SHAHEED BENAZIR BHUTTO UNIVERSITY
SHAHEED BENAZIRABAD

Construction of Extension of Facilities at Shaheed Benazir Bhutto University, Shaheed Benazirabad (Building Works)

Package – 5

Construction of Hostel for Faculties/Visiting Faculties at Shaheed Benazir Bhutto University, Shaheed Benazirabad

Issued to M/s. _____

PROJECT COORDINATOR
Shaheed Benazir Bhutto University Shaheed Benazirabad
Sakrand Road Landhi Stop, Nawabshah
Tel No: 0244-9370520 Fax No: 0244-9370521
Email: pc@sbbusba.edu.pk
Website: http://www.sbbusba.edu.pk

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INSTRUCTIONS TO APPLICANTS

1. GENERAL

The Shaheed Benazir Bhutto University, Shaheed Benazirabad under the PSDP funded project titled as **"Extension of Building Facilities at Shaheed Benazir Bhutto University, Shaheed Benazirabad"** intends to achieve qualified Construction Firms/Contractors for their Building Projects.

Master plan and detail designing is finalised by Consultant and attached in Tender Documents for proposed buildings having approximate covered area mentioned and highlighted against each building along with external and other infrastructure development as approved in the PC-I / required at site detail as under at existing campus, of SBBU, SBA.

S.No	Description	Proposed Scope / Assignment
1.	Construction of Academic Block-III	67,570 Sft
2.	**Construction of Administration Block-II**	**10,875 Sft**
3.	**Construction of Faculty / Visiting Faculty Hostel**	**16,051 Sft**
4.	Construction of Boys Hostel	35,676 Sft
5.	Construction of Girls Hostel	35,676 Sft
6.	Construction of Girls Hostel (Boundary Wall)	1,600 Rft

2. SUBMISSION OF APPLICATIONS

2.1 The Project Coordinator Shaheed Benazir Bhutto University Shaheed Benazirabad invites the applications from the interested bidders to undertake the Construction of Extension of Facilities at Shaheed Benazir Bhutto University, Shaheed Benazirabad (as per attached Notice Inviting Tender).

2.2 Applications for qualification (One Original and One Copy) must be submitted in separate sealed envelopes clearly mark Original (or) Copy, and placed under an outer envelope clearly marked with “Application for Package-4 or Package-5 qualification” Construction of Extension of Facilities at Shaheed Benazir Bhutto University, Shaheed Benazirabad.

This should be delivered by hand (or) courier to

Project Coordinator
Shaheed Benazir Bhutto University Shaheed Benazirabad
Sakrand Road Landhi Stop, Nawabshah
Tel No: 0244-9370520
Email: pc@sbbusba.edu.pk

2.3 All pages of the Qualification Documents shall be numbered, stamped and signed by the Authorized person. Pages which are unsigned and unstamped shall not be considered in evaluation. Binding documents shall be allowed as spiral and lose file shall not be accepted.

2.4 The name and mailing address of the applicant shall be clearly marked on top left corner of the envelope.

2.5 The applications shall be prepared in the English language. Information in any other language shall be accompanied by its translation in English. The Employer reserves the rights for rejection of qualification in case of non-compliance of the above requirement.

2.6 The applicants must respond to all questions and provide complete information as advised in this document. Any false statement provided or any lapses to provide essential information may result in disqualification of the applicant.

2.7 Applicant, who has obtained qualification documents, may request for clarification of contents of the document in writing, and response to such queries shall be made in writing within three calendar days, provided they are received at least five calendar days prior to the date of submission of qualification documents.

2.8 At any time prior to the deadline for submission of documents, the Employer may amend the qualification Document by issuing addenda. Any addendum issued shall be part of the qualification Document and shall be communicated in writing to all who have obtained the qualification Document.

2.9 Documents shall be received by the Employer at the address given in Section 2.2, on the date which has been set in Advertisement. The Employer may, at its discretion, extend the deadline for the submission of documents by amending the qualification Document, and in which case all rights and obligations of the Employer and the applicants subject to the previous deadline shall thereafter be subject to the deadline as extended. ***In case of downloading of qualification Documents from websites, the nominated fee shall be submitted at the time of submission of Proposals.***

2.10 To assist in the evaluation of information, the Employer may, at its discretion, ask any applicant for a clarification of any information which shall be submitted within a stated reasonable period of time. Any request for clarification shall be in writing. If any applicant does not provide clarifications of the information requested by the date and time set in the Employer's request for clarification, then application of the applicant may be rejected.

2.11 The Employer reserves the right to accept or reject late applications.

2.12 Applicants will be informed, in due course, of the result of the evaluation of applications. Only the firms of constructors and joint ventures prequalified under this process will be invited to bid.

3. EVALUATION / PRE-QUALIFICATION CRITERIA

3.1 GENERAL

Qualification will be based on all the criteria given in succeeding paras 3.2 to 3.7 regarding the Applicant's Experience Record, Personnel Capabilities, Equipment Capabilities and Financial Soundness as demonstrated by the Applicant's responses in the forms provided within this document.

Sub-contractor's experience and resources shall not be taken into account in determining the applicant's compliance with the qualifying criteria. However, for Joint Venture experience & resources of all firms will be considered as per para 4.Consortium or Association of firms will be considered for similar treatment as in case of Joint Venture.

The Employer reserves the right to waive minor deviations; if these don't materially affect the capability of an applicant to perform the contract.

The Employer reserves the right to verify or seek clarification of the information furnished by the applicants. The Employer may reject any application for any false statement knowingly made by any applicant in, or pursuant to, their application or for any statement furnished in connection therewith, and intended to be relied upon by the Employer, which is incorrect in any respect.

Applicants meeting the minimum requirements mentioned in Para's below besides other factors shall be considered for qualification.

3.2 PRELIMINARY EXAMINATION

All applications/documents submitted shall be checked for the following items:

3.2.1 Has the Letter of Application (Annex A) been signed?

3.2.2 Has all information asked for in **Form A-1 to A-12** been provided?

3.2.3 Have all Affidavits required under Form A-10 to A-12 been provided and duly signed by the authorized person?

3.2.4 Have audited balance sheets of last three years been provided?

3.2.5 In case of Joint Venture; has the relevant agreement been provided and duly signed?

3.3 MANDATORY REQUIREMENTS

All the applicants shall be subjected to initial scrutiny using the following criteria:

3.3.1 Registration with Pakistan Engineering Council in Category C-5 or above and at least in specialization codes CE09, CE10, EE04, EE06, EE11.The contractor should enclose PEC Registration Certificate, valid for the current year.

3.3.2 The Bidder should be registered with FBR and Sindh Revenue Board - SRB for both Income and Sales Tax, with company name appearing on the active taxpayer list (ATL). The contractor should also submit copy of Registration Certificate of NTN and SNTN and print from ATL.

3.3.3 The bidder shall submit affidavit of no litigation history, affidavit of non blacklisting, affidavit of never indulge in any corrupt, fraudulent and collusive practices. The bidder shall also submit affidavit that the information and documents provided with this pre-qualification document is correct.

3.4 DETAILED EVALUATION

After the initial screening of all applicants, a detailed evaluation of the applicants shall be undertaken using the following criteria based on the scoring system as follows:

Clause	Category	Marks/ Points
3.5.1	Professional Experience Record	40
3.5.2	Financial Soundness	20
3.5.3	Personnel Capabilities	15
3.5.4	Equipment Capabilities	25
	Total:	**100**

Note: *The qualifying marks for Technical Evaluation shall be 75 marks/points out of 100 marks/points.*

3.5 CRITERIA FOR DETAILED EVALUATION

The further detailed criteria for each category may be developed as given under each head as follows.

3.5.1 Professional Experience Record

Experience for Projects Completed (Form A-2, A-3 and A-4) will be evaluated as below.

General

(Information regarding similar / comparable projects completed supported by documents such as Work Orders, Completion Certificate, Maintenance / Defects Liability Certificate and any other relevant document).

Sr. No.	Description	Maximum Points
1.	*Building works Executed and Completed during last 5 years of amounting to* Rs. 30 Million or above worth of each work *(05 Marks for each Work/Project)*	25
2.	*Building Works in Progress during last 5 years of amounting to* Rs. 30 Million or above worth of each work *(03 Marks for each Work/Project)*	15
	Sub Total:	**40**

Note: *In case of any negative feedback on any work/project, the marks of the said work/project will not be counted.*

3.5.2 Financial Soundness

Tendering Capability of an applicant will be taken as follows:

3.5.2.1 The applicant should demonstrate that he has access to, or has available liquid assets, un-encumbered real assets, lines of credit and other financial

means sufficient to meet the cash flow for the execution of works.
Applicant's commitments for other ongoing contracts shall also be considered.

3.5.2.2 The Bank Statements and Income Tax Returns of last 5 years must be submitted and should demonstrate the soundness of the applicant's financial position, showing long term profitability. Where necessary, the Employer will make inquiries with the applicant's bankers.

3.5.2.3 Points shall be awarded under this category based on the following criteria:

Sr. No.	Description	Marks Assigned	Criteria for Marks Obtained
a)	Average Annual Turnover for Last five (05) Years	10	Average annual turnover of last five years from audited reports: • Rs. 50 Million or above = 10 Points • From Rs. 30M to 39.99M = 7 Points • From Rs. 10M to 29.99M = 5 Points • From Rs. 5M to 9.99M = 2 Points
b)	Submission of Income Tax Return for last 5 Years	10	Income tax return submitted in last five years: • Two Mark given for each year
Total Marks Allocated			**20**

3.5.3 Personnel Capabilities

- **<u>Brief Discussion of Personnel Capabilities</u>**

Personnel deputed on site (Form A-6 & A-7) will be evaluated on the basis of following points:

(Information regarding education qualification, total work experience and specific work experience is supported by documents such as Appointment Letter, Pay Slip, copy of education/qualification certificate and CVs of concerned personnel proposed position, duly signed and, any other relevant documents).

Sr. No.	Description	Maximum Points
1.	Project Manager (Qualified B.E with 10 years or preferably M.E with minimum 10 years experience of similar nature)	4
2.	Assistant Project Manager (Qualified B.E with minimum 5 years experience of similar nature)	2
3.	Site Engineer (Qualified B.E with minimum 2 years experience)	2
4.	Quantity Surveyor (DAE with minimum 5 years experience)	1.5
5.	Surveyor (DAE with minimum 5 years experience)	1.5
6.	Site Supervisor (Civil) (DAE with minimum 5 years experience)	1.5
7.	Site Supervisor (Electrical) (B.E with 5 years and DAE with minimum 5 years experience)	1.5

8.	Lab Technician (Msc Geology or Chemistry with 02 years experience)	1
	Sub Total:	**15**

Note. *Procuring agency shall reserve the right to conduct interview of the mentioned personnel. All Safety measures will be the responsibility of Project Manager and Site Engineer.*

3.5.4 Equipment Capabilities

The applicant should own, or have assured access to (through rented, lease, purchase agreement or other means), the following key equipment (limited to only major items of equipment) in full working order, and must demonstrate that, based on known commitments, these will be available for deployment on the proposed contract or works. (Form A-8) The applicant may also list alternative equipment which he would propose for the contract together with an explanation of the alternate proposal.

Points will be given on the basis of the following criteria:

Sr. No.	Description	Max. Points
1.	Concrete Batching Plant of Capacity of at least 5 m3 / hour	5
2.	Concrete pouring pump	5
3.	Transit Mixer (T.M) 01 mark for each	3
4.	Ply wood fair face Formwork (Shuttering, Scaffolding, pipes and accessories) *01 mark for each lot of 5,000 sqft*	3
5.	Rebar / Steel Cutting and Bending Machine	2
6.	Earth Rammer	1
7.	Electric Generator *(Minimum capacity 5 KVA)*	1
8.	Total Station, Auto Level & other Survey Equipment	1
9.	De-watering Pump *(Minimum 2"dia)*	2
10.	Concrete Hoist	1
11.	Concrete Vibrators 0.5 mark for each	1
	Total Maximum Points	**25**

Note: *Documentary Evidence (Ownership Certificate or Lease agreement) must be provided for* ***Sr. 1, 2 & 3***

3.6 LITIGATION HISTORY (FORM A-10)

The applicant should provide an affidavit showing accurate information of all litigation or arbitration resulting from contracts completed or under execution. A consistent history of more than one award against the applicant or any partner or a joint venture will result in rejection of the application. In case of no litigation history in the last 5 years, a "No Litigation Certificate" shall be submitted on stamp paper with the bid.

3.7 NON BLACKLISTING & OTHER AFFIDAVITS (FORM A-11)

An affidavit / Undertaking is to be provided that the applicant currently is not blacklisted by the government / semi government or any autonomous body.

The applicant should also provide an undertaking / affidavit on non-judicial stamp paper to the effect that all documents / particulars / information given with this pre-qualification document are true.

The applicant should also provide an affidavit to the effect that applicant has never indulged in corrupt, fraudulent or collusive practice for procuring contracts.

4. JOINT VENTURE (FORM A-5)

The contractor can form a Joint Venture (JV) to strengthen their technical & financial capabilities. In case of JV all information regarding both partners shall be given in relevant forms. JV agreement should be attached for information. Marking for Joint Venture Firms will be Cumulative.

Joint Venture must comply with the following minimum requirements: -

a. The lead partner shall meet not less than 50 percent of all qualifying criteria given in Para's 3.1 and 3.7 heretofore.

b. Each of the partners shall meet not less than 25 percent of all the qualifying criteria given in Para's 3.1 and 3.7 heretofore.

c. The joint venture must collectively satisfy the criteria of Para's 3, 4 and 5, for which purpose the relevant figures for each of the partners shall be added together to arrive at the JV's total capacity. Individual members must satisfy each of the requirements of Para's 3.5 and 3.6 heretofore.

d. Any change in a prequalified JV after prequalification shall not be allowed.

e. Already prequalified firm or partner of any JV, cannot form JV with any other firm.

f. Bid shall be signed by all members in the JV so as to legally bind all partners, jointly and severally, and any bid shall be submitted with a copy of the JV agreement duly incorporating the joint and several liabilities with respect to the contract.

g. The prequalification of a JV does not necessarily prequalify any of its partners individually or as a partner in any other JV or association.

5. CONFLICT OF INTEREST

The Applicant (including all members of a JV) must not be associated, nor have been associated in the past, with the consultant or any other entity that has prepared the design, specifications, and other prequalification/ post-qualification and bidding documents for the project, or was proposed as Engineer for the contract, over the last fifteen (15) years. Any such association may result in disqualification of the Applicant.

6. UPDATING QUALIFICATION INFORMATION

Bidders shall be required to update the financial, personnel and equipment information used for qualification at the time of submitting their bids, to confirm their continued compliance with the qualification criteria and verification of the information provided at the time of prequalification. A bid shall be rejected if the Applicant's qualification thresholds are no longer met at the time of bidding.

7. OTHER FACTORS

Only firms and JVs that have been qualified under this procedure shall be invited to bid. A qualified firm or a member of a qualified JV may participate only in one bid for the contract. If a firm (singly or as a JV) submits more than one bid, all bids including that bidder will be rejected. This rule will not apply in respect of bids which include specialist sub-contractors who are used by more than one bidder.

The Employer reserves the right to:-

a. Amend the scope and value of any contract(s) to be bid, in which event the bidder(s) will only bid among those prequalified bidders who meet the requirements of the contract(s) as amended. However, the Employer has to review the disqualified bids who originally do not meet the specified criteria for Qualification.

b. Reject or accept any application without any explanation; and

c. Cancel the qualification process and reject all applications.

The Employer shall neither be liable for any such actions nor be under any obligation to inform the Applicant of the grounds for rejection, however, maybe debriefed if solicited.

Applicants will be informed in writing by mail or email of the result of their applications and may be debriefed if solicited.

ANNEXURE – A

Annex-A

Letter of Application

[Letterhead paper of the Applicant, or partner responsible for a joint venture, including full postal address, telephone no, fax no., telex no., cable and email address]

Date: .....

To:

Project Coordinator
Shaheed Benazir Bhutto University Shaheed Benazirabad
Sakrand Road Landhi Stop, Nawabshah
Tel No: 0244-9370520
Email: pc@sbbusba.edu.pk

Sirs,

1. Being duly authorized to represent and act on behalf of..... (Hereinafter "the Applicant"), and having reviewed and fully understood all the technical qualification information provided, the undersigned hereby apply to be prequalified as a bidder for the work of Construction of Extension of Facilities at Shaheed Benazir Bhutto University, Shaheed Benazirabad.

2. Attached to this letter are copies of original documents defining[1]:

   (a) The Applicant's legal status;

   (b) The principal place of business; and

   (c) The place of incorporation (for applicants who are corporations); or the place of registration and the nationality of the owners (for applicants who are partnerships or individually-owned firms).

3. Your Organization and its authorized representatives are hereby authorized to conduct any inquiries or investigations to verify the statements, documents, and information submitted in connection with this application, and to seek clarification from our bankers and clients regarding any financial and technical aspects. This Letter of Application will also serve as authorization to any individual or authorized representative of any institution referred to in the supporting information, to provide such information deemed necessary and requested by yourselves or the authorized representative to verify statements and information provided in this application, or with regard to the resources, experience, and competence of the Applicant.

4. Your Organization and its authorized representatives may contact the following persons for further information[2], if needed.

General and Managerial Inquiries

Contact 1	Telephone 1
Contact 2	Telephone 2

Personnel Inquiries

Contact 1	Telephone 1
Contact 2	Telephone 2

Technical Inquiries

Contact 1	Telephone 1
Contact 2	Telephone 2

Financial Inquiries

Contact 1	Telephone 1
Contact 2	Telephone 2

5. **This application is made with the full understanding that**:

   (a) Bids by technical qualified applicants will be subject to verification of all information submitted for qualification at the time of bidding;

   (b) Your Organization reserves the right to:

      (i) Amend the scope and value of any contract under this project; in such event bids will only be called from qualified bidders who meet the revised requirements; and

      (ii) Reject or accept any application, cancel the qualification process, and reject applications; and

      (iii) Your Organization shall not be liable for any such actions and shall be under no obligation to inform the Applicant of the grounds for actions at 5(b) here above.

      (iv) Your Organization shall not be liable for consequence of, and shall be under no obligation to inform the applicant of the grounds for, actions taken under Para 5(b) here above.

6. Appended to this application, we give details of the participation of each party, including capital contribution and profit/loss agreements, to the joint venture or association. We also specify the financial commitment in terms of the percentage of the value of the (each) contract, and the responsibilities for execution of the (each) contract.

7. We confirm that in the event that we bid, that bid as well as any resulting contract will be.

   a. Signed so as to legally bind all partners, jointly and severally; and

   b. Submitted with a Joint Venture agreement providing the joint and several liabilities of all partners in the event the contract is awarded to us.

8. The undersigned declare that the statements made, and the information provided in the duly completed application are complete, true, and correct in every detail.

Signed:

Name:

For and on behalf of
(Name of Applicant or Lead Partner of a Joint Venture)

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1 -- For applications by joint ventures, all the information requested in the qualification documents is to be provided for the joint venture, if it already exists and for each party to the joint venture separately. The lead partner should be clearly identified. Each partner in the joint venture shall sign the letter.

2 -- Application by joint ventures should provide information on separate sheet information for each party to the application.

-- Applicants who are not joint ventures should delete Para 6 & 7 and initial the deletions.

APPLICATION FORMS

APPLICATION FORM A-1 **Page___ of ____Pages**

GENERAL INFORMATION

All individual firms and each partner of a joint venture applying for qualification are requested to complete the information in this form. Nationality information is also to be provided for foreign owners or applicants who are forming part of the Joint Ventures as required under the PEC Bye-Laws as a Partnership/Joint Venture.

Where the Applicant proposes to use named subcontractors for critical components of the works or for work contents in excess of 10 percent of the value of the whole works, the following information should also be supplied for the specialist subcontractor(s).

1.	Name of Firm:	
2.	Head Office Address:	
3.	Telephone	Contact Person: Name: Title:
4.	Fax	Email:
5.	Place of Incorporation/Registration	Year of Incorporation/Registration
6.	NTN No:	Sales Tax No:

NATIONALITY OF OWNERS		
NAME		**NATIONALITY**
1.		
2.		
3.		
4.		
5.		

APPLICATION FORM A-2 **Page___ of ____Pages**
GENERAL EXPERIENCE

Name of Applicant or Partner of a Joint Venture

*Applicant and each partner to an applicant should provide information along with Letter of Award, Taking over Certificate, Maintenance / Defects Liability Certificate and any other relevant document, on their completed building and related contracts executed during last **ten (10)** years (Instructions to Applicant, Para 3.5.1).*

Use a separate sheet for each contract

1.	Name of Contract:
2.	Country/ Location:
3.	Name of Employer:
4.	Employer Address, Phone Numbers & E-mail Address …….
5.	Nature of works and special features relevant to the contract for which the Applicant wishes to prequalify …… …….
6.	Contract Role (Tick One) ☐Main Contractor, ☐Sub-Contractor, ☐Partner in a Joint Venture
7.	Value of the total contract at completion, or at date of award for current contract Contract Price…….. Currency……..
8.	Equivalent in Pak/Rs.
9.	Date of Award
10.	Date of Completion
11.	Contract Duration (Years and Months)_____ Years_____ Months
12.	Specified Requirements: …… …… (*Insert any specific criteria required for particular operations, such as annual volume of earthmoving, underground excavation, or placing concrete etc.)*

All individual firms and all partners of a joint venture are requested to complete the information in this form. The information supplied should be the annual turnover of the Applicant (or each member of a joint venture), in terms of the amounts billed to clients for each year for work in progress or completed over the past five years.

APPLICATION FORM A-3 **Page___ of ____Pages**

EXPERIENCE OF SIMILAR NATURE COMPLEXITY PROJECTS COMPLETED

Name of Applicant or Partner of a Joint Venture

*Applicant and each partner to an applicant should provide information along with Letter of Award, Taking over Certificate, Maintenance / Defects Liability Certificate and any other relevant document, on their completed contracts of similar / comparable nature executed during last **ten (10)** years (Instructions to Applicant, Para 3.5.1).*

Use a separate sheet for each contract.

1.	Name of Contract:
2.	Country/ Location:
3.	Name of Employer:
4.	Employer Address, Phone Numbers & E-mail Address ……
5.	Nature of works and special features relevant to the contract for which the Applicant wishes to prequalify …… ……
6.	Contract Role (Tick One) ☐Main Contractor, ☐Sub-Contractor, ☐Partner in a Joint Venture
7.	Value of the total contract at completion, or at date of award for current contract Contract Price…….. Currency……..
8.	Equivalent in Pak/Rs.
9.	Date of Award
10.	Date of Completion
11.	Contract Duration (Years and Months)_____ Years_____ Months
12.	Specified Requirements: …… …… (*Insert any specific criteria required for particular operations, such as annual volume of earthmoving, underground excavation, or placing concrete etc.)*

All individual firms and all partners of a joint venture are requested to complete the information in this form. The information supplied should be the annual turnover of the Applicant (or each member of a joint venture), in terms of the amounts billed to clients for each year for work in progress or completed over the past five years. Use a separate sheet for each partner of a joint venture.

On a separate page, using the format of Application Form A-5, each applicant or partner of a Joint Venture is required to list all contracts of a value equivalent to Pak Rs.-(User/Employer to provide the amount) million, of a similar nature and complexity to the contract for which the Applicant wishes to qualify, undertaken during the last five years. The information is to be summarized, using Application Form A-5, for each contract completed or under execution by the Applicant or by each partner of a Joint Venture.

Where the Applicant proposes to use named subcontractor(s) for critical components of the works or for work contents in excess of 10 percent of the value of the whole works, the information in the afore-mentioned forms should also be supplied for each specialist subcontractor.

APPLICATION FORM A-4 **Page___ of ____Pages**

SUMMARY SHEET: CURRENT CONTRACT COMMITMENTS/WORKS IN PROGRESS

Name of Applicant or partner of a joint venture

Applicants and each partner to an application 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 substantial Completion Certificate has yet to be issued.

Name of Contract	**Value of Outstanding work (Equivalent Pak Rs. Millions)**	**Estimated Completion Date**
1.		
2.		
3.		
4.		
5.		
6.		

Use a separate sheet for each partner of a joint venture.

APPLICATION FORM A-5 **Page___ of ____Pages**

JOINT VENTURE SUMMARY

Name of all Partners of a Joint Venture
1. Lead Partner
2. Partner
3. Partner
4. Partner
5. Partner
6. Partner

Total value of annual construction turnover, in terms of work billed to clients,

Annual Turnover Data (Construction only; Equivalent in Pak Rupees, Millions)						
Partner	**Form A-2 Page No.**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1. Lead Partner						
2. Partner						
3. Partner						
4. Partner						
5. Partner						
6. Partner						
Total:						

1
Where applications are being invited for a number of contracts, suitable wording should be introduced, to allow applicants to apply for individual contracts or groups of contracts(slice and package contracts).

APPLICATION FORM A-6 **Page___ of ____Pages**

PERSONNEL CAPABILITIES

Name of Applicant or Partner of a Joint Venture

For specific positions essential to contract implementation, Applicants should provide the names of at least two candidates qualified to meet the specified requirements stated for each position in Para 3.5.2of the Instructions to Applicants. The data on their experience should be supplied on separate sheets using one Form for each candidate (Application Form A-7).

1.	Title of Position
	Name of Prime Candidate
	Name of Alternate Candidate
2.	Title of Position
	Name of Prime Candidate
	Name of Alternate Candidate
3.	Title of Position
	Name of Prime Candidate
	Name of Alternate Candidate
4.	Title of Position
	Name of Prime Candidate
	Name of Alternate Candidate

APPLICATION FORM A-7 **Page___ of ____Pages**

CANDIDATE SUMMARY

Name of Applicant or Partner of a Joint Venture

Position		**Candidate** [Tick appropriate one] ☐Prime ☐ Alternate
Candidate information	1. Name of Candidate	2. Date of Birth
	3. Professional Qualification	
Present employment	4. Name of Employer	
	Address of Employer	
	Telephone	Contact (manager/personnel officer)
	Fax	Telex
	Job title of candidate	Years with present employer

Summarize professional experience over the last 10 years, in reverse chronological order. Indicate particular technical and managerial experience relevant to the Project.

Month/ Dates/Years		**Company / Project / Position / Relevant technical and management experience**
From	**To**	

APPLICATION FORM A-8 **Page___ of ____Pages**
EQUIPMENT CAPABILITIES

Name of Applicant or Partner of a Joint Venture

The Applicant shall provide adequate information to demonstrate clearly that he has the capability to meet the requirements for each and all items of equipment listed in the Instructions to Applicants. A separate Form shall be prepared for each item of equipment listed in Para 3.5.3 of the Instructions to Applicants, or for alternative equipment proposed by the Applicant.

Item / Equipment		
Equipment information	1. Name of manufacturer	2. Model and power rating
	3. Capacity	4. Year of manufacture
Current status	5. Current location	
	6. Details of current commitments	
Source	7. Indicate source of the equipment ☐ Owned ☐ Rented ☐ Leased	

Omit the following information if it is owned by the Applicant or partner.

Owner	8. Name of owner	
	9. Address of owner	
	Telephone	Contact name and title
	Fax	Telex
Agreement	Details of rental/lease specific to the Project.	

Use a separate sheet for each partner of a joint venture.

APPLICATION FORM A-9 **Page___ of ____Pages**

FINANCIAL CAPABILITY

Name of Applicant or Partner of a Joint Venture

Applicants, including each partner of a joint venture, should provide financial information to demonstrate that they meet the requirements stated in the Instructions to Applicants. Each applicant or partner of a joint venture must fill-in this form. If necessary, use separate sheets to provide complete banker information. A copy of the audited balance sheets should be attached.

Banker	Name of banker	
	Address of banker	
	Telephone	Contact name and title
	Fax	Email

Summarize actual assets and liabilities in Pak Rupees (Equivalent at the current rate of exchange at the end of each year) for the previous five years, based upon known commitments, projected assets and liabilities in Pak Rupees equivalent for the next two years.

Financial Information in Pak Rs. or Equivalent	**Actual** ***previous five year***					**Projected** ***next two years***	
	1	**2**	**3**	**4**	**5**	**6**	**7**
1. Total Assets							
2. Current Assets							
3. Total Liabilities							
4. Current Liabilities							
5. Profits before Taxes							
6. Profits after Taxes							

Specific proposed sources of financing to meet the cash flow of the Project, net of current commitments (Instructions to Applicants, Para 3.5.4).

Annual Turnover (Construction Only)		
Year	**Turnover (in actual currency)**	**Equivalent Rupees in Millions.**
1.		
2.		
3.		
4.		
5.		

Source of financing	**Amount (Pak Rs. or equivalent)**
1.	
2.	
3.	
4.	

Attach audited financial statements for the last five years (for individual applicant or each partner of joint venture).
Firms owned by individuals, and partnerships, may submit their balance sheets certified by a registered accountant, and supported by copies of tax returns, if audits are not required by the laws of their countries of origin in case of foreign firms.

APPLICATION FORM A-10 **Page___ of ____Pages**

LITIGATION HISTORY

Name of Applicant or Partner of a Joint Venture

Applicants, including each of the partners of a joint venture, should provide information on any history of litigation or arbitration resulting from contracts executed in the last five years or currently under execution (Instructions to Applicants, Para 3.6). A separate sheet should be used for each partner of joint venture.

Year	Award FOR or AGAINST Applicant	Name of client, cause of litigation, and matter in dispute	Disputed amount (current value Pak Rs. or equivalent)

APPLICATION FORM A-11 **Page___ of ____Pages**

ADDITIONAL INFORMATION

Name of Applicant or Partner of a Joint Venture

1. Integrity Pact should be attached as Application **Form A-12** duly signed and stamped.
2. Any other pertinent information in support of this technical qualification should also be furnished.

Disqualification of Contractors

*"The Employer **may** disqualify a contractor if it finds, at any time, that the information submitted by his concerning his qualification as contractor was false and materially inaccurate or incomplete.*

APPLICATION FORM A-12 **Page___ of ____Pages**
INTEGRITY PACT

Name of Applicant or Partner of a Joint Venture

DECLARATION OF FEES, COMMISSIONS AND BROKERAGE ETC. PAYABLE BY THE CONTRACTORS / SUPPLIERS OF WORKS, GOODS & SERVICES

_____ [the Contractor / Supplier / Seller] hereby declares its intention not to obtain or induce 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 generally of the foregoing, [the Contractor / Supplier / Seller] represents and warrants that it has fully declared the brokerage, commission, fees etc. paid or payable to anyone and not given or agreed to give and shall not give or agree to give to anyone within or outside Pakistan either directly or indirectly through any natural or juridical person, including its affiliate, agent, associate, broker, consultant, director, promoter, shareholder, sponsor or subsidiary, any commission, gratification, bribe, finder's fee or kickback, whether described as consultation fee or otherwise, with the object of obtaining or including 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.

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

[the Contractor / Supplier / Seller] accepts full responsibility and strict liability for making any false declaration, not making full disclosures, misrepresenting facts or taking any action likely to defeat the purpose of this declaration, representation or 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 avoidable at the option of GoP.

Notwithstanding any rights and remedies exercised by GoP in this regard, [the Contractor / Supplier / Seller] 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 [the Seller / Supplier / 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.

Name of Employer …….	Name of Applicant..…….
Signature..……	Signature ..…….
Seal	Seal

SHAHEED BENAZIR BHUTTO UNIVERSITY
BENAZIRABAD

BILL OF QUANTITIES

PACKAGE NO 5

CONSTRUCTION OF HOSTEL FOR FACULTIES/VISITING FACULTIES

Suite No. 314, 3rd Floor Mashriq Centre, Sir Shah Sulaiman Road, Gulshan-e-Iqbal, Karachi
Ph: (92-21) 34941059, Fax: (92-21) 34890770

PACKAGE NO 5

BILL OF QUANTITIES
FOR

CONSTRUCTION OF HOSTEL FOR FACULTIES/VISITING FACULTIES

AT
SHAHEED BENAZIR BUTTO UNIVERSITY SHAHEED BENAZIRABAD
COST SUMMARY

S.No	DESCRIPTION	TOTAL AMOUNT
1	CONSTRUCTION OF HOSTEL FOR FACULTIES	
2	CONSTRUCTION OF VISITING FACULTIES	
	TOTAL COST	

CONSTRUCTION OF HOSTEL FOR FACULTIES

BILL OF QUANTITIES

CONSTRUCTION OF HOSTEL FOR FACULTIES

AT

SHAHEED BENAZIR BUTTO UNIVERSITY SHAHEED BENAZIRABAD

COST SUMMARY						
S.No	**DESCRIPTION**	**SCHEDULE ITEM**	**ADD % ABOVE / BELOW ON SCHEDULE ITEMS**		**NON SCHEDULE ITEM**	**TOTAL AMOUNT**
1	CIVIL WORKS	21,346,412	**_____%**			
2	PLUMBING WORKS	587,657	**_____%**			
3	ELECTRICAL WORKS	1,488,688	**_____%**			
4	BORING	208,002	**_____%**			
	TOTAL COST	**23,630,759**				

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BILL OF QUANTITIES
CONSTRUCTION OF HOSTEL FOR FACULTIES
AT
SHAHEED BENAZIR BUTTO UNIVERSITY SHAHEED BENAZIRABAD

CIVIL WORKS

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
		SCHEDULE ITEM				
SECTION - 1 EARTH WORK						
S.No. 18 (c) /P-4	1.1	Excvation in foundation of building bricks and other structure i/c dag belling dressing refilling arround the structure with excvated earth watering and ramming lead upto 5 ft. (c) In hard soil or soft murum.	22235	%oCft	3554.38	79,031
S.No. 21/P-4	1.2	Filling, watering and ramming earth in floor with surplus earth from foundation lead upto the one chain and lift upto 5 ft. (for plinth)	7006	%0Cft	1512.50	10,597
S.No. 22/P-4	1.3	Filling, watering and ramming earth under floor with new earth (Excavated from outside) lead upto one chain and lift upto 5 feet.	17303	%0Cft	3630.00	62,810
S.No.13 (b)/P-3	1.4	Earth work compaction (Soft ordinary or hard soil)(b) Laying earth in 6 layers levelling and dressing and watering for compaction etc. complete.	24309	%0Cft	354.00	8,606
					TOTAL COST	**161,044**
SECTION -2 PLAIN AND REINFORCED CONCRETE						
S.No. 5(i)/P-15	2.1	Cement concrete plain including placing compacting, finishing and curing, complete (includingscreening and washing of stone aggregate without shuttering). (a) Ratio 1:4:8	2532	%Cft	11288.75	285,878
S.No. 5(h) P-15	2.2	Cement concrete plain including placing compacting, finishing and curing, complete (including screening and washing of stone aggregate without shuttering). Ratio (1: 3:6)	2946	%Cft	12595.00	371,017
S.No 19 b (ii) / P-17	2.3	Erection and removal of centering for R.C.C or plain concrete works of Partal wood vertical	2528	%Sft	3127.41	79,073
S.No. 6(a) P-17	2.4	Reinforcement concrete work including all labour and material except the cost of steel reinforcement and its labour for bending and binding which will be paid separately. This rate also includes all kind of forms, moulds, lifting shuttering, curing, rendering and finishing the exposed surface (including Screening and washing of shingle) R.C.C work in roof slab beams columns rafts lintels staircases and other structural members laid in situ or pre-cast laid in position complete in all respects, ratio (II) Ratio 1:1-1/2 :3	16784	Cft	349.00	5,857,788

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
S.No 2 /P-15	2.5	Dry rammed shingle brick ballast or stone ballast 1.5" to 2"guage	2090	%Cft	3327.50	69,534
S.No 16 (c) /P-42	2.6	Provide & lay topping of concrete 1:2:4, including surface finishing & dividing in panels : 2" thick (For Under Floor)	11477	%Sft	3275.50	375,925
S.No 6 /P-17	2.7	Precast reinforced cement concrete in columns, beams lintels stair cases, shelves, etc.(I) Ratio 1 : 2: 4	18	Cft	309.78	5,537
. S.No. 8(b) P-16	2.8	Providing and fabrication of tor steel reinforcement for cement concrete including cutting, bending, laying in position, making joints and fastenings including cost of binding wire (also including removal of rust from bars)	1,049	Cwt	5001.7	5,246,937
					TOTAL COST	**12,291,690**
SECTION -3 BRICK MASONRY WORK						
S.No 5(I)/P-21	3.1	Pacca brick work in ground floor in (e) Cement sand mortar. 1:6	1185	% Cft.	12674.36	150,165
S.No 24 & 30 /P-19	3.2	Pacca brick work in first floor in (e) Cement sand mortar. 1:6	5067	% Cft.	16099.98	815,820
					TOTAL COST	**965,985**
SECTION -4 SURFACE RENDERING						
S.No 13(b) /P-52	4.1	Cement plaster 1:6 upto 12' height (b) 1/2" thick (For Internal Side)				
	a	Ground Floor	7175	%Sft	2206.60	158,322
	b	First Floor(Add 13% extra labour rate)	14494	%Sft	2308.85	334,644
S.No 11(a) /P-52	4.2	Cement plaster 1:4 upto 12' height (a) 3/8" thick (For Ceiling)				
	a	Ground Floor	6332	%Sft	2197.52	139,155
	b	First Floor(Add 13% extra labour rate)	5145	%Sft	2299.77	118,312
S.No 13(b) /P-52	4.3	Cement plaster 1:6 upto 12' height (b) 1/2" thick (For External)				
	a	Ground Floor	2352	%Sft	2206.60	51,893
	b	First Floor(Add 13% extra labour rate)	2031	%Sft	2308.85	46,899
S.No 32 /P-55	4.4	Rough cost/stucco cement plaster 3/4" thick in Proportion of 1:1 1/2" 1 1/2" in cement hill sand and bajri in patterns. (For External)	151	%Sft	2306.10	3,489
S.No 34 /P-55	4.5	Extra labour rate for making grooves of 1" x 1/4" or 3/4" x 1/2" plastered surface with true edges both vertically and horizontly with uniform depth and, with groove base smoothly finished etc. complete as per instruction of Engineer Incharge.	13669	P.Rft	7.71	105,389
S.No 35 /P-55	4.6	Extra labour rate for making cement plaster pattas/band around straight or carved openings and around the edges of roof slabs, the width not less than 6" with fine finishing as derected by Engineer Incharge.	943	P.Rft	19.36	18,251
					TOTAL COST	**976,354**
SECTION -5 ROOFING & WATERPROOFING						
S.No 9 /P-71	5.1	Bitumen coating to plastered or cement concrete surface.	4597	%Sft	778.09	35,769

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
S.No 14 /P-18	5.2	Reinforced cement concrete spout i/c fixing in position 2-1/2"x6"x5"	10	No,s	261.25	2,613
					TOTAL COST	**38,382**
SECTION -6 PAINTING & VARNISHING						
S.I. No. 36(a) / P-54	6.1	Preparing the surface and painting with matt finish i/c rubbing the surface with bathy (Silicon carbide rubbing brick) filling the voids with zink/chalk/plaster of paris mixture, applying first coat premix making the surface smooth and then painting 3 coats with matt finish of approved make etc: complete (3 coats)	21669	%Sft	3444.38	746,359
S.I. No. 23/P-53	6.2	Primary coat of Chalk under distemper (for ceiling)	11477	%Sft	442.75	50,814
S.I No. 24/P-53.	6.3	Distempering (c) three coats.(for ceiling)	11477	%Sft	1079.65	123,910
S.No 38(A) +(B x 2)/P-56	6.4	Preparing the surface and painting with weather coat i/c rubbing the surface with rubbing brick / sand paper filling the voids with chalk/plaster of pairs and then painting with weather of approved make (new surface) three coat	4383	%Sft	2567.95	112,553
S.No 7 /P-71	6.5	French polishing complete: On new work	1206	%Sft	3841.75	46,316
S.No 5(d) /P-70	6.7	Painting new surfaces:- (d) Preparing surface and painting guard bars, gates of iron bars, gratings, railings (including standards braces, etc). And similar open work.				
		(a) Priming coat.	1857	%Sft	521.95	9,692
		(b) Each subsequent coat of paint.	1857	%Sft	374.44	6,953
					TOTAL COST	**1,096,596**
SECTION -7 FLOOR FINISHES						
S.No 24 /P-43	7.1	Laying floor of approved with glazed tile 1/4" thick in white cement 1:2 over 3/4" thick cement mortar 1:2 complete.	956	%Sft	27678.86	264,626
S.No 38 /P-45	7.2	Glazed tile dado 1/4" thick laid in pigment over 1:2 cement sand mortar 3/4" thick including finishing.	5218	%Sft	28299.30	1,476,571
S.No 41 /P-13	7.3	Cement tiles (8" x 8" x 3/4") laid flat in 1:2 cement mortar over 3/4" thick cement mortar 1:2.	101	%Sft	10916.65	11,004
S.No 61 /P-48	7.4	Providing and laying HALA or pattern tiles glazed 6" x 6" x 1/4" on floor or wall facing in required colour and pattern of STILE specification jointed in white cement and pigment over a base of 1:2 grey cement mortar 3/4" thick including washing and filling of joints with slurry of white cement and pigment in desired shape with finishing, cleaning and cost of wax polish etc. complete including cutting tiles to proper profile.	315	%Sft	47651.56	150,102
					TOTAL COST	**1,902,304**
SECTION -8 CARPENTRY AND JOINERY						

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
S.No 3 /P-57	8.1	Fist class deodar wood wrought, joinery in doors and windows etc, fixxed in position including chowkats hold fasts hinges, iron tower bolts, chocks cleats, handles and cords with hooks, etc. (1273.76-370.83=902.93)	603	Sft	902.93	544,286
S.No 29 /P-93	8.2	Providing and fixing G.I frames /Choukhats of size 7" x 2" or 4 1/2" x 3" for door using 20 gauge G.I sheet I/c welded hinges and fixing at site with necessary hold fasts, filling with cement sand slurry of ratio 1:6 and repairing the jambs. The cost also i/c all carriage , tools and plants used in making and fixing.	640	P.Rft.	228.90	146,542
S.No 83 (B) /P-108	8.3	Supplying & fixing inposition Aluminium channels framing for hinged/Sliding doors or Alcop made with 5 mm thick tinted glass glazing (Belgium) and Alpha (Japan) locks I/c handles, stoppers etc. (b) Deluxe model (Bronze).	880	Sft	1507.66	1,326,741
S.No 84 /P-108	8.4	Supplying & fixing in position Aluminium channels framing for slidding windows & ventilators of Alcop made with 5 mm thick tinted glass glazing (Belgium) & Aluminium fly screen I/c handles stoppers & locking arrangement etc. complete.	928	Sft	1647.69	1,529,715
S.No 89 /P-109	8.5	Providing & Fixing railing for curtains I/c fixed in wall with clips screwed in gitties etc. complete.	205	Rft	174.84	35,772
S.No 21 /P-60	8.6	Providing and fixing approved quality mortice lock.	18	Each	1786.13	32,150
					TOTAL COST	**3,615,207**
SECTION -9 METAL WORK						
S.No 26 /P-93	9.1	Supplying & fixing in position iron/steel grill of 3/4" x 1/4" size flat iron of approved design including painting 3 coats etc. complete (weight not to be less than 3.7 Lbs./Sq . Foot of finished grill).	928	Sft	180.50	167,576
					TOTAL COST	**167,576**
SECTION -10 MISCELLANEOUS						
S.No 91 /P-108	10.1	Providing anti-termite treatment by spraying/ sprinkling / spreading Neptachlar 0.5% or equivalent. Emulsion as an over all Pre Construction treatment in slab type construction along external foundation trenches of the building over complete parimeter of the foundation trench etc. as per directions of engineer incharge.	8205	Sft	9.74	79,914
S.No 45 /P-3	10.2	Difference of SR cement.	1284	Bags	40.00	51,360
					TOTAL COST	**131,274**
					SUB TOTAL COST OF SCHEDULE ITEM	**21,346,412**
NON SCHEDULE ITEM						
SECTION-1 FAIR FACE CLADDING						

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Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
NSI	1.1	Providing and laying 4-1/2" thick fair face Special brick Cladding (9"x4-1/2"x3") laid in (1:3) cement / red posso mortar having 1/4" thick groove finish i/c the cost of 8 SWG wire in shape of 8 placed horizontally and vertically at 36" and 18" c/c respectively i/c cutting charges as per approved drawing including carriage charges complete in all respect as approved and directed by the Engineer Incharge.	8,088	Sft		
SECTION -2 RAILING						
NSI	2.1	Providing and fixing S.S. pipe railing, comprising, vertical posts of 1-1/2" x 1-1/2" S.S Square tube and horizontal bracing of 3/4" x 3/4" Wooden Handrail at top as per design including cost of specials, bends, threading, cutting and making good damages on the floor or wall of any kind etc. at any floor. complete as per instruction of the Engineer-in-Charg.(Taiwan or Equivalent)	154	Rft		
NSI	2.2	Provide and fix corridor railing 2" x 4" deodar wooden hand rail as top horizontal member to be welded with s.s Plat 1.5 x 3/16 , blusters of 1"x1",with s.s clips 5mm thick tempered partly forested glass all as shown in drawing as per specification, complete in all respects Drawing.(Taiwan or Equivalent)	169	Rft		
SECTION -3 CARPENTRY AND JOINERY						
NSI	3.1	Supply and fixing UPVC Flush doors (Bathroom) with 60mm wide frame 2-2.5mm wall thickness inclusive of all accessories and galvanized iron support i/c all accessories locks complete in all respect as approval by the Engineer Incharge	289	Sft		
NSI	3.2	Supply and fix, Kitchen Floor / Sink Floor Cabinet, 600mm wide and 862mm high with First Laminated Lasini (Karachi) frame, 19mm thick TLaminated Lasini (Karachi) shutter, drawers incl all necessary screws, rawal plug, polishing/ painting 3 coat to gola complete.	151	Sft		
SECTION -4 FLOOR FINISHES						
NSI	4.1	Providing and laying porcelain (imported) tiles (of approved colour/shade/texture) upto 4 Sft. in size on floors laid in pattern, jointed in 1:3 cement sand mortar and grouted with white/coloured cement using imported pigments, including laser cutting, over and including 1:3 cement sand mortar base, complete.	10608	Sq.ft.		

