Procurement Notice
INVITATION TO BID

SUBJECT: Construction of Homework Centre for the Beer Al Basha Village - Jenin District
Reference Number: ITB/ PAL10/ 51653/ Bir Al Basha

The United Nations Development Programme / Programme of Assistance to the Palestinian People (UNDP/PAPP) calls for bids from eligible contractors for the provision of Construction of Homework Centre for the Beer Al Basha Village - Jenin District, funded by the Government of Japan through the Human Security Trust Fund.

In this respect, UNDP/PAPP, requests sealed offers from eligible competitors for the supply of the services above referred and fully described in the technical specifications of the bidding documents.

The complete bidding documents concerning this call for bids can be examined and obtained free of charge from the following Web site:


The bids should be delivered at UNDP/PAPP main office in Jerusalem at the below address on 22nd May 2007, Jerusalem time, at or before 10:00 AM. Late bids shall be rejected.

A pre-bid meeting will be held on 8th May, 2007 at Bir Al Basha village council at 11:30 hours. Site visits will be conducted at the same date right after the pre-bid meeting.

Deadline for requesting any clarifications from the UNDP/PAPP will be at 3:00 PM on 11th May 2007. The UNDP/PAPP will publish the responses to clarifications promptly on 14th May 2007 at the above mentioned Website addresses.

Bids will be opened in the presence of Bidders’ Representatives, who choose to attend, at 10:30 AM on 22nd May 2007, at UNDP/PAPP Office in Jerusalem.

United Nations Development Programme
4A Yakubi St., Jerusalem, 91191
P.O. Box: 51359
Tel: (+972 2) 646 8 425
Fax: (+972 2) 626 8 222
Invitation to Bid

Date: April 27, 2007

Dear Sir/Madam,

Subject: Construction of Homework Center for the Beer Al Basha Village – Jenin District
Reference Number: ITB/PAL10/51653/Bir Al Basha

1 We hereby solicit your bid for the supply of following works and services:
Construction of Homework Center for the Beer Al Basha Village – Jenin District.

To enable you to submit a bid, please find enclosed:
Annex I. Instructions to Bidders
Annex II. Bid Data Sheet
Annex III. General Conditions of Contract for Civil Works
Annex IV. Special Conditions
Annex V. Statement of Works (Technical Specifications)
Annex VI. Drawings
Annex VII. Bid Submission Form
Annex VIII. Price Schedule (Bill of Quantities)

2 Interested Bidders may obtain further information at the following address:
Contact Person: Shehadeh A. Habash
Name of Office: UNDP/PAPP, Jerusalem
Telephone & Fax: 02- 6469422, 02-6268222
E-Mail: Shehadeh.Habash@undp.org

3 Sealed bids must be delivered to the above office on or before 10:00 hours on May 22nd, 2007. Late bids shall be rejected.

4 Bids will be opened right after the dead line at UNDP/PAPP Office in Jerusalem on May 22nd 2007 @ 10:30hours.

5 This letter is not to be construed in any way as an offer to contract with your firm.

Yours sincerely,

Jens Teyberg-Franken
Special Representative

Rev Oct 2000 1
INSTRUCTIONS TO BIDDERS

A. Introduction

1. **General**: UNDP invites Sealed Bids for the supply of works to the UN system

2. **Eligible Bidders**: Bidders should not be associated, or have been associated in the past, directly or indirectly, with a firm or any of its affiliates which have been engaged by UNDP to provide consulting services for the preparation of the design specifications, and other documents to be used for the procurement of works to be purchased under this Invitation to Bids.

3. **Cost of Bid**: The Bidder shall bear all costs associated with the preparation and submission of the Bid, and the procuring UN entity will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the solicitation.

B. Solicitation Documents

4. **Examination of Solicitation Documents**: The Bidder is expected to examine all corresponding instructions, forms, terms and specifications contained in the Solicitation Documents. Failure to comply with these documents will be at the Bidder’s risk and may affect the evaluation of the Bid.

5. **Clarification of Solicitation Documents**: A prospective Bidder requiring any clarification of the Solicitation Documents may notify the procuring entity in writing. The response will be made in writing to any request for clarification of the Solicitation Documents that it receives earlier than Ten (10) days prior to the Deadline for the Submission of Bids. Written copies of the response (including an explanation of the query but without identifying the source of inquiry) will be sent to all prospective Bidders that received the Solicitation Documents.

