications		Application
	ASTM	BS	
a.	C150 (Type I)	BS 12	Ordinary Portland Cement: For use in general concrete construction when the special properties specified for Type II, III, IV and V are not required.
b.	C150 (Type II)	BS 1370	Moderate Heat Portland Cement: For use in general concrete construction exposed to moderate sulfate action, or when moderate heat of hydration is required.
c.	C150 (Type III)	BS 12	Rapid Hardening Portland Cement: For use when high early strength is required.
d.	C150 (Type IV)	BS 1370	Low Heat Portland Cement: For use when low heat of hydration is required.
e.	C150 (Type V)	BS 4027	Sulfate Resisting Portland Cement: For use when high sulfate resistance is required.

3.3 Packing and Marking

- a. Cement shall be furnished in sacks or in bulk form, as approved by the Engineer.
- b. Cement in sacks shall be delivered in strong, well made, paper or cloth bags, each plainly marked with the manufacturer's name, brand, type of cement and the weight of cement contained therein, except that, in the case of Type-I cement, the type need not be identified.
- c. A bag shall contain 50 Kg. net.
- d. When the cement is delivered in bulk; this information shall be contained in the shipping invoice, accompanying the shipment.

3.4 Inspection

The Contractor shall facilitate the Engineer, in all respects, for careful sampling and inspection, either at the mill or at the site of work, as may be specified by the Engineer. The following periods, in days, from the time of sampling shall be allowed for completion of testing.

- a. 1-day test 6
- b. 3-day test 8
- c. 7-day test 12
- d. 28-day test 33

3.5 Rejection

- a. Cement may be rejected if it fails to meet any of the requirements of these specifications.
- b. Cement remaining in bulk storage at the mill, prior to shipment, for a period greater than six months after completion to the tests, may be tested and may be rejected if it fails to conform to any of the requirements of these specifications.
- c. Packages varying more than 3% from the weight marked thereon may be rejected and if the average weight of packages in any consignment as determined by weighing fifty packages taken at random, is less than that marked on the packages, the entire consignment may be rejected.
- d. Packages received in broken or damaged condition shall be rejected or may be accepted only as fractional packages as determined by the Engineer.
- e. Cement that is found to be adversely affected by moisture, as determined by the Engineer, shall be rejected.

3.6 Method of Sampling and Testing

- a. The sampling and testing of Portland cement shall be in accordance with relevant BS or ASTM standard specifications.
- b. Contractor shall carry out all tests on Portland cement, at his own cost, if required by the Engineer.

3.7 Transportation of Cement

Transportation of the cement from the mill to the site stores and to the point of use shall be accomplished in such a manner that the cement is completely protected from exposure to moisture.

3.8 Storage

- a. Cement shall be stored in dry, weather tight and properly ventilated structures. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification of each consignment.
- b. The sacks should be stacked closely on a damp proof floor or on timber planks, raised by a minimum of 12" (300 mm), from the ground, with air space below. There should be similar air space between the stacks and walls.
- c. To avoid bursting of bags and setting under pressure, the height of the stacks shall be limited 8 bags.
- d. Adequate storage capacity shall be furnished to provide sufficient cement to meet the peak needs of the project.
- e. Cement storage facilities shall be emptied and cleaned by the Contractor when so directed, however, the interval between required cleaning normally will not be less than four months.

3.9 Usage

- a. The Contractor shall use cement in the approximate chronological order in which it is received at the site. All empty sacks shall be promptly disposed off as approved by the Engineer.
- b. No cement stored through a monsoon, or for a period of more than six months, should be used, unless tests have been applied and cement found up to the requisite standard.
- c. Suitable, accurate scales shall be provided by the Contractor for weighing the cement in stores and elsewhere on the work, if required, and he shall also furnish all necessary test weights.

3.10 Delivery and Usage Record:

Accurate records of delivery of cement and its use in the works shall be kept by the Contractor. Copies of these records shall be supplied to the Engineer in such a form as he may require.

4. WHITE PORTLAND CEMENT

4.1 Quality Characteristics

White Portland cement, where specified, shall have same properties and characteristics as those of ordinary Portland cement, conforming to ASTM C150 (Type I) or BS 12, except as follows:

- a. It shall be manufactured from raw materials, containing not more than 1% (one percent) iron contents.
- b. It shall give a pure white look, without any stain or tint.

4.2 Other Requirements

Other requirements including packing and marking, inspection, rejection, method of sampling and testing, storage and limitation of use, for the white cement, shall be same as laid down in Article 3, of this Section.

5. COLORED CEMENT

5.1 Composition

- a. Colored cements shall be made by adding and mixing suitable mineral pigments to ordinary Portland cement, in case of deep shades, and to white Portland cement, in case of light shades.
- b. The type of cement, grey or white, and the nature and amount of the coloring matter, to obtain the required color and shade, shall be, as approved by and to satisfaction of the Engineer.
- c. In general, following compounds shall be used, to obtain various colors:
 - i. Oxides of iron for red, yellow or brown color
 - ii. Oxides of chromium for green color
 - iii. Cobalt for blue color
 - iv. Oxides of manganese for black or brown color

5.2 Other Requirements

Other requirements including packing and marking, inspection, rejection, method of sampling and testing, storage and limitation of use, for the colored cements, shall be same as laid down in Article 3, of this Section.

6. AGGREGATE

6.1 General Requirements

- a. Aggregates for normal concrete shall conform to the requirements of ASTM Designation C 33 "Specifications for Concrete Aggregates".
- b. In case the Contractor prefers to use aggregate from a source other than that approved by the Engineer; following tests shall be carried out, at the Contractor's cost, to determine suitability of the material for the intended use:
 - i. Mechanical properties
 - ii. Porosity
 - iii. Organic impurities
 - iv. Clay and Silt Contents
 - v. Abrasion and Soundness Tests
 - vi. Alkali Reactivity Potential
 - vii. Water soluble Chloride Contents
- c. The nominal maximum size of the aggregate shall not be larger than one fifth of the narrowest dimension of the finished wall or slab, or larger than three fourth of the minimum clear spacing between the reinforcing steel and embedment.

6.2 Nature of Aggregate

- a. Fine Aggregate: The use of natural sand or a combination of natural and manufactured sands may be permitted, provided that the fine aggregate meets the applicable requirements of the specifications herein, for particular use intended.
- b. Coarse Aggregate: Except where otherwise specified, coarse aggregate shall consist of crushed natural stone.

6.3 Source

The Contractor shall obtain concrete aggregate from deposits of natural sand and gravel or shall procure crushed aggregate from approved quarries, which produce aggregates meeting with the Specifications contained herein.

6.4 Sampling and Testing

- a. The Contractor shall provide facilities, as may be necessary, for the ready collection of representative test samples, of the aggregates, to determine compliance with specifications.
- b. The Engineer will obtain and test such samples, at the expense of the Contractor, using appropriate standard test methods, selected by the Engineer.

- c. Testing of concrete aggregates by the Engineer shall not relieve the Contractor of his responsibility to maintain, control and ensure the production, stockpiling and handling of both fine and coarse aggregates, in accordance with these Specifications.

6.5 Aggregate Processing

- a. General: All aggregates, as delivered to the mixer, shall consist of clean, hard, dense and durable and uncoated particles.
- b. Light Weight Elements: Light weight elements, like chalk, clay and organic matter shall be separated by vibro-floatation process. Where required, fines shall be removed from the coarse aggregate by adequate washing.

c. Soft Particles

- i. The Contractor in planning his aggregate processing operations shall make necessary provisions, as regards methods and equipment, to ensure effective elimination of soft particles from all aggregates.
- ii. The percentage of soft particles present in the processed coarse aggregate shall not exceed 3 percent by weight, when determined in accordance with the applicable requirements of ASTM Designation C235 "Standard Method of Test for Scratch Hardness of Coarse Aggregate Particles" or other standard test method, selected by the Engineer.
- iii. Test Samples shall be representative of the each size group of processed coarse aggregate, as specified in Article 5.6, obtained according to the ASTM Methods D 75.

6.6 Grading Requirements

Compliance with the aggregate grading and uniformity requirements will be determined at the mixer. The aggregates, as delivered to the mixers, shall conform to the following specific grading requirements:

a. Fine Aggregates

- i. The grading of fine aggregate shall conform to the following requirements:

U.S. Standard Sieve Mesh	Percent Passing
0.375" (9.50 mm)	100
No.4 (4.75 mm)	95-100
No.8 (2.37 mm)	80-100
No.16 (1.18 mm)	50-85
No.30 (0.60 mm)	25-60
No.50 (0.30 mm)	10-30
No.100 (0.15 mm)	2-10

- ii. Fineness modulus shall range between 1.9 and 2.78.
- iii. The sand equivalent value, as determined by ASTM Designation D 2419, "Standard Test Method For Sand Equivalence Value Of Soils And Fine Aggregate", shall not be less than 75.

b. Coarse Aggregate: The grading of the coarse aggregate, within the separated size groups, shall conform to the following requirements:

US Standard Sieve Size (Nominal Size)	Percent by Weight Finer than Each Laboratory Sieve			
	1/4"(6.25 mm) to No. 4 Group	3/4"(19 mm) to No. 4 Group	1"(25 mm) to No. 4 Group	1.5"(37.5 mm) to No. 4 Group
2.00" (50.00 mm)	-	-	-	100
1.50" (37.50 mm)	-	-	100	95-100
1.00" (25.00 mm)	-	100	95-100	-
0.75" (19.00 mm)	100	90-100	-	35-70
0.50" (12.50 mm)	90-100	-	25-60	-
0.375" (9.50 mm)	40-70	20-55	-	10-30
No. 4 (4.75 mm)	0-15	0-10	0-10	0-5
No. 8 (2.37 mm)	0-5	0-5	0-5	-

6.7 Particle Shape

- A flat particle is one having a ratio of width to thickness greater than three. An elongated particle is one having a ratio of length to width greater than three.
- The shape of the particles shall generally be spherical or cubical.
- The quantity of flat and elongated particles, in the separated size groups of coarse aggregate, as defined and determined by standard tests, approved by the Engineer, shall not exceed 15% by weight in any size group.

6.8 Deleterious Substances

- Fine Aggregate: The maximum percentages of deleterious substances, in the fine aggregate, as delivered to the mixer, shall not exceed the following values, with sum of the percentages of all deleterious substances not to exceed 5 percent, by weight.

Substances	Percent of Weight
Material passing No. 200 sieve	3
Shale	1
Total of other deleterious substances including mica, chloride, coated grains and soft flaky particles	3

- Coarse Aggregate: The maximum percentages of deleterious substances, in any size of coarse aggregate, as delivered to the mixer, shall not exceed the following values, with the sum of the percentages of all deleterious substances not to exceed 3 percent by weight.

Deleterious Substances	Percent of Weight
Material passing No. 200 sieve	1
Shale	1
Clay lumps	0.5
Other deleterious substances	1

6.9 Storage

- Aggregate shall be stored, at the site, in such a manner as to prevent its deterioration or the inclusion of foreign matter.

- b. Aggregate, which has deteriorated or which has been contaminated, shall not be used for concrete.
- c. All methods employed by the Contractor for loading, unloading, handling and stock-piling aggregates shall be subject to the approval of the Engineer, at all times.
- d. Sufficient aggregate shall be maintained at the site, at all times, to assure continuous placement and completion of any lift of concrete started.

6.10 Moisture Control

- a. All fine aggregate and smallest size group of the coarse aggregate shall remain in free draining storage at the site for at least 72 hours, immediately prior to use.
- b. The free moisture content of the fine aggregate and of the smallest size group of coarse aggregate, as delivered to the mixer, shall be controlled so as not to exceed 4% and 1% respectively, expressed as percent by weight, of the dry aggregates; unless higher limits are allowed by the Engineer.
- c. In addition to the limits on the maximum amounts of free moisture in aggregate, the moisture content shall be controlled so that, for each size, the variation in the free moisture will not be more than 0.5 percent, during any one hour of mixing plant operation.
- d. Coarse aggregates, with other sizes, as delivered to the mixers, shall have the least amount and least variation, of the free moisture contents, practicable under the job conditions.
- e. Under no conditions shall the aggregate be delivered to the mixed plant being dripping wet.
- f. The Contractor shall carry out such tests, at his own expense, as the Engineer may deem necessary, to determine the free moisture content of aggregate.

7. WATER

7.1 Source

Water, for all construction purposes, shall be obtained from an approved source.

7.2 Quality

- a. The water shall be clean and free from clay, silt and injurious amounts of oil, acid, alkali, salt, organic matter, or other deleterious substance, likely to cause efflorescence or interfere with setting of mortars or otherwise be harmful to the work.
- b. Water fit for drinking purpose shall be accepted as suitable for all construction purposes.
- c. The water shall conform to the requirements of BS 3148, as to its suitability, for construction. It shall meet the following chemical requirements. All requisite water testing, in this regard, shall be carried out at the Contractor's Cost.

Substances	Permissible Levels
Chlorides	≤ 3000 mg/l
Sulfates	≤ 2000 mg/l
Impurities	≤ 2000 mg/l
pH Value	5 to 10

7.3 Storage

Water shall be stored in watertight tanks or containers, adequately protected from the admixture of dust and other foreign matter.

SECTION 04.1: EARTHWORK (GENERAL)

1. DESCRIPTION

The section outlines the general requirements and procedures for all types of earthwork. All the provisions of this section shall apply to the following sections:

- a. Section 04.2 Earthwork For Buildings And Structures
- b. Section 04.3 Earthwork For Roads
- c. Section 04.4 Earthwork For Pipe Trenches
- d. Section 04.5 Area Leveling and Grading

2. SOIL DATA AND INFORMATION

- a. The Contractor shall be deemed to have made independent inquiries as to the nature of the ground, subsoil strata and existing structures and foundations, which might be encountered during excavation and other earthwork operations.
- b. The Contractor shall base his bid estimates solely on his own soil investigation.
- c. In case the subsoil investigation report is available with the Engineer, it will be supplied to the Contractor, for reference.
- d. The Contractor shall not be entitled to receive an extra or additional payment nor be relieved from any of his obligations, by reasons of the nature of ground, subsoil or material to be excavated or penetrated or any information, thereof, that may have been exhibited or indicated in the Report, Drawings or in any other Contract Documents or obtained by the Contractor as a result of discussion with the Engineer or others.

3. METHODS

- a. Prior to proceeding for any earthwork operation, the Contractor shall submit to the Engineer full details of his proposals, for construction methods and procedures.
- b. The Engineer may require modifications to be made if he considers the Contractor's proposals to be unsatisfactory and the Contractor shall give effect to such modifications but shall not be relieved of his responsibilities with respect to such work.
- c. The design, provision, construction, maintenance and removal of all the requisite temporary works shall be the responsibility of the Contractor.

4. EXCAVATION

4.1 General

- a. All excavation shall be made to the lines and grades shown on the Drawings or as established by the Engineer.
- b. Any excavations made, by the Contractor, for his convenience or due to his fault, beyond the prescribed limits, shall be re-filled by the Contractor, by suitable material, at his own cost, as directed or approved by the Engineer.
- c. All excavations shall be properly maintained while these are open and exposed.
- d. Sufficient numbers of suitable barricades, flood lights, warning lights, signs and similar items shall be provided and installed by the Contractor.
- e. The Contractor shall be responsible for any personal injury or property damage due to his negligence.
- f. Excavation in the streets shall be done in such a manner that street passage is not blocked by excavated material.
- g. During excavation, materials, which in the opinion of the Engineer are suitable for filling and backfilling purposes, shall be stock-piled in an orderly manner, for subsequent reuse as necessary.
- h. The excavation should be done in such a manner, as to ensure that the work rests on a solid and perfectly clean foundation.
- i. No excavation shall be re-filled nor any permanent work commenced; until it has been duly inspected by the Engineer and his permission to proceed obtained in writing.
- j. Wherever necessary or required for the convenience of the public or individual residents, the Contractor shall provide suitable temporary bridges over unfilled excavations. All such bridges shall be maintained in service until backfilling has been completed.
- k. Where necessary, during the progress of excavation works, the Contractor shall make proper detour for the traffic and shall install proper signs, indicating the detour, in accordance with the instructions of the Engineer.

4.2 Protection and Preservation of Excavations

- a. The Contractor shall be fully responsible for the safety of work in progress, for the finished work, the workmen and adjacent pavings, structures and utilities, as part of the work under the excavation items and at no extra cost.
- b. The Contractor shall preserve the materials below and beyond the lines of excavations and protect the excavations from damage from slips and earth movements, ingress of water from any source whatsoever and deterioration by exposure to the sun and the effects of the weather.
- c. If ordinary open-cut excavation is not possible or advisable, the Contractor shall furnish and install, with prior approval of the Engineer, all shoring, sheeting, wall bracings, planking, strutting and similar items necessary for the safety of work, the general public and adjacent property.
- d. Sheeting, shoring and wall bracings shall be removed as the work progresses and in such manner as to prevent damage to the finished work and adjacent structures and property.
- e. As soon as its is withdrawn all voids left by the sheeting and bracing shall be carefully filled with selected material and compacted.
- f. Various materials shall be stored at a sufficient distance from the bank of the excavation to avoid over-loading and to prevent sides from caving.
- g. If any portion of the excavation gets deteriorated due to any reason, or the sides and ends of any excavation give way, the Contractor shall make it good to the satisfaction of the Engineer, without extra cost.

4.3 Protection of Existing Facilities

- a. The Contractor shall take special care of existing subsurface facilities likely to be encountered during the excavation for their protection, such as sewers, drain pipes water main conduits, gas lines, cables, communication cables and the foundations of adjacent structures.
- b. The Contractor shall be responsible for any damage to any such facility and shall repair the same at his expense whether or not the facility has been shown on the drawing.
- c. Where buildings in the opinion of the Engineer near excavation are likely to be affected, the Contractor shall provide proper shoring to protect such buildings in addition to timbering of trenches. The Contractor shall be required to leave timbering inside trenches if so required by the Engineer for protection of these buildings, at no extra cost.

4.4 Dewatering of Excavations

- a. As part of the work, under all the excavation items, and at no extra cost, the Contractor shall build all drains and do ditching, pumping, well-pointing, bailing and all other work necessary to keep the excavation clear of ground water, sewage and storm water during the progress of the work and until the finished work is safe from injury.
- b. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the Engineer.

4.5 Disposal of Surplus and/or Unsuitable Excavated Material

- a. The Contractor shall dispose of all the surplus and/or unsuitable excavated materials, not required to be used on the work, in a manner and at locations, approved by the Engineer.
- b. The disposal of these materials shall not interfere with other works and shall not damage or spoil other materials.
- c. When it is necessary to haul earth material over streets or pavements, the Contractor shall prevent such material from falling on the streets or pavements.

4.6 Disposal of Filth and Garbage

No night soil filth and garbage met with during the excavation shall be allowed to be deposited on side of road/street so as to cause nuisance or obstruction to traffic. The same shall be disposed of by the Contractor to a place to the satisfaction of the Engineer.

4.7 Cutting Pavement

- a. In cutting or breaking the existing street surfacing and road pavements, where required, the Contractor shall not use equipment, which will damage the adjacent pavement.
- b. The road ballast, brick pavement, and other materials shall be placed on one side and shall be preserved for re-installation when the excavation is filled.

5. FILLING AND BACK-FILLING

5.1 Borrow

- a. Where suitable materials, for filling or backfilling purposes, are not available in sufficient quantities, from the excavations, the Contractor shall obtain these materials from the approved borrow areas.
- b. The development of the borrow areas shall include the following:
 - i. Necessary clearing and grubbing of borrow areas including disposal of debris and other unsuitable materials, therefrom.
 - ii. Acquiring the necessary right-of-way for and making access roads, for hauling of materials.
 - iii. Making provisions for the satisfactory drainage of the borrow areas.

5.2 Compaction of Backfill and Fill

- a. Backfills, designated to be compacted, shall be compacted to the lines of the excavations as shown on the Drawings or established by the Engineer.
- b. The Contractor's operations in the placing materials, for backfills and fills, designated to be compacted, shall be such that it shall result in an acceptable gradation of materials when placed.
- c. The backfills and fills, designated to be compacted, shall be compacted, in layers, of thickness, as determined by the Engineer, until the dry density of the compacted material, in each layer, is not less than that specified.
- d. Prior to and during placement operations, the material shall have the optimum moisture content required for the purpose of compaction, in each layer, as determined by the Engineer.
- e. if the moisture content is less than optimum for compaction, the moisture content shall be supplemented by sprinkling and reworking the material at the site of compaction.
- f. If the moisture content is greater than optimum for compaction, the material shall be dried by reworking, mixing the dry materials or other approved means.
- g. The Engineer shall take samples from the material being compacted and will perform the required tests to determine that the compaction is meeting the requirements of these Specifications. The Contractor shall aid the Engineer in obtaining samples for testing.
- h. The Contractor shall be responsible for any damage to structures caused by his operations in compaction of backfills and any damage to structures shall be repaired by the Contractor at his own expense.

5.3 Grading

After the completion of all backfilling and filling operations, the contractor shall grade the work areas to the lines, grades and elevations shown on the drawings, or as directed by the Engineer.

SECTION 04.2: EARTHWORK FOR BUILDINGS AND STRUCTURES

1. DESCRIPTION

- a. The work to be done under this section consists of performing all earthworks, for the following works, as shown on the Drawings or as directed by the Engineer.

i. Building foundations and floors ii
Foundation of bridges and culverts iii.
Basements iv. Tanks and reservoirs v External
Pavings

vi. Other foundations

b. The earthwork , for the above works, as shown on the Drawings or as directed by the Engineer, shall consist of the following works:

- i. Excavation shall include performing the required excavation, in earth or rock, and placing excavated material in stockpiles for backfilling or filling, at designated places, and/or transporting the excavated material to points of final use or in designated disposal areas.
- ii. Backfilling, around structures, and filling, in areas, shall include backfilling/filling and compacting of one or more of the following materials, below or above the natural surface levels, as specified in BOQ, shown on the Drawings and/or established by the Engineer.
 - Suitable materials, obtained from excavations
 - Suitable earth, obtained from borrow areas
 - Sand
 - Any other material, as specified
- c. All the provisions of Section 04.1 shall apply to this section of specifications.

2. EXCAVATION FOR BUILDINGS AND STRUCTURES

Where any concrete is required or approved to be placed against the surface of the excavation, without the use of intervening forms, excavation shall be finely trimmed to the prescribed lines of the structure.

3. BACKFILLING AND FILLING

3.1 Materials for Backfilling and Filling

- a. Earthen Materials: The earthen materials, obtained from excavations or borrow areas, intended to be used for backfilling around foundations and structures and filling, shall be free from trash, lumber and other debris and from stones and hard clods larger than 75mm (3 inches) in any dimension.
- b. Sand: The sand, intended to be used for backfilling around foundations and structures and filling, shall be clean and coarse grained, with no more than 10% passing US Sieve No. 50 and shall be obtained from an approved source.

3.2 Compaction

a. Unless otherwise specified, the backfills and fills, with earthen materials, shall be compacted to minimum of the following percentages of the laboratory maximum dry density, based on AASHTO Test T180, Table D (Modified Proctor). The field density shall be determined in accordance with AASHTO T191.

i. Backfilling around foundations and structures 90% ii. Filling under floors and slabs on grade 85%

b. Unless otherwise specified, the backfills and fills, with sand, shall be compacted to minimum of 90% of relative density.

- c. Type of the compactor, to be used, shall depend upon the volumes of earthwork, to be compacted, and the space constraints and it shall be as approved by the Engineer.
- d. Placing and compaction of backfilling and filling around walls shall proceed, simultaneously, on both sides of the structure, to avoid unbalanced pressures.
- e. Backfills and fills shall not be placed, against structures, earlier than 4 days after placing of concrete or brick masonry.

4. MEASUREMENT

4.1 Excavations and Backfilling for Structures

- a. Measurement, for excavations and backfilling (with the same excavated material), for structures, will be made in the specified units, of theoretical volume of unclassified excavation, acceptably carried out, on the basis of the dimensions, for the neat excavation finish lines, in accordance with the Drawings or directions of the Engineer.
- b. Any excavation carried out outside the limits, shown on Drawings or directed by the Engineer, shall not be measured as excavation and shall not be paid for.
- c. Filling, with the imported materials, for structures, will be measured and paid, separately, as laid down in Section 4.2.

4.2 Filling

Measurement, for filling, under structures, foundations and floors, will be made in the specified units, of theoretical volume of compacted fill, of specified material and quality, acceptably placed, on the basis of the dimensions, for the neat filling finish lines, in accordance with the Drawings or directions of the Engineer.

5. RATE AND PAYMENT

5.1 Payment

Payment for, both excavation and backfilling and filling, of specified nature, will be made for the respective quantities of these items, measured in accordance with Article 4, at the unit rates, tendered in the priced Bill of Quantities.

5.2 Rate

The unit rates tendered, for both excavation and backfilling and filling, shall be deemed to be inclusive of, but not limited to the following:

a. Common Applicable to All Items

- i. All operations related with transportation, involved in the process
- ii. All operations related with storage of materials
- iii. All sorts of wastages
- iv. Operations including maintenance, protection and repairs, of the works
- v. Design, provision, construction, maintenance and removal of all the requisite temporary works like bridges and detours for the traffic

- vi. Design, provision, construction, maintenance and removal of the requisite public protection and warning works like suitable barricades, flood lights, warning lights, signs and similar items
- vii. Protection of existing adjacent facilities like paving, structures and utilities
- viii. Making good all damages
- ix. Obtaining soil data and information
- x. Carrying out all sampling and testing
- xi. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

b. Excavations and Backfilling for Structures

- i. Protection, preservation and maintenance of excavations
- ii. Stock piling of suitable excavated materials
- iii. installation and removal of shoring, sheeting, wall bracings, planking, strutting and similar items
- iv. Dewatering for excavations, including works like drains, ditching, pumping, well-pointing, bailing, disposal and all other work
- v. Disposal of surplus and/or unsuitable excavated material and filth and garbage
- vi. All operations associated with back-filling including placing, watering and compaction, of the back-filling materials

c. Filling

- i. Providing filling material
- ii. Development of borrow areas including necessary clearing and grubbing, disposal of debris and other unsuitable materials, acquiring the necessary right-of-way for and making access roads, for hauling of materials and making provisions for the satisfactory drainage of the borrow areas
- iii. All operations including placing, spreading, watering and compaction of fill materials
- iv. Final grading and leveling

SECTION 04.3: EARTHWORK FOR ROADS

1. SCOPE OF WORK

- a. The work to be done under this section consists of performing all earthworks, for the roads, in accordance with these Specifications and in conformity with the lines, grades, sections, and dimensions shown on the drawings or as directed by the Engineer.
- b. Earth work, for roads, shall include the following:
 - i. Performing the required excavations, in earth, rock or other materials, from the roadway, adjacent areas or from borrow areas
 - ii. Transporting and disposal of unsuitable and/or surplus excavated materials
 - iii. Transporting, placing and compacting the excavated materials in embankments and for improvement of sub grades

c. All the provisions of Section 04.1 shall apply to this section of specifications.

2. EXCAVATION OF UNSUITABLE OR SURPLUS MATERIAL

2.1 General

"Unsuitable or Surplus Material" is the material, arising from Roadway Excavation, which is declared in writing by the Engineer to be unsuitable for use or surplus to the requirements of the Project.

2.2 Construction Requirements

- a. All suitable material, excavated within the limits of the project, shall, unless provision is expressly made to the contrary, be used in the most effective manner for the formation of the embankment, for widening the roadway, for backfill, or for other work included in the Contract.
- b. Any excavated material, surplus to the project requirement or declared, by the Engineer, to be unsuitable, shall be disposed of, as directed by the Engineer.

3. COMPACTION OF NATURAL SURFACES

3.1 General

This work shall consist of compacting the cleared and excavated surfaces, prepared for receiving the road embankment or, directly, the pavement courses, as the case may be.

3.2 Construction Requirements

- a. The top 200 mm (8") layer, of the cleared or excavated surface, to be prepared for receiving the road embankment or, directly, the pavement courses, shall be scarified and the soil contents, thoroughly, mixed.
- b. Moisture contents, in the top layer, shall be brought, close to the optimum moisture contents, for compaction.
- c. Except where otherwise specified, top 200 mm (8") layer, of the cleared or excavated surface of the ground, shall be compacted to minimum of the following percentages of the laboratory maximum dry density, based on AASHTO Test T180, Table D (Modified Proctor). The field density shall be determined in accordance with AASHTO T191.
 - i. Level difference between finished sub grade surface 95% and surface to be compacted, less than 1 m (3.25')
 - ii. Level difference between finished sub grade surface 85% and surface to be compacted, 1 m (3.25') or more

4. EMBANKMENT FORMATION

4.1 General

This work shall consist of excavation of materials, haulage, filling and placing, compaction, shaping and sloping necessary for the construction of all embankment, sub grades, shoulders and special backfills, to the required alignment, grade and cross-sections, shown in the Drawings.

4.2 Material Requirements

- a. General: All materials excavated for embankment formation shall be unclassified and paid for regardless of the material encountered. It shall include suitable fill material excavated from roadway and borrow area.

b. Borrow Excavation

- i. Borrow excavation shall include the material that is suitable for the construction of roadway embankments or other work of constructing embankments, covered by the Contract, and also unsuitable material that is necessary to excavate, as determined by the Engineer, to obtain suitable material.
- ii. Borrow shall be resorted to only when sufficient quantities of suitable material are not available, as herein prescribed, from roadway excavation, to properly construct the embankment sub grade and shoulders and to complete the backfilling of structures.
- iii. In no case shall material be borrowed until so ordered by the Engineer, and then only from the designated borrow pits with their location duly approved by the Engineer.

4.3 Embankment Construction

a. General

- i. Embankment shall be constructed with suitable material, as approved by the Engineer, true to lines, grades and cross-sections, shown in the Drawings, within a tolerance of 13 mm ($1/2$ ").
 - ii. Except where otherwise specified, the embankment shall be constructed in successive layer of not more than 250mm (10") in thickness measured loose for the full width of the embankment.
 - iii. Embankment shall be constructed in lengths of not less than 90m (300') or for the full length of road.
- b. Placing near Pipes and Structures: Embankment over and around pipes, culverts, arches and bridges shall be made with selected materials and thoroughly compacted in such a manner as to avoid undue strains upon the structures.
 - c. Traffic Distribution over Embankment: All traffic over the work during the construction of embankment shall be distributed so as to cover the entire surface of each layer.
 - d. Stability of Embankments: The Contractor shall be responsible for the stability of all embankment made by him and shall replace at his own expense any portions which, in the opinion of the Engineer, have been displaced, due to carelessness or negligent work on the part of the Contractor, except for damages, resulting
from natural cause such as storms, cloud burst, movements of natural ground or due to shrinking of the material of which the embankment is constructed.

4.4 Embankment Compaction

- a. General: All embankments shall be compacted in accordance with the following requirements:
 - i. Each layer of embankment material, except layer consisting of stones, shall be moistened or dried uniformly to the optimum moisture content, and then thoroughly mixed with a blade grader or disc harrow or any other suitable equipment and then compacted by rolling with sheep foot roller, tamping or pneumatic tired roller or 3 wheel power roller.
 - ii. During the progress of the work, the Engineer shall make density tests, to measure the degree of compaction. In case the measured degree of compaction, in any layer, is less than the required; the Contractor shall perform additional rolling, as may be necessary, to achieve the required compaction.
 - iii. On the written request of the Contractor, the Engineer may permit in writing compaction with types of equipment other than those specified above, provided the Contractor demonstrates that use of the alternate equipment will consistently produce densities of not less than the specified percent as provided above.
- b. Moisture Content: Materials shall be at a moisture content $\pm 2\%$ (two percent) of optimum moisture (AASHTO T180).
- c. Compaction Requirement for New Embankment: Except where otherwise specified, sub grade embankment shall be compacted to minimum of the following percentages of the laboratory maximum dry density, based on AASHTO Test T180, Table D (Modified Proctor), for its full width. The field density shall be determined in accordance with AASHTO T191.
 - i. Portions of embankment lying within 95% top 1 m (3.25') of embankment
 - ii. Portions of embankment lying 85%
below 1 m (3.25') of finished sub grade surface

d. Testing Requirements for Compaction

- i. The compaction, of each and every layer, shall be tested and approved before the next layer of fill is placed.
 - ii. The result shall be examined on a statistical basis. Only one result, in ten consecutive tests, may fall below the specified degree of compaction, with no result having values below 97.5% of the specified degree of compaction.
- e. Maintenance of Sub grade Surface:
 - i. After the sub grade has been prepared, as specified above, the Contractor shall maintain it free from ruts and depressions and all damage resulting from the carriage or hauling of any materials, machinery and equipment shall be made good, to the required standard.
 - ii. Ditches and drains shall be constructed and maintained, along the completed sub grade section. A completed sub grade equal to at least the length of base or pavement to be laid the next working day shall be maintained at all times.
 - f. Testing of Sub grade Surface: Prior to the laying of pavement, the sub grade levels shall be checked by the use of leveling stakes and/or other means, approved by the Engineer and any necessary correction made, as specified hereinafter:

- i. After the sub grade has been prepared and immediately before the paving course is laid, the sub grade shall be tested as to crown and elevation by the use of an approved sub grade template.
- ii. The template shall be so constructed that its lower or testing edge will just come to the true position of the sub grade when the template is riding on the forms, set for this purpose.
- iii. Where the sub grade is found not to be at the proper elevation, material shall be removed or added, as the conditions necessitate and compacted to bring all portions of the sub grade to the correct elevation and to specified density.
- iv. Where the sub grade is more than 7.5m (25 feet) in width; it shall be tested in strips 7.5m (25 feet) or less in width by the use of crown stacks, temporary forms or other means approved by the Engineer.