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
NSI	4.2	Providing and laying approved Quality Granite slab polished Required Size Steps & floor on laid over 3/4 inch (20 mm) thick cement mortar 1:2 setting the tiles with Bound over cement mortar, jointing the tiles with white cement slurry and nosing including curing, etc.complete all as specified.& Instruction by engineer in charge	828	Sq.ft.		
NSI	4.3	Providing and laying approved Granite slab polished Required Size on Riser laid over 1/2 inch (12 mm) thick cement mortar 1:2 setting the tiles with Bound over cement mortar, jointing the tiles with white cement slurry and nosing including curing, etc.complete all as specified.& Instruction by engineer in charge	264	Sq.ft.		
NSI	4.4	Providing and laying approved Granite slab Required Size on counter tops/Venity laid over 3/4 inch (20 mm) thick cement mortar 1:2 setting the tiles with Bound over cement mortar and nosing including curing, etc.complete (Imported origin China, Italy or equivalent) all as specified.& Instruction by engineer in charge	110	Sft		
SECTION -5 FALSE CEILING						
NSI	5.1	Providing and fixing of Gypsum board false ceiling (Elephant brand or as approved equivalent) as per approved design , 1/2" thick, including hanging arrangement supported including paint finish of ICI make and as directed by the Architect/Engineer incharge.	4342	Sft		
SECTION - 6 ROOFING & WATERPROOFING						
NSI	6.1	Water proofing treatment on roof slabs comprising hot bitumen coat ,2” (50mm) thick thermopore Sheet, Chicken Mesh Jali & 2” thick (1:2:4) PCC including surface finishing & dividing in panels complete in all respects as approved by the Engineer Incharge.	2781	Sft		
SECTION -7 MISCELLANEOUS						
NSI	7.1	Extra for arches, architrave coping,ornamantal work and cornice of any shape on External face as per drawing and instruction of engineer incharge	871	Rft		
NSI	7.2	Providing and fixing of rubber 3 bubbles water stopper 275 mm to 300 mm wide in vertical or horizontal including cutting and jointing etc.	220	Rft		
NSI	7.3	Providing and fixing 2" thick theremopore sheet cavity wall.complete as per instruction of the Engineer-in-Charg.	13427	Sft		

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Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
NSI	7.4	Providing and fixing in position Aluminum Jali as per approved design, including all supports as required to fix on wall,polishing complete as directed by the Architect/Engineer incharge.	478	Sft		
NSI	7.5	Supply and Erection of fiber glass sheet roof 5 mm thick standard ridges with galvanized iron bolts, nuts, limpets and bitumen washers etc as per design, welding / grinding of joints and painting three coats complete in all respect as approved by the Engineer In charge	1063	Sft		
NSI	7.6	Supply and making Atrium Japanese rock dry garden including all necessary fitting, accessories etc. complete as per design, pattern and approved drawings and instructions of engineer in charge	1	Job		
NSI	7.7	Providing and fixing in position Spiral Precast Stiar as per approved design, including all supports as required to fix on wall,polishing complete as directed by the Architect/Engineer incharge.	1	Job		
TOTAL COST OF NON SCHEDULE ITEM						

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SHAHEED BENAZIR BUTTO UNIVERSITY SHAHEED BENAZIRABAD

PLUMBING WORK

Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
SCHEDULE ITEM						
SECTION -1 SANITARY FIXTURES AND FITTINGS						
S.I. No.23/P-6	1.1	Providing & fixing in position nyloon connection complete with 1/2" dia brass stop cock with pair of brass nuts and linig joints to nyloon connection .	Each	50.00	447.15	22358
S.I. No.19/P-19	1.2	Providing & fixing C.P muslim shower with double bib cock & ring pipe .	Each	15.00	3432.00	51480
S.I. No.19/P-6	1.3	Providing and fixing steel stainless local make complete with cast iron or wrought iron brackets 6 inches built in wall, 1-1/2" rubber plug chorme brass chain 1-1/2" c.p brass waste with 1-1/2" plate P.V.C waste pipe and making good in cement concrete 1:2:4 a) Steel sink stainless sized 40" x 20" local making (Standard Pattern)	Each	2.00	5052.30	10105
S.I. No.4(b)/P-7	1.4	Providing and fixing 15" x 12" bavelled edge mirror of belgium glass complete with 1/8" thick hard board and c.p screws fixed to wooden pleat (b) Superior Quality	Each	18.00	2047.76	36860
S.I. No.1/P-7	1.5	Providing & fixing chrome plated brass towel rail complete with brackets fixing on wooden cleats with 1" long c.p brass screws. (I) Towel rail 36" long (b) 3/4" dia round or square (Superior quality).	Each	18.00	1412.95	25433
S.I. No.14/P-19	1.6	(a) Supplying & Fixing wash basin mixture of superior quality with C.P head 1/2" dia	Each	18.00	2882.00	51876
S.I. No.17/P-19	1.7	Supplying & Fixing sink mixture of superior quality with C.P head 1/2" dia	Each	2.00	2745.00	5490
S.I. No.16/P-19	1.8	Supplying & Fixing bath room accessories set (7 Piece) i/c towel rod , brush holder , soaptray,shelf of approved design i/c cost of screw nuts etc complete .(Master Brand)	Each	15.00	10322.40	154836
S.I. No.16/P-19	1.9	(a) Supplying & Fixing swan type piller cock of Superior quality single c.p. head 1/2" dia.	Each	5.00	795.30	3977
S.I. No.13b/P-19	1.10	(b) S/Fixing long bib- cock of crystal head with 1/2" dia.	Each	5.00	1384.24	6921
S.I. No.15/P-19	1.11	Supplying & fixing jet shower with rod of superior quality single c.p head 1/2" dia.	Each	13.00	1142.24	14849
S.I. No.1(i)/P-24	1.10	Supplying & fixing 6" x 4" earthen gully trap with 4" outlet complete with 4" thick 1:2:4 C.C for bed & 1/2 thick cement plaster (1:3) to the karb C.I grating 6" x 6" and C.I. cover and frame 12"x12" (inside) etc Complete (b) earthen ware glazed gully trap(a) (i) 6'x6"x4" (i) With C.I Cover and Frame	Each	11.00	1220.67	13427

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Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
S.I. No.1/P-46	1.11	Constructing manhole or inspection chamber for the required diameter of circular sewer and 3'-6"(1067mm) depth with walls of B.B in cement sand mortar 1:3 cement plastered 1:3,1/2" thick inside of walls and 1" (25mm) thick over benching and channel i/c fixing C.I manhole Cover with Frame of Clear opening 1-1/2' x 1-1/2' (457x457 mm) of 1.75 cwt (88.9) embedded in plain C.C 1:2:4 and fixing 1" (25mm) dia M.S Steps 6' (150 mm) Wide Projecting 4" (102mm) from the face of wall at 12" (305 mm) C/C duly Painted Etc. Complete as per standard Specification and Drawing. (a) 4" to 12" dia 2'x2'x3'-6"	Each	11.00	14748.00	162228
SECTION -2 VALVES						
S.I. No.5/P-18	2.1	Supplying & fixing ball valves (china)				
	a	1" dia	Each	15.00	318.34	4775
	b	1-1/2" dia	Each	26.00	573.7	14916
	c	2" dia.	Each	11.00	738.76	8126
					TOTAL COST	**587657**
NON SCHEDULE ITEM						
SECTION -1 SANITARY FIXTURES AND FITTINGS						
NSI	1.1	Supply and fix, Wash Basin with pedestal, glazed ware, Imported (like Porta,Marchi or quivalent) in white / Ivory colour, one hole, complete with waste pipe coupling, CP chain and plug and pedestal etc (except mixer) best quality, fixed to concrete, brick, stone or wood work.	Each	16.00		
NSI	1.2	Supply and fix Pedestal less wash basin 75cm x 45cm of (like Porta,Marchi or quivalent) including all fitting accessories but excluding the cost of mixing tap etc complete.	Each	3.00		
NSI	1.3	Supply and fix, WC apparatus, European Pattern, complete (coupled set), comprising closet 13 lit flushing cistern glazed, in white colour, seat cover, complete set (like Porta,Marchi or quivalent) fixed to concrete , brick ,stone or wood work, best quality, as per instruction of engineer in charge	Each	15.00		
NSI	1.4	Supply and fix, WC Asiatic pattern white colour including foot rest, full(like Porta,Marchi or quivalent) 13 lit flushing cistern, low down (plastic), flush pipe etc fixed to concrete, brick, stone, or wood work, best quality, as per instruction of engineer in charge	Each	2.00		
NSI	1.5	Providing and fixing CP Soap tray of approved shape pattern and size, complete with plugs, screws etc complete and as per instructions of engineer in charge.	Each	16.00		
NSI	1.6	Providing and fixing C.P brass toilet paper holder of standard size with chrome plated brass brackets complete similar to two ford design superior quality.	Each	16.00		

Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
NSI	1.7	Providing & fixing S.S floor trap(Stainless Steel or approved by engineer in charge) with110mm dia inlet and 110mm dia outlet of the approved self cleaning design with a Grating with or without a vent arm including cost of making requisite number of holes in walls plinth and floor for pipe connections and making good cement concrete 1:2:4.	Each	44.00		
NSI	1.8	Supply and fix, Disabled WC apparatus, European Pattern, complete (coupled set), comprising closet 13 lit flushing cistern glazed, in white colour, seat cover, rails ,handle etc complete set (like Porta,Marchi or quivalent) fixed to concrete , brick ,stone or wood work, best quality, as per instruction of engineer in charge	Each	1.00		
NSI	1.9	Supply and fix, Disabled bath wash basin, glazed ware, Imported (like Porta,Marchi or quivalent) in white / Ivory colour, one hole, complete with waste pipe coupling, CP chain and plug, automatic mixer etc best quality, fixed to concrete, brick, stone or wood work as per instruction of engineer in charge	Each	1.00		

Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
SECTION -2 WATER SUPPLY PIPES AND FITTINGS						
NSI	2.1	Providing, laying, fixing, testing and disinfecting, polypropylene pipelines for cold and hot water supply as per DIN 8077/8078 PN-20 for pipe and DIN 16962 PN-25 for fittings or equivalent BS specification Dadex, Firat (Turkey make) or formul (Turkey make) make as approved by the Engineer Incharge complete in all respects to their entire satisfaction, including specials such as tee, cross, reducer, bend, union, elbow, plug, socket etc., supported on walls or suspended from slab or run in chases including supports, cutting and making good the same as necessary to the structure, excavation and backfilling in layers complete in all respects..				
		(a) 20mm (3/4") dia	Rft	55.00		
		(b) 25 mm (1")	Rft	491.00		
		c) 38mm (1-1/2") dia	Rft	308.00		
		d) 50mm (2") dia	Rft	1078.00		
SECTION -3 SOIL, WASTE AND VENT PIPES						
NSI	3.1	Providing and fixing upvc Soil and Waste Pipe with specials and clamps including fixing, cutting and fitting including the cost of breaking through walls and roofs etc complete and as per instructions of engineer in charge. 3 inches (75mm) dia (Dadex or equivalent)	Rft	549.00		
NSI	3.2	Providing and fixing upvc Soil and Waste Pipe with specials and clamps including fixing, cutting and fitting including the cost of breaking through walls and roofs etc complete and as per instructions of engineer in charge. 4 inches (110mm) dia (Dadex or equivalent)	Rft	455.00		
					Cost of Non Schedule items (Rs.)-	

CONSTRUCTION OF HOSTEL FOR FACULTIES AT SHAHEED BENAZIR BHUTTO UNIVERSITY, SHAHEED BENAZIRABAD

SCHEDULE ITEM

S:NO	S-I	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
		Wiring:-				
1						
	124	Wiring for light or fan point with (3/.029) PVC insulated wire in 20mm (3/4") dia PVC conduite recessed in the wall or column as required.				
		Ground Floor	Point	140	1130	158,200
		First Floor & Roof	Point	138	1130	155,940
2						
	126	Wiring for plug point (3/.029) PVC insulated wire in 20mm (3/4") dia PVC conduite recessed in the wall or column as required.				
		Ground Floor	Point	40	985	39,400
		First Floor & Roof	Point	41	985	40,385
3						
	112	P/Laying (Main or Sub Main) Pvc insulated and PVC sheeted with 4 core copper conductor 600/1000 volts size 120mm sq (U/G) cable. (from supply point).				
		Ground Floor	Mtr	100	8175	817,500
		First Floor & Roof	Mtr	0		
4						
	11	P/Laying (Main or Sub Main) Pvc insulated and PVC sheeted with 4 core copper conductor 600/1000 volts size 16 mm sq (from supply point).				
		Ground Floor	Mtr	30	1300	39,000
		First Floor & Roof	Mtr	35	1300	45,500
		Fittings & Fixtures				
5						
	226	Providing and fixing three pin 5 amp plug/socket flush type				
		Ground Floor	Nos	40	151	6,040
		First Floor & Roof	Nos	41	151	6,191

S:NO	S-I	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
6	227	Providing and fixing three pin 10/15 amp plug/socket flush type.				
		Ground Floor	Nos	1	162	162
		First Floor & Roof	Nos		162	
7	228	Providing and fixing bakelite / Plastic ceiling rose with two terminals.				
		Ground Floor	Nos	11	72	792
		First Floor & Roof	Nos	14	72	1,008
8	235	Providing and fixing brass ceiling fan 56" (good quality).				
		Ground Floor	Nos	26	3185	82,810
		First Floor & Roof	Nos	20	3185	63,700
		Circuit breaker				
9	203	Providing and fixing circuit breaker 20 amp sp(TB-5S) on prepared board as required.(for Air conditioning)				
		Ground Floor	per NO	16	916	14,656
		First Floor	per NO	19	916	17,404
		TOTAL COST OF SCHEDULE ITEM=				**1,488,688**

NON SCHEDULE ITEM

1	**Fittings & Fixtures:-**			
	Providing and fixing LED surface type down light 12w good quality complete in all respect or as approved by the E/I as required.			
	Ground Floor	Pcs	97	
	First Floor & Roof	Pcs	104	
2	Providing and fixing LED bulkhead fitting Aluminum Body good quality complete in all respect or as approved by the E/I as required.			
	Ground Floor	Pcs	6	
	Roof	Pcs	3	
3	Providing and fixing exhaust fan 12" sweep good quality with shatter including making hole connection complete in all respect or as approved by the E/I as required.			
	Ground Floor	Pcs	11	
	First Floor & Roof	Pcs	14	
	Earthing:-			

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S:NO	S-I	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
	4	Providing and fixing Earthing set with 2'x2'x1/8" copper plate buried in the ground at a depth of 12 feet or less if water comes out from the ground level (salt & charcoal, or earthing chemical powder) etc. making the pit 12 feet deep by excavation of all type of soil (except soft or hard rock) including fixing of 2x8 SWG copper wire in 1/2" dia GI conduit complete in as respect including fixing tee and making pit with cover complete as required.	Job	1		
	5	Providing, installation , testing and commisioning of split type wall mounted air conditioner (cool only) in the specified place. The job includes connection of copper piping of out door unit fitted on roof or angle iron frame, making inter connection of unit with suitable sizes of wire also piping forcondensed water etc as required approved make (imported).				
		Ground Floor		3		
		first Floor		3		
	6	**DB (GF+FF)**				
		Providing and fixing testing, commissioning cubical type metal sheet distribution board surface / flush type with locking arrangement duly powder quoted paint including all fastening material including wiring with suitable gauge PVC x PVC wire complete in all respect (Seimens, Pel, Libra, RCO, Karimi, Electromech System, In Power Tech).				
		Incoming:				
		60 ATP 1no v/m 1no A/M 1no C/T 60/5a pilot lamp 3no				
		outgoing:				
		20 A SP 30 A SP 15A SP	job	4		
	7	**MAIN BOARD**				

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S:NO	S-I	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT

Providing and fixing testing, commissioning cubical type metal sheet distribution board surface / flush type with locking arrangement duly powder quoted paint including all fastening material including wiring with suitable gauge PVC x PVC wire complete in all respect (Seimens, Pel, Libra, RCO, Karimi, Electromech System, In Power Tech).

Incoming:

250 A TP	1NO			
V/M/S	1NO			
A/M/S	1NO			
PILOT LAMP	3NO			
C/T 250/5A	3NO			
outgoing:				
60 A TP	4NO	job	1	

TOTAL COST OF SCHEDULE ITEM=

BILL OF QUANTITIES
FOR
BORING
AT
SHAHEED BENAZIR BUTTO UNIVERSITY SHAHEED BENAZIRABAD

Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
SCHEDULE ITEM						
PHS.I No O-1-P-41	1	Boring for tube well in all water bearing soils from ground level upto 100 ft. or 30.5 meter depth i/c sinking and with drawing of casing pipe. d)150 mm (6" dia)	Rft	100.00	414.00	41,400
PHS.I No O-2-P-41	2	Boring for tube well in all water bearing soils from depth 100.1 to 200 ft. or 30.51 meter below groun level i/c sinking and with drawing of casing pipe. b)150 mm (6" dia)	Rft	100.00	516.00	51,600
PHS.I No 8b-P-43	3	Supplying & fixing M.S bail plug	Each	1.00	2607.00	2,607
PHS.I No 12-b-43	4	Supplying and installing PVC blind pipe 'B' Class of approved design quality and make i/c necessary sockets etc. complete. b) 100 mm (4" dia)	Rft	100.00	179.10	17,910
PHS.I No 12-d-43	5	Supplying and installing PVC blind pipe 'B' Class of approved design quality and make i/c necessary sockets etc. complete. d) 150 mm (6" dia)	Rft	100.00	338.90	33,890
PHS.I No 14-P-45	6	Plugging of joint of casing and blind pipe with cement concrete 1:1=1/2:3	Rft	100.00	347.00	34,700
PHS.I No 9-P-43	7	Supplying and installing PVC strainers 'B' class of approved design quality and make i/c necessary sockets etc. complete. B) 100 mm (4" dia)	Rft	100.00	209.95	20,995
PHS.I No 13-P-45	8	Shrouding with graded bajri (3/8" to 1/8") or (9 to 3 mm) in between bore and blind pipe for the following diameters of strainers. B)100 mm (4" dia)	Rft	100.00	49.00	4,900
					TOTAL COST OF SCHEDULE ITEM	**208,002**
		NON SCHEDULE ITEM				
NSI	1	Supplying and fixing submersible pump complete set for tube well, with AC electric motor driven, 400 V, 3 phase, 50 cycles, complete with pump, motor, cable, column pipes, motor control unit, pump capacity 0.5 cusec upto 97 M head, pump setting 60M with 15 hp motor, 2900 rpm etc complete and as per instructions of engineer in charge.	Each	1.00		
					TOTAL NON SCHEDULE COST	

CONSTRUCTION OF VISITING FACULTIES

BILL OF QUANTITIES

CONSTRUCTION OF VISITING FACULTIES

AT

SHAHEED BENAZIR BUTTO UNIVERSITY SHAHEED BENAZIRABAD

SUMMARY						
S.No	**DESCRIPTION**	**SCHEDULE ITEM**	**ADD % ABOVE / BELOW ON SCHEDULE ITEMS**		**NON SCHEDULE ITEM**	**TOTAL AMOUNT**
1	CIVIL WORKS	10,306,524	**_____%**			
2	PLUMBING WORKS	518,553	**_____%**			
3	ELECTRICAL WORKS	436,342	**_____%**			
	TOTAL COST	**11,261,419**				

BILL OF QUANTITIES
CONSTRUCTION OF VISITING FACULTIES
AT
SHAHEED BENAZIR BUTTO UNIVERSITY SHAHEED BENAZIRABAD

CIVIL WORKS

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
		SCHEDULE ITEM				
SECTION - 1 EARTH WORK						
S.No. 18 (c) /P-4	1.1	Excvation in foundation of building bricks and other structure i/c dag belling dressing refilling arround the structure with excvated earth watering and ramming lead upto 5 ft. (c) In hard soil or soft murum.	9,829.91	%oCft	3554.38	34,939.24
S.No. 21/P-4	1.2	Filling, watering and ramming earth in floor with surplus earth from foundation lead upto the one chain and lift upto 5 ft. (for plinth)	3,280.16	%0Cft	1512.50	4,961.24
S.No. 22/P-4	1.3	Filling, watering and ramming earth under floor with new earth (Excavated from outside) lead upto one chain and lift upto 5 feet.	3,973.24	%0Cft	3630.00	14,422.87
S.No.13 (b)/P-3	1.4	Earth work compaction (Soft ordinary or hard soil)(b) Laying earth in 6 layers levelling and dressing and watering for compaction etc. complete.	7,253.40	%0Cft	354.00	2,567.70
					TOTAL COST	**56,891.06**
SECTION -2 PLAIN AND REINFORCED CONCRETE						
S.No. 5(i)/P-15	2.1	Cement concrete plain including placing compacting, finishing and curing, complete (includingscreening and washing of stone aggregate without shuttering). (a) Ratio 1:4:8	1,340.46	%Cft	11,289	151,320.84
S.No. 5(h) P-15	2.2	Cement concrete plain including placing compacting, finishing and curing, complete (including screening and washing of stone aggregate without shuttering). Ratio (1: 3:6)	1,282.17	%Cft	12,595	161,489.21
S.No 19 b (ii) / P-17	2.3	Erection and removal of centering for R.C.C or plain concrete works of Partal wood vertical	1,177.41	%Sft	3,127	36,822.55
S.No. 6(a) P-17	2.4	Reinforcement concrete work including all labour and material except the cost of steel reinforcement and its labour for bending and binding which will be paid separately. This rate also includes all kind of forms, moulds, lifting shuttering, curing, rendering and finishing the exposed surface (including Screening and washing of shingle) R.C.C work in roof slab beams columns rafts lintels staircases and other structural members laid in situ or pre-cast laid in position complete in all respects, ratio (II) Ratio 1:1-1/2 :3	6,530.70	Cft	349	2,279,215.56

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Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
S.No 2 /P-15	2.5	Dry rammed shingle brick ballast or stone ballast 1.5" to 2"guage	1,122.41	%Cft	3,328	37,348.09
S.No 16 (c) /P-42	2.6	Provide & lay topping of concrete 1:2:4, including surface finishing & dividing in panels : 2" thick (For Under Floor)	3,777.34	%Sft	3,276	123,726.90
. S.No. 8(b) P-16	2.8	Providing and fabrication of tor steel reinforcement for cement concrete including cutting, bending, laying in position, making joints and fastenings including cost of binding wire (also including removal of rust from bars)	408	Cwt	5001.7	2,041,539
					TOTAL COST	**4,831,461.92**
SECTION -3 BRICK MASONRY WORK						
S.No 5(I)/P-21	3.1	Pacca brick work in ground floor in (e) Cement sand mortar. 1:6	2,903.66	% Cft.	12,674.36	368,020
S.No 24 & 30 /P-19	3.2	Pacca brick work in first floor in (e) Cement sand mortar. 1:6	3,222.48	% Cft.	16,099.98	518,819
					TOTAL COST	**886,839.00**
SECTION -4 SURFACE RENDERING						
S.No 13(b) /P-52	4.1	Cement plaster 1:6 upto 12' height (b) 1/2" thick (For Internal Side)				
	a	Ground Floor	7956	%Sft	2206.6	175,563
	b	First Floor(Add 13% extra labour rate)	7906	%Sft	2308.85	182,539
S.No 11(a) /P-52	4.2	Cement plaster 1:4 upto 12' height (a) 3/8" thick (For Ceiling)				
	a	Ground Floor	2003.44	%Sft	2197.52	44,026
	b	First Floor(Add 13% extra labour rate)	2049.75	%Sft	2299.77	47,140
S.No 13(b) /P-52	4.3	Cement plaster 1:6 upto 12' height (b) 1/2" thick (For External)				
	a	Ground Floor	2257	%Sft	2206.6	49,807
	b	First Floor(Add 13% extra labour rate)	2323	%Sft	2308.85	53,639
					TOTAL COST	**552,714.06**
SECTION -5 ROOFING & WATERPROOFING						
S.No 9 /P-71	5.1	Bitumen coating to plastered or cement concrete surface.	941.93	%Sft	778.09	7329.07
S.No 14 /P-18	5.2	Reinforced cement concrete spout i/c fixing in position 2-1/2"x6"x5"	7.00	No,s	261.25	1828.75
					TOTAL COST	**9,157.82**
SECTION -6 PAINTING & VARNISHING						
S.I. No. 36(a) / P-54	6.1	Preparing the surface and painting with matt finish i/c rubbing the surface with bathy (Silicon carbide rubbing brick) filling the voids with zink/chalk/plaster of paris mixture, applying first coat premix making the surface smooth and then painting 3 coats with matt finish of approved make etc: complete (3 coats)	15862.32	%Sft	3444.38	546,358.5
S.I. No. 23/P-53	6.2	Primary coat of Chalk under distemper (for ceiling)	4053.19	%Sft	442.75	17,945.5
S.I No. 24/P-53.	6.3	Distempering (c) three coats.(for ceiling)	4053.19	%Sft	1079.65	43,760.3

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Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
S.No 38(A) +(B x 2)/P-56	6.4	Preparing the surface and painting with weather coat i/c rubbing the surface with rubbing brick / sand paper filling the voids with chalk/plaster of pairs and then painting with weather of approved make (new surface) three coat	4580.40	%Sft	2567.95	117,622
S.No 7 /P-71	6.5	French polishing complete: On new work	1,777.60	%Sft	3,841.75	68,291
S.No 5(d) /P-70	6.6	Painting new surfaces:- (d) Preparing surface and painting guard bars, gates of iron bars, gratings, railings (including standards braces, etc). And similar open work.				
		(a) Priming coat.	880.00	%Sft	521.95	4,593
		(b) Each subsequent coat of paint.	880.00	%Sft	374.44	3,295
					TOTAL COST	**801,865.91**
SECTION -7 FLOOR FINISHES						
S.No 24 /P-43	7.1	Laying floor of approved with glazed tile 1/4" thick in white cement 1:2 over 3/4" thick cement mortar 1:2 complete.	517.22	%Sft	27,678.86	143,161
S.No 38 /P-45	7.2	Glazed tile dado 1/4" thick laid in pigment over 1:2 cement sand mortar 3/4" thick including finishing.	2711.46	%Sft	28,299.30	767,326
					TOTAL COST	**910,486.21**
SECTION -8 CARPENTRY AND JOINERY						
S.No 7 /P-58	8.1	Fist class deodar wood wrought, joinery in doors and windows etc, fixxed in position including chowkats hold fasts hinges, iron tower bolts, chocks cleats, handles and cords with hooks, etc. (1273.76-370.83=902.93)	888.80	Sft	902.93	802,524.18
S.No 29 /P-93	8.2	Providing and fixing G.I frames /Choukhats of size 7" x 2" or 4 1/2" x 3" for door using 20 gauge G.I sheet I/c welded hinges and fixing at site with necessary hold fasts, filling with cement sand slurry of ratio 1:6 and repairing the jambs. The cost also i/c all carriage , tools and plants used in making and fixing.	1,160.50	P.Rft.	228.90	265,638.45
S.No 84 /P-108	8.3	Supplying & fixing in position Aluminium channels framing for slidding windows & ventilators of Alcop made with 5 mm thick tinted glass glazing (Belgium) & Aluminium fly screen I/c handles stoppers & locking arrangement etc. complete.	440.00	Sft	1,647.69	724,983.60
S.No 89 /P-109	8.4	Providing & Fixing railing for curtains I/c fixed in wall with clips screwed in gitties etc. complete.	107.80	Rft	174.84	18,847.75
S.No 21 /P-60	8.5	Providing and fixing approved quality mortice lock.	33.00	Each	1,786.13	58,942.29
					TOTAL COST	**1,870,936.28**
SECTION -9 METAL WORK						

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Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
S.No 26 /P-93	9.1	Supplying & fixing in position iron/steel grill of 3/4" x 1/4" size flat iron of approved design including painting 3 coats etc. complete (weight not to be less than 3.7 Lbs./Sq . Foot of finished grill).	1,547.70	Sft	180.50	279,359.85
					TOTAL COST	**279,359.85**
SECTION -10 MISCELLANEOUS						
S.No 91 /P-108	10.1	Providing anti-termite treatment by spraying/ sprinkling / spreading Neptachlar 0.5% or equivalent. Emulsion as an over all Pre Construction treatment in slab type construction along external foundation trenches of the building over complete parimeter of the foundation trench etc. as per directions of engineer incharge.	8,504.12	Sft	9.74	82,830.16
S.No 45 /P-3	10.2	Difference of SR cement.	599.55	Bags	40	23,982.00
					TOTAL COST	**106,812.16**
					SUB TOTAL COST OF SCHEDULE ITEM	**10,306,524**
		NON SCHEDULE ITEM				
SECTION-1 FAIR FACE CLADDING						
NSI	1.1	Providing and laying 4-1/2" thick fair face Special brick Cladding (9"x4-1/2"x3") laid in (1:3) cement / red posso mortar having 1/4" thick groove finish i/c the cost of 8 SWG wire in shape of 8 placed horizontally and vertically at 36" and 18" c/c respectively i/c cutting charges as per approved drawing including carriage charges complete in all respect as approved and directed by the Engineer Incharge.	1,830	Sft		
SECTION -2 RAILING						
NSI	2.1	Providing and fixing S.S. pipe railing, comprising, vertical posts of 1-1/2" x 1-1/2" S.S Square tube and horizontal bracing of 3/4" x 3/4" Wooden Handrail at top as per design including cost of specials, bends, threading, cutting and making good damages on the floor or wall of any kind etc. at any floor. complete as per instruction of the Engineer-in-Charg.(Taiwan or Equivalent)	11.00	Rft		
SECTION -3 CARPENTRY AND JOINERY						
NSI	3.1	Supply and fixing UPVC Flush doors (Bathroom) with 60mm wide frame 2-2.5mm wall thickness inclusive of all accessories and galvanized iron support i/c all accessories locks complete in all respect as approval by the Engineer Incharge	365.75	Sft		

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Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
SECTION -4 FLOOR FINISHES						
NSI	4.1	Providing and laying porcelain (Local) tiles (of approved colour/shade/texture) upto 4 Sft. in size on floors laid in pattern, jointed in 1:3 cement sand mortar and grouted with white/coloured cement using imported pigments, including laser cutting, over and including 1:3 cement sand mortar base, complete.	3917.67	Sq.ft.		
NSI	4.2	Providing and laying approved Quality Granite slab polished Required Size Steps & floor on laid over 3/4 inch (20 mm) thick cement mortar 1:2 setting the tiles with Bound over cement mortar, jointing the tiles with white cement slurry and nosing including curing, etc.complete all as specified.& Instruction by engineer in charge	87.47	Sq.ft.		
NSI	4.3	Providing and laying approved Granite slab polished Required Size on Riser laid over 1/2 inch (12 mm) thick cement mortar 1:2 setting the tiles with Bound over cement mortar, jointing the tiles with white cement slurry and nosing including curing, etc.complete all as specified.& Instruction by engineer in charge	24.48	Sq.ft.		
SECTION - 5 ROOFING & WATERPROOFING						
NSI	5.1	Water proofing treatment on roof slabs comprising hot bitumen coat ,2" (50mm) thick thermopore Sheet, Chicken Mesh Jali & 2" thick (1:2:4) PCC including surface finishing & dividing in panels complete in all respects as approved by the Engineer Incharge.	1151.58	Sft		
					TOTAL COST OF NON SCHEDULE ITEM	

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BILL OF QUANTITIES
CONSTRUCTION OF VISITING FACULTIES
AT
SHAHEED BENAZIR BUTTO UNIVERSITY SHAHEED BENAZIRABAD

PLUMBING WORK

Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
SCHEDULE ITEM						
SECTION -1 SANITARY FIXTURES AND FITTINGS						
S.I. No.23/P-6	1.1	Providing & fixing in position nyloon connection complete with 1/2" dia brass stop cock with pair of brass nuts and linig joints to nyloon connection .	Each	31.00	447.15	13,862
S.I. No.19/P-19	1.2	Providing & fixing C.P muslim shower with double bib cock & ring pipe .	Each	16.00	3432.00	54,912
S.I. No.19/P-6	1.3	Providing and fixing steel stainless local make complete with cast iron or wrought iron brackets 6 inches built in wall, 1-1/2" rubber plug chorme brass chain 1-1/2" c.p brass waste with 1-1/2" plate P.V.C waste pipe and making good in cement concrete 1:2:4 a) Steel sink stainless sized 40" x 20" local making (Standard Pattern)	Each	2.00	5052.30	10,105
S.I. No.4(b)/P-7	1.4	Providing and fixing 15" x 12" bavelled edge mirror of belgium glass complete with 1/8" thick hard board and c.p screws fixed to wooden pleat (b) Superior Quality	Each	16.00	2047.76	32,764
S.I. No.1/P-7	1.5	Providing & fixing chrome plated brass towel rail complete with brackets fixing on wooden cleats with 1" long c.p brass screws. (I) Towel rail 36" long (b) 3/4" dia round or square (Superior quality).	Each	16.00	1412.95	22,607
S.I. No.14/P-19	1.6	(a) Supplying & Fixing wash basin mixture of superior quality with C.P head 1/2" dia	Each	2.00	2882.00	5,764
S.I. No.17/P-19	1.7	Supplying & Fixing sink mixture of superior quality with C.P head 1/2" dia	Each	2.00	2745.00	5,490
S.I. No.16/P-19	1.8	Supplying & Fixing bath room accessories set (7 Piece) i/c towel rod , brush holder , soaptray,shelf of approved design i/c cost of screw nuts etc complete .(Master Brand)	Each	16.00	10322.40	165,158
S.I. No.16/P-19	1.9	(a) Supplying & Fixing swan type piller cock of Superior quality single c.p. head 1/2" dia.	Each	16.00	795.30	12,725
S.I. No.13b/P-19	1.10	(b) S/Fixing long bib- cock of crystal head with 1/2" dia.	Each	16.00	1384.24	22,148
S.I. No.15/P-19	1.11	Supplying & fixing jet shower with rod of superior quality single c.p head 1/2" dia.	Each	16.00	1142.24	18,276
S.I. No.1(i)/P-24	1.10	Supplying & fixing 6" x 4" earthen gully trap with 4" outlet complete with 4" thick 1:2:4 C.C for bed & 1/2 thick cement plaster (1:3) to the karb C.I grating 6" x 6" and C.I. cover and frame 12"x12" (inside) etc Complete (b) earthen ware glazed gully trap(a) (i) 6'x6"x4" (i) With C.I Cover and Frame	Each	16.00	1220.67	19,531

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Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
S.I. No.1/P-46	1.11	Constructing manhole or inspection chamber for the required diameter of circular sewer and 3'-6"(1067mm) depth with walls of B.B in cement sand mortar 1:3 cement plastered 1:3,1/2" thick inside of walls and 1" (25mm) thick over benching and channel i/c fixing C.I manhole Cover with Frame of Clear opening 1-1/2' x 1-1/2' (457x457 mm) of 1.75 cwt (88.9) embedded in plain C.C 1:2:4 and fixing 1" (25mm) dia M.S Steps 6' (150 mm) Wide Projecting 4" (102mm) from the face of wall at 12" (305 mm) C/C duly Painted Etc. Complete as per standard Specification and Drawing. (a) 4" to 12" dia 2'x2'x3'-6"	Each	8.00	14748.00	117,984
SECTION -2 VALVES						
S.I. No.5/P-18	2.1	Supplying & fixing ball valves (china)				
	a	1" dia	Each	16.00	318.34	5,093.44
	b	1-1/2" dia	Each	16.00	573.7	9,179.20
	c	2" dia.	Each	4.00	738.76	2,955.04
					TOTAL COST	**518,552.89**
		NON SCHEDULE ITEM				
SECTION -1 SANITARY FIXTURES AND FITTINGS						
NSI	1.1	Supply and fix, Wash Basin with pedestal, glazed ware, Imported (like Porta,Marchi or quivalent) in white / Ivory colour, one hole, complete with waste pipe coupling, CP chain and plug and pedestal etc (except mixer) best quality, fixed to concrete, brick, stone or wood work.	Each	16.00		
NSI	1.2	Supply and fix Pedestal less wash basin 75cm x 45cm of (like Porta,Marchi or quivalent) including all fitting accessories but excluding the cost of mixing tap etc complete.	Each	2.00		
NSI	1.3	Supply and fix, WC apparatus, European Pattern, complete (coupled set), comprising closet 13 lit flushing cistern glazed, in white colour, seat cover, complete set (like Porta,Marchi or quivalent) fixed to concrete , brick ,stone or wood work, best quality, as per instruction of engineer in charge	Each	14.00		
NSI	1.4	Supply and fix, WC Asiatic pattern white colour including foot rest, full(like Porta,Marchi or quivalent) 13 lit flushing cistern, low down (plastic), flush pipe etc fixed to concrete, brick, stone, or wood work, best quality, as per instruction of engineer in charge	Each	3.00		
NSI	1.5	Providing and fixing CP Soap tray of approved shape pattern and size, complete with plugs, screws etc complete and as per instructions of engineer in charge.	Each	3.00		
NSI	1.6	Providing and fixing C.P brass toilet paper holder of standard size with chrome plated brass brackets complete similar to two ford design superior quality.	Each	16.00		
NSI	1.7	Providing & fixing S.S floor trap(Stainless Steel or approved by engineer in charge) with110mm dia inlet and 110mm dia outlet of the approved self cleaning design with a Grating with or without a vent arm including cost of making requisite number of holes in walls plinth and floor for pipe connections and making good cement concrete 1:2:4.	Each	31.00		

Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
SECTION -2 WATER SUPPLY PIPES AND FITTINGS						
NSI	2.1	Providing, laying, fixing, testing and disinfecting, polypropylene pipelines for cold and hot water supply as per DIN 8077/8078 PN-20 for pipe and DIN 16962 PN-25 for fittings or equivalent BS specification Dadex, Firat (Turkey make) or formul (Turkey make) make as approved by the Engineer Incharge complete in all respects to their entire satisfaction, including specials such as tee, cross, reducer, bend, union, elbow, plug, socket etc., supported on walls or suspended from slab or run in chases including supports, cutting and making good the same as necessary to the structure, excavation and backfilling in layers complete in all respects..				
		(a) 20mm (3/4") dia	Rft	22.00		
		(b) 25 mm (1")	Rft	231.00		
		c) 38mm (1-1/2") dia	Rft	308.00		
		d) 50mm (2") dia	Rft	220.00		
SECTION -3 SOIL, WASTE AND VENT PIPES						
NSI	3.1	Providing and fixing upvc Soil and Waste Pipe with specials and clamps including fixing, cutting and fitting including the cost of breaking through walls and roofs etc complete and as per instructions of engineer in charge.				
		3 inches (75mm) dia (Dadex or equivalent)	Rft	393.00		
NSI	3.2	Providing and fixing upvc Soil and Waste Pipe with specials and clamps including fixing, cutting and fitting including the cost of breaking through walls and roofs etc complete and as per instructions of engineer in charge.				
		4 inches (110mm) dia (Dadex or equivalent)	Rft	362.00		
					Cost of Non Schedule items (Rs.)-	

BILL OF QUANTITIES
VISITING FACULTIES
SHAHEED BENAZIR BUTTO UNIVERSITY SHAHEED BENAZIRABAD
ELECTRICAL WORKS

S.NO	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
1	**Wiring:-** Wiring for light or fan point with (3/.029) PVC insulated wire in 20mm (3/4") PVC conduite recessed in the wall or column as required				
	Ground Floor	Point	78	1130	88,140
	First Floor	Point	78	1130	88,140
2	Wiring for plug point (3/.029) PVC insulated wire in 20mm (3/4") PVC conduite recessed in the wall or column as required				
	Ground Floor	Point	25	985	24,625
	First Floor	Point	29	985	28,565
3	P/Laying (Main or Sub Main) Pvc insulated with size 4-7/.052 (10mm²) copper conductor in (1.5") dia PVC conduite recessed in the wall, column as required (From main DB to Sub DBs)				
	Ground Floor	Mtr	36	858	30,888
	First Floor	Mtr	36	858	30,888
4	Providing & fixing three pin 5 amp plug & socket switch flush				-
	Ground Floor	No.	25	217	5,425
	First Floor	No.	29	217	6,293
9	Providing & fixing three pin 10/15 amp plug & socket flush type on metal board & covered with plastic sheet (S.No-227, Pg-33).				
	Ground Floor	No.			-
	First Floor	No.	1	162.00	162
7	P/Laying (Main or Sub Main) PVC insulated with 4-7/.044 (6mm square) copper conductor in 1 1/2" dia PVC conduit recesseed in wall or column i/c 2.5 mm squre PVC insulated wire as ECC. (for 40 A Tp)	Mtr	12	558	6,696
8	Providing & fixing bakelite / PVC ceiling rose with two terminals (S.No-228, Pg-33).				
	Ground Floor	No.	25	72	1,800
	First Floor	No.	25	72	1,800
9	**Providing & fixing brass / PVC batten holder superior quality (S.No-232, Pg-33).**				-
	Ground Floor	No.	59	70	4,130
	First Floor	No.	59	70	4,130
10	Providing & fixing ceiling fan 56" good quality (S.No-235 Pg-34)				-
	Ground Floor	No.	17	3185	54,145
	First Floor	No.	19	3185	60,515
		TOTAL COST			**436,342**
NON SHEDULE OF ITEM					
	Providing and fixing LED Bulb 12 watt lamp as required.				
	Ground Floor	No.	50		

S.NO	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
	First Floor	No.	49		
1					
	Providing and fixing 4 1/2" x 4 1/2" MS dia casted powder coated recessed type fan clamp box with 1/2" dia MS bar fan clamp fixed on roof at casting time as required.				
	Ground Floor	No.	25		
2	First Floor	No.	25		
	Providing and fixing 30cm (12") sweep metallic body exhaust fan complete with blades, motor etc including shutter and making hole & including connection with 14.0076 flexible wire complete as required Millat / Pak / Asia / Climax / Younas / Royal.				
3	Ground Floor	No.	8		
	First Floor	No.	10		
	Providing and fixing 6 Amps Piano fan dimmer fixed on plastic or fiber top cover sheet on 14 SWG metal board recessed in the wall and column including connection as required.				
4	ground Floor	No.	25		
	First Floor	No.	25		
	providing and fixing circuit wiring with 7/.029 pvc insulated wire in 1" dia pvc conduit recessed i/c 2.5 mm square ECC wire as required				
5	Ground floor	No.	19		
	Providing and fixing Earthing set with 2'x2'x1/8" copper plate buried in the ground at a depth of 12 feet or less if water comes out from the ground level (with salt and charcoal, or Earthing chamical Powder) etc making the pit 12 feet deep by excavation of all type of soil (except soft or hard rock) including fixing of 8 SWG copper wire in 1/2 " G.I conduit complete in all respect as required.				
6	Ground Floor	No.	1		
	Providing and fixing testing, commissioning cubical type metal sheet distribution board surface / flush type with locking arrangement duly powder quoted paint including all fastening material including wiring with suitable gauge PVC x PVC wire complete in all respect (Seimens, Pel, Libra, RCO, Karimi, Electromech System, In Power Tech).	No.	2		
7	**incoming**				
	1) 50 A TP MCCB 1 No				
	2) Pilot Lamp 3 No				
	Outgoing:				
	1)20 A TP MCCB 2 NO				
	2) 20 A TP MCCB FOR GF 1NO				
	3) 20 A TP MCCB 1NO				
	DB 2 FIRST FLOOR				
8	Providing and fixing testing, commissioning cubical type metal sheet distribution board surface / flush type with locking arrangement duly powder quoted paint including all fastening material including wiring with suitable gauge PVC x PVC wire complete in all respect (Seimens, Pel, Libra, RCO, Karimi, Electromech System, In Power Tech).	No.	1		

S.NO	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
	incoming				
	1)20 A Tp MCCB 1NO				
	2) Pilot Lamp 3 No				
	outgoing:				
	1) 20 A Sp 2 No				
	TOTAL COST OF NON SCHEDUL ITEM				

SHAHEED BENAZIR BHUTTO UNIVERSITY SHAHEED BENAZIRABAD

BIDDING DOCUMENTS

VOLUME-II (TECHNICAL SPECIFICATION)

PACKAGE-5

Construction of Hostel for Faculties/Visiting Faculties at Shaheed Benazir Bhutto University, Shaheed Benazirabad

OCTOBER, 2022

Head Office (Karachi): Suite No. 314, 3rd Floor, Mashrique Center, Gulshan-e-Iqbal Block-14, Karachi
Ph: 021-34941059 Mob: 0300-8251864 **Fax:** 021-34890770
Multan Office: House No. 1379, F Block, Wapda Town, Phase II, Multan.
DI Khan Office: Office No. 21, 1st Floor, Cantt Market, Dera Ismail Khan Tel No: 0966-715755 & Cell # 0336-0109883
Website: www.ess-i-aar.com **Email:** info@ess-i-aar.com & eia1946@hotmail.com

TABLE OF CONTENTS

GENERAL PROTECT SPECIFICATIONS

SECTION - 0

GENERAL REQUIREMENTS

0.01 GENERAL DESCRIPTION

0.1.01 Location of Site

The site of the project is located in Shaheed Benazir Bhutto University, Nawabshah.

0.1.02 Work Under This Contract

The work under this Contract comprises the Construction, Completion, Handing over and Maintenance of Structure, Architectural, Finishes, Building Services relating to Electrical, Water Supply and Sewerage, site work and /or any other discipline necessary to be executed together with or incorporated in the structure works including but not limited to pipe sleeves, embedded parts, conduits, earthing pits, tube wells etc. as specified by the Contract/ necessitated by the project requirements/ instructed by the Engineer.

The Contractor shall be required to plan and execute the works in a manner such that the project is completed within the time specified in the Contract and in conformity with the provisions contained in the documents of Contract. The Contractor shall furnish a detailed construction Programealong with a list of plant and equipment with capacities and capabilities for the approval of the Engineer. The Contractor shall also be required to submit a site supervisory/ management chart.

0.1.03 Execution of Work

All Work shall be executed in accordance with the requirements and in a manner set forth in the documents of Contract and in accordance with the instructions of the Engineer or Engineer's Representative. The Contractor shall confine his operations to the areas that are actually designated, for the Works, by the Employer. The Contractor shall be required to supply and maintain his own storage facilities, site office, sanitary facilities, and all temporary connections for electricity, water, sewerage and telephone etc. at his cost, subject to the approval of the Engineer.

0.02 APPLICABLE STANDARDS

Unless specified otherwise in the Contract Documents, all the Work and materials shall conform to the requirements of American Society for Testing Materials (ASTM) Specifications, American Concrete Institute (ACI) and British Standard Specifications (BSS) and as per the Drawings and Specifications.

0.03 TEST LABORATORY AND TESTING

0.03.1 Testing unless specified otherwise in the Contract, shall be performed by an approved testing agency as proposed by the Contractor and at no extra cost to the Employer. The Engineer may require all testing to be carried out under his supervision.

0.03.2 The quality control testing shall be arranged and performed by the Contractor's competent personnel in accordance with a Site Testing and Quality Control Programe/Facility to be established by the Contractor, and approved by the Engineer. The Contractor shall keep complete record of all the quality tests performed including the date and time of testing and submit the same to the Engineer. All quality control and related tests shall be carried out in accordance with applicable standards and codes under the supervision of the Engineer. The Contractor shall establish a laboratory on site which shall have equipment for testing Compressive Strength of concrete, Sieve Analysis and Compaction Test, as per the instructions and to the satisfaction of the Engineer.

0.04 STORAGE AND HANDLING FACILITY

The Employer shall assign the Contractor storage space for the storage of plant, equipment and materials for Contract Works. However the Contractor shall ensure that, on no account shall such temporary installation conflict/interfere with any of the permanent installations, services and any operational function of the Employer. The handling and storage of all plants, equipment and materials at Site shall be the responsibility of the Contractor and at no risk or cost to the Employer.

The Contractor shall protect all materials against corrosion, damage of any kind or deterioration during storage and also during erection on Site. The protection methods shall be to the approval of the Engineer.

0.05 TEMPORARY FACILITIES

The Contractor shall provide, erect/install, maintain, alter as and when necessary and remove on completion except as otherwise directed by the Engineer all temporary facilities and services as described hereinafter and/or in the Contract documents and/or as instructed and approved by the Engineer, all at his own cost and expenses.

0.05.1 Contractor's Site Office

The Contractor's temporary site office and stores etc. including all buildings, utilities and facilities shall be available for use not later than 15 days after the date of the Site handing over.

0.05.2 Temporary Fencing & Lightning

The Contractor shall provide and maintain at his own cost all temporary lights, guards, fencing and watching to the approval of the Engineer for the safety and protection of the Works.

0.05.3 Site Sign Boards

Before manufacturing and installing sign boards at site, the Contractor shall present a design and obtain the approval of the Engineer.

0.05.4 Temporary Services

a. Water & Electricity

The Contractor shall make his own arrangement at his cost for water for construction, drinking and other purposes and shall also provide temporary power for the operation of construction equipment and lighting. The Contractor shall be responsible for the supply, maintenance, repair and operation of these services at his own costs throughout the construction period. The Contractor shall also provide adequate sanitary facilities for the use of his staff and Workmen and remove these services upon completion of Works at his own cost.

b. First Aid

The Contractor shall provide and maintain First Aid Facilities on the Site. First Aid kits of the type, model and number, equipped properly according to the requirements of the local health authorities and as approved by the Engineer must be furnished by the Contractor at Site.

c. Fire Fighting

The Contractor shall provide and maintain adequate firefighting facilities on the Site at his own cost to the approval of the local Fire Authority and Civil Authority and the Engineer. Firefighting equipment like fire buckets, fire extinguishers or other effective means ready for instant use shall be installed at suitable places at the project.

0.06 FACILITIES FOR THE ENGINEER

0.06.1 Supervisory Staff Site Office

a. The Contractor shall provide and maintain suitably furnished Supervisory Staff Site Office for the Engineer and his staff as per the details approved by the Engineer. The site office shall be air-conditioned and provided with ceiling fans, utilities, security, kitchen and toilet facilities. The floor area and design of the site office shall be as approved by the Engineer. This duly furnished office shall be ready for possession of the Engineer within 15 days of Receipt of Engineer's notice to commence the work.

b. It shall be provided with Office attendants, Computers, printers, photocopy machines, phones, necessary office stationary etc. as listed in the tender documents

c. The Kitchen shall be equipped with all necessary Kitchen equipment, microwave oven and fridge.

d. Telephone and fax facilities as at (b) above shall be provided by the Contractor and all the installation and running costs shall be deemed to be included in the rates of the Contractor.

e. The Contractor shall provide and would be responsible for the daily cleaning, as well as the running and maintenance of the site office including, electricity supply, water, sewerage disposal etc.

f. The Site Office shall be removed from the site when the project is complete, leaving the site neat and clean and/or all as required by the Engineer. The cost on this account shall be deemed to be included in the unit rates of the Contractor.

0.06.2 **Supervisory Staff Transport**

The Contractor shall provide new air conditioned vehicles as listed in the tender document along with drivers for the use of the Engineer and his staff till the completion of the project. The Contractor shall be responsible for all the running and maintenance costs of the said vehicles. No separate payment shall be allowed on this account and all such costs shall be deemed included in the unit rates of the Contractor. All maintenance and repair works during the currency of the project shall be carried out promptly by the Contractor failing which all such works shall be got done by the Engineer at the cost of the Contractor.

0.07 PROJECT RECORD DOCUMENTS

The Contractor will submit shop drawings showing work sequence, work methodology, including location of construction joints, pouring sequences for the approval of Engineer prior to start of work on each stage of the project or at any time if requested by the Engineer.

The Contractor will maintain complete, accurate log of all construction work as it progresses through recording progress on the approved work-plan, progress reports and construction photographs stage wise.

The Contractor will submit weekly and monthly progress reports to the engineer, on approved format with photographs

On completion of foundation, retaining walls and other major construction milestones, prepare certified As-built drawing showing work done, dimensions, locations, angles and elevations of construction and site work.

0.08 MEASUREMENTS AND PAYMENT

No separate payment shall be made for the services and performance provided under this section of Specifications.

The Contractor is deemed to have covered the costs of all related supplies and performance in the unit prices of other contract items.

**** END OF SECTION****

SECTION - 1

CLEARING, GRUBBING & SETTING OUT OF WORKS

1.01 SCOPE OF WORK

The Work covered by this section of Specifications consists of furnishing all labour, materials, necessary equipment, services, miscellaneous and necessary items, required to satisfactorily complete the clearing, grubbing and setting out of the Works, as indicated on Drawings, specified herein and subject to the terms and conditions of the Contract.

1.02 CLEARING

Clearing shall consist of cutting up or trimming of trees, if any, and the satisfactory disposal of trees and other vegetation designated for removal, together with the down timber, snags, bushes, and rubbish occurring within the areas to be cleared. Trees, other vegetation, stumps, roots, and bushes in areas to be clear shall be cut-off below the original ground to extract the roots except such individual trees, groups of trees and vegetation as may be indicated on the Drawings or designated by the Engineer to be left standing. Individual trees, groups of trees, and other vegetation, to be standing, shall be thoroughly protected from damage incident to construction operations by the erection of barriers or by such other means as the circumstances required, and as approved by the Engineer. Clearing operations shall be conducted so as not to cause any damage or harm to existing structures and installations and to those under construction, and so as to provide for the safety of employees and others.

1.03 GRUBBING

Grubbing shall consist of the removal and disposal of all occurring stumps, roots larger than 38 mm in diameter, matted roots in the designated grubbing areas, stumps, roots, logs or other timber more than 38 mm in diameter, matted roots and other debris shall be excavated and removed to a depth not less than 450 mm below any subgrade, shoulder or slope. In areas where the cut is over 1.0m, grubbing shall not be necessary. In areas to be paved, or in areas indicated on the Drawings or designated by the Engineer as future paved areas where excess excavation from grading operations is placed, grubbing will be necessary.

1.04 DISPOSAL

Unless directed otherwise, timber and other refuse shall be disposed of by burning at locations approved by the Engineer in a manner that will avoid all hazards such as damage to existing structures, construction in progress, trees and vegetation's. The Contractor shall be responsible for compliance with all pertinent laws and regulations pertaining to the burning of fires and observance of any security regulations applicable thereto.

Disposal by burning shall be kept under constant attendance until the fires have burned out or have been extinguished. No materials will be permitted to be pushed or placed on adjacent property without prior written approval of the owner of such property.

1.05 SETTING OUT OF WORKS

The Contractor shall set out the Works and shall be responsible for true and perfect levels and setting out of the same and for correctness of the direction, positions, levels, dimensions and alignments of all parts thereof. If any error in this respect shall appear during the progress of the Work, the Contractor shall at his own expense rectify such error to the satisfaction of the Engineer. Any checking by the Engineer shall not relieve the Contractor from his complete unshared responsibility for correct setting out of Works. The Contractor shall construct and maintain accurate bench marks so that the lines and levels can be easily checked by the Engineer.

1.06 DRAINAGE DITCHES/DEWATERING

The Contractor shall construct and maintain such ditches/drains in addition to those shown on Drawings or as may be ordered by the Engineer to adequately drain the areas under construction of the water from any source including subsoil water in foundations. If due to any negligence the area is flooded the same shall be drained with adequate measures by the Contractor at his own cost.

1.07 MEASUREMENT AND PAYMENT

The quantities for grubbing, clearing, disposal and protection works shall be taken into account on lump sum basis and payment shall be made accordingly at the rate entered in the Bill of Quantities.

No separate payment shall be made for setting out of Works. The Contractor shall be deemed to cover the costs for this item of work in the unit price of other Contract items.

Disposal of surplus material beyond initial 1000m lead

**** END OF SECTION****

SECTION - 2

EXCAVATION AND BACKFILLING

2.01 SCOPE OF WORK

The Work covered by this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with excavation, de-watering, filling, back-filling, stock piling of suitable excavated material and disposal of all surplus and unsuitable material for construction works and foundations for structure & services line trenches, complete, in strict accordance with this section of the Specifications and the applicable Drawings and subject to the terms and conditions of the Contract and as per existing laws imposed by the local authorities.

2.02 SUB-SOIL CONDITIONS

2.02.1 The Contractor shall acquaint himself with the nature of the ground, existing structures, foundations and subsoil conditions, which might be encountered during excavation or earthworks on the Site and his bid shall be fully covering the works involved. The Employer does not guarantee or warrant in any way that the materials to be found in the excavation will be similar in nature to that of any samples which may have been exhibited or indicated in the Geotechnical Report, Drawings or in any other Contract Documents or to material obtained from boring or trial holes.

2.02.2 The Contractor shall make his own deductions for sub-surface conditions which may affect methods or cost of constructions of the work hereunder and he shall make no claim whatsoever for damages or compensation, should he find conditions during the progress of the Work, different from those as calculated and/or anticipated by him.

2.02.3 The Contractor shall be deemed to have made local and independent inquiries as to and shall take the whole risk of the nature of the ground, subsoil or material to be excavated or penetrated and the Contractor shall not be entitled to receive any extra or additional payment nor to be relieved from any of his obligations by reasons of the nature of such ground, subsoil or material.

2.03 EXCAVATION

2.03.1 The Contractor shall perform a joint survey with the Engineer's Representative, of the area where earthwork is required, plot the ground levels on the drawings and obtain approval from the Engineer before starting the earthwork.

2.03.2 Excavation shall include the removal of all material of every name and nature. If rock or concrete is encountered, it should be removed carefully and without excessive noise and vibration. Use of explosives shall not be permitted and no extra rates or any payment in such a case shall be made to the Contractor.

2.03.3 The Contractor shall give reasonable notice to commence any excavation and he shall submit to the Engineer full details of his proposals. If the Engineer may require modifications to be made in the Contractor’s proposals, the Contractor shall give effect to such modifications but shall not be relieved of his responsibility with respect to such work.

2.03.4 For major excavations, the Contractor shall submit for the prior approval of the Engineer full details and Drawings showing the proposed method and procedure for supporting and strutting, dewatering and maintenance of adjacent structures. The design, provision, installation, erection, maintenance and removal of such temporary works shall be the responsibility of the Contractor and all costs in these respects shall be deemed to be included in the rates quoted by the Contractor.

2.03.5 The Contractor’s attention is drawn particularly to his obligations under the General Conditions of Contract in respect of those works which are in close proximity to existing buildings/structures.

2.03.6 The Contractor, if he deems necessary, for large excavations in soil including soft rock, can use excavators, caterpillars, backhoes and/or other excavating machinery as approved by the Engineer, to facilitate efficient operations on site.

2.03.7 The excavation shall conform to the dimensions and elevations as indicated on the Drawings or as directed by the Engineer. Foundations on made up ground shall have to be taken down to natural bottom soil as per Drawings, direction and approval of the Engineer.

2.03.8 Excavation shall extend to a sufficient distance from wall and footings to allow for placing and removal of forms, installation of services and for inspection but the same shall not be paid separately and is deemed to be included in the unit rates of the Contractor.

2.03.9 In the event of any excavations being carried out deeper than required/specified levels, the same shall be filled in by the Contractor at his own cost to the required levels with lean concrete 1:3:6 under the footings and foundation slabs as per the instructions of the Engineer.

2.03.10 In the event of any excavations being carried out wider than the required/specified dimensions, the same shall be filled in by the Contractor at his own cost to the required levels with properly compacted well graded sand free from any deleterious substance as per directions of the Engineer.

2.03.11 No excavation shall be back-filled nor any Permanent Work commenced until the foundation has been inspected by the Engineer and his permission to proceed given.

2.03.12 In case, any excavation is carried out and the pits and trenches, are filled with accumulated sand or debris from blowing windstorm, dust-storms, moving sand dunes or by any other reasons thereof after the levels were checked by Engineer, then the excavation or levelling shall have to be carried out again in the same manner as before unless and until concreting is done in the foundation/trenches. No separate payment shall be made on any such accounts.

2.03.13 The Contractor shall construct and maintain such ditches, in addition to those shown on the plans, as will adequately drain areas under construction.

2.04 SHORING AND BRACING

The Contractor shall provide at his own cost, where required, all shoring, bracing, walls, supports etc. to the sides of the excavation to prevent sliding or any movement. Where necessary, excavated sides shall be sloped as directed by the Engineer with no extra cost to the Employer.

Shoring including sheet piling, where required during excavation, shall be installed to protect workmen and the banks, adjacent, structures, paving and utilities. The term shoring shall also be deemed to cover whatever methods the Contractor selects to adopt with prior approval of the Engineer, for upholding the sides of excavation against the side of public roadways and adjoining properties in existing hardcore or any other material. The Contractor will be held responsible for upholding the sides of all excavations and no claim for additional excavation, concrete or other material will be considered in this respect and shall be deemed to be included in his rates.

2.05 DEWATERING AND DRAINAGE

If water is met with in the excavations due to springs, seepage, rain or any other causes, it shall be removed by suitable diversions, pumping or bailing out and the excavation kept dry at all times. Care shall be taken to discharge the drained water into suitable outlets as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the contractor, if any such damage is caused, it shall be the sole responsibility of the contractor to repair/restore to the original condition at his own cost or compensate for the damage.

The Contractor shall control at his own cost all the grading in the vicinity of the Site of Work in order to prevent any water from running into the excavated areas.

The Contractor shall, at his own cost, keep bone dry all pits and trenches during construction and all dewatering and pumping out whether due to ground water seepage or otherwise shall be included in the rates as quoted by the Contractor. The method employed in all cases shall be approved and agreed by the Engineer.

2.06 PROTECTION OF UTILITY LINES

When any existing utility lines whether to be retained or to be removed are encountered within the area of operations, the Contractor shall notify the Employer/Engineer, and shall not proceed until necessary measures are

taken for protection or removal of the lines and instructions are obtained from the Engineer/Employer. This will be done at no extra cost to the Employer.

2.07 FILL AND BACKFILL

2.07.1 After completion of foundations, footings, walls, slabs and other construction below the elevation of the final grades and prior to backfilling, forms shall be removed and excavation shall be cleaned of trash and debris. No backfilling shall be done until the entire foundations and footings etc. have been cured, inspected, approved and measured by the Engineer. Backfill shall be placed in horizontal layers not more than 6" thick and shall have a proper moisture content for the required degree of compaction of 95%. Each layer shall be compacted by mechanical tampers or by other suitable equipment approved by the Engineer. Backfill shall be brought to a suitable elevation above grade to provide for anticipated settlement and shrinkage thereof.

2.07.2 Where concrete slabs, floors and pavements are to be placed on the ground, any loam, organic and other unsuitable materials shall be removed.

2.07.3 Filling shall consist of approved selected material from excavation or approved granular material, free from lumps, debris, rubbish, wood, organic or other unsuitable matter and capable of compaction by approved means.

Fill, where required to raise the sub-grade for concrete slabs, shall be clean unadulterated earth, free from deleterious and organic substances and shall also be free from wood, stones and other debris. In case, sand shall be provided for filling, the same shall be clean and free from harmful substances.

2.07.4 All materials, when used in fill shall be compacted to 95% modified AASHTO density by power roller, mechanical rammer, or other approved equipment, in layers not more than 6" thick. In sand filling, each layer shall be uniformly spread, saturated with water or dried and then compacted. The Contractor shall arrange at his own cost the testing of the filling.

2.07.5 Backfill shall not be placed against foundation walls etc. before 14 days and not prior to the damp proofing /water proofing treatment as specified elsewhere in these documents. Backfills shall be brought up evenly on each side of structures as far as practicable. Heavy equipment for spreading and compacting backfill shall not be operated closer to the structures less than the distance equal to the height of the backfill above the top of footing.

2.07.6 The filling material shall be subject to the approval of the Engineer and shall conform to AASHTO Soil Classification System.

2.07.7 Filling around pipes and cables shall be carried out carefully by placing fine material to cover the pipe or cable completely before the normal filling is placed.

2.08 COMPACTION

Fill and/or backfill within the building or wherever required within the premises shall be compacted to a density of not less than 95% of the maximum density at optimum moisture content.

2.09 ROUGH GRADING

2.09.1 Necessary rough grading shall be carried out by the Contractor to establish the finish grade or construction requirements of the Site, grades not otherwise indicated shall be uniform levels or slopes between points on existing and finished grades. Abrupt changes in slopes shall be rounded. Additional fill required to complete rough grading shall be provided as directed by the Engineer.

2.09.2 Where paving or slabs are specified, all rough grading shall be done to the sub-grade of the base course, removing all large stones and debris and shall be compacted uniformly to the correct lines and levels ready to receive the paving or slab. Refilling, where required shall be executed with suitable selected materials in layers not exceeding 6" in thickness and thoroughly compacted to the required density.

2.10 BOTTOM ELEVATIONS OF FOOTINGS/FOUNDATIONS

The elevations as noted in the Drawings are only approximate and must be adjusted in the field with the approval of the Engineer depending on the soil conditions encountered. No concreting shall begin until the design soil bearing capacity is substantiated by visual inspection by the Engineer. Where suitable foundation material is found lower than the underside of footings as detailed, the space between the founding material and footing soffit shall be backfilled with well compacted gravel/soling. Where soling is provided below the foundations, it shall be well compacted and the interspaces shall be properly filled with lean concrete.

The Contractor in planning his work shall make arrangements and provision to construct the lowest level footing first.

2.11 DISPOSAL OF SURPLUS EARTH AND RUBBISH

All surplus earth, unsuitable material and rubbish shall be disposed of the Site as directed by the Engineer. The term disposal shall include all operations of loading, unloading, stacking, spreading, re-handling, filling depressions, leveling and grading as per instructions of the Engineer. The maximum limit for disposal of surplus material shall be 18miles.

2.12 SAND FILLING IN TRENCHES AND/OR UNDER FLOORS

Sand filling shall be done in layers not more than 4" (100 mm) thick and shall be rammed after saturation to such an extent that 4" (100 mm) layer is reduced to about 2.7" (68 mm) after compaction.

The required in situ density w.r.t. maximum density to optimum moisture content shall be in compliance with test 12 of B.S 1377-1967.

The base shall be perfectly level. A slope of 1:64 shall be provided in verandahs and bath rooms is required.

Sand shall conform in all respect to the specifications for fine aggregate except for its grading, i.e. shall pass through a Sieve No. 16 and not more than 30% shall pass through a Sieve No. 100.

2.13 GRAVEL LAYER UNDER FOOTINGS

A gravel layer, as shown in drawings, will be provided below footings/ rafts as a drainage layer. It shall conform to conditions set out in Section 29 of this specification.

2.14 HARD ROCK EXCAVATION

Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and un-stratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock and which cannot be removed without systematic drilling and blasting. Except where trees are indicated to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the ENGINEER. Trees shall be supported during excavation by any means previously reviewed by the ENGINEER.

It is expected that nearly all excavation can be accomplished using conventional equipment.

a. For general excavation, a D-9N Caterpillar tractor with a single shank ripper, or equivalent equipment, is considered conventional equipment, if it can rip at a production rate of at least 300 bank cubic yards per hour.

b. For trench excavation, a 235C Caterpillar excavator with a medium stick and a rock ripping bucket, or equivalent equipment, is considered conventional equipment, if it can excavate at a production rate of at least 30 bank cubic yards per hour.

If material is encountered which the Contractor believes cannot be excavated by conventional equipment, the Engineer shall be immediately notified.

The Contractor shall provide performance tests of the specified conventional or equivalent equipment. If the Engineer confirms in writing that the specified conventional equipment cannot perform at the production rates specified, the excavation shall be considered rock excavation.

In areas to be later rip-rapped, large rock found during excavation of the stream channel may, upon approval of the Engineer, be left in place, excavated around and incorporated into the final riprap.

Should the Contractor encounter bedrock or excessive large boulders within the project site, which will require extensive excavation to achieve final grade, the Contractor shall immediately notify the Engineer. The Engineer shall review the hydraulic requirements of the stream in the affected area in a timely manner and advise the Contractor on acceptable alternate excavation.

The Contractor shall adopt a method of working such that at any time, control perimeter blasting operations including the drilling of perimeter holes do not advance by more than one panel ahead of bulk blasting operations and more than two panels ahead of mucking operations to remove all blasted materials to the perimeter face, unless specially approved by the Engineer, in order that adjustments to drilling, charging and detonation can be made, appropriate to the conditions being encountered.

Rock on the cut face that is loose, hanging, or creates a potentially dangerous situation during or upon completion of the excavation in each lift shall be removed or stabilized. No drilling for the next lift shall be carried out until this work is completed. Stabilization shall be performed at Contractors' own expense if caused by the Contractor's blasting operations

Slopes of cuttings formed in rock are to be cleaned of all rock fragments which move when pressed with a crowbar

Explosives and Blasting

It is not anticipated that blasting will be required for this project. Should the Contractor exhaust conventional equipment and methods for rock excavation and removal and desire to use explosives to accomplish this work, it shall comply with the following:

a. Blasting and storage and handling of explosives shall be in accordance with the Construction Safety Orders of the Division of Industrial Safety of the California Department of Industrial Relations, Federal Safety Requirements, the San Mateo County Sheriff, and other authorities which have jurisdiction.

b. The Contractor shall obtain all necessary permits and furnish copies to the Engineer before explosives are transported to the site. The Contractor shall pay for permits at no additional cost to the Owner.

c. Blasting shall be done only by skilled operators under the direction of a licensed foreman.

d. The Contractor shall identify all property, structures, and persons which may be affected by blasting and shall take all safety precautions and protective measures to prevent damage or injury to same. All personal injury or damage to persons or property of any nature, whether in the WORK or appurtenant to it, shall be the responsibility of the Contractor.

e. The Contractor agrees by submission of a bid to indemnify and hold the Owner, its officers, agents, employees, and the Engineer harmless from any and all liability claims, costs and expenses including expenses of investigation and defending against same in regard thereto.

f. Blasting shall only be permitted in hours approved by the Engineer and regulatory agencies having jurisdiction. Blasting will not be permitted on legal holidays.

Pre-Blasting

a. Inspections of all structures within [300-feet] of the blast site shall be made more than 2 weeks prior to commencement of blasting. A qualified independent inspector shall perform the inspections for the purpose of detecting and documenting any visible or reasonable recognizable pre-existing defects or damages in structures.

b. Waiver of inspections shall be in writing, signed by structure owners or persons with control or custody of the structures.

c. Complete inspection reports listing findings with photographs or waivers shall be signed by the inspector. One copy of inspection reports and waivers, shall be submitted to the Engineer before blasting commences.

d. The Contractor shall give 30 and 5-day notices to all residence and businesses, and utility owners which may be affected by blasting.

Blasting

a. The Contractor shall perform instrumented seismographic monitoring on blasting. A seismograph shall be placed at [the nearest structure to the blast] to monitor the ground motion particle velocity and frequency during each blast. One copy of each daily seismograph chart shall be furnished to Engineer.

b. Fly rock from blasting shall be contained within the project site and shall not represent a hazard to persons, vehicles, existing improvements, or vegetation.

c. The blasting site shall be cleaned of all debris at the end of each day.

d. No blasting shall be done within 100-feet of concrete which has been placed in less than 7 days, except by permission of the Engineer.

Post-Blasting

The Contractor shall submit an As-built layout plan showing the extent of the rock excavation/blasting area (Before and after excavation within the claiming period) with indication of hard rock area rock's spot levels.

The independent inspector shall investigate each complaint of property damage and a written report shall be furnished to the Engineer within 30 days of receipt of the complaint.

2.15 MEASUREMENT & PAYMENT

Excavation shall be measured per cubic Meter/ft on the assumption of vertically excavated walls required for the nominal concrete dimensions of the structural members of the foundation shown on the Drawings and paid for at the unit rates entered in the Bill of Quantities, inclusive of backfilling, compaction, disposal of surplus earth, dewatering, bracing, shoring etc.

All horizontal measurements shall be taken from established reference point. At the option of the Engineer-in-charge, the contractor shall leave depth indicators during excavations of such shape and size and in such positions as directed so as to indicate the original ground level as accurately as possible. The contractor shall see that these remain intact till the final measurements are taken.

Disposal of surplus material beyond initial 100 ft lead up to a maximum of 18 miles, shall be paid separately, at the rate approved by the Engineer.

Dewatering shall not be paid separately. All dewatering and pumping out whether due to ground water seepage or otherwise shall be included in the rates as quoted by the Contractor

**** END OF SECTION****

SECTION - 3

TERMITE CONTROL

3.01 SCOPE OF WORK

The Work covered by this section of Specifications consists of furnishing all labour, materials, equipment, services, miscellaneous and necessary items required to complete Termite Control Work, related works as indicated on Drawings, specified herein, in the Bill of Quantities and subject to the terms and conditions of the Contract.

The work for anti-termite treatment will includes injection of insecticide in sides and bottom of excavated foundation, trenches, spraying on stockpiled backfill material, filled up earth, injections of the insecticide in floor sub-grade of the building and any other operation, which the specialized firm may considered necessary in context to their guarantee obligations. The scope also covers treatment of all wood works with insecticides before installation in position.

3.02 MATERIALS

3.02.1 The chemicals approved by Pakistan Council of Scientific and Industrial Research (PCSIR) like Fiprokil, Biflex, Agenda, Dursbanetc., or approved equivalent,emulsifiable concentrate insecticide, specially formulated to prevent infestation by termites.

3.02.2 The chemical will be diluted with water as per manufacturer/ supplier instructions. Fuel oil will not be permitted as diluents.

3.02.3 Pure turpentine shall be used for dilution of insecticide, in approved proportion for application to woodwork.

3.03 METHOD OF APPLICATION

Pesticide solution shall be applied with approved pressure spraying equipment maintaining a pressure of 1N/mm^2 (10 Kg/cm^2) to all applications on or in earth. Spraying to wood shall be done by hand compression sprayers with an approximate pressure of 0.15 N/mm^2 (1.5 Kg/cm^2). Mixing and dilution of the concentrate insecticide with water shall be doneat site and as per manufacturer recommendations. This solution shall be sprayed over 500 square feet of surface area.

Rate of application of the solution shall be as per the recommendations of the manufacturer. Insecticide shall penetrate to a depth of 1 inch. (25mm) minimum in porous earth at bottom and at least 50mm at the sides of excavations

3.04 EXTENT OF APPLICATION

3.07.1 Soil treatment shall begin after all work of preparation of earth prior to installation of concrete has been done. After application, no additional earth moving or work upon sub grade should be done. No covering of earth or concrete should be applied over soil treatment until at least 24 hours after treatment has been made.

3.07.2 Insecticide solution should not be applied during wet weather, or when the earth surface is excessively wet. Application should be made to all areas beneath concrete slabs-on-grade, including sidewalks and paving abutting buildings for distance of at least 6 feet beyond building line.

3.07.3 Contractor to ensure a continuity of treatment under and around the footings and up to the slab on grade in the form of an envelope.

3.07.4 Care shall be exercised to insure that no marks or damage occurs to the finished structure as a result of the work under this section.

3.07.5 All woodwork for the entire project is to be insecticide treated (before application of solignum). Insecticide shall be sprayed on all surfaces of all the wooden work viz., door frames, blocking, furring, planks, boards etc. before installation. Spraying is to be done at the site, after delivery and before installation. No spraying shall be necessary after field sawing, jointing or installation of such material.

3.07.6 Sides of foundation excavations, grade beam, and similar areas shall be treated with solution at a rate of 0.5 lit per square feet upon inner sides of such excavations, and at all locations where concrete slabs for platforms and similar work about the building. Similar treatment shall be made at all

locations where expansion Joints, control joints, column bases and similar work occur at or below grade slabs.

3.07.7 In the areas of application signs shall be fixed to show that soil treatment has been applied. Such signs shall be removed when areas are covered by other construction.

3.07.8 All excavations, all walls and bottoms of all pits or trenches for footings or foundations are to be sprayed. Pesticide shall penetrate to a depth of 12" minimum in porous earth at bottom and 3" minimum at sides of excavations.

3.07.9 Stockpiled excavated material to be used as backfill is to be spray treated as above. After backfilling to plinth level, area of the whole building up to 10 ft. outside the building line is again to be sprayed penetrating a minimum of 12" into soil.

3.07.10 After grading, compaction and levelling and before formation of hard core/soling under floor slabs, all areas to receive slabs shall be sprayed with pesticides, penetrating a minimum of 12" into soil.

3.05 LOCATION AND SCHEDULING

3.08.1 Saturation of earth is to be done by adequate personnel and in such a manner as to in no way disrupt the progress of Work.

3.08.2 Care shall be exercised to ensure that no marks or damage occurs to the finished building as a result of the work under this section and the Contractor shall verify and ensure that no material used herein will impede the growth of grass or plants at areas where spraying is done.

3.06 APPLICABLE STANDARDS

All methods of termite protection used herein shall be in accordance with best standard practices of National Pest Control Association, USA and the British Wood Preserving Association.

3.07 QUALITY ASSURANCE

In addition to the requirements of these specifications, the contractor shall comply with manufacturer's instructions and recommendations for the work, including preparation of substrata and application.

A professional operator shall be engaged who shall have license in accordance with regulations of governing authorities for application of soil treatment solution.

3.08 GUARANTEE

The Contractor is to guarantee that the building shall be free from termite (white ants), wood bores and other pests or rodents which cause damage to wood or other organic material for at least 10 years from the date of acceptance of the building.

In the event of any damage caused within the guarantee period, the Contractor shall replace at his own cost such damaged material, finishes and affected portion thereof and suitably preserve and treat the entire premises with the best method known to the trade to prevent the spreading of termites.

3.09 TESTING

The Contractor shall supply samples of all the materials to be used for insecticide control for approval of the Engineer-in-charge.All materials and samples shall be subject to standard testing in accordance with the standards specified herein and shall be rejected if found below these standards. Rejected materials shall be removed from the Site immediately.

3.10 MEASUREMENT AND PAYMENT

Only the top surface area of the finished floor or pavement shall be measured for the payment of termite proofing work of the whole project carried out under this section. The measurement will be made in square feet/ meter and paid for at the unit rates entered in the Bill of Quantities

**** END OF SECTION****

SECTION - 4

PLAIN AND REINFORCED CONCRETE

4.01 SCOPE OF WORK

The Work covered by this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with plain and/or reinforced concrete work complete in strict accordance with this section of Specifications, applicable Drawings and subject to the terms and conditions of this Contract.