6. **Amendments of Solicitation Documents**: No later than Seven (7) days prior to the Deadline for Submission of Bids, the procuring entity may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, amend the Solicitation Documents. All prospective Bidders that have received the Solicitation Documents will be notified in writing of any amendments. In order to afford prospective Bidders reasonable time in which to take the amendments into account in preparing their offers, the procuring entity may, at its discretion, extend the Deadline for the Submission of Bids.

C. Preparation of Bids

7. **Language of the Bid**: The Bid prepared by the Bidder and all correspondence and documents relating to the Bid exchanged by the Bidder and the procuring entity shall be written in the language indicated on the Bid Data Sheet.

8. **Documents Comprising the Bid**: The Bid must comprise the following documents:

   (a) a Bid Submission form;
   (b) a Price Schedule completed signed stamped in accordance with the Annex V, VI and VIII and clause 11 of Instructions to Bidders;
9. **Documents Establishing Bidder’s Eligibility and Qualifications:** The Bidder shall furnish evidence of its status as qualified company. The documentary evidence of the Bidder’s qualifications to perform the contract if its Bid is accepted shall be established to the Purchaser’s satisfaction.

10. **Documents Establishing Works’ Conformity to Bidding Documents:**

11. **Bid Currencies/Bid Prices:** All prices shall be quoted in US dollars. The Bidder shall indicate on the appropriate Price Schedule the unit prices (where applicable) and total Bid Price of the works it proposes to supply under the contract.

12. **Period of Validity of Bids:** Bids shall remain valid for 120 days after the date of Bid Submission prescribed by the procuring UN entity pursuant to clause 16 of Instructions to Bidders. A Bid valid for a shorter period may be rejected as non-responsive pursuant to clause 20 of Instructions to Bidders. In exceptional circumstances, the procuring UN entity may solicit the Bidder’s consent to an extension of the period of validity. The request and the responses thereto shall be made in writing. Bidders granting the request will not be required nor permitted to modify their Bids.

13. **Bid Security:** (N/A)

(a) The Bidder shall furnish as part of its Bid a Bid Security to the Purchaser in the amount of 5% of the Offer Value.

(b) The Bid Security is to protect the Purchaser against the risk of the Bidder’s conduct which would warrant the security’s forfeiture, pursuant to Clause 13(g) below.

(c) The Bid Security shall be denominated in the currency of the Purchase Order or in a freely convertible currency and shall be in one of the following forms:

   i. bank guarantee or irrevocable letter of credit, issued by a reputable bank located in the purchaser’s country or abroad, and in the form provided in these Solicitation Documents, or,

   ii. cashier’s cheque, or certified cheque.

(d) Any Bid not secured in accordance with Clauses 13 a) and 13 c) above will be rejected by the Purchaser as non-responsive pursuant to clause 20 of Instructions to Bidders.

(e) Unsuccessful Bidder Bid Security will be discharged or returned as promptly as possible as but not later than thirty (30) days after the expiration of the period of Bid Validity prescribed by the Purchaser pursuant to clause 12 of instructions to Bidders.

(f) The successful Bidder’s Bid Security will be discharged or returned upon the Bidder signing the Purchase Order, pursuant to clause 26 of Instructions to Bidders, and furnishing the Performance Security, pursuant to clause 27 of Instructions to Bidders.

(g) The Bid Security may be forfeited:

    1) If a Bidder withdraws its offer during the period of the Bid Validity specified by the Bidder on the Bid Submission Form, or,
2) In the case of a successful Bidder, if the Bidder fails:

   i. to sign the Purchase Order in accordance with Clause 26 of Instructions to Bidders, or,
   ii. to furnish Performance Security in accordance with Clause 27 of Instructions to Bidders.

D. Submission of Bids
14. Format and Signing of Bid: The Bid shall be typed or written in indelible ink and shall be signed by
   the Bidder or a person or persons duly authorized to bind the Bidder to the contract. A Bid shall
   contain no interlineations, erasures, or overwriting except, as necessary to correct errors made by the
   Bidder, in which case such corrections shall be initialed by the person or persons signing the bid.