5. MEASUREMENT

5.1 Excavation of Unsuitable or Surplus Material

- a. Measurement, for excavation of unsuitable or surplus materials, will be made in the specified units, of theoretical volume of unclassified excavation, acceptably carried out, on the basis of the dimensions, for the neat excavation finish lines, in accordance with the Drawings or directions of the Engineer.
- b. Any excavation carried out outside the limits, shown on Drawings or directed by the Engineer, shall not be measured as excavation and shall not be paid for.
- c. Only excavated materials, which are surplus to the requirements of the Project or are unsuitable, as established by the Engineer, will qualify for measurement and payments under this item. Excavation of materials, which are used for filling and embankment construction, shall be deemed to be included in the pay items, relating to the parts of the work, where these materials are used.

5.2 Compaction of Natural Surfaces

Measurement, for compaction of natural surfaces, at or below NSL, will be made in the specified units, of theoretical area of the surfaces, acceptably compacted, on the basis of the dimensions, in accordance with the Drawings or directions of the Engineer.

5.3 Embankment Formation

Measurement, for embankment formation, will be made in the specified units, of theoretical volume of compacted fill, of specified material and quality, acceptably placed, on the basis of the dimensions, for the neat embankment finish lines, in accordance with the Drawings or directions of the Engineer.

6. RATE AND PAYMENT

6.1 Payment

Payment, for the above measured items, will be made for the respective quantities of these items, measured in accordance with Article 5, at the unit rates, tendered in the priced Bill of Quantities.

6.2 Rate

The unit rates tendered, for the above measured items, shall be deemed to be inclusive of, but not limited to the following:

a. Common Applicable to All Items

- i. All operations related with transportation, involved in the process
- ii. All operations related with storage of materials
- iii. All sorts of wastages
- iv. Operations including maintenance, protection and repairs, of the works
- v. Design, provision, construction, maintenance and removal of all the requisite temporary works like bridges and detours for the traffic
- vi. Design, provision, construction, maintenance and removal of the requisite public protection and warning works like suitable barricades, flood lights, warning lights, signs and similar items
- vii. Protection of existing adjacent facilities like paving, structures and utilities
- viii. Making good all damages
- ix. Obtaining soil data and information
- x. Carrying out all sampling and testing
- xi. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

b. Excavation of Unsuitable or Surplus Material

- i. Protection, preservation and maintenance of excavations
- ii. Stock piling of suitable excavated materials
- iii. Installation and removal of shoring, sheeting, wall bracings, planking, strutting and similar items
- iv. Dewatering for excavations, including works like drains, ditching, pumping, well-pointing, bailing, disposal and all other work
- v. Disposal of surplus and/or unsuitable excavated material and filth and garbage
- vi. Obtaining the consent of the Owner or tenant of the land, for disposal of surplus or unsuitable material.

c. Compaction of Natural Surfaces

- i. All operations including scarifying, mixing, watering and compaction of the top soil layer.

d. Embankment Formation

- i. Providing filling material including its excavation and transportation
- ii. Development of borrow areas including necessary clearing and grubbing, disposal of debris and other unsuitable materials, acquiring the necessary

- right-of-way for and making access roads, for hauling of materials and making provisions for the satisfactory drainage of the borrow areas
- iii. All operations including placing, spreading, watering and compaction of fill materials
 - Final grading, leveling and dressing

SECTION 04.4: EARTH WORK FOR PIPES TRENCHES

1. SCOPE OF WORK

- a. The work to be done under this section consists of performing all operations in connection with excavation and back-filling, of trenches, for the pipes, laid for the following services, in accordance with these Specifications and in conformity with the lines, grades, sections, and dimensions shown on the drawings or as directed by the Engineer:
 - i. Water supply pipelines
 - ii. Sanitary and storm sewers
 - iii. Other pipelines
- b. Earth work, for pipes, shall include the following:
 - i. Performing the required trench excavations, in earth, rock or other materials
 - ii. Transporting and disposal of unsuitable and/or surplus excavated materials
 - iii. Back-filling of trenches
- c. All the relevant provisions of Section 04.1 shall apply to this section of specifications.

2. TRENCH EXCAVATION

2.1 General

- a. Trenches for pipelines shall be excavated to the lines and grades, shown in the drawings or as directed by the Engineer, as necessary for the proper completion of the work.
- b. The contractor shall do all excavations, of whatever substance encountered, to the depth shown on the drawings or otherwise specified.
- c. Excavation shall include without classification the removal and disposal of all materials of whatever nature that would interfere with the proper construction and completion of the work and shall include the furnishing, placing and maintenance of supports for the sides of the excavations.
- d. The work shall also include all pumping, ditching, dewatering and other measures required for the removal and exclusion of water.
- e. Except as otherwise specified, excavation for pipes shall be open cut trenches, with sides as nearly vertical as practicable.
- f. Unless otherwise directed or permitted by the Engineer, not more than the following length, of any trench, in advance of the end of the pipeline already laid, shall be opened at any time.
 - i. 150 meters (500 feet), for water line
 - ii. 50 meters (165 feet), for sewer line
- g. Unless otherwise directed or permitted by the Engineer, not more than 300 meters (1000 feet) of any one trench shall be worked on at a time.
- h. Bell holes and depressions, for joints, shall be dug after the trench bottom has been prepared and graded. 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 particulars type of joint.

- i. Stones shall be removed, from the trench beds, to avoid point bearing.
- j. 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.
- k. In no case, material removed from trench excavation shall be used as backfill material, unless approved by the Engineer.

2.2 Trench Excavation for Water Pipelines

Unless otherwise shown in the drawings or directed by the Engineer, trenches, for water lines, shall be of a depth to provide a cover, over the top of the pipe, of 0.75 meters (2.50 feet) from the existing ground surface or finished grade whichever is closer.

2.3 Trench Excavation for Sewers

- a. The trenches for sewers shall be made to their proper levels with the aid of suitable boning rods and sight rails which shall be fixed according to the requirements of the Engineer at intervals not exceeding 12.5 (40') and also by leveling along the invert with leveling instruments.
- b. All sight rails and posts shall be well seasoned deodar timber of ample size and strength. The rails and boning rods shall be suitably and accurately planned and no warped or otherwise defective or damaged sight rails or boning rods shall be used. All boning rods shall suitably be shod with iron.
- c. Sight rails shall be secured to the posts by strong steel clamps to the approval of the Engineer and in such a manner that they shall be fixed as immovable in relation to the correct lines and levels.
- d. All boning rods and sight rails shall have the center line accurately marked thereon, by a fine saw cut and shall be painted black and white to the requirements of the Engineer.
- e. At least four separate sight rails shall always be maintained in correct level and alignment along the line of sewer at every place where construction work is proceeding and the alignment and level of the sight rails shall be checked by the level and line at least twice every day to ensure that no disturbance or interference of the alignment and level have taken place.

2.4 Excavation for Appurtenances

- a. Excavation for appurtenances shall be sufficient to leave at least 300 mm (12") but not more than 600 mm (24"), between the outer surface and the embankment or timber that may be used to hold and protect the banks.
- b. Any over excavation below such appurtenances that has not been directed by the Engineer, will be considered unauthorized and shall be refilled with compacted sand, gravel or concrete, as directed by the Engineer and at no additional cost to the Owner.

3. BACKFILLING OF TRENCHES

3.1 General

- a. After satisfactory completion of the installation and testing of the pipe work, in trenches, all voids shall be backfilled with suitable materials specified below.
- b. The trench shall be backfilled carefully, to the ground surface, with selected excavated material or other material, as approved by the Engineer, in 150 mm (6") layers.
- c. Except where otherwise specified, each layer of the back-fill material shall be watered and compacted, with suitable hand tampers, to a minimum of 90% of the laboratory maximum dry density, based on AASHTO Test T180, Table D (Modified Proctor). The field density shall be determined in accordance with AASHTO T191.
- d. If any soil layer fails to meet the specified degree of compaction; it shall be reexcavated, refilled and compacted to the specified density.
- e. Where, in the opinion of the Engineer, damage is likely to result from withdrawing sheeting, shoring and bracings, the same shall be left in place and cut off at a level 300 mm (12"), below ground surface.

3.2 Back-fill Materials

- a. Lower Portion of Trench: The backfill material in the lower portion of trench, upto 300mm (12"), over the top of pipe, shall consist of sandy clay or other approved materials, totally free from stones and humps.
- b. The Remainder of the Trench: The remainder of the trench shall be backfilled with material that is free from stones larger than 50mm (2") in any dimension.

4. MEASUREMENT

- a. Measurement, for excavations and backfilling of trenches, for pipelines, of specified purpose, will be made in the specified units, of theoretical volume of unclassified excavation, acceptably carried out, on the basis of the dimensions, for the neat excavation finish lines, in accordance with the Drawings or directions of the Engineer.
- b. Any excavation carried out outside the limits, shown on Drawings or otherwise specified or directed by the Engineer, shall not be measured and shall not be paid for.
- c. Maximum widths of trenches, allowed for measurement and payment, for sewer lines, will be as follows:
 - i. 600 mm (24") plus external diameter of the pipe, for trenches, not exceeding 1.8 m (6') in depth
 - ii. 750 mm (30") plus external diameter of the pipe, for trenches, exceeding 1.8 m (6') and not exceeding 3.6 m (12') in depth
 - iii. 900 mm (36") plus external diameter of the pipe, for trenches, exceeding 3.6 m (12') in depth
- d. Maximum widths of the trenches, allowed for measurement and payment, for waterlines, will be as shown in the Drawings.
- e. Sheeting, left in place, at the direction of the Engineer, will be measured and paid, separately, at the rate, approved, by the Engineer.

5. RATE AND PAYMENT

5.1 Payment

Payment for, for excavations and backfilling of trenches, for pipelines, of specified purpose, will be made for the respective quantities of these items, measured in accordance with Article 4, at the unit rates, tendered in the priced Bill of Quantities.

5.2 Rate

The unit rates tendered, for excavations and backfilling of trenches, for pipelines, of specified purpose, shall be deemed to be inclusive of, but not limited to the following:

- a. Providing suitable material, for back-filling, where required
- b. All operations related with transportation, involved in the process
- c. All operations related with storage of materials
- d. All sorts of wastages
- e. All operations including:
 - i. Excavation
 - ii. Replacing soft soil, at bottom of trenches, with suitable material
 - iii. Protection, preservation and maintenance of excavations
 - iv. Stock piling of excavated materials, suitable for back filling
 - v. Installation and removal of shoring, sheeting, wall bracings, planking, strutting and similar items
 - vi. Dewatering for excavations, including works like ditching, pumping, wellpointing, bailing, disposal and all other work
 - vii. Disposal of surplus and/or unsuitable excavated material and filth and garbage
 - viii Back-filling including placing, watering and compaction, of the back-filling materials
- ix. Final grading and leveling
- x. Maintenance, protection and repairs, of the works
- f. Design, provision, construction, maintenance and removal of all the requisite temporary works like bridges and detours for the traffic
- g. Design, provision, construction, maintenance and removal of the requisite public protection and warning works like suitable barricades, flood lights, warning lights, signs and similar items
- h. Protection of existing adjacent facilities like pavings, structures and utilities
- i. Making good all damages
- j. Obtaining soil data and information
- k. Carrying out all sampling and testing
- l. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

SECTION 05.1: ASPHALTIC PAVEMENTS (GENERAL)

1. SCOPE

The section outlines the general requirements and procedures for the construction of asphaltic pavements, for roads. All the provisions of this section shall apply to the following sections:

- a. Section 05.2 Subbase and Base Courses
- b. Section 05.3 Pavement Surface Treatment
- c. Section 05.4 Asphaltic Concrete Surfacing
- d. Section 05.5 Brick Edging and Road Curbs

2. SPECIFICATIONS

- a. The materials and methods, to be used, are referred to the specifications and testing procedures of either the American Association of State Highway and Transportation Officials (AASHTO) or the American Society of Testing and Materials (ASTM), as described in the latest editions of the AASHTO and ASTM Standards.
- b. All materials, which the Engineer has determined to be not conforming to the requirements of these specifications, shall be, whether in place or not, removed, immediately, from the site of the work, at the Contractor's expense.

3. TRAFFIC CONSIDERATIONS

- a. While subgrade and paving operations are under way, public traffic shall be permitted to use the shoulders, when authorized and if half-width paving methods are used, shall also be permitted to use the side of the roadbed opposite the one under construction.
- b. When sufficient width is available, a passageway, wide enough to accommodate at least 2 lanes of traffic, shall be kept open at all times at locations where subgrade and paving operations are in active progress.
- c. Water shall be applied, if ordered by the Engineer, for the alleviation or prevention of dust nuisance.
- d. Wherever work is being performed, adjacent to a lane carrying traffic, the edge of lane or edge of pavement shall be delineated, by placing temporary portable delineators adjacent thereto.
- e. In order to expedite the passage of public traffic through or around the work, or whenever the Contractor's operations create a condition hazardous to traffic or to the public, the Contractor shall furnish, erect, and maintain, at his own expense, such fences, barricades, signs, lights, flares, and other facilities, as are necessary, for the convenience and direction of public traffic or are required to prevent accidents or damage or injury to the public. Also, where directed by the Engineer, the Contractor shall furnish competent flagmen and guards, at his own expense, whose sole duties shall consist of directing the movement of public traffic, through or around the work, and giving adequate warning to traffic or to the public of any dangerous conditions to be encountered.
- f. The Contractor shall be fully responsible for the public safety.

4. ASPHALTIC MATERIALS

4.1 Classification

The asphaltic materials shall include the following:

- a. Asphalt Cement: Asphalt Cement shall be oil asphalt, or a mixture of refined liquid and solid asphalt, prepared from crude asphaltic petroleum. It shall be free from admixture with any residues obtained by the artificial distillation on coal, coal tar, or paraffin oil and shall be homogeneous and free from water.

No emulsification shall occur when a 30gram sample is boiled for 2 hours with 250 cubic centimeters of distilled water in a 500-cubic centimeter Erlenmeyer flask equipped with a reflux condenser. Asphalt Cements shall be classified by penetration and when tested in accordance with the standard methods of tests, the grades of asphalt cements shall conform to the requirements set forth in AASHTO M-20. The grade of asphalt to be used shall be as specified or as directed by the Engineer.

- b. Cut Back Asphalt: Liquid asphalts (cut back) shall consist of materials conforming to the following classifications. When tested in accordance with the standard methods of tests of the AASHTO, the grades of liquid asphalt shall conform to the requirements specified in the AASHTO M-81 and AASHTO M-82. Rapid curing products designated by the letters RC, shall consist of asphalt cement with a penetration of approximately 85 to 100, fluxed or blended with a naphtha solvent. Medium curing products designated by letters MC, shall consist of asphalt cement fluxed or blended with a kerosene solvent.
- c. Emulsified Asphalt: Asphaltic emulsions shall be composed of a bituminous base uniformly emulsified with water and an emulsifying or stabilizing agent. They shall be classified according to use as Rapid Setting (RS) or Slow Setting (SS), and shall conform to the requirements specified in AASHTO M-140. The bituminous base used in manufacturing RS-1 type emulsion shall be asphalt cement, Grade 120-150 or Grade 200-300, as designated by the Engineer. The bituminous base used in manufacturing SS-1 type emulsion shall be paving asphalt, Grade 60-70 or Grade 120-150, as designated by the Engineer.

4.2 Specifications

Following specifications shall apply to various asphaltic materials:

Material Type	Grade	Grading Parameter	Parameter Values	Application Temperatures (Degree F)
Asphalt Cement	60-70 85-100 120-150 200-300	Penetration, 100 g, 5 sec, at 25° C [AASHTO M-20]	60-70 85-100 120-150 200-300	heated to produce viscosities of 85 to 100 seconds Say bolt Furol
Cut Back Asphalt (Rapid Curing)	RC-70 RC-250 RC-800	Kinematic Viscosity, ° C, in at 60 centistokes [AASHTO M-81]	70-140 250-500 800-1600	120-190 165-230 200-265
Cut Back Asphalt (Medium Curing)	MC-70 MC-250 MC-800	Kinematic Viscosity, at 60° C, in centistokes [AASHTO M-82]	70-140 250-500 800-1600	120-190 165-230 200-265
Emulsified Asphalt (Rapid Setting)	RS-1 RS-2	[AASHTO M-140]		75-130 110-160
Emulsified Asphalt (Slow Setting)	SS-1 SS-1h	[AASHTO M-140]		75-130

SECTION 05.2: SUBBASE AND BASE COURSES

1. DESCRIPTION

This work shall consist of furnishing, spreading and compacting graded sub base and base material, in one or more layers, constructed, on a prepared sub grade surface, in accordance with these specifications and to the lines, grades, thickness and cross sections shown on the Drawings and/or as directed by the Engineer. All the provisions of Section 05.1 shall apply to this section of specifications.

2. TOLERANCES

The allowable tolerances for the sub grade, prior to placing the sub base and base, together, with the allowable tolerances, for these layers are given in the following table.

Component	Thickness	Level
Subbase	+ 9.5 mm (0.375") - 19.0 mm (0.750")	+ 9.5 mm (0.375") - 28.0 mm (1.125")
Base	+ 5.0 mm (0.188") - 9.5 mm (0.375")	+ 5.0 mm (0.188") - 9.5 mm (0.375")

3. MATERIALS REQUIREMENTS

3.1 General

Materials for sub base and base construction shall consist of hard and durable crushed gravel or stone fragments, which shall be clean and free from organic matters, lumps of clay and other deleterious substances.

3.2 Grading Requirements

The soil aggregate material, for sub base and base courses, comprising coarse and fine aggregate, shall conform to the following grading requirements:

US Standard Sieve Size	Percent by Weight Finer than Each Sieve					
	Subbase Course			Base Course		
	Class A	Class B	Class C	Class A	Class B	Class C
2.00" (50.00 mm)	100	100	100	100	100	100
1.50" (37.50 mm)	-	-	-	80-100	80-100	100
1.00" (25.00 mm)	75-95	100	100	60-100	60-100	100
0.75" (19.00 mm)	-	-	-	50-85	55-85	75-100
0.375" (9.50 mm)	40-75	50-85	60-100	-	-	-
No. 4 (4.75 mm)	30-60	35-65	50-85	25-45	35-60	40-60
No. 10 (2.00 mm)	20-45	25-50	40-70	15-35	25-50	25-45
No. 40 (0.375 mm)	15-30	15-30	25-45	8-22	15-30	12-25
No. 200 (0.075 mm)	2-20	5-15	5-20	2-9	8-15	5-12

3.3 Other Quality Characteristics

a. Other quality characteristics, of the soil aggregate material, shall be as follows:

Characteristics	Sub-base	Base
Maximum percentage wear, by Los Angles abrasion test, of coarse aggregate, at 500 revolutions (AASHTO T96)	50	40
Minimum CBR-value (AASHTO T193) at the maximum dry density, according to AASHTO T180, Method D	30	80
Maximum loss by Sodium Sulfate Soundness test, at five cycles (AASHTO T104)	-	12%

b. Fine Aggregate

- i. Subbase Course: The fine aggregate shall consist of finely divided mineral matter (sand silt). The fraction passing 0.075 mm sieve (No. 200) shall not be greater than two thirds of the fraction passing the 0.375mm (No.40) sieve. The fraction passing 0.375mm (No.40) sieve shall have a liquid limit not greater than 25 and plasticity index not greater than 6.
- ii. Base Course: The sand equivalent determined according to AASHTO T176 shall not be less than 50, or the material shall have a Liquid Limit of not more than 25 and a Plasticity Index of not more than 6 as determined by AASHTO T89 and 90, respectively.
- c. Blending Materials: If fine aggregate or filler in addition to that naturally present in the material, is necessary in order to meet the grading requirement, or for satisfactory bonding of the materials, it shall be uniformly blended with the material at the screening and crushing plant or on the road. The material for such purposes shall be obtained from sources approved by the Engineer and shall be free from hard lumps. If the blending is done at the crushing and screening plant, and the material is then transported over a distance, water shall be added to prevent segregation.

4. CONSTRUCTION REQUIREMENTS

4.1 Subbase Course

a. Material Placing

- i. The sub base course shall be placed on the prepared sub grade, in layers, each of the such thickness, to result into the compacted thickness, after addition of any blending material, varying from 75mm (3 inch) to 115mm (4.5"), as directed by the Engineer.
- ii. When more than one layer is required, each layer shall be shaped, compacted and tested before the succeeding layer is placed. The operations, in the placing of upper layer, shall be such so as not to disturb the lower layers.
- iii. The placing of material shall begin at the point designated by the Engineer. Placing shall be from spreader boxes or from vehicles, specially, equipped to distribute the material in a uniform layer.
- iv. When hauling is done over previously placed material, hauling equipment shall be routed as uniformly as possible over the entire area of previously constructed layers.

b. Adding Blending Material: When additional fine aggregate or filler is required to be added and blended with the material on the road, the blending material shall be uniformly placed, with spreader boxes or other approved devices.

c. Mixing and Spreading

- i. After each layer, of sub base course material, has been placed and blending material added, when required, it shall be thoroughly mixed to its full depth by means of mixing equipment or manually, as approved by the Engineer.
- ii. During mixing, water shall be added in the amount necessary to provide the optimum moisture content for compaction.
- iii. When uniformly mixed, the mixture shall be spread, smoothly, to the required profile.

d. Compaction

- i. Immediately following final spreading and smoothing, each layer shall be compacted to the full width by means of smooth-wheel power rollers or pneumatic-tyred rollers.
- ii. Rolling shall progress gradually from the sides to the centerline of the road, and shall continue until the surface has been rolled.
- iii. Any irregularities or depressions, that develop, shall be corrected by loosening the material at these places and adding or removing material, until the surface is smooth and uniform.
- iv. Along curbs, headers, and walls and at all places, not accessible to the roller, the sub base material shall be tamped thoroughly with mechanical tampers or with hand tampers if approved by the Engineer.
- v. As an alternative, the Engineer may permit compaction with types of equipment other than those specified above, provided he determined that use of the alternative equipment will consistently produce densities as equal to the density provided above. The Engineer's permission for use of alternative compaction equipment shall be obtained in writing.
- vi. During the progress of the work, the Engineer shall make density tests, to measure the degree of compaction. In case the measured degree of compaction, in any layer, is less than the required; the Contractor shall perform additional rolling or tamping, as may be necessary, to obtain the required compaction.
- vii. Except where otherwise specified, each layer of the sub base, shall be compacted to not less than 100% of maximum laboratory density, based on AASHTO Test T180, Table D (Modified Proctor), with field density to be determined in accordance with AASHTO T191.

e. Thickness Requirements

- i. Immediately after final compaction of the sub base course, the thickness shall be measured at one or more points in each 90m (300 feet) length of sub base course. Measurements shall be made by means of test holes or other approved methods.
- ii. The points for measurement shall be selected by the Engineer, at random locations, within each 90m (300 feet) section, in such manner as to avoid any regular pattern. Various points on the cross section shall be covered.
- iii. As the work proceeds, without deviation, in thickness, beyond the allowable tolerances, the space interval, between tests, may be increased, at the discretion of the Engineer, to a maximum of 300m (1000 feet), with occasional tests at closer intervals.
- iv. Whenever a measurement indicates a variation, from the specified thickness, more than the allowable tolerance; it shall be corrected by removing or adding material, as necessary, and shaping and compacting, as specified.

- v. The cutting of test holes and refilling with materials, properly compacted, shall be done by Contractor to the entire satisfaction of the Engineer.
- f. Surface Requirements: When tested by a crown template, conforming to the typical cross section, and a 3m (10 feet) straight edge, applied at right angles and parallel to the centerline of the roadbed, the variation of the surface, from each testing edge, between any two contacts, with the surface, shall at no point exceed 13mm (1/2") for the crown template and 8.5mm (1/3") for the straight edge.
- g. Stockpiling: If the Contractor elects to produce a stockpile aggregate, prior to placement on the roadbed, the aggregates shall be stockpiled, in accordance with the instructions of the Engineer.

4.2 Base Course

All the construction requirements, for the sub base courses, laid down in Article 4.1, shall apply to the base courses, with following additional requirements:

a. Applying Screenings

- i. Immediately after the compaction of the coarse aggregate, sufficient, clean and dry, screenings shall be uniformly applied, to fill all voids. Dry rolling shall be continued while screenings are being applied.
- ii. Hand brooms shall be used if the roller is not equipped with a broom. Screening shall be spread in thin layers at a uniform and slow rate to insure filling voids.
- iii. Spreading screenings, booming, and rolling shall be continued until the voids are completely filled.

b. Sprinkling

- i. Immediately after the voids, of a layer, have been filled with screenings, the macadam shall be sprinkled with water, the sprinkler being followed by the roller. All excess screenings forming in piles or cakes on the surface shall be scattered by light sweeping.
- ii. The sprinkling and rolling shall continue, and additional screenings shall be applied where necessary, until all voids are completely filled and the coarse stone firmly set and bonded. The quantity of screenings and water shall be sufficient to completely fill and bond the entire depth of the coarse aggregate and to produce a granular surface.
- iii. Provisions shall be made, by the Contractor, for furnishing water, at the site of the work, by equipment of ample capacity and of such design, as to assure uniform application.

e. Maintenance and Protection of Base Course: The surface, of any layer, shall be maintained, in its finished condition, until the succeeding layer or surfacing is placed.

5. MEASUREMENT

Measurement, for both sub base and base courses, will be made in the specified units, of theoretical volume of compacted sub base and base courses, of specified class,

acceptably placed, on the basis of the dimensions, for the neat pavement finish lines, in accordance with the Drawings or directions of the Engineer.

6. RATE AND PAYMENT

- a. Payment for, both sub base and base courses, of specified class, will be made for the respective quantities of these items, measured in accordance with Article 5, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for both sub base and base courses, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials
 - ii. All operations related with transportation, involved in the process
 - iii. All operations related with storage of materials
 - iv. All sorts of wastages
 - v. All operations including placing, mixing, spreading, watering, rolling and compaction, of the materials; and maintenance, protection and repairs, of the courses
 - vi. Carrying out all sampling and testing
 - vii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

SECTION 05.3: PAVEMENT SURFACE TREATMENT

1. GENERAL

All the provisions of Section 05.1 shall apply to this section of specifications.

2. EQUIPMENT

2.1 Asphalt Spraying Equipment

The equipment, to be used for spraying liquid asphaltic material, shall be pressure distributor, of following specifications:

- a. It shall be of approved manufacture, with capacity not to be less than 950 liters.
- b. It shall be mounted on pneumatic tires of such width and number that the load produced on the road surface will not exceed 100 kg. per cm width of tire.
- c. The tank shall have a heating device able to heat a complete charge of asphaltic liquid, upto 180 degree centigrade. The heating device shall be so that overheating will not occur.
- d. The liquid shall be circulated or stirred during the heating.
- e. The tank shall be insulated, in such a way, that the drop in temperature, when the tank is filled and not heated, will be less than 2 degree centigrade per hour.
- f. A thermometer shall be fixed to the tank in order to be able to control, continuously, the temperature of the liquid. The thermometer shall be placed in such a way that the highest temperature in the tank is measured. A thermometer shall be fixed, which indicates the temperature of the liquid immediately before it leaves the spraying bar.

- g. The tank shall be furnished with a device that indicates the contents. The pipes for filling the tank shall be furnished with an easily interchangeable filter.
- h. The distributor shall be able to vary the spray width of the asphaltic liquid, in steps of maximum 100mm (4 inch) to a total width of 4m (13'). The spraying bar shall have nozzles from which the liquid is discharged, in a fan-shaped spray, on the road surface, equally distributed over the total spraying width.
- i. The distributor shall have a pump, driven by a separate motor, for dozing the liquid. The pump shall be furnished with an indicator, showing the performance in liters per minute. At the suction side, the pump shall have a filter easily exchangeable.
- j. The distributor shall be furnished with a tachometer, indicating the speed in meter per minute. The tachometer shall be visible from the driver's seat.
- k. The function of the distributor shall be so exact that the deviation from the prescribed quantity, to be spread, on any unit area, does not exceed 10%.
- l. The distributor shall be equipped with a device, for hand spraying of the bituminous liquid.

3. BITUMINOUS COAT

3.1 Description

This work shall consist of furnishing and applying asphaltic material, on the prepared and untreated surfaces, in accordance with these specifications and as shown on the Drawings or as directed by the Engineer.

3.2 Material Requirements

Asphaltic materials shall conform to the requirements laid down in Section 05.1 and shall be cut back or emulsified asphalt, as specified.

3.3 Construction Requirements

- a. Asphaltic material shall be sprayed by means of a pressure distributor, as described in Article 2.1, at the specified application temperature, stated in Section 05.1.
- b. Except where otherwise specified, rates of application, of the liquid asphalt, shall be 0.5 liters per square meter (1.0 imp. gallons per 100 sft).
- c. Immediately before applying the bituminous coat, the full width of surface, to be treated, shall be swept, with a power broom, to remove all dirt and other objectionable material.
- d. Bituminous coats shall be applied, only, when the surface, to be treated, is dry; except that when emulsified asphalt is used, the surface may be reasonably moist.
- e. No application shall be made when the weather is foggy or rainy.
- f. All areas inaccessible to the distributor shall be sprayed, manually, using the device, for hand spraying, from the distributor.
- g. Care shall be taken that the application of bituminous material is not in excess of the specified amount; any excess shall be blotted with sand or similarly treated.
- h. The surfaces, of structures and trees, adjacent to the area, being treated, shall be protected, in such manner, as to prevent their being spattered or marred.
- i. The Contractor shall maintain the bituminous coat, until the next course is applied.

- j. The bituminous coat shall be left undisturbed, for a period of at least 24 hours, and shall not be opened to traffic, until it has penetrated and cured sufficiently so that it will not be picked up by the wheels of passing vehicles.

4. SURFACE TREATMENT

4.1 Description

This work shall consist of furnishing and applying asphaltic material, of the specified type and grade, with aggregate material of specified size and quality, in accordance with these specifications and as shown on the Drawings or as directed by the Engineer.

4.2 Materials

- a. Asphaltic Material: Asphaltic materials shall conform to the requirements laid down in Section 05.1. Except where specified otherwise, asphalt cement (Grade 85-100) shall be used.

b. Aggregate

- i. Aggregate shall comprise clean, tough and durable fragments of crushed gravel or stone. It shall be free from dirt or other objectionable matter.
- ii. The percentage wear, as determined by AASHTO T-96 (Los Angeles Abrasion Test), at 500 revolutions, shall not be greater than 40, for the aggregate material.
- iii. The aggregate, for each layer, of surface treatment, shall be of the specified nominal size.

4.3 Rates of Application of Materials for Triple Surface Treatment

Except where otherwise specified, following rates of application of materials shall be used for the triple surface treatment.

Surfacing Layer	Aggregate		Asphaltic Material
	Nominal Size mm (inch)	Application Rate m ³ /100m ² (ft ³ /100 ft ²)	Application Rate kg/m ² (lb/ft ²)
First (Bottom)	25-30 (1.00-1.25)	1.70 (5.58)	1.96 (0.40)
Second	6-13 (0.25-0.50)	0.84 (2.76)	1.22 (0.25)
Third	1.5-6 (0.06- 0.25)	0.46 (1.51)	0.69 (0.14)

4.4 Construction Requirements

a. Weather and Seasonal Limitations

- i. Bituminous material shall be applied, only, when the surface, to be treated, is dry or slightly damp and drying.
- ii. The atmosphere temperature, in the shade, at the time of asphalt application, shall be above 13 Degree Centigrade (55 degree Foreign height), if rising or above 16 Degree Centigrade (60 Degree Foreinheight) if falling.
- iii. The asphalt application shall not be carried out in rain or dust storm.

b. Preparation of the Surface for Treatment:

- i. The surface shall be cleaned, of all loose dust and deleterious material, using mechanical broom and/or mechanical blower. Hand brooms may be approved by the Engineer if sufficient labor is available.
- ii. All necessary patching shall be carried out, to bring the surface of the patch to match the texture of the remaining road, as closely as possible, at least ten days ahead of treatment.

c. Application of Bituminous Materials

- i. The bituminous material shall be applied, through a pressure distributor, as described in Article 2.1, at the specified rate of application.
- ii. Successive widths of spray shall overlap by an appropriate amount to give even rate of spread over the joint. If the sprayer does not give a clear start and stop, building paper shall be spread across the road and the spray started and stopped on this. The paper shall be disposed of as directed by the Engineer.

d. Spreading the Cover Aggregate

- i. The cover aggregate, for each layer of bitumen, shall be spread, at the specified rate, within 5 minutes of the application of bitumen.
- ii. Any bare spots shall be covered up by hand or brushing material, from areas of surplus. Cover aggregate should be swept from the joint before the next width is sprayed.

e. Rolling

- i. Rolling may be done by self-propelled pneumatic tyred roller (min. weight 3/4 ton per wheel with 40 psi tyre pressure) or 6-12 ton three wheel rollers.
- ii. Rolling should not be continued when the chippings show sign of crushing.
- iii. After 24 hours, or longer period if the contractor elects, the surplus aggregate shall be removed by brushing, and the subsequent layers applied as specified in the same manner.

f. Opening of Traffic and Traffic Control

- i. The pavement, undergoing surface treatment, shall not be opened to traffic, until the bituminous material has dried, and in the opinion of the Engineer, will not pick up under the traffic.
- ii. Provided that if it becomes necessary to permit traffic, prior to the drying time, which in no case shall be sooner than 24 hours, after the application of bituminous material; fine sand shall be applied, as directed by the Engineer, and then the traffic shall be permitted to use the road so treated.

5. MEASUREMENT

Measurement, for both bituminous coat and surface treatment, will be made in the specified units, of theoretical surface area of bituminous coat and surface treatment, of specified number of layers, asphalt type and material application rates, acceptably placed, on the basis of the dimensions, of the area to be treated, in accordance with the Drawings or directions of the Engineer.