4.02 APPLICABLE STANDARDS

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

4.02.1 Pakistan Standards

PS233	Portland Cement (ordinary & rapid hardening)
PS243	Natural aggregates for concrete
PS279	Abrasion of coarse aggregates by the use of Los Angeles machine.
PS280	Determination of aggregates crushing value
PS281	Organic impurities in sand for concrete aggregate.
PS282	Material finer than No. 200 BS test sieve in aggregates, method of test for
PS283	Soundness test for aggregates by the use of sodium sulphate or magnesium sulphate.
PS284	Sampling aggregates for concrete
PS285	Sieve or screen analysis of fine and coarse
PS286	Description and classification of mineral aggregates
PS421	Sampling fresh concrete
PS422	Slump test for concrete
PS560	Making and curing concrete compression test specimen in the field. Sulphate-resistant Portland cement type 'A' and sampling fresh concrete in the laboratory.
PS612	Mixing
PS716	Compacting factor test for concrete
PS717	Definitions and terminology of cements
PS746	Making and curing concrete compression test cubes.
PS849	

4.02.2 ASTM (American Society for Testing and Materials)

C33	Standard Test Method for Fine and coarse aggregates Organic impurities in sand for concrete.
C39	Standard Test Method for Compressive Strength of Cylindrical Concrete
C40	Specimens
C87	Effect of organic impurities in fine aggregates on strength of mortar. Soundness of aggregates.
C88	Ready mixed Concrete.
C91	Cement Standards and Concrete Standards
C94	Compressive strength of hydraulic cement mortars
C 109	Material finer than No. 200 (0.075mm) sieve
C 117	Light weight pieces in aggregates.
C 123	Concrete and concrete aggregates.
C 125	Specific gravity and absorption of coarse aggregate.
C 127	Specific gravity and absorption of fine aggregate.
C 128	Resistance to abrasion of small size coarse aggregate.

C 131	Sieve or screen analysis of fine and coarse aggregate.
C 136	Clay lumps and friable particles in aggregates.
C 142	Slump of Portland Cement Concrete
C 143	
C150	Standard Specification for Portland Cement
C156	Water retention by concrete curing material
C171	Sheet material for curing concrete.
C185	Air content or hydraulic cement mortar.
C188	Density of hydraulic cement.
C191	Time of setting of hydraulic cement by vicat needle
C260	Air entraining admixture for concrete.
C289	Potential reactivity of aggregate.
C309	Liquid membrane forming compounds for curing concrete.
C387	Chemical admixtures for concrete.
C494	Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete
C535	
C75	Resistance to abrasion of large size coarse aggregates.
C994	Aggregate sampling.
C1190	Preformed expansion joint filler for concrete.
C1715	Concrete joint sealer (hot poured elastic type).
	Preformed expansion joint filler for concrete paving and structural concrete.
D1850	Concrete joint sealer (cold application type).
E11	Wire cloth sleeves for testing purposes.
E96	Water vapor transmission of materials in sheet form.
E154	Materials for use as vapor barrier under concrete slabs.
E337	Relative humidity by wet and dry bulk psychrometer.

4.02.3 **ACI (American Concrete Institute)**

211	Recommended practice for selecting proportions for normal and heavy weight concrete.
214	Quality control charts
301	Specifications for structural concrete for building.
304	Recommended practice for measuring, mixing, transporting and placing concrete.
305	Hot weather concreting.
308	Recommended practice for curing concrete.
309	Recommended practice for consolidation of concrete
315	Manual of standard practice of detailing reinforcement concrete structure.
	Building code requirement of reinforced concrete.
318	Recommended practice for concrete formwork.
347	

4.02.4 **British Standards**

BS 12	Specifications for Portland cement, ordinary and rapid hardening
BS 410	Specifications for Test Sieve
BS 812	Specification for aggregates from natural sources for concrete Method of testing concrete
BS 822	Test for water making concrete
BS 1881	Method for determination of Compressive Strength of Concrete Cubes
BS 1348	Rigid expanded polyvinyl chloride for thermal insulation.
BS 3837	Sulphate-resisting Portland cement
BS 4027	Specification for Sulfate-Resisting Portland Cement
CP 8110	Specifications for Design and Construction of Reinforced and Pre-stressed Concrete
CP 114	
BS 4550	The Structural Use of Reinforced Concrete in Buildings

BS 8500	Methods of Testing Cement Concrete – Complementary British Standard

In addition, the latest editions of other Pakistan and British Standards, American Concrete Institute Standards, American Society for Testing and Materials Standards and other Standards as may be specified by the Engineer for special Materials and Construction are also relevant.

4.03 GENERAL

4.03.1 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.

4.03.2 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.

4.03.3 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.

4.03.4 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.

4.03.5 The Contractor shall get the bar bending schedules of reinforcement checkedand approved from the Engineer prior to the cutting of reinforcement.

4.03.6 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.

4.03.7 Throughout the concrete work, the Contractor shall employ full time on theWorks suitable number of qualified and experienced Engineers whose sole duties shall be as follows:

- Design of concrete mixes
- Quality control of concrete
- Supervision of mixing, transporting, placing, compacting, finishing, curing and protecting concrete.
- Supervision of sampling and testing.
- Preparation and submission of test certificates and reports.
- Completion and keeping of record.
- Such other duties as the Engineer may direct.

4.03.8 All concrete work including reinforcement etc. shall be carried out in accordance with the applicable requirements of ACI/ASTM/BSS Standards and to the instructions of the Engineer.

4.04 MATERIALS

4.04.1 Cement

a) Ordinary Portland cement shall be grey normal setting cement of approved make and source and of the specified gravity, fineness and chemical composition fully conforming to British Standard Specifications BS-12 and shall be capable of satisfying all tests such as the tensile strength tests contained therein.

b) Sulphate resistant cement where required shall be sulphate resistant Portland cement of the approved make fully conforming to BS-4027 and satisfying the requirements for fineness, chemical composition, strength, setting time and soundness, etc.

c) For all types of cement described in sub-clauses 4.03.1 (a) & (b) above, the cement shall have a tricalcium aluminate (C_3A) content by weight not less than 5% and not more than 8%.

d) For all types of cement described in sub-clauses 4.03.1 (a)& (b) above. The initial setting time shall not be less than 45 minutes and final setting time not more than 10 hours.

e) The supply of cement must be so programmed by the Contractor that at no time the quantity of cement stock shall be less than that required for an average consumption of four weeks. Lorry or truck or other means of transportation for the conveyance of cement to the Site of Work shall be clean, dry, metal-lined and covered from top with water proof sheets, so that cement is sufficiently protected from any deterioration during transit.

f) Cement shall be delivered in sealed bags and be stored in moisture-protected and well-ventilated sheds and each cement supply shall be stored separately.

g) The Contractor shall provide at his own cost on the Site all necessary sheds which shall be perfectly dry, waterproof and adequately protected against ingress of water for the storing of cement to be delivered to the Work, to ensure adequate supplies being available for the Work.

h) Cement, which is damp or contains lumps which cannot be broken to original fineness by finger pressure will be condemned irrespective of age and must be removed from the Site.

i) If any time the Engineer considers that any batch of cement may have deteriorated on Site during storage for any reason, he will direct that tests shall be made and the batch of cement on the Site which may be in question shall not be used until it has been shown by test to be of satisfactory quality at a laboratory approved or appointed by the Engineer. The Contractor shall bear all costs of such testing. The Contractor without delay shall remove any rejected cement from the Site. Cement reclaimed from cleaning bags or leaking containers shall not be used in the Works and immediately be removed from the Site.

j) Cement shall be consumed in the sequence of its arrival at Site unless otherwise directed by the Engineer.

4.04.2 **Aggregates**

a) All fine and coarse aggregates to be used shall be supplied from approved sources, which shall not be changed without permission in writing from the Engineer. Aggregates shall conform to the requirements of applicable ASTM C33-82.

b) Fine aggregates, shall be from an approved source of supply of a uniform quality conforming to ASTM C-33-82 and shall be clean and sharp and free from clay, earth, vegetable and organic matters, alkaline or acid reactions or other deleterious salts or such harmful matters and impurities.

c) Fine aggregates shall conform to the requirements of the relevant ASTM C-33-82 Specifications, and shall be graded as follows;

Sieve Number/Size	Percentage (by weight) passing
9.5 mm (3/8")	100
4.75 mm (No. 4)	95 - 100
2.36 mm (No. 8)	80 – 100
1.18 mm (No. 16)	50 – 85
0.6 mm (No. 30)	25 – 60

0.3 mm (No. 50)	10 – 30
0.15 mm (No. 100)	2 – 10

d) Coarse aggregates shall be approved river gravel or hard crushed stone from a source approved by the Engineer and shall be clean, inert, hard, non-porous and free from laminated particles, sand, dust, salt, lime, chalk, clay, organic impurities or other deleterious matter.

e) Coarse aggregate shall also conform to the requirements of Table 2 of ASTM C-33 and shall be graded as follows:-

For Reinforced Concrete (Nominal Size of Graded Aggregates 20.0 mm to 2.36 mm)

Sieve Number/Size	Percentage (by weight) passing
25.0 mm	100
20.0 mm	90 – 100
9.5 mm	20 – 55
4.75 mm (No. 4)	0 – 10
2.36 mm (No .8)	0 – 5

f) All aggregates shall be stored on properly constructed paving and in bins and there shall be a physical partition between the stockpiles of coarse and fine aggregates. No mixed up aggregates shall be used in any concrete. Under no circumstances aggregates shall be allowed to be in contact with ground.

g) If required, aggregates shall be washed and screened to the sequence of receipt of supplies unless otherwise directed by the Engineer.

h) All aggregates shall be subjected to the approval of the Engineer. Any aggregates not found to be of the required standard shall be rejected by the Engineer and shall have to be removed from Site without delay. Concrete structures executed with rejected aggregates shall be dismantled and rebuilt at the Contractor's expense.

i) Special fine gravel of 9 mm. size shall be used if called for in the Drawings or as directed by the Engineer.

j) Physical properties of aggregates shall be in accordance with Table 3 of ASTM C33.

4.04.3 **Water**

Water to be used in the Work shall be potable water and shall be free from all impurities whether suspended or dissolved. Further, the water shall not contain any chemical impurities, salts etc. of any kind. Water shall be tested for its fitness in Works in accordance with AASHTO Method T26-51.

4.04.4 **Admixtures**

a) Suitable admixtures from BCR, Sika, Fosroc, Betocrete C-16or Master Builders or other approved manufacturers may be used in concrete mixes with the prior approval of the Engineer. The amount of admixtures added to each batch of concrete requires careful control and shall be added in the doses as recommended by the manufacturers and approved by the Engineer. The cost of the admixtures shall be deemed to be included in the rates.

b) For use of an admixture, the information required by the Engineer shall be submitted to him for each admixture for his approval.

c) BASF 700 or approved equivalent concrete retarding agent, may be used if required with the approval of Engineer

4.05 CLASSIFICATION OF CONCRETE

Classification of concrete to be used in various parts of the Works shall be as indicated on the Drawings and mentioned in the Bill of Quantities. Unless noted otherwise, all blinding concrete shall be of Class E. The concrete of various grades shall be proportioned as set out in Table-1 appended hereto.

Table-1 showing minimum required compressive strengths on 6" x 12" long test cylinders and minimum quantity of cement required per m^3 of finished concrete for various mixes and under various conditions is given below:

TABLE – 1

Class of Concrete	Minimum Qty. of Cement Kg/m^3	Work Cylinder Strength		Max. Water-Cement Ratio
		@ 7 days (psi)	@ 28 days (psi)	
D2	540	4200	6000	0.33
D1	400	3500	5000	0.40
D	385	3150	4500	0.42
A3	350	2800	4000	0.45
A2	325	2450	3500	0.47
A1	300	2100	3000	0.50
C	300	1750	2500	0.50
E	275	1400	2000	0.52
F	217	875	1250	0.55
G	159	600	850	-

Non-structural Concrete

Non-structural concrete (NS concrete) shall be used only for non-structural purposes where shown on the Drawing.NS concrete shall be compound of ordinary Portland cement and aggregates complying with this Specification.

The weight of cement mixed with 0.3 cubic meters of combined aggregate shall not be less than 50 kg. The mix shall be proportioned by weight or by volume. The maximum aggregate size shall be 40 mm nominal.

The concrete shall be mixed by machine or by hand to a uniform colour and consistency before placing. The quantity of water used shall not exceed that required to produce a concrete with sufficient workability to be placed and compacted where required.

The concrete shall be compacted by hand towels or rammers or by mechanical vibration.

4.06 PROPORTIONING OF CONCRETE MIXES

All concrete shall be proportioned by weight for design of concrete mixes, unless specifically agreed by the Engineer to proportion them by volume, which permission shall be given only if the arrangements made at Site are satisfactory. The Contractor shall submit to the Engineer proposed mix designs for concrete to be used, based on preliminary laboratory tests to determine proportion of cement, aggregates and water in the concrete conforming to the quality and strength requirements specified herein. Preliminary test results of at least three different mixes of each class of concrete with varied water-cement ratio shall be submitted. The results of 7 days and 28 days cylinder tests shall be used to establish the ratio between 7 days and 28 days strengths of used concrete. The Engineer may make adjustments in the ratio of fine to coarse aggregates in the mix for a certain work. Preliminary design of mixes and testing shall be the responsibility of the Contractor at his own cost. The proportion of voids in between the coarse aggregate shall be controlled and if it exceeds 0.45%, the Contractor

without any charge shall increase sand and consequently the cement. If the proportion is less than 0.45%, sand shall be decreased but not the cement.

The detailed data, calculations and test results shall be compiled in a report and the proposed mix be declared by the Contractor. The report shall be submitted to the Engineer in time before commencing the concrete works and all test results shall be to the Engineer's satisfaction.

Lack of approval by Engineer shall not constitute a reason for an extension of time or additional costs.

4.06.1 **No Fines Concrete**

"No Fines" concrete shall consist of approved aggregate graded between 40mm and 20mm with not more than 5% passing the 20mm sieve.

The mix shall consist of 0.25 cu m of aggregate to 50kg cement. The aggregate is to be damp at the time of mixing and the water/cement ratio is to be strictly controlled to evenly wet the aggregate with grout.

The concrete is to be placed as quickly as possible after mixing and is to be lightly rodded to assist placing. The concrete shall not be vibrated or rammed.

4.06.2 **Maximum Allowable Water Content**

All concrete specimens shall be made, cured and tested in accordance with ASTM Standard. A curve representing the relation between the water content and the average 28 days compressive strength or earlier strength at which the concrete is to receive its full working load shall be established for a range of values including all the compressive strengths shown on the plans. The curve shall be established by at least four points, each point representing average values for at least four test specimens. The maximum allowable water content for the concrete shall be as determined from this curve and shall correspond to a strength 15% greater than indicated on the plans. However, the water cement ratio shall not exceed the value given in Table-1 above for the class/strength of concrete specified. No substitution shall be made in the materials used in the work without additional tests in accordance herewith to indicate that the quality of the concrete is satisfactory.

4.06.3 **Slump Test**

The slump for concrete, determined in accordance with ASTM C-143 Test for Concrete, shall be minimum of 2" and maximum of 4" 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.

4.07 BATCHING AND MIXING

Concrete shall be mixed by a mechanical batch type mixing plant with adequate facilities for accurate measurements and control of each material entering the mixer and for changing the proportions to conform to varying conditions of the Work. The mixing plant assembly shall permit ready inspection of operations at all times. The plant and its location shall be subject to approval of the Engineer.

Water shall be measured for every batch with due allowance for water already present in aggregates.

4.07.1 **Batching Units**

Batching units shall be supplied with the following items:-

a) Weighing unit shall be provided for each type of material to indicate the scale load at convenient stages of the weighing operations. Weighing units shall be checked at times directed by and in the presence of the Engineer and required adjustments shall be made before further use.

b) Water mechanism shall be tight, with the valves interlocked so that the discharge valve cannot be opened before the filling valve is fully closed and shall be fitted with a graduated gauge.

c) Discharge gate shall control the mix to produce a ribboning and mixing of cement with aggregates. Delivery of materials from the batching equipment to the mixer shall be accurate within the following limits:-

Materials	**Percentage by Weight**
Cement	+1%
Water	+1%
Aggregate smaller than 3/4"	+2%
Aggregate larger than 3/4"	+3%

4.07.2 **Mixing Units**

a) Mixers shall not be charged in excess of rated capacity nor be operated in excess of rated speed. Excessive mixing requiring addition of water to preserve required consistency shall not be permitted. The entire batch shall be discharged and discarded before re-charging.

b) Mixing time shall be measured from the instant water is introduced into the mixer drum containing all solids. All mixing water shall be introduced before one-fourth of the mixing time has elapsed. Mixing time for mixers of one cubic meter or less shall be not less than 2 minutes; for larger than one cubic meter capacity mixers, time shall be increased by 15 seconds for each additional half cubic meter or fraction thereof, which may be varied if the charging and mixing operations fail to result in the required uniformity in composition and consistence within a batch and from batch to batch. If an air-entraining agent is allowed to be used, additional mixing time shall be allowed so as to provide the specified air-content.

c) Unless waived by the Engineer, device such as discharge-lock to lock the discharge mechanism, until the required mixing time has elapsed, shall be provided on each mixer. Mixing shall continue for at least 40 revolutions of mixer drum.

d) No hand mixing under any circumstances even with extra cement shall be permitted. If during concreting, the mixing plant fails, the concrete already poured shall be removed, unless directed otherwise by the Engineer. Mixers, which have been out of use for more than 30 minutes shall be thoroughly cleaned before any further concrete is mixed.

e) The mixing water shall be regularly sampled and tested for salt content and contamination.

4.08 SAMPLES AND TESTING

4.08.1 **General**

Test cylinders of concrete shall be prepared and stored by the Contractor in accordance with the ASTM C-172, as and when directed by the Engineer. Test cylinders and the concrete materials shall be tested in an approved laboratory and the Contractor shall bear all charges for the same, including such other tests as may be determined by and acceptable to the Engineer.

4.08.2 **Water**

Water shall be tested in accordance with AASHTO Method of Test T26-51.

4.08.3 **Cement**

Cement shall be tested as prescribed in BS-12.

4.08.4 **Aggregate**

Aggregates shall be tested as prescribed in ASTM C-33. In addition, fine aggregates shall be tested for organic impurities in conformity with ASTM C-40.

4.08.5 **Reinforcement**

Reinforcement bars shall be tested as prescribed in BS 4449, BS-4461 and ASTM A-615-82(S1) for deformed steel bars and mild steel plain bars. Refer clause 4.10 of this section for specification requirements of reinforcement works.

4.08.6 **Testing of Concrete**

4.08.6.1 Concrete Compressive Strength Test

a) Works Test Cylinders shall be made of all structural concrete incorporated into the works. Unless otherwise directed by the Engineer, one set of cylinder of any particular mix shall be taken from either :-
   - Each 350 Cft or part thereof in columns
   - Each 1050 Cft in walls and small foundations
   - Each 1750 Cft in slabs, beams and large foundations, or
   - each day's production

   Whichever is the more frequent

b) Each set of the Works Test Cylinders shall comprise six 6"x12" Cylinders made from a single sample of concrete taken from the point of final deposition of the set concrete under the Engineer's supervision.

c) The sampling, making, curing and testing of Works Test Cylinders shall be carried out in accordance with ASTM C3 & C39. Test results shall be recorded on approved forms and submitted in duplicate to the Engineer immediately following the test.

d) A sample of concrete shall be taken at random on eight separate occasions during each of the first five days of using that mix. The number of samples per day and the times which they are taken shall be varied at random (thereafter at least one sample shall be taken each day the concrete of that particular mix is made).

e) From each sample six Cylinders shall be made, two for test at seven days, and the other four for test at twenty-eight days.

f) Specimens shall be cured under laboratory conditions except that the Engineer may require curing under field conditions in which case strength of field cured specimens shall not be less than 85% of that of companion laboratory condition cured specimens.

g) All cylinder moulds shall be steel moulds perfectly true, having all internal and meeting faces machined to a smooth surface.

h) If the strength tests of the laboratory cured specimens for any portion of the Work falls below the minimum allowable compressive strength at 28 days required for the class of concrete used in that portion, the Engineer shall have the right to order replacement of the affected work.

i) All test specimens shall bear distinguishing mark showing number, date of casting, quality of concrete and place from where sample was taken. A proper daily record of test specimens made and test results obtained shall be

maintained by the Contractor and weekly test results shall be submitted to the Engineer.

4.08.6.2 Testing for Chloride Ion Content

Maximum water soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed 0.15% by weight of cement. To determine water soluble chloride ion content, test procedures shall conform to ASTM C 1218.

4.08.7 **Concrete Members not complying with Specifications**

(i) Where concrete in the Works does not comply with the Specifications, the Engineer may order any or all of the following or any other appropriate action to be taken:

(a) The drilling of test cylinders in mass concrete and testing the cylinders to destruction by compression.

(b) The carrying out of load tests or other non-destructive tests on concrete structure.

(c) The cutting out and replacement of such volume as is considered defective by the Engineer.

(d) Strengthening of the structure in accordance with the requirements and as proposed by the Engineer.

(ii) The Contractor shall carry out all such tests, investigations, rehabilitation or replacement in coordination with and as acceptable to the Engineer at no additional cost to the Employer.

4.09 TRANSPORTING AND PLACING CONCRETE

4.09.1 General

a) Concreting shall be conveyed and deposited as quickly as possible after mixing and shall proceed so that, as far as possible, a complete section of the Work is done in one operation. The concrete may be distributed in barrows, skips, and chutes and by any other method such as pumps, conveyor belts etc. all to the approval of the Engineer.

b) Transportation of concrete shall be in a manner approved by the Engineer and shall be so as to avoid segregation or loss of ingredients of concrete.

c) All foundations and portions of Work to be concreted shall be approved by the Engineer in writing before concrete is poured.

d) All forms and reinforcement shall be completed, cleaned, inspected and approved before pouring of concrete. No concrete is to be deposited till the Engineer has inspected and approved in writing all reinforcement, foundations, forms, details, positioning of all fixtures and materials to be embedded in concrete, control levels and screeds, etc. and is satisfied with the arrangements the Contractor has made to efficiently proceed with the work such as sufficient labour, materials, plants etc. Such an approval will not relieve the Contractor from any of his obligations under this Contract. No concrete shall be deposited without the written permission from the Engineer who shall have no authority to waive off this condition. Any concrete without such written authorization shall be liable to be rejected.

e) Placing of concrete shall not be permitted when, in the opinion of the Engineer the sun, heat, wind, cold, snow, or limitations or facilities furnished by the Contractor prevent proper placing, finishing and curing of concrete.

f) All concrete shall be thoroughly compacted and consolidated by means of pneumatic or mechanical immersion type vibrators of suitable size having minimum frequency of 8000 RPM. Care shall be taken to avoid segregation due to excessive vibration. The Contractor shall maintain on Site at all times one or more standby vibrators. Tapping or other external vibration of forms shall not be allowed unless so directed by the Engineer. In that case formwork shall be adequate to withstand vibrations. Compaction shall be done until the whole mass assumes a jelly like appearance and consistency with water just appearing on the surface. Concrete shall be sufficiently tamped and consolidated around the steel bars, care shall be taken that the vibrator does not touch steel or formwork, and is worked into all parts of the moulds in order that no voids or cavities are left. Steel shall not be disturbed during operations of concreting. Concrete shall be brought up in even layers not more than 8" thickness and worked against side of forms to give a smooth and uniform surface. No surplus water shall be allowed to come out and lie on the surface of concrete. The concrete must be of such a consistency that when ramming, consolidating and tamping is completed, a thin film of water is just appearing on the surface. In vibrating, care shall be taken to avoid displacing the reinforcement.

g) Hardened concrete, debris and foreign materials shall be removed from interior of forms and from inner surface of mixing and conveying equipment.

h) Runways and gangways shall be provided for wheeled concrete handling equipment and workmen, and such equipment shall not be wheeled over reinforcement, nor shall runways be supported on reinforcement.

i) Concrete shall not be dropped freely from a height of more than 10 ½ ft. in columns and 4 ft. elsewhere. In cases where an excessive drop is inevitable, the Contractor shall provide spouts, down pipes, chutes, or side ports to forms with pockets, which will let concrete stop and flow easily into the form without any risk of segregation. The discharge of the spouts, down pipes or chutes shall be controlled so that the concrete may be effectively compacted into horizontal layers not more than 8" thick.

j) Concrete is to be deposited as quickly as possible after mixing and to proceed continuously. Concrete which has attained its initial set or has contained its mixing water for more than 30 minutes shall not be allowed to be placed in the work.

k) When concrete is laid on hard core, such as sub-grade for floor slabs, or other absorbent material, the surface is to be watered, consolidated and, where specified, blinded before the concrete is deposited.

l) Fresh concrete shall not be placed on previously laid concrete or on old concrete surfaces until the latter has been cleaned of all dirt, scum and laitence by wire brushes. The clean surface shall then be thoroughly wetted and grouted with cement slurry as approved by the Engineer.

m) Care shall be taken not to disturb newly placed concrete by vibrator, indirect loading or otherwise. No traffic or loading shall be allowed on the concrete until it has thoroughly set and hardened.

n) Construction joints in concrete shall only be given at locations indicated on the drawings or as approved by the Engineer. If approved by the Engineer, the concrete at the end of the day's work shall be finished off against a temporary shutter stop, which shall be vertical and securely fixed. Such stops shall be removed within 24 hours of placing of concrete. Construction joints not shown on the Drawings shall be reinforced with steel bars or dowels, if deemed necessary by the Engineer, and shall be furnished by the Contractor without any additional cost.

o) No concrete shall be placed during rains or inclement weather and all fresh concrete shall be suitably protected from rain fall and excessive heat or cold.

p) Should any part of the exposed surface present a rough, uneven or imperfect appearance, when the shuttering is removed, it shall be picked out to such depth and refilled and properly re-surfaced and entirely redone as per directions and approval of the Engineer at the cost of the Contractor.

q) On removal of the forms and before the concrete skin has had time to harden, all faces of the concrete inside and outside to be kept exposed (i.e. unplastered) shall be rubbed over with carborundum stone, and washed with cement to remove all marks, projections, hollows, or any other defect. No extra payment shall be made for this work.

r) All exposed surfaces and lines of the concrete work are to be true and fair without cracks, bends, windings and distortions of all kinds, without any extra charges by the Contractor. All concrete work to remain exposed and unplastered is to be fairfaced, smooth, pleasing and to the entire satisfaction of the Engineer.

s) A float or screed is to be worked over the exposed surfaces of all concrete work on the flat or curve, so as to render the surfaces perfectly smooth, clear and to the necessary slopes or falls or as required to receive the floor or roof finishes according to the Drawings and as directed by the Engineer without any extra charge by the Contractor.

4.09.2 Temperature

No concrete shall be mixed or placed while the temperature is above 35 degrees centigrade (°C) on a rising thermometer or above 40 degrees centigrade (°C) on a falling thermometer. The Contractor shall supply an accurate maximum and minimum thermometer and hang it in an approved position in the Works.

The Contractor shall plan the day's concrete in such a manner as to ensure that each bay or panel is completed at a proper construction joint before the temperature rises above the permissible limit.

The Contractor shall allow in his rates for any additional expenses incurred by complying with this Clause in order to complete the works within the "Time for Completion".

4.09.3 Hot Weather Concreting

Hot Weather Concreting Operation should conform to the provisions of ACI Standard 305-72 "*Recommended Practice for Hot Weather Concreting*". The following precautions should be adopted as necessary to comply with the above limit:-

a. Shading of aggregate stock piles.
b. Insulation of water tanks and pipelines and formwork.
c. Refrigeration of mixing water.
d. Addition of ice to mix to lower temperature.
e. Shading of formwork and reinforcement from the sun and drying winds.
f. Cooling of formwork and reinforcement prior to and ahead of casting of the concrete by mist spraying.
g. Covering and spraying with water of hardening concrete surfaces.
h. Concreting during the cooler part of the day.

4.10 PROTECTION AND CURING

All exposed concrete shall be cured. Curing shall be accomplished by preventing loss of moisture, rapid temperature change and mechanical injury or injury from rain or flowing water for a period of at least seven (7) days. Curing shall be started as soon as the concrete has hardened sufficiently for the surface not to be marked. Curing shall be done either by covering with sand, hessian, canvas or other approved fabric mats, which shall be kept continuously wet. If required and so directed by the Engineer, formed surface with forms in position shall also be cured by keeping all forms continuously wet. As an alternative, curing of concrete on all exposed surfaces which could not be kept covered, such as sides of the beams, under side of the slabs, may also be done by sealing concrete surface with liquid membrane-forming curing compounds white pigment type conforming to ASTM C-309 or equal so as to arrest loss of moisture from concrete, with the approval of the Engineer. Care shall be taken so

as to spray the compound/chemical on all the exposed faces of concrete so that no loss of moisture takes place. The Contractor shall take special care that curing of concrete is satisfactorily carried out and in accordance with methods specified herein and/or as instructed by the Engineer.
Any negligence in this regard may result in total rejection of such concrete works, which in the opinion of the Engineer have not been adequately cured. Period of curing for any concrete shall be 7 days or more as directed by the Engineer. All concrete pours and concrete structures shall be clearly marked with non-washable paints to indicate the date of placing concrete. During hot weather, curing shall be done even at night. It shall be obligatory on the part of the Contractor to obtain a certificate from the Engineer that the curing has been properly done. A suitable format shall be printed and kept on Site to be signed by the Engineer for every part of the Work.

For sections 5 ft. or more thick, the Contractor shall ensure that the temperature differential between the inner and outer surfaces shall not exceed 20°C and shall submit to the Engineer his proposals to control and monitor this.

4.11 CONSTRUCTION JOINTS

Construction joints shall be located as indicated on the Drawings and/or as approved or directed by the Engineer. Prior to construction of any structure, the Contractor shall submit a proposal showing location of construction joints and sequence of construction to suit his concreting programmed for the approval of the Engineer. Joint in columns shall be made at the underside of the deepest beam framing thereto. Beam stems and slabs shall be poured monolithically unless allowed otherwise by the Engineer in writing. Joints not specified or shown on the Drawings if so required and approved by the Engineer, shall be so located as to least impair the strength and appearance of the Work. Except and where indicated on the Drawings, no jointing shall be made in footings or foundations without written approval of the Engineer. Construction joints shall be at right angles to the member and shall be formed against firm stop boards. The stop board shall be removed as soon as possible after placing the concrete but without the risk of movement of the concrete and the concrete surface shall be well brushed with a hard brush and washed off with a spray of water, two to four hours after casting, to expose the aggregate and provide key for the next pour.
In all water retaining structures and other substructure pits and trenches, P.V.C. or any other approved water stops shall be provided at the construction joints in the manner shown on the Drawings and/or approved by the Engineer.

Whenever a section of concrete is left unfinished, for any reasons with the approval of the Engineer, leaving surface which will be hard-set before additional concrete can be joined to it, such dovetails, grooves or other bonds shall be provided as may be necessary to ensure a good bond with the new work, at the cost of the Contractor. Before deposition fresh concrete upon or against any concrete which is already set, the surface of the set concrete shall be roughened with a cutting tool, any laitance removed, thoroughly cleaned from all foreign matter, well-watered and covered with approved bonding agent and cement grout, and special care shall be taken to ram the fresh concrete thoroughly up and against the set concrete; and, if deemed necessary by the Engineer, the joints shall be reinforced with steel bars or dowels to be all furnished and done by the Contractor without any additional cost.

4.12 CONCRETE FLOOR SLAB FINISHING

Concrete slabs shall be finished as described herein. In preparation for finishing, floor slabs shall be struck off to the required level at or below the elevation or grade of the finished floors as shown on the Drawings. Floors shall be levelled with a tolerance of 1 mm in 1m. Where drains occur, the floor surface shall be pitched to the drains as indicated on the Drawings or as directed by the Engineer.

4.13 MONOLITHIC FINISH

All concrete surfaces in floors, except where other finish is specified, shall be finished by steel floats or straight edges to bring the surface to the required finish level as shown on the Drawings. While the concrete is still green, but sufficiently hardened to bear a man's weight without deep imprint, it shall be wood floated to a true even plane with no coarse aggregate visible. Sufficient pressure shall be used on the wood floats to bring moisture to the surface. The concrete shall then be hand trowelled to produce smooth impervious surface free from trowel marks. If necessary, the process shall be repeated so that

the final finish shall produce ringing sound from the trowel. No separate payment shall be made for finishing floor slabs in the aforementioned manner.

4.14 CONCRETE TOPPING

Where indicated on the Drawings, base slab under concrete topping shall receive a screeded finish. After the base slab is thoroughly cured and when directed, concrete topping shall be laid to the thickness as indicated on the Drawings in alternate panels of suitable sizes as directed by the Engineer.

4.15 ANCHOR BOLTS, INSERTS, SLEEVES, CHASSIS, RECESSES, STEEL FRAMES

The Contractor shall provide chases and openings required for other sections of the Works and will cooperate and coordinate with other trades in placing their pipes, ducts, recesses and other built-in items as the Work proceeds, entirely at his own cost and risk.

The Contractor shall furnish and place in position accurately, as shown on the Drawings, all inserts, sleeves, chases, recesses, etc., supplied by the Contractor, subcontractors or other contractors, as directed. Full cooperation and coordination shall be maintained with other contractors, subcontractors in this regard.

4.16 WATERPROOF CONCRETE

Waterproof concrete shall consist of structural concrete as specified herein and with the addition of an approved waterproofing additive. This shall be mixed in accordance with the manufacturer's instructions and as detailed in the Bill of Quantities.

Contractor's attention is drawn to the special care required for casting roof framing, ponds, swimming pools and all underground structures including basement floor, retaining walls, sumps, pits, etc. These are all designed to BS 8007, British Standard for water retaining structures. The contractor shall ensure that workmanship and curing is up to the required standard. The crack widths in such structures shall not exceed 0.2mm.

The Contractor shall take full responsibility for ensuring that the resulting construction is completely watertight and free from penetration of moisture.

When in the opinion of the Engineer, damp patches and/or leakage of water in the finished work are due to failure of the Contractor to comply with this specification, the affected work shall be made good at the Contractor's expense.

Water-stoppers shall be provided in all construction joints and the type of Water-stoppers will be as specified or to the approval of the Engineer. All Water-stoppers will be joined by welding strictly in accordance with the manufacturer's recommendations and all multiple joints and special intersections shall be manufactured by the supplier.

Before commencement of work, the Contractor shall obtain the Engineer's approval of the methods to be used to support and maintain the Water-stoppers in the correct location while the concrete is placed and also the layout and form of all additional construction joints other than those shown on the drawings. Unless indicated otherwise on the drawings, all construction joints in waterproof concrete shall be formed incorporating Water-stoppers to Engineer's approval.

All service holes cast in shall incorporate sleeves with puddle flanges and temporary openings for services should incorporate Water-stoppers.

Care shall be taken at all times to ensure that Water-stoppers are not perforated or damaged in any way and the concrete shall be carefully placed and compacted around the Water-stoppers to ensure void free impervious concrete.

All kickers or starter plinths to walls (if used) on the periphery of the watertight construction shall be cast monolithically with the base.

The formwork shall comply with this Specification and in addition any bolt or fastening embedded in or passing through the concrete shall be to the approval of the Engineer and not impair the water tightness of the structure. The use of through bolts and sleeves is strictly prohibited.
Special attention shall be given to the elimination of shrinkage or thermal cracking. The size of any bay or slab or wall and sequence of pouring shall be such as to minimize cracking.

Slotted inserts or sockets cast into the structural concrete shall be provided for all fixings including services. The cutting of holes in watertight concrete is strictly prohibited.

The Contractor is completely responsible for making all basements and swimming pools absolutely watertight. If any leakages or moist patches occur, the cost of any repairs, etc. to make the basement and swimming pool fully watertight will be borne by him. The Contractor is to give a ten year guarantee for water tightness, reckoned from the date of completion of roof framing, basement and swimming pool. The form of guarantee is to be to the satisfaction of the Client. Should any leaks or dampness occur during the Guarantee period of ten years, the Contractor shall, at no cost to the Client, immediately re-waterproof the defective area or areas and make good all damages to surface finishes such as plaster, painting, paneling, tiling, etc. electrical or other installations or other property, caused by leaks or dampness or reimburse the Client for making good such damages.

Water tightness of swimming pools shall be inspected and tested in accordance with BS 8007:1987 and/or ACI-350.

4.17 CLEANING AND REMOVAL OF RUBBISH

On completion of Works herein, the Contractor shall remove all concrete debris, rubbish, shuttering materials, scraps etc., from the vicinity of the structures completed. All areas shall be cleaned to the satisfaction and approval of the Engineer. The rubbish shall be disposed of within or outside the Site premises, free of cost as directed by the Engineer.

4.18 MEASUREMENT AND PAYMENT

a) Concrete works shall be measured and paid for as per theoretical volumes calculated on the basis of the Drawings, or as otherwise approved by the Engineer and paid at per cubic foot at the rates entered in the Bill of Quantities.

   Recesses (e.g. openings in slabs, break-through and the like) with an individual volume of more than 1 sq. ft. or 2 cft shall be deducted.

b) The prices for concrete works shall include all cost for the complete work and are not limited to the cost of formwork, its support, anchoring's, chamfers, construction joints etc., the required scaffolding, falsework, temporary works, post-treatment and, if necessary, repair of concrete, all preliminary and routine tests, as well as the required statical checks and drawings for Temporary Works in connection with the concrete works.

c) The cost for special finishing of exposed concrete surfaces such as fair-faced finish etc. shall be included in the unit price applicable to the respective structural member and will not be compensated for separately.

d) The cost of all concrete admixtures and additives shall not be paid for separately and is deemed to be included in the unit rates of respective items of the BOQ.

Joints

a) Expansion Joints

   Expansion joints will be paid per number, according to the Drawings. The prices shall include all costs for the different materials and performances relative to the laying and sealing of the joints.

b) Dummy Joints

Dummy joints required by the Contractor with the Engineer's consent for the sound execution of the Works will not be paid for separately, but the costs involved are deemed to be covered by the concrete prices applicable to the respective structural member.

c) Construction Joints

Construction joints will be measured and paid for as below:

The Contractor is deemed to have covered the costs for all related supplies, laying, formation and performances of construction joints included in the respective concrete prices.However, the cost of PVC water stoppers and or swell bars shall be measured and paid for separately per running foot of accepted lengths.

It the approved pouring sequence has not been followed by the contractor. Any increase in quantity of materials (pvc water stoppers, swell bars, rear guards, sealants, SBR etc.) associated with the construction joints and or additional reinforcement required shall be paid for by the Contractor at his own cost.

Tamping of Equipment and Grouting of Recesses

The costs resulting from materials and performances in connection with the tamping of installed items or the grouting of recesses are deemed to be included in the prices for the supply and/or installation of the respective items, and will therefore not be separately compensated for.

**** END OF SECTION****

SECTION - 5

REINFORCEMENT STEEL

5.01 SCOPE OF WORK

The work covered by this subsection of the specifications consists of furnishing all materials, tools, labor and in performing all operations in connection with the providing, straightening, cutting, bending, fixing, binding including binding wire, chairs, pins, spacer blocks complete in strict accordance with this subsection of the Specifications, the applicable Drawings, approved bar bending schedule, and the terms and conditions of the Contract.

5.02 GENERAL

a) The Contractor shall procure reinforcing steel only from reputable manufacturers/ suppliers duly approved by the Engineer.

b) Verification of the source of supply shall be prepared by the Contractor and submitted to the Engineer along with necessary certificates and test reports.

c) The Contractor shall prepare detailed bar cutting and bending schedules on the basis of the working Drawings and in consideration of BS-4466 and of any requirement resulting from the applied bar bending process.

d) The Contractor shall inform the Engineer of the completion of any reinforcement in time, in order to facilitate its inspection and check of conformity with the working Drawings well before the concreting. Relevant formalities shall be agreed upon between the Contractor and the Engineer at the appropriate time.

e) Reinforcement bar sizes have generally been shown on the Drawings in the form of designated bar numbers.

5.03 MATERIAL

a) Reinforcement shall be deformed reinforcement, except that plain reinforcement bars are permitted for spirals. Reinforcing steel bars (Plain and deformed) shall be from the new billet stock of mild steel and shall conform to the British Standard Specifications mentioned below and as indicated on the Drawings and Bill of Quantities.

i. Hot rolled deformed bars conforming to ASTM A-615 / BS 4449
ii. Cold worked deformed bars to conforming to BS 4461 (revised 4449-1988)
iii. Plain round steel bars to conforming to BS 4449

b) For each consignment, the Contractor shall furnish to the Engineer the manufacturer's mill test certificates to guarantee that the steel supplied meets all the requirements of the relevant specifications and further meets the requirements of specified characteristic strength and minimum tensile strength requirements given as under:-

High Yield Deformed Steel Bars:

i. Specified Characteristic Strength:

up to 16 mm (5/8")	460 N/mm2 (66,700 psi)
over 16 mm (5/8")	425 N/mm2 (61,625 psi)

ii. Tensile Strength:
Minimum Tensile Strength shall be 10% greater than the Specified Characteristic Strength.

iii. Minimum Elongation

up to 16 mm (5/8")	12%
over 16 mm (5/8")	14%

Mild Steel Plain Steel Bars:

(i) Specified Characteristic Strength 250 N/mm2 (36,000 psi)

(ii) Tensile Strength:
Minimum Tensile Strength shall be atleast 15% more than the Specified Characteristic Strength.