15. Sealing and Marking of Bids:

   15.1 The Bidder shall seal the original and each copy of the Bid in separate envelopes, duly marking
       the envelopes as one “ORIGINAL”, “COPY” and a “CD”. The envelopes shall then be sealed in an
       outer envelope. Furthermore, bidder shall include a CD with the original copy.

   15.2 The inner and outer envelopes shall:

       (a) be addressed to UNDP at the address given in Annex II (BID DAT ASHEET) of these
           Solicitation Documents; and
       (b) make reference to the “subject” indicated in Annex II (BID DAT ASHEET) of these Solicitation
           Documents, and a statement: “DO NOT OPEN BEFORE”, to be corresponding with the time and
           the date specified in section one of these Solicitation Documents for Bid Opening pursuant to
           clause 16 of Instructions to Bidders.

   15.3 The inner and outer envelopes shall also indicate the name and address of the Bidder to enable
       the Bid to be returned unopened in case it is declared “late”.

   15.4 If the outer envelope is not sealed and marked as required by clause 15.2 of Instructions to
       Bidders, UNDP will assume no responsibility for the Bid’s misplacement or premature opening.

16. Deadline for Submission of Bids/Late Bids:

   16.1 Bids must be delivered to the office on or before the date and time specified in section one of
       these Solicitation Documents.

   16.2 UNDP may, at its discretion, extend this deadline for the submission of the bids by amending
       the Bidding Documents in accordance with clause 6 of Instructions to Bidders, in which case all
       rights and obligations of UNDP and Bidders previously subject to the deadline will thereafter be
       subject to the deadline as extended.

   16.3 Any Bid received by UNDP after the Deadline for Submission of Bids will be rejected and
       returned unopened to the Bidder.

17. Modification and Withdrawal of Bids: The Bidder may withdraw its Bid after submission, provided
       that written notice of the withdrawal is received by the procuring UN entity prior to the deadline for
       submission. No Bid may be modified after passing of the Deadline for Submission of Bids. No Bid
       may be withdrawn in the interval between the Deadline for Submission of Bids and the expiration of
       the Period of Bid Validity.
E. Opening and Evaluation of Bids

18. Opening of Bids:

18.1 UNDP will open all Bids in the presence of Bidders’ Representatives who choose to attend, at the time, on the date, and at the place specified in section one of this Solicitation Document. The Bidders’ Representatives who are present shall sign a register evidencing their attendance.

18.2 The bidders’ names, Bid Modifications or withdrawals, bid Prices, discounts, and the presence or absence of requisite Bid Security and such other details as UNDP, at its discretion, may consider appropriate, will be announced at the opening. No Bid shall be rejected at Bid Opening, except for Late Bids, which shall be returned unopened to the Bidder pursuant to clause 20 of Instructions to Bidders.

18.3 Bids (and modifications sent pursuant to clause 17 of Instructions to Bidders) that are not opened and read out at Bid Opening shall not be considered further for evaluation, irrespective of the circumstances. Withdrawn Bids will be returned unopened to the Bidders.

18.4 UNDP will prepare minutes of the Bid Opening.

19. Clarification of Bids: To assist in the examination, evaluation and comparison of Bids the procuring UN entity may at its discretion ask the Bidder for clarification of its Bid. The request for clarification and the response shall be in writing and no change in price or substance of the Bid shall be sought, offered or permitted.

20. Preliminary Examination:

20.1 Prior to the detailed evaluation, UNDP will determine the substantial responsiveness of each Bid to the Invitation to Bid (ITB). A substantially responsive Bid is one which conforms to all the terms and conditions of the ITB without material deviations.

20.2 UNDP will examine the bids to determine whether they are complete, whether any computational errors have been made, whether the documents have been properly signed, and whether the bids are generally in order.

20.3 Arithmetical errors will be rectified on the following basis: If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If the Bidder does not accept the correction of errors, its Bid will be rejected. If there is a discrepancy between words and figures the amount in words will prevail.

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

21. Conversion to Single Currency: To facilitate evaluation and comparison, the Purchaser will convert all Bid Prices expressed in the amounts in various currencies in which the Bid Prices are payable to US dollars at the official UN exchange rate on the last day for Submission of Bids.