6. RATE AND PAYMENT

- a. Payment, for both bituminous coat and surface treatment, of specified number of layers, asphalt type and material application rates, will be made for the respective quantities of these items, measured in accordance with Article 5, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for both bituminous coat and surface treatment, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials
 - ii. All operations related with transportation, involved in the process
 - iii. All operations related with storage of materials
 - iv. All sorts of wastages
 - v. All operations including surface cleaning and preparation; asphalt spraying; and maintenance, protection and repairs, of the coats (in case of bituminous coat)
 - vi. All operations including surface cleaning and preparation; asphalt spraying; placing, spreading and rolling, of the cover material; and maintenance, protection and repairs, of the treatment (in case of surface treatment)
 - vii. Carrying out all sampling and testing
 - viii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

SECTION 05.4: ASPHALTIC CONCRETE SURFACING

1. GENERAL

All the provisions of Section 05.1 shall apply to this section of specifications.

2. EQUIPMENT

2.1 Spreading

Depositing and spreading of the asphaltic concrete shall be accomplished by means of a bituminous paver or manually in case the area is so small that the use of paver is practically not possible.

- a. Bituminous pavers shall be self-contained, power-propelled units, provided with an activated screed or a strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown in the contract documents.
- b. Paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed.
- c. Screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture.

- d. When laying mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture.
- e. The bituminous paver shall be equipped with an automatic leveling device controlled from either a string line that has been set as the grade reference, or from a short or long ski grade follower, riding on an adjacent lane, curb, or gutter.
- f. Subsequent passes shall utilize a matching device of 300 mm minimum length riding on the adjacent lay.

2.2 Rolling

Rollers shall be of the steel wheel and/or pneumatic-tire type and shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the bituminous mixture.

- a. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition.
- b. Vibratory rollers with separate controls for energy and propulsion and especially designed for bituminous mixture compaction may be used.
- c. Use of equipment which results in excessive crushing of the aggregate will not be permitted.

2.3 Pressure Distributor

Used for applying prime coat and tack coat material, designed and operated as to distribute the prime material in a uniform spray without atomization, in the amount and between the limits of temperature specified by the supplier. Equipped with a speed tachometer registering feet per minute and so located as to be visible to the truck driver to maintain the constant speed required for application at the specified rate.

- a. Pressure distributor shall be equipped with a tachometer registering the pump speed, pressure gauge, and a volume gauge. The rates of application shall not vary from the rates specified by more than 10 percent.
- b. An accurate measurement of the prime coat material temperature shall be available at all times. The thermometer well shall be so placed as not to be in contact with a heating tube.
- c. Distributor shall be so designed that the normal width of application shall be not less than 6 feet (1.8 m), with provisions for the application of lesser width when necessary.
- d. Distributor shall be so equipped and operated that the prime material shall be circulated or agitated throughout the entire heating process.

3. PREPARATION

3.1 Emulsified Asphalt

Heat in such a manner that steam or hot oils will not be introduced directly into the emulsified asphalt during heating.

- a. Contractor shall furnish and keep on the site at all times an accurate thermometer suitable for determining the temperature of the emulsified asphalt.
- b. Various grades of emulsified asphalt shall be applied at temperatures within the limits specified in Table below.

Application Temperature of Emulsified Asphalt

Emulsion Asphalt Grade	Mixing	Spraying
RS-1	Not Used	21-60°C
RS-2	Not Used	52-85°C
SS-1	10-71°C	21-60°C
SS-1h	10-71°C	21-60°C

- c. Emulsified asphalt shall be reheated, if necessary, but at no time after loading into a tank car or truck for transportation from the refinery to the purchaser shall the temperature of the emulsion be raised above 85 degrees C.
- d. During all reheating operations the emulsified asphalt shall be agitated to prevent localized overheating. Emulsified asphalt shall not be permitted to cool to a temperature of less than 4 degrees C.

3.2 Prime Coat

For asphalt concrete pavement constructed directly upon an aggregate base course, an emulsified asphalt prime coat shall be applied to surfaces of bases at least 12 hours prior to placing the asphalt cement unless otherwise directed by Engineer.

- a. Immediately prior to application of the asphalt prime, an inspection will be made to verify that the base course has been constructed as specified. Also, all loose and foreign material shall be removed by light sweeping. Material so removed shall not be mixed with other aggregate.
- b. Surface to be primed shall be in a smooth and well-compacted condition, true to grade and cross section, and free from ruts and inequalities.
- c. Asphalt prime shall be applied uniformly at the rate of 0.45 to 1.36 liter per square meter. It shall be applied only when permitted by the Engineer and when the air temperature is not less than 4 degrees C.
- d. Contractor shall protect the prime coat against all damage and markings, both from foot and other traffic.
- e. Barricades shall be placed where necessary to protect the prime coat. If, after the prime coat is disturbed after application, it shall be restored to its condition at the time of acceptance.

3.3 Tack Coat

For asphalt concrete pavement constructed directly upon an existing hard-surfaced pavement, a tack coat shall be evenly and uniformly applied to such existing pavement preceding the placing of the asphalt concrete.

- a. Surface shall be free of water, all foreign material, or dust when the tack coat is applied. No greater area shall be treated in any one day than will be covered by the asphalt concrete during the same day. Traffic will not be permitted over tack coating.
- b. Tack coat shall consist of an emulsified asphalt. Application rate shall be no more than 0.45 liter per square meter.
- c. A similar tack coat shall be applied to the surface of any course if the surface is such that a satisfactory bond cannot be obtained between it and the succeeding course.
- d. Contact surfaces of all cold pavement joints, curbs, gutters, manholes, and the like shall be painted with a tack coat immediately before the adjoining asphalt concrete is placed.

3.4 Sand Cover

If the asphalt prime coat has not been completely absorbed by the base course prior to the start of placing the asphalt concrete mixture, sufficient sand shall be spread over the surface to blot up the excess liquid asphalt.

- a. Sand shall also be used at intersections and such areas where traffic may pass over the prime coat.
- b. Prior to placing the asphalt concrete, loose or excess sand shall be swept from the base.
- c. If a sand cover is specified on the drawings to cover asphalt prime, it shall be applied within 4 hours after the application of prime coat.

4. APPLICATION

4.1 General

Asphalt concrete shall be placed in uniform layers/lifts at least equal to two times (2x's) the nominal size aggregate of the job mix formula used but not greater than 75 mm. Pavement lift thickness shall be selected to use the maximum size aggregate defined in this specification.

4.2 Placement

Asphalt concrete may be placed when the temperature is 4 degrees C and rising, and the weather is favorable as determined by the Engineer. No asphalt concrete shall be placed on material which is significantly over optimum moisture, causing deterioration of compacted grade.

- a. Asphalt concrete shall be evenly spread upon the subgrade or base to such a depth that after rolling, the pavement will be of the specified cross section and grade of the course being constructed.

- b. All joints shall be completely bonded.
- c. Placing, once commenced, must be continued without interruption. No greater amount of the mixture shall be delivered in any one day than can be properly distributed and rolled during that day.
- d. In narrow, deep, or irregular sections, intersections, turnouts, or driveways, where it is impractical to spread and finish the base and level the surface mixtures by machine methods, the Contractor may use spreading equipment or acceptable hand methods approved by the Engineer.
- e. Pavement cuts of 2.4 meter or more in width and 30 meter or more in length must be paved with an approved bituminous paving machine.

4.3 Compaction

Asphalt concrete compaction shall begin when the asphalt concrete temperature is in the range specified in the authorized job mix formula by the asphalt cement supplier's temperature viscosity curve.

- a. Temperature of the asphalt concrete in the paver's receiving hopper shall not be less than 107 degrees C prior to placement.
- b. Compaction shall not be allowed on material with a material temperature equal to or less than 85 degrees C.
- c. Materials shall be compacted to a density of at least 93% but not greater than 97% of the theoretical maximum density as determined by ASTM D2041.
- d. Diesel fuel or other petroleum based solvents shall not be used as a release agent to clean equipment used to place and compact asphalt concrete.
- e. Rolling of both the base course and surface course shall be continued until all roller marks are eliminated.
- f. In areas not accessible to the roller, the mixture shall be thoroughly compacted with hand-operated mechanical tampers.
- g. Any mixture that becomes mixed with foreign material or in any way is defective shall be removed, replaced with fresh mixture, and compacted to the density of the surrounding pavement.
- h. Test strip of a minimum of 3 meter wide and 76 meter long shall be placed to establish the rolling pattern to be used on each asphalt mix and thickness to be placed on the project.

4.4 Rolling

- a. Rolling shall be continued with steel and pneumatic wheel rollers until the layer has become thoroughly compacted throughout and is true to grade and cross section.
- b. Rollers shall be maintained in good mechanical condition, and those that cannot be operated without jerking or driven along a straight path shall not be used.
- c. No leakage from any roller shall be allowed to come in contact with the pavement being constructed nor shall any roller be permitted to stand motionless on any portion of the work before it has been properly compacted.

- d. Steel roller wheels shall be treated with water or oil to prevent the adherence of the asphalt concrete, and water or oil may be used on pneumatic-tired rollers but the quantity used must not be such as to be detrimental to the surface being rolled.
- e. If the vibratory rollers cause surface cracking, use pneumatic-tired rollers following rolling with vibratory rollers.

4.5 Joints

Care shall be exercised in connection with the construction of joints to insure that the surface of the pavement is true to grade and cross section.

- a. In making the joint along any adjoining edge such as a curb, gutter, or an adjoining pavement and after the hot mixture is placed by the finishing machine, sufficient hot material shall be carried back to fill any space left open. This joint shall be properly “set up” with the back of a rake at proper height and level to receive the maximum compression under rolling. The work of “setting up” this joint shall be performed by competent workmen who are capable of making a correct, clean, and neat joint.
- b. Longitudinal and transverse joints shall be made in a careful manner to ensure well-bonded and sealed joints. Joints between old and new pavements or between successive days’ work shall be carefully made in such a manner as to insure a thorough and continuous bond between the old and new surfaces.
- c. In the case of surface course, the edge of the old surface course shall be cut back for its full depth so as to expose a fresh surface and, if necessary to obtain a well-bonded joint, shall be painted with a tack coat after which the hot surface mixture shall be placed in contact with it and raked to a proper depth and grade.
- d. Before placing mixture against contact surfaces of curbs, gutters, headers, manholes, etc., they shall be painted with a tack coat.

4.6 Tolerances

When a 3 meter straight edge is laid on the finished surface parallel to the centerline of the roadway, the surface shall not vary from the edge of the straightedge more than 5 mm, except at intersections or any changes of grade. Areas that are not within this tolerance shall be brought to grade immediately following the initial rolling.

After the completion of final rolling, the smoothness of the course shall be checked, and the irregularities that exceed the specified tolerances or that retain water on the surface shall be corrected by removing the defective work and replacing with new material as directed at the expense of the Contractor.

5. FIELD QUALITY CONTROL

5.1 Sampling Prior to Placement

An asphalt concrete sample will be taken in accordance with the requirements of ASTM D979 for up to each 250 tons delivered per day to a project, for each job mix delivered.

- a. Sample will be of such size to provide material for all tests specified in table below and retain age to perform verification tests if required.
- b. Asphalt concrete sample will be tested for, but not limited to the properties specified in table below.

Asphalt Concrete Sample Tests

1. Marshall Properties [2] a. Stability b. Flow	ASTM D1559 [3] ASTM D1559
2. Physical Properties a. Asphalt Content [6] b. Bulk Density c. Air Voids in Asphalt Concrete d. Voids in Mineral Aggregate - VMA e. Voids Filled f. Extracted Aggregate Gradation [7] g. Maximum Theoretical Density	ASTM D2172 [4], or D4125 ASTM D2726 ASTM D3203 Standard Marshall Calculations Standard Marshall Calculations ASTM C136, ASTM C117, [4] ASTM D2041

- [1] Material used for an individual test will be split from the same sample.
- [2] Asphalt concrete material to be compacted for Marshall Properties, shall be compacted at the MEDIAN TEMPERATURE of the compaction temperature range (± 5 degrees F), (± 3 degrees C), recommended by the asphalt cement supplier in the viscosity temperature relationship curve of the asphalt cement, specified for a respective job mix formula. The MEDIAN TEMPERATURE shall be defined as the temperature halfway between the minimum and maximum compaction temperatures recommended.
- [3] A minimum of three (3) standard briquettes shall be molded.
- [4] Corrected for mineral material extracted with the asphalt.
- [5] The laboratory may retain the unused portion of the split sample for testing as required until the lot that the sample represents is accepted by the SDR.
- [6] Asphalt content test results shall be corrected for extracted mineral material, if applicable. [7] Aggregate gradation shall be adjusted for extracted mineral material, if applicable.

5.2 Sampling Pavement after Placement

Samples of the compacted asphalt pavement will be taken and tested to determine conformance of the finished pavement with the specified requirements. Contractor shall replace the pavement at his expense where samples are removed. The number of samples including rings and cores to be taken will be as required herein.

- a. Minimum test requirements for the pavement shall consist of a test for:
 - i. Gradation of extracted aggregates.
 - ii. Density of compacted pavement.
 - iii. Asphalt content by extraction (if not previously controlled and verified by tank strap test).
- b. Frequency for these tests shall not be less than one (1) test in each of the three (3) categories for each 500 tons or fraction thereof of asphalt concrete placed and for asphalt concrete less than 500 tons placed during one day's run.

5.3 Field Testing

In-place field compaction tests will be conducted in accordance with the requirements of ASTM D 2950 at the minimum rate of one test per lift per 420 m² of asphalt material placed, or one (1) test per day if less than 420 m² is placed.

- a. Compaction tests shall measure the density of the fresh constructed asphalt concrete roadway lift only.
- b. Compaction test of the subgrade or base course material for the asphalt concrete roadway lift to be constructed, shall be taken prior to the placement of the fresh asphalt concrete lift. The density of the subgrade or base course material determined by the compaction test shall be used as reference in performing the compaction test of the fresh asphalt material.
- c. Compaction test of the subgrade or base course material shall be taken at the rate of one (1) test for each 420 m² of surface or less to be paved over in a day.
- d. Density of the subgrade or base course material will be reported as “reference support material density” in the compaction test report of the constructed asphalt concrete pavement over the area represented by the subgrade or base course material compaction test.
- e. In place field compaction tests shall be taken at various locations on the asphalt being placed. The exact location of each test shall be directed by the Engineer.
 - i. The three (3) general areas in which tests are to be taken are the edge of the mat, mat interior, and the joints. The number of tests taken in each area will vary but the total number of tests taken on any project shall be in the approximate proportions shown in table below.

Field Compaction Tests

Location	% of Total Compaction Tests
Edge of Mat [1]	20% to 30%
Mat Interior	40% to 60%
Joints [2]	20% to 30%

[1] Edge of Mat tests will be taken in the area between one (1) foot (305 mm) and two (2) feet (610 mm) in from a free edge and/or an edge adjacent to a curb or structure, or longitudinal or transverse abutting joints.

[2] Joints will include the longitudinal and transverse butt joints between adjacent lifts of asphalt having the same final elevation.

- ii. If core samples are required or requested by the Contractor, four (4) inch (102 mm) diameter cores shall be taken and tested in accordance with the requirements of ASTM D2726.

SECTION 05.5: PAVEMENT EDGING, CURBS AND GUTTERS

1. DESCRIPTION

- a. This work shall consist of furnishing and laying pavement edging, curbs and gutter, of specified type and materials, on a prepared sub grade surface, in accordance with these specifications and to the lines, grades, thickness and cross sections shown on the Drawings and/or as directed by the Engineer.
- b. All the provisions of Section 05.1 shall apply to this section of specifications.

2. MATERIALS

2.1 General

- a. Bricks, Portland cement and water shall conform to the requirements, laid down in Section 02.1 "Common Building Materials".
- b. Portland cement concrete and formwork shall conform to the requirements, laid down in Section 08.1.1 "Portland Cement Concrete".
- c. Sand, for bedding under edging, curbs and gutters shall be locally available clean sand.

2.2 Pavement Edging

Except where otherwise specified, pavement edging shall consist of a single layer of brick on edge, with 230mm x 75mm (9" x 3") face, contiguous to the pavement edge, with close joints, laid over 25mm (1") sand cushion and sand grouted.

2.3 Road Curbs and Gutters

Except where otherwise specified, road curb and gutter units shall be of precast, plain Portland Cement Concrete (Class C), with fair finish on all visible faces, constructed to lengths, shapes and other details, as shown in the Drawings.

3. CONSTRUCTION REQUIREMENTS

3.1 Pavement Edging

- a. Except for the top most layer of the base course, all other layers, of sub base and base courses, shall be laid and compacted without laying edging, but after completion of the consecutive layers of earthen shoulders at the same level, as the pavement layer to be rolled.
- b. While laying the top most layer of the base course, the edging units layer shall be laid, over sand cushion, of specified thickness, with close joints and sand grouted.
- c. The top of the edging units, after rolling, shall be in line with the finished profile of the base course. The edging layer shall be rolled, simultaneously, with the final layer of base course, after completion of the earthen shoulders.

3.2 Road Curbs and Gutters

- a. Excavation: Excavation shall be made to the required depth and the sub grade, upon which the curb is to be set, shall be compacted to an even surface. All soft and unsuitable

material shall be removed and replaced with suitable material, which, shall be thoroughly compacted.

- b. Sand Bed: Where specified, a sand layer, of specified thickness, shall be placed and compacted over well-prepared sub grade.
- c. Blinding Concrete: Where specified, a blinding concrete layer, of specified class and thickness, shall be placed, over the sand bed, or directly over well prepared sub grade, as shown.
- d. Installation: The curbs and gutters shall be so set, that the face and top lines conform to the required lines and grades.
- e. Joints: Curbs and gutters shall be laid with joints, as close as possible. These joints shall be filled with 1:3 cement sand mortar.

5. RATE AND PAYMENT

- a. Payment, for pavement edging, curbs and gutters, of specified type, will be made for the respective quantities of these items, measured in accordance with Article 4, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for pavement edging, curbs and gutters, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials including sand for bedding
 - ii. All operations related with transportation, involved in the process
 - iii. All operations related with storage of materials
 - iv. All sorts of wastages
 - v. All operations involved in the preparation of precast concrete items, in accordance with the relevant specifications
 - vi. All operations including excavation, disposal of surplus materials, sub grade preparation, laying sand bedding (if any), installation, jointing, maintenance, protection and repairs
 - vii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.
- c. Unless otherwise specifically stated in the Bill of Quantities, blinding layer concrete, if any, will be measured and paid, separately.

SECTION 08.1.1: CONCRETE WORK

1. DESCRIPTION

This section covers the manufacture, forming, transporting, placing, stripping of forms, finishing and curing of plain and reinforced cement concrete.

2. SPECIFICATIONS

- a. Until and unless specified or directed otherwise by the Engineer all materials and workmanship shall be based on the latest versions of applicable ASTM Standards in force at the time of inviting tenders.
- b. The Contractor shall submit, for the approval of the Engineer, before commencement of any work, his Method Statement, which would provide complete details of the procedures and equipment, to be used, for the satisfactory execution of the work. The approval of such Method Statement shall not relieve the Contractor of any of his responsibilities, under the Contract.
- c. Any defective work in the opinion of the Engineer shall be removed and reconstructed without undue delay to the approval of the Engineer and the Contractor shall bear all additional costs incurred.
- d. Any previous checks by the Engineer shall not in any way relieve the Contractor of his responsibility in respect of quality and accuracy of Work.
- e. Full care shall be taken to install embedded items. Embedded items shall be inspected and checks for reinforcements and other materials and items shall be completed and approved before concrete is placed.
- f. The Contractor shall get the bar bending schedules of reinforcement checked and approved from the Engineer prior to the cutting of reinforcement.
- g. The Contractor shall maintain an accurate record of ambient temperature of Site. Ambient temperature shall be measured using mercury thermometers or other thermometers acceptable to the Engineer.
- h. Throughout the concrete work, the Contractor shall employ full time on the Works suitable number of qualified and experienced Engineers whose sole duties shall be as follows;
 - i. Design of concrete mixes
 - ii. Quality control of concrete
 - iii. Supervision of mixing, transporting, placing, compacting, finishing, curing and protecting concrete.
 - iv. Supervision of sampling and testing.
 - v. Preparation and submission of test certificates and reports.
 - vi. Completion and keeping of record.
 - vii. Such other duties as the Engineer may direct.
- i. All concrete work including reinforcement etc. shall be carried out in accordance with the applicable requirements of ACI-318-83 and to the instructions of the Engineer.

3. COMPOSITION

Concrete shall be composed of Portland cement, of specified type, fine and coarse aggregates, water and any admixtures, as and when specified or approved.

4. CEMENT

Specifications for cement shall conform to the requirements laid down in Section 02.1. Except where otherwise specified, cement for concrete shall be Sulfate Resisting Portland cement, conforming to ASTM Designation C150, Type IV.

5. AGGREGATE

Specification for aggregates shall conform to the requirements laid down in Section 02.1.

6. WATER

Water for washing aggregates and for mixing and curing concrete shall meet the requirements laid down in Section 02.1.

7. CONCRETE ADMIXTURES

Concrete admixtures shall not be used without permission in writing from the Engineer. Should the Contractor require to use admixtures, he shall provide full evidence in support of the suitability of the admixture proposed as per BS 5075 and 6349.

7.1 Supply and storage

- a. Admixtures for concrete shall comply with BS.
- b. All admixtures that are to be used in dose forms shall be supplied in containers or packages marked with the recommended dosage for each type of mix in which they are to be used.
- c. Admixtures shall be stored strictly in accordance with manufacturers' recommendations and precautions shall be taken during delivery and storage to prevent damage to or adulteration of admixtures.
- d. Cement replacements shall be stored and handled in accordance with the requirements as specified for cement.
- e. Any cement containing admixtures shall be supplied in bags or containers clearly marked to show the nature and quantity of such admixtures and shall be stored separately from any other type of cement.

7.2 Use of admixtures

Any admixture used in any concrete mix shall only be used at the rate of dosage or in the proportions previously approved by the Engineer, and in accordance with the manufacturer's instructions.

Any batch of concrete which has received an incorrect dose of an admixture or which shall show deterioration after placing as a result of incorrect use of admixtures, shall be broken out or otherwise replaced without charge to the Contract.

Liquid admixtures or powder admixtures that are to be used as solutions shall be dispensed by an appliance fixed to the mixer, which measures weight, volume or dosing time and is provided with a recorder. This appliance shall be accurately calibrated and the calibration and dosage shall be checked at regular intervals or as directed by the Engineer. All such admixtures shall be dispensed with the mixing water.

All admixture dispensers shall be thoroughly cleaned before commencing each day's work and at every interruption to the work.

Where admixtures are to be used in bulk form, these shall be weigh-batched as is provided in this Specification for the batching of cement.

Powder admixtures to be used in dose form shall only be allowed if premixed and used as solutions and then only if the premixing procedure has been previously approved by the Engineer.

Trial mixes shall be undertaken as described, together with additional trial mixes showing the effect of overdosing and underdosing of the concrete mix.

7.4 Chlorides

Under no circumstances shall calcium chloride or chloride based admixtures be used in any concrete mix, grout or mortar and the chloride content of the total mix shall comply with Clause 8.1

8. PROPORTIONING OF CONCRETE

8.1 Classes of Concrete

Various classes of concrete, to be used, as shown in the drawings or specified in BOQ, shall be as follows:

Concrete Class	Mix Ratio by Volume	Minimum 28-Day Cylinder Strength kg/cm ² (psi)	Minimum Cement Contents kg/m ³ (lb/ft ³)
Class E	1:4:8	-	-
Class D	1:3:6	-	-
Class C	-	211 (3000)	311 (19.4)
Class B	-	281 (4000)	396 (24.7)

8.2 Proportioning for Classes D and E Concrete

- a. Proportions: Mix ratio, of cement, fine and coarse aggregate, by volume, shall be as specified, in Article 8.1.
- b. Water Contents: Water cement ratios shall be such as to produce concrete having suitable workability, density, impermeability and durability, to the satisfaction of the Engineer.

8.3 Proportioning for Classes B and C Concrete

- a. Proportions: The proportions of all materials entering into the concrete, of Class B and C, where a minimum compressive strength is specified, as laid down in Article 8.1, shall be based upon the concrete mix design or the directions of the engineer.

- b. Concrete Mix Design: The concrete mix design shall be carried by the Contractor, where instructed by the Engineer. Trial mixes and tests shall be made by the Contractor, for this purpose. Following shall be established, in the process of
concrete mix design, for the specified concrete strength, workability and size, type and gradation of the aggregate used:
- i. Cement Contents: Cement contents, however, shall not to be less than the minimum amount specified in Article 8.1.
- ii. Water Contents: Water cement ratios shall be such as to produce concrete having suitable workability, density, impermeability, durability and the required strength, without the use of excessive amount of cement.
- c. Measurement: All materials entering into the concrete should be measured by weight or by volume as approved by the Engineer.

8.4 Related Requirements

- a. Consistency: The amount of water used in the concrete will be regulated, as required by the Engineer, to secure concrete of proper consistency, taking into account the effect of any variation, in either or both the moisture contents or grading of the aggregates, as they enter the mixer. Addition of water to compensate for stiffening of concrete, before placing, will not be permitted. Uniformity in concrete consistency, from batch to batch, shall be ensured.
- b. Slump Test: The slump for concrete, determined in accordance with ASTM C-143 Test for Concrete, shall be minimum of 25 mm and maximum of 75 mm provided the requisite strength is obtained. Corrective additions to remedy deficiencies in aggregate gradations shall be used only with the written approval of the Engineer. When such additions are permitted, the material shall be measured separately for each batch of concrete.

9. BATCHING AND MIXING

9.1 General

Hand mixed concrete shall not be used; however, the Engineer may allow concrete to be mixed in small mixers. All concrete shall be produced in a batch and mix plant or a mechanical mixer.

9.2 Mixers

- a. The mixer, provided by the Contractor, shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation.
- b. Mixers shall not be charged in excess of the capacity, recommended by the manufacturer and shall not be recharged, before completely discharging the previous batches.
- c. Excessive over-mixing, requiring additions of water, will not be permitted.
- d. The mixers shall be operated at a drum speed, designated by the manufacturer.
- e. The mixers shall be maintained in satisfactory operating condition, and mixer drums shall be kept free of hardened concrete. Mixer blades shall be replaced when worn down more than 10 percent of their depth.

9.3 Type and Capacity of Mix Plant

The size of batch and mix plant shall be such that the proposed arrangement shall produce sufficient quantity of concrete meeting with all the other requirements of these Specifications and the construction schedule. The batched materials shall be thoroughly combined into a uniform mixture, before the addition of water. The water be added gradually and the mixers operated for adequate duration of time, so as to obtain a thoroughly mixed concrete of uniform color and quality.

9.4 Water Batcher

A suitable water-measuring device shall be provided, by the Contractor, which will be capable of measuring water, within the specified requirements for each batch. The mechanism for delivering water, to the mixer, shall be such that no leakage will occur when the valves are closed.

9.5 Location

The concrete plant and mixers shall be installed at the site of the work, at locations selected by the Contractor and approved by the Engineer.

9.6 Arrangement

- a. Separate bins and compartments shall be provided for each size or classification of aggregate and Portland cement.
- b. The compartments shall be of ample size and so constructed that the materials will be maintained separated under all working conditions.
- c. Batching equipment/arrangement shall be capable of delivering concrete within the following limits of accuracy:

Materials	Percent
Cement	+1%
Water	+1%
Aggregate Smaller than 19mm (3/4")	+2%
Aggregate Larger than 19mm (3/4")	+3%

9.7 Cooling

- a. Adequate cooling facilities shall be provided to ensure that the temperature of concrete, when discharged from the mixers, is sufficiently low to meet the temperature requirements.
- b. Use of cool water or ice for mixing, use of pre-cooled aggregates and/or shading the stockpiles with roofing, or any other arrangements, may be used, to keep the temperature of concrete, within prescribed limits.
- c. These cooling arrangements shall be subject to the approval of the Engineer, but approval shall not, in any way, relieve the Contractor of his responsibility of placing concrete at temperatures at or below the specified limits.

9.8 Scales

- a. Adequate weigh and volume batching facilities, as approved by the Engineer, shall be provided, by the Contractor, for the accurate measurement and control of each of the materials, entering each batch of concrete.
- b. The accuracy of the weighing equipment shall conform to the requirements of applicable standards, selected by the Engineer, for such equipment.
- c. The weighing equipment shall be arranged so that the concrete plant operator and Engineer can observe the dials or indicators.

9.9 Mixing Time

- a. The mixing time, after solid materials are in the mixer drum, provided that all the mixing water is introduced before one fourth of the mixing time has elapsed, shall be as follows:

Capacity of Concrete Mixer	Mixing Time (Minutes)
Upto 1.7 cubic meters (2 cubic yards)	1.50
2.5 cubic meters (3 cubic yards)	2.00

- b. The mixing periods, specified above, are applicable in case of proper control of the speed of rotation of the mixer and of the proper introduction of the materials into the mixer. The mixing time will be increased, when such increase is necessary, to secure the required uniformity and consistency of the concrete.

9.10 Testing Facilities

- a. The Contractor shall provide a set of standard sieves and other relevant control testing equipment and a working space for the inspector and a space suitable for the plastic testing of concrete and moulding of concrete tests specimens. Such arrangement shall be subject to approval by the Engineer.
- b. The Contractor may, at his discretion, install a concrete compression test machine at site. In this case certain percentage of cylinders, to be fixed by the Engineer, from time to time, shall be got tested from an approved laboratory, for counter check, at the Contractor's expenses.

10. CONVEYING

- a. Concrete shall be conveyed from mixer to the place of final deposit, as rapidly as practicable, using methods, which will prevent segregation or loss of ingredients and in accordance with ACI 304, "Recommended Practice for Measuring, Mixing Transporting and Placing Concrete".
- b. Any wet batch hopper, through which the concrete passes, shall be conical in shape. There shall be no vertical drop greater than 6 feet, except where suitable equipment is provided to prevent segregation, and where specifically authorized.
- c. Belt conveyors, chutes, or other similar equipment will not be permitted, for conveying concrete, except where the use of such equipment is approved, in writing, by the Engineer, in advance of any such use.

- d. Each type or class of concrete shall be visually identified, by placing a colored tag or marker on the bucket, as it leaves the mixing plant, so that the concrete may be positively identified and placed in the forms in the desired position.

11. PLACING

11.1 General

- a. Concrete placing shall follow the provisions of ACI 304, "Recommended Practice for Measuring, Mixing, Transporting and placing Concrete".
- b. No concrete shall be placed until all formwork, reinforcement, installation of parts to be embedded, bracing of forms and preparation of surface, involved in the placing, and the method of placement have been approved, by the Engineer.
- c. Before concrete is placed, all surfaces upon or against which concrete is to be placed shall be free from standing water, mud, debris or loose material.
- d. All surfaces of form and embedded material that have become encrusted with dried mortar or grout from concrete previously placed shall be cleaned of all such mortar or grout before the surrounding or adjacent concrete is placed.
- e. The surface of absorptive materials against or upon which concrete is to be placed shall be moistened thoroughly so that the moisture will not be drawn from the freshly placed concrete.
- f. Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items without permitting the material to its final position in the forms.
- g. The depositing of concrete shall be regulated so that the concrete may be effectively compacted with a minimum of lateral movement into horizontal layers approximately 1.5 feet in thickness.
- h. No concrete that has partially been hardened or contaminated by foreign materials shall be deposited in the structure, nor shall re-tampered concrete be used.
- i. The surfaces of construction joints shall be kept continuously wet for at least eighteen hours during the 24 hours prior to placing concrete except as otherwise directed by the Engineer. All free water shall be removed and the construction joint shall be completely surface dry prior to placement of concrete.
- j. All concrete placing equipment and methods shall be subject to approval.
- k. Concrete placement will not be permitted, when, in the opinion of the Engineer weather conditions prevent proper placement and consolidation.

11.2 Time Interval between Mixing and Placing

- a. Concrete mixed in stationary mixers and transported by non-agitating equipment shall be placed within thirty minutes after it has been mixed, unless otherwise authorized.
- b. When a truck mixer or agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be completed within 1-1/2 hours after introduction of the cement to the aggregates. The concrete shall be placed within 20 minutes after it has been discharged.
- c. In all cases, concrete shall be placed and compacted well within the initial setting time.

11.3 Placing Temperature

Concrete shall be placed at following temperatures, except as otherwise determined by the Engineer.

- a. Thin sections (2.3 feet or less in thickness), at the coolest practicable temperature but in no case more than 32o C.
- b. Mass Concrete (with sections greater than 2.3 feet in thickness), at temperature of not more than 21oC.

11.4 Lift in Concrete

- a. Concrete shall be installed in lifts of depths, as shown on the drawings. The placement shall be carried on at such a rate and in such a manner that formation of cold joints is prevented.
- b. Slabs shall be placed in sections, not exceeding 3600 sft. (350 sq.m) unless otherwise authorized or directed.
- c. In walls and columns, lifts shall terminate at such levels, as will conform to structural details.
- d. Where slabs and beams are placed continuously with walls and columns, the concrete, in walls and columns, shall have been in place for at least three hours, or for a longer period, when so directed by the Engineer, before placing concrete in the slabs and beams.
- e. The top surface of vertically formed lifts shall be generally level. The concrete in columns shall be placed in one continuous operation, unless otherwise authorized.
- f. In general, the construction joints, in beams and slabs, shall be located, at mid span, in both the directions, as shown on the drawings and concrete shall be placed in the sequence, indicated on the drawings, or as authorized by the Engineer.
- g. The maximum differential in height between the various pours of the structure shall be as shown on the drawings, or directed by the Engineer.