(iii) Minimum Elongation 22%

a) **Bendability**
All the bars shall be capable of being bent cold through 180 degree round a pin without cracking on the outside of the bent portion as per ASTM-A615.

b) 18 gauge galvanized wire to BS 4482 shall be used for binding the steel reinforcement.

c) Samples shall be tested for above requirements in an approved laboratory before starting the cutting of bars or when so required by the Engineer; and all cost of such tests shall be borne by the Contractor.

d) All reinforcing steel bars shall be free from loose mill scale, loose rust, oil, grease, dirt or other harmful substances.

Wire Gauze

General
Unless otherwise specified the wire gauze shall be of best quality approved uniformly, woven wire webbing of 12 x 12 meshes to 645 mm square (one Sq. Inch) made from 22 gauge galvanized iron wire. All panels shall be in one piece and no joints shall be allowed.

Fixing
Wire gauze shall be fixed as shown on the drawings or as directed. The gauze shall remain tight to the fill width without any sag.

5.04 STORAGE

Reinforcement bars shall be stored on platform sufficiently above ground surface and be free from scales, oil, and structural defects prior to placement in Works. Rusted or dirty steel bars shall not be used in the Works unless brushed and cleaned by proper steel wire brushes and after being approved for use by the Engineer.

5.05 REINFORCEMENT CUTTING AND PLACING

All reinforcement steel shall be cut and bent cold in strict accordance with bar bending schedules prepared by the Contractor and approved by the Engineer. The Contractor shall prepare bar bending schedule from approved structural working Drawings and as per instructions of the Engineer. The bending schedules shall be drawn on approved forms and submitted to the Engineer for checking and approval. The steel reinforcement shall be cut and bent to sizes as per Drawings and approved bending schedules. In case, any bars cut, bent or even fixed in position are found incorrect in dimensions, size and shape and are not according to the requirements of the Drawings or instructions of the Engineer, notwithstanding any previous approval of the Engineer, the Contractor shall replace such steel bars, cut, bent or fixed in position, by correct sizes bars at his own cost and no extra payment shall be made to the Contractor on such account. Suitable spacers, chairs as approved by the Engineer shall be used for the purpose of supporting and spacing of bars. In case, any bars are bent or displaced they shall be straightened or replaced prior to pouring. All reinforcement bars within the limit of a day's pour shall be in place and firmly tied with 18 gauge wires. Bars with kinks or bends not shown on the Drawings shall not be used. Reinforcement bars shall not be used for supporting the workmen and concreting work. Separate supporting system shall be used for this purpose.

Concrete cover to all reinforcement bars shall be provided as shown in the Drawings using steel chairs and concrete spacer blocks.

The concrete spacer blocks shall be cast from cement sand mix in a ratio of 1:2 in suitable required sizes. These shall be well cured and dry before use in the Works. The spacers shall meet the specified requirements of water absorption. All spacers shall be properly fixed in their required positions and as directed by the Engineer.

For any structural member which shall receive fair-forced concrete surfaces, special spacers shall be used while do not impair the specified appearance of concrete surfaces.

5.05.1 Laps and Splices

No splicing of bars shall be allowed at positions other than shown on the Drawings. All lap lengths shall be of the minimum sizes as indicated on the Drawings and in accordance with ACI 318-95. Splices of adjacent bars shall be staggered, unless approved otherwise by the Engineer. All reinforcing steel fixed in position shall be inspected by the Engineer and no concrete shall be poured until steel placement has been approved in writing by the Engineer. For inspection purposes, the Contractor shall give to the Engineer reasonable notice before the scheduled pouring time. Clear concrete cover to reinforcement steel shall be as specified or indicated on the Drawings.

5.05.2 Mesh Reinforcement

a) Where indicated mesh shall be of the sizes as shown on the Drawings and conform to BS 4482 or 4449 with mesh sizes to BS 4483 or ASTM A-185 (Welded Steel Wire Fabric for Concrete Reinforcement). Mesh reinforcement when used in slabs shall be supported at proper elevations by standard accessories. In slabs on ground (porous fill), precast concrete spacer blocks may be substituted for chairs.

b) Overlaps in fabric reinforcement shall be a minimum of two meshes, except where otherwise shown on the Drawings, correctly aligned and atleast 50% of the wire intersections shall be tied with 18 gauge tying wire. Laps shall be staggered in adjacent rows of sheets.

5.06 MEASUREMENT AND PAYMENT

Reinforcing bars will be measured as per Drawings in consideration of the volumetric weight of 7.85 t/m3, without additions for rolling tolerances, deformations, waste lengths and binding wires and paid per ton at the unit rate entered in the Bill of Quantities.

The prices shall include all costs involved with the supply, transportation, storage and protection, the cutting, bending and placing, inclusive of concrete spacers, supports, stands, tying into position, etc.

Assembly stands, spacers etc., whether designated in the Drawings or not or otherwise demanded by the Engineer will not be measured and paid for separately.

If installed reinforcement must be dismantled under certain circumstances or where additional reinforcing bars are to be provided on Engineer's instruction, the Contractor is not entitled to any compensation, if such additional supplies and/or performances are required and demanded by the Engineer due to the Contractor's faulty execution of the respective work.

**** END OF SECTION****

SECTION - 6

FORMWORK

6.01 GENERAL

The formwork shall be inclusive of all labor, material, workmanship and alike. All formwork and supports thereto shall be designed by the Contractor and relevant drawings shall be submitted to the Engineer for approval before the Work is put in hand. Such an approval shall not relieve the Contractor from all or any of the obligations of the Contractor or give rise to any claims.

6.02 MAKING FORMS

The formwork for columns, beams, slabs, foundations, pits, lintels, fins, panels, purdees, parapets and all other works whether to be precast or cast-in-situ shall be of steel plates, scaffolding pipes and joints or other approved material and shall be rigidly formed and designed by the Contractor to the shapes and forms as per Drawings in accordance with the best of the existing practices, so as to be able to withstand without displacement, deflection or deformation or movements of any kind, the pressure of the moist concrete and all other loads. No plank timber formwork will be accepted at any location. Only system formwork will be accepted.

6.03 FAIR FACED FINISH

a) Facing Material
The form facing material shall produce a smooth, hard, uniform texture on the concrete. It shall be M.S. steel sheets, plywood, tempered concrete grade hardboard, metal or plastic, or other approved material capable of producing the desired finish. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the practical minimum. It shall be supported by studs or other backing capable of preventing excessive deflection. Material with raised grain, torn surface, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface, shall not be used. Tie holes and defects shall be patched. All fins shall be completely removed.

b) Shop Drawings
Shop Drawings shall be submitted by the Contractor for Engineer’s approval, showing grooves, joints etc. if indicated on the Drawings or instructed by the Engineer before taking up the job of formwork in hand.

c) Repair
No repair of surfaces designated `fairfaced' shall be allowed. Any concrete failing to achieve the desired finish or with defective surfaces shall be removed and replaced at Contractor's expense. The Engineer may reject any defective concrete surface and order it to be cut out in part or in whole and replaced at the Contractor's expenses.

6.04 RIGID WITH ALLOWANCE FOR CAMBER & BULGES

The formwork shall be fabricated and erected in position, perfect in alignment, levels and true to plumb and shape and securely braced so as to enable it to withstand all weights, dead and live, to be endured during placing of concrete and its subsequent hardening till the formwork is struck. It shall be sufficiently rigid as not to lose its shape and shall be made to compensate for bulging, and deflection to give the finished concrete the required lines, plumb, size and shape.

6.05 EXPOSED SURFACES LEFT UN-PLASTERED

In addition to the provision made elsewhere, for all the concrete work covered in this Contract which are to remain exposed in the finished work and left un-plastered, the formwork shall be smoothly faced by using M.S. steel sheets or lining the shuttering with smooth G.I. sheets or non-absorbent material like Formica sheets or in any manner as approved by the Engineer so as to make a perfectly smooth surface of the finished concrete. Where any surface defects on the exposed concrete surfaces occur and which do not impair the structural performance, being in excess of the designed surfaces and the

architectural appearance of the Work in the opinion of the Engineer such defects may be removed by guniting and grinding with carborundum stone or in any other approved manner, at the cost of the Contractor, otherwise the whole or part of the Work shall be removed and made good by the Contractor, at his own cost. For precast concrete members, the forms shall be rigid, exact and smooth.

6.06 MATERIALS AND LABORS

The Contractor shall supply all materials runners, and labor, necessary for a good and speedy erection of formwork such as steel plates, shuttering planks, struts, bolts, stays, gangways, boards, fillets etc. and shall do all that is essential in executing the job in a workman-like manner to the satisfaction of the Engineer.

6.07 FORMWORK NOT TO INTERFERE OR INJURE WORK

The formwork shall be so designed and arranged as to not unduly interfere with concrete during its placing and easy to be removed without injuring the finished concrete. Wedges, clamps, bolts and rods shall be used, when permitted and where practicable, in making the formwork rigid and in holding it to true position.

6.08 OPENINGS IN FORMWORK

Wherever concreting is required to be carried out within forms of depth exceeding 6.5 feet, temporary openings in the side of the form shall be provided to facilitate the pouring and consolidation of the concrete. Small temporary openings shall be provided at bottom of the forms to permit the removal of rubbish etc. but the same shall be suitably closed before pouring.

6.09 OPENING AND OTHER DETAILS

Provision shall be kept in the formwork such as openings, recesses, holes, pockets, fillets, etc. for housing services and other architectural details in the finished concrete or on its surface and edges as shown on the Drawings or as directed by the Engineer and to fix all necessary inserts, dowels, pipes, holdfasts etc. in concrete as shown on the Drawings or as directed by the Engineer.

6.10 JOINTS IN FORMWORK

All joints in the formwork shall be sufficiently closed to prevent leakage of mortar from concrete for concrete surfaces not to be exposed in the finished work. The joints in the finished work shall be close jointed and perfectly smooth so as not to allow any leakage of the mortar from the concrete and show any appearance of leaking mortar on concrete surfaces.

6.11 TREATMENT AND INSPECTION OF FORMS

All rubbish particularly chippings, shavings and saw dust shall be removed from the interior of the forms, before placing concrete. Forms shall be coated with approved shuttering oil before reinforcement is placed. Surplus oil on forms and any oil thus applied on reinforcing steel shall be removed. If the forms are not used within 24 hours, a fresh coat of oil shall be given before placing of concrete.

6.12 STRIPPING SHUTTERING

Formwork should not be removed until the concrete has developed sufficiently strength to support all loads placed upon it. The time required before formwork removal depends on the structural function of the member and the rate of strength gain of the concrete. The grade of concrete, type of cement, water/cement ratio, temperature during curing etc. influence the rate of strength gain of concrete.

No struts or timbering which serve the purpose of supporting the shuttering or centering shall be struck and removed without permission from the Engineer in writing and the work of striking and removal after the receipt of such permission shall be conducted under the personal supervision of the competent foremen in the employment of the Contractor and the Contractor even after the permission from the Engineer shall hold himself fully responsible for any consequences whatsoever.

In all cases the Engineer will direct and control the minimum period of time for which the forms, shuttering or centering shall remain in place before being struck; but, for the general guidance of the Contractor, the following are to be considered as the minimum periods for the main classes of Work.

Type of Formwork	Normal Weather	Cold Weather
Footing Sides	24 hours	36 hours
Vertical sides of Beams, Walls and Columns (unloaded)	24 hours	36 hours
Slabsoffits (up to 15 ft span)	10 days	14 days
Slab soffits (> 15 ft span)	14 days	21 days
Beam soffits (up to 15 ft span)	14 days	21 days
Beam soffits (> 15 ft span)	21 days	28 days

The Engineer may require, however, that any walings, soldiers, struts or other timbers or supports, the removal of which may cause the transference of load to the finished work, to be kept in place for three weeks after the placing of the concrete.

The formwork parts and connections should be arranged in a way that makes formwork removal easy and simple, prevents damage to concrete and formwork panels so that it can be reused without extensive repair.

The formwork removal procedure should be supervised by the engineer to ensure that quality of hardened concrete in structural member, i.e. it should be free from or has minimum casting defects such as honeycombing, size and shape defects etc. These defects in concrete influence the strength and stability of structure. Thus immediate repair works can be done or the members can be rejected.

The separation of forms should not be done by forcing crowbars against the concrete. It may damage the hardened concrete. This should be achieved by using wooden wedges.

Beam and joist bottoms should remain in place until final removal of all shoring under them are done.

Joist forms should be designed and removed so that the shores may be removed temporarily to permit removal of joist forms but must be replaced at once. The shores and joists will be dismantled beginning from the middle of the member's span, continuing symmetrically up the supports.

The approval from the engineer should be obtained for the sequence and pattern of formwork removal, prior to start of removal.

6.13 INJURY OR DAMAGE

The Contractor shall be responsible for any injury to the Work and any consequential damages caused by or arising from the removal and striking of forms, centering and supports, due to striking too soon. Any advice, permission or approval given by the Engineer relative to the removal and striking of forms, centering and supports shall not relieve the Contractor from the responsibilities herein defined.

6.14 TREATMENT AFTER REMOVAL OF FORMS

Any minor surface honey-combing or other irregularities are to be properly made good immediately upon the removal of the formwork and the surface made good to the satisfaction of the Engineer at the Contractor's own expense. Any small voids shall be neatly repaired with cement mortar consisting of one part of cement to two parts of sand and the whole surface rubbed over with carborundum stone and cement wash to bring the whole to a smooth and pleasing finish and uniform color.

6.15 TOLERANCES

The structure shall be built to dimensions and levels shown on the Architect's drawings. Deviation from true positions and/or levels will be accepted only if they do not affect the finished dimensions, positions and levels as shown on the Architect's drawings.

Permitted tolerances shall be in accordance with the current issue of BS 5606, Code of Practice for Accuracy in building with up-to-date amendments.

Construction Tolerances of Structural Elements Supporting curtain walls or surfaces affecting curtain wall set out:-

- Maximum deviation vertically from defined position immediately after stripping of formwork ±12mm.
- Maximum deviation laterally from defined position immediately after stripping formwork and prior to any pre-stressing (if used) ±12mm or building height/4000 whichever is greater. This laterally out of position tolerance includes all local deviations in edge of slab or edge beams as well as overall building tolerance.

NOTE: All structural tolerances given above are for curtain walls (if used) and for all external structural faces of building affecting set out of masonry, windows and other cladding/finishes.

6.16 EXTERNAL EXPOSED CONCRETE SURFACE

All external exposed concrete surfaces of cast-in-situ or precast units shall be given smooth or pattern finish as shown in the Drawings schedule or as directed by the Engineer.

6.17 MEASUREMENT AND PAYMENT

All costs for formwork must be included in the concrete prices and will not be measured and paid for separately.

**** END OF SECTION****

SECTION - 7

CEMENT CONCRETE BLOCK MASONRY WORK

7.01 SCOPE OF WORK

The Work covered by this section of the Specifications consists of all work required in connection with construction of block masonry portions of structures and partition walls including but not limited to furnishing of precast solid or hollow cement concrete blocks, cement mortar, all related items and appurtenances including all items supplied by other trades and customarily built-in and installed under masonry work or required to complete masonry work, all labor, plant, tools, scaffolding, hoisting equipment and all other materials, and in performing all operations in connection with blockwork, i.e., erecting, placing, bedding, building in, curing and protecting all masonry works, complete in accordance with requirements of Drawings, Bill of Quantities, Specifications as stated herein, and to the entire satisfaction of the Engineer and subject to the terms and conditions of this Contract.

7.02 MATERIALS

7.02.1 Portland Cement

All Portland cement for concrete block and mortar shall conform to the stipulations and requirements specified in "Section 4 – Specifications of Plain and Reinforced Concrete".

7.02.2 Sand and Coarse Aggregates

All sand and coarse aggregates for the cement concrete blocks and sand for mortar shall be obtained from approved quarries and shall conform to the requirements specified herein below:

a. Sand

Sand shall be clean, and shall be of the same quality as the sand obtained from approved quarries for concrete works. It shall be hard, strong, durable, soft and free from flaky particles, injurious amounts of dust, alkali, organic matter or other deleterious substances and shall comply with all the requirements for concrete. The Contractor will be required to screen and wash the sand to remove any foreign matter in it. The sand or fine aggregate shall be graded as specified in the section on concrete or in the manner approved by the Engineer.

Coarse Aggregate

Coarse aggregate shall be gravel obtained by screening the gravel or hard crushed stone and shall comply with the requirements for aggregates for concrete. The Contractor shall screen the aggregate through 9 mm and 5 mm sieve as many times as may be necessary to obtain such material as shall be retained on the 5 mm sieve. The grading shall be approved by the Engineer and may be modified if required. A representative sample of the aggregate collected by the Contractor from time to time shall be tested by the Engineer and if the sample would not conform with the approved grading as required by the Engineer, the entire gravel collected by the Contractor will be liable to be rejected.

The aggregate shall be free from soft, friable, porous, flaky, elongated or laminated pieces. The aggregate shall also be free from dirt, silt, clay, shale, alkali or organic matter. It shall be sufficiently strong to utilize the full strength of cementing material.

7.02.3 Water

Water used for making concrete blocks, mortar, laying of masonry, or any other operation of constructions shall be potable water free from objectionable quantities of silt, organic matter,

alkali, salts and other impurities and shall comply with the requirements of water for mixing and curing of concrete and shall be tested and approved by the Engineer.

7.02.4 **Admixtures**

a. Mortar plasticizers shall comply with the requirements of BS 4887.

b. Admixtures used in the manufacture of blocks shall comply with BS 5075.

7.02.5 **Mortar**

Pre mixed mortars shall comply with the general requirements for materials and mix proportions shall be as given in this Specification.

7.02.6 **Damp-Proof Course**

Flexible damp-proof course materials shall comply with BS 743 where applicable and shall comprise of the following:

i) bituminous roofing felt not less than 3 mm thick, or
ii) polyethylene sheeting not less than 0.5 mm thick or
iii) any other approved material

The damp-proof membrane shall be laid on an even bed of cement sand mortar (1:1) and lapped 6" at all joints. The damp-proof membrane shall cover the full width of the blocks.

7.02.7 **Bonding Ties**

Bonding Ties shall be expanded metal strips as shown on the Drawings or as directed by the Engineer.

7.02.8 **Wall Ties**

Wall ties shall comply with BS 1243 and shall be hot dip galvanized steel as approved by the Engineer.

7.03 STRENGTH OF CONCRETE BLOCK

Crushing strength shall be min 13 MPa (1900psi) unless otherwise required, considering overall dimension on the axis on which test is performed.

7.04 MAKING OF CONCRETE BLOCKS

7.04.1 All solid and hollow blocks shall be machine moulded of required sizes as shown on Drawings and approved by the Engineer and shall generally conform to the requirements of British Standard 2028, 1346:1968 "Precast 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.

7.04.2 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.

7.04.3 For casting, the moulds shall be placed on a level platform cast from 2" thick 1:3:6 concrete. The finished blocks shall be true to shape i.e. every face shall 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 will not be allowed to be used on the Work and must be removed from the Site of Work within 24 hours of their being rejected.

7.04.4 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 atleast 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.

7.04.5 The average compressive strength of any five solid blocks at random shall be not less than 1000 pounds per sq. inch.

7.04.6 The average moisture content of all the concrete masonry units shall not exceed 30% of the total water absorption of units. The shrinkage of cement concrete blocks is much greater at the time it dries for the first time after moulding and subsequent curing. It is, therefore, essential that the Contractor shall take full care to see that blocks are sufficiently and thoroughly dried so that their initial shrinkage is completed before the blocks are laid in the Works. Not only well dried blocks shall be used, but the blocks shall also be laid dry without wetting except with slightly moistened surfaces on which mortar is to be applied to obviate absorption of water from the mortar and even during curing of the mortar joints. The walls shall be slightly moistened and shall not be allowed to be excessively wet till they receive any plaster or render.

7.04.7 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.

7.05 MORTAR

7.05.1 All mortar for masonry shall be in proportion of one part of cement to six parts of sand (fine aggregate) or as directed by the Engineer. The ingredients shall be mixed by volume in purpose made gauge boxes. All mortar shall be mixed in a mechanical mixers. Hand mixing, when permitted by the Engineer shall be done on clean, hard platform of only such quantities as required for immediate use with just sufficient water to produce mortar of stiffest consistency and sufficient workability.

7.05.2 Cement shall be Portland cement as specified under the section “Plain and Reinforced Concrete” as per BS 12.

7.05.3 Fine aggregate (sand) shall be clean, hard, durable, soft and free from flaky particles as specified herein above shall be subject to the approval of the Engineer. Mortar shall be mixed only in sufficient quantities for immediate use and all mortar not used within 30 minutes after addition of water to the mix shall be rejected. Re-tempering of mortar will not be allowed.

7.05.4 The dry materials (cement and sand) shall be dry mixed for approx. two (2) minutes and for three minutes after addition of water making total minimum time of five (5) minutes in a mortar mixer. When hand mixing is permitted, dry mix, rake well, turn over materials for each batch before adding water, until uniform colour of mixed materials indicated through distribution of cementitious material. After dry mixing is complete, add water until the correct consistency is obtained.

The sand shall meet the following B.S. Specifications:

a. Sand for mortar shall comply with the requirements of BS 1200.

b. The grading of sand for general purpose mortars shall be within the limits of Table 1 of BS 1200. The grading of sand for reinforced blockwork mortars shall be within the limits of Table 2 of BS 1200.

c. The clay/silt content, when determined in accordance with BS 812, shall not exceed 3%.

d. The Chloride and Sulphate contents shall not exceed the limits given in aggregates for concrete.

7.06 LAYING OF BLOCK MASONRY

7.06.1 All blockwork shall be set out and built to the respective lengths, dimensions, thickness & heights shown on the Drawings.

7.06.2 All blockwork should be true to lines, plumb and level. Chases, grooves, raglet block and raked out joints shall be kept free from mortar and debris.

7.06.3 Blockwork shall be carried up in a uniform manner, no one portion being raised more than 3 ft. above another at one time unless special circumstances render this impracticable. All perpends, quoins etc. shall be kept strictly true and square and the whole properly bonded together. The maximum height which is to be built in one day is 5 ft.

7.06.4 All horizontal and vertical joints shall be completely and solidly filled with mortar as and when the blocks are laid.

The thickness of joints shall generally be ½" and at no point more than 5/8". All cross joints shall also be filled well.

7.06.5 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.

7.06.6 Where masonry abuts R.C.C. columns or walls, it shall be anchored thereto by means of 3/8" diameter bars at a vertical spacing of 16" and as shown on the Drawings or as instructed by the Engineer.

7.06.7 Masonry shall be cured for atleast ten (10) days from the day it is laid.

7.06.8 Mortar already spread which becomes diluted by rain shall be removed and replaced before continuing with the work.

7.06.9 Hollow blocks where used shall be placed in a manner as shown on the Drawings and/or as directed by the Engineer.

7.06.10 Block walls shall be built in stretcher bond, accurately special with each breaking joints with the course below. Intersections of block walls shall be properly bonded in alternative courses.

7.06.11 Generally, blockwork 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 ¾" deep when the mortar is still fresh so as to provide proper bond for the plaster.

7.06.12 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.

7.06.13 A solid or pre-filled course of blockwork shall be provided at sill level of openings and under bearing of all insitu concrete.

7.06.14 Pointing of exposed blockwork shall be as shown in the Drawings or as directed by the Engineer. Pointing shall be done as the work proceeds.

7.06.15 Unless otherwise shown on the Drawings or specified, the spaces around frames and other built-in-items shall be solidly filled with mortar, except the joints that are to be caulked shall be raked out ¾" deep.

7.06.16 Work required to be built in with masonry including anchors, wall plugs and accessories shall be built in, as the work progresses. Wood plugs and blocking shall not be built into masonry.

7.06.17 No masonry to be erected when temperature of outside air is below 40°F unless suitable means as approved are provided to heat material protected from cold and frost and ensure that material will harden without freezing.

7.06.18 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.

7.07 COORDINATION

7.07.1 The Contractor shall provide chases and openings in blockwork required under other sections to sizes and locations as shown in the Drawings.

7.07.2 The Contractor shall cooperate with other trades in setting built-in items, take special care in cutting, fitting, setting units so that built-in members are in their true, respective positions.

7.07.3 The Contractor shall also coordinate during blockwork for the items provided in other sections such as door frames, hold fasts, miscellaneous metal work occurring in the masonry and sleeves, anchors, supports, nailing strips, braces, jambs etc. to be built-in the masonry.

7.07.4 Special care shall be taken in building walls of door frames. Contractor shall see that frames are square and in plumb. Check frames before building blockwork around or against them. The Contractor shall see that electric conduits are not housed into frames so as to prevent extension of frame anchors.

7.07.5 The Contractor shall be responsible for any damage or abortive work due to lack of coordination on his part or due to negligence of his Site supervisory staff in coordination of various sections of Works and no compensation shall be made to the Contractor on such account. The Contractor shall reinstate/make good such affected works at his own cost.

7.08 PROTECTION AND CLEANING

7.08.1 Surface of masonry not being worked on shall be properly protected to all times during the construction operations. When rain is expected and the work is discontinued, the top of exposed masonry walls shall be covered with a strong waterproof membrane, well secured in place.

7.08.2 Exposed masonry surfaces shall be cleaned with water and fiber brushes or as directed by the Engineer.

7.08.3 Protect adjacent work during cleaning operations. Make good any damages from neglect of this account.

7.09 SAMPLES

Samples of all kind of materials to be used on the job shall be submitted to the Engineer and to be approved by him before quantities are procured for the Works. Source of supply or quality or materials not be changed unless authorized in writing by the Engineer.

7.10 TESTING

All the materials and completed masonry work shall be subjected to standard testing and if found below the Specifications and BSS or ASTM standards, shall be rejected. Rejected material shall be removed from the Site immediately at the Contractor's expense. All testing shall be done at the Contractor's cost.

7.11 CONCRETE LINTEL BEAM

Unless otherwise indicated, provide concrete lintel over openings in the concrete masonry unit walls and partitions. Lintels shall be of the size and shall be reinforced as indicated. All lintel shall be as-in

place and when exposed shall be the same color, surface texture and finish as the adjacent walls or partition. Concrete work shall conform to section 4 of this specification.

7.12 MEASUREMENT AND PAYMENT

Masonry Works in accordance with this section of Specifications shall be measured and paid for per square Meter/feet wall of a thickness as specified in the Drawings and Bill of Quantities complete and approved including mortar as specified, preparations, tests etc. but excluding cost of blocks which shall be supplied by the Employer. Openings of more than 0.28 sq.m shall be deducted. Damp-proof course shall be measured and paid for separately.

Steel anchors/wall ties for connection to R.C.C. or steel columns are deemed to be included in the above rates and will not be paid for separately.

Cuttings for conduit/pipe installations, anchors, fixing of other installations, embed items, fittings & fixtures are deemed to be included in the relevant items and will not be paid for separately.

**** END OF SECTION****

SECTION - 8
PLASTERING AND RENDERING

8.01 SCOPE OF WORK

The Work covered by this section of the Specifications consists of furnishing all plant, labor, appliances/ equipments and materials for performing all operations in connection with lathing, plastering and rendering, complete in all respect; in strict accordance with this section of the Specifications and the applicable Drawings and subject to the terms and conditions of the Contract.

8.02 APPLICABLE STANDARDS

Latest editions of following Pakistan, British & ASTM standards are relevant to these specifications wherever applicable.

Pakistan Standard
PS 232 Ordinary Portland Cement

ISO (International Organization for Standardization)
R 597 Definitions and terminology of cement.

R 679 Method of testing strength of cements, compressive and flexural strength of plastic mortar (Rilem - Embureau method).

R 680 Chemical analysis of cement& main constituents of Portland cement.

R 681 Chemical analysis of cements-mixer Constituents of Portland cement.

R 682 Chemical analysis of cements - determination of Sulphur as Sulphide.

ASTM (American Society for Testing and Material)
C 144 Aggregate for Masonry mortar
C 631 Bonding compounds for interior plastering

BSI (British Standards Institution)
812 Methods for sampling and testing of mineral aggregates, sands and fillers.

1199 Sands for external renderings internal plastering with lime and Portland cement and floor screeds.

1369 Metal lathing (steel) for plastering.

5262 External rendered finishes.

5492 Internal plastering.

8.03 GENERAL

Except as may be otherwise shown or specified, all interior & exterior plaster shall be cement plaster in specified thickness shown on Drawings & BOQ. Plastered ceilings and walls shall include partitions, piers, columns, beams, ceilings, plastered jambs and other returns, reveals, and backs of recesses and alcoves, and joints and heads of windows and doors, unless otherwise specified or shown on the Drawings. Plaster on walls shall be carried down to dado, skirting and projected bases. Plasterwork shall also include all plasterwork on and under concrete surfaces and masonry. Concrete surfaces to be left exposed and concrete not specified to be left fairfaced, as indicated on Drawings.

A 3/8" render coat shall be applied to walls with a slightly roughened surface where wall finishes of applied nature, such as ceramic tiles, marble tiles, granite tiles, textured paint etc., are to be installed over wall surfaces.

Plastering shall not commence until all electric conduits, drainage and sanitary pipes, inlets to tanks, brackets, clamps, doors and window frames and all sorts of inserts and embedded items are fixed in position. It shall be the responsibility of the Contractor to make sure that other contractors carry out all such work before starting of plasterwork. Chiseling and repairing of cement plaster shall not be permitted without the approval of the Engineer.

8.04 MATERIALS

a. Cement for plaster shall be Ordinary Portland Cement (BS 12 or PS 232) or Sulphate Resisting Cement (BS 4027 or P.S. 612) as specified and shall conform to requirements specified in the section "Plain and Reinforced Concrete".

b. Sand for plaster shall comply with the requirements of BS 1199, BS 1200, ASTM C-33 and/or the Pakistan Standard "Sand for Plaster" as directed by the Engineer.

c. Water shall be clean and free from oils, acids, alkalis, salts and organic or other injurious matter and as described in section for "Plain and Reinforced Concrete".

d. All materials and workmanship for plaster not explained in these Specifications, shall comply with the requirements of relevant BS CP 211 and CP 221 as directed by the Engineer.

e. External rendered finishes should comply with appropriate clauses of BS 882.

f. Mortar plasticizer shall comply with BS 4887 and shall be used in accordance with the manufacturer's instructions.

g. Pigments to be used shall comply with BS 1104.

h. Galvanized metal angle beads and plaster stops shall be as manufactured by the Expanded Metal Co. Ltd., London or other equal and approved.

8.05 MIXING OF PLASTER

Measurement of materials by volume shall be by containers of known capacity to maintain consistent proportions. No lumpy or caked material shall be used. Mixing equipment boxes and tools shall be clean. Materials shall be proportioned as specified on the Drawings or as directed by the Engineer. Mixing shall be continuous until all ingredients are evenly distributed and thoroughly mixed. Only limited water shall be added for proper workability and such quantity of mortar shall be prepared which can be consumed in thirty minutes after preparation. Preparation of mortar in bulk quantity for use during the entire day or for any other time more than that stipulated above is expressly prohibited. Re-tempering shall not be permitted and all mortar, which has begun to stiffen, shall be discarded.

Except where hand mixing of small batches is approved by the Engineer, mechanical mixers of an approved type shall be used for the mixing of plaster. Frozen, caked, or lumped materials shall not be used. Mechanical mixers, mixing boxes and tools shall be cleaned after mixing each batch and kept free of plaster from previous mixes. Plaster shall be thoroughly mixed with the proper amount of water until uniform in color and consistency.
Re-tempering will not be permitted, and all plaster which has begun to stiffen shall be discarded.
Plaster ingredients shall be thoroughly mixed either by hand on a clean cement concrete platform or by a mechanical mixer, as directed by the Engineer.

Water Proofing Plaster 1/2 inch. (13mm) thick 1:4 cement sand plaster mixed with approved water proofing agent.

Re-tempering will not be permitted, and all plaster which has begun to stiffen shall be discarded.

8.06 PROPORTIONING OF PLASTER ON INTERNAL AND EXTERNAL WALLS

All plaster shall be Portland cement plaster, all coats of which shall be mixed in the following proportions by volume:

- One part cement and 4 parts sand or specified otherwise.

All coats of plaster in water retaining structures shall be waterproofed by the addition of an approved waterproofing additive/admixture from BCR, Sika, Fosroc, Betocrete C-16or Master Builders or approved imported equivalent.

External plaster shall be pigmented plaster in the shades/ colors to the approvalof the Engineer.

8.07 PREPARATION OF SURFACES OF PLASTER

a. Surfaces to receive plastering shall be brushed to remove all loose particles, dust, laitance, efflorescence, etc. and any projecting fins on concrete surfaces shall be hacked off.

b. Glossy or greasy surfaces shall also be suitably cleaned and chipped off to remove all traces of mould oil.
c. Where unduly smooth in-situ concrete surfaces are encountered, such surfaces must be hacked properly before applying plaster.
d. Surfaces shall thoroughly be sprayed with water and all free water allowed to disappear before plaster is applied.
e. Irregularities in the surfaces to be plastered shall be filled with cement mortar 24 hours before plastering is commenced.
f. Before plastering is commenced, all junctions between differing materials shall be reinforced. This shall apply where walls join columns and beams particularly where cracks are likely to develop and places directed by the Engineer. The reinforcement of such joints shall consist of a strip of galvanized expanded metal lathe/mesh, at least 6" wide, which shall be plugged, nailed or stapled to the surfaces to be plastered at the intervals not exceeding 12". The joints in mesh shall be lapped minimum 6".
g. Metal angle beads shall be fixed with plaster dabs at 24" centers applied to the wall on either side of the arise and the wings of the beads pressed well in.
h. The Plaster stops shall also be fixed in a similar manner or plugged, nailed or stapled to the surfaces to be plastered to the approval of the Engineer.
i. Metal angle beads and plaster stops shall be fixed at places shown on the Drawings or as directed by the Engineer.
j. It shall be responsibility of the Contractor to ensure that all electrical conduits, pipes, concealed or embedded items, ducts, brackets, doors, window and ventilator frames, and all other fixtures on walls, ceilings, columns or required elsewhere have been fixed in position before the plastering is commenced.
k. Cuttings and chasings in the blockwork shall be repaired as per the instructions of the Engineer at least twenty four hours before the plastering is commenced.

8.08 APPLICATION OF PLASTER

The Contractor shall not start any work till the surfaces are inspected by the Engineer. In case, any plaster work is done without obtaining the consent of the Engineer, the Engineer shall have the right to order removal of all such work and cleaning and preparation of the surfaces to his full satisfaction and the Contractor shall comply with such orders without any delay.

All surfaces to be plastered shall be treated with cement slurry as a base coat for proper bond. Any approved bonding agent may also be used as an alternative to cement slurry.

Plaster to internal and external surfaces shall be applied in the thickness shown on the Drawings or specified elsewhere. In any case, the plaster thickness shall not be less than the specified thickness.

Plaster shall be applied in two (2) coats on masonry and concrete surfaces where thickness is more than 3/4". The thickness of each coat shall not exceed 3/4".

a. In case of 2 coats, the first coat or the under coat shall be full and thick and shall be applied with sufficient force to form good keys. The under coat shall be roughened and cross-scratched upon attaining its initial set to provide a proper bond to the next coat and shall be kept damp with a fog spray.
b. Finish coat shall not be applied until the under coat has seasoned for 2 days. Just before application of the finish coat, the under coat shall again be wetted evenly with a fog spray.
c. Finish coat shall be smooth finished.
d. The finish coat shall be kept moist with a fog spray for atleast 2 days and thereafter shall be protected against rapid drying until properly and thoroughly cured.

Plastering shall be executed in a neat workmanlike manner and shall be finished off with a wood or steel float, straight and plumb and shall not have wavy surface. The surface shall be of even texture and entirely free from all marks. The edges and corners shall represent a straight line. All the arises shall be rounded to 6 mm radius unless otherwise specified.

Plastering shall neatly be made good around pipes or fittings.

As far as practical, plastering shall not be commenced until all mechanical, electrical and plumbing items, conduits, pipes, fittings and fixtures have been installed in their sequence of operations.

Plaster is to be maintained in moist condition for atleast four days after it has developed enough strength not to be damaged by water.

Plaster stops and angle beads of expanded metal shall be used for protection of arises, edges and plaster ends as shown on the Drawings and as directed by the Engineer.

Plaster containing cracks, blisters, pits, discoloration or any defects shall not be acceptable. Any such defective plaster rejected by the Engineer shall be removed and replaced in conformity with these Specifications by the Contractor at his own cost to the satisfaction and approval of the Engineer.

8.09 SAMPLING OF PLASTER

Samples may be taken by the Engineer at any time from plaster work in place. Areas represented by samples which show over sanding will be rejected.

8.10 PATCHING

Plaster containing cracks, blisters, pits, checks, or discoloration will not be acceptable. Such plaster shall be removed and replaced with plaster conforming to this Specification and approved by the Engineer. Patching shall match with existing work in texture and colour.

8.11 CONCRETE / MASONRY JOINTS

All joints of concrete and block walls shall be specially treated as described here or as shown on Drawings. A 150 mm wide approved expanded metal shall be fixed at the joints and then plaster shall be applied. The expanded metal shall be with a weight of 3.0 lbs./sq. yd.

8.12 CLEANING AND PROTECTION

Rubbish and debris shall be removed as necessary to make way for work of other trades and as directed by the Engineer. As each room or space is completed al! Rubbish, debris, scaffolding and tools should be removed to leave the room clean.

Prior to plastering all aluminum windows, finished metals should be covered by sheet of plastic or tarpaulin to protect it from damage.

Protect finished plaster from injury by any source. Contractor shall also protect walls, floors and work of other trades from plaster materials.

8.13 TOLERANCES

The work shall be carried out while maintaining the following tolerances:

- Surfaces of plaster work shall be finished with a true plane to correct line and level unless otherwise specified and with walls and reveals plumb and square.
- Maximum permitted tolerances shall not exceed 1/8 inch. (3mm) in 6ft. (2 meter), but not exceeding 12 mm, maximum over the length of the building.
- Variation from plumb or level in any exposed line or surface and 1/16 inch (1.5 mm)
- Variation between planes of abutting edges or ends 1/16 inch (1.5 mm)
- Maximum permissible Offset at joints is1.5 mm maximum

8.14 MEASUREMENT AND PAYMENT

Plaster shall be measured and paid per square Meter/feet, complete and approved, at the unit rates entered in the Bill of Quantities, including preparations, junction reinforcements, angle beads, plaster stops, framing and metal furring, metal lathe, chamfered edges, rounding off corners etc. and in the thickness as specified in Bill of Quantities.

**** END OF SECTION****

SECTION - 9

CARPENTRY AND JOINERY

9.01 SCOPE OF WORK

The work covered under this section of Specifications consists of providing all material, labor, plant, equipment, appliances and performing all operations connected with the fabrication and erection of all woodwork, mill work, construction assembly, surface finish treatment and building in of all cabinet type items, supports etc. of wood or metal and incidentals, associated woodwork appurtenances, procuring and applying preservatives, installation of "Finish Hard Ware" in connection with finish woodwork as per details shown on the Drawings or as directed by the Engineer. The scope of this section is covered with detailed specifications as laid down herein.

9.02 APPLICABLE STANDARDS

Latest editions of following British and ISO Standards are relevant to these specifications wherever applicable.

ISO (International Organization for Standardization)

1891 Bolts, screens, nuts and accessories-Terminology and nomenclature.

1097 Plywood - Measurement of dimensions of panels.

1098 Veneer ply wood for general use-General requirements.

2427 Veneer ply wood with rotary cut veneer for general use-Classification by appearance of panels with outer veneer of beech.

2429 Ply wood - Veneer ply wood with rotary cut veneer for general use-Classification by appearance of panels with outer veneers of brand leaved species of tropical Africa.

3804 Ply wood-Determination of dimension of test pieces.

3805 Ply wood-Determination of density.

3806 Ply wood-Determination of moisture content.

6442 Door leaves-Measurement of defects.

6443 Door leaves-Measurement of dimensions and of defects of squareness.

6444 Door leaves-Test of behavior under humidity variations.

BSI (British Standards Institution)

459 Wooden doors.
1186 Quality of timber and workmanship in joinery.
1127 Hinges
1331 Builder's hardware for housing.
1567 Wood door frames and linings nails.
1202 Nails
1203 Specifications for synthetic resin adhesive for plywood.
1204 Synthetic resin adhesives for wood.
1282 Guide to choice, use and application of wood preservatives
1494 Fixing accessories for building purposes.
1579 Connectors for timber.
3842 Treatment of ply wood with preservatives.

9.03 MATERIALS

1. **Timber**

   Common Timber shall be sub divided into following:-.

   - ***Hardwood 1st Class***

     - Teak Burma
     - Shisham

   - ***Softwood 1st Class***

     - Deodar

   - ***Softwood 2nd Class***
     - Kail
     - Chir
     - Partal
     - Spruce
     - Garjan
     - Loagerstoemia

   Wood types to be used shall be taken as per architectural details.

2. **General Characteristics**

   All the timber shall be in accordance with the requirements of BSI No: 1186, 'Quality and Workmanship in Joinery'.

   The whole of the timber shall be from the heart of sound and fully grown tree, uniform in substance, straight in fibber, first class quality properly seasoned, free from large or loose dead knots, and open shakes and excessive sapwood. The scantlings of all timbers shall be bright, sound and square edged. The moisture content of timber shall not be more than ten (10) percent.