22. Evaluation of Bids: Determination of compliance with the Solicitation Documents is based on the content of the Bid itself without recourse to extrinsic evidence.
### Evaluation Criteria

<table>
<thead>
<tr>
<th><strong>Evaluation Criteria</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.1</strong> Compliance with pricing conditions set in the ITB.</td>
</tr>
<tr>
<td><strong>1.2</strong> Compliance with requirements relating to technical design features or the product’s ability to satisfy functional requirements.</td>
</tr>
<tr>
<td><strong>1.3</strong> Compliance with Special and General Conditions specified by these Solicitation Documents.</td>
</tr>
<tr>
<td><strong>1.4</strong> Compliance with start-up, delivery or installation deadlines set by the procuring entity.</td>
</tr>
<tr>
<td><strong>1.5</strong> Demonstrated ability to comply with critical provisions such as execution of the Contract by honoring the tax-free status of the UN.</td>
</tr>
<tr>
<td><strong>1.6</strong> Demonstrated ability to honor important responsibilities and liabilities allocated to Supplier in this ITB (e.g. performance guarantees, warranties, or insurance coverage, etc).</td>
</tr>
<tr>
<td><strong>1.7</strong> <strong>Copy of company’s registration required by law and issued by authorized agency:</strong> This document is mandatory for administrative compliance and starting with technical evaluation of bids.</td>
</tr>
<tr>
<td><strong>1.8</strong> <strong>Organizations general and specific experience:</strong> The organizations general reliability, experience and capacity in implementing similar projects.</td>
</tr>
<tr>
<td><strong>1.9</strong> <strong>Adequacy of the proposed work plan:</strong> The Bidder's approach in responding to the SOW and BOQ by presenting work plan including a time schedule for all activities during the construction period and present clear work plan.</td>
</tr>
<tr>
<td><strong>1.10</strong> <strong>Key personnel, machinery and capacity to implement:</strong> The qualification, competence and experience of the personnel proposed for the various assignments included in this project, and capacity to deliver on time. Submit resumes (CV) for key personnel and detailed descriptions of machineries owned or intended to be purchased or leased for the purpose of executing the contract by the Bidder.</td>
</tr>
<tr>
<td><strong>1.11</strong> <strong>Reference list and value of project implemented in last four years:</strong> Include list of projects with similar scale, completion period and list of equipments engaged in this project. Include name of project, kind of executed works, name, telephone, email of Investor, value of executed work (use USD or local currency) and duration of executing work (from, month/year – to, month/year)</td>
</tr>
<tr>
<td><strong>1.12</strong> <strong>Reference list and value of ongoing projects contracted by bidder:</strong> Include list of projects, name of investors, value of contracted works (use USD or local currency) and deadline for construction works (from, month/year-to month/year)</td>
</tr>
<tr>
<td><strong>1.13</strong> <strong>Local knowledge:</strong> Proven experience of organization and involved personnel in working in the same Province.</td>
</tr>
</tbody>
</table>

---

**F. Award of Contract**

23. **Award Criteria:** The procuring UN entity will Issue the Contract to the lowest priced technically qualified Bidder. UNDP reserves the right to accept or reject any Bid, to annul the solicitation process and reject all Bids at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder(s) or any obligation to provide information on the grounds for UNDP’s action.

24. **UNDP’s Right to Vary Requirements at Time of Award:** UNDP reserves the right at the time of making the award of contract to increase or decrease by up to 15% the quantity of works specified in the Schedule of Requirements without any change in unit price or other terms and conditions.

25. **Notification of Award:** Prior to the expiration of the period of Bid Validity, UNDP will send the successful Bidder the Contract. The Contract may only be accepted by the Supplier’s signing and returning an acknowledgement copy of it or by timely delivery of the works in accordance with the terms of this Contract, as herein specified. Acceptance of this Contract shall affect a contract between
the parties under which the rights and obligations of the parties shall be governed solely by the terms and conditions of this Contract.

26. **Signing of the Contract**: Within 3 days of receipt of the Contract the successful Bidder shall sign, date and return it to UNDP.

27. **Performance Security**: The successful Bidder shall provide the Performance Security on the Performance Security Form provided for in these Solicitation Documents, within 30 days of receipt of the Purchase Order from the purchaser.