11.5 Elapse Time between Placement of Lifts

Except as otherwise approved on the basis of lift drawings, submitted by the Contractor, a minimum of 72 hours shall elapse between the placing of successive lifts of walls and thin sections and 120 hours shall elapse between placing lifts of moderate sections and mass concrete.

11.6 Time between Adjacent Pours

The time between adjacent pours shall be defined as the time elapsing from the end of the striking off of one pour to the start of placing the next pour. The minimum time elapsing between adjacent pours shall be 120 hours for mass concrete and 72 hours for all other concrete. Mass concrete have been defined in Article 11.3.

11.7 Placing Concrete through Reinforcement

In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs. In certain cases, the congestion of steel near the forms may make placing difficult. In such cases, as decided by the Engineer, a layer of mortar of

a composition compatible with the required concrete strength, shall be first deposited to cover the surface to a depth of approximately 16mm (5/8").

11.8 Vibration of Concrete

- a. Provisions of ACI 309, "Recommended Practice for Consolidation of Concrete", shall be followed for concrete compaction.
- b. Concrete shall be compacted with mechanical vibrating equipment supplemented by hand spading and tamping.
- c. In no case, shall vibrators be used to transport concrete inside the forms.
- d. The vibrating equipment shall be of the internal type and shall, at all times, be of adequate numbers, to properly consolidate all concrete.
- e. Form or surface vibrations shall not be used, unless specifically approved.
- f. The intensity (amplitude) of vibration shall be sufficient (frequency not less than 8,000 impulses per minute) to produce satisfactory consolidation.
 - f. The duration of vibration shall be limited to that necessary to produce satisfactory consolidation. Excessive surface working will not be permitted.

12 JOINTS IN CONCRETE

12.1 Construction joints

The position and form of construction joints, where not shown on the Drawings shall be agreed with the Engineer before concreting begins. Unless otherwise directed they will be made across planes of minimum shear. They shall be made only along a horizontal or vertical plane except that, in the case of inclined or curved members, they shall be at right angles to the principal axis of the member.

Vertical construction joints shall be made against properly constructed stop-ends, firmly fixed and holed to permit the reinforcement to pass through, or by means of expanded metal. If expanded metal is used, it shall be kept back from the face of the concrete by a distance equal to the minimum concrete cover to reinforcement. It shall be securely held in position so as not to distort or move, in accordance with the requirements for normal formwork. It shall be left in position and new concrete placed against it when construction is resumed.

All necessary steps shall be taken to ensure that good dense concrete is achieved against construction joints.

Prior to concreting, stop-ends may be treated with an approved surface retarder, instead of mould-oil, if required, to facilitate the exposing of the coarse aggregate. Such a retarder may also be applied after concreting to upper surfaces, which are to form construction joints. All such uses of retarders for construction joint surfaces shall be subject to the prior approval of the Engineer.

Stop-ends shall be carefully removed, without disturbing the concrete and reinforcement as soon as possible after concreting depending on the ambient temperature and curing conditions, as approved by the Engineer. This will normally be within 9 hours of placing the concrete. Immediately on removal of the stop-ends,

all horizontal and vertical joints are to be well brushed and hosed down in order to remove all excess laitance and fine aggregate. Coarse aggregate is to be left exposed but undisturbed.

When concreting is resumed against a construction joint the surface of the previously placed concrete shall be hosed down and the surplus water allowed to drain away before placing the new concrete.

Construction joints in base slabs shall be constructed with rubber waterstop. Construction joints in walls shall be applied by steel waterstop and flexible injection ducts.

All construction joints shall be cleaned and roughed by removal of cement skin and high pressure water blasting.

12.2 Movement joints

The spacing, location, dimensions and construction of all movement joints shall be as shown on the Drawings, unless otherwise instructed by the Engineer.

12.3 Debonding coat

Where a debonding coat is required, e.g. at a movement joint between two concrete members, this shall be achieved by the use of an approved debonding membrane or bituminous paint.

12.4 Pre-formed joint filler

Where pre-formed joint filler is detailed on the Drawings, for expansion or other joints, it shall comply with one of the specifications given below.

Joint filler shall be of the thickness shown on the Drawings with a tolerance of ± 1.5 mm, fixed in single thickness sheets, unless otherwise directed, being of suitable lengths, not less than 1.2 metres. Wherever possible joints shall be filled with a single sheet of filler, but where the size of the joint is such that two or more sheets have to be used, these sheets shall be cut and butt-jointed so that the edges are in continuous contact. The sheet joint shall then be wrapped in approved self-adhesive PVC jointing tape to prevent any grout leakage through the joint.

The pre-formed joint filler used for expansion or other joints shall be as detailed or directed and shall normally be bitumen impregnated fibreboard.

Where detailed or directed, bitumen-bonded cork shall be used as pre-formed joint filler, complying with the requirements of ASTM D1751.

Where detailed or directed, low density cellular filler shall be used as pre-formed joint filler.

All the above products shall be from a reputable manufacturer and shall be subject to the approval of the Engineer.

12.5 Joint sealing materials

Where detailed or directed, in particular for vertical or inclined joints, surface sealing of joints shall be by two-part, polysulphide liquid polymer sealant material, complying with the requirements of BS 4254.

Where detailed or directed, hot-poured rubber/bitumen sealing compounds shall be used, for low movement horizontal joints only, complying with the requirements of BS 2499: Part 1: 1993.

For similar joints where the potential movement is outside the range of the hot poured rubber/ bitumen sealing compounds, a suitable approved cold poured sealing compound shall be used complying with BS 5212 of a type approved by the Engineer.

All the above products shall be from a reputable manufacturer and shall be subject to the approval of the Engineer.

12.6 Application of joint sealants

Joint sealants shall be applied to the dimensions indicated on the Drawings or as otherwise approved or directed by the Engineer.

All joint sealants shall be mixed and applied strictly in accordance with the manufacturer's instructions and the requirements of this Specification.

Immediately prior to permanent sealing the groove shall be thoroughly cleaned and any dirt or loose material or any temporary sealing former or other filling material, grease or oil shall be removed. The surfaces of the groove shall be dry at the time of sealing. Any spalling at the edges of the grooves shall be repaired to the satisfaction of the Engineer using an approved material, compatible with the sealant, before the sealant is applied, and care shall be taken not to damage the edges of the groove during sealing. If recommended by the manufacturer or directed by the Engineer the groove shall be primed with an approved priming compound compatible with the sealant, and/or an approved bond breaker strip shall be applied to the back of the joint cavity before sealing. Unless otherwise detailed or directed sealants shall be applied so as to be 5 mm below the concrete surface.

12.7 Water bars

Where specified on the Drawings, water bars shall be provided at construction joints. These shall be installed in accordance with the manufacturer's recommendations and shall be continuous.

13. TEST OF CONCRETE

13.1 Strength Test during the Work

- a. Strength tests of the concrete, placed during the course of the work, will be made by the Engineer, in an approved laboratory at the Contractor's expense.

- b. The Contractor shall assist the Engineer in obtaining, for control purposes, such number of cylinders, as the Engineer may direct.
- c. In general, three sets of three cylinders, each, and/or three sets of three beams, taken from each 76 m³ (2,700 cft) or fraction thereof or from each days pour, which ever is less, of each class of concrete placed, shall govern.
- d. Test specimens shall be made and cured by the Contractor in accordance with the applicable requirements of ASTM Designation C31, "Standard Method of Making and Curing Concrete Compressive and Flexural Test Specimens in the Field".
- e. Cylinders and beams shall be tested in accordance with the applicable requirements of ASTM Designation C39, "Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens" and ASTM Designation C78, "Standard Method of Test for Flexural Strength of Concrete" (Using simple beam with third point loading), respectively.
- f. The test results shall be based on the average of the strength, of the test specimens; except that if one specimen, in a set of three, shows manifest evidence of improper sampling, moulding, or testing; the test result shall be based on the average of the remaining two specimens.
- g. The standard age of test will be 28 days, but 7 days test may be used, at the discretion of the Engineer, based on the relation between the 7-days and 28-days strengths of the concrete, as established by tests for the materials and proportions used.
- h. If the strength of the test specimens, cured under laboratory controls, for any portion of the work, falls below the minimum standard, at 28 days, required for the class of concrete, used in that portion, the Engineer may change the proportions of the constituents of the concrete, as necessary to secure the required strength for the remaining portions of the work.
- i. If the average strength of the specimens, cured under actual field conditions, as specified herein before, falls below the minimum allowable strength, the Engineer will make such changes in the conditions for temperature and moisture under which the concrete work is being placed and cured as may be necessary to secure the required strength.

13.2 Tests of Hardened Concrete

- a. Where the results of the strength tests, of the control specimens, indicate that the concrete, as placed, does not meet Specification requirements or there is other evidence that the quality of the concrete is below Specification requirements, core-boring tests will be made by the Contractor in accordance with the applicable requirements of ASTM Designation C42, "Standard Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete".
- b. If the concrete, in the structure, is more than superficially wet, under service conditions, the cores shall be immersed in water for at least 48 hours and tested wet.
- c. In the event that the core-boring test indicates that the concrete placed does not conform to the Drawings and Specifications; the Engineer shall have the authority to prescribe corrective measures and the Contractor shall take such measures, to correct the deficiency.
- d. If a strength deficiency is found and is due to the Contractor's fault or negligence, the entire cost of the replacing faulty concrete shall be borne by the Contractor who shall also reimburse the Owner for the cost of making tests. Otherwise, payment for removing and replacing faulty concrete will be made under applicable items of the Bill of Quantities as determined by the Engineer.

13.3 Strength Relation

Where cylinders are made by wet screening of concrete, with aggregate greater than one and a half inches (37.5 mm) size, such as three-inches (75mm) aggregate concrete, the cylinders will be required to have a compressive test strength greater than the specified strength, to indicate that the respective concrete in place in the work has the specified strength. Such increments, over the allowable strengths, will be established by the Engineer, after the mix design has been done and prior to mixing of concrete.

14. FORMS

14.1 General

- a. Forms shall be true to lines and grades, mortar tight and sufficiently rigid to prevent objectionable deformation under load.
- b. Where forms, for continuous surfaces, are placed in successive units, care shall be taken to fit the forms over the completed surfaces so as to obtain accurate alignment of the surface and to prevent leakage of mortar.
- c. Responsibility for adequacy of forms shall rest with the Contractor; however the material, type, shape, size, quality and strength, of all the forms, shall be subjected to specific approval by the Engineer.
- d. Bolts and rods, used for internal ties, shall be so arranged, that when the forms are removed; metal will not be less than 2" (50 mm) away from any concrete surface.
- e. Whenever form ties are used, their arrangement and spacing shall be in a regular pattern, in accordance with the dimensions of the formwork panels and as instructed by the Engineer.
- f. Wire ties will not be permitted where the concrete surface will be exposed to weathering and where discoloration will be objectionable.
- g. Depressions resulting from removal of the form ties shall be filled in accordance with the provisions of Article 14 "Repair of Concrete".
- h. Suitable openings, as required, shall be provided in the formwork for the passage of piping ducts, channels etc.
- i. All forms shall be so constructed that they can be removed without damaging the concrete.
- j. Forms to be used more than once shall be maintained in serviceable condition and shall be thoroughly cleaned before reuse.

14.2 Coating

Shortly before concrete is placed, forms for exposed surfaces shall be coated with approved non-staining form oil, which shall not interfere with the setting of the concrete nor be otherwise deleterious. After oiling, surplus oil on the form surfaces and any oil on the reinforcing steel or other surfaces requiring bond with the concrete shall be removed to the satisfaction of the Engineer. Forms for unexposed surfaces may be thoroughly wetted, in lieu of oiling, immediately before the placing of concrete.

14.3 Removal

- a. Forms shall be removed, with prior approval of the Engineer, in such a way that:
 - i. on one side, to ensure sufficient time for the concrete to attain the sufficient strength before removal.
 - ii. and on the other, to do it as soon as practicable keeping in view the minimum time requirements, to avoid delay in water curing and to enable earliest practicable repair of surface imperfections.
- b. Forms shall be removed with care so as to avoid injury to concrete.
- c. Forms for the openings shall be constructed in such a manner as to be removed until the strength of the concrete is such that form removal will not result in perceptible cracking, spalling and breaking of edges of surfaces or other damage to the concrete.
- d. In general, the approximate elapsed time before removal of forms shall be as stated below:
 - i. Beams and slabs 14 days
 - ii. Columns and walls 36 hours
 - iii. Mass Concrete 24 hours

15. TOLERANCES FOR CONCRETE CONSTRUCTION

15.1 General

- a. Permissible surface irregularities, for the various classes of concrete surface finish, as specified in Article 15 "Finishes", are to be distinguished from tolerances as described herein.
- b. The Contractor shall be responsible for setting and maintaining concrete forms within the tolerance limit so as to ensure that the completed work will be within the specified tolerances.
- c. Concrete work that exceeds the tolerance limits specified herein shall be remedied or removed and replaced by and at the expense of the Contractor.

15.2 Permissible Tolerances for Reinforced Concrete

Except where otherwise shown in the Drawings or directed by the Engineer, the permissible construction tolerances, for reinforced concrete, shall conform to the following requirements, as applicable.

- a. Variation from Plumb:
 - i. In the lines and surfaces of columns, piers, walls, and in arises:
 - In any 3m (10 feet) of length. 6mm (1/4")
 - Maximum for the entire length. 19mm (3/4")
 - ii. For exposed columns, joint grooves, and other conspicuous lines:

In any 6m (20 feet).	6mm (1/4")
Maximum for the entire length.	19mm (1/2")
- b. Variation from the level or from the grades:
 - i. In slab soffits, beam soffits and in arises:

In any 3m (10 feet) of length.	6mm (1/4")
In any bay or in any 3m (20 feet) of length.	9.5mm (3/8")
Maximum for the entire length.	19mm (3/4")
 - ii. In exposed lintels, sills, and other conspicuous lines:

In any bay or in 6m (20 feet) of length.	6mm (1/4")
Maximum for the entire length.	13mm (1/2")

- c. Variation of the linear building lines from established position in plan and related position of columns, walls and partitions:
- | | | |
|----------------------------|------------|-------------|
| In any bay | | 13mm (1/2") |
| In any 6m (20 feet) length | 6mm (1/4") | Maximum for |
| the entire length | 25mm (1") | |
- d. Variation in the sizes and location of sleeves, floor openings, and wall openings + 6mm (1/4")
- e. Variation in sectional dimensions of columns & beams and in the thickness of slabs & walls.
- | | |
|------------------|--|
| Minus 6mm (1/4") | |
| Plus 13mm (1/2") | |
- f. Footings:
- i. Variations in dimensions in plan:
- | | | |
|-------------------|------------------|--|
| Minus 13mm (1/2") | Plus 13mm (1/2") | ii. Misplacement of eccentricity: |
| | | 2% of the footing width in the direction of misplacement but not more than |
| | | 50mm (2") |
- iii.
- Thickness:
- | | |
|---------------------------------|----|
| Decrease in specified thickness | 5% |
|---------------------------------|----|
- g. Variation in steps:
- i. In a flight of stairs:
- | | | |
|---------------------|------------------|---------------------------|
| Riser 3mm (1/8") | Tread 6mm (1/4") | ii. In consecutive steps: |
| Riser 1.5mm (1/16") | Tread 3mm (1/8") | |

16. REPAIR OF CONCRETE

16.1 General

- a. Concrete that is damaged, from any cause, honeycombed, fractured, or is otherwise defective, and concrete with excessive surface depressions, must be excavated or removed; replaced with concrete, mortar or dry-pack mortar and built up to bring the surface to the prescribed lines, as specified hereinafter.
- b. Repair of concrete shall be performed, only, by skilled workmen and within 24 hours of removal of forms.
- c. The Contractor shall keep the Engineer advised as to when repair of concrete will be performed. Repair of concrete shall be performed, only, in presence of the Engineer, unless inspection is waived in a specific case
- d. Repairs shall be made in accordance with procedures approved by the Engineer.

16.2 Materials Requirement

All materials used in the repair of concrete shall conform to the applicable requirements of the Specifications herein before stated.

16.3 Protrusions

Where bulges and abrupt irregularities protrude, outside the specified limits, on the formed surfaces, not to be concealed permanently, the protrusions shall be reduced by bush hammering and grinding so that the surfaces are within the specified limits.

16.4 Depressions

- a. All fillings, for depressions, shall be boned tightly to the surfaces and shall be sound and free from shrinkage cracks and dummy areas; after the fillings have been cured and have dried.
- b. All fillings, in surfaces of view, shall contain sufficient white Portland cement to produce the same color as that of the adjoining concrete.
- c. Repairs shall be made with concrete, mortar, or dry-pack mortar, except where repairs with epoxy concrete, and/or epoxy mortar, are directed to be made, by the Engineer.
- d. Concrete, mortar and dry-pack mortar shall, each, be mixed in proportions, approved by the Engineer, to produce a repair, at least, equivalent in strength, density and durability to the concrete, in which the repair is required.

16.5 Concrete Filling

Concrete filling shall be used for following cases:

- a. Holes extending, entirely, through concrete section.
- b. Holes in which no reinforcement is encountered and which are greater than 0.1 sq.m (1.1 sq.ft.) and deeper than 100 mm (4").
- c. Holes, in reinforced concrete, which are greater in area than 0.05 sq.m (0.55 sq.ft.) and which extend beyond reinforcement.

16.6 Mortar Filling

Mortar filling, placed, under impact, by use of a mortar gun, may be used for repairing defects on the surfaces:

- a. Not exposed to public view
- b. Where the defects are too wide for dry-pack filling and too shallow for concrete filling and no deeper than the far side of the reinforcement that is nearest the surface.

16.7 Dry-pack Mortar

- a. Dry-pack mortar fillings shall be used for filling holes, having a depth nearly equal to, or greater than, the least surface dimensions; for narrow slots cut for repair of crack; for grout pipe recesses; and for ties and fastener recesses.
- b. Dry-pack mortar shall not be used for filling holes behind reinforcement that extend completely through a concrete section.

16.8 Surface Finishes of Patched Area

The Contractor shall correct all imperfections, on the concrete surfaces, as necessary to produce surfaces, that conform to the requirements specified, for the adjacent area, in

Article 17 "Finishes". Unless otherwise approved, repair of imperfections in formed concrete shall be completed within 24 hours after removal of forms.

17. FINISHES

17.1 General

- a. Tolerances for Concrete Construction, as specified in Article 15, are to be distinguished from irregularities in finishes as described herein.
- b. The classes of finish and the requirements, for finishing of concrete surfaces, shall be as, generally, specified in this clause and as indicated on the drawings.
- c. Finishing of concrete surfaces shall be performed, only, by skilled concrete finishers.
- d. The Contractor shall keep the Engineer advised, as to when finishing of concrete will be performed.
- e. Unless inspection is waived, in each specific case, finishing of concrete shall be performed, only, in the presence of the Engineer.
- f. Concrete may be tested by the Engineer, where necessary, to determine whether surface irregularities are within the limits, hereinafter specified.
- g. Surface irregularities are classified as abrupt or gradual.
- h. Abrupt irregularities, including offsets caused by displaced or misplaced form or otherwise defective form section, will be tested by direct measurements. All other irregularities will be considered as gradual irregularities and will be tested by use of a 6 feet long template, consisting of a straight edge or the equivalent thereof for curved surfaces.

17.2 Ordinary Concrete Finish

- a. Ordinary concrete finish (OCF) applies to surfaces upon or against which fill material or concrete is to be placed.
- b. If unformed, the finishing operation shall consist of sufficient leveling and screeding to produce even uniform surfaces.
- c. When formed, the surfaces require no treatment after form removal except for repair of defective concrete and filling of holes, left by the removal of fasteners from the end of the tie rods, as required under Article 16 "Repair of Concrete".

17.3 Rough Concrete Finish

- a. Rough concrete finish (RCF) applied to surfaces which are intended to receive tiles or cement plaster, as indicated on the drawings.
- b. After consolidation and leveling of concrete, to the specified tolerances, the surface shall be roughened with stiff brushes or raked, before final set.
- c. Where rough concrete finish is specified for wall surfaces, the same shall be obtained by use of formwork suitable to produce the required finish.
- d. Surface irregularities, measured as described in Article 17.1, shall not exceed 9.5mm (3/8") for floor and 6mm (2/8") for walls.

17.4 Ordinary Slab Finish

- a. Ordinary slab finish (OSF) applies to slab surfaces which are intended to receive floorings or are to act as floor, themselves, as indicated on the drawings.

- b. After the concrete has been placed, consolidated, struck-off and leveled and the concrete surface has stiffened sufficiently, floating shall be performed by use of hand or power driven equipment and shall be minimum necessary to produce a surface, that is free from screed marks and is uniform in texture.
- c. Floating shall be continued until a small amount of mortar, without excess water, is brought to the surface, so as to permit effective trowelling.
- d. Steel trowelling shall be started, when the floated surface has hardened, sufficiently, to prevent excess of fine material, from being drawn to the surface.
- e. Steel trowelling shall be performed with firm pressure, such as will flatten the sandy texture of the floated surface and produce a dense uniform surface, free from blemishes and trowel marks.
- f. Surface irregularities measured as described in Article 17.1, shall not exceed 9.5mm (3/8").

17.5 Fair Finish

- a. Fair finish (FF) applies to the exposed formed surfaces, the appearance of which is required to be of special importance.
- b. Surface irregularities measured as described in Article 17.1, shall not exceed 6mm (1/4") for the gradual irregularities and 3mm (1/8") for abrupt irregularities, except that the abrupt irregularities will not be permitted on the construction joints.
- c. Abrupt irregularities, at the construction joints and elsewhere, in excess of 6mm (1/4"), shall be rendered by grinding to conform to the specified limits.

18. CURING CONCRETE

18.1 General

- a. All concrete shall be cured by an approved method or combination of methods in accordance with ACI 308, "Recommended Practice for Curing Concrete".
- b. The Contractor shall have all equipment and materials, needed for adequate curing and protection of the concrete, ready to use; before actual concrete placement begins.
- c. Means shall be provided for the protection of concrete from the sun, winds, and traffic until the specified curing has been completed.
- d. The curing medium and method, or the combination of mediums and methods used, shall be subject to approval in writing by the Engineer.
- e. The curing medium shall be applied so as to prevent loss of moisture from the concrete.
- f. Concrete shall be protected from heavy rains for 24 hours.
- g. All concrete shall be adequately protected from damage. No fire or excessive heat, including the heat resulting from the welding of any sort or reinforcing bars, shall be permitted near or in direct contact with concrete at any time.
- h. All galleries, conduits and other formed openings, through the concrete, shall be closed during the entire curing period.

18.2 Moist Curing

- a. Unless otherwise approved by the Engineer, the concrete shall be moist cured, by maintaining all surfaces continuously wet for at least 14 days, immediately following the placing or until covered with fresh concrete.
- b. Curing water shall not be allowed to form stagnant pools, on the exposed surface.

- c. Surfaces of concrete, which are to be permanently exposed, shall be cleaned if water used leaves stains on them.
- d. When in contact with mass concrete, steel forms shall be kept wet.
- e. Horizontal construction joints and finished horizontal surfaces, cured with moist sand shall be covered with a minimum uniform thickness of 50 mm (2 inch) of sand that shall be kept continuously saturated.
- f. The following exceptions to the requirements for moist curing are permitted:
 - i. Horizontal construction joints may be allowed to dry for six hours immediately prior to placing of the following lift.
 - ii. Moist curing of surfaces, against which backfill is to be placed within 24 hours of concrete placement, will not be required.

19. PLACING REINFORCEMENT

Placing of reinforcement, in reinforced cement concrete sections, shall conform to the requirements laid down in Section 08.2.1.

20. MEASUREMENT

20.1 Portland Cement Concrete

- a. Measurement, for Portland cement concrete, will be made in the specified units of volume, of concrete, of specified class, acceptably placed, on the basis of the dimensions, for the neat concrete finish lines, in accordance with the Drawings or directions of the Engineer.
- b. No deductions will be made, from the above computed concrete volumes, for the following:
 - i. for reinforcement steel
 - ii. for water stops and joint materials

20.2 Formwork

Measurement, for formwork, where specified to be measured and paid, separately, from concrete, will be made in the specified units of developed superficial area, of formed concrete surfaces, of specified finish, on the basis of the dimensions, for the neat concrete finish lines, in accordance with the Drawings or directions of the Engineer.

21. RATE AND PAYMENT

21.1 Portland Cement Concrete

- a. Payment for, Portland cement concrete, of specified class, will be made for the quantity of concrete, measured in accordance with Article 20.1, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for all items of concrete, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials

- ii. All operations related with transportation, involved in the process
 - iii. All operations related with storage of materials
 - iv. All sorts of wastages
 - v. All operations including batching, mixing, cooling, conveying, placing, compacting, curing and repair of concrete
 - vi. Preparing concrete mix design
 - vii. Carrying out all sampling and testing
 - viii All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.
- c. Unless otherwise specifically stated in the Bill of Quantities, formwork for concrete will be measured and paid, separately.
 - d. Unless otherwise specifically stated in the Bill of Quantities, concrete reinforcement will be measured and paid, separately.

21.2 Formwork

- a. Payment for, for formwork, where specified to be measured and paid, separately, from concrete, of specified finish, will be made for the area of formwork, measured in accordance with Article 20.2, at the unit rates tendered in the priced Bill of Quantities.
- b. Unless otherwise specifically stated in the Bill of Quantities, the unit rates tendered, for all items of formwork, shall be deemed to be inclusive of, but not limited to the following:
 - i. Formwork and scaffoldings including materials, transport, storage, fabrication, installation, lubrication and removal
 - ii. Preparing formwork design, where required
 - iii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

SECTION 08.2.1: STEEL REINFORCEMENT

1. DESCRIPTION

The work, to be covered under this Section, shall include furnish, testing, cutting, bending and placing all steel reinforcement, as indicated on the Drawings or otherwise required.

2. MATERIALS REQUIREMENT

2.1 General

No steel shall be incorporated in the Work, without prior approval of the Engineer. All reinforcement shall be free from loose rust, scales and oil, grease or other coating, which might destroy or reduce its bond with the concrete.

2.2 Specifications

Concrete reinforcement bars shall be of following specifications, as shown in the Drawings and/or specified in Bill of Quantities:

- a. Cold worked steel bars, conforming to BS 4461.
- b. Grade 40 and Grade 60 steel bars, conforming to ASTM 615.
- c. Hot rolled mild steel round bars, complying with BS 4449, with guaranteed yield strength of not less than 36000 psi.

2.3 Testing

The Contractor shall provide all measuring and testing facilities to ascertain quality, weight and quantity of steel, at his own expense and shall furnish manufacturers certificate, stating chemical composition of steel, if so directed by the Engineer.

3. BAR BENDING SCHEDULE

Where instructed by the Engineer, bar bending schedules, for the concrete reinforcement, shall be prepared, from the Drawings, by the Contractor, at his expense, and submitted, to the Engineer, for approval.

4. CUTTING AND BENDING

- a. Steel reinforcement may be mill or field cut and bent.
- b. All bending shall be in accordance with standard approved practices and methods.
- c. When bending is required, it shall be performed prior to embedding the bars in the concrete. In all such cases, the bars shall be cold bend.
- d. Bending or straightening of bars, partially, embedded in set concrete, shall not be permitted, except in isolated cases, where corrective action or a field change is required and is specifically approved by the Engineer.
- e. Bending hot at a cherry-red heat (not exceeding 840 degree centigrade) will be allowed for mild steel bars. Bars bent hot should not be cooled by quenching.

5. PLACING AND POSITIONING

- a. Reinforcement shall be placed and maintained, within the specified tolerance of its position, as shown on the Drawings.
- b. Welding of bars shall not be permitted, for assembly of reinforcement, unless authorized by the Engineer.
- c. The use of reinforcement, for the transmission of current, for welding will not be permitted.
- d. Where tying wires or clips are used, care should be taken to ensure that the projecting ends do not encroach into the concrete cover.
- e. All reinforcement shall be secured in place by use of metal or concrete supports, spacers, or tiles, as approved by the Engineer. Such supports shall be of sufficient strength to maintain the reinforcement in place, throughout the concreting operation.
- f. The supports shall be used in such a manner that they will not be exposed or contribute, in any way, to the discoloration or deterioration of the concrete.

- g. Concrete supports shall be manufactured of the same concrete mix, as used in the structure to be concreted.

6. RELATION OF BARS TO CONSTRUCTION SURFACES

The cover of all main reinforcement shall be as specified or shown on the Drawings. The actual concrete cover, to all steel, at any point, shall not be less than the required nominal cover by more than 3mm (1/8 inches).

7. SPLICING

Except as otherwise shown on the Drawings or directed by the Engineer, all splices, lengths of laps, splice locations, placement and embedment of reinforcement shall conform to the applicable requirements of American Concrete Institute 318, "Building Code Requirements for Reinforced Concrete". If welded splices are proposed, welder of approved qualification and experience shall be employed, after obtaining approval of Engineer. Sufficient number of butt welds shall be tested, to failure, in each lot, to maintain a check on the quality, at the cost of the Contractor.

8. TOLERANCES

Following tolerances shall be observed:

a. Fabricating Tolerances

- | | |
|--|-----------------|
| i. Sheared length | + 25 mm (1.00") |
| ii. Depth of truss bars | + 13 mm (0.50") |
| iii. Outer dimensions of stirrups, ties, and spirals | + 6 mm (0.25") |
| iv. All other bends | + 25 mm (1.00") |

b. Placing Tolerances

- | | |
|--|-----------------|
| i. Clear distance to formed surface | + 6 mm (0.25") |
| ii. Minimum spacing between bars | - 6 mm (0.25") |
| iii. Top bars in slabs and beams | |
| Members depth 200mm (8") or less | + 6 mm (0.25") |
| Members depth 200 mm to 600 mm (8" to 24") | + 13 mm (0.50") |
| iv. Lengthwise of Members | + 50 mm (2.00") |

c. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits or embedded items, subject to approval of the Engineer.

9. EMBEDMENT ITEMS

- Before placing concrete, care shall be taken to determine that all embedded items are properly placed and are firmly and securely fastened in place as indicated on the Drawings or as instructed by the Engineer.
- Embedded Items shall be free of oil and other foreign matter.
- The embedding of wood or other foreign materials in concrete is prohibited.

- d. All reinforcement, including dowels, remaining exposed in the work shall be suitably protected until embedded in concrete.

10. MEASUREMENT

- a. Measurement, for concrete reinforcement, will be made in the specified units of weight, of reinforcing steel, of specified quality, acceptably placed, on the basis of the lengths of bars, actually installed, in accordance with the Drawings or bar schedules or as directed.
- b. Following unit weights will be used for converting the length of bars, of different sizes, to determine the weight of concrete reinforcement, for the purpose of measurement:

Bar Designation	Unit Weight kg/m (lb/ft)	Bar Size (mm)	Unit Weight kg/m
# 2	0.249 (0.167)	8	0.395
# 3	0.560 (0.376)	10	0.616
# 4	0.994 (0.668)	12	0.888
# 5	1.553 (1.043)	16	1.579
# 6	2.236 (1.502)	20	2.467
# 7	3.043 (2.044)	22	2.984
# 8	3.975 (2.670)	25	3.854
# 9	5.061 (3.400)	28	4.834
# 10	6.406 (4.303)	32	6.313
# 11	7.909 (5.313)	36	7.990
# 14	11.388 (7.650)		
# 18	20.246 (13.60)		

- c. Overlaps, unless clearly shown in the Drawings or approved by Engineer, for the purpose of payment, shall not be measured and allowed.

11. RATE AND PAYMENT

- a. Payment for concrete reinforcement, of specified quality, will be made for the weight of reinforcement, computed in accordance with Article 10, at the unit rates, tendered in the priced Bill of Quantities.
- b. Should the Contractor provide lengths of reinforcement, which are greater than those shown on the drawings or directed by the Engineer, no payment for extra lengths shall be made.
- c. The Contractor shall not claim for the difference in the actual weights of bars and their standard weights given in the Article 10.
- d. The unit rates tendered, for all items of reinforcement, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing reinforcement bars
 - ii. Providing M.S. binding wire and concrete, metal and plastic chairs, spacers and hangers, necessary to support the reinforcement.
 - iii. All sorts of transportation involved in the process
 - iv. All sorts of wastages
 - v. All operations including cleaning, cutting, bending, placing and fixing, in position, of reinforcement; binding with wire; and placing supports and spacers
 - vi. Preparing bar bending schedules
 - vii. Carrying out all sampling and testing
 - viii All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

SECTION 08.3.1: POLYVINYLCHLORIDE WATER STOP

DESCRIPTION

The work shall comprise providing and installing of all types of polyvinylchloride (PVC) water stops and expansion joints, in concrete structures and elsewhere, in accordance with these specifications and to the location, lines, grades and crosssections shown on the Drawings and/or as directed by the Engineer.

2. MATERIAL REQUIREMENTS

- a. PVC water stops shall be extruded from an elastomeric plastic compound, having basic resin of polyvinylchloride (PVC).
- b. The compound shall contain such additive resins, plasticizers, stabilizers or other materials, needed to ensure following physical characteristics when tested by the US Corps of Engineers Test Methods, as specified below:

Characteristics	Minimum Requirement	Test Method
Tensile strength, using die III	123 kg/cm ² (1750 psi)	568
Ultimate elongation, using die III	350%	573
Low temperature brittleness with no sign of failure such as cracking or chipping	- 35° F	570
Stiffness in flexure, 1/2" span	28 kg/cm ² (400 psi)	571

- c. The PVC expansion joints shall be the water stops of the type having center bulb.