3. **Preservation of Wood**

   Prior to installation of all finish wood works in their respective positions, preservatives shall be applied to safeguard the woodwork against fungus, termite and bores.

   The preservatives shall be of the best available quality of solignam oil (clear) as approved by the Engineer. The method of application shall be strictly in accordance with the manufacturer's instructions. The treatment and application of all the preservatives shall comply with the requirements of BS-CP 98:1964.

4. **Adhesive:**

   The adhesives shall conform to the requirements of BSI No. 745 "Animal Glues for Wood" or as directed and approved by the Engineer.

5. **Nails and Screws:**

   All Nails shall comply with BS 1202, screws with BS 1210, bolts with BS 916 and timber connectors with BS 1579

6. **Ply Wood**

   a. The plywood shall comply in all respects with BSI No. 1455:1963. All the plywood shall

only be obtained from manufacturers approved by the Engineer.

b. Plywood used for doors, paneling and other similar works shall be to the thickness and size as shown on the Drawings or as directed by the Engineer. The grade shall be first quality and the face and back shall be free from end joints, dead knots, overlaps, patches and other surfaces shall be free, smooth for painting or polishing.

c. The veneer shall be of the required thickness and quality including base veneer and shall be impregnated with an approved adhesive and machine compressed. Such machine pressed veneered wood shall be fixed on all sides of the inner core wood (softwood of approved quality) after it has been treated with water resistant hot setting glue.

d. External quality plywood shall have Grade 2 veneer with WBP bonding and internal quality plywood shall have Grade 2 veneer with MR bonding.

7. **Manufactured Boards**

a. Blockboard shall comply with BS 3444 Grade 2.

b. Chipboard shall be resin-bonded wood chipboard complying with BS 2604.

c. MDF boards shall be "Lasani Board" complying with BS 1142 -89.

d. Gypsum plaster board shall comply with BS 1230.

8. **Decorative Plastic Laminate**

Decorative laminated plastic sheeting shall be 0.6 mm thick locally available complying to BS 3794 Class. Color and type shall be to the approval of the Engineer.

9. **Priming Coat**

Priming Coat shall comply with BS 2521.

10. **Wood Treatment**

Prior to fixing in position, all the timber including ceiling frames, joints, purlins, planks, all the door frames, furring strips, blocking, grounds, nailing strips scantlings, boards etc. in contact with concrete or masonry or wood or other materials shall first be treated with clear Termidor insecticide for termite proofing with approved pressure spraying equipment. All spraying will be done within one week of working of the material. Spraying shall once again be done at the site, after delivery and before installation in accordance with manufacturer's instructions and complying with BS 1282.

11. **Ground, Blocking and Nailing Strips**

Ground, blocking and nailing strips shall be provided in ceiling and elsewhere as necessary or as shown on Drawings to receive the Work included herein ad as required for the Work of other trades.

Except as otherwise shown or specified and approved by the Engineer, ground, blocking and nailing strips shall be secured in place as follows:-

- To steel – by means of ½" diameter bolts spaced not over 4 ft.
- To concrete blocks - by the use of steel cut nails spaced not more than 4 ft. apart and driven directly into the block.
- To poured concrete – by means of galvanized screws as per details shown on the Drawings.

12. **Glues**
All glues and adhesives used in carpentry, joinery and in the door manufacture shall be synthetic resin adhesives to BS 1204, unaffected by oil, gasoline and solvents, resistant to the growth of fungus and bacteria, immune from insects and such that the cured glue shall not be harmed by paint and lacquer solvents. The Contractor shall furnish a guarantee that the adhesives/glues used in the manufacture of all doors, joinery and paneling work conform to the Specifications stated above. All the samples of gluing materials shall be subject to the approval of the Engineer before use.

9.04 SAMPLES

All samples of the material used for the work under this Section of Specification shall be approved by the Engineer and same type of material shall be used throughout the work. If the Engineer desires to get the material tested, this will be done by the Contractor at his own cost from a laboratory approved by the Engineer.

9.05 FABRICATIONS

General
Unwrought' timber shall be used. Sawing shall be done true to the size and dimensions to finally meet the requirements of specified sizes and dimensions of the finished work.

All framing shall be joined as shown on the Drawings or as directed by the Engineer. All joints shall be secured with sufficient number of nails. The Contractor shall perform all necessary mortising, tenoning, grooving, matching, tonguing, housing, rebating and all operations required for the correct jointing. The Contractor shall also provide all metal plates, screws, nails and other fixing material that may be ordered by the Engineer for the proper execution of the joinery work. Fabrication that develop defects due to bad workmanship or unsound materials not conforming to these specifications and the directions of the Engineer, shall be cut out and replaced at Contractor's own expense before the expiry of the maintenance period.

Doors
Verify design and size of doors required for each opening. Door thickness shall be 40 mm (1 1/2 inch.) unless otherwise indicated.

Fabricate flush wood doors in accordance with the following requirements.

Cores
Edging of doors, cores and shutters shall be of wood as shown on the drawings planed to a smooth uniform thickness.

All doors and shutters shall have wood lapping on all edges as per details shown on the drawing.

Face Panels
- Door facing on each side of door shall consist of plywood have total minimum thickness of 1/8 inch before sanding.

- Door plywood shall be bonded to each other, and to core unit with approved adhesive and machine compressed.

9.06 PROTECTION OF MATERIALS

All materials and assembled units shall be protected from weather and stored in such a way as to prevent decay and attack by fungus and termites.

9.07 WOODEN DOORS& DOOR FRAMES

9.07.1 Materials

- First class Deodar wood as approved by the Engineer shall be used for the doorframes and full/half glazed and paneled shutters.

- The plywood and veneering shall be of selected best quality as approved by the Engineer.

9.07.2 Exterior and Interior Door Frames

All exterior and interior door frames shall be constructed 18 SWG MS sheet or of wood as shown on the drawings.

The door frames shall be secured in place by means of mild steel anchors welded/screwed in place and built into the masonry as it is being constructed. There shall be one such anchor near the top and bottom of each jamb but not over 900mm intervals between the top and bottom anchors.

9.07.3 Exterior and Interior Wooden Doors

The Engineer shall unless otherwise shown or specified, of the paneled type, flush and type as shown on the Drawings or as direct the exterior and interior wooden door.

All the door shall conform to the following requirements:

Paneled doors shall be constructed in accordance with the requirements of Part I of British Standard Specification No. 459 with the additional requirements that panels in exterior openings shall be assembled with waterproof glue, glued tacked in place. Flush door shall comply with BSI 459 Part-2 and shall consist of solid core 40mm (1 1/2 inch.) thick shutters as shown on drawings.

9.07.4 Door Shutters

The shutters will be fixed to the frames with approved quality hardware schedule.

All doors, shutters shall be fabricated in a workman- manner strictly to the correct sizes and shapes as shown on the Drawings or as directed by the Engineer.

The door shutters shall have solid core as shown on the Drawings. It shall be built in sections, properly jointed and glued together, both sides being covered with plywood of the required thickness and approved quality. The surfaces shall be prepared for painting or polishing.

The arrangements of inner core for solid shutters shall be approved by the Engineer. It shall be so adjusted that circulation of air is free and uninterrupted. Minute holes shall be provided in edges at suitable places to admit and exit air.

Each door shall be constructed so as to permit the installation of hinges, knobs and locks in the position shown on the Drawings.

Completed doors shall be sound, rigid and free from defects and warp. All edges shall have Deodar wood lipping and shall be aligned and smooth, joints shall be close fitting, hard wood doweled or mortised framed and of strength to maintain frame and of strength to maintain the structural properties of the member connected. All adjoining edges and faces shall be flush and smooth. Edges shall be rectangular and solid

9.07.5 Fitting. Hanging and trimming

All the doors shall be fitted, hung and trimmed as hereinafter specified and as indicated on the Drawings.

Doors shall have a clearance of 4 mm at sides and top unless otherwise directed by the Engineer and shall have 5 mm clearance at bottom. Doors shall be hung and trimmed with hardware as specified. All the locks shall be installed at the same height and shall be located at height as directed by the Engineer.

9.07.6 **Hardware**

Hardware shall be of approved quality and first class finished material. The Contractor shall obtain prior approval from the Engineer for quality; shape and pattern of ail the hardware materials by providing samples and shall provide and fix only the approved hardware materials.

Hardware shall be carefully and securely fitted. Upon handing over the work, hardware shall be demonstrated to operate freely. Keys shall be placed into respective locks and upon acceptance of the work keys shall be tagged and delivered to the Employer.

9.07.7 **Quality Assurance**

Tolerances: Doors shall be fabricated to the following

- Size: Plus or minus 1.6 mm overall dimensions
- Maximum Wrap: 3mm
- Squareness: Maximum diagonal difference 3mm (between length of diagonal measured on face of door from upper right corner to lower left corner and length of diagonal measured from upper left corner to lower right corner).

9.07.8 **Submittals**

a. Provide shop drawings showing door types, details and locations, referred to the door type and hardware group shown on door and hardware schedules.

b. Provide certificates stating that doors were constructed timbers of the species specified having moisture content and meeting equilibrium and relative humidity requirements.

c. Submit samples of face veneers for selection of color and pattern.

9.07.9 **Product Delivery, Storage and Handling**

a. Keep products dry, stack products off ground on level platforms, fully protected from weather, including direct sunlight.

b. Identify type, size and location of each door in order to permit installation at correct location.

9.07.10 **Installation**

a. Install doors at correct openings and assure smooth swing and proper closer with frames.

b. Install finishes hardware in accordance with manufacturer directions.

9.08 KITCHEN CABINETS/WOODEN

CABINETS/WARDROBES/DRESSERS/SHELVES/SEATS

All kitchen cabinet/wardrobes/dressers/shelves/seat/ file cabinetsincluding fittings, fixtures and hardware's shall be supplied of approved manufacturer and shall be of best quality fabricated by using materials and details as shown on the drawings.

9.09.01 **Installation**

All cabinets, wardrobes and shelves/seat shall be installed in position by the skilled workmen specialized in the job. Works shall be executed in accordance with drawings and the Engineer's instructions.

The Contractor shall inspect delivered cabinets, wardrobes seats and shelves and related parts for indication or location, size required by field measurements, finishing hardware and similar preliminary works. Verify locations for installation, required floor and wall finishes, painting and all other related work. Cabinets/wardrobe, shelves and seats shall exactly flush the floor and wall surfaces. Cut and fit accurately scribe strips at wall surfaces and bases. Secure wall cabinet to blocking. Concealed fasteners all joints surfaces shall be smooth and even. Doors and other moving parts shall exactly fit in the frame. Refit, as necessary, to ensure proper and easy operation. Refit, if necessary, all cabinet, wardrobes and shelves hardware, test for proper operation, remove for painting and other finishing and properly replace in position with all fittings and accessories.

All work shall be thoroughly protected from damage at all times by suitable methods approved by the Engineer. Adjacent works shall similarly be protected from damage. Any damage or disfigurement shall immediately make good at Contractor's expense.

9.09.02 Cabinet work will be coordinated with Employer supplied items (if any) such as cooking range etc.

9.09.03 Kitchen cabinet work, generally all Framing will be in treated Deodar wood with portions' etc., in best quality commercial plywood. All exposed surfaces will be covered by approved laminates. Exposed edges, if any, will be covered by polished Deodar wood lipping. Where approved counter tops for kitchen will be specified thick selected marble on painted M.S. framing.

9.09.04 Best quality hinges, metallic drawer guides (with bearing) and handles will be used. Samples and shop drawings to be approved by Engineer.

9.09.05 **Wardrobes**

Wardrobes (and similar works) will be made of deodar wood. Internal partitions will be as shown on the drawings. Shutters will have a (deodar wood) louvered front backed by laminated plywood. All louvers and exposed deodar wood edges/faces will be polished. Best quality hinges metallic drawer guiders (with bearing) handles locks catches etc., will be used. Shoe rack (inside wardrobe) will consist of 13mm dia (hollow) chrome plated M.S. rods. Samples and shop draw to be approved by the Engineer.

9.09 WOODEN LOUVERS

If shown on Drawings, wooden louvers shall be made in first quality seasoned deodar wood. Frame with recesses on sides to receive louvres shall be made as per details shown on the Drawings from first quality seasoned deodar wood planks and louvers shall be securely fixed in the recesses. The frame shall be anchored by means of 1”x4” M.S. hold fasts, and shall be perfectly in line and plumb.

9.10 ARCHITRAVES, MOLDINGS AND TRIMS

Architraves, Moldings, Beadings, miscellaneous trim and scribe pieces shall be provided as shown on Drawings and shall be in deodar wood shop milled to type, profiles and machine sanded to a smooth and even finish all to the approval of Engineer. On running trim, all outsides corners to be mitered and shall be leveled. All flat trim is to be blocked out to prevent warp. Nailing is to be concealed wherever practicable and all nails are to be driven below surface, filled in and polished or painted as specified

9.11 DEFECTIVE WORK

In the event of non-conformance to specification and drawings, the wood works shall be rejected by the

Engineer and the Contractor shall remove and replace the rejected work by new work of same specifications.

9.12 SURFACE PREPARATION

The surfaces of all wood works shall be prepared in the manner as directed by the Engineer for polishing and painting.

9.13 MOCK-UP SAMPLE

After approval of shop drawings and tests etc., the contractor shall submit at his own cost one mock-up sample of each type of wood works complete with all fittings/fixtures accessories prior to the actual fabrication of the bulk.
The samples shall be returned to the Contractor for incorporation in the works after installation of at least 80% of the works.

9.14 MEASUREMENT AND PAYMENT

Door shutters shall be measured per square Meter/ feet rough opening area, complete and approved, including cost of door frames, hardware as specified in Drawings, architraves/beadings etc. supply, fabrication, fixing, installation, at the unit rates entered in the Bill of Quantities.

No separate payment shall be made for Termite Proofing for carpentry/joinery items and shall be deemed to be included in the rates of relevant items.

All other items shall be paid at the rates entered in the Bill of Quantities.

***** END OF SECTION*****

SECTION - 10

ALUMINUM WORKS

10.01 SCOPE OF WORK

The work under this section of specification includes furnishing all labor, equipment, appliances and materials and performing all operations in carrying out the work of anodized aluminum doors, windows and ventilators (other than curtain wall type doors and windows) ventilators, louver and fly screen. All related items such as sealants, rubber gasket for glazing, netting, rollers, latches, fastenings, glazing, anchor bolts and all items supplied by other trades and customarily built in and/or installed in strict accordance with this section of the specifications and as shown on the applicable drawings and subject to the terms and conditions of the Contract.

10.02 APPLICABLE STANDARDS

Latest editions of following ISO and British Standards are relevant to these Specifications wherever applicable.

a. ISO (International Organization for Standardization

1804 Doors	- Terminology
6442 Door Leaves	- Measurement of defects of general flatness,
6443 Door Leaves	- Measurement of dimensions and defects of squareness.
6444 Door Leaves	- Test of behavior under humidity variations (successive uniform climates)
6612 Windows& Doors	Wind resistance tests
6613 Windows& Door	- Air permeability test.

b. BSI (British Standard Institution)

1227	- Hinges
4873	- Aluminum alloy windows

10.03 GENERAL

a. Aluminum doors and windows shall be of profile, pattern and design shown on drawings and manufactured by reputable manufacturer approved by the Engineer. The contractor shall provide manufacture literature completely describing the product, instructions for installation and maintenance.

b. All the sections used for doors, windows, ventilators& fly screens shall be of best quality aluminum products such as equal and unequal angles, channels, tubes, corrugated strips, moldings etc., in accordance with International standards conforming to ASTM B308&B221.

c. All doors windows& ventilators shall be of type and size indicated on drawings and shall conform to the requirements shown and specified herein.

d. Contractor shall arrange tests and analysis if directed by the Engineer of scaled models of each window type at the maker's works or any laboratory specified by the Engineer for the material supplied by him to be tested in the presence of the Engineer's Inspector, to whom test certificates, proof sheets, etc. shall be furnished. The models shall be submitted to the Engineer for approval prior to testing. 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 of materials found not in accordance with these specifications.

e. The contractor shall submit shop drawings, which shall show full construction details, quantities and locations, fastenings and attachment to adjacent construction and materials. Shop drawings shall be submitted at the proper time to allow for checking, revisions, and agreement and to permit manufacturer's product delivery and start of site work to suit the building program. The Contractor shall submit representative samples of finished windows, anchoring mechanism, embedded parts, fastenings, glass panes, accessories and other materials for the Engineer's

approval.

f. After approval of shop drawings and tests etc., the contractor shall submit at his own cost one mock-up sample of each type of aluminum works complete with glazing, all component assemblymethod and required fittings and accessories prior to the actual fabrication of the bulk. The samples shall be returned to the Contractor for incorporation in the works after installation of at least 80% of the works.

g. Fabricate and assemble all work in the shop of the approved manufacturer to reduce field fabrication to a minimum unless otherwise directed by the Engineer.

h. The glass shall conform to specification laid down under section 'Glazing' 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 drawings, so as to fit the grooves in door and window members. All the glass shall be best quality of approved manufacture.

i. The structural shape of the Aluminum members shall be of uniform quality, color and temper, clean, round, commercially straight and free from injurious defects.

j. All doors, windows and ventilators shall be fabricated as a complete unit, fully airtight and watertight, including rubber gasket for glazing, rollers, latch, anodized in specified color, inclusive of glass sheet, necessary holes for fixing, door locks, door closures and window locking requirements, all as approved by the Engineer.

k. Contractor shall, on request, get 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.

10.04 MATERIAL

10.04.1 Aluminum

a. All aluminum extruded sections shall comply with BS 1470 to BS 1474 and shall be manufactured by Pakistan Cables or approved equivalent. Certificates of origin shall be supplied in all cases.

b. All aluminum shall be anodized to comply with BS 3987 and 1615 with an anodic film thickness of not less than 25 microns. All surfaces are to be anodized.

c. Aluminum shall be supplied in natural matt anodized finish to the approval of the Engineer.

d. The Contractor/manufacturer shall provide 25 years guarantee of 25 micron anodized aluminum extruded sections against corrosion to the satisfaction of the Employer.

10.04.2 Other Components

a. All glazing gaskets are to be vinyl glazing channel gaskets (extruded Neoprene or Hypalon). Gaskets shall conform to commercial standard CS-230-60.

b. All draught seals are to be either in Neoprene as above, or in approved nylon pile, of density and configuration suitable for the designed condition.

c. All fly screens are to be approved pattern aluminum screens.

d. Hardware shall be manufacturer's standard match door and windows finish.

e. Joint sealant shall be approved elastomer.

f. The finish shall be in approved color in accordance with the standards of Aluminum Association.

g. Minimum coating should not be less than 23-25 micron.

10.04.3 Fixings

All fixings shall be in aluminum, non-ferrous metal or stainless steel, selected to prevent galvanic action with the components fastened. In no circumstances shall untreated or painted steel fixings be employed on any part of any door or window component.

10.04.4 **Glass and Glazing**

Glazing shall be provided as shown in Drawings and Bill of Quantities and shall meet the Specification requirements as described in "Section 12 – Glass & Glazing".

10.04.5 **Frames/Shutters**

The frames/shutters of anodized aluminum doors, windows, ventilator and louvers shall be formed from rolled, strip or extruded aluminum and be as per drawing. Fastening bolts and screws shall be made from hardened aluminum.

10.05 WORKMANSHIP DESIGN AND FABRICATION

The Contractor shall be responsible for the protection and installation of all items furnished. All items shall be installed plumb and square and shall be solidly anchored in a good workman like manner in accordance with the manufacturer's instruction 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 firmly be secured in the rebates with the rubber gasket. Ensure that the beads and grooves are clean, dry and unobstructed at the time of glazing. The complete unit shall be airtight and watertight on completion. No doors windows ventilator louvers shall be considered complete until and unless the fingerprints and other stains and marks have been removed from the surface of glass and aluminum.

10.06 PRODUCT DELIVERY AND STORAGE

10.06.01 Deliver doors, windows, ventilator and louvers in a manner preventing damage to units. Store materials off the ground under cover in a manner preventing deterioration or damage.

10.06.02 All embedded parts and anchor bolts shall be delivered to the site carefully and keeping the fabricated shape and configuration. All these parts shall be suitably marked for identification.

10.07 FIXING AND ERECTION

10.07.01 All aluminum doors, windows & ventilators shall be fixed in strict accordance with the manufacturer's detailed requirements and recommendations, using only fixing components specified by them, by operative experience in this work. All windows & ventilators shall be solidly and rigidly fixed, square, level, plumb and without distortion; all opening lights and hardware are to be eased, oiled and otherwise left operating smoothly.

10.07.02 All aluminum protection is to be left in place until all surrounding wet trades have been completed and cured; then removed by approved means.

10.07.03 Raw plugs and anchoring bolts shall be embedded into the concrete or block masonry for holding the doors, windows, ventilators and louvers in their correct positions.

10.07.04 Care shall be taken to install the doors and windows, ventilators and louvers in line and plumb& solidly anchored in a good workman like manner in accordance with the drawings. Should any scale or scratch appears on the surface of doors, windows, ventilators the contractor shall at his own expense and louvers the contractor shall at his own expenses and at the Engineers direction have all exposed surfaces cleaned to bare bright specified color.

10.07.05 All works shall be installed in strict accordance with the manufacturer's instructions.

10.08 PROTECTION AND CLEANING

10.08.01 Temporary protection shall be achieved by applying water-soluble protective coating capable of withstanding the action of lime mortar.

10.08.02 Apply coating in the manufacturer's plant to the exposed surfaces of all components.

10.08.03 Before application of coating, remove all fabrication compounds, moisture and dirt accumulations.

10.08.04 All the aluminum doors, windows & ventilators and other items shall be protected throughout the Contract period.

10.08.05 Any damage occurring to any of the member of the windows & ventilators before the Contract completion from whatever cause shall be rectified or replaced at Contractor's cost, all to the satisfaction of the Engineer

10.09 DEFECTIVE WORK

In the event of non-conformance to specifications and drawings the aluminum work shall be rejected by the Engineer and the Contractor shall remove and replace the rejected works by new work of same specifications.

10.10 GUARANTEE

The manufacturer shall furnish his standard written guarantee against leakage of rain, excessive infiltration of dust and air and all defects in materials and workmanship covering all work under this section.

Such guarantee shall be in addition to and not in lieu of all other liabilities, which manufacturers and the Contractor may have by law or by other provisions of the Contract Documents.

10.11 MEASUREMENT AND PAYMENT

Aluminum doors, windows & ventilators shall be measured per Square Meter/feet and paid for at the unit rates entered in the Bill of Quantities and as per the terms and Conditions of this Contract.

The unit rates shall include the cost of all glazing, aluminum sections, hardware, fly screens, fixing accessories, gaskets, sealants etc., fixing and installation, complete in all respect.

***** END OF SECTION*****

SECTION - 11

GLAZING

11.01 SCOPE OF WORK

The work under this section of the Specifications consists of furnishing all labor, equipment, tools, appliances, scaffoldings and providing glass gaskets, sealants, compound and other materials required for performing all operations in connection with the installation and setting of all types of glass, glazing and glass blocks complete in every respect in accordance with the Drawings or as directed by the Engineer. The scope of this section of Specifications is covered with detailed Specifications as laid down herein.

11.02 APPLICABLE STANDARDS

Latest editions of following British Standards are relevant to these specifications wherever applicable.

BSI (British Standards Institution)

952 Glass for glazing

5051 Security glazing Part I&I)

CP.152 Glazing

11.03 GENERAL

a. Glazing sealant shall be as recommended by the manufacturer for the particular application.

b. Spacer shims (distance pieces) shall be elasticized polyvinyl chloride (PVC). Thickness shall be equal to space shown on drawings between glass and rebates, bead or cleat. Depth shall give not less than inch cover of glazing sealant.

c. Contractor shall submit samples for each type of glass, minimum 4 ft. x 4 ft. in size with protective edges. Samples of glazing sealant minimum 0.1 liter of specified types shall be submitted. Samples of minimum of three glass blocks shall also be submitted.

d. Contractor shall submit 1 feet long sample of each type of glazing gasket.

e. Contractor shall also submit printed materials manufacturer's installation instructions for specified glazing gaskets, compounds sealants and accessories including description of required equipment and procedures and precautions to be observed.

11.04 DELIVERY STORAGE AND HANDLING

a. Contractor shall deliver materials in manufacturer's original, unopened containers clearly labeled with manufacturer's name and address, material, brand, type, class and rating as applicable.

b. Contractor shall store the materials in original unopened containers with labels intact/protected from ground contact and from elements which may damage glass.

c. Contractor shall handle the materials in a manner to prevent breakage of glass and damage to surfaces.

11.05 MATERIALS

11.05.1 General

Glass shall be free from all blemishes, bubbles, distortions and other flaws of any kind and shall be properly cut to fit the rebates so as to have a uniform clearance of 1.6 mm round the panes between the edges of glass and the rebates. All glass shall be best quality from reputable manufacturer (USA/Sweden) as approved by the Engineer.

11.05.2 **Glass**

Glass for windows, and ventilators and louvers shall be of specified thickness and of approved quality.

Clear and Tinted Plate Glass
Clear plate glass shall be imported glass complying with BS 952 Part I M Table 2, Ordinary Glazing Quality.

The single glazing shall comprise of 5 mm thick clear/ tinted plate glass.

The double glazing shall comprise of an assembly of two glass panels of clear plate glass each 6 mm thick, with a 12 mm separator between them and hermetically sealed

Clear Laminated Glass
Clear Laminated glass shall comply with BS 952, ASTM C1036 or C1048. The thickness shall be 11 mm.

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.

11.05.3 **Glazing Sealants and Compounds**

Contractor shall provide material colored to match frame in which glass is installed. Provide only compounds known to be fully compatible with surfaces, which they will contact as follows:

- Two component polysulfide glazing sealant.
- One component acrylic glazing
- Acrylic-latex glazing sealant consisting of modified latex rubber and acrylic emulsion, non-hardening, non- staining and non-bleeding.
- Cleaners, Primers and sealer as recommended by the sealant manufacturer.

11.05.4 **Accessories**

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

Glazing Sealant
It shall be tape or ribbon of polymerized butyl or mixture of buty 1 and polyisolbutylene compounded with inert fillers and pigments, solvent based, 95 percent solids thread or fabric reinforced, paintable, non- staining.

Setting Blocks
It shall be chloroprene (Neoprene) 70 to 90 durometer hardness, compatible with sealant used, channel shaped and of the necessary height for proper perimeter clearance.

Channels. Gaskets, and spacer's
It shall be chloroprene (Neoprene), 40 to 50 durometer hardness compatible with sealant used.

11.06 INSTALLATION OF GLAZING

a. Glass is to be handled with care, and placed into openings without distortion, set on such spacers, sprigs or other components as recommended.

b. Glazing shall comply with the recommendations of glass and glazing materials manufacturers.

c. Examine each piece of glass and discard and replace glass with edge damage or face imperfection. All glazing shall be wind tight and fully water tight on completion.

d. All rebates, grooves, etc. for glazing shall be prepared by thoroughly cleaning of all dirt, dust, oil, grease and other foreign matter. Clean glazing channels and other framing members indicated to receive glass. Remove coatings, which are not firmly bonded to the substrate.

e. Remove lacquer from metal surfaces wherever elastomeric sealants are to be used. Apply primer and sealer to joint surfaces wherever recommended by the sealant manufacturer and as shown on the drawings.

f. All glass shall be cut to suit each opening, perfectly square, and with due allowance for glazing tolerances, thermal expansion as recommended by the manufacturer.

g. Trim and clean excess glazing materials from surrounding surfaces immediately after installation and eliminate stains and discolorations.

h. Cure glazing sealants and compounds in compliance with manufacturer's instructions to obtain high early bond strength internal cohesive strength and surface durability.

i. All glazing secured by neoprene gaskets is to be held in place by full enclosure of gaskets, applied with approved tools, corners continuously gasketted not mitred

j. While glazing operation is in progress care shall be taken to avoid breakage or damage to the glass and adjoining glazing. The Contractor shall make good at his own cost, all glass broken by his workmen while cleaning or carrying out other operations. On the completion of the glazing work, all glass that has been set by the Contractor shall, if it becomes loose, within the maintenance period, be refixed at Contractor's expense.

k. No glazing shall be considered complete until and unless paint and other stains have been removed from the surface of the glass ad checked by the Engineer for water tightness.

l. 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.

m. All glass shall thoroughly be cleaned on completion

11.07 PROTECTION AND CLEANING OF GLAZING

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.

11.08 ACCEPTANCE

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.

11.09 CLEANING

Remove all smears, labels and excess glazing sealant, leave clean inside and outside free from scratches. The Contractor shall be responsible for the protection of installed glass. Before final acceptance, damaged or broken glass shall be removed and replaced with new glass at no additional expense to the Employer.

All glass surfaces shall be washed clean both inside and outside within two weeks prior to final acceptance by the Employer.

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.

11.10 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 shall not crack, dry out, crumble or

fall away from smash on glass.

11.11 SAMPLES

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.

11.12 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.

11.13 MEASUREMENT AND PAYMENT

No separate payment shall be made for the supply, installation and fixing of glass/ glazing as per the requirements of this section of Specifications but is deemed to be included in the unit rates of the relevant items of aluminum doors, windows, ventilators, glazed screens/walls etc. entered in the Bill of Quantities.

Glass bricks/ blocks shall, however, be paid separately per square meter/feet for the supply, installation and fixing as per the requirement of this section of Specifications at the unit rates entered in the Bill of Quantities and as per the terms of the Conditions of this Contract.

***** END OF SECTION *****

SECTION - 12

ROOF WATER PROOFING

12.01 SCOPE OF WORK

The works under this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in any floor and at any height in connection with installation of insulation, water-proofing and built-up roofing, including water proof treatment to roof, terraces, balconiesand other roofing structures complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract.

12.02 SUBMITTAL

2.1 Shop Drawings: Shop drawings showing layout and all the details for construction.

2.2 Samples of all materials proposed for use under this section shall be submitted to the Engineer for approval.

12.03 MATERIALS

a. 1/2" thick CS slurry with SBR

b. 3mm thick water proofing membrane

c. 200 micron thick polythene sheet

d. Average 3" thick PCC 1:3:6 screed

e. 3" to 1" CC 1:6 base laid to slope

f. Heat insulation tiles with expansion joints (for Roof)

g. 3/4" thick boticina marble slab (For Open Terrace)

h. Cement and aggregates shall be in accordance with specifications Sectionfor "plain and reinforced concrete".

12.04 DELIVERY STORAGE AND HANDLING

Materials shall be protected from damage during loading shipment delivery and storage non-staining materials shall be used for blocking and packing.

12.05 PREPARATORY WORK

All scuppers and roof drains shall be placed and metal flashing, cant strips flanges etc. shall be provided in time to be installed along with the roofing assembly.

All surfaces, to be treated shall be dust free and dry. Application of roof finishes shall not start unless the preparatory work has been inspected and approved by the Engineer.

12.06 APPLICATION

a. All water proofing treatment shall be done as specified, as indicated on the drawings, as per manufacturer/ supplier instruction and to the approval of Engineer.

b. Waterproofing shall not be applied during rain or while surfaces are damp, it shall be applied only to surfaces that are clean and dry.

c. Mopping of surface with bitumen shall be performed so that the surface shall be completely covered. Coats of bitumen shall be as specified in drawings. All bitumen shall be applied with mops except that the hot surfacing application shall be poured from a dipper.

d. Polyethylene sheet shall be laid in position wherever shown in drawings. Where joint is necessary at the side or end of the sheet, this shall be a double weld folded joint made by placing the edges together and folding over twice continuously taking the top edge prior to plastering or screeding. The contractor shall protect the sheets from damages during laying and subsequent operation and shall replace at his own cost all damaged sheets to the satisfaction of the Engineer.

e. Mud mortar/concrete screed of specified thickness as indicated on drawing shall be laid in slope.

f. Brick tiles of specified size laid over prepared base to be grouted and flush pointed with cement sand mortar.

12.07 MEASUREMENT AND PAYMENT

The waterproofing shall be measured per square meter and paid as per unit rates entered in the Bill of Quantities inclusive of all overlaps, complete in accordance with the terms and Conditions of Contract.

PVC water stop shall be measured per running meter and paid at per unit rates entered in the Bill of Quantities of accepted lengths a complete with accordance with the terms and Conditions of the Contract.

***** END OF SECTION*****

SECTION - 13

MARBLE AND GRANITE WORK

13.01 SCOPE OF WORK

The work under this section of specifications, consists of providing all material, labor, plant, equipment, appliances and performing all operations required for providing and installing marble natural stone slab and tile finishes in floor and special aglow marble stone in floor& skirting, where shown on the drawings, complete in strict accordance with this section of the specification and the applicable Drawings.

13.02 SUBMITTALS

Submit three range samples of size as mentioned in BOQ, of each type of marble, graniteused; showing color, grade, finishing and texture for approval.

13.03 DELIVERY, STORAGE AND HANDLING

Materials shall be protected from damage during loading, shipment, delivery and storage. Non-staining materials for blocking and packing shall be used. Stack marble units at site in accordance with manufacturer's recommendations and as required to prevent staining, scratching, etching or breakage.

13.04 MATERIALS

13.04.1 General

The marble/granite work of all types should be consistent in type, color range and texture.

Provide slabs or tiles of specified sizes in floor and wall areas as given in BOQ.

Provide marble/stone of specified thickness. Saw-cut the back surfaces that are meant to be concealed in finished work.

Provide irregular shaped units, staircase units and skirting base units to the profiles of required, with arises sharp true and matched at joints, polish exposed edges.

13.04.2 Marble/Granite Type

All marble/granite types are to be selected, as shown in drawings, as written in BOQ and as approved by the Engineer for quality, color and texture as:

a. Marble of local origin or imported, first class quality and high class finish acceptable to the Engineer.

b. As approved by the Engineer.

c. Granite shall be of good quality, having smooth, hard polished surface, regular in shape, size and of uniform thickness, of good appearance, and of sharp and square edges. It shall be free from cracks and other defects. The color and size shall be as per the instruction of the engineer, as per drawings, or given in BOQ. Sample of granite stone to be used shall be submitted to the engineer and his approval should be taken before the bulk purchase. All the granite stone supplied shall conform to the approved sample in all respect.

13.04.3 Beds and Backings

Where applicable, standard cementitious screed and mortar beds and backings, mixed and proportioned by volume as given in BOQ.
Mortar mixing shall be done as per specification for mortar mixing of block masonry work

13.04.4 **Adhesives Grouts and Sealants**

Proprietary adhesives, joint grouts and sealants of approved type as required and recommended by the manufacturer for specific application shall be used. The color of the joint grout and the sealants shall match with the color of stone/marble.

13.04.5 **Marble, Granite Counter Tops**

Marble/ Granite slabs to kitchen counters, toilet counters or others shall be provided to sizes and profiles as indicated on the Drawings. The marble/ granite tops shall be provided in configurations to suit the built-in cabinets as per approved shop drawings in approved shade and color, delivered to Site polished and finished to the approval of the Engineer. Marble/ Granite tops for toilets shall be recessed to provide wash hand basins, where required.

13.05 EXECUTION

13.05.1 **Flooring, Skirting and Stair**

Apply cement slurry coat over surfaces of concrete substrate immediately prior to placing setting bed. Limit area of application to avoid premature drying out. Install setting bed of required thickness and set marble/stone units before initial set occurs. Apply a thin layer of cement paste to bottom of each unit. Set, tamp and level units immediately. Set units in required pattern with uniform joint widths.

Joints as soon as possible after initial set. Force grout into Joints, strike flush and tool slightly concave.

Remove mortar and grout from surfaces while still moist and as the work progresses. Do not permit traffic on finished surface during setting and for a minimum of 24 hours after final pointing of joints.

13.05.2 **Dressing**

Each marble/granite stone slab shall be machine cut to required size and shape as specified in the drawings. All angles and edges of the marble/granite slabs shall be true and square and free from chippings and the surface shall be true and plane. The thickness of the stone shall be as specified in the drawings. No tolerance shall be allowed for thickness.

The marble/granite slabs shall be mirror polished. All v stones shall be brought pre-polished to the site. The contractor shall prepare samples and obtain approval of the Engineers before proceeding with the work.

The contractor shall ensure that no chisel marks are visible on the surface of the stone before fixing. Stones with chisel marks or broken edges shall be rejected.

13.05.3 **Laying**

The base shall be made rough and watered and given a cement wash and then the mortar shall be laid in 19-20 mm. thick layers as per instruction of Engineer. After laying mortar, it should be leveled with wooden floats. Proper slope for draining wash water shall be provided as per instruction of the Engineer. And over this, marble/granite stone should be laid; the joints should not be more than 1.5 mm. The joints should be painted with approved colored cement slurry.

13.05.4 **Curing**

After about 2 hours of laying, the surface shall be covered with wet bags and kept wet and left undisturbed for 2 days.

13.05.5 **Repair and Cleaning**

Remove and replace marble/stone units, which are broken, chipped, stained or otherwise damaged. Where directed, remove and replace units, which do not match adjoining stonework or are not in line and level as shown on Drawings. Provide new matching units, install and point joints to eliminate evidence of replacement. Repoint defective and unsatisfactory joints to provide neat, uniform appearance.
Clean stonework not less than 6 days after completion of work, using clean water and bristle brushes. Do not use wire brushes, acid or caustic type cleaning agents or other cleaning compounds which may be detrimental to the marble/stone finish or joint grout.

13.05.6 **Protection**

Provide covers, boards, supports and all other necessary materials to protect finished work from collapse, deterioration, discoloration or damage during installation and until contract completion.

13.05.7 **Polishing**

The finished surface shall be provided with two applications of approved wax polish or as approved by Engineer.

13.05.8 **Finish**

Finally, when the surface is absolutely dry, the surface shall be rubbed with wax to give a glazing surface, as per instruction of Engineer. Care shall be taken that the floor is not left slippery and that ordinary wax is not used under any circumstances

13.06 MEASUREMENT AND PAYMENT

Measurement shall be in square meter of exact length and breadth of the floor. Rate shall include materials, mixing, laying, curing, finishing and labor etc. all complete.

***** END OF SECTION*****

SECTION - 14

FLOOR AND WALL FINISHES

14.01 SCOPE OF WORK

The work under this section of the Specification consists of furnishing all plant, labor, equipment, appliances and materials and performing all operations in connection with the laying of cement concrete floors and floor finishes including bases, skirting and dado, complete in strict accordance with this section of the specifications and the applicable drawings and in accordance with the terms and conditions of the Contract.

14.02 APPLICABLE STANDARDS

Latest editions of following Pakistan, ISO, British& ASTM standards are relevant to these specifications wherever applicable.

Pakistan Standard

P.S. 232 Ordinary Portland Cement

ISO (International Organization for Standardization

R 680 Chemical analysis of cements Main constituents of Portland Cement.
R 681 Chemical analysis of cements Minor constituents of Portland cement.

ASTM (American Society for Testing and Materials)

C 482 Bond strength of ceramic tile to Portland cement.
C 648 Breaking strength of ceramic tile.
C 650 Resistance of ceramic tile to chemical substances.
C 798 Color permanency of glazed ceramic tile.
E 84 Surface burning characteristics of building materials

BSI (British Standards Institutions)

882	Pt.2 Course and fine aggregates from natural sources.
1199	Sands for external renderings, internal plastering with lime and Portland cement and floor screeds.
1201	Pt.2 Aggregates for granolithic concrete floor finishes.
1281	Glazed ceramic tiles and tile fittings for internal walls.
5442	Classification of adhesives for use in Construction pt-1 Adhesives for use.
203	Tile flooring
204	In-situ Floor Finishes.
209	Pt.1 Care and Maintenance of floor surface, wooden flooring.

14.03 GENERAL

14.03.1 Samples and Approval

a. All applied floor finishes materials such as terrazzo tiles, marble imported or local, imported Porcelain Tiles and ceramic tiles etc. to be used in the Works shall receive prior approval of the Engineer.

b. Samples of all the materials to be used shall be submitted to the Engineer for his selection and approval before their use in the Works. The Contractor shall strictly follow the instructions of the manufacturers and the floor finishes shall be laid accordingly.

c. Floor finishes shall be laid true to the line and level in approved manner satisfactory to the Engineer.

d. Any work covered under this section of the Specifications not conforming to the requirements of the specified quality and workmanship will not be acceptable and shall be rejected and the Contractor shall be required to remove and replace such work at his own cost as per the instructions of the Engineer.

14.03.2 Floor Screed Beds

a. All floor finishes of an integral nature such as cement concrete flooring, waterproof flooring shall be laid direct on to structural or site reinforced concrete slabs. In these cases, the slabs must first have been fully cured, then hacked, chipped or otherwise roughened to provide a good adhesion key, then brushed, hosed and cleaned thoroughly of all loose concrete, dirt, dust, grease, oil and other impurities. The surfaces shall then be thoroughly wetted for a period of at least a day before the application of the floor finish, and given a thin brush applied cement slurry grout. The floor finishes of integral nature shall then be laid as described in their respective subsections.

b. All floor finishes of an applied nature such as terrazzo tiling, ceramic/marble tiling, etc. shall be laid on a floor screed as described below at 7.03 or as per the instructions of the Engineer. The floor screed shall be laid to a thickness calculated to be the overall nominal floor thickness less the actual thickness of the applied finish.

c. Care is to be taken to relate finished floor levels to specified floor levels. The screed is to be completely flat, level and smooth, with no projections, low or high areas, etc., and finished with a wood float. Where required, the screed shall be laid to falls as shown on Drawings or as directed by the Engineer.