Failure of the successful Bidder to comply with the requirement of clause 26 or clause 27 of Instructions to Bidders shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security, in which event the Purchaser may make the award to the next lowest evaluated Bidder or call for new Bids.
BID DATA SHEET

The following specific data for the works to be procured shall complement, supplement, or amend the provisions in the Instruction to Bidders. Whenever there is a conflict, the provisions herein shall prevail over those in the Instructions to Bidders.

<table>
<thead>
<tr>
<th>Relevant clause(s) of Instruction to Bidders</th>
<th>Specific data complementing, supplementing, or amending instructions to Bidders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language of the Bid</td>
<td>√ English</td>
</tr>
<tr>
<td>Bid Price</td>
<td>The prices quoted shall be in unit price for estimated activities in BoQ in US $.</td>
</tr>
<tr>
<td>Place: Jenin District</td>
<td></td>
</tr>
<tr>
<td>Documents Establishing Bidder’s Eligibility &amp; Qualifications</td>
<td>√ Required.</td>
</tr>
<tr>
<td></td>
<td>Valid registration with Palestinian Union of Contractors: Grade 1 and / or 2 in Building and Water</td>
</tr>
<tr>
<td></td>
<td>Audited financial report of the company for the last three years. Registration with Ministry of Finance and submittal of a valid Tax Clearance Certificates.</td>
</tr>
<tr>
<td></td>
<td>The Contractor general reliability, experience and capacity in implementing similar projects.</td>
</tr>
<tr>
<td></td>
<td>CVs for key personnel and detailed descriptions of machineries owned by the Bidder.</td>
</tr>
<tr>
<td></td>
<td>list of projects performed by the contractor for the last 2 years with similar scale, including completion period, equipments engaged, kind of executed works, name, telephone, email of employer, value of executed work (use USD or local currency) and duration of executing work (from, month/year – to, month/year)</td>
</tr>
<tr>
<td>Bid Validity Period.</td>
<td>√ 120 days</td>
</tr>
<tr>
<td>UNDP’s Right to Vary Requirements at Time of Award</td>
<td>UNDP reserves the right at the time of making the award of contract to increase or decrease the quantity of works specified in the Schedule of Requirements, regardless of the percentage of change in quantities, without any change in unit price or other terms</td>
</tr>
<tr>
<td>Preliminary Examination</td>
<td>1. Partial bids are not permitted</td>
</tr>
<tr>
<td></td>
<td>2. The Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items for which no rate or price is entered by the Bidder will not be paid for by UNDP when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities. UNDP reserves the right to reject any or all proposals. Without limiting the generality of the foregoing, any proposal which is incomplete, obscure, or irregular may be rejected. A proposal shall contain no interlineations, erasures, or overwriting, except as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by person or persons signing the bid.</td>
</tr>
<tr>
<td></td>
<td>3. All documents are properly signed</td>
</tr>
</tbody>
</table>
|                                            | 4. Bids determined to be substantially responsive will be checked by UNDP for any arithmetic errors. Errors will be corrected by UNDP as follows:
(a) Where there is a discrepancy between the amounts in figures and in words, the amount in words will govern; and
(b) Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern, unless in the opinion of UNDP or the authorized representative there is an obviously gross misplacement of the decimal point in the unit rate, in which case the line item total as quoted will govern, and the unit rate will be corrected.

The amount stated in the Bid will be adjusted by UNDP in accordance with the above procedure for the correction of errors and, with the concurrence of the Bidder, shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount, the Bid will be rejected, and the Bid Security may be forfeited.

5. In evaluating the bids, UNDP will determine for each Bid the evaluated Bid price by adjusting the Bid price as follows:
(a) Making any correction for errors;
(b) Excluding provisional sums and the provision, if any, for contingencies in the Bill of Quantities, but including Day work, where priced competitively;

| **Clarification of Solicitation Documents (Clause 5)** | Should a bidder find discrepancies in, or omissions from, the Drawings or Contract Documents, or should he be in doubts as their meaning, he should at once notify the UNDP focal person before the bid opening date at 3:00 PM on 11<sup>th</sup> May 2007, who may send a written instruction to all bidders. Pre bid meeting for all participating bidders will be conducted on 8<sup>th</sup> May, 2007 at Bir Al Basha village council at 11:30 hours. Subsequent site visit will be made to the project location. |
| **Bid Security** | N/A |
| **Clarification of Bids (Clause 19)** | To assist in the examination, evaluation, and comparison of bids, UNDP or the authorized representative may, at UNDP or the authorized representative’s discretion, ask any Bidder for clarification of its Bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable, telex, or facsimile, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the UNDP or the authorized representative in the evaluation of the bids. |
| **Sealing and Marking of Bids (Clause 15)** | Sealed Envelops should be marked as:
ITB for **Construction of Homework Center for the Beer Al Basha Village – Jenin District Reference Number: ITB/PAL10/51653/Bir Al Basha**