3. CONSTRUCTION REQUIREMENTS

- a. All the operations of installing, jointing and splicing the water stops shall be carried out in accordance with the recommendations and instructions of the Manufacturer and the directions of the Engineer.
- b. All embedment in concrete, lapping, turning and sealing shall ensure absolute water tightness.
- c. No holes shall be made through any water stops.
- d. The water stops, wherever indicated on drawings or directed by the Engineer, shall be cast integrally with the in-situ concrete, with separate junction and intersection pieces, placed and jointed at Site.
- e. The water stops shall be installed, in such a way that they are held securely, in their correct position, during the placement of concrete.
- f. The concrete shall be fully and properly compacted around the water stops to ensure that no voids or porous areas remain.
- g. Where reinforcement is present; adequate clearance shall be left, between water stops and the reinforcement, to permit proper compaction of concrete.

- h. Splices, in the continuity, or at the intersections of runs of PVC water stops, shall be performed by heat-sealing the adjacent surfaces.
- i. A thermostatically controlled electric source of heat shall be used to make all splices. The correct temperature at which splices should be made will differ with the material used but should be sufficient to melt but not char the plastic.
- j. After splicing, a remolding iron, with ribs and corrugations to match the pattern of the water stop, shall be used to reform the ribs at the splice. The continuity, of the characteristic components of the cross-section, of the water stop design (ribs, tabular center axis, protrusions, and the like) shall be maintained across the splice.

4. MEASUREMENT

- a. Measurement, for PVC water stops, will be made in the specified units of length, of the water stops, of specified type and size, acceptably placed, on the basis of the dimensions, in accordance with the Drawings or directions of the Engineer.
- b. No allowance will be made, in the above computed lengths, for the laps and splices.

5. RATE AND PAYMENT

- a. Payment for, PVC water stops, of specified type and size, will be made for the quantity of water stops, measured in accordance with Article 4, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for all items of concrete, shall be deemed to be inclusive of, but not limited to the following:

- i. Providing all materials including splicing, sealing, jointing and filler materials
- ii. All operations related with transportation, involved in the process
- iii. All operations related with storage of materials
- iv. All sorts of wastages
- v. All operations including installing, splicing, sealing, jointing and securing water stops; laying of sealants and fillers in expansion joints; and protection, maintenance and repairs, of the water stops
- vi. Carrying out all sampling and testing
- vii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

SECTION 09.1: MASONRY - GENERAL

SCOPE

The section outlines the general requirements and procedures for all types of masonry works. All the provisions of this section shall apply to the following sections:

- a. Section 09.2 Brick Masonry
- b. Section 09.3 Stone Masonry
- c. Section 09.4 Block Masonry

2. MATERIALS REQUIREMENT

- a. Portland Cement and Water: Portland cement and water shall conform to the requirements, laid down in Section 02.1 "Common Building Materials".
- b. Sand for Mortars: Sand, for mortars, shall be clean and free from organic matters, silt, clay and other deleterious substances.
- c. Metal Wall Ties: Except where otherwise specified, metal wall ties shall conform to the requirements of BS 243 "Metal Wall Ties", where applicable. All wall ties shall be galvanized.

3. SAMPLES

- a. The samples of all the materials, to be used for masonry work, shall be approved by the Engineer and same type of material shall be used during the work.
- b. If the Engineer desires to get the material tested, this will be got done by the Contractor, at his own expense from a laboratory, approved by Engineer.

4. MORTAR FOR MASONRY

4.1 Mix Proportions

The materials and their mix proportions, by volume, for mortars, for masonry works, shall be as shown in the Drawings and/or specified in the Bill of Quantities.

4.2 Preparation of Mortar

- a. Component materials, excluding water, shall, first, be thoroughly mixed in dry state, on a paved platform or on metallic sheets.
- b. Water shall be added, in sufficient quantity, to make the mortar workable. Water shall be added, in a manner, so that segregation of cement does not take place.
- c. Through mixing of the mortar shall be carried out to produce a homogenous workable mass.
- d. Mixing shall be done mechanically, unless otherwise specifically permitted by the Engineer.
- e. Specified proportions of the mixing materials shall be accurately controlled and maintained.

4.3 Use of Mortar

- a. Only such quantity of mortar shall be prepared, as can be used before the initial setting time of cement.

- b. Any mortar, which has initially set, shall not be used.
- c. At the close of day's work, the mixing troughs, pans or platforms shall be thoroughly washed and cleaned.

5. CONSTRUCTION REQUIREMENTS

5.1 General

- a. Where shown on drawings or directed by the Engineer, Contractor shall leave openings, in masonry, for air-conditioning ducts and grilles, plumbing pipes, electric conduits and similar items.
- b. Where according to plans and sections, the masonry would require cut masonry units to be used; the same shall be done, by the Contractor, at no extra cost, to obtain correct thickness, according to Drawings.
- c. All instruments and equipments, used for mixing, transporting and applying mortars, shall be clean and free from set mortar, dirt, or other injurious foreign substances. It shall be thoroughly cleaned, at the end of each day's work.

5.2 Scaffolding

- a. Necessary and suitable scaffolding shall be provided to facilitate construction, of masonry work, in superstructures.
- b. Scaffolding shall be sound and strong enough to withstand all loads likely to come upon them.

5.3 Built-In Items

- a. Built-in items like holdfasts, anchor bolts, inserts, pipe supports hangers, pipe sleeves, dowels, ties and similar fixtures, shown in the Drawings or directed by the Engineer, shall be built into the masonry, in their correct position, in specified mortar, as the work progresses and not inserted later on into space, left for them.
- b. Frames and other built-in items shall be maintained in their proper position and the bracing's shall not be removed until they are securely held by the masonry.
- c. The spaces left around all built-in items shall be filled with mortar.
- d. Should cuts be required in walls for the passage of conduits, the entire cut out shall be filled with the specified mortar.

5.4 Curing

The masonry works, laid in cement mortars, shall be properly water cured, by keeping them wet, for at least 10 days.

5.5 Precautions and Protection

- a. No masonry shall be erected when the ambient temperatures are 4 degree centigrade or below, except by permission of the Engineer.
- b. No masonry work shall be laid upon the frozen works and the works, having a film of frost, on their surfaces.
- c. All masonry work shall be protected, during construction, from the effect of rain and frost. If the work, already carried out, gets damaged, due to any reason, it shall be made good, by the Contractor, at his own cost, without any extra claim.

SECTION 09.4: BLOCK MASONRY

DESCRIPTION

- a. This work shall consist of furnishing and laying all type of concrete block masonry work, in foundations, superstructure, facades, underground structures and elsewhere, in accordance with these specifications and to the lines, grades, thickness and cross-sections shown on the Drawings and/or as directed by the Engineer.
- b. All the provisions of Section 09.1 shall apply to this section of specifications.

2. MATERIAL REQUIREMENT

2.1 Concrete Blocks

- a. Manufacture, forming, transporting, placing, stripping of forms, finishing and curing of Portland cement concrete for pre-cast concrete blocks, in general, shall conform to the requirements laid down in Section 08.1.1.
- b. Except where otherwise specified, the concrete for pre-cast concrete blocks shall be Class
- c. All solid and hollow blocks shall be machine molded, of required sizes, as shown on Drawings and approved by the Engineer and shall generally conform to the requirements of BS 2028, 1346:1968 “Pre-cast Concrete Blocks” unless specified otherwise. The ingredients shall be well worked into the moulds, vibrated, tamped and pressed to ensure that the blocks are dense and free from voids.
- d. In case of the hollow blocks, the cavities shall be true to the shapes and sizes specified and shall have uniform wall thickness on the outside of the cavities. The cavities in hollow blocks shall not be more than 25% of the total volume.
- e. For casting, the moulds shall be placed on a level platform. The finished blocks shall have every face to be perfect rectangle, exactly parallel to the opposite face and exactly perpendicular to the adjoining faces. All the blocks shall be free from cracks, spalls, chips, rugged edges or other defects detrimental to their use. Blocks with broken edges or which are skew shall not be used on the Work and must be removed from the Site of Work within 24 hours of their being rejected.

- f. The blocks must not be lifted from the platform till they have been cured for a period of 2 days in addition to 10 hours required for setting. After 2 days the blocks must be removed and stacked to reasonable height as directed by the Engineer. The block stacks are to be kept wet for a period of 8 days and then shall be allowed to dry in shade for at least twenty (20) days before they are used in the Work. The blocks cast on different dates must be separately stacked. The date of casting and number of blocks in each stack shall be properly marked with non-washable paint.
- g. The average compressive strength of any five solid blocks at random shall be not less than 1000 psi.
- h. Contractor shall take full care that blocks are sufficiently and thoroughly dried so that their initial shrinkages is completed before the blocks are laid in the Works. The walls shall be slightly moistened and shall not be allowed to be excessively wet till they receive any plaster or render.
- i. The blocks shall be stored in such a manner as to avoid any contact with moisture on the Site of Works. The blocks shall be stock piled on platforms or other supports free from contact with the ground. If necessary, cover for protection against wetting shall be provided. The blocks right from casting to curing, drying, stock piling and their subsequent placing in masonry walls shall be handled with care.

2.2 Other materials

Other materials, used in the block masonry, shall conform to the requirements, laid down or referred in Section 09.1 "Masonry (General)".

3. CONSTRUCTION REQUIREMENTS

3.1 Mortar

- a. The materials and their mix proportions, by volume, for mortars, for block masonry works, shall be as shown in the Drawings and/or specified in the Bill of Quantities.
- b. Preparation and use of mortars, for the block masonry, shall be in accordance with the requirements, laid down in Section 09.1 "Masonry (General)".

3.2 Laying of Block Masonry

- a. Block work shall be carried up in a uniform manner, no one portion being raised more than 1.00 m (3') above another at one time, unless special circumstances render this impracticable.
- b. All horizontal and vertical joints shall be completely and solidly filled with mortar as and when the blocks are laid.
- c. Thickness of joints shall not be less than 1/4" (6mm) and shall not more than 1/2" (10mm).

- d. Any mortar, which falls on the floor from the joints or removed due to raking of joints shall not be reused and must be cleaned and removed from work-site at the end of the day.
- e. Where masonry abuts RCC columns or walls, it shall be anchored thereto by means of 8 mm diameter steel bars at a vertical spacing of 400 mm, except where otherwise shown in the Drawings or specified.
- f. Block walls shall be built in stretcher bond. Intersections of block walls shall be properly bonded in alternative courses.
- g. Generally, block work where exposed shall be flush jointed as the work proceeds. Joints of those facings, which are to receive external or internal plastering, shall be raked out 13 mm deep when the mortar is still fresh so as to provide proper bond for the plaster.
- h. All hollow blocks shall be filled at sides of openings and intersections with concrete mix having a compressive strength at 28 days of not less than that of the block.
- i. A solid or pre-filled course of block work shall be provided at sill level of openings.
- j. When the masonry is to receive plaster on one side and pointing on the other, the block shall be placed in such a way that the better face shall be on the side of pointing.
- k. Unless otherwise specified or shown on Drawings, metal ties, in cavity walls, shall be spaced in a staggered manner with a minimum spacing of 900 mm (3'), horizontally, and 450 mm (18") vertically.

4. MEASUREMENT

- a. Except where otherwise laid down in the Bill of Quantities, measurement, for block masonry will be made in the specified units of volume, of masonry, of specified type, laid in specified mortar, acceptably placed, on the basis of the dimensions, for the neat masonry finish lines, in accordance with the Drawings or directions of the Engineer.
- b. Deductions will be made, for all the openings.

5. RATE AND PAYMENT

- a. Payment, for block masonry, of specified type, laid in specified mortar, will be made for the quantity of masonry, measured in accordance with Article 4, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for all items of block masonry, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials including ties

- ii. All operations related with transportation, involved in the process
 - iii. All operations related with storage of materials
 - iv. All sorts of wastages
- v. All operations including manufacturing of blocks, mortar preparation; cutting, dressing and laying, of block; fabrication and erection of scaffolding; and curing, protection, maintenance and repairs, of block work
- vi. Carrying out all sampling and testing
- vii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

c. Where specified in the Bill of Quantities, the unit rates tendered, for all items of block masonry, shall be deemed to be inclusive of the following:

- i. All materials and operations related with pointing, of specified type
- ii. All materials and operations related with reinforcement, of specified grade and quality, for block work
- iii. All materials and operations related with the insulation, of specified type and quality, for cavity block masonry

SECTION 09.5: STONE PITCHING

1. DESCRIPTION

- a. This work shall consist of furnishing and laying dry and grouted stone pitching works, on grades and on slopes, in accordance with these specifications and to the lines, grades, thickness and cross-sections shown on the Drawings and/or as directed by the Engineer.
- b. All the provisions of Section 09.1 shall apply to this section of specifications.

2. MATERIAL REQUIREMENT

2.1 Stones

The stones shall comprise good, hard and durable broken boulders or pieces of rocks, from a source approved by the Engineer. These shall be sound, dense, resistant to the action of air and water and suitable in all aspects for the purpose intended. Stones to be used for pitching, shall conform to the following specifications:

Description	Class A	Class B
Application	Heavy Pitching	Light Pitching
Range of weight of stones	15-25 kg	10-15 kg
At least 50% stones by weight to have weight more than	20 kg	12 kg
Depth of stones	20-25 cm	15-20 cm

2.2 Mortars

Mortars, where used in the stone pitching, shall conform to the requirements, laid down or referred in Section 09.1 "Masonry (General)".

3. CONSTRUCTION REQUIREMENTS

3.1 General

- a. The sub-grade or gravel bed, as the case may be, upon which pitching is to be laid, shall be firm and compacted to the specified degree, as shown in the Drawings or as directed and approved by the Engineer.
- b. The stones shall be roughly dressed and shaped, to the satisfaction of the Engineer.

3.2 Dry Pitching

- a. The stones shall be securely bedded with breaking bond and closely packed with all interstices filled with selected stone aggregates hammered in, all to secure a stable mass. The stones shall be placed by manual dumping or other methods approved by the Engineer.
- b. The edges of pitched areas shall be protected from undermining by the use of edge stones at least twice the general size and weight set on end. In large or sloping areas of pitching, key stones shall be provided at the rate of one per square meter, at least one and a half times the general size and weight, set on end.

3.3 Grouted Pitching

a. Mortar

- i. The materials and their mix proportions, by volume, for mortars, where used in the stone pitching, shall be as shown in the Drawings and/or specified in the Bill of Quantities.
- ii. Preparation and use of mortars, where used in the stone pitching, shall be in accordance with the requirements, laid down in Section 09.1 "Masonry (General)".

b. Laying of Stone Pitching

- i. The surfaces of the rock shall be cleaned of adhering dirt and clay and shall be moistened, before being laid.
- ii. Stones shall be carefully arranged by hand to inter lock and so as to yield true and even surface with minimum voids and conforming to the contour required.
- iii. The exposed surface of the stones shall project not less than four (4) centimeters and not more than eight (8) centimeters of the grout surface.

- iv. The grouted stone pitching shall be cured by an approved method for a minimum period of 10 days and after expiration of the curing period, the exposed surfaces shall be cleared of all curing mediums.
- v. Any mortar, which falls from the joints or removed due to raking of joints shall not be reused and must be cleaned and removed from work-site at the end of the day.

4. MEASUREMENT

Except where otherwise laid down in the Bill of Quantities, measurement, for stone pitching will be made in the specified units of area, of stone pitching, of specified type and thickness, acceptably placed, on the basis of the dimensions, for the neat pitching finish lines, in accordance with the Drawings or directions of the Engineer.

5. RATE AND PAYMENT

- a. Payment, for stone pitching, of specified type and thickness, will be made for the quantity of stone pitching, measured in accordance with Article 4, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for stone pitching, shall be deemed to be inclusive of, but not limited to the following:
 - Providing all materials for stone pitching layer and the aggregate/gravel base
(if any)
 - All operations related with transportation, involved in the process
 - All operations related with storage of materials
 - All sorts of wastages
 - All operations including mortar preparation, grouting and curing (in case of grouted pitching only); cutting, dressing and laying, of stones; laying and compaction of aggregate/gravel base (if any) and protection, maintenance and repairs, of the work
 - Carrying out all sampling and testing
 - All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.
- c. Except where otherwise specified in the Bill of Quantities, preparation and compaction of the sub-grade shall be measured and paid separately.

SECTION 10.1: THERMAL AND MOISTURE PROTECTION (GENERAL)

1. SCOPE

- a. The section outlines the general requirements and procedures for all types of thermal and moisture protection works.

- b. Prevent the infiltration of moisture through the portion of the building envelope that occurs below grade or below a wearing surface.
- c. All the provisions of this section shall apply to the Sections 10.2 to 10.5.
- d. Do not allow water to migrate between the waterproofing material and the structural substrate.
- e. Protect the waterproofing material against damage during and after construction.

2. SAMPLES

- a. The samples of all the materials, to be used for thermal and moisture protection works, shall be approved by the Engineer and same type of material shall be used during the work.
- b. If the Engineer desires to get the material tested, this will be got done by the Contractor, at his own expense from a laboratory, approved by Engineer.

3. MATERIALS REQUIREMENT

3.1 Bituminous Material for Damp Proofing

- a. Except where otherwise specified, special Industrial Bitumen of grade 10/20 (SIB 10/20) shall be used for, all damp proofing works. The material shall conform to the following specifications:
 - i. Specific Gravity, at 77 °F 1.02/1.04
 - ii. Softening Point (R&B), °F 170/200
 - iii. Penetration at 77oF, 100 gm 10/20
 - iv. Ductility at 77oF (cms) 4/7
 - v. Solubility in Ce 14 (min) 99.5%
 - vi. Working Temperature, °F 300/350
- b. The approved materials shall be brought, in sealed containers, with a certificate of manufacturer regarding the quality of material.
- c. The storage and application of material shall strictly follow the manufacturer's instructions.

SECTION 10.2: DAMP PROOF COURSES

1. DESCRIPTION

This work shall consist of furnishing and laying all types of horizontal and vertical damp proof courses/ waterproofing membranes in buildings and structures, in accordance with these specifications and to the lines, grades, thickness and crosssections shown on the Drawings and/or as directed by the Engineer. All the provisions of Section 10.1 shall apply to this section of specifications.

2. MATERIALS REQUIREMENTS

- a. Portland Cement and Water: Portland cement and water shall conform to the requirements, laid down in Section 02.1 "Common Building Materials".
- b. Portland Cement Concrete and Fine and Coarse Aggregate: Portland cement concrete and fine and coarse aggregates shall conform to the requirements, laid down in Section 08.1.1 "Portland Cement Concrete".
- c. Bitumen: Bitumen, for damp proofing, shall conform to the requirements, laid down in Section 10.1 "Thermal and Moisture Protection: General".
- d. Membrane: Water proofing sheet membrane with non woven or mat of polyester of specified thickness, coated with an elastomeric or modified bituminous compound. The upper surface covered with aluminum foil, polyethylene film, and/or decorative color granules for protection against UV radiation, lower surface with torch-able polyethylene film or siliconized releasable paper to protect the adhesive side of sheet during storage .
- e. Primer: cold applied solvent base oxidized bituminous primer to provide permanent adhesion to a range of torch applied or self adhesive waterproofing membrane under types of various application conditions

3. CONSTRUCTION REQUIREMENTS

3.1 General

- a. The continuity of the damp proof treatment shall be ensured, without any breaks.
- b. The polythene sheet/membrane shall be laid with a minimum lap of 150 mm (6").
- c. The bitumen coat shall be applied after the concrete, screed or plaster has been properly cured for at least 72 hours.

- d. In all cases, bitumen/primer shall be applied on dry surfaces.
- e. The bitumen/membrane, applied, shall have neat uniform un-interrupted surface, free from bubbles, pinholes, dust, oil, grease and nails etc.

3.2 Horizontal Damp Proof Course/Membrane in Walls

- a. The horizontal damp proof course/membrane, in walls, shall be as shown in the Drawings or directed by the Engineer.
- b. Unless otherwise specified, the horizontal DPC, in walls, shall comprise the following:
 - i. 38mm (1.5") thick layer of plain cement concrete, Class C
 - ii. 2 coats of hot bitumen (SIB:10/20) @ 1 kg per m² (20 lbs. per 100 ft²), each coat
 - iii. Polythene sheet (300 gms)

3.3 Horizontal Damp Proof Course/Membrane under Floors

- a. The horizontal damp proof course/membrane, under floors, shall be as shown in the Drawings or directed by the Engineer.
- b. Unless otherwise specified, the horizontal DPC, under floors, shall comprise the following:
 - i. 1 coat of hot bitumen (SIB: 80/100) @ 1 kg per m² (20 lbs. per 100 ft²), each coat
 - ii. 2 coats of hot bitumen (SIB:10/20) @ 1 kg per m² (20 lbs. per 100 ft²), each coat
 - iii. 2 layers of 2mm (0.08") thick self adhesive membrane confirming to ASTM standards.
 - iv. 50mm (2") thick screed of cement sand mortar (1:3), with 5% puddle, to even out the existing surface,

3.4 Vertical Damp Proof Course/Membrane on Walls

- a. The vertical damp proof course/membrane, on walls, shall be as shown in the Drawings or directed by the Engineer.
- b. Unless otherwise specified, the vertical DPC, on walls, shall comprise the following:

- i. 1 coat of hot bitumen (SIB: 80/100) @ 1 kg per m² (20 lbs. per 100 ft²), each coat
- ii. 2 coats of hot bitumen (SIB:10/20) @ 1 kg per m² (20 lbs. per 100 ft²), each coat
- iii. 2 layers of 2mm (0.08") thick self adhesive membrane confirming to ASTM standards.
- vi. 100 mm (4") thick Block Masonry as specified in section 09.4.

4. MEASUREMENT

Measurement, for damp proof courses, will be made in the specified units of surface area, of damp proof courses, of specified materials and thickness, acceptably placed, on the basis of the dimensions, for the neat finish lines, in accordance with the Drawings or directions of the Engineer.

5. RATE AND PAYMENT

- a. Payment, for damp proof courses, of specified materials and thickness, will be made for the quantity of these items, measured in accordance with Article 4, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for all items of damp proof courses, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials
 - ii. All operations related with transportation, involved in the process
 - iii. All operations related with storage of materials
 - iv. All sorts of wastages
 - v. All operations including preparation of the surface; mixing, laying, finishing and curing of base layers of concrete, plaster or screed; bitumen heating and application; laying polythene sheets or felts; and protection, maintenance and repairs, of the damp proof works
 - vi. Carrying out all sampling and testing
 - vii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

SECTION 11.1.1: PLASTER AND POINTING (GENERAL)

1. SCOPE

The section outlines the general requirements and procedures for all types of plaster and pointing works. All the provisions of this section shall apply to the Section 11.1.1 to 11.1.5.

2. MATERIALS REQUIREMENT

- a. Portland Cement and Water: Portland cement and water shall conform to the requirements, laid down in Section 02.1 "Common Building Materials".
- b. Sand for Mortars: Sand, for mortars, shall be shall be clean and free from organic matters, silt, clay and other deleterious substances.

3. SAMPLES

- a. The samples of all the materials, to be used for plaster and pointing work, shall be approved by the Engineer and same type of material shall be used during the work.
- b. If the Engineer desires to get the material tested, this will be got done by the Contractor, at his own expense from a laboratory, approved by Engineer.

4. MORTARS FOR PLASTER AND POINTING WORKS

4.1 Mix Proportions

The materials and their mix proportions, by volume, for mortars, for plaster and pointing work, shall be as shown in the Drawings and/or specified in the Bill of Quantities.

4.2 Preparation of Mortar

- a. Component materials, excluding water, shall, first, be thoroughly mixed in dry state, on a paved platform or on metallic sheets.
- b. Water shall be added, in sufficient quantity, to make the mortar workable. Water shall be added, in a manner, so that segregation of cement does not take place.
- c. Through mixing of the mortar shall be carried out to produce a homogenous workable mass.
- d. Mixing shall be done mechanically, unless otherwise specifically permitted by the Engineer.
- e. Specified proportions of the mixing materials shall be accurately controlled and maintained.

4.3 Use of Mortar

- a. Only such quantity of mortar shall be prepared, as can be used before the initial setting time of cement.
- b. Any mortar, which has initially set, shall not be used.
- c. At the close of day's work, the mixing troughs, pans or platforms shall be thoroughly washed and cleaned.

5. CONSTRUCTION REQUIREMENTS

5.1 Applicable to Plastering and Pointing

- a. Instrument Cleaning: All tools and instruments, used for mixing, transporting and applying mortars, shall be clean and free from set mortar, dirt, or other injurious foreign substances. It shall be thoroughly cleaned, at the end of each day's work.

b Scaffolding

- i. Necessary and suitable scaffolding shall be provided to facilitate plaster and pointing work, in superstructures.
 - ii. Scaffolding shall be sound and strong enough to withstand all loads likely to come upon them.
 - iii. All put-log holes shall be filled up, as the scaffolding is being taken down.
- c. Preparation of Masonry Surfaces: Prior to plastering and pointing works, the joints of all masonry shall be raked out with a hook to a depth of 1/2" (13 mm). The mortar dust coming out of these joints as a result of raking shall be cleaned with a stiff wire brush.
 - d. Precautions and Protection: All plaster and pointing work shall be protected, during construction, from the effect of rain and frost.
 - e. Defective Work: Defective and damaged work, due to any reason, shall be made good, by the Contractor, at his own cost, without any extra claim.

5.2 Applicable to Plastering

- a. Curing: The plaster works, laid in cement mortars, shall be properly water cured, by keeping them wet, for at least 7 days, in a manner approved by the Engineer. The brick masonry surfaces shall be watered for 24 hours, before plastering.
- b. Preparation of Concrete Surfaces: In case of cement concrete to receive plaster, all surfaces shall be roughened at the Contractor's cost by dragging wire brushes when the concrete surface is yet raw or by chiseling if the surface has been hardened.
- c. Extent: Plaster shall be carried out to the full length of the wall or to the natural points.

SECTION 11.1.3: PLAIN PLASTER WORK

1. DESCRIPTION

- a. This work shall consist of furnishing and laying all type of plain plaster work, of specified thickness, in specified mortar, in any position, irrespective of the location, depth, height and shape, in accordance with these specifications and to the lines, grades and thickness, as shown on the Drawings and/or as directed by the Engineer.
- b. All the provisions of Section 11.1.1 shall apply to this section of specifications.

2. MATERIAL REQUIREMENT

- a. Common materials, used in the plain plaster work, shall conform to the requirements, laid down or referred in Section 11.1.1 "Plaster and Pointing (General)".
- b. Plaster stops, corner guards and beads shall be of galvanized metal.

3. CONSTRUCTION REQUIREMENTS

3.1 Mortar

- a. The materials and their mix proportions, by volume, for mortars, for the plain plaster work, shall be as shown in the Drawings and/or specified in the Bill of Quantities.
- b. Preparation and use of mortars, for the plain plaster works, shall be in accordance with the requirements, laid down in Section 11.1.1 "Plaster and Pointing (General)".

3.2 Plastering

- a. The plain plaster shall be laid and finished, to a smooth, uniform, leveled and plumbed surface, free from patches, undulations, cracks, blisters, blow holes, trowel marks and other defects.
- b. The plastered surface shall be tested, frequently, for undulations, with a straight edge not less than 10 feet in length. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb-bob, as the work proceeds.
- c. Finishing of the surface shall be done with steel or wooden floats, as directed by the Engineer.
- d. Where shown in the Drawings or directed by the Engineer, grooves, of specified size and patterns, shall be made, in the plaster.

- e. Not more than 1/2" (13 mm) thick plaster shall be done in one layer.
- f. If the specified plaster thickness is more than 13 mm (1/2") then the Engineer may direct plaster to be applied in two coats comprising rendering coat and the final coat. Rendering coat shall be roughened with waving lines drawn by wire brushes to provide bond for the final coat and it shall be properly moistened before application of subsequent coat. The final coat shall be finished with floats to present smooth and uniform surface.
- g. Where shown or directed, plaster stops and beads shall be used.

4. MEASUREMENT

- a. Measurement, for plain plaster work, will be made in the specified units of surface area, of plaster, of specified thickness, laid in specified mortar, acceptably placed, on the basis of the dimensions, for the neat finish lines, in accordance with the Drawings or directions of the Engineer.
- b. Deductions will be made, for all the openings.

5. RATE AND PAYMENT

- a. Payment, for plain plaster work, of specified thickness, laid in specified mortar, will be made for the quantity of plastering, measured in accordance with Article 4, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for all items of plain plaster work, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials including mortar additives
 - ii. All operations related with transportation, involved in the process
 - iii. All operations related with storage of materials
 - iv. All sorts of wastages
 - v. All operations including mortar preparation; laying and finishing of plaster; construction of drip courses; fabrication and erection of scaffolding; and curing, protection, maintenance and repairs, of plaster work
 - vi. Carrying out all sampling and testing
 - vii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.
- c. Where specified in the Bill of Quantities, the unit rates tendered, for all items of plain plaster works, shall be deemed to be inclusive of the all materials and operations related to the following:
 - i. Installation of plaster beads, corner guards and stops
 - ii. Construction of grooves in plaster

SECTION 11.1.4: SPECIAL PLASTER WORK

1. DESCRIPTION

- a. This work shall consist of furnishing and laying special plaster work, otherwise not covered, of specified thickness, in specified mortar, in any position, in accordance with these specifications and to the lines, grades and thickness, as shown on the Drawings and/or as directed by the Engineer.
- b. All the provisions of Section 11.1.1 shall apply to this section of specifications.

2. MATERIALS AND CONSTRUCTION REQUIREMENTS

2.1 Mechanically Finished Plaster

a. General: Where specified, the top surface of the base slabs, of the settling, thickening or other such tanks provided with rotating or translating sludge scrapers, shall be laid with plaster, of specified thickness, in specified mortar, to be finished by the mechanical movement of the dummy wooden templates, attached temporarily in place of the scraper blade, for this purpose, at the bottom of the sludge scraper.

b. Materials Requirement

- i. Common materials, used in the special plasterwork, shall conform to the requirements, laid down or referred in Section 11.1.1 "Plaster and Pointing (General)".
- ii. Plaster stop, corner guards and beads, if any, shall be of galvanized metal.

c. Mortar: Preparation and use of mortars, for the special plaster works, shall be in accordance with the requirements, laid down in Section 11.1.1 "Plaster and Pointing (General)".

d. Construction Requirement

- i. The dummy wooden templates shall be of such shape, size and quality that they can withstand all the forces and stresses, due to the plastering operation.
- ii. The lengths, slope, orientation and placement of the dummy templates and the whole operation of plaster finishing shall be such as to ensure full coverage of the surface to be plastered and to result into smooth finished surface, such that clearance between finished surface and the scraper blades remains uniform and equal to the specified clearance, throughout the tank base.

- iii. Removal of the scraper blades and their re-installation after completion of plaster and fixing of the dummy templates for the purpose of plastering and their removal, in accordance with the directions of the Engineer, shall be the responsibility of the Contractor.
- iv. The concrete surface to receive the plaster shall be roughened with waving lines drawn by wire brushes to provide bond for the plaster and it shall be properly moistened before application of plaster.
- v. The plaster shall be laid and finished, to a smooth and uniform surface, free from patches, undulations, cracks, blisters, blow holes, trowel marks and other defects.
- vi. The plastered surface shall be tested, for undulations, with a straight edge not less than 10 feet (3 m) in length. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb bob, as the work proceeds.
- vii. Not more than 1/2" (13 mm) thick plaster shall be done in one layer. If the specified plaster thickness is more than 13 mm (1/2") then the Engineer may direct plaster to be applied in two coats comprising rendering coat and the final coat. Rendering coat shall be roughened with waving lines drawn by wire brushes to provide bond for the final coat and it shall be properly moistened before application of subsequent coat.

3. MEASUREMENT

- a. Measurement, for special plaster work, will be made in the specified units of surface area, of plaster, of specified type and thickness, laid in specified mortar, acceptably placed, on the basis of the dimensions, for the neat finish lines, in accordance with the Drawings or directions of the Engineer.
- b. Deductions will be made, for all the openings.

4. RATE AND PAYMENT

- a. Payment, for special plaster, of specified type and thickness, laid in specified mortar, will be made for the quantity of plastering, measured in accordance with Article 3, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for all items of special plasterwork, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials including mortar additives and admixtures and materials for dummy wooden templates
 - ii. All operations related with transportation, involved in the process
 - iii. All operations related with storage of materials
 - iv. All sorts of wastages

- v. All operations including fabrication and erection of dummy wooden templates; Removal and re-installation of scraper blades; Fixing and removal of the dummy templates; mortar preparation; laying and finishing of plaster; operation of sludge scraper for plastering operation; surface roughening; and curing, protection, maintenance and repairs, of plaster work
- vi. Carrying out all sampling and testing
- vii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

SECTION 11.2.5: CERAMIC TILE FINISHES

1. DESCRIPTION

- a. This work shall consist of furnishing and laying all types of ceramic tiles on floors and walls, in accordance with these specifications and to the lines, grades, thickness and cross-sections, shown on the Drawings and/or as directed by the Engineer.
- b. Tile flooring shall comprise tiles laid over one of the following:
 - i. base layers over natural sub grade
 - ii. base layers over compacted fill over natural sub grade
 - iii. base layers over structural slab
- c. Tiles on walls, shall be laid, over base plaster, of specified thickness, over wall surface.

2. SAMPLES

The samples of all the materials, to be used for the flooring works, shall be approved by the Engineer and same type of material shall be used during the work. If the Engineer desires to get the material tested, this will be got done by the Contractor, at his own expense from a laboratory, approved by Engineer.

3. MATERIALS REQUIREMENT

- a. Portland Cement and Water: Portland, white Portland and colored cement and water shall conform to the requirements, laid down in Section 02.1 "Common Building Materials".
- b. Portland Cement Concrete and Fine and Coarse Aggregate: Portland cement concrete and fine and coarse aggregates shall conform to the requirements, laid down in Section 08.1.1 "Portland Cement Concrete".
- c. Glazed Ceramic Tiles: Glazed ceramic tiles shall conform to BS 1281 "Glazed Earthenware Wall Tiles", of approved make, size, pattern and color.