14.04 CEMENT SAND SCREED

14.04.1 Preparation of Base

a. The laitance on the base shall be entirely removed by complete chipping, hacking & exposing the clean coarse aggregate. All loose concrete and dirt should be removed by thorough washing or hosing. The Contractor shall not undertake any finishing work until the surfaces are approved by the Engineer.

b. The base concrete shall be wetted thoroughly for a period of at least a day before the application of floor finishes and any excess water is brushed off before laying the screed.

c. Just before the screed is to be laid, a neat grout should be brushed into the base. The grout should consist of water and cement mixed to the consistency of a thick fluid. An approved bonding agent may be used as an alternative to the grout. Excess of the grout shall be removed by thorough sweeping just prior to placing the topping material.

14.04.2 Laying of Screed

a. Cement sand screed up to a thickness of 40 mm shall be mixed in the proportions of 1:3 by volume with fine aggregate of approved size and gradation. Screeds over 40 mm thick should be mixed in the proportions of 1: 1 ½ :3 (cement: sand: aggregate) to the approval of the Engineer.

b. Where specified, Aqua guard or an equal approved waterproofing additive shall be mixed in the waterproof cement sand screed in the ratio as per manufacturer's instructions or as directed by the Engineer and shall be finished with a steel float.

c. Where screeds are to receive terrazzo or marble tiles etc. the screeds shall be finished with a slight rough finish to accept the cement paste and tiles. The mortar bed shall be spread and tamped to an even thickness over an area no greater than that, which can be tiled before the mortar reaches its initial set. However, ceramic tiles shall be bedded over a hard set cement sand floor screed laid earlier and well cured.

14.05 MARBLE FLOOR TILES

14.05.1 Description

a. The Work included under this subsection shall comprise of providing and fixing marble tiles in floors at locations shown on the Drawings in approved shades and colors. Unless otherwise specified, all marble work shall be in conformity with the latest British Code of Practice for this Work.

b. The marble tiles shall be from approved local source, uniform in color, texture, shade and quality.

c. Generally, marble tiles shall be 12”x12”x 1/2” and 24” x 24” x 3/4" or of size and thickness specified in the Drawings and Bill of Quantities.

14.05.2 Materials

a. Marble

- Marble shall be best quality Boticina marble, compact, dense, metamorphic rock of lime stone origin from quarries in Pakistan or elsewhere. It must be evenly grained with sugar like appearance. The shade and colors shall be to the approval of the Engineer.
- All marble tiles shall be totally free from cracks, defects, fissures etc. and shall have adequate strength to perform as required with good resistance against abrasion and shall have an abrasive strength not less than 20.

b. Portland cement conforming to BS 12.

c. White Cement conforming to relevant BS Specification.

d. Sand and aggregate shall comply with requirements of ASTM Specifications C-33.

e. Water shall be clean potable drinking water, free from oils, acids, alkalis, and salts and organic or other injurious matter.

f. Pigments to be used shall comply with BS 1014.

14.05.3 Samples

a. The Contractor shall provide samples of marble tiles to be used for this item of Work showing the entire range of variation and color for the selection and approval of the Engineer. The samples shall be in finished sizes and shape, the cost of which shall be deemed to be included in the rates. The approved samples shall be retained by the Engineer to form standards against which deliveries will be judged.

b. The samples supplied shall conform to the ASTM standards stated below for the determination of the following:

Weight % Absorption	ASTM C-97-47
Modules of Rupture	ASTM C-99
Compressive Strength	ASTM C-170
Resistance to Abrasion	ASTM C-241-51
Flexural Strength	ASTM C-8880-78

14.05.4 Bedding & Finishing

a. The Contractor shall employ skilled and trained marble workers for doing this job. The Contractor may be allowed to employ an approved specialist subcontractor for this item of Work. All Work shall be of the highest quality in conformance with the Contract requirements and to the approval of the Engineer. Any substandard work shall be rejected and the Contractor shall remove and replace the same at his own cost.

b. The surface over which the marble tiles are required to be fixed shall be clean of all dirt and dust and should be properly hacked so that the mortar sticks well to the surface.

c. The Contractor shall ensure that all the edges of tiles supplied at Site are at right angles to each other, unless other angles are required due to design requirements. The Contractor shall also ensure that all sizes are adequate for the Work as specified.

d. Damaged tiles or tiles with broken edges shall not be acceptable and in no case shall be used in the Work & shall immediately be removed from the Site.

e. Marble tiles shall be bedded on the wet screeding described above at 7.02.2 and 7.03 by applying a thin layer of neat cement paste on to the screed bed and the tiles placed in position and tamped down gently with a wooden mallet to be level with other tiles. The tiles shall be laid in the manner so that they align perfectly to the specified lines and levels and are square. The tile joints shall be as thin as possible but not more than 2 mm wide and shall be regular and perfectly straight, and setting out shall be carried to ensure a minimum of cut tiles. Any tiles requiring to be cut shall be saw-cut by approved tools. Tiles pattern shall be square to the spaces floored, and any patterning by tile jointing, alternating colors, etc. is to be carried out as indicated on the Drawings and as approved by the Engineer.

f. The surface during laying shall be frequently checked with a straight edge at least 2m long to obtain a true surface with dead level or slope, as directed.

g. All tile joints shall be grouted up solidly with a grout comprising of white Portland cement and water, all surplus to be cleaned off immediately.

h. Once bedded, curing shall be carried out by covering in hessian and continuous wetting for a minimum period of 3 days and the floor kept clear of traffic for at least 48 hours.

i. When cured, the marble tiling shall be polished with chemical polish to the approval of the Engineer. No wax polish shall be allowed. Polishing must be evenly and carefully carried out and a perfect smooth surface produced.

j. The marble shall be chemical polish finished to a glossy surface that will reflect light to emphasize the color and marking. All finished surfaces shall be of uniform texture, color and appearance.

14.05.5 Dado

a. Dado in all marble tiled areas are to be in marble to match the floor tiling to the area concerned, unless specified otherwise. The dado shall be produced in an identical manner as for tiling. The dado shall normally be fixed to the walls up to heights shown in the Drawings with top edges arris-rounded or as shown on the Drawings or as approved by the Engineer.

b. The dado tiles shall be fixed to walls on a plastered backing having a slightly rough surface with neat cement paste. The back of each tile shall be covered with a thin layer of neat cement paste and the tile shall then be gently tapped against the wall with a wooden mallet so that the tile faces are set in one plane. The tiles shall then be grouted and polished with chemical polish as for marble floor tiling.

14.05.6 Marble Tread and Risers

Stair tread and riser slabs shall be provided in local “Boticina” marble or imported marble in approved color and shade and to sizes and profiles as indicated on the Drawings. Treads to be 3/4” thick in single pieces as shown on Drawings, length to suit stair widths, one long edge arris-rounded and polished, risers shall be 3/8” thick in single pieces of sizes to suit stair widths; ends polished. Treads and risers shall be bedded in screed as for tiling, of thickness as indicated, all level and square or to profiles shown on Drawings, chemical polished and finished.

14.05.7 Marble Counter Tops

Marble slabs to kitchen counters, toilet counters or others shall be provided to sizes and profiles as indicated on the Drawings. The marble tops shall be provided in configurations to suit the built-in cabinets as per approved shop drawings in approved shade and color, delivered to Site polished and finished to the approval of the Engineer. Marble tops for toilets shall be recessed to provide wash hand basins, where required.

14.06 CERAMIC FLOOR TILES

14.06.1 Description

The Work included in this sub-section shall comprise of providing and fixing in position locally manufactured ceramic floor tiles in approved sizes, color and pattern at locations shown on the Drawings and mentioned in the Bill of Quantities.

14.06.2 Materials

a. Ceramic floor tiles shall be local or imported or equal approved from local source. Ceramic floor tiles for bathrooms shall be non-skid.

b. The tile shall be bedded with neat cement paste or as recommended by the manufacturer to the approval of the Engineer.

c. Joint filler shall be white cement grout which shall be non-shrinking, stain resistant, permanent in colors, and shall not inhabit fungus and bacterial growth. It shall be odorless and non-toxic, of smooth consistency for easy preparation and neat, rapid installation, and shall not contain any metallic material or ingredients. The joint floor grout shall be water resistant and shall not washout underwater.

d. Portland cement conforming to BS 12.

e. White Cement conforming to relevant BS standard.

f. Sand & aggregate shall comply with ASTM C33.

g. Water shall be clean potable drinking water, free from oils, acids, alkalis, salts and organic or other impurities and injurious matter.

h. Pigments to be used shall comply with BS 1014.

14.06.3 Samples

The tile samples for local ceramic floor tiles shall be furnished from various product ranges of different manufacturers in sizes, patterns and colors for the selection and approval of the Engineer. The approved samples shall be retained by the Engineer to form standards against which deliveries will be judged.

14.06.4 Bedding, Laying & Jointing

a. Ceramic Tiles shall either be bedded on the hard set floor screeding described above at 7.02.2(b) and 7.03 by applying a thin layer of neat cement paste on to the screed bed and the tiles placed in position and tamped down gently with a rubber mallet to be level with other tiles or directly on top of the M. S. plate with approved tile adhesive. The tiles shall be laid in the manner so that they align perfectly to the specified lines and levels and are square. The tile joints shall be as thin as possible but not more than 2 mm wide if spacer nibs not provided, and shall be regular and perfectly straight, and setting out shall be carried to ensure a minimum of cut tiles. Any tiles requiring to be cut shall be cut by approved tools. Tiles pattern shall be square to the spaces floored, and any patterning by tile jointing, alternating colors, etc. is to be carried out as indicated on the Drawings and as approved by the Engineer.

b. The surface during laying shall be frequently checked with a straight edge at least 2m long to obtain a true surface with dead level or slope as directed. Tiles that are out of true plane or placed incorrectly shall be removed and reset.

c. All tile joints shall be straight, level and of even width throughout. The tile joints shall be grouted up solidly in matching color with a grout comprising of white cement or approved tile joint filler, pigment and water; all surplus to be cleaned off immediately.

d. Once bedded, curing shall be carried out by covering in hessian and continuous wetting for a minimum period of 3 days and the floor kept clear of traffic for at least 48 hours.

e. When cured, the floor shall be washed and cleaned to the approval of the Engineer.

14.06.5 Skirting

a. Skirting in all ceramic floor tiled areas are to be of ceramic tile to match the floor tiling to the area concerned, as specified or shown on Drawings. The skirting shall be provided in an identical manner as for tiling. The skirting shall normally be 4" high with top edges arris-rounded or in the size and shape as shown on the Drawings or as approved by the Engineer.

b. The skirting shall be fixed to walls on a plastered backing having a slightly rough surface with neat cement paste. The back of each skirting tile shall be covered with a thin layer of neat cement paste and the tile shall then be gently tapped against the wall over rendered backing with a rubber mallet so that the tile faces are set in one plane. The skirting shall be grouted and finished as for ceramic floor tiles.

14.06.6 Dado

a. Dado in all ceramic floor tiled areas is to be in ceramic tiles to match the floor tiling to the area concerned, as specified or shown on Drawings. The dado shall be provided in an identical manner as for tiling. The dado shall normally be fixed on walls upto the heights shown in the Drawings with top edges arris-rounded or as shown on the Drawings or as approved by the Engineer.

b. The dado tiles shall be fixed to walls on a plastered backing having a slightly rough surface with neat cement paste. The back of each tile shall be covered with a thin layer of neat cement paste and the tile shall then be gently tapped against the wall over a rendered backing with a wooden mallet so that the tile faces are set in one plane. The dado shall be grouted and finished as for ceramic floor tiles.

14.07 QUARRY FLOOR TILES

The non-slip quarry tiles shall be in accordance to B.S. ASTM standard of sizes colors and design as indicated in the Schedule of Finishes. Square tiles shall be laid square with straight joints perfectly horizontal and vertical. Rectangular tiles shall be laid similarly to the square tiles or with broken joints to the tile face.

The preparation, Workmanship and protection are to be as described in the above Specification for Tiling work.

14.08 PORCELAIN FLOOR TILES

14.08.1 Description

The Work included in this subsection shall comprise of providing and fixing in position imported porcelain floor tiles of approved size, color and pattern at locations shown on the Drawings and mentioned in the Bill of Quantities.

14.08.2 Materials

a. Imported non-skid Porcelain Ceramic Floor Tiles shall be from RAK Ceramics, UAE, or equal approved to the approval of the Engineer in the specified size, color and pattern.

b. The tiles shall be bedded with neat cement paste or as recommended by the manufacturer and approved by the Engineer.

c. Joint filler grout shall be from the same manufacture. The grout which shall be non-shrinking, stain resistant, permanent in color, and shall not inhabit fungus and bacterial growth. It shall be odorless and non-toxic, of smooth consistency for easy preparation and neat, rapid installation, and shall not contain any metallic material or ingredients. The joint floor grout shall be water resistant and shall not washout underwater.

d. Portland cement conforming to BS 12.

e. White Cement conforming to relevant BS standard.

f. Sand & aggregate shall comply with ASTM C33.

g. Water shall be clean potable drinking water, free from oils, acids, alkalis, salts and organic or other impurities and injurious matter.

h. Pigments to be used shall comply with BS 1014.

14.08.3 Samples

The tile samples for the imported porcelain floor tiles shall be furnished from various product ranges of different manufacturers in sizes, patterns and colors for the selection and approval of the Engineer. The approved samples shall be retained by the Engineer to form standards against which deliveries will be judged.

14.08.4 Bedding, Laying & Jointing

a. Porcelain Tiles shall either be bedded on the hard set floor screeding described above at 7.02.2(b) and 7.03 by applying a thin layer of neat cement paste on the screed bed and the tiles placed in position and tamped down gently with a rubber mallet to be level with other tiles. The tiles shall be laid in the manner so that they align perfectly to the specified lines and levels and are square. The tile joints shall be as thin as possible but not more than 2 mm wide, and shall be regular and perfectly straight, and setting out shall be carried to ensure a minimum of cut tiles. Any tiles requiring to be cut shall be cut by approved tools. Tiles pattern shall be square to the spaces floored, and any patterning by tile jointing, alternating colors, etc. is to be carried out as indicated on the Drawings and as approved by the Engineer.

b. The surface during laying shall be frequently checked with a straight edge at least 2m long to obtain a true surface with dead level or slope as directed. Tiles that are out of true plane or placed incorrect shall be removed and reset.

c. All tile joints shall be straight, level and of even width throughout. The tile joints shall be grouted up solidly in matching color with approved tile joint filler and water; all surpluses to be cleaned off immediately.

d. Once bedded, curing shall be carried out by covering in hessian and continuous wetting for a minimum period of 3 days and the floor kept clear of traffic for at least 48 hours.

e. When cured, the floor shall be washed and cleaned to the approval of the Engineer.

14.08.5 Skirting

a. Skirting in all porcelain ceramic floor tiled areas are to be of porcelain tiles to match the floor tiling to the area concerned, as specified or shown on Drawings. The skirting shall be provided in an identical manner as for tiling. The skirting shall normally be 4" high with top edges arris-rounded or in the size and shape as shown on the Drawings or as approved by the Engineer.

b. The skirting shall be fixed to walls on a plastered backing having a slightly rough surface with neat cement paste. The back of each skirting tile shall be covered with a thin layer of neat cement paste and the tile shall then be gently tapped against the wall over rendered backing with a rubber mallet so that the tile faces are set in one plane. The skirting shall then be grouted and finished as for porcelain tiling.

14.08.6 Protection

The completed Works or parts thereof shall be protected by the Contractor against any damage. The Works shall be handed over in perfect condition. If any damage is incurred then the Contractor shall remove and/or replace the same at no additional costs. The Contractor shall exercise all care to protect the works executed by other trades and not covered by his Contract. Any damage to these shall be made good and the works restored at no additional cost.

14.09 MEASUREMENT AND PAYMENT

Floor tiling works covered by this section of Specifications, complete and approved, will be measured and paid for per square meter, at the individual item rates entered in the Bill of Quantities and generally in accordance with the applicable terms and conditions of the Contract.

Skirting, treads and risers shall be measured and paid for per square meter at the individual item rates entered in the Bill of Quantities, as per terms stated above.

***** END OF SECTION*****

SECTION - 15

PAINTING

15.01 SCOPE OF WORK

The work under this section of the Specifications consists of furnishing all materials, plant, labor, equipment, appliances and performing all operations in connection with surface preparation, mixing, painting concrete works, gates, grills, frames, walls, ceilings and all such surfaces as shown on the Drawings and/or as directed by the Engineer. The scope of this section of specification is covered with detailed specifications as laid down herein.

15.02 APPLICABLE STANDARDS

Latest editions of following British Standards are relevant to these specifications wherever applicable.

BSI (British Standards Institution)

BS 245 -- Specification for mineral solvents (white spirits and related hydrocarbon solvents) for paints and other purposes.

BS 2521 -- Lead-based priming paint for woodwork.

BS 2522 -- Lead based priming paint for iron and steel.

BS 2569 -- Sprayed metal coatings. Paint colors for building purposes

CP231 -- Painting of building

CP3012 -- Cleaning and preparation of metal surfaces.

15.03 GENERAL

15.03.1 Except as otherwise specified, all painting shall be applied in conformity with BS CP 231 "Painting of Building" as applicable to the work.

15.03.2 The Contractor shall repair at his own/expense all damaged or defective areas of shop-painted metal work and structural steelwork. Metal surfaces against which concrete is to be placed will be furnished shop-painted and shall be cleaned to being embedded in concrete.

15.03.3 Except as otherwise specified, all concrete and plastered surfaces are to be painted.

15.03.4 The Engineer will furnish a schedule of colors for each area and surface. All colors shall be mixed in accordance with the manufacturer's instructions.

15.03.5 Colors of priming coat (and body coat where specified, shall be lighter than those of finish coat. The Engineer shall have unlimited choice of colors.

15.03.6 Samples of all colors and finishes shall be prepared in advance of requirement so as not to delay work and shall be submitted to the Engineer for approval before any work is commenced. Any work done without such approval shall be redone to the Engineer's satisfaction, without additional expense to the Employer,samples of each type of paint shall be on separate 1 ft. x 1 ft. x 1/8 inch tempered hard hoard panels. Manufacturer's color chart shall be submitted for color specifications and selection.

15.04 MATERIALS AND EQUIPMENT'S

15.04.1 All materials shall be acceptable, proven, first grade products and shall meet or exceed the minimum standards of approved manufacturers.

15.04.2 Colors shall be pure, non-fading pigments, mildew-proof, sun-proof, finely ground in approved medium. Colors used on plaster and concrete surfaces shall be lime-proof. All

materials shall be subject to the Engineer's approval.

15.04.3 Approved quality Distemper paint shall be used for painting where specified on the drawings as directed by the Engineer.

15.04.4 The plastic emulsion/weather shield paint or similar as approved by the Engineer shall be used where specified on the drawing as directed by the Engineer.

15.04.5 Other materials/ equipment's to be used are;

- Cement primer, Turpentine, Putty, Polish paper, Wood primer, Emery polish paper and Water
- Drop cloth and polythene sheets of suitable size & quality shall be used to protect other materials and surfaces.
- The masking material where-ever necessary shall be used in sufficient quantities to avoid falling of paint on unwanted surfaces.
- Grinding / buffing wheels, wire brush & emery paper.
- Electrical distribution panels switch boards & hand lamps.
- Kerosene, thinners, acetone etc. to remove oil / grease etc.
- Painting brush:
- Good quality brushes with long and flexible bristles free from any paint residue shall be used.
- Neat, clean & painted scaffoldings of good quality.
- Good quality ladders, platforms etc.
- Safety gears to be used by personnel like respirator, face mask, hand gloves, protective clothing etc.

All material shall be delivered to site in their original unbroken containers or packages and bear the manufacturer's name, label, brand and formula and will be mixed and applied in accordance with his directions.

15.05 DELIVERY STORAGE AND CONTAINER SIZES

Paints shall be delivered to the site in sealed containers which plainly show the type of paint, color (formula or specifications number) batch number, quantity, and date of manufacture, name of manufacturer and instructions for use. Pigmented paints shall be supplied in containers not larger than 20 liters. All materials shall be stored under cover in a clean storage space which should be accessible at all times to the Engineer. If storage is allowed inside the building, floors shall be kept clean and free from paint spillage.

15.06 SURFACE PREPARATION

a. All oil, grease, dirt, dust, loose mill scale and any other foreign substance shall be removed from the surface to be painted, polished and white washed by the use of a solvent and clean wiping material. Following the solvent cleaning, the surfaces shall be cleaned by scrapping, chipping, blasting, wire brushing or other effective means as approved by the Engineer.

b. All the surfaces to be painted shall be free from dust, dirt, fungus, lichen, algae etc. old paint, varnish and lime wash should always be removed by scraping and washing.

c. All surfaces shall be made smooth, prior to the application of primer by rubbing with Bathy (silicon carbide rubbing brick) and/ or sand paper, filling the voids putty (Zinc/ Chalk/ Plaster of Paris mixture).

d. In the event the surfaces become otherwise contaminated in the interval between cleaning and painting, re-cleaning will be done by the Contractor at no additional cost.

e. No work in this section shall be allowed until all surfaces or conditions have been inspected and approved by the Engineer.

15.07 APPLICATION

All paint and coating materials shall be in a thoroughly mixed condition at the time of application. All work shall be done in a workman like manner, leaving the finished surface free from drips, ridges, waves, laps, and brush marks. All paints shall be applied under dry and dust free conditions, Unless approved by the Engineer paint shall not be applied when the temperature of the metal or of the surrounding air is below 7 degrees centigrade, Surfaces shall be free from moisture at the time of painting.

All primary paintshall be applied by brushing. The first coat of paint shall be applied immediately after cleaning. When paint is applied by spraying, suitable measures shall be taken to prevent segregation of the paint in the container during painting operation.

Effective means shall be adopted for removing all free oil and moisture from the air supply lines of the spraying equipment.

A priming coat shall be applied to the cleaned and smooth surfaces first. Unless otherwise specified in the BOQ or approved by the Engineer, all surfaces shall have at least 3 coats of paint in addition to the priming coat.

Each coat of paint shall be allowed to dry or harden thoroughly before the succeeding coat is applied. Surfaces to be painted that will be inaccessible after installation shall be completely painted prior to installation. Only as much material should be mixed as can be used up in one hour. Over-thinning will not be permitted. After the first coat the surfaces will be soaked evenly four or five times and the second coat shall be applied after leaving for at least overnight.

a. Where shown on Drawings all exterior finishes shall be stucco plaster 3/4" thick on all external surface with 1:1:2 (One white cement, one Malir sand and two Makli crushed stone passing 8mm sieve and retained on 3mm sieve) applying in external walls in panels with horizontal and vertical grooves made with 10mm wide aluminum channel nailed in walls before application of plaster, applying a spray of retarder on the plastered surface and washing of the surface with water and sponge complete to give stone finish as per directions of Engineer.

b. For Interior finishes on concrete, masonry, door, windows, cabinets, grills etc. any of the listed types of paints, i.e.; *Whitewash, Oil,* Plastic or Matte Emulsion*, Cement-based, Enamel, Distemper, Textured, Bituminous, Epoxy, Anti-condensation, Luminous (fluorescent), Latex, Lead, Metallic, Rubber, Aluminum, Silicone, Zinc rich, Anti-corrosive,* Fungicidal Paintof the approved make and shade shall be applied to surfaces as shown on Drawings or as specified by the Engineer.

Walls, floors & ceiling and adjacent equipment's and piping shall be satisfactorily protected by drop clothes. Other precautionary measures should be taken during spray / brush painting to ensure at surrounding area /equipment is not affected.

The application should be as per manufacturer's instructions / specifications. Before opening the packed drum, it should be rolled on the floor and after opening the drum paints shall be stirred well so that no material/ pigments remains settled at the bottom. Suitably of the paint shall be checked as per requirement before opening.

The choice of method of application i.e. by brush or by spray gun will be decided by the Engineer. However, adjacent equipment / structures shall be suitably protected and care shall be taken to prevent intoxication of the surrounding area. The method of paint application depending upon the area shall be jointly discussed and decided with Engineer. Paint thickness (DFT) shall be as per the item scheduled. In case the dry film thickness of finish paint is observed less than the specified values, additional coat shall have to be applied free of charge.

Polishing

After fine sanding by a skilled operator, one coat of clear polish should be rubbed in by hand using a cloth or pad, be allowed to dry and buffed up with worn fine sand paper or steel wool to remove raised grain. A second coat of clear polish should then be applied.

15.08 JOB CONDITIONS

15.08.1 Observe manufacturer's recommended minimum and maximum temperature but do not apply paint or finish to any surface unless ambient temperature is 10 degree C or above and less than 43 decree C. No painting shall be done above 90% relative humidity.

15.08.2 Adequately protect all finished work.

15.08.3 Remove and replace all items of finish hardware, device plates, accessories, lighting fixtures or other removable items.

15.08.4 In no case shall any finish hardware or other finished item that is already fitted into place be painted, unless otherwise specified

15.09 Inspection & check :

All the work is subject to the inspection of the Engineer or his authorized representative which shall be carried out in a manner, satisfactory to the Engineer. The contractor shall rectify any short comings pointed out by the said representative. The general inspection requirements are as follows:-

a. No paint shall be applied until the authorized inspection has ascertained that all prepared surfaces are satisfactorily cleaned and are in a condition to ensure the proper receipt of and adhesion of the coating.
b. The contractor shall furnish all gauges, instruments and the necessary measuring equipment's required for inspecting the work, test pieces, samples etc. at site and in the shop. The Engineer's authorized representative is intended to ensure that the material and workmanship are in accordance with this specification, but it will not relieve the contractor for any of his responsibilities for the ultimateworkmanship and performances.

15.10 QUALITY ASSURANCE

All paint for any one surface shall be top quality, of one manufacturer of the specified. Deep tone accent colors shall be used and the unavailability of final coat colors may be the basis for rejecting materials for any one surface.

15.11 MEASUREMENT AND PAYMENT

All the painting and finishing on all surfaces, other than timber and steelworks which shall be deemed to be inclusive of painting and finishing in their own items of works, shall be measured per square Meter/ft in accordance with standard method of measurement and paid for at the unit rates entered in the Bill of Quantities and in accordance with the terms and conditions of this Contract.

Where separate quantities are not shown in the Bill of Quantities, these shall be deemed to have been included in the rate of the relevant items to be finished and painted and no separate payment shall be made for painting/finishing works of such items.

***** END OF SECTION *****

SECTION - 16

MISCELLANEOUS METAL WORK

16.01 SCOPE OF WORK

The Work covered in this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with the fabrication and installation of miscellaneous metal works, complete in strict accordance with this section of the Specifications and the applicable Drawings and subject to the terms and conditions of the Contract.

16.02 GENERAL

All metal shall be well formed to shape and size, with sharp lines or angles. Shearing and punching shall be left clean to true lines and surfaces. Shop connections shall be welded or riveted and site connections bolted unless otherwise noted. Use flat headed countersunk rivets where riveted connections are exposed to view in finished work. Bolts shall be turned up tight and threads nicked to prevent loosening. All bolts shall be provided with washers.

For exposed connections with hair line joints which are flush and smooth, concealed fasteners shall be used wherever possible. If exposed fasteners are unavoidable, use countersunk flathead screws or bolts.

All metals shall be free from corrosion, scale, distortion and other damage, and only new material shall be used for fabrication purposes.

16.03 MATERIALS

16.03.1 Steel

a. All steel sections shall comply with BS 4, parts 1 and 2, and BS 4848. Steel shall be mild steel complying with BS 4360, Grades 43A, 43B and 43C as appropriate.

b. Steel tubes for structural and general engineering purposes shall comply with BS 1775.

c. Steel tubes and tubulars for balustrades shall comply with BS 1387 designation of either light, medium or heavy and the steel pipe fittings shall comply with BS 1740.

d. Galvanized MS tube shall comply with BS4 and BS 1387 medium grade.

e. Stainless steel sections shall be to BS 970, quality En. 58A. stainless steel pipes shall be to BS 3605.

f. All steel shall be supplied from a specifically approved source, from approved manufacturers, and certificates of origin and mill test certificates shall be supplied in all cases, proof of compliance with the relevant standards shall be a condition of approval.

16.03.2 Nuts, Bolts and Screws

a. Nuts and bolts etc. shall comply with BS 4190 and BS 1494 and shall have SI metric threads complying with BS 3643.

b. Stainless steel bolts are to be set bolts and shall comply with BS 4190. The stainless steel for bolts, nuts and washers shall comply with BS 970, quality En 58 A.M.

c. Self-tapping screws shall comply with BS 4194.

16.04 COORDINATION WITH OTHER TRADES

a. All work under this section shall be coordinated with the work to be done as specified under other sections of the Specifications and as well as with other trades.

b. The Contractor shall furnish all information and instructions required for work by other trades.

c. The Contractor shall drill, tap, cut and fit the work included herein as required to accommodate work of other trades in conjunction with it.

d. The Contractor shall be responsible for obtaining exact site dimensions and accurate execution of all parts of the work specified.

e. All the works shall be carried out exactly in accordance with the approved shop drawings.

16.05 SAMPLES

Samples or materials specified shall be submitted for approval when required by the Engineer.

16.06 FABRICATION

16.06.1 General Fabrication

a. All steel and other metals are to be cut, drilled, formed, bent, worked and otherwise fabricated to the details, forms and dimensions indicated on the approved shop drawings; setting out joints and fixings are to be such as to produce finished components that are perfectly square, sound and rigid. All members are to be of the sizes specified, and no alterations, additions or omissions in the size or arrangements of members may be made without Engineer's approval. The inclusion of gussets, bracing plates, fixing lugs, spacers, packings, etc. in the interests of rigidity or ease of fixing may be considered, but on a specific approval from the Engineer.

b. All open-ended members, including hollow sections, shall be capped off with welded plates or caps; no hollow surfaces which cannot be galvanized or maintained are to be left exposed to atmosphere, whether shown so on Drawings or not.

c. The provision of BS 449 shall apply generally to fabrication workmanship.

16.06.2 Joints

All steel joints specified as welded shall be cleanly and solidly welded, in general accordance with the provisions of BS 5135, using electrodes as specified in BS 639. All welds shall be continuous, solid, with no spot welding, and shall be ground off smooth flush and perfect on completion.

All joints specified as bolted, screwed or otherwise mechanically connected shall be properly set out to provide sufficient but not excessive tolerance, holes drilled accurately, and then soundly and solidly connected. All bolts, screws and connectors shall be either hot-dipped galvanized steel, stainless steel or non-ferrous metal, no untreated steel fixing device is to be used in any circumstances. Fixings shall be selected suitable for the particular purposes, and Engineer's approval obtained.

16.06.3 Tolerances

All metalwork shall be fabricated to overall dimensions so as to provide sufficient but not excessive tolerances between the components and adjoining work, and between adjoining metal components, bearing in mind building materials tolerances, thermal expansion, erection distortions and all other factors.

16.06.4 Drawings and Calculations

Detailed fabrication and shop drawings and, where appropriate, structural calculations shall be prepared by the Contractor for the approval of the Engineer for all the fabricated components. These shall be approved before commencement of work and should indicate all connections, fixing, methods of fabrication, and all other relevant details.

16.06.5 Finishes and Protection

All steel and other metal components specified for painting shall be finished in a smooth workmanlike fashion, free of irregularities of surface, burrs, galvanizing excess, mill marks, oil, grease, dirt, etc. ready for painting.

All metalwork shall be protected during transportation delivery, storage on Site, and after erection, by such measures as shall be agreed with the Engineer, to prevent damage of any

type, in particular scratching, denting, distortion, and other mistreatment. Materials so damaged will not be acceptable, and shall have to be replaced.

16.06.6 **Riveting**

Riveting where exposed shall be flush unless otherwise indicated on Drawings or directed by the Engineer.

16.06.7 **Bolting**

Bolting, where permitted, shall be done with proper size bolts. Nuts shall be drawn tight and thread nicked.

16.06.8 **Steel**

The use of Structural Steel in Buildings shall comply with BS 449 Part 2.

16.06.9 **Welding**

a. Welding of all steel shall comply with BS 5135. All welded joints which will be exposed shall be ground to a smooth finish. All welding shall be executed by experienced certified welders.

b. Welding shall be continuous except where tack-welding is specifically permitted. Tack welding will not be permitted on exposed surfaces.

c. Where galvanized items are to be welded, the weld and joint shall be ground smooth. Only complete welded assemblies may be hot pip galvanized. No cold galvanizing paint permitted cold galvanizing zinc.

d. No black bolts will be accepted. Only H.D. galvanized bolts shall be allowed.

16.06.10 **Shop Finishing**

a. Provide a 6 micron thick zinc coating for the items shown or specified to be galvanized using the hot dip process after fabrication.

b. Shop paint all ferrous metalwork except galvanized work and those portions of items which are to be embedded in concrete or masonry and surfaces and edges which are to be site welded.

c. Remove scale, rust and other deleterious materials before the shop coat of paint is applied.

d. Immediately after surface preparation, anticorrosion metal primer paint be applied in accordance with the manufacturer's instructions. Use painting methods which will result in full coverage of joints, corners, edges and all exposed surfaces.

16.06.11 **Installation**

a. Provide anchorage devices and fasteners where necessary for securing to finished work including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, rag-bolts, wood screws and other connectors as necessary.

b. Cut, drill and fit as necessary for installation. Set the work accurately in location, alignment and elevation, plumb, level and true. Provide temporary bracing or anchors in formwork for items which are to be cast or built into concrete, masonry or similar construction. Form right joints with exposed connections accurately fitted together. Do not cut or abrade members with finishes which cannot be completely restored on Site. Where cutting, welding and grinding are required for fitting and jointing of the work, restore finishes to eliminate any evidence of such corrective work.

c. Carry out all welds and carefully make good on completion.

d. Immediately after erection, clean all site welds, bolted connections and rough areas of the shop paint and coat all exposed areas with the same material as used for shop painting.

e. No site welding to galvanized item will be permitted.

16.06.12 **Storage and Handling**

a. All items described under this Section shall be handled, delivered and stored in a manner that will avoid damage, rust or deformation. Items shall be stored off-ground and shall be entirely covered with weatherproof coverings in storage area.

b. Items which become rusted or damaged because of non-compliance with these conditions will be subject to rejection, and such items shall be replaced without additional cost to the Employer.

16.06.13 **Protection**

a. Before arriving on Site, all surfaces of hot-dip galvanized method which are damaged, have rough spots or joints may be permitted to be by the Engineer be touched up, using an approved zinc primer coat. Damaged hot dip galvanized components will however generally be rejected. Primer shall be compatible for finish paint. Hot dip galvanized items shall not receive a shop coat of primer so that there may be a visual inspection on Site of such items by the Engineer.

b. Thoroughly insulate all non-ferrous items in contact with dissimilar metals, concrete, masonry and mortar with approved zinc-chromate coating or plastic membrane on contact surfaces before installation.

16.07 MISCELLANEOUS ITEMS

16.07.1 **Hollow Metal Frames and Doors**

Metal doors shall comprises of M.S. frames and shutters. All shapes and sizes of complete unit as well as components shall be strictly in accordance with details shown on the Drawings, fabricated, painted and fixed to hollow metal frame as per details shown on the Drawings.

a. **Frames**

i. All hollow metal frames shall be fabricated using 16 gauge M.S. sheets of best quality, free from all defects, and in accordance with the details indicated on the Drawings and Bill of Quantities.

ii. Frames shall be constructed as full welded units from approved manufacturers as per approved shop drawings.

iii. All corners mitred and back-welded and any exposed welds at all joints ground and dressed smooth.

iv. Anchors shall be provided as per approved details, 9” long, three to jambs and welded to frame at shop for embedding in blockwork.

v. All frames shall have channel spreaders. Frames cut, reinforced, mortised, drilled and tapped as required for application of all hardware. All frames shall be fabricated as per final approved hardware schedule.

vi. Rubber/Neoprene bumper or sound absorbers shall be installed 3 per strike jamb.

vii. All contact edges shall be closed tight.

viii. Finished work shall be strong and rigid, neat in appearance and free from defects, warps, bulges or buckles. Moulded members shall be clean-cut straight with true edges.

ix. All cut-outs shall be protected against mortar or plaster with mortar guards of approved gauge.

x. After the frame is fabricated, all tool marks shall be ground smooth, all exposed surfaces degreased and thoroughly cleaned of rust, oil and other impurities and coated with approved primer to enable the surface of the metal to resist corrosion and promote paint adhesion. The remaining irregularities specially welding shall be dressed smooth.

b. **Doors**

Single or double leaf doors shall be fabricated from 20 gauge M.S. sheets of best quality and free from all defects and in accordance with the details indicated on the Drawings and Bill of Quantities.

The doors shall be manufactured from approved manufacturer as per the approved shop drawings. The door shall be provided with hinges and ready to receive locks etc.

c. **Installation**

i. Doors and frames that are fabricated and brought on the Site shall be approved by the Engineer before installation. Any defective or substandard work shall not be acceptable.

ii. Doors and frames shall be installed in accordance with the manufacturer's drawings and recommendations, all to the satisfaction of the Engineer.

d. **Painting**

i. One coat of anti-corrosion primer paint shall be applied to all exposed surfaces before the door and frame is installed. After this another base coat of enamel paint should be given.

ii. After the door and frame has been installed properly, three coats of enamel paint of an approved quality and shade shall be finally applied to all exposed surfaces.

e. **Storage and Handling**

The Contractor shall be responsible for storage, handling and protection of the material on the job. Scratches, holes, dents and nicks and other marring of the paint film will have to be made good and touched up without any extra cost.

16.07.2 **Pipe Handrail**

M.S. pipe hand rail shall be fabricated and installed, as per details indicated on Drawings & Bill of Quantities, by approved manufacturers in accordance with approved shop drawings. The pipe handrail shall be of 2 ½" dia M.S. balusters, M.S. fixing brackets/plates and screws etc., painted and installed.

16.07.3 **M.S. Ladder**

M.S. ladder shall be fabricated and installed, as per details indicated on Drawings & Bill of Quantities, by approved manufacturers in accordance with approved shop drawings.

16.08 MEASUREMENT AND PAYMENT

Metal doors shall be measured per square meter and paid for at the unit rates entered in the Bill of Quantities, inclusive of hollow metal frame, anchors, hardware, painting, installation, complete in all respect.

M.S. pipe handrail shall be measured per-running foot and paid for at the unit rate entered in the Bill of Quantities, inclusive of M.S. balusters, M.S. fixing brackets / plates, screws etc., painting and installation, complete in all respect.

M.S. ladder shall be measured and paid for at the unit rate entered in the Bill of Quantities, inclusive of all materials etc., painting and installation, complete in all respect.

***** END OF SECTION *****

SECTION - 17

WALL TILING

17.01 SCOPE OF WORK

The Work under this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with providing and laying of wall tiles, complete in strict compliance with this section of Specifications, the applicable Drawings and in accordance with the terms and conditions of the Contract.

17.02 GENERAL

Best quality local or imported wall tiles from approved manufacturers in approved size, color and pattern at locations shown on the Drawings and in the Bill of Quantities shall be supplied and laid dully approved by the Engineer.

17.03 MATERIALS

Tile can be from of any of the types listed below:

Ceramic tiles, Porcelain tiles, Marble tiles, Granite tiles, Cement tiles, Vitrified tiles, Glass Tiles, Mosaic Tiles, Travertine tiles, Slate Tile, Quartzite Tiles etc.

a. All the tiles shall be perfectly true to shape, flat, free from crazing, walks and other flaws and shall be consistent in color and pattern equal to samples presented to the Engineer for approval. The bedding faces of all tiles shall be keyed to an approved pattern.

Except as otherwise specified, the following British Standards and Code of Practice shall be applicable to materials and fixing methods for ceramic tiles:

i. British Standard 1281: 1966 “Glazed Ceramic Tiles and Tile Fittings for internal wall”.

ii. British Standard CP 212: for fixing methods and workmanship.

b. Adhesives for ceramic tiling shall be neat cement paste or as recommended by the tile manufacturer.

c. Joint Filler shall be white cement grout in matching color which shall be non-shrinking, stain resistant, permanent in color, and shall not inhabit fungus and bacterial growth. It shall be odorless and non-toxic, of smooth consistency for easy preparation and neat, rapid installation, and shall not contain any metallic material or ingredients. The joint grout shall be water resistant and shall not wash out under water.

d. Portland cement conforming to BS 12.

e. White Cement conforming to relevant BS Specifications.

f. Sand shall comply with ASTM C-33.

g. Water shall be clean potable drinking water, free from oils, acids, alkalis, salts and organic or other injurious matter.

h. Pigments to be used shall comply with BS 1014.

17.04 SAMPLES

All wall tiles materials such as ceramic tiles etc. to be used in the Works shall receive prior approval of the Engineer.

The Contractor shall submit adequate number of samples of tiles from the product ranges of different local manufacturers for the selection and approval of the Engineer. The approved samples shall be kept by the Engineer to form standards against which all deliveries will be judged.

The Contractor shall strictly follow the instructions of the manufacturers and the wall finishes shall be applied accordingly.

Wall tiling to internal and external walls and fascia shall be fixed true to the line level and plumb in approved manner satisfactory to the Engineer. All tiles shall be aligned properly with straight joints in even widths.

Any work covered under this section of the Specifications, not conforming to the requirements of the specified quality and workmanship will not be acceptable and shall be rejected by the Engineer, and the Contractor shall be required to remove and replace such work without any claim at his own cost as per the instructions of the Engineer.