Address:

UND/PAPP Jerusalem Office
4A, Yacubi Street
Jerusalem
DO NOT OPEN BEFORE 10:00 hours - May 22<sup>nd</sup>, 2007 |
Annex III

General Conditions of Contract for Civil Works

1. Definitions
2. Singular and Plural
3. Headings or Notes
4. Legal Relationships
5. General Duties/Powers of Engineer
6. Contractor's General Obligations/Responsibilities
7. Assignment and Subcontracting
8. Drawings
9. Work Book
10. Performance Security
11. Inspection of Site
12. Sufficiency of Tender
13. Programme of Work to be furnished
14. Weekly Site Meeting
15. Change Orders
16. Contractor's Superintendence
17. Contractor's Employees
18. Setting-Out
19. Watching and Lighting
20. Care of Works
22. Damage to Persons and Property
23. Liability Insurance
24. Accident or Injury to Workmen
25. Remedy on Contractor's Failure to Insure
27. Fossils, Etc.
28. Copyright, Patents and Other Proprietary Rights, and Royalties
29. Interference with Traffic and Adjoining Properties
30. Extraordinary Traffic and Special Loads
31. Opportunities for Other Contractors
32. Contractor to Keep Site Clean
33. Clearance of Site on Substantial Completion
34. Labor
35. Returns of Labor, Plant, Etc.
36. Materials, Workmanship and Testing
37. Access to Site
38. Examination of Work Before Covering Up
39. Removal of Improper Work and Materials
40. Suspension of Work
41. Possession of Site
42. Time for Completion
43. Extension of Time for Completion
44. Rate of Progress
45. Liquidated Damages for Delay
46. Certificate of Substantial Completion
47. Defects Liability
48. Alterations, Additions and Omissions
49. Plant, Temporary Works and Materials
50. Approval of Materials, Etc., Not Implied
51. Measurement of Works
52. Liability of the Parties
53. Authorities
54. Urgent Repairs
55. Increase and Decrease of Costs
56. Taxation
57. Blasting
58. Machinery
59. Temporary Works and Reinstatement
60. Photographs and Advertising
61. Prevention of Corruption
62. Date Falling on Holiday
63. Notices
64. Language, Weights and Measures
65. Records, Accounts, Information and Audit
66. Force Majeure
67. Suspension by UNDP
68. Termination by UNDP
69. Termination by the Contractor
70. Rights and Remedies of UNDP
71. Settlement of Disputes
72. Privileges and Immunities

Appendix I: Formats of Performance Security
Performance Bank Guarantee
Performance Bond
DEFINITIONS

For the purpose of the Contract Documents the words and expressions below shall have the following meanings:

a) "Employer" means the United Nations Development Programme (UNDP).

b) "Contractor" means the person whose tender has been accepted and with whom the Contract has been entered into.

c) "Engineer" means the person whose services have been engaged by UNDP to administer the Contract as provided therein, as will be notified in writing to the Contractor.

d) "Contract" means the written agreement between the Employer and the Contractor, to which these General Conditions are annexed.

e) "The Works" means the works to be executed and completed under the Contract.

f) "Temporary Works" shall include items to be constructed which are not intended to be permanent and form part of the Works.

g) "Drawings" and "Specifications" mean the Drawings and Specifications referred to in the Contract and any modification thereof or addition thereto furnished by the Engineer or submitted by the Contractor and approved in writing by the Engineer in accordance with the Contract.

h) "Bill of Quantities" is the document in which the Contractor indicates the cost of the Works, on the basis of the foreseen quantities of items of work and the fixed unit prices applicable to them.

i) "Contract Price" means the sum agreed in the Contract as payable to the Contractor for the execution and completion of the Works and for remedying of any defects therein in accordance with the Contract.

j) "Site" means the land and other places on, under, in or through which the Works or Temporary Works are to be constructed.