4. CONSTRUCTION REQUIREMENTS

4.1 General Requirements

- a. Preparation of Sub grade: In case of flooring, to be laid on grade, the sub grade shall be prepared, as follows:
 - i. The Contractor shall prepare the sub grade to provide smooth and firm foundation, for paving and floorings, finished accurately to lines, grades and dimensions shown on drawings or as directed by the Engineer.
 - ii. The sub grade shall be sprinkled with water, without being muddy and compacted to a the specified density.
 - iii. Except where otherwise specified, sub grade shall be compacted to a minimum of 90% of standard AASHTO maximum dry density.
- b. Base Layers:
 - i. The base layer(s), for the flooring, to be laid over the sub grade or compacted fill or structural concrete, as the case may be, shall be as shown in the Drawings and/or Bill of Quantities.
 - ii. Except where otherwise shown in the Drawings or specified in the Bill of Quantities, top base layer, for floorings, shall be 40 mm (1½") thick Portland cement concrete, Class C.
 - iii. Except where otherwise shown in the Drawings or specified in the Bill of Quantities, the base layer, for tiles to be laid on walls and similar surfaces, shall be ½" thick plaster, laid in 1:3 cement sand mortar.

4.2 Laying Tiles

- a. The top base layer of cement concrete shall be leveled with a trowel and straight edge, consolidated and finished with steel trowels to an even but rough surface.
- b. The surfaces of the top base layer, whether of concrete or plaster, as the case may be, on which the tiles are to be laid, shall be clean, wet and roughened, enough, to furnish bond.
- c. The tiles, well soaked in water, shall be bedded in 1:3 cement sand mortar;, the mortar being buttered on the back of the tile to give a bed, ¼" thick. The tile shall, then, be pressed and tapped home in correct position.
- d. The joints shall be properly raked and filled with paste of white cement mixed with the approved color, to match that of tiles.
- e. Any fixture, required to be fixed, in the ceramic tile work, shall be done with tiles, cut to exact size with proper tools. Where whole tiles can be used, pieces will not be permitted.
- f. The surface shall be tested, with a straight edge and 10" spirit level, to detect surface undulations. The straight edge shall not be less than 8 ft long, with parallel sides.

5. MEASUREMENT

Measurement, for tile flooring and other tile finishes, will be made in the specified units of surface area, of these items, of specified materials, thickness and pattern, acceptably

placed, on the basis of the dimensions, for the neat finish lines, in accordance with the Drawings or directions of the Engineer.

6. RATE AND PAYMENT

- a. Payment, for tile flooring and other tile finishes, of specified materials, thickness and pattern, will be made for the quantity of these items, measured in accordance with Article 5, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for all items of tile flooring and other tile finishes, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials
 - ii. All operations related with transportation, involved in the process
 - iii. All operations related with storage of materials
 - iv. All sorts of wastages
 - v. All operations including mixing, laying and curing of the top base layer of plaster/concrete; laying and cleaning of tiles; and protection, maintenance and repairs, of the work
 - vi. Carrying out all sampling and testing
 - vii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.
- c. Where the prices of the base layers, in addition to the top base layer, are specified to be included in the unit rates, tendered for the items of tile flooring works; the unit rates tendered, for all such items, shall be deemed to be inclusive of all materials and operations related with the preparation of sub grade.
- d. Where specified in the Bill of Quantities, the unit rates tendered, for the items of tile flooring works, shall be deemed to be inclusive of the following:
 - i. All materials and operations related with the construction of the specified base layers

SECTION 11.2.6: GLASS AND GLAZING

1. SCOPE

The work covered in this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and performing all operations in connection with the supply and installation of glass and glazing, complete in strict accordance with this section of the Specifications and the applicable Drawings and subject to the terms and conditions of the Contract. For payment, area from Main Frame will be measured.

2. GENERAL

All glass shall be of best quality imported from Belgium or USA from the approved manufacturers as per the approved list and shall be free from specks, bubbles and other

defects and shall give undistorted vision. It shall be of the type, quality, color, thickness and size as shown on Drawings or approved by the Engineer. All glass shall comply with BS 952 or other relevant applicable British Standard.

3. MATERIALS

3.1 Tinted Glass

Tinted glass shall comply with BS 952 Part 1 M Table 1.6 mm thick tinted glass shall be provided as shown on the Drawings or in Bill of Quantities.

3.2 Clear Plate Glass

Clear plate glass shall be provided where shown and shall comply with BS 952 Part 1 M Table 2, Ordinary Glazing Quality. The thickness shall be 6 mm as specified or as shown on the Drawings or in Bill of Quantities.

3.3 Clear Laminated Glass

Clear Laminated glass shall comply with BS 952, ASTM C1036 or C1048. The thickness shall be 11 mm as shown on the Drawings and shall be provided to internal glazed screens and doors.

3.4 Tinted Laminated Glass

Tinted Laminated glass shall be 11 mm thick and shall be provided to external glazed screens/curtain walls as shown on the Drawings. The glass shall meet minimum requirements as specified in ASTM C1036 or C1048 and BS 952.

3.5 Glass Bricks

Glass bricks/blocks shall be best quality imported glass bricks/blocks, to the approval of the Engineer and shall comply with BS 1207.

3.6 Sealants/Gaskets

All glazing compounds, sealants, neoprene gaskets, tapes, cords, bedding materials, etc. shall be those recommended by the manufacturers for application to aluminum or other window frame materials to suit the environmental conditions.

4. WORKMANSHIP

- All rebates, grooves, etc. for glazing shall be prepared by thoroughly cleaning of all dirt, dust, oil, grease and other foreign matter and priming if necessary. All glass shall be cut to suit each opening, perfectly square, and with due allowance for glazing tolerances, thermal expansion as recommended by the manufacturers.
- Glass is to be handled with care, and placed into openings without distortion, set on such spacers, springs or other components as recommended, and bedded and pointed with the approved glazing compound or sealant so that all joints are solidly and fully grouted up; all to be cut and smoothed off cleanly and neatly. All, excess compound, sealants, grease, etc. shall be cleaned off glass, and all glass thoroughly cleaned on completion.
- All glazing secured by neoprene gaskets is to be held in place by full enclosure of gaskets, applied with approved tools, corners continuously gasketed not mitered.
- All glazing, by whatever method employed, shall be completely watertight and sound, and generally be in accordance with B.S.C.P. 152 Section 4/404.

5. GLAZED CURTAIN WALLS & SCREENS

- All glazed curtain walling and screens shall be in the form of an aluminum framed system by Pakistan Cables or ALCOP and shall also incorporate weathering capping. The system shall be fabricated and installed by approved specialist subcontractors.
- Glazing bars, capping and gaskets shall be designed as an integrated system, in conjunction with the glazing, all in accordance with the provisions of B.S. Code of Practice 145 Part 1:1, so as to be perfectly weatherproof in the conditions specified in the B.S.C.P., be structurally stable in the conditions imposed by span, superimposed loads and wind loads, provide means for the escape of condensation, and be non-combustible. All components shall be in aluminum alloy, casketing in neoprene, and all fixings in stainless steel or non-ferrous metals.
- Glazed doors incorporated in the glazed screens/walls shall be floor mounted hinged doors in top and bottom aluminum frame. Glazed screens/curtain walls shall also be installed in top and bottom aluminum frame. The doors shall be provided with C type stainless steel pull handles.
- All aluminum shall be finished as natural matt anodized or as specified in the Drawings or as approved by the Engineer.
- All areas shall be single glazed, incorporating glass as separately specified on Drawings.
- Fabrication and layout drawings, structural calculations, aluminum sections and full specification details shall be produced for Engineer's approval before manufacture commences.
- All glazing shall be as specified to the approval of Engineer.

6. ACCEPTANCE of CLEANING

- Labels showing glass manufacturer's identity, type of glass, thickness and quality will be required on each piece of glass. Labels must remain on glass until it has been set and inspected.
- Any labels, smears, stains, marks, spots and dirt etc. shall be removed from the glass and the glass shall be washed clean on both sides taking care not to scratch or damage the glass.
- Plaster, mortar, paint, excess sealant, putty etc. or any other material shall be removed immediately after contact with the glass and shall not be permitted to remain on the glass surface.

7. GUARANTEE

Contractor shall provide a guarantee that all glazing joints in exterior openings shall remain water tight for a period of at least ten years after the acceptance of the building. The Contractor shall also guarantee that during the above period, glazing gaskets, sealants and compounds shall not crack, dry out, crumble or fall away from smash on glass.

8. SAMPLE

Samples of all kinds of materials to be used on the job shall be submitted to the Engineer for approval. Approved samples shall be retained by the Engineer to form standards against which all deliveries will be judged.

9. TESTING

All materials shall be subject to standard testing and specifications such as ASTM, British Standard or equivalent. If any item found below the specified standard, shall be rejected and removed from the Site immediately and replaced by the Contractor at his own cost.

10. PROTECTION

Glass shall be protected against damage. Any damaged or broken glass shall be removed and replaced by the Contractor at his own cost to the approval of the Engineer.

SECTION 11.3: PAINTING AND POLISHING

1. DESCRIPTION

This work shall consist of furnishing and applying all types of paints and polishes, of specified type and quality, on all types of surfaces including masonry, plastered, concrete, metal,

wooden and others, in accordance with these specifications and to the schedules, shown on the Drawings and/or as directed by the Engineer.

2. GENERAL REQUIREMENTS

- a. The term "Paint and Polish", wherever used in these "Specifications, shall be interpreted to mean and include the surface finish treatments, consisting of any, all or some of the items, including sealers, primers, fillers, body and final coats, emulsions, varnish, shellac, stain or enamels, as more specifically defined, hereinafter, as to kind and quality and function for various surfaces and finishes.
- b. The work shall conform to the requirements of British Standard Code of Practice CP: 231:1966, "Painting of Building", and other requirements laid down, herein.
- c. All paint, polish and accessory materials, including its color, tint and finish shall be subject to the approval, by the Engineer. The color or tint, of any particular surface, as determined by the Engineer, shall, in no instance, be a subject for an additional cost or charge to Owner.
- d. All painting work, except where otherwise specified, shall comprise three (3) coats work, in addition to the shop protection coats.
- e. All paints and polishing materials shall be of approved local manufacture and shall be delivered, on the work, in original unbroken packages, bearing the manufacturer's name and brand.
- f. The paints shall be used without any admixture or adulteration; except where recommended in the Manufacturer's printed instructions.

3. SAMPLES AND TESTS

- a. The samples of all the materials, to be used for the painting and polishing works, shall be submitted for the approval of the Engineer and same type of material shall be used.
- b. In addition to the submission of samples, the Contractor shall submit authenticated reports, of tests of the materials, proposed for use, as required by the Engineer.
- c. If the Engineer desires to get the material tested, this will be got done by the Contractor, at his own expense from a laboratory, approved by Engineer.
- d. Where desired by the Engineer, prior to the start of the application of any paint or polish treatment, the Contractor shall apply samples, of the required treatments, , for approval of the Engineer, in accordance with the directions of the Engineer.

4. MATERIALS REQUIREMENT

- a. Paints: Paints including vinyl emulsions, plastic emulsions, weather resistant emulsion paints (for external applications), and enamel paints shall have following characteristics:
 - i. Except where otherwise specified, these paints shall be of ICI make.

- ii. These shall be well ground; shall not settle, or thicken in the container; shall be broken up with a paddle, to a smooth consistency; and shall show easy brushing properties.
- iii. The paints shall become suitable for spraying, when thinned with not more than twelve (12) percent, by volume, of mineral spirits.
- b. White Wash Material: The lime shall be slaked, with an excess of water, to the consistency of paste or cream and shall remain, in water, for forty eight (48) hours. The mixture shall, then, be screened, through coarse cloth. Gum water (having 60 gram of gum to one 1 pint of water) shall be added to the mixture.
- c. Color Wash Material: Color wash material shall be same as the white wash material, with the addition of coloring matter. The coloring matter is to be boiled; gum added to it; and the matter strained into white wash material.
- d. Color Pigments: Color pigments shall be pure, non-fading and finely ground, with, at least, 99% passing through a 325 mesh.
- e. Brushes: Brushes, to be used for the painting work, shall conform to BS 2092.
- f. Wax Polish Material:
 - i. Except where otherwise specified, "Mansion" wax polish or approved equal shall be used.
 - ii. If allowed by the Engineer, wax polish shall be prepared by adding two parts of boiled linseed oil to two parts of bees wax and heating the mixture, over a slow fire. When dissolved and still warm, one part of turpentine shall be added to the mixture. Coloring material shall be added, to give a tint to the polish, as directed by the Engineer.

5. PROTECTIVE PAINTS

5.1 Steel Work

- a. Unless otherwise specified, all exterior and interior ferrous metal work, to be painted, shall be given a shop coat of protective paint of Approved quality.
- b. Except where otherwise specified or approved by the Engineer, ferrous metal work shall have one coat of anti-corrosive red oxide paint.
- c. Surface to be painted shall be thoroughly cleaned of scale, dirt and rust by the use of steel scrapers, wire brushes and blast or other equally suitable tools or methods.
- d. Oil and grease shall be removed with benzene or other suitable solvent.

5.2 Application of Preservatives to Wood Work

- a. All portions of woodwork, which shall remain unpainted and unpolished, shall be treated with wood preservative.

- b. Except where otherwise specified or approved by the Engineer, wood preservative shall be " Sheldrite wood preservative ".

6. CONSTRUCTION REQUIREMENTS

6.1 General

- a. Hardware, accessories, lighting fixtures and similar items, likely to be effected by the painting and polishing, shall either be removed prior to painting or shall be otherwise protected.
- b. Floors and other adjacent work shall be properly protected by drop cloths or other coverings.
- c. All surfaces to be painted or polished shall be clean, smooth, dry and free from dust, grit, oil and grease and other objectionable materials.
- d. All work shall be done in a workmanlike manner, leaving the finished surfaces free from drips, ridges, waves, laps and brush marks.
- e. Except if specified or required, paints and polishes shall be applied under dry and dust free conditions and shall not be applied when the temperature is below 40°F.
- f. All primer and intermediate coats of paint shall be unscrapped and completely integral at the time of application of each succeeding coat.
- g. Each coat of paint shall have a slight variation of color to distinguish it from the preceding coat. Sufficient time shall be allowed between coats to ensure proper drying.
- h. Paints shall be thoroughly stirred and kept at a uniform consistency during the application. Paint containers shall not be opened, until required for use.
- i. Paint shall preferably be applied by the spray or brush or roller, as directed by the Engineer.

6.2 Painting of Concrete and Plastered Surfaces

a. General

- i. Concrete and plaster work shall be, at least, two (2) months old (or less if allowed by the Engineer) and shall be free from cracks, holes, loose materials and surface irregularities; before the paint is applied.
 - ii. All concrete and plaster surfaces shall be tested for the presence of Alkali, which if present, shall be removed, by applying solution of zinc sulfate (2.5 to 3 pounds of zinc sulfate to a gallon of water). After drying, the precipitate shall be removed by brushing.
 - iii. In applying the finish coat, an entire wall surface shall be completed in one operation. If this is impracticable, painting shall be carried out to some natural stopping point.
- b. White or Color Wash: Where specified or directed by the Engineer, three coats of white, color or chalk color wash, of approved quality, shall be applied.
 - c. Vinyl and Plastic Emulsion and Enamel Paint:

- i. Vinyl or plastic emulsion or enamel paint (glossy or matt finish), of approved color, shall be applied, in three coats, as per Manufacturer's instructions and directions, on a well-prepared smooth base.
- ii. After the priming coat has been applied; holes, cracks and other depressions, in surface, shall be filled flush with putty, colored to match the finish coat and smoothed with the sand paper.
- iii. Putty shall be dry before subsequent painting.

d. Weather Resistant Emulsion Paint:

- i. Weather resistant emulsion paint, of approved color, for external application, shall be applied, in three coats, as per Manufacturer's instructions and directions, on a well-prepared base.
- ii. After the priming coat has been applied; holes, cracks and other major depressions, in surface, shall be filled flush with a mixture of cement and the paint, colored to match the finish coat.

6.3 Painting of Metal Work

- a. Shop primed metal work shall be kept clean and free from corrosion, following installation.
- b. Unless specified otherwise, all metal work shall be painted with three (3) coats of enamel paint (glossy or matt finish, as directed by the Engineer), of approved color, in accordance with the manufacturer's instructions.

6.4 Wood Work

a. General:

- i. Small seasoned knots shall be, thoroughly, cleaned and scraped and shall be given a thin coat of orange shellac varnish; before the priming coat is applied.
- ii. Large, open, unseasoned knots and all beads or streaks of pitch shall be heated by a blow torch and then scrapped off, or if the pitch is still soft, it shall be removed with mineral alcohol. Resulting voids, if any, shall be filled with putty.
- iii. Surface of wood work to be painted or polished shall be finished smooth with the plane, making sure, that no plane marks are left after finishing.
- iv. The surface, then, shall be made smooth by rubbing it with coarse to medium grained sand paper.
- v. Painting or polishing shall proceed, only, when, in the opinion of the Engineer, the wood is satisfactorily dry.

b. Painting of Wood Work

- i. After surface preparation, one coat of wood primer shall be applied.

- ii. After wood primer has thoroughly dried, the surface shall be painted, except where otherwise specified, with two (2) coats of enamel paint (glossy or matt finish, as directed by the Engineer), of approved color, in accordance with the manufacturer's instructions.

c. Wax Polishing of Woodwork

- i. After initial rubbing, the surface shall be rubbed perfectly smooth, first with medium grained sand paper, and then, with fine sand paper.
- ii. The final rubbing shall be done, for a few seconds, with sand paper, which has been slightly treated with linseed oil.
- iii. The wax polish shall be applied with a clean cloth pad and rubbed with uniform pressure and with frequent change in direction.
- iv. First coat of wax polish shall be applied and rubbed continuously for at least half an hour.
- v. When the surface is quite dry, the second coat shall be applied, in the same manner, and rubbed continuously for one hour, or till the surface has dried.
- vi. The final coat shall, then, be applied and rubbed for two hours (more if necessary), till the surface has assumed a uniform gloss and is quite dry, showing no signs of stickiness when touched.

7. PROTECTION

- a. The Contractor shall protect all the work against damage or injury by his employees, or by the materials, tools or utensils used in connection with the work, under this Contract.
- b. All painted work shall be touched up and restored, where damaged or defaced, to the complete satisfaction of the Engineer.

8. CLEANING

- a. The Contractor shall clean all paint, spots, oil and stains, entirely, from all surfaces, upon completion and leave the Work in perfectly clean conditions, in every respect, to the entire satisfaction of the Engineer.
- b. All cloth and cotton waste, which might constitute a fire hazard shall be placed in metal containers or destroyed at the end of each work day.
- c. Upon completion of all work all staging, scaffolding, and containers shall be removed from the Site or destroyed in a manner satisfactory to the Engineer.

9. MEASUREMENT

Except where otherwise laid down in the Bill of Quantities, measurement, for painting and polishing, will be made in the specified units of surface area, of painting and polishing, of specified type, on specified type of surface, acceptably placed, on the basis of the dimensions, for the neat finish lines, in accordance with the Drawings or directions of the Engineer.

10. RATE AND PAYMENT

- a. Payment, for painting and polishing, of specified type, on specified type of surface, will be made for the quantity of painting and polishing, measured in accordance with Article 9, at the unit rates, tendered in the priced Bill of Quantities.
- b. The unit rates tendered, for all items of painting and polishing, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials including protection and preservation paints and materials for bases
 - ii. All operations related with transportation, involved in the process
 - iii. All operations related with storage of materials
 - iv. All sorts of wastages
 - v. All operations including application of protection and preservation paints; laying samples; fabrication and erection of scaffolding; preparation of surfaces; laying of bases; preparation and application of paints and polishes; cleaning of effected areas; and protection, maintenance and repairs, of painting and polishing works
 - vi. Carrying out all sampling and testing
 - vii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

SECTION 11.4: PROTECTIVE COATING OF CONCRETE SEWER

Scope:

The following specification describes the work, materials and equipment for structural system to provide corrosion protection in a sewer system. This system is applicable to sewer integrity, eliminating water infiltration and the application of a monolithic, high build epoxy coating manholes, lift station wet well chambers, water clarifiers, concrete and steel pipe, digesters, sumps and junction boxes

1. PART 1 – GENERAL

1.1. SECTION INCLUDES

Coal tar Epoxy coating on reinforced pipes. The interior surface of all reinforced concrete pipes for sanitary or combined sewers shall receive a protective coating of an approved coal tar epoxy resin compound at the plant where the pipe is manufactured prior to delivery to the site of the work. The coating material shall be a coal tar epoxy resin formulation resistant to attack from seawater, sanitary sewage, chemicals, including hydrogen sulfide, and shall cure by chemical action.

Requirements for cleaning, surface preparation and applying an epoxy coating system to the sewer pipes, manhole wall surfaces etc.

Surfaces to be coated shall be brushed with a stiff broom or brush and then air blown to remove all dust, dirt, loose sand and latent. No surface shall be coated until all grease, oil and other contaminants are entirely removed.

1.2. RELATED SECTIONS

Concrete repair.

1.3. REFERENCES

ASTM C 76	Reinforced Concrete Pipe, Epoxy Coating
ASTM C 267	Standard Test Method for Determining the Chemical Resistance of Grouts and Mortars.
ASTM D	Tensile Strength of Plastics
ASTM D 695	Compressive Strength of Rigid Plastics.
AASHTO T277	Rapid Determination of the Chloride Permeability of Concrete.
ASTM D 638	Tensile Strength of Plastics.
ASTM D 695	Compressive Strength of Rigid Plastics.
ASTM D 790	Flexural Strength Properties of Un-reinforced and Reinforced Plastics
ASTM D 2240	Standard Test Method for Durometer Hardness, Type D.
ASTM D 4060	Standard Test Method for abrasion Resistance of Organic Coatings by the Taber Abraser.
ASTM D 4541-89	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D 543	Standard Practice for Evaluating the Resistance of Plastics to Reagents.
ASTM G 20	Standard Test Method for Chemical Resistance of Pipeline Coatings.
ACI 201.2R-93	Guide for Durable Concrete.
NACE	National Association of Corrosion Engineers (NACE International) Published Standards.
NACE	Steel Structure Painting Council Published Standards

1.4. SUBMITTALS

Submit the following information to the engineer:

- a. Technical data for each product, including brand name and product manufacturer.

- b. Provide a reference list of similar sewer, manhole protective coating and rehabilitation projects with five years of history. Include the Owner and Engineer's name and the project date.
- c. Provide a certification that demonstrates the applicator is trained and approved by the manufacturer to apply the epoxy materials.

1.5. QUALITY CONTROL

Use a procedure that meets applicable ASTM, NACE and SSPC inspection standards and provide quality assurance controls that meet the manufacturers printed recommendations

1.6. DELIVERY, STORAGE AND HANDLING

Store the materials in a dry area and protect from weather. Protect the epoxy coating materials, store between 10° C and 32° C. Handle each product according to the material safety data sheets, MSDS. Keep open flame away.

1.7. WARRANTY

The applicator shall guarantee the work to be free of defects in materials and workmanship for a one-year period, unless otherwise stated. The applicator shall repair the defects in materials or workmanship, which may develop during the one year period. Also repair any damage to other work caused by such defects or discovered within the same period at no additional cost to the owner.

2. PART 2 – PRODUCTS

2.1. CONCRETE SUBSTRATE

- 2.1.1. Cure the concrete prior to applying the epoxy coating system.
- 2.1.2. Use a factory blended, rapid set (system compatible) cement based patching mortar that is suitable for making repairs with the specific epoxy coating system Apply the trowel grade or spray applied patching mortar according to the manufacturers' recommendation
- 2.1.3. Remove all of the old existing coatings before applying the new epoxy coating. The applicator shall provide a strict surface preparation procedure that is suitable for the new epoxy coating. The applicator will adhere to all applicable surface preparation guidelines

2.2. MANUFACTURER

- 2.2.1. Standard Cement Materials approved manufacturer,

2.2.2. The manufacturer shall provide a written certification that exhibits the applicator is approved to apply system. Manufacturer's representative shall be available for two days of on-site consultation or by telephone upon 48-hour notice.

2.3. REPAIR MATERIALS

2.3.1. Use the Fast Set Bench Repair Cement patcher to repair, fill bug-holes and voids, and provide structural restoration before applying the high build epoxy coating system.

2.3.2. Use the Protective Coating Material as specified: Standard Epoxy Coating 4553™, a 100% solids, solvent-less two-component epoxy resin-coating system with increased bond strength and board range chemical resistance. Use it to protect concrete, steel, masonry and Fiberglass structures in moist and damp environments. Apply a maximum of 40 mils in two applications over a smooth horizontal, vertical or overhead surface. The recommended coverage's will vary from 30 to 60 mils depending on the application.

Property	Standards	Psi
Product type		Amine cured epoxy
Mix ratio		2:1
Compressive Strength	ASTM D 695	9,200
Flexural Strength	ASTM D 790	8700
Tensile Strength	ASTM D 638	5400
Tensile Elongation		5.9%
Hardness, Shore D	ASTM D 2240	85
Taber Abrasion:		
CS 17 Wheel	ASTM D 4060	< 3.3 mg loss
Adhesion to:		
Concrete	ASTM D 4541	Concrete substrate failure
Steel (SSPC-10)	ASTM D 4541	> 1,250 psi
Corrosion Resistance		
Suitable = .5 pH:		
30% sulfuric acid		No effect
50% sulfuric acid		No effect
Temperature Resistance		200° F

2.4. PROTECTIVE COATING APPLICATION EQUIPMENT

Use heated plural component spray pump equipment designed specifically for two component epoxy coating application purpose. mixed both the components of the specified Epoxy Coating to the recommended thickness.

3. PART 3 – EXECUTION

3.1. SURFACE PREPARATION

3.1.1. Clean the Existing Concrete Surface:

Clean and prepare each surface to be coated as specified or according to the manufacturer's instruction. Use a non-diluted, bio-degradable heavy duty concrete cleaner to clean the concrete surface, high pressure washing technique or an abrasive sand blast process to clean and remove any previously applied cement paste, concrete patches, epoxy coatings or special paints. Remove all efflorescence, Chalk, loose or dry cement laitance, discolored cement mortar, and dust, grease, oils or release agents. Continue the cleaning process to produce an exposed aggregate profile. Clean the surface as recommended by the epoxy coating system manufacturer.

Use 3,500-psi minimum water pressure to clean the surface. Remove all the deleterious materials. Collect and remove all of the debris and foreign materials.

The cleaned surface profile shall be repaired, leveled and smoothed using fast set repair cement (FSR Cement)

3.1.2. After all the preparations have been completed, repair or fill any damaged areas or large voids in the concrete.

3.2. APPLICATION OF PROTECTIVE EPOXY COATING SYSTEM

3.2.1. The protective coating shall be applied in at least 2 separate coats. The total dry film thickness of the coating shall be a minimum of 380 microns (15 mils). In doing this work, the coating manufacturer's instructions for the best application procedures, temperatures and allowable working life of the material shall be strictly adhered to. Any deficiency in total film thickness shall be corrected by the application of an additional protective coat. If a prime coat is necessary, it shall be as per the manufacturer's specifications. A prime epoxy coat shall not be applied on a smooth concrete pipe. Before placement in field, all areas abraded in transit shall be repaired by the application of 2 coats of the same material that was used in the shop, in accordance with the directions of the coating manufacturer.

3.2.2. The applicator shall bear complete responsibility for cleaning the structure, stopping all minor water infiltration, mixing of the materials, applying and finishing of the epoxy coating system. The work activity and material storage shall be limited to the repair area. All additional work in the adjacent streets and material installation and removal of line plugs shall be performed as shown on the drawings.

- i. The applicator shall comply with all local; state and OSHA confined space entry requirements.
- 3.2.3. The protective coating shall not be applied on any part of the pipe joints nor within 1 inch of the joints. The concrete pipe shall be cured at least 7 days before being painted. All surfaces to be painted shall be prepared in a workmanlike manner and shall be strong and sound, clean and dry, and free of scale, loose material, grease, oil and all foreign matter before the application of any coating. The method to be used for surface preparation is dependent on the condition of the surface and the materials to be removed. No slurry mix shall be used on the concrete. All concrete surfaces to be painted shall be brush blasted as a means of removing laitance. All dirt and sand particles should be removed by the use of an air blower, followed by thorough cleaning with a vacuum cleaner.

3.3. CURING

The ambient temperature and condition in the sewer line and lift station wet well is usually adequate for curing. Protect it from the heat, wind changes or extremes. Keep the epoxy coating system dry and clean for a minimum of 8 hours.

3.4. INSPECTION

- a. Visually inspect each structure the same day following the application of the epoxy coating.
- b. The Contractor will be required to use an Engineer approved third party inspector to inspect the completed coating. May sue an accredited inspector if available or the manufacturer's representative. Check for holidays and voids. Upon final completion of the work, the manufacturer will provide a written certification to the Engineer. The certification will confirm that the epoxy coating materials were applied per the manufacturer's recommendations.
- c. Any water leaks or blisters will be chipped back, plugged and coated immediately with coaltar epoxy coating. Allow the repair areas to cure for 4 hours.

4. PART 4 - BASIS OF PAYMENT

- 4.1. Payment shall be based on the Contract Unit Price per structure coated as indicated in the priced bill of quantities. The Contract Unit Price shall be payment in full for performing the work and for furnishing all labor, supervision, materials, equipment and all the testing necessary to complete the work.

SECTION 12.1: METAL WORK (GENERAL)

1. SCOPE



- a. The section outlines the general requirements and procedures for all types of metal works.
- b. All the relevant provisions of this section shall apply to the Sections 12.2 to 12.5.

2. SAMPLES AND TESTS

- a. The samples of all the materials, to be used for metal work, shall be approved by the Engineer and same type of material shall be used during the work.
- b. Each supply shall be accompanied by a mill test certificate indicating the mechanical characteristics of material.
- c. If the Engineer desires to get the material tested, this will be got done by the Contractor, at his own expense from a laboratory, approved by Engineer.

3. MATERIALS REQUIREMENT

3.1 Steel

- a. General: The steel sections shall be sound and free from injurious matter, cracks, air-holes, blows, wounds, scales, spitted grains and blunt rises.
- b. Structural Steel Sections: Structural steel sections, where required, shall conform to the applicable requirements of BS 15 "Mild Steel for General Structural Purposes".
- c. Steel Sheets and Plates: Steel sheets and plates, where required, shall conform to the requirements of BS 1449 "Steel Plates, sheet and strips".
- d. Steel Bolts:
 - i. Steel bolts shall be of strength grade 4.8, if Cold Forged, or 4.6, if hot forged, in accordance with BS 4190.
 - ii. The chemical composition shall be selected by the Manufacturer, except that the maximum sulfur and phosphorous content shall not exceed 0.006 percent.
- e. Washers: Washer shall conform to BS 4320 and only black washers, unless otherwise specified, made of mild steel, shall be used.

3.2 Steel Wire Gauze

Wire gauze shall be uniformly woven. It, unless otherwise indicated, shall be of mesh size 12x12 per square inch, made from 24 gauge galvanized iron wire.

3.3 Glass

- a. Glass, clear, tinted or frosted, for glazing purposes, shall conform to BS 952.

- b. All glass used shall be even, free from specks, bubbles, distortion and flaws of every kind.
- c. Unless otherwise specified, thickness of glass, for glazing purposes, shall be 5 mm.

4. CONSTRUCTION REQUIREMENTS

4.1 Fabrication

a. Metal Sections

- i. The metal sections shall be thoroughly straightened by methods that will not injure it, before being laid off or worked in any way.
- ii. The members shall be so straightened that they are not, more than 1/16", away from a straight plane in either direction, for the full length of members.
- iii. Metal sections shall be well formed, to shape and size, with sharp line or angles. Shearing and punching shall leave clean, true lines and surfaces.
- iv. All members shall be so cut and formed that they can be accurately assembled without being unduly cracked, strained or forced into position.
- iv. Splices and joints shall be made, only, in such positions, as shown on drawings or as directed by the Engineer.

b. Casting: Castings, where required, shall be sound and free from warp, holes and defects that impair their strength and appearance. Exposed surfaces shall have a smooth finish and sharp well-defined lines.

4.2 Jointing

- a. All fieldwork or fabrication, riveting, bolting and welding shall be carried out in workman-like manner.
- b. The metal work shall be shop fabricated, but assembled, at site, by welding, riveting, or bolting, as shown in the Drawings or directed by the Engineer.
- c. The welding, where required, shall be done with the help of electric/hydroxy flame. Welding points should be made smooth by filing them, to the satisfaction of the Engineer.
- d. Welding shall be continuous along entire line of contact, except where spot welding is indicated on the drawings or is authorized by the Engineer.
- e. Bending, straining or pounding, with sledges, shall not be allowed, during erection.

4.3 Finishing

All finished members must be free from twists, bends, and open joints.

4.4 Built-in Items

All parts of metal work, which are to be built into the structure of the building and structures, shall be furnished, as required, during the progress of the work.

4.5 Protection

The Contractor shall take care to protect the work from any damage, of whatsoever nature, during the construction period. In case of any damage done, to the work, the Contractor shall remove, replace, or rectify such work at his own cost, without any additional compensation.

4.6 Painting

- a. Except where otherwise specified, all ferrous metal surfaces except working parts, machinery, galvanized surfaces and other surfaces not normally painted, shall receive one coat of rust inhibitive metal primer or red lead paint and two coats of finish painting, with enamel paint, of approved color.
- b. Painting of metal works shall conform to the requirements laid down in Section 11.3 "Painting and Polishing".