17.05 BEDDING AND JOINTING

a. The tiles shall be fixed to the walls over a rendered backing as described below:

Rendered Backing

The tiles to be fixed to walls shall be fixed on a rendered backing. Walls to be tiled are to be prepared exactly as for rendering/plastering. A 10 mm thick cement sand render coat shall then be applied exactly as described for plastering in a ratio of 1:4. The surface to be scratch-keyed as approved and particular attention to be given to curing. The tiles shall be fixed to this rendered backing with a paste of cement.

b. Surfaces to receive the ceramic tiling shall be clean and free of dirt, dust, oil, grease or other objectionable material.

c. After having been immersed in clean water for a minimum of 7 hours, until saturated the tiles shall then be bedded in a bedding coat of cement paste, all to the approval and instructions of the Engineer.

d. Tiles shall be set out carefully and bedded to a true vertical face, square and plumb, aligned in accurate continuous horizontal and vertical courses to an un-bonded pattern so as to give regular joint widths of approx. 2 mm if spacer nibs are not provided.

e. Tiled areas shall be cured when set by continuous wetting for a minimum period of 3 days.

f. When cured, tile joints shall be pointed with a liquid neat white Portland cement grout in matching color so as to fill each joint solidly and continuously. When set, joints shall be finger-smoothed off to an even concave profile.

g. Tiles where required to be cut shall be marked off and cut with approved tools perfectly square and true, with no chipped or cracked edges. Cut tiles shall generally be positioned on the perimeters, and setting-out should be carefully carried out to ensure this. Tiles shall similarly be carefully and cleanly cut around pipes, fixings and other projecting components.

17.06 PROTECTION

The completed works or parts thereof shall be protected by the Contractor against any damage. The works shall be handed over in perfect condition. If any damage is incurred then the Contractor shall remove and/or replace the same at no additional costs. The Contractor shall exercise all care to protect the works executed by other trades and not covered by his Contract. Any damage to these shall be made good and the works restored at no additional cost.

17.07 MEASUREMENT AND PAYMENT

Wall tiling work covered under this section of Specifications, complete and approved, will be measured and paid for per square meter including preparations, rendered backing, tile adhesive, grouting and

pointing etc. at the respective individual item rates entered in the Bill of Quantities and generally in accordance with the applicable terms and Conditions of the Contract.

***** END OF SECTION *****

SECTION - 18

SUSPENDED CEILING

18.01 SCOPE OF WORK

The Work under this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with the installation of suspended ceilings at locations shown on the Drawings, complete in strict accordance with this section of the Specifications and applicable Drawings and subject to the terms and conditions of the Contract.

18.02 GENERAL

a. Suspended ceilings to be provided at the project shall be Gypsum Board Ceiling:

b. All the suspended ceilings shall be installed in conformance with British Code of Practice: CP 290.

c. In most cases, ceilings are intended to conceal or contain services. The Contractor shall liaise directly with the mechanical and electrical services specialists and following this shall prepare detailed reflected ceiling plans and shop drawings of each area of ceiling indicating the intendedmethod of framing, tile layout, position of electrical light fittings & smoke detectors etc. for the approval of Engineer. Requirements for removable access panels shall be determined by the services specialists and indicated on the drawings accordingly. Suspended ceilings shall then be installed as per the approved shop drawings.

d. Suspended ceilings shall be installed by specialist subcontractors as per the recommendations of the manufacturers in conformity with the approvedshop drawings and to the approval of the Engineer.

18.03 SAMPLES

a. The Contractor shall provide samples of gypsum board ceiling tiles, and proposed suspension and framing systems for the selection and approval of the Engineer. The samples shall be in finished sizes and shape, the cost of which shall be deemed to be included in the rates. The approved samples shall be retained by the Engineer to form standards against which deliveries will be judged.

b. All the materials shall be supplied from the approved manufacturers as per the samples approved by the Engineer.

18.04 MATERIALS AND INSTALLATION

Gypsum Board Ceiling

Gypsum board ceiling shall comprise of gypsum board tiles, 7.5 mm thick, fixed to the framing.

Framework to be fabricated from wooden runners or galvanized steel metal frame. Sizes of sections to be appropriate to spans and framing conditions so that a perfectly stable and rigid result is achieved.

Boards are to be fixed to the framework with rustproof self-tapping screws/nails with heads countersunk and filled. Gaps between boards are to be filled with a suitable inert filler and the whole surface sanded off so as to produce a perfectly plane smooth matching surface.

Removable access panels shall be provided where indicated on the approved reflected ceiling plans. The panels shall be secured by suitable rustproof proprietary fixing devices.

Propriety Acoustic Suspended CeilingSystems

The suspended ceiling systems shall be from approved suppliers/ manufacturers all propriety ceilings shall be inclusive of all suspension system steel framing, trims angles exposed or concealed grid system subject to approval of the Engineer.

Approved Manufacturers

- U.S. Gypsum
- Armstrong

- Or other approved suppliers, manufacturers

Dampa Acoustic Metal Pan CeilingSystems

The suspended aluminum ceiling systems shall be from approved suppliers/ manufacturers all propriety ceilings shall be inclusive of all concealed/ exposed system as recommended by the manufacturers and approved by the Engineer. Various whole sizes and perforation patters in conformation with colored acoustic felt bonded to the reverse side of the tiles shall be used to achieve optimal acoustics. All panels must achieve NRC rating of 0.75 ASTM minimum panel size shall be 600mm x 600mm.

Approved Manufacturers

- Dampa U.K
- Thermec Engineering (PVT) LTD.
- Or other approved suppliers, manufacturers

- **Other Ceiling Systems**

  - Mineral fiber Acoustical Ceiling Tiles.
  - Glass fiber Insulation board adhesive applied to chip board panels
  - False Ceiling comprising of Fur Wood Planks.
  - False Ceiling of Fur Wood planks with deodar wood facia

18.05 WORKMANSHIP

a. The installation of suspended ceiling shall be carried out byapproved specialist subcontractors with adequate experience in this field.
b. The Work shall generally by executed in accordance with best practice; members shall be cut, drilled and framed, joints made, fixings positioned and made, and work assembled and fixed generally in accordancewithapprovedshop drawings and manufacturers recommendations.
c. The workmanship shall generally comply with the standards set out in CP 290.
d. All suspended ceilings shall be set out and installed in accordance with the details shown on the approved reflected ceiling plans and shop drawings and no modification in form or detail may be made except with the specific approval of the Engineer.
e. All fixtures shall be fixed as per approved plans.
f. No suspended ceilings shall be fixed until all wet trades and services above have been completed.

18.06 PROTECTION

a. All the suspended ceilings shall be protected throughout the Contract period.

b. Any damage occurring to the suspended ceiling before the Contract completion from whatever cause shall be made good or replaced at Contractor's cost, all to the approval of the Engineer.

18.07 MEASUREMENT AND PAYMENT

Suspended ceilings shall be measured per square meter and paid at the unit rates entered in the Bill of Quantities inclusive of all framing, suspension system, accessories, painting, access panels, recesses for lights etc., complete in all respect.

***** END OF SECTION *****

SECTION - 19

WATER RETAINING STRUCTURES

19.01 SCOPE OF WORK

The Work covered under this subsection of Specifications consists of furnishing all labor, tools, scaffolding, hoisting equipment, appliances and materials of every kind and character; and in performing all operations in connection with procurement, transportation and delivery, supply and installation of special provisions for water retaining structures to ensure water tightness in all possible respects in strict accordance with requirements of Drawings and Bill of Quantities as specified herein, and to the entire satisfaction of the Engineer and subject to the terms and conditions of the Contract.

19.02 GENERAL

a. Special consideration shall be given to the control of cracking and the provision of dense impervious concrete. Special consideration will also be given to the design of the concrete mix and to the supervision of the placing and compacting in order to provide a dense impermeable concrete. The mix shall be of the stiffest consistency having a workability which will ensure that it can be satisfactorily placed in the formwork and compacted without risk of segregation, honey-combing, sweating or bleeding. Special care shall be given to the method and order of placing the concrete and to the construction of joints in order to achieve full continuity and complete water tightness.

b. The Contractor shall maintain an accurate record of ambient temperature at Site.

c. Ambient temperature shall be measured using mercury thermometers or other thermometers acceptable to the Engineer.

d. 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;

- Design of concrete mixes
- Control of quality of concrete
- Supervision of mixing, transporting, placing, compacting, finishing, curing and protecting concrete including thermal control of concrete pours.
- Supervision of sampling and testing.
- Preparation and submission of test certificates and reports.
- Compilation and keeping of record.
- Such other duties as the Engineer may direct.

19.03 CEMENT CONTENT

The minimum cement content for all water retaining structures shall be 385 kg/m3 and the maximum cement content of 500 kg/m3. The maximum water-cement ratio shall not exceed 0.42.

19.04 ADMIXTURES

a. Suitable admixtures from BCR, Sika, Fosroc, Betocrete C-16or Master Builders may be used in concrete mixes with the prior approval of the Engineer. The amount of admixtures added to each batch of concrete requires careful control and shall be added in the doses as recommended by the manufacturers and approved by the Engineer. The cost of the admixtures shall be deemed to be included in the rates.

b. For use of an admixture, the information required by the Engineer shall be submitted to him for each admixture for his approval.

19.05 JUNCTION OF FLOOR AND WALL

Where the walls are designed to be monolithic with the bottom slab and beam system, a continuous upstand section of the wall shall be cast at the same time integrally with slab. A suitable arrangement of the reinforcement and formwork shall be made to facilitate this. The height of this upstand, which shall not be less than specified shall be sufficient to enable the next lift of formwork to fit tightly and avoid leakage of the cement paste from the newly deposited concrete. Such leakage, where it occurs is liable to cause porosity in the finished concrete and is not acceptable.

19.06 PIPES THROUGH WALLS AND FLOOR

When it is necessary for pipes to pass through a wall or bottom floor, it is preferable to cast the pipes into the panel when it is concreted. If this is not practicable, it will be necessary to box out. In either case, it is desirable that the position of the pipe shall not coincide with a joint. When an opening has been boxed out the sides of the opening shall be treated as construction joint.

All piping and fittings shall be tested as a unit for leaks immediately prior to concreting. The testing pressure above atmospheric pressure shall be fifty (50) percent in excess of the pressure to which the piping and fittings may be subjected but the minimum testing pressure shall be not less than 1.0 N/mm2 150 psi above atmospheric pressure. The pressure test shall be held for four hours with no drop in pressure except that which may be caused by air pressure.

No liquid, gas or vapor, except water not exceeding 32°C nor 0.135 N/mm2 pressure, is to be placed in the pipes until the concrete has thoroughly set.

The concrete cover of the pipes and fittings shall be not less than 1½ inch. The piping and fittings shall be assembled by welding, brazing, solder seating, or other equally satisfactory method. Screw connections shall be prohibited. The piping shall be so fabricated and installed that it will not require any cutting, bending, or displacement of the reinforcement from its proper locations.

Drain pipes and other piping designed for pressure of not more than 1 psi above atmospheric pressure need not be tested.

19.07 ARRANGEMENT OF REINFORCEMENT

Particular attention shall be given to the spacing of reinforcement at points so that access to the concrete surface can be provided to enable it to be prepared to receive the following batch of concrete.

The length of lap and anchorage provided shall be in accordance with the requirements of ACI 318-95.

19.08 FORMWORK

Ties used to secure and align the formwork shall not pass completely through any part of the water retaining structure unless effective precaution can be taken to ensure water tightness after their removal. The ends of any embedded ties shall have cover equal to that required for the reinforcement. The gap left from the end of the tie to the face of the concrete shall effectively be sealed. Any steel left in the structure shall be adequately protected against corrosion.

19.09 CONSTRUCTION

The degree of success in achieving a watertight structure depends on the quality of workmanship in making and placing concrete, good on site organization, proper ground water control, clean and dry excavation, careful storage of materials, close-fitting formwork, correctly fixed reinforcement and clean joints.

It is essential that the concrete, when placed, is thoroughly compacted to form a dense uniform mass. The mix shall be of adequate workability and compaction by vibration. Immediately after the removal of formwork, the concrete surface shall be carefully inspected and any defects made good as soon as possible.

19.10 CURING

Even after minimum curing period specified in the clause pertaining to curing in the Specifications for Plain and Reinforced Concrete, it may be desirable to prevent drying of the concrete and to restrict the range of temperature changes which it is subjected to.

19.11 INSPECTION AND REPAIR

As soon as possible after completion of the water retaining structures, the structure shall be examined for defects which may lead to water penetration or leakage. All openings exposed to the weather shall be covered and all water on the floors shall be removed and the surfaces allowed to dry before the inspection. Water retaining structures shall be tested in accordance with BS: 5337 or other approved standard.

Defects that are revealed through which water may penetrate or leak shall be repaired by the Contractor to the entire satisfaction of the Engineer. Where internal repairs are to be made, the areas of weakness shall be isolated by suitable means and any cracks sealed by an approved process by a specialist contractor experienced in this type of work.

19.12 INSPECTION AND MAKING GOOD

a. Inspection of Defects

(i) Surfaces exposed after stripping shall be inspected by the Concrete Engineer of the Contractor, together with the Engineer. The following standards shall be valid for the assessment of the concrete quality:

- The appearance of the concrete surface must conform to the specified classification of finish, refer to Subsection 3.04.2.
- The concrete surface must be uniformly smooth, even and free of ridges and other irregularities,
- The concrete must have a pore-free, dense surface on all sides with no evidence of segregation or inadequate compaction,
- No reinforcing bars may be exposed or signs be present, which indicate an inadequate concrete cover of the reinforcing bars,
- No hair cracks shall be visible.

(ii) During the inspection, the Engineer will determine the type and extent of defects to be eliminated and ascertain if cracks are still moving.

(iii) The Contractor is obligated, if necessary and applicable, undertake the following in accordance with para (iii) below:

- To expose reinforcing bars, which apparently have an inadequate concrete cover, in the area determined by the Engineer and to bend them inward through suitable measures.
- To caulk out honeycombs and similar defective spots, which are traceable to segregation of the concrete.
- To pressure-grout damaged areas, cracks, etc.,
- To seal all hair cracks of a measured width of more than 0.05 mm, with suitable and recognized epoxy resin material.
- To seal all holes resulting from the removal of formwork bolts and the like.

- To demolish and reconstruct such structural concrete members which cannot satisfactorily be repaired or which are otherwise unfit for the Works in the Engineer's opinion.

- To propose and apply a proven system or measures according to the type and extent of the defect, as set out in para (iii) below in order to achieve a result and appearance acceptable to the Engineer.

b. <u>Patching & Repair</u>

(i) Apply a cementitious repair material approved by the Engineer. The proprietary cementitious repair material, bonding agent and application method shall meet the following criteria:

- The repair material shall be cementitious and shall possess a similar thermal co-efficient to the base concrete.
- The repair material shall have shrinkage compensating characteristics.
- The bonding agent shall be compatible with both the existing concrete and the repair material.
- The system shall exhibit long term durability.

The proprietary cementitious repair material and bonding agent shall be stored, applied and cured in accordance with the manufacturer's requirements and recommendations.

Finish the cementitious repair material to a straight line with the existing surface, to the profile of the original undamaged concrete section.

The Engineer may direct that where the cover to the existing reinforcing is insufficient, the repair may protrude beyond the existing concrete face. The protruding edges of the repair shall then have a 45° chamfer, and shall be horizontal or vertical to provide a pleasing finish.

The Engineer's evaluation of the Contractor's proposed materials and application method shall be based on the above criteria.
The Contractor shall submit full details and specifications of his proposed materials and installation methods to the Engineer for approval prior to commencement of work.

This shall include certificates of approval from competent authorities to prove their suitability.

(ii) Patching work shall begin at the latest 24 hours after stripping, however it shall in no case be undertaken prior to carrying out the joint inspection of the concrete by the Contractor and the Engineer.

(iii) Patching and repair work shall be executed only through qualified personnel using high quality and recognized materials, e.g., concrete and cement or special mortar. A special bonding agent such as suitable epoxy resin and the like, of first class quality shall be used where appropriate, to also ensure good bonding and adequate denseness in the joints.

(iv) All costs for repair and patching work are to be borne by the Contractor.

c. <u>Sealing of Cracks</u>

(i) Cracks detected in concrete members cast by the Contractor, are to be sealed according to the directives of the Engineer, provided cracked structural concrete members are not rejected by the Engineer.

(ii) All cracks identified by the Engineer as requiring remedial work shall be sealed by

injection of epoxy resin to a maximum depth of 4" from the exposed surface. The surface of the cracks must be cleaned. Injection nipples are to be provided at 6" to 12" intervals and the remaining surfaces of the cracks are to be sealed with a thixotropic epoxy resin compound. Prior to the injection, the crack shall be cleaned of dust etc. by blowing oil free and clean compressed air through all the injection nipples. In case of cracks in vertical or sloped walls, the injection must start at the lowest nipple.

(iii) The epoxy resin shall be Fosroc Nitokit TH System or product of equivalent or better performance and as approved by the Engineer. Epoxy injection shall be in accordance with the manufacturers written instructions. Note that on completion of injection and curing of the epoxy, the nipples are to be removed and the exposed surfaces ground or scraped smooth (following heating with a hot air gun) to provide a smooth, even and tidy finish restoring the original profile).

19.13 MEASUREMENT & PAYMENT

All work done under this section shall be paid under relevant respective works; i.e. concrete, reinforcement, formwork, waterproofing etc.

***** END OF SECTION *****

SECTION - 20

POLYVINYLCHLORIDE (P.V.C) WATER STOPPER AND SWELL BARS

20.01 SCOPE OF WORK

The work comprises of providing all labour, tools, equipments, to install, place and fabricate in position and locations rubber water stops together with all jointing and sealing materials as per recommendations, specifications of the Manufacturer and instructions. All embedment in concrete, lapping, turning, sealing shall ensure absolute water tightness subjected to any pressures. The workmanship and operation shall be perfect and guarantee leak proof at places wherever used in the structure.

20.02 MATERIAL REQUIREMENTS

Polyvinylchloride water stop shall be extruded from an elastomeric plastic compound, the basic resin of which shall be polyvinylchloride (PVC). The compound shall contain such additional resins plasticizers stabilizers or other materials needed to ensure that when the material is compounded and extruded to the shapes and dimensions shown, it will have physical characteristic when tested by U.S. Corps of Engineers Test Method specified below:-

Physical Characteristic	No. of Specimens Tested	Requirement	Test Method
Tensile strength using die III,not less than	5	1750 psi	568
Ultimate elongation using die III, not less than	5	350%	573
Low temperature brittleness, no sign of failure such as cracking or chipping at	3	(-) 35 F	570
Stiffness in flexure, 1/2" span, not less than	3	400 psi	571

Swell Bar is a flexible, hydrophilic waterstop based on synthetic rubber, with cross-sectional dimensions of 20 mm by 10 mm, applied with the help of adhesive which is used to secure the swell bar to the concrete substrate and around penetrations.

Swell bars of approved make shall satisfy provisions of a Type B (structurally integral) protection as defined in BS 8102: 2009 to waterproof construction joints and penetrations in underground waterproof reinforced concrete structures.

20.03 CONSTRUCTION REQUIREMENTS

Splices in the continuity or at the intersections of runs of PVC water stoppers shall be performed by heat sealing the adjacent surfaces in accordance with the Manufacturer's recommendations or as directed.

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. After splicing, a remoulding iron with ribs and corrugations to match the pattern of the water stoppers shall be used to reform the ribs at the splice. The continuity of the characteristic components of the cross section of the water stoppers design (ribs, tabular centre axis, protrusions, and the like) shall be maintained across the splice.

The expansion joints wherever indicated on drawings shall have centre bulb rubber water stops or its equivalent as indicated on drawings to be cast integrally with the in-situ-concrete of retaining walls, beams, columns, slabs or at any locations marked on the drawings incorporating junction places or as straight lengths with separate intersection pieces to be jointed at site as per Manufacturer's recommendations and Specifications. The water stops shall be installed so as to hold them securely in

their correct position during the placement of concrete. The concrete shall be fully and properly compacted around the water stops to ensure that no voids or porous areas remain. Where reinforcement is present adequate clearance shall be left between water stoppers and the reinforcement to permit proper compaction of concrete. No holes shall be made through any water stops. Hot or cold volcanising for jointing places of water stoppers at site shall be done with the prior Approval in accordance with the Manufacturer's recommendations and specifications.

20.04 MEASUREMENT

Measurement will be made of the number of Linear feet/meter of Polyvinylchloride water stoppers of the size and gauge shown on the drawings acceptably placed in the work. In computing the quantities, no allowance will be made for laps.

20.05 RATE AND PAYMENT

Payment will be made for the number of Linear feet/meter measured as provided above at the contract unit price per Ft/M. for Furnishing and installing polyvinylchloride water stoppers and shall include full compensation for splicing materials, splicing, sealant and all other work related to the section.

***** END OF SECTION *****

SECTION 21

WATERPROOFING OF TANKS AND BELOW-GRADE STRUCTURES

21.01 SCOPE OF WORK

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 waterproofing of basements, pools, tanks and below grade structures, complete in strict accordance with this section of the Specifications and the applicable Drawings, Bill of Quantities and subject to the terms and conditions of the Contract.

21.02 GENERAL

The Contractor shall be completely responsible for the supply and proper installation of the specified waterproof membrane system, or its equivalent, to make the basement structure absolutely watertight. All membrane material shall be new and shall comply with the specified material requirements. The Contractor shall produce testing certificates to verify that the membrane meets the specification and is suitable for the end use intended.

The Contractor shall engage a qualified waterproofing specialist as a sub-contractor to supply, install and protect the waterproof membrane system, all in accordance with the membrane manufacturer's recommendations. The waterproofing specialist shall be approved by the Engineer and shall be selected on the basis of past track record, technical reliability, capability and willingness to supply technical assistance, and reputation for standing behind his product and work. The Contractor shall submit the name of his Specialist Contractor at the time of tender.

All basement and below-grade structures (including lift pits, water tanks, fuel tanks, etc) shall be protected by a water proof membrane all round, of the type complying with clause 14.07.

The Contractor shall be responsible for the implementation and maintenance of a temporary dewatering system to keep the Site dry at all times for proper installation of the membrane system. Where relief holes and/or relief panels are required to be left in the basement structure to prevent hydro-static uplift during the construction stage, these shall be cast back with full water proofing treatment following completion of the superstructure and/or when directed by the Engineer.

21.03 PERFORMANCE GUARANTEE

The Contractor shall provide a ten (10) year guarantee for water tightness of the basement, swimming pools, tanks and/or other below-grade structures (including lift pits), effective from the date of completion of the whole Works. The guarantee shall be submitted in the specified format and shall be subject to the approval and acceptance by the Employer.

Should any leak, moist lines, points or patches occur during the guarantee period, the Contractor shall immediately carry out the necessary remedial works, to restore the water tightness of the structure, at no cost to the Employer.

The Contractor shall make good damages to all finishes (such as plaster, paint, panelling, tiling, etc.) electrical or other installations, or other property, caused by water leakage or dampness. Alternatively, he shall reimburse the Employer for making good such damages.

21.04 SHOP DRAWINGS

The Contractor shall provide the Engineer with comprehensive shop drawings showing all details and procedures for the relevant parts of the Works. Reasonable time shall be allowed for checking by the Engineer in programming the production of shop drawings. Delays caused by the late submission of shop drawings or repeated amendments of drawings due to inadequate or inaccurate drawings will not be recognised as a reason for extension to the contract time.

The manufacturer's standard application details shall be used only as a guide for the preparation of shop drawings. The Contractor is deemed to have taken due consideration of the particular requirements of this contract based on the tender documents. Where necessary, the Contractor is expected to improve upon the

manufacturer's standard details to suit the project requirements and such amendments shall be shown in shop drawings for approval by the Engineer. The Contractor shall not be entitled to extra contract cost and/or time in this respect.

21.05 CONCRETE CONDITIONING

The membrane material shall be compatible with the surface of concrete. The use of curing compounds, release coatings on concrete forms, or admixtures in the concrete that interfere with the adhesion of the barrier material to concrete shall not be permitted.

Curing compounds shall not be used on concrete surfaces unless the Contractor can conduct field tests to demonstrate that complete removal of the compound can be achieved before application of the membrane. Alternatively, the Contractor may perform field tests to establish the compatibility of the compound with the membrane materials and the concrete surface.

Release agents such as oil, wax, grease and silicone which transfer to the concrete surface during placement, and contribute to poor adhesion between membrane system and concrete, shall not be used. The use of proprietary paint systems applied to forms and formulated to prevent contamination of the concrete surface, or the use of polyethylene lined forms, may be considered.

Special purpose admixtures, such as water-immiscible chemicals intended to retard evaporation of water during cure, may create adhesion problems and shall not be used.

21.06 CONCRETE SURFACE PREPARATION

i. Surface defects, including tie holes, unless otherwise specified in the Contract Documents, shall be repaired immediately after form removal. All honeycombed and defective concrete areas shall be removed down to sound concrete which shall then be cleaned. If chipping is necessary, the edges shall be perpendicular to the surface or slightly undercut. No feather edges shall be permitted.

ii. Unless specifically recommended by the membrane material manufacturer, normal mix Portland cement-based patching materials shall not be used for the repair of small surface voids and rutted cracks on account of their relatively poor adhesion to cured concrete. Such repair shall be effected with suitable resin-based materials composed of the same resin found in the protective membrane material mixed with inert fillers, but the specific recommendation of the membrane system manufacturer shall be obtained before using such materials for patching. Coarse aggregate shall be omitted.

iii. Large surface voids and rutted cracks shall be dry packed with graded aggregate and pressure grouted with suitable non-shrink cementitious mortar.

iv. The quantity of mixing water shall be limited to that necessary for handling and placing. The patching material shall be thoroughly mixed to the extent that it is the stiffest consistency that will permit placing.

v. The area to be patched and a band at least 150mm wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. After surface water has evaporated from the area to be patched, an approved bonding agent shall be well brushed into the prepared surface. The premixed patching mortar shall be thoroughly consolidated into place, struck off so as to leave the patch slightly higher than the surrounding surface and left undisturbed for at least 1 hour to allow for some initial shrinkage before being finally finished. The patched area shall be kept damp for 7 days.

vi. Proprietary compounds may be used in lieu of, or in addition to, the foregoing patching procedures. Such compounds must be used strictly in accordance with the manufacturer's recommendations. Specific approval from the membrane manufacturer shall be obtained before proprietary compounds are used for patching. These materials shall be compatible with the membrane system and the concrete, and not interfere with good adhesion between the two.

vii. Fins, protrusions or similar irregularities projecting from the concrete surface shall be removed back to the surface by chipping, bush-hammering, needle-gunning, or wire brushing. Care shall be exercised to obtain a reasonably planar surface for application of the membrane system. Sharp offsets in the surface, such as those caused by formwork misalignment, shall be mechanically abraded to provide gradual and smooth transitions between the offset surfaces.

viii. The Contractor shall employ a suitable method of repair to stop any seepage or flow of water into or through the concrete structure prior to application of the membrane system. The method of repair shall depend on the type of defects present in the concrete and the source of water.

ix. Generally, surfaces shall be dry and must be newly exposed concrete, free of chemical contaminants and loose, weak or unsound materials.

21.07 MATERIAL

i. The waterproofing membrane shall be applied in double layers, each layer shall be a self-adhesive 2.0 mm thick water-proofing sheet membrane, "Aquafin-Latex" or equivalent, consisting of a non-woven polyester, coated on both sides with an elastomeric bitumen compound. The upper surface of the membrane is covered with polyethylene film with 8 cm strip of siliconized release paper and the lower surface is fully covered with siliconized release paper to protect the adhesive side of the rolls during storage and is removed just prior to application. Joining of seams shall be only by hot air welding without any use of adhesives or solvents. Proper accessories such as preformed corners, outlets, pipe collars and terminations shall be used. The waterproofing membrane shall conform to ASTM Standards D-146, D412 and D751.

ii. The 3mm thick waterproofing membrane shall have high biaxial strength, elongation and puncture resistance. It shall be resistant to most chemicals including all ground chemicals and be root-impenetrable. All joints shall be hot air welded with double seams with a test channel for integrity verification.

iii. The waterproofing membrane shall be terminated at the top of vertical walls, pile caps, etc. by heat-welding to double anchor strips or mechanical fastening by using an adhesive underlay (Heat-seal or an approved equivalent). The adhesive underlay shall be capable of providing an excellent bond between the waterproofing membrane and substrate. Termination using only liquid-applied sealants is not acceptable.

iv. The water-proofing membrane for walls shall be covered with cement-sand mortar layer protected by block wall, as shown on the Drawings.

v. Prior to commencement of waterproofing treatment, the Contractor shall submit shop drawings for each waterproofing detail and endorsed by the manufacturer or his approved representative. These are to be approved by the Engineer. The shop drawing shall be on a CAD-recognisable format and A1 or AO size.

21.08 METHOD OF CONSTRUCTION

Generally, the application procedures shall be consistent with the Manufacturer's recommendations.

The procedure of work shall be as follows unless otherwise modified by the Engineer to suit the site and project requirements.

a) At formation level, install proper drainage system including dewatering system, drain channels, sumps and pumps, to ensure dry site conditions. Lay stone soiling and concrete screed as specified. Concrete surface shall be smooth wood float finish.

b) The concrete surface shall be prepared in accordance with the requirements of the clause headed "Concrete Surface Preparation" in this Specification. The surface shall be free of sharp projections such as nail heads, concrete ribs, etc.

c) The waterproofing shall be a well-designed system installed by a single Specialist Waterproofing Contractor strictly according to the recommendations of the manufacturer.

d) The waterproofing membrane shall be identified with the manufacturer's inscriptions on the packaging.

e) The waterproofing membrane shall be rolled out lengthwise and aligned with an adjoining membrane to form an overlap joint of 50mm. A special hand operated hot-air welding gun or versions of the automatic welding machine shall then be used to fuse the membranes together and weld the overlap.

f) If required, single anchor strips shall be welded to the waterproofing membrane bi-directionally to provide structural anchoring to the base slab and create watertight compartments at not more than 100 sq.m grid.

g) The waterproofing membrane may be terminated to pile caps, ground beams using double anchor strips or an adhesive underlay.

h) If an adhesive underlay is used for termination, the concrete surface shall be primed with an approved primer prior to the installation of the adhesive underlay. The waterproofing membrane shall be terminated by using an adhesive underlay to bond the membrane to the structure and thereafter mechanical fastening it. The minimum widths for the termination using adhesive underlay shall be 250mm at ground beams, pile caps. The membrane shall be terminated using the same termination methods.

i) The waterproofing membrane shall be terminated at the top of the vertical walls at least a 300mm minimum above ground level by only using double anchor strips.

j) For horizontal below ground areas, the waterproofing membrane shall be protected with a minimum 25mm thick 1:3 cement and sand screed render prior to the commencement of further construction activities.

k) For vertical surfaces, the waterproofing membrane shall be covered with the approved protection material prior to backfilling.

21.09 Membrane Flashing

Flashing shall be provided at the line or joint where the membrane will terminate, particularly at the diaphragm walls and pile foundations. The flashing material used shall be of approved and durable type, and shall be resistant to weathering and mechanical damage. The flashing material shall be compatible with all other material employed in the membrane system and shall not cause chemical reactions when in contact with the latter.

The surface of adjoining building elements that are used to form the terminus of the waterproofing membrane shall meet the same requirements as the surfaces that receive the barrier. A treated timber nailer or equivalent device shall be used to mechanically secure the top edge of the flashing material according to the manufacturer's recommendations. Reglets shall not be used as a substitute for a nailing strip or device.

Flashing materials shall be the same as or compatible with those used in the waterproofing system. Compatibility shall be determined by the membrane manufacturer.

21.10 JOINTS

The waterproofing specialist shall give careful consideration to the design of membrane details at expansion, contraction and construction joints in the concrete substrate to minimise damage to the membrane due to differential movement.

Where the movement of soil substrate supporting horizontal membrane is likely to occur, the waterproofing specialist in association with the Contractor shall take appropriate measures as necessary to ensure the integrity of the membrane is not compromised.

21.11 MEMBRANE PROTECTION

Membrane protection shall be applied immediately following the application and testing of the waterproofing membrane. No membrane material shall be left permanently exposed for any period of time after installation.

The Contractor shall take immediate steps to cover up the Works following the application of membrane protection. If for any reason the Works cannot be covered up immediately, the Contractor shall be responsible for taking all necessary and approved measures required either to protect the membrane material from damage or if damage of the material has occurred, to make good all such damage, for the duration of exposure of the Works prior to covering up.

21.12 WATER TESTING

Water tightness test of below-grade holding structures shall be carried out in full compliance with BS 8007 Section 9, all at the Contractor's expense within contract period. Any leaks found shall be rectified at the Contractor's expense and re-tested to the Engineer's satisfaction.

Where required by the Engineer, water testing shall be carried out to check the performance of horizontal membrane applications. The area to be tested shall be flooded with at least 25mm of water. Drains shall be plugged and kerbings (temporary or permanent) shall be formed to retain the water for a period of at least 24 hours. Any leaks found during this period shall be repaired in accordance with the manufacturer's recommendations and the area shall then be retested. Before repairing the surfaces, they shall be dry.

Where it is impractical to water test an area because the slope of the substrate would produce excessive water depths, the membrane shall be tested by allowing water to run continuously over the area for a period of at least 8 hours. During the 8 hour period, the whole area shall be kept completely immersed.

Where water testing is not possible because of job conditions, location, etc, a thorough inspection shall be carried out to check all laps, terminations and flashings for any evidence of 'fish mouths', incomplete adhesion or other conditions that may be detrimental to the watertight integrity of the membrane.

21.13 WATERPROOFING TO TANKS AND LIFT PITS

Lift Pits and Non-Potable Water Tanks

a) All lift pits (bases and walls up to Ground Floor level) shall be constructed using waterproof concrete. The waterproofing shall be effected by incorporation of an approved waterproofing additive.

b) The internal faces of lift pits in contact with the ground and of concrete tanks holding non-potable water, including the underside of tank roofs, shall be made watertight with Industries or other approved equivalent.

c) Preparation of the concrete substrate and the method of application shall be carried out strictly in accordance with the manufacturer's directions. The substrate shall be well saturated with water but the concrete surface is to be kept matt damp and free of ponding before mortar application. The sealing mortar shall be applied in 3 coats of 1.0 - 1.5mm each. The preceding coat shall be allowed to set before applying the next coat but the time lapse between successive coatings shall not be more than 2 days. The total dry coat thickness of Tricolastic sealing mortar or equivalent (3 coats combined) shall not exceed 3mm.

Potable Water Tanks

a) The waterproofing system provided to internal face of concrete tanks holding potable water for consumption shall be of a type which is non-toxic and approved for such use. Flexible waterproofing coating Flexolastic or approved equivalent shall be used for waterproofing of potable water tanks as per manufacturer's recommendation.

b) The Contractor shall allow for 9" wide central bulb water-stop for all walls installed in accordance with the earlier requirements of the Concrete Specification.

21.14 MEASUREMENT AND PAYMENT

The waterproofing of basement raft and walls shall be measured per square meter /feet and paid as per unit rates entered in the Bill of Quantities inclusive of all overlaps, complete in accordance with the terms and Conditions of Contract.

PVC water stopper/ swell bars shall be measured per running meter/ feet and paid at per unit rates entered in the Bill of Quantities of accepted lengths a complete with accordance with the terms and Conditions of the Contract.

***** END OF SECTION *****

SECTION – 22

EXTERNAL PAVING, PARKING AREAS

22.01 SCOPE

The work covered under this section consist of providing and making items as per specifications laid down herein under, drawings and Bill of Quantities.

- CC Paving Stones as per finishes schedule and Bill of Quantities
- Kerb Stone as per finishes schedule and Bill of Quantities
- CC floor with grooves
- CC floor laid in panel

22.02 MATERIAL REQUIREMENTS

Cement, Sand, Aggregate:Shall conform to specifications given in the relevant Section of this specification.

Concrete Blocks:Shall conform to specifications given in the relevant Section of this specification.

Tiles and Special Dry Bond Mortar:Shall conform to specifications given in relevant Section of this specification.

Concrete Pavers / Tuff Tiles / Uni-block:Asper manufacturer's specifications

Chips: For washed terrazzo shall conform to specifications given in relevant section of "Materials" & washed Terrazzo.

Strength: Min 28 days Cylinder Compressive strength for 50 mm thickness shall be 35 MPa (5000 psi) and for 60 / 80 mm thickness, it shall be 48 MPa (7000 psi).

Thickness of Sub Base and Pavers: Recommended thickness of sub base and pavers is shown in Table below:

Application	Thickness of sub-base mm (in.)		Thickness of paver (mm)
	Dry Area	Low Wet Area	
LIGHT DUTY Residential, drive way, walk ways, parking patios etc.	0 to 76 (0 to 3)	100 to 204 (4 to 8)	50
MEDIUM DUTY Residential, Streets, Public Parking, service road, maintenance area, canal lining, storage area, City petrol pumps etc.	100 to 152 (4 to 6)	254 (10)	60
HEAVY DUTY City Streets, Loading deck Industrial floors, Highway petrol pumps etc.	204 (8)	305 (12)	80

Shapes:Pavers are available in Uni-Block, I-Section, Rectangle, Half Rectangle, Wavy, Heagon and Delta Shapes

Quantity and thickness:Quantity and thickness required per Square meter of different shape and size of pavers is shown in Table below:

Specification for the Paving Stone

S.No	Type	Thickness (mm)	Area per Tile Sq cm (Sq In.)	Nos. of Tiles/Sqm (Tiles/Sq Ft)
1.	Uni-Block	50/60/80	249.74 (38.71)	39.81 (3.70)
2.	I-Section	50/60	270.83 (41.98)	36.90 (3.43)
3.	Rectangle	60/80	196.90 (30.52)	50.67 (4.71)
4.	Half Rectangle	60	128.12 (19.86)	78.01 (7.25)
5.	Wavy	60	275.99 (42.78)	35.83 (3.33)
6.	Hexagon	60	346.64 (53.73)	28.83 (2.68)
7.	Delta	50	245.74 (38.09)	40.67 (3.78)

22.03 CONSTRUCTION REQUIREMENTS

The entire area under external Paving shall be prepared by dressing earth, to a hard or graded surface where necessary, the prepared surface shall be made up to the required levels by filling and consolidating earth in accordance with the specifications for earth filling under floors.

CC Paving Stones
50mm thickcc paving stone in natural color shall be laid over 50mm thick sand over compacted earth for entrance foyer.

Kerb Stone
The kerb stone 350mm x 300mm x 150mm shall be joint in Cement Mortar 1:4 or as specified by Engineer.

CC Floor
CC Type "A," (1:2:4) with Power float Screed bed 50 mm thick in panel of 10'x10' where joint is filled with hot bitumen mixed with fine sand on bond breaking material as specified by Engineer.

22.04 MEASUREMENT AND PAYMENT

Measurement for all the items covered under this section shall be made in Sq. ft/m of the actual surfaces completed and approved.

The rate quote from the work items covered in this Section shall constitute full compensation for all materials, labor equipment, plant and all incidentals to complete the works.

***** END OF SECTION *****

SECTION 23

SOLING

23.01 SCOPE OF WORK

The work to be done under this section of specifications consists of furnishing all plant, labour, equipment, appliances, materials and performance of all operations required in connection with the construction of stone or gravel bottoming under foundations and/or floors in strict accordance with the specifications and Drawings and/or as directed by the Engineer. The scope of this section of specifications is covered with detailed specifications as laid down herein.

23.02 MATERIAL

Stone/ Gravel

Stone to be used shall comprise of strong, hard, durable stone of the specified/approved size, free from impurities, quarry sap, dust, dirt and solubility characteristics. The stone/ gravel shall be obtained from approved quarries and shall be sound, free from laminations and weak cleavages.

23.03 CONSTRUCTION

I. Preparation of Sub-grade

Sub-grade shall be formed of suitable materials free of clods, roots, stumps, bush or other objectionable material.

Sub-grade material shall be placed in successive layers not exceeding 6 inch. (150mm) in thickness loose measure, and each layer shall be thoroughly compacted to give the specified density.

The sub-grade will be compacted at optimum moisture content and loose pockets, if any, cut-out and refilled with selected materials in layers not more than 6 inch. (150mm) thick and formed to levels and grades shown on the Drawings.

Compaction shall be done by approved methods consistent with the soil/material to be compacted.

The maximum dry weight density of the sub-grade shall not be less than 95% of Modified AASHTO requirements.

Maximum density is defined as the maximum dry weight density as determined by ASTM Designation D-1557 (MOD-AASHTO).

II. Stone Soling

The stone shall be well graded having a maximum size or 2 inch (50mm). It should be graded down to 3/4 inch (20mm).

The soling material shall be laid and packed to even grades and well rolled to a consolidated thickness as shown on the Drawings.

The whole of the surface of the compacted stone bottoming will be blinded with or any other approved gritty material, after the interstices have been filled with smaller size stones, so as to effectively fill in the voids and crevices, watered, if necessary and again thoroughly rolled with the same roller to produce a smooth and even surface free from irregularities, true to line and level.

Care is to be taken to avoid any damage to existing structures, mains or pipes while rolling operation is in progress. In places inaccessible for a roller, compaction shall be done by hand tampers weighing not less than 9 kg or power rammers as directed by the Engineer.

23.04 MEASUREMENT AND PAYMENT

Soling shall be measured per cubic ft/ Meter; on areas and in thickness as shown on the Drawings and paid for at the unit rates entered in the Bill of Quantities, inclusive of compaction, grading, leveling, bracing, shoring etc.

***** END OF SECTION*****