SINGULAR AND PLURAL

Words importing persons or parties shall include firms or companies and words importing the singular only shall also include the plural and vice versa where the context requires.

HEADINGS OR NOTES

The headings or notes in the Contract Documents shall not be deemed to be part thereof or be taken into consideration in their interpretation.

LEGAL RELATIONSHIPS

The Contractor and the sub-contractor(s), if any, shall have the status of an independent contractor vis-à-vis the Employer. The Contract Documents shall not be construed to create any contractual relationship of any kind between the Engineer and the Contractor, but the Engineer shall, in the exercise of his duties and powers under the Contract, be entitled to performance by the Contractor of
its obligations, and to enforcement thereof. Nothing contained in the Contract Documents shall create any contractual relationship between the Employer or the Engineer and any subcontractor(s) of the Contractor.

GENERAL DUTIES/POWERS OF ENGINEER

a) The Engineer shall provide administration of Contract as provided in the Contract Documents. In particular, he shall perform the functions hereinafter described.

b) The Engineer shall be the Employer's representative vis-à-vis the Contractor during construction and until final payment is due. The Engineer shall advise and consult with the Employer. The Employer's instructions to the Contractor shall be forwarded through the Engineer. The Engineer shall have authority to act on behalf of the Employer only to the extent provided in the Contract Documents as they may be amended in writing in accordance with the Contract. The duties, responsibilities and limitations of authority of the Engineer as the Employer's representative during construction as set forth in the Contract shall not be modified or extended without the written consent of the Employer, the Contractor and the Engineer.

c) The Engineer shall visit the Site at intervals appropriate to the stage of construction to familiarize himself generally with the progress and quality of the Works and to determine in general if the Works are proceeding in accordance with the Contract Documents. On the basis of his on-site observations as an Engineer, he shall keep the Employer informed of the progress of the Works.

d) The Engineer shall not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Works or the Temporary Works. The Engineer shall not be responsible for or have control or charge over the acts or omissions of the Contractor (including the Contractor's failure to carry out the Works in accordance with the Contract) and of Sub-contractors or any of their agents or employees, or any other persons performing services for the Works, except if such acts or omissions are caused by the Engineer's failure to perform his functions in accordance with the contract between the Employer and the Engineer.

e) The Engineer shall at all times have access to the Works wherever and whether in preparation or progress. The Contractor shall provide facilities for such access so that the Engineer may perform his functions under the Contract.

f) Based on the Engineer's observations and an evaluation of the documentation submitted by the Contractor together with the invoices, the Engineer shall determine the amounts owed to the Contractor and shall issue Certificates for Payment as appropriate.

g) The Engineer shall review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for conformity with the design concept of the Works and with the provisions of the Contract Documents. Such action shall be taken with reasonable promptness so as to cause no delay. The Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

h) The Engineer shall interpret the requirements of the Contract Documents and judge the performance there under by the Contractor. All interpretations and orders of the Engineer shall be consistent with the intent of and reasonably inferable from the Contract Documents and shall be in writing or in the form of drawings. Either party may make a written request to the Engineer for such interpretation. The Engineer shall render the interpretation necessary for the proper execution of the Works with
reasonable promptness and in accordance with any time limit agreed upon. Any claim or dispute arising from the interpretation of the Contract Documents by the Engineer or relating to the execution or progress of the Works shall be settled as provided in Clause 71 of these General Conditions.

i) Except as otherwise provided in the Contract, the Engineer shall have no authority to relieve the Contractor of any of his obligations under the Contract nor to order any work involving delay in completion of the Works or any extra payment to the Contractor by the Employer, or to make any variations to the Works.

j) In the event of termination of the employment of the Engineer, the Employer shall appoint another suitable professional to perform the Engineer's duties.

k) The Engineer shall have authority to reject work which does not conform to the Contract Documents. Whenever, in his opinion, he considers it necessary or advisable for the implementation of the intent of the Contract Documents, he will have authority to require special inspection or testing of the work whether or not such work be then fabricated, installed or completed. However, neither the Engineer's authority to act nor any reasonable decision made by him in good faith either to exercise or not to exercise such authority shall give rise to any duty or responsibility of the Engineer to the Contractor, any subcontractor, any of their agents or employees, or any other person performing services for the Works.

l) The Engineer shall conduct inspections to determine the dates of Substantial Completion and Final Completion, shall receive and forward to the Employer for the Employer's review written warranties and related documents required by the Contract and assembled by the Contractor, and shall issue a final Certificate for Payment upon compliance with the requirements of Clause 47 hereof and in accordance with the Contract.

m) If the Employer and Engineer so agree, the Engineer shall provide one or more Engineer's Representative(s) to assist the Engineer in carrying out his responsibilities at the site. The Engineer shall notify in writing to the Contractor and the Employer the duties, responsibilities and limitations of authority of any such Engineer's Representative(s).