5. SHOP DRAWINGS

- a. Where called for in the drawings or directed by the Engineer, the Contractor shall prepare and submit, for the approval of the Engineer, shop drawings, for the metal work, showing all details, in accordance with the instructions of the Engineer.
- b. Shop drawings shall show, in detail, the method of construction, erection data, materials list, and required connections. Schedules designating location, quantity and finishing details of each item shall accompany every shop drawing.
- c. The shop drawings, where required to be modified or revised, by the Engineer, shall be re-submitted, until approved.

6. MISCELLANEOUS METAL WORK

6.1 Description

This work shall consist of furnishing and installing miscellaneous metal work, otherwise, not covered, elsewhere, to be carried out in accordance with these specifications and to the lines, grades, thickness and cross-sections shown on the Drawings and/or as directed by the Engineer.

6.2 Measurement

Except where otherwise specified in the Bill of Quantities, measurement, for a miscellaneous metal work item, of specified materials, quality and dimensions, will be made in

numbers, of that item, acceptably placed, in accordance with the approved Drawings or directions of the Engineer.

6.3 Rate and Payment

- a. Payment for various miscellaneous metal work items, of specified materials, quality and dimensions, will be made for their respective quantities, measured in accordance with Article 6.2, at the unit rates, tendered in the priced Bill of Quantities.
- b. Irrespective of the unit of measurement, specified, the unit rates tendered, for all items of miscellaneous metal work, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials, shown in the Drawings and/or specified in the Bill of Quantities, including false work, painting/coating, welding/fastening and sealing materials
 - ii. All sorts of transportation involved in the process
 - iii. All sorts of wastages
 - iv. All operations including erection of false work; casting, machining, milling, cleaning, fabrication, assembling, jointing, finishing and painting of metal and ancillary work; its installation in building/structure; and maintenance, protection and repairs, of the work
 - v. Preparing shop drawings
 - vi. Carrying out all sampling and testing
- vii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

SECTION 12.2: STEEL WORK IN BUILDINGS

1. DESCRIPTION

This work shall consist of furnishing and installing steel works in buildings, including, but not limited to, the steel gates, doors, windows, ventilators, grills, stairs and railings, to be carried out in accordance with these specifications and to the lines, grades, thickness and cross-sections shown on the Drawings and/or as directed by the Engineer. All the relevant provisions of Section 12.1 shall apply to this section.

2. CONSTRUCTION REQUIREMENTS

2.1. General Requirements

- a. General: Unless otherwise specified, all work carried out, under this section, shall conform to BS 449 "The use of Structural Steel in Building" and Code of Practice CP 113.

b. Wood Work: Woodwork, for items, covered under this section shall conform to the provisions of Section 13.1 "Wood Work: General".

c. Glazing: Glazing shall be in conformity with requirements of BS Code of Practice CP152 "Glazing and Fixing of Glass for Building".

d. Wire Gauze Panels

- i. All wire gauze panels shall be in one piece, with no joint, being allowed in the gauze.
- ii. Wire gauze shall be stretched taught and fixed to the members, with nuts and bolts or screws, with MS flat beading.

e. Installation

- i. The external frames, of doors, windows, ventilators and fixed glazing shall be fixed, in the structure, with the holdfasts of specified size and numbers.
- ii. Doors, windows, ventilators and fixed glazing shall be installed plumb, level, in alignment and properly braced to prevent distortion.

2.2. Casement Steel Windows and Ventilators

- a. All sections shall be hot rolled low carbon steel, one-piece sections, with flanges rolled integrally, in accordance with BS 990.
- b. Composite steel sections made by welding channels, angles and plates shall be accepted, in lieu of one piece section, only, when specifically called for or when shown on drawings.
- c. Longitudinally, all members shall be in one length, without splices.
- d. Unless otherwise indicated of specified, following hardware shall be installed on windows:

No.	Hardware Item	Numbers per Openable Panel
1	Hinges, of steel or malleable iron, with non-ferrous bushings or washers (for window height less than 5'-6")	2
2	Hinges, of steel or malleable iron with non-ferrous bushings or washers (for window height more than 5'-6")	3
3	Locking handle, in smooth finished solid brass	1
4	Peg stay, 10" long, in smooth finished solid brass	1

2.3. Steel Gates

Unless otherwise indicated of specified, following hardware shall be installed on steel gates:

- a. Two hinges per leaf, of steel or malleable iron, with non-ferrous bushings or washers
- b. Two numbers, 18" long sliding bolts, one inside and one outside

2.4. G.I Pipe Safety Railing

- a. Supplying, fabrication, transportation, alignment and erection of G.I. pipe (galvanization shall must comply the requirements as laid down in Section 12.4 of this tender document) safety railing at all elevations including
- b. Preparation of shop drawings,
- c. Prior to fabrication of straight or inclined railing,
- d. Installation at platform, walk-ways, pathways, bridges, passages, staircases, landings etc, Fixing, bolting, clamping, painting etc. complete with other fittings and fixtures including all taxes, duties, transportation, grinding, bolting, all welding, edge preparation, blast cleaning of welded surfaces to near white metal surface (Sa 2 1/2),
- e. Coating with zinc rich primer of approved quality,
- f. Testing, complete as per specifications, drawings and instruction of the Engineer.
- g. Acceptably installed by the Contractor and approved by the Engineer.

3. MEASUREMENT

Except where otherwise specified in the Bill of Quantities, measurement, for various metal work items, of specified materials, quality and dimensions, will be made in the following units, of these items, acceptably placed, in accordance with the approved Drawings or directions of the Engineer:

- a. Doors including folding/collapsible doors (except the gates, sliding doors and rolling shutters), windows, ventilators, fixed glazing and grills shall be measured, in specified units, of the area of the opening, in masonry/concrete, in which they are fixed.
- b. Gates and sliding doors shall be measured, in specified units, of the area of the one side of the leaves.
- c. The railings shall be measured, in specified units, of the centerline length, of the railing.

4. RATE AND PAYMENT

- a. Payment for various metal work items, of specified materials, quality and dimensions, will be made for their respective quantities, measured in accordance with Article 3, at the unit rates, tendered in the priced Bill of Quantities.
- b. Irrespective of the unit of measurement, specified, the unit rates tendered, for all items of various metal work, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials, shown in the Drawings and/or specified in the Bill of Quantities, including materials for false work, painting/coating, welding, fastening and anchoring, sealing, glazing, fly proofing and common hardware items including hinges, locks, handles, peg stays, sliding bolts and latches
 - ii. All sorts of transportation involved in the process
 - iii. All sorts of wastages
 - iv. All operations including erection of false work; cleaning, fabrication, assembling, jointing, finishing, glazing and

- painting of metal and ancillary work; its installation in building/structure; installation of hardware; and maintenance, protection and repairs, of the work
- v. Preparing shop drawings
 - vi. Carrying out all sampling and testing
 - vii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.
- c. Where shown in the Drawings or specified in the Bill of Quantities, the unit rates tendered, for all items of metal work, shall be deemed to be inclusive of the following:
- i. All materials and operations related with special hardware items including spring hinges, push plates, kick plates, door closures, eyes, catches, hasps and staples

SECTION 12.3: ALUMINUM DOORS AND WINDOWS

1. DESCRIPTION

The works covered by this section of the Specifications consist of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with carrying out the work of Aluminum Doors, Windows, Ventilators, partitions etc. and all related items such as rubber gasket for glazing, netting, rollers, latches, fastenings, glazing, rawal plugs and all items supplied by other trades and customarily built in and/or installed, complete in strict accordance with this section of the Specifications and the applicable drawings and subject to the terms and conditions of the Contract. The scope of this section of Specifications is covered with detailed specification of Aluminum Doors and Windows as laid down herein.

2. GENERAL

- a. The aluminum sections to be provided for doors and windows shall consist of aluminum windows of sliding and hinged pattern, which shall be the product of a reputable manufacturer such as (Pakistan Cables or approved equal) approved by the Engineer.
- b. All the sections used for doors and windows shall be of best quality aluminum products such as equal and unequal angles, channels, tubes, corrugated strips, moldings, etc. in accordance with international standards in Pakistan or conforming to ASTM B 308 & B.S. 221.
- c. All doors and windows shall be of the type and size indicated on the drawings and shall conform to the requirements shown and specified herein.
- d. The Contractor shall arrange tests and analysis at the fabricator's works for the material arranged by them to be tested in the presence of the Engineer's Inspector to whom test certificates, proof sheets, etc. shall be furnished. Nevertheless, neither the

fact that the materials have been tested in the presence of the Inspector, nor that the Engineer may have been furnished with test certificates in lieu 'of sending an Inspector to the works, shall affect the liberty of the Engineer to reject after delivery, materials found not in accordance with these specifications.

- e. After getting approval of the Engineer, the Contractor shall submit shop drawings which will show full construction details, quantities and locations, fastenings and attachment to adjacent construction and materials, manufacturer's fabrication and installation program. Drawings shall be submitted reasonably in advance to allow for checking, revisions, agreement and to permit manufacturer's product delivery and start of site work to suit the construction schedule. The Contractor shall submit representative samples of windows, anchoring mechanism, embedded parts, fastenings, glass panes, accessories and other materials for the Engineer's approval.
- f. The glass shall be 6 mm thick for doors, 5 mm thick for windows, 12mm round tempered glass for curved windows and 4 mm thick for ventilators and shall be free from all blemishes, bubbles, distortions and other flaws of any kind and shall be properly cut to size as shown on the drawings, so as to fit the grooves in panels. All the glass shall be of best quality and of Pakistani manufacture or any equivalent standard, as approved by the Engineer.
- g. The structural shape of the aluminum members shall be of uniform quality, color and temper, clean, round, commercially straight and free from injurious defects.
- h. All doors and windows shall be fabricated as a complete unit, fully air- tight and watertight including rubber gasket for glazing, rollers, latch, anodized in natural colour, inclusive of glass sheet, door locks, door closures and window locking requirements, all as approved by the Engineer.
- i. Wire gauzed doors and windows shall all be manufactured as specified in pare (h) except that aluminum wire gauze shall also be fixed. The aluminum wire gauze shall be of best quality available or any equivalent standard as approved by the Engineer.
- j. The Contractor shall, on request, get a certificate signed by the manufacturer stating that each lot has been sampled, tested and inspected and has met the requirements in accordance with these specifications, and the same shall be furnished to the Engineer if asked.

3. CONSTRUCTION

The Contractor shall be responsible for the protection and installation of all items furnished. All items shall be installed in line and plumb and square and shall be solidly anchored in a good workmanlike manner in accordance with the manufacturer's instructions and as specified herein. The Contractor shall be responsible for the protection of installed items from damage by other trades. All items shall be left in operating, neat and clean condition, free from dirt, finger marks, etc. The Contractor shall be responsible for final cleaning before the final acceptance.

The glass panes shall be firmly secured in rebates with the rubber gasket. It shall be ensured that the beads and grooves are clean, dry and unobstructed at the time of glazing, and the complete unit shall be airtight and watertight on completion. No doors and

windows shall be considered complete until and unless finger prints and other stains and marks have been removed from the surface of glass and aluminum.

4. PRODUCT DELIVERY AND STORAGE

- a. Doors and windows shall be delivered in a manner preventing damage to units. Windows shall be stored off the ground under cover in a manner preventing deterioration or any sort of damage.
- b. All embedded parts and anchor bolts shall be carefully delivered to the site keeping the fabricated shape and configuration. All these parts shall be suitably marked for identification.

5. ERECTION

Rowel plugs and anchoring bolts shall be embedded into the concrete or block masonry for holding the doors and windows in their correct position.

Care shall be taken to install the doors and windows in line and plumb and solidly anchored in a good workmanlike manner in accordance with the drawings. Should any scale or scratch appear on the surface of doors and windows, the Contractor shall replace the section or remove the objection at his own expense and at the Engineer's direction. Have all exposed surface cleaned to bare bright metal.

SECTION 12.4: METAL GALVANIZING

1. DESCRIPTION

This work shall cover the requirements for zinc coating (galvanizing) by the hot-dip process on iron and steel products made from rolled pressed and forged shapes, castings, plates, bars, and strips. It will cover both un-fabricated products and fabricated products and repair of damaged galvanized surfaces. However object of less than 0.76 mm thickness shall not fall under this specification.

Galvanized coatings shall conform to ASTM A123; ASTM A 153. Any defects in galvanizing shall be repaired as specified in ASTM A780, or the relevant portions of the Standard Specifications.

2. GENERAL REQUIREMENTS

- a. Use zinc for coating that conforms to ASTM B-6 and is at least equal to the grade designated as "Prime Western".
- b. Provide a zinc coating for those items indicated or specified to be galvanized as follows:

- i. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strips 3.175 mm thick and heavier.
 - ii. ASTM A 153 for galvanizing iron and steel hardware.
- c. Apply zinc on 3.175 mm to 1.58 mm thick steel at a rate of at least 600 gm per square meter of surface area.
- d. Apply zinc on 6.35 mm and thicker steels at a rate of at least 700 gm per square meter with no individual test measuring less than 600 gm per square meter of surface area.
- e. The specified zinc coating to be applied shall be in an amount not less than 610 grams per square meter. This application will result in a minimum nominal thickness of 0.087 millimeters
- f. Repair all shop damaged galvanized surfaces by the metalizing, hot stick or zinc rich paint, ASTM C 780 process.
- g. Repair field damaged, cut, burned or uncoated surfaces in the field by coating with a dust-zinc oxide paint conforming to FS TT-P-641 or MIL P-21035.

3. WORKMANSHIP

The galvanizing shall be applied to assure the spelter will not peel off. The finished product shall be free from blisters and excess spelter. The coating shall be even, smooth, and uniform throughout. Machine work, die work, cutting, punching, bending, welding, drilling, thread cutting and other fabricating shall be accomplished prior to galvanizing. No member out of alignment shall be galvanized. All members (nuts, bolts, washers, etc.) shall be galvanized before a structural unit is assembled. All uncoated spots, damaged coatings due to poor workmanship, rough handling, or related reason shall be rejected.

4. TESTING

The thickness of the galvanized coating shall be first tested by the Contractor and witnessed by the Engineer at the galvanizer's works, using an approved measuring device. In the event of any dispute, an independent test shall be carried out in accordance with the Conditions of Contract

Test coupons for determining the quality of the galvanizing shall be wired to the materials to be galvanized before immersion in such a manner as to represent the amount of coating deposited on the materials.

5. REPAIR TO DAMAGED SURFACES:

Unless otherwise specified, where galvanized surfaces are field or shop cut, broken, burned or abraded, thus breaking the galvanizing, the locations thus damaged shall be

repaired by the metalizing, hot stick or zinc rich paint in conformance with ASTM C 780 process and to the satisfaction of the Engineer

All visible damage (i.e., scratches, nicks, cracks) to the galvanized coating, caused during shipment, storage or placement shall be repaired by the Contractor at the job site in accordance with appropriate ASTM specifications. Any article that have been sheared, sawed, or cut by other means shall be coated. The area damaged by welding shall be repaired and properly coated. Field coating of damaged areas shall be performed in accordance with the coating manufacturer's recommendations.

6. ASSURANCE

When requested, the Contractor will responsible to get the weight of zinc coating verified in accordance with ASTM E 376.

7. REFERENCES

- a. ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- b. ASTM A 153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- c. ASTM A 780: Standard Practice for Repair of Damaged Hot-Dip Galvanized Coatings.
- d. ASTM B 6: Standard Specification for Zinc (Slab Zinc).
- e. ASTM E 376: Standard Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods.
- f. FS TT-P-641: Primer Coating, Zinc Dust - Zinc Oxide (for Galvanized Surfaces).
- g. MIL P-21035: Paint, High Zinc Dust Content, Galvanizing Repair.

8. PROTECTION

- a. The Contractor shall protect all the work against damage or injury by his employees, or by the materials, tools or utensils used in connection with the work, under this Contract.
- b. All painted work shall be touched up and restored, where damaged or defaced, to the complete satisfaction of the Engineer.
- c. All visible damage (i.e., scratches, nicks, cracks) to the galvanized coating of the reinforcement, caused during shipment, storage or placement shall be repaired by the Contractor at the job site in accordance with appropriate ASTM specifications.

9. CLEANING

- a. The Contractor shall clean all paint, spots, oil and stains, entirely, from all surfaces, upon completion and leave the Work in perfectly clean conditions, in every respect, to the entire satisfaction of the Engineer.
- b. All cloth and cotton waste, which might constitute a fire hazard shall be placed in metal containers or destroyed at the end of each work day.
- c. Upon completion of all work all staging, scaffolding, and containers shall be removed from the Site or destroyed in a manner satisfactory to the Engineer.

SECTION 13.0: WATER-PROOFING, BUILT-UP ROOFING, INSULATED ROOFING AND FALSE CEILING

1 SCOPE

The work covered by this section of the Specifications consists of furnishing all plant, labour, equipment, appliances and materials and in performing all operations in connection with installation of insulation, water-proofing and builtup roofing complete, in strict accordance with this section of the Specifications and the applicable drawings and subject to the terms and conditions of the Contract.

This section also applies to water-proofing membranes and vapour barriers applied at places other than roofs, with necessary modifications as per instructions of the Engineer. The scope of this section of Specifications is covered with detailed specifications as laid down herein.

2 MATERIALS

- a. Bitumen for roofing shall be an approved asphalt with the following characteristics:

	Min.	Max.
i) Softening Point	85°C	96°C
ii) Volatility 163°C, 50 g, 5 hrs.	-	3%
iii) Penetration at 25°C, 100 g, 5 sec.	10	20
iv) Flash Point (open cut)	260°C	-
v) Specific Gravity at 16°C	0.900	1.030
vi) Soluble in carbon tetrachloride	99%	-
vii) Sulphur	-	1.5%

viii) Susceptibility factor	55	-
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(Penetration at 4°C divided by the penetration at 25°C and multiplied by 100).

- b. Asphalt priming oil shall be made by the manufacturer of the asphalt.
- c. Felt shall be an asphalt impregnated type IC fibre base felt as per BS 747. The number of plies shall be as specified in the drawings or Bill of Quantities or as approved by the Engineer.
- d. Pea gravel shall be stone chips or well-worn, washed river gravel and shall be clean, dry, opaque, and ranging in size from 6 mm to 13 mm uniformly proportioned.
- e. Sheet steel for cant strips, gravel strips, and flashing shall be 24 US gauge carbon steel of uniform quality, hot dip coated with 4.9 N (0.5 kg) of zinc per square metre, ASTM Specification A-93.
- f. Nails shall be of the size and type recommended by the roofing manufacturer for the job conditions.
- g. Expanded polystyrene shall be of the type as approved by the Engineer, conforming to BS 2972: 1961. The adhesive for Expanded Polystyrene shall be as Specified by the manufacturer of polystyrene or as approved by the Engineer.
- h. Cement, aggregate and coarse sand shall be in accordance with the specifications for "Plain and Reinforced Concrete".
- i. Diesel Oil shall be standard, light diesel oil as approved by the Engineer.
- j. Samples of all materials proposed for use under this section shall be submitted to the Engineer for his approval.

3 PREPARATORY WORK FOR FELT ROOFING

- a. Treated wood nailing strips 25 mm thick shall be embedded in uninsulated cast-in-place or precast roof decks at rakes, eaves, and around large openings, so that flanges of gravel strips, edging strips, large vents, etc. may be properly secured to deck during the application of the roofing.
- b. All metal gravel strips, scuppers and roof drains shall be placed and metal, flashing, flanges, etc. shall be provided in time to be installed along with the roofing assembly. Cant strips shall be installed at the angle formed by the roof deck and the vertical surfaces.
- c. All surfaces to be roofed shall be broom clean and dry. Roofing shall not start unless the preparatory work has been inspected and approved by the Engineer.
- d. When the slope of non-available concrete deck exceeds one in six, 25 mm by 50 mm treated wood nailing strips shall be embedded in the concrete with surface flush with the deck. Nailers shall be spaced 900 mm on centres, and may be installed either parallel or at right angles to the slope. Roofing felt shall then be laid at right angles to the nailing strips and each blind nailed into each nailer. For slopes between one in twelve and one in six on concrete decks in areas of high temperature, nailer-shall be

- provided at the ridge, felt shall be applied parallel to the slope, and nail upper ends shall be securely blinded into wood nailers.
- e. Joints of precast concrete panels shall be grouted smooth with 1:3 cement sand mortar.

4 APPLICATION OF FELT ROOFING

- a. Asphalt for built-up roofing shall not be applied when it is above 205°C, nor shall it be heated above 245°C.
- b. Felt shall be stacked in properly protected piles and maintained at temperature of at least 10°C for a period of not less than 24 hours prior to laying. Felt and the gravel surfacing material shall always be dry when applied. Asphalt shall be hot when applied and the several layers of felt shall be laid free from wrinkles or buckles.
- c. Built-up roofing shall consist of layers of asphalt priming oil, bituminous paint and felt as specified by the Engineer. Roofing shall not be applied during rain or while surfaces are damp; it shall be applied only to surfaces that are clean and dry.
- d. Method of laying the different layers of built-up roofing shall be strictly in accordance with the instructions of the Engineer.
- e. Built-up roofing shall not be laid when the temperature, at the location of the work, is below 5°C.
- f. Heating of asphalt shall be strictly regulated by means of an accurate thermometer of approved type, kept constantly suspended in the heating kettle while the work is in progress.
- g. Entire deck surface and parapet walls shall be painted with concrete primer and allowed to dry thoroughly. Prime shall be kept several centimeters back from joints of pre-cast panels.
- h. Mopping of surface with asphalt shall be performed so that the surface shall be completely covered. Bond coats of asphalt shall be at the rate of 1471.5 N/100 sq.m (150 kg/100 sq.metres). The rate of application shall be such that the bitumen mopping shall not be more than one metre ahead of the roll of felt. All asphalt shall be applied with mops except that the hot surfacing application shall be poured from a dipper.
- i. Felt shall be laid with each sheet lapping the preceding one as required to provide the number of plies specified. Each sheet shall be lapped 700 mm with an exposed lap of 215 mm. All end laps shall be 100 mm minimum. The laying of felt shall, in general, be started at low points, working upward to high points to surface, and using split sheets as necessary to secure the required number of plies and laps. Roll all roofing felt after the mop as it spreads the asphalt, rubbing and pressing the sheets into the asphalt from the centre outwards to edges so as to ensure thorough sticking and a smooth, firm surface, free from wrinkles or buckles. The first two plies to roofing shall be extended 150 mm beyond the edges of roof legs of the gravel stops and shall be covered with two additional plies of felt, 380 mm and 430 mm wide respectively, and each cemented in place with bitumen.
- j. A flood coat of asphalt shall be applied over the top or top layer of felt at the rate of 2452.5 N/100 sq.m (250 kg/100 sq.metres) of area shall be embedded therein.

- k. There shall be two types of base flashings:
- i. Where built-up base flashing are required, they shall be made by continuing the built-up roofing upon the cant and securing the top edge with galvanized roofing nail used with metal discs. The nails shall be spaced not over 100 mm apart.
 - ii. Where metal base flashing occur, apply 3 layers of felt, extending up on the vertical surface 150 mm and out on the roof surfaces 100 to 150 mm respectively cementing the same in place with asphalt plastic, trowelled on. These three flashing strips shall be applied over the top ply of roofing and under the metal base flashing. The portion of metal flashing extending out over roof surfaces shall be covered with two additional plies of felt, 380 mm and 430 mm wide respectively and both cemented in place with bitumen.
- l. Water-proofing treatment to reinforced cement concrete slabs shall be done in the following order:
- i. Spreading of Grade Class “C” cement concrete screed of specified thickness and slope.
 - ii. After the surface is thoroughly broomed, cleared and dried a primer coat @ 50 liters/100 m² shall be applied.
 - iii. A coat of hot bitumen @ 1471.5 N/100 sq.m (150 kg/100 sq.m) shall be applied over the primer.
 - iv. Three ply roofing felt shall then be laid over hot bitumen according to the instruction laid down in clause 13.4(i).
 - v. Over the felt a flood coat of bitumen @ 2452.5 N/100 sq.m (250 kg/100 sq.m) shall be applied.
 - vi. Pea gravel @ one cu.m/100 sq.m shall be sprinkled and penetrated into the flood coat so as to seal the surface properly.

Weight of 3 ply standard roll of 22 x 0.915 m should be 45.5-50 kg.

5 WATER PROOFING WITH Hycarb-A-20 AND DIESEL OIL

- a. 75 mm thick screeding with cement concrete Grade Class “C” shall be provided over RCC roof slabs with correct slope for roof drainage. Screeding shall be finished to have smooth surface.
- b. An application of light diesel oil at the rate of 0.8 kg per sq.metre shall be done as priming coat on top of screeding after the concrete has set and dried.
- c. Over the priming coat, two coats of (Hycarb A-20 or bitumen of equivalent grade with coarse sand shall be applied as mentioned hereunder:
 - i. First Coat: 15 kg. Bitumen with 0.05 m³ of coarse sand per 10 m².
 - ii. Second Coat: 12.5 kg. Bitumen with 0.05 m³ of coarse sand per 10 m².

6 INSULATED ROOFING

Insulated roofing shall be applied where specified. From top to bottom it shall consist of:

- a. 75 mm thick slope forming screeding with correct slope for roof drainage.
- b. Application of priming coat of light diesel oil at the rate of 0.8 kg per square meter and two coats of (Hycarb A-20 or bitumen of equivalent grade) at the rate of 1.50 kg per square meter plugged with coarse sand.
- c. One layer of 30 mm thick thermopore (polystyrene) sheet with density not less than 200 milligrams per centimeter cube
- d. Laying of precast cement tiles 300mm x 300mm x 25mm over 25mm thick cement mortar 1:3.

7 BITUMEN COATING

Unless otherwise specified, all concrete work in contact with earth upto plinth level shall be given an application of hot bitumen of approved grade and manufacture at the rate of 7.5 kg. per 10 sq. metre ensuring that no pin holes/patches are left out. Bitumen shall be applied after ensuring that the concrete has been cured and dried. Back-filling of earth in foundation upto plinth shall only be carried out after the application of Bitumen coat as specified here-in and as directed by the Engineer.

8 FALSE CEILING

8.1 General

False ceiling is provided to meet the various requirements namely, to improve appearance of roof's interior to reduce the air conditioning loads and also to conceal any service duct, or pipe lines running along the roof. Ceiling is also required to meet the acoustic requirements. Material for this purpose may be soft board, hard board, A.C. sheets, Thermopore sheets, specially perforated acoustic boards and Plaster of Paris or Gypsum precast ceiling panels etc.

8.2 Material

The material for the false ceiling shall be according to the provision made in the item of work and it's thickness and dimensions shall also conform to the item of work and / or as directed by the Engineer.

8.3 Frame

Frame shall either be wooden frame, steel frame, or aluminium frame and either be suspended from the surface or provided as a rigid frame as per design and or as required by the Engineer.

8.4 Fixing

Fixing of false ceiling board or tiles could be either by screws or by special clips depending upon the design of the ceiling frame and shall be carried out as per direction of the Engineer. Fixing of the ceiling shall also be required by providing of beading of either wooden strips or any other metallic strips as required in the item of work. For venting purpose in case of any type of board or A.C sheet ceiling 13 mm holes shall be provided in the end panels as directed by the Engineer.

9 MEASUREMENT AND PAYMENT

- a. Unless otherwise specifically stated in the Bill of Quantities or herein, all the work and costs involved within the scope of this section of Specifications shall be deemed to be inclusive of, but not limited to the following:
 - i. Contractor's establishment charges, overhead charges, profit, interest. ii. All other expenses, charges, taxes, specified in Conditions of Contract. iii. Labor and all costs in connection therewith.
 - iv. Use of plant, equipment and machinery and all costs in connection therewith e.g. mobilization, demobilization, transportation, fuel, energy charges, grease, oil, installing, operating, storing, watching, returning, replacing, handling, maintaining, idle stand, parking, removing damaged, destroyed, salvaged items.
 - v. Material and goods e.g. marketing, selecting, conveyance, loading, unloading, storing, watching, returning, handling, hoisting, lowering, cutting, jointing, fixing, wastage, removing destroyed, damaged, salvaged materials. vi. Cost of collection and preparation of samples, as well as all laboratory and field tests stipulated in these Specifications.
- b. The cost of all the works involved within the scope of these specifications as per all the drawings and Conditions of Contract are covered within the quoted rate of items of the Bill of Quantities.
- c. Works shall be measured net acceptably completed and as applied in position conforming to the drawings and the instructions of the Engineer. Each measurement shall be taken to the nearest 10 mm. However, this rule shall not apply to any dimensions stated in descriptions.
- d. Water-proofing and built-up roofing, except where otherwise stated shall be measured as the net actual visible area of the treated surface in square metres describing the quality and type of treatment.
- e. Insulation of jutoid except where otherwise stated in B.O.Q. shall be measured as the net visible area of the treated surface in square metres.
- f. Insulation of thermopore except where otherwise stated in B.O.Q. shall be deemed included as net area of roof insulation of required thickness in square meters of any thickness.
- g. Unit rate for insulation, water-proofing and built-up roofing shall be deemed to be inclusive of all preparatory works, scrapping, scratching, cleaning, priming, nailing strips, cant strips, gravel strips, flashings, scuppers, roof drains, thermopore, felt, polythene sheet, grouting of precast panel joints turn ups, turn downs and wedging of

- felt, laps of felt and the like, complete as per drawings and as directed by the Engineer.
- h. Unless otherwise specified, formwork will not be measured or paid for.
 - i. The amount of bid shall be the full payment for the completion of the f works in all respects as specified herein or as instructed by the Engineer.
 - j. Measurement for false ceiling shall be for net superficial area in square meter, and the rate shall cover all the requirements of work as indicated in the nomenclature of item of work, inclusive of all labour, materials, frame and ceiling board or sheets etc., complete.

SECTION 13.1: WOOD WORK (GENERAL)

1. SCOPE

The section outlines the general requirements and procedures for all types of wood works. All the relevant provisions of this section shall apply to the Sections 13.2 to 13.3.

2. SAMPLES AND TESTS

The samples of all the materials, to be used for woodwork, shall be approved by the Engineer and same type of material shall be used during the work. If the Engineer desires to get the material tested, this will be got done by the Contractor, at his own expense from a laboratory, approved by Engineer.

3. MATERIALS REQUIREMENT

3.1 Timber

a. General

- i. Type of timber for various carpentry, joinery and structural works, shall be as shown in the Drawing or as specified, herein.
- ii. The timber shall conform to the requirements of BS 1186, Part 1, "Quality of Timber".

b. General Quality:

- i. Timber shall be of good quality, felled, not less than two years before use for carpentry and, not less four years for joinery work and shall be properly seasoned.
- ii. Timber shall be uniform in texture, straight in fibbers, free from open shakes, bore holes, fungus attack, rots, dots, decay, warps, twists, springs or cracks and all other defects and blemishes.
- iii. Sap Wood shall not be permissible in any carpentry, joinery and structural works.
- iv. Timber shall be free from knots, other than the sound knots, appearing on surface only and not exceeding 13 mm ($1/2$ ") in diameter.
- v. Loose or decayed dead knots shall not be permissible in any joinery and shall be cut out and plugged properly.

c. Size

- i. The round logs, of timber, shall not be less than 10' (3 meter) and more than 40' (12 meter) in length and 7' (2.1 meter) in girth.
- ii. Tapered logs shall not be less than 4' (1.3 meter) in girth at the small end.
- iii. Square logs shall be of the size not less than 10' (3 meter) in length and 16"x16" (400 mmx 400 mm) in cross section.

d. Storage

- i. Timber shall be stacked on a raised wooden or paved platform to eliminate chances of white ant attack.
 - ii. It shall be stacked under a proper shelter, where maximum aeration is possible without subjecting it to the direct sun, rain or other weathering agents.
- e. Seasoning of Timber: Timber shall be properly seasoned. It shall be kiln or air dried to reduce the moisture content to a minimum of 20% of its natural weight.
- f. Preservation of Timber: Preservation of the timber shall be carried out in accordance with the procedures laid down in Section 11.3 "Painting and Polishing".

3.2 Ply Wood

- a. The ply wood shall conform to the requirements of BS 1455:1963, "Ply Wood Manufactured from Tropical Hard Woods".
- b. Except where otherwise specified, synthetic resin bonded, three-ply wood shall be used, for all the interior wood work.
- c. The grades of the veneer, used in the ply wood, to be employed for various purposes, shall be as follows, subject to the approval of the Engineer.
 - i. Grade I Veneer: For use, where subsequent polishing is intended
 - ii. Grade II Veneer: For use where subsequent painting is intended
 - iii. Grade III Veneer: For use where it is not normally visible

3.3 Laminated Board and Block Board

a. General

- i. Laminated and block boards shall conform to the requirements of BS 3444:1961, "Block Board and Laminated Board".
- ii. Total thickness of the laminated and block boards, for any item of woodwork, shall be as shown in the Drawings or as specified in the Bill of Quantities.
 - b. Laminated Board: The core of the laminated board shall be built of 3 to 7 mm wide narrow strips, faced with the veneers, of specified thickness and quality.
 - c. Block Board: The core of the laminated board shall be built of about 25 mm wide blocks, faced with the veneers, of specified thickness and quality.

3.4 Hard Board

Where required hard board, of specified quality and thickness, shall be of following characteristics:

- a. It shall be hard and free from cracks, flaws, dents, and other defects.
- b. It shall not warp in moist climate nor turn into laminations.
- c. It shall have uniform color and thickness.

3.5 Chip Board

Where required chipboard, of specified quality and thickness, shall be of following characteristics:

- a. It shall be hard and free from cracks, flaws, dents, and other defects.
- b. It shall not warp in moist climate.
- c. It shall have uniform texture and thickness.

3.6 Steel Wire Gauze

- a. Wire gauze shall be uniformly woven.
- b. Wire gauze, unless otherwise indicated, shall be of mesh size 12x12 per square inch, made from 24 gauge galvanized iron wire.

3.7 Glass

- a. Glass, clear, tinted or frosted, for glazing purposes, shall conform to BS 952.
- b. All glass used shall be even, free from specks, bubbles, distortion and flaws of every kind.
- c. Unless otherwise specified, thickness of glass, for glazing purposes, shall be 5 mm.

3.8 Adhesives

For joinery work, animal glues (BS 745, "Animal Glues for Wood"), Casein glues (BS 745, "Cold Setting Casein Glue for Wood"), or synthetic resin adhesive (BS 1204, "Cold Setting Synthetic Resin Adhesives for Construction Work in Wood") shall be used.

3.9 Putty

Putty, for wooden frames, shall be an elastic glazing compound, conforming to the requirements of BS 544 "Linseed oil putty for use in wooden frames". Where ever required, the putty shall be colored to match with the wooden finish.

3.10 Fastening and Fixing Accessories

Various fastening and fixing elements, for wood joinery work, shall be of following specifications:

- a. BS 1202 Wire Nails and Cut Nails for Building Purposes
- b. BS 1210 Wood Screw
- c. BS 325 Black Counter Sunk Nuts and Washers
- d. BS 916 Bolts, Screws and Nuts
- e BS 1494 Fixing Accessories for Building Purposes

4. CONSTRUCTION REQUIREMENTS

4.1 General

- a. All the wood work shall be neatly and truly finished, to exact dimensions and details, as shown on the Drawings or directed of the Engineer.
- b. All the false work, including loose planks, battens, trestles, ladders and scaffolding, necessary for the proper execution of the work, shall be carried out by the Contractor, at his own expense.
- c. All wood work, as far as practicable, shall be assembled in shop, finished and prime coated before delivery for fixing.

4.2 Jointing and Fixing

- a. The wood planks and scantlings shall be sawn, slightly, in excess of the actual measurements, to provide for planning. Such allowance may be to the extent of 1.5 mm (1/16") for each wrought face.
- b. The joints and connections, for wood work, including their type and the size, spacing, type, positioning and number of various types of fasteners, for joints, shall be designed and constructed, by the Contractor, such that they are capable of resisting the expected loads and stresses, to the satisfaction of the Engineer.
- c. In determining the type, size and strength of nails and screws, CP 112 "The Structural Use of Timber in Buildings" shall be followed.
- d. Unless otherwise specified or directed by the Engineer, all joints shall be simple tenon and mortise joints. The thickness of each tenon shall be about 1/3rd of the thickness of the section and width of the tenon shall be about five times of its thickness. The joint shall fit truly and fully.
- e. Unless otherwise specified or directed by the Engineer, all components of joints shall be glued before joining.
- f. The arrangement of jointing and fixing, of all wood works, shall be such that shrinkage in any part and in any direction shall not impair the strength and appearance of the finished work.

4.3 Screwing and Nailing

- a. Holes of correct size shall be drilled before inserting screws. Driving in or starting in screws with hammer shall not be allowed. All screws shall be dipped in oil before they are inserted in the wood.
- b. The heads of nails or screws shall be sunk and puttied or dealt with as directed by the Engineer.

4.4 Installation

- a. All woodwork shall be fitted, to plaster and other finished work, in a careful manner, so as not to injure these surfaces. Where plaster or other work is damaged or disturbed, it shall be restored, to its original state, by the Contractor, at no additional cost.
- b. Reasonable tolerance shall be provided at all connections between woodwork and the building, whether of masonry or concrete construction, so that any irregularities, settlements or other movements shall be adequately compensated.

4.5 Glazing

Glazing shall be in conformity with requirements of BS Code of Practice CP152 "Glazing and Fixing of Glass for Building".

4.6 Wire Gauze Panels

All wire gauze panels shall be in one piece, with no joint, being allowed in the gauze.

4.7 Painting

Painting and polishing of wood work shall conform to the requirements laid down in Section 11.3 "Painting and Polishing".

4.8 Protection

- a. The Contractor shall take care to protect the work from any damage, of whatsoever nature, during the construction period.
- b. In case of any damage done, to the work, the Contractor shall remove, replace, or rectify such work at his own cost, without any additional compensation.
- c. If after the wood work has been erected, any undue shrinkage, distortion or bad workmanship is discovered; the Contractor shall forthwith replace or amend the same, without any extra charge, to the satisfaction of the Engineer.

5. SHOP DRAWINGS

- a. Where called for in the drawings or directed by the Engineer, the Contractor shall prepare and submit, for the approval of the Engineer, shop drawings, for the woodwork, showing all details, in accordance with the instructions of the Engineer.
- b. Shop drawings shall show, in detail, the method of construction, materials list, and required connections. Schedules designating location, quantity and finishing details of each item shall accompany every shop drawing.
- c. The shop drawings, where required to be modified or revised, by the Engineer, shall be re-submitted, until approved.

SECTION 13.2: WOOD WORK IN BUILDINGS

1. DESCRIPTION

This work shall consist of furnishing and installing wood work in buildings, including, but not limited to, the doors, windows, ventilators, railings, paneling and all cabinet and counter type items, to be carried out in accordance with these specifications and to the lines, grades, thickness and cross-sections shown on the Drawings and/or as directed by the Engineer. All the relevant provisions of Section 13.1 shall apply to this section.

2. MATERIAL REQUIREMENTS

The materials, covered therein, shall conform to the requirements, laid down in Section 13.1.

3. CONSTRUCTION REQUIREMENTS

3.1 General Requirements

a. General

- i. All construction requirements, related to fabrication, jointing, fixing, installation, glazing, fly proofing, painting, polishing and protection, of wood work, shall, in general, comply with the provisions laid down in Section 13.1.
- ii. Wood work, in general, shall conform to the requirements of the British Standard Codes of Practice CP 151:1957 (Part II) and CP 112:1952.
- iii. No joints and splicing shall be allowed in the straight lengths, of the members and in the sheets, to be placed in one plane, except with an expressed approval of the Engineer.

- iv. Hardware shall be demonstrated to work freely, keys shall be fitted into their respective locks, and upon acceptance of the work, keys shall be tagged and delivered in duplicate to the Engineer.
- v. Brass screws shall be used with brass fittings.

b. Metal Work: Metal work, for items, covered under this section shall conform to the provisions of Section 12.1 "Metal Work: General".

3.2 Flush Doors

Unless otherwise shown in the Drawings or described in the Bill of Quantities, flush doors shall comply with the following requirements.

a. General: Flush Doors shall conform to the applicable requirements of BS 459 "Flush wood doors" and Pakistan Standard PS 142:1961.

b. Door Frames

- i. Door frames shall be fabricated of first class *Deodar* wood.
- ii. The total depth of the frame, in general, shall be such that when installed, the finished surface of the wall is flush with that of the frame.
- iii. The vertical members of frames shall be embedded in floors, at least 50mm (2") deep.
- iv. Door frames, for walls of thickness, 4½", shall comprise planks of crosssection 140mm x 45mm (5½"x1¾").
- v. Door frames, for wall of thickness, 9" and above, shall be fabricated by planks of size 75mm x 45 mm (3"x1¾"). Two individual frames, fabricated from these planks, shall be interconnected, by the wood pieces, of same cross-section, placed at a center to center spacing of about 300 mm (12").
- vi. Frames shall have rebate, 13 mm (½") deep and its width equal to the thickness of door, to receive the leaves.
- vii. The corners, of the door frame, shall be bound with 50mmx 3mm (2"x 1/8") MS strap, bent into right angle, with length of each leg equal to the depth of frame, fixed with four 50 mm (2") screws.
- viii Ply wood sheets (Grade I), of the same type, as used for the leafs, with minimum thickness of 3.2 mm (1/8"), shall be glued and nailed, on the inner face of the door frame.

c. Holdfast

- i. The doorframes shall be secured to the masonry or concrete with holdfasts, which shall be built into the wall, with cement sand mortar (1:3).
- ii. The holdfasts shall be made of 38mm x 6mm (1½"x¼") M.S. flats, bent at both ends, leaving 350 mm (14") clear length between the ends. Bend on one side shall have two holes, by which the holdfast shall be screwed, to the frame, by means of two (2) 10 mm (¾") dia screws.
- iii. Following numbers of holdfasts shall be fixed, on each side of the frame, along the vertical members:

- For frames of height upto 2.1 m (7')
 - For frames of height above 2.1 m
- 3
(7') 4
- iv. The holdfasts shall be painted with 2 coats of anti-corrosive paint, before they are secured to masonry or concrete.
- d. **Door Leaf** : The flush door leaf comprising core, ply wood facing and lipping shall be fabricated as follows:
- i. The core, of the leaf, shall comprise a grid frame, fabricated of first class *Partal* wood.
 - ii. Outer frame, of the core, shall have, all the four sides, of planks, with crosssection 75mm x 32mm (3"x1 1/4"). Wooden strips of cross-section 38mm x 32mm (1 1/2"x1 1/4"), spanning the shorter direction, of the leaf, shall be fixed, to the longer sides of the outer frame, at a center to center spacing of about 100 mm (4").
 - iii. The core shall be treated with the approved anti-termite chemical, prior to ply pasting.
 - iv. Ply wood sheets (Grade I), of specified type, with minimum thickness of 3.2 mm (1/8"), shall be glued and pressed, on either face of the core.
 - v. The leaf shall be edged, on all four sides, with 13 mm (1/2") thick *Deodar* wood lipping.
- e. **Fitting, Hanging and Trimming**: The door leaf shall be hung to the door frame by means of hinges, which shall be counter sunk, into both leaf and frame, the recesses being cut to the exact size and depth of the hinge. The hinges shall be fixed to both leaf and door frame, by means of counter sunk screws.
- f. **Architrave**: *Deodar* wood architrave, of maximum width 75 mm (3"), of approved design, with its one side, flush with the inner face of the door frame, shall be installed, on both sides, of the door frames.
- g. **Hardware**: Unless otherwise indicated of specified, following hardware shall be installed on doors:

No.	Hardware Item	Door Leaves	
		Single	Double
1	Lock, knob type, (Alpha, Japan or approved equal)	1	1
2	Hinges, Brass	3	6
3	Tower bolt, Brass	1	1

3.3 Cabinets, Counters and Wardrobes

Unless otherwise shown in the Drawings or described in the Bill of Quantities, cabinets, counters and wardrobes shall comply with the following requirements.

a. General: Cabinets, counters and wardrobes shall, in general, comprise the boxes, shutters and drawers, as shown in the Drawings, which shall be fabricated, as follows:

b. Boxes

- i. Except for the back, if abutting with the wall, and the front, with or without shutters, all sides of the boxes, for cabinets, counters and wardrobes, shall be of 19 mm (³/₄") thick chip board, duly, jointed together, by screwing.
- ii. The back, of the cabinets, counters and wardrobes, abutting with the walls, shall be of 3.2 mm (¹/₈") thick commercial ply wood sheets (Grade II).
- iii. All frontal edges of the boxes, except for those, bordering the shutters and drawers, shall be provided with 19mm x 13mm (³/₄" x ¹/₂") *Deodar* wood lipping.
- iv. All frontal edges of the boxes, bordering the shutters and drawers, shall be provided with frames, made from wooden strip, of cross-section 50mm x 38 mm (2" x 1¹/₂"). These frames shall have rebate, 6 mm (¹/₄") deep and its width equal to the thickness of shutters or front panel of the drawer, to receive the shutter or drawer, as the case may be.

c. Shutters

- i. The shutter shall be fabricated, by pasting 3.2 mm (¹/₈") thick commercial ply wood sheet (Grade I), on one side (back face), of 13 mm (¹/₂") thick chip board, and the 3.2 mm (¹/₈") thick ply wood sheet (Grade I), of specified type, or Formica sheet, of approved design, on the other side (front face) of it, as shown in the Drawings or specified in Bill of Quantities.
- ii. The shutter shall be edged, on all four sides, with 13 mm (¹/₂") thick *Deodar* wood lipping.
- iii. The shutter shall be attached to the box frame by means of spring type hinges, for cabinets and counters and by continuous hinges, for the wardrobes.

d. Drawers

- i. Except for the front panel, all sides of the drawers shall be of 19 mm (³/₄") thick chip board, duly, jointed together, by screwing.
- ii. The front panel shall be fabricated, by pasting 3.2 mm (¹/₈") thick ply wood sheet (Grade I), of specified type, or Formica sheet, of approved design, on one side (front face), of the 13 mm (¹/₂") thick chip board, as shown in the Drawings or specified in Bill of Quantities.
- iii. The front panel shall be edged, on all four sides, with 19 mm (³/₄") thick *Deodar* wood lipping.
- iv. The drawers rails, duly, attached, with the drawer body, by means of screws, shall be provided.

e. Hardware: Unless otherwise indicated of specified, following hardware shall be installed on cabinets, counters and wardrobes:

Hardware Item	Per Shutter	Per Drawer
Concealed lock	1	1
Spring hinges for cabinets and counters	2	-
Continuous hinges, of shutter's length, for wardrobes,	1	-

Catcher for wardrobes	1	-
Opening handle	1	1
Pair of drawers rails	-	1

4. MEASUREMENT

Except where otherwise specified in the Bill of Quantities, measurement, for various wood work items, of specified materials, quality and dimensions, will be made in the following units, of these items, acceptably placed, in accordance with the approved Drawings or directions of the Engineer:

- a. Doors including folding/collapsible doors (except the sliding doors), windows, ventilators and fixed glazing shall be measured, in specified units, of the area of the opening, in masonry/concrete, in which they are fixed.
- b. Sliding doors shall be measured, in specified units, of the area of the one side of the leaves.
- c. Cabinets, counters and wardrobes shall be measured, in specified units, of the frontal area, of these items.

5. RATE AND PAYMENT

- a. Payment for various wood work items, of specified materials, quality and dimensions, will be made for their respective quantities, measured in accordance with Article 4, at the unit rates, tendered in the priced Bill of Quantities.
- b. Irrespective of the unit of measurement, specified, the unit rates tendered, for all items of various metal work, shall be deemed to be inclusive of, but not limited to the following:
 - i. Providing all materials, including false work, painting, polishing & coating, fastening and anchoring, sealing, glazing and fly proofing materials, for door frames, cabinets, counters and wardrobe boxes, drawers, leafs/shutters, architrave and moldings
 - ii. Providing metal items, including holdfasts, lugs, screws, nuts, bolts and nails and common hardware items including hinges, locks, opening handles, sliding bolts and latches, tower bolts, catchers, hanging rods, hanging hooks and drawers rails
 - iii. All sorts of transportation involved in the process
 - iv. All sorts of wastages
 - v. All operations including erection of false work; fabrication, assembling, jointing, finishing and painting, polishing & coating of wood and ancillary metal work including door frames, cabinets, counters and wardrobe boxes, drawers, leafs/shutters, architrave, moldings, glazing and fly proofing; installation of

wood work items in building/structure; installation of hardware; and maintenance, protection and repairs, of the work

- vi. Preparing shop drawings vii. Carrying out all sampling and testing
 - viii All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.
- c. Where shown in the Drawings or specified in the Bill of Quantities, the unit rates tendered, for all items of wood work, shall be deemed to be inclusive of the following:
- i. All materials and operations related with special hardware items including stops, push plates, kick plates, door closures, eyes, hasps and staples

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KARACHI PORT TRUST

ENGINEERING DEPARTMENT

SCHEDULE OF QUANTITIES

NAME OF WORK: MAINTENANCE / REPAIR TO FLAT NO: CB-09 APARTMENT TOWER BATHISLAND

S.No	Description of Work	Unit	Rate	Quantity	Amount(Rs.)
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Notes:-

- a)** After the completion of the work the contractor is required to clear away and remove from the site all construction plants, surplus material, rubbish, debris and temporary works of every kind etc. to the entire satisfaction of the Engineer. It may be noted that Contractors' account will not be finalized till such time a certificate to this effect is obtained from Executive Engineer and submitted to the Chief Engineer for his information.
- b)** The Contractor must ensure that the dismantled materials should be disposed in accordance with safety standards fixed by the civic agencies and specified environmental protection rules.
- c)** Debris dismantled materials, rubbish etc. should be disposed in such a way that it should not cause any pollution and shall not be source of harm to public.
- d)** The tenderer must fill all the pages of tender documents, and ensure enclosing of the pay order for Bid Security amount of **Rs. _____ (M) (Fixed)**.
- e)** The tenderers are advised to avoid cutting / over writing in B.O.Q. In case any cutting / over writing it should be properly re-write, sign and stamp otherwise, the tenders may not be considered.
- f)** The (Contractor Tech Representative) is bound to visit the plan monthly & give satisfactory report after checking the plan or he is bound to visit on the call of the Engineer Incharge as & under required.
- g)** ***“Only the FBR & SRB Registered Contractors are eligible for bidding, Contractor has to quote their rates inclusive of all Govt. Taxes”.***


Chief Engineer
Engineering Department
Karachi Port Trust

B. O. Q. ITEMS

Case -Id MAINTENANCE / REPAIR TO FLAT NO: CB-09 APARTMENT TOWER BATHISLAND

Plan #

Dated :

<u>S.No.</u>	<u>Ref.</u>	<u>Item description</u>	<u>Unit</u>	<u>R a t e</u>	<u>Rate in Words</u>	<u>Quantity</u>	<u>Amount</u>
1		DISMANTLING CEMENT CONCRETE / TILE FLOOR, DADO OR SKIRTING IN BASEMENT PLINTH AND GROUND FLOOR INCLUDING BASE MORTAR & STACKING SALVAGED MATERIAL (SERVICEABLE) & DISPOSING OF SURPLUS STUFF AS DIRECTED BY ENGINEER	PER/SQM			200.00	
2		PROVIDING AND LAYING 1:3:6 CEMENT CONCRETE SOLID BLOCK MASONRY OF SIZE 75MM TO 150 MM (3" TO 6") THICK WALLS AND PILLARS USING GRADED SCREENED BAJRI 20 MM (3/4") AND DOWN GAUGE SET IN 1:4 CEMENT MORTAR IN FOUNDATION, BASEMENT AND PLINTH INCLUDING SCAFFOLDING RAKING OUT JOINTS AND CURING ETC., COMPLETE, (FOUNDATION AND BASEMENT MASONRY UPTO 1.50 M. (5 FT) DEPTH AND PLINTH UPTO 1.25 M. (4 FT) HEIGHT FROM THE GROUND LEVEL).	PER/CUM			2.00	
3		PREPARE SURFACE AND APPLYING 1/2" THICK CEMENT SAND PLASTER AT ANY HEIGHT OF RATIO 1:4, FINISHED SMOOTH INCLUDING CURING, SCAFFOLDING, CORNICES, EDGES ALL AS SPECIFIED AND DIRECTED.	PER/SQM			60.00	
4		PROVIDING LAYING 6MM THICK WHITE / COLORED CERAMIC TILES GLAZED / MATT NOT EXEC . 144 SQ INCH FINE DRESSED ON THE SURFACE WITHOUT SENDING LAID OVER 1" THICK CEMENT MORTAR OF RATIO 1:2 , AND IN DADOS AND SKIRTING LAID OVER 1/2" THICK BASE OF CEMENT MORTAR 1:3 SETTING TILES IN SLURRY OF GREY CEMENT , JOIINTING AND WASHING THE TILES WITH WHITE/ COLORED CEMENT SLUIRRY ALL AS SPECIFIED OR USE OF BOND MORTAR INSTEAD OF CEMENT MORTAR WHICH EVER REQUIRED.(SIZE18"X18")	PER/SQM			120.00	
5		PROVIDING LAYING SUPERIOR QUALITY PORCELAIN FLOOR / WALLS TILES 6MM THICK WHITE / COLORED SIZE 24"X24" FINE DRESSED ON THE SURFACE WITHOUT SENDING LAID OVER 1" THICK CEMENT MORTAR OF RATIO 1:2 AND IN DADOS AND SKIRTING LAID OVER 1/2" THICK BASE OF CEMENT MORTAR 1:3 SETTING TILES IN SLURRY OF GREY CEMENT , JOIINTING AND WASHING THE TILES WITH WHITE/ COLORED CEMENT SLUIRRY ALL AS SPECIFIED OR USE OF BOND MORTAR INSTEAD OF CEMENT MORTAR WHICH EVER REQUIRED.	PER/SQM			80.00	
6		PROVIDIING AND FIXING ARTIFICIAL WOOD KITCHEN CABINETS WALL MOUNTED 15" DEEP FROM MAIN WALL TO OUT SIDE OF SHUTTER, COMPRISES OF 3/4" THICK LASANI WOOD LAMINATED (BOTH SIDES) SHEET FOR MAIN FRAME, SHUTTERS AND DIVIDING SHELVES EDGES LIPPPED WITH HARD WOOD BEADS, BACK WITH 3 MM LAMINATED PLY STRENGTHEN WITH THE HELP OF 2" X 1" SOFT	PER/SQM			12.00	

MAINTENANCE / REPAIR TO FLAT NO: CB-09 APARTMENT TOWER BATHISLAND

Plan #

Dated :

S.No.Ref.	Item description	Unit	R a t e	Quantity	Amount
	WOOD (PARTAL) FRAME FIXED WITH THE USE OF NAILS, GLUE, SCREWS, ETC COMPLETE AND WITH USE OF ALL NECESSARY FITTINGS AND FIXTURES LIKE HANDLE, LOCKS , CHANNELS, HINGES, GLASS PANELS WITH 5 MM THICK PLAIN/ FROSTED/ TINTED GLASS ETC AS REQUIRED AND AS DIRECTED BY THE ENGINEER INCHARGE. (COST OF 5MM THICK GLASS PANES INCLUDED , IF RQUIRED THE OLD CABINETS REMOING CAREFULLY REPAIRING AND REFIXING AS PER DIRECTIONS OF THE ENGINEER INCHARGE				
7	PROVIDING AND FIXING OF ALUMINUM PARTITIONS (FIX / SLIDING TYPE) / WINDOWS (SLIDING / OPENABLE TYPE) INCLUDING FLY PROOFING / DOORS (SINGLE OR DOUBLE SHUTTER SLIDING OR SWINGING TYPE) COMPLETE OF DELUXE MODEL EXTRUDED SECTION INCLUDING 5 MM THICK TINTED / PLAIN / FROSTED GLASS COMPLETE JOB WITH ALL NECESSARY FITTINGS AND FIXTURES LIKE HANDLES, LOCKS, HINGES, CATCHERS, HYDRAULLIC DOOR CLOSERS ETC ALL AS SPECIFIED AND DIRECTED.	PER/SQM		22.00	
8	PROVIDING AND FIXING 38MM (1-1/2") THICK BEST QUALITY FLUSH DOOR OF COMMERCIAL / MALAYSIAN PLY SOLID DOOR WITH APPROVED FITTINGS COMPLETE IN ALL RESPECT	PER/SQ		4.00	
9	PROVIDING AND FIXING G.I FRAME (CHOWKHAT) 18 GUAGE INCLUDING ALL THE ACCESSORIES WITH COMPLETE FITTINGS AS DIRECTED BY THE ENGINEER INCHARGE	PERSQM		10.00	
10	PROVIDING AND FIXING EUROPEAN TYPE COLOURED WHITE / GLAZED EARTHEN WARE WASH DOWN W.C PEN COMPLETE IN ALL RESPECTS WITH 3 GALLONS FLUSHING CISTERN WITH INTERNAL WITH FITTING AND CLAMPS 19MM (3/4") DIA WARNING PIPE CARRIED OUTSIDE AND BENT VERTICALLY DOWNWARD AS PER DIRECTION OF ENGINEER INCHARGE	EACH		4.00	
11	PROVIDING AND FIXING WASH HAND BASIN VANITY OF APPROVED QUALITY INCLUDING THE COST OF ALL NECESSARY FITTINGS LIKE WASTE COUPLING, WASTE PIPE, CONNECTIONS, KIT SCREWS/ WROUGHT IRON BRACKETS, MIXER & MAKING CONNECTION WITH THE WATER AND SEWERAGE MAIN ETC ALL AS SPECIFIED AND DIRECTED.	EACH		3.00	

B. O. Q. ITEMS

MAINTENANCE / REPAIR TO FLAT NO: CB-09 APARTMENT TOWER BATHISLAND

Plan #

Dated :

<u>S.No.Ref.</u>	<u>Item description</u>	<u>Unit</u>	<u>R a t e</u>	<u>Quantity</u>	<u>Amount</u>
12	PROVIDING AND FIXING WASH HAND BASIN 25" X 18" INCLUDING PEDESTAL WHITE/ LIGHT COLOR GLAZED WARE INCLUDING THE COST OF ALL NECESSARY FITTINGS LIKE WASTE COUPLING, WASTE PIPE, CONNECTIONS, KIT SCREWS/ WTROUGHT IRON BRACKETS AND MAKING CONNECTION WITH THE WATER AND SEWERAGE MAIN ETC ALL AS SPECIFIED AND DIRECTED. (EXCLUDING THE COST OF T-STOP COCK, STOP COCK, MIXER, FLOOR TRAP ETC)	EACH		2.00	
13	PROVIDING AND FIXING OF BEST QUALITY OF APPROVED MAKE AND QUALITY (MASTER S/G OR EQUIVALENT) 07 PIECES SUPREME QUALITY FIXTURE SET(SONEX OR FAISAL) BATH FIXTURE SET, FANCY TYPE GLASS TYPE (ECONOMY MODEL) FIXED COMPLETE.	EACH		4.00	
14	PROVIDING AND FIXING OF BEST QUALITY OF APPROVED MAKE AND QUALITY (MASTER OR EQUIVALENT) 07 PIECES BATH ACCESSORIES SET FANCY TYPE GLASS TYPE (ECONOMY MODEL) FIXED COMPLETE.	EACH		4.00	
15	PROVIDING APPROVED SIZE AND QUALITY STAINLESS STEEL SINK /BOWL AND FIXING IN POSITION WITH APPROVED FITTINGS AS PER DIRECTIONS OF ENGINEER INCHARGE.	EACH		2.00	
16	PROVIDING AND FIXING STAINLESS STEEL SINK MIXER WITH ALL NECESSARY FITTINGS LIKE KIT SCREW AND MAKING CONNECTION WITH THE WATER AND MAIN ETC ALL AS SPECIFIED AND DIRECTED.	EACH		1.00	
17	PROVIDING AND LAYING 1" THICK MARBLE SLAB OF APPROVED QUALITY FINE DRESSED ON . THE SURFACE WITHOUT SINDING LAID OVER 1" THICK CEMENT MORTAR OF RATIO 1:2 SETTING SLAB IN SLURRY OF GREY CEMENT, JOINTING AND WASHING THE SLAB WITH WHITE COLORED CEMENT SLURRY INCLUDING GRINDING AND POLISHING ETC ALL AS SPECIFIED OR USE OF BOUND MORTAR INSTEAD OF CEMENT MORTOR WHICH EVER REQUIRED OR AS DIRECTED BY ENGINEER INCHARGE	PER/SQM		5.00	
18	PROVIDING AND FIXING IN POSITION FLY PROOF NETTING AND MOSQUITO NETTING OF FIBER OR APPROVED MATERIAL WITH WOODEN BEEDING AND FRAME I/C REMOVING EXISTING JALI WITH BEEDING OR AS DIRCTED BY ENGINEERINCHARGE. CAREFULLY COMPLETE AS PER DIRECTION OF ENGINEER INCHARGE	PER/SQM		40.00	
19	PROVIDING AND FIXING OF 1/2" DIA CPVC PIPE AND SPECIALS INCLUDING EXCAVATION/ CUTTING OF WALL, GROUND ETC AND FIX WITH ALL ACCESSORIES LIKE "T", BENDS, SOCKETS, ELBOWS, "Y" UNIONS ETC COMPLETE AND USE OF BOND ADHESIVE ALL OF BEST APPROVED QUALITY AND MAKE INCLUDING COST OF MAKING GOOD THE DISTURB SURFACES ON LIKE TO LIKE BASIS, FIXED AT	PER/RM		60.00	

B. O. Q. ITEMS

MAINTENANCE / REPAIR TO FLAT NO: CB-09 APARTMENT TOWER BATHISLAND

Plan #

Dated :

<u>S.No.</u>	<u>Ref.</u>	<u>Item description</u>	<u>Unit</u>	<u>R a t e</u>	<u>Quantity</u>	<u>Amount</u>
		ANY HEIGHT ANY SURFACE.				
20		PROVIDING AND FIXING OF 4" DIA UPVC PIPE AND SPECIALS INCLUDING EXCAVATION / CUTTING OF WALL, GROUND ETC AND FIX WITH ALL ACCESSORIES LIKE 2T, BENDS, SOCKETS, ELBOWS, 2Y, UNIONS ETC COMPLETE AND USE OF BOND ADHESIVE ALL OF BEST APPROVED QUALITY AND MAKE INCLUDING COST OF MAKING GOOD THE DISTURB SURFACES ON LIKE TO LIKE BASIS, FIXED AT ANY HEIGHT ANY SURFACE	PER/RM		20.00	
21		PROVIDING AND FIXING OF 3/4" DIA CPVC PIPE AND SPECIALS INCLUDING EXCAVATION / CUTTING OF WALL, GROUND ETC AND FIX WITH ALL ACCESSORIES LIKE 2T, BENDS, SOCKETS, ELBOWS, 2Y, UNIONS ETC COMPLETE AND USE OF BOND ADHESIVE ALL OF BEST APPROVED QUALITY AND MAKE INCLUDING COST OF MAKING GOOD THE DISTURB SURFACES ON LIKE TO LIKE BASIS, FIXED AT ANY HEIGHT ANY SURFACE.	PER/RM		20.00	
22		PREPARE SURFACE AND APPLYING 2X COATS OF OIL BOUND DISTEMPERING APPROVED MAKE AND SHADE INCLUDING SCRPAING SAND PAPERING DUSTING AND FILLING THE HOLES, CRACKS AND INEQUALITIES IF ANY AT ANY HEIGHT AND IN ANY FLOOR I/C, REMOVING RUBBISH ETC., OUTSIDE KPT	PER/SQM		300.00	
23		PREPARE SURFACE AND APPLYING 3X COATS OF MATT / PLASTIC EMULSION FINISH PAINT APPROVED MAKE AND SHADE INCLUDING SCRAPING SAND PAPERING DUSTING AND FILLING THE HOLES, CRACKS AND EQUALITIES IF ANY AT ANY HEIGHT AND IN ANY FLOOR I/C. REMOVING RUBBISH ETC., OUTSIDE KPT	PER/SQM		650.00	
24		PREPARE SURFACE AND APPLYING 2X COATS OF SYNTHETIC ENAMEL PAINT APPROVED MAKE AND SHADE INCLUDING SCRAPING SAND PAPERING DUSTING AND FILLING THE HOLES, CRACKS AND EQUALITIES IF ANY AT ANY HEIGHT AND IN ANY FLOOR I/C. REMOVING RUBBISH ETC., OUTSIDE KPT LIMIT.	PER/SQM		40.00	
25		APPLYING FRENCH OR SPIRIT POLISHING TWO COATS OF APPROVED MAKE INCLUDING MINOR WOOD WORK AT ANY HEIGHT IN ANY FLOOR.	PER/SQM		60.00	
26		PROVIDING & FIXING OF HANDLE LOCK / ALPHA DOOR LOCK WITH ALL NECESSARY FITTINGS ETC COMPLETE I/C REMOVE THE OLD DAMAGED LOCKS AS DIRECTED BY ENGINEER.	EACH		12.00	

B. O. Q. ITEMS

MAINTENANCE / REPAIR TO FLAT NO: CB-09 APARTMENT TOWER BATHISLAND

Plan #

Dated :

<u>S.No.Ref.</u>	<u>Item description</u>	<u>Unit</u>	<u>R a t e</u>	<u>Quantity</u>	<u>Amount</u>
27	PROVIDING AND FIXING STEEL GATE OF FLAT IRON SECTION OF APPROVED DESIG WITH OR WITHOUT M.S SHEET COVERING INCLUDING HOLD FAST WITH OR WITHOUT ROLLER AND TRACK ARRANGMENT INCLUDING PROVIDING WICKET SHUTTER OF REQUIRED SIZE ALL ACCESSORIES AND LOCKING ARRANGMENTS COMPLETE AS PERB DIRECTION OF THE ENGINEER INCHARGE	PER/KG		200.00	
28	PROVIDING ANTI-TERMITE TRETMENT BY SPRAYING / SPRINKLING / SPREADING AGENDA EC 25 TERMITE CONTROL CHEMICAL (RATE OF APPLICATION MIXTURE @ 4-5 LITERS SOLUTION PER SQM) AS AN OVERALL PRE CONSTRUCTION TRETMENT IN SLAB TYPE CONSTRUCTION ALONG EXTERNAL FOUNDATION TRENCHES OF THE BUILDING OVER COMPLETE PARAMETER OF THE FOUNDATION TRENCH ETC, AS PER DIRECTION OF ENGINEER INCHARGE.	PER/SQM		300.00	
29	REPAIRING OF EXISTING ALUMINIUM DOORS, WINDOWS WITH ALL NECESSARY FITTINGS, LOCKING, CHANNEL,WHEEL ARRANGEMENTS LOCK, TOWER BOLTS, HINGES ETC COMPLETE AS PER DIRECTED.	EACH		10.00	
30	PROVIDING AND FIXING 38MM (1-1/2") THICK BEST QUALITY KALE WOOD DOOR, WINDOW AND VENTILATORS DOUBLE LEAF, FULLY / PARTIALLY PANELLED AND PARTIALLY PLAIN GLAZED WITH APPROVED BRASS FITTING, BEADING COMPLETE ARE ASDIRECTED BY THE ENGINEER INCHARGE	PER/SQM		8.00	

TOTAL :	
ADD 5% CONTINGENCIES	0
NET TOTAL	
ADD 15% S.R.B	
GRAND TOTAL	0