CONTRACTOR'S GENERAL OBLIGATIONS/RESPONSIBILITIES

6.1. Obligation to Perform in Accordance with Contract

The Contractor shall execute and complete the Works and remedy any defects therein in strict accordance with the Contract, with due care and diligence and to the satisfaction of the Engineer, and shall provide all labor, including the supervision thereof, materials, Constructional Plant and all other things, whether of a temporary or permanent nature, required in and for such execution, completion and remedying of defects, as far as the necessity for providing the same is specified in or is reasonably to be inferred from the Contract. The Contractor shall comply with and adhere strictly to the Engineer's instructions and directions on any matter, touching or concerning the Works.

6.2 Responsibility for Site Operations

The Contractor shall take full responsibility for the adequacy, stability and safety of all site operations and methods of construction, provided that the Contractor shall not be responsible, except as may be expressly provided in the Contract, for the design or specification of the Permanent Works or of any Temporary Works prepared by the Engineer.
6.3. Responsibility for Employees

The Contractor shall be responsible for the professional and technical competence of his employees and will select for work under this Contract, reliable individuals who will perform effectively in the implementation of the Contract, respect local customs and conform to a high standard of moral and ethical conduct.

6.4. Source of Instructions

The Contractor shall neither seek nor accept instructions from any authority external to the Employer, the Engineer or their authorized representatives in connection with the performance of his services under this Contract. The Contractor shall refrain from any action which may adversely affect the Employer and shall fulfill his commitments with fullest regard for the interest of the Employer.

6.5. Officials Not to Benefit

The Contractor warrants that no official of the Employer has been or shall be admitted by the Contractor to any direct or indirect benefit arising from this Contract or the award thereof. The Contractor agrees that breach of this provision is a breach of an essential term of the Contract.

6.6. Use of Name, Emblem or Official Seal of UNDP or the United Nations

The Contractor shall not advertise or otherwise make public the fact that he is performing, or has performed services for the Employer or use the name, emblem or official seal of the Employer or the United Nations or any abbreviation of the name of the Employer or the United Nations for advertising purposes or any other purposes.

6.7. Confidential Nature of Documents

All maps, drawings, photographs, mosaics, plans, reports, recommendations, estimates, documents and all other data compiled by or received by the Contractor under the Contract shall be the property of the Employer, shall be treated as confidential and shall be delivered only to the duly authorized representative of the Employer on completion of the Works; their contents shall not be made known by the Contractor to any person other than the personnel of the Contractor performing services under this Contract without the prior written consent of the Employer.

ASSIGNMENT AND SUBCONTRACTING

7.1. Assignment of Contract

The Contractor shall not, except after obtaining the prior written approval of the Employer, assign, transfer, pledge or make other disposition of the Contract or any part thereof or of any of the Contractor's rights, claims or obligations under the Contract.

7.2. Subcontracting

In the event the Contractor requires the services of subcontractors, the Contractor shall obtain the prior written approval of the Employer for all such subcontractors. The approval of the Employer shall not relieve the Contractor of any of his obligations under the Contract, and the terms of any subcontract shall be subject to and be in conformity with the provisions of the Contract.
7.3. Assignment of Subcontractor's Obligations

In the event of a subcontractor having undertaken towards the Contractor in respect of the work executed or the works, materials, Plant or services supplied by such subcontractor for the Works, any continuing obligation extending for a period exceeding that of the Defects Liability Period under the Contract, the Contractor shall at any time after the expiration of such Period, assign to the Employer, at the Employer's request and cost, the benefit of such obligation for the unexpired duration thereof.

DRAWINGS

8.1. Custody of drawings

The drawings shall remain in the sole custody of the Employer but two (2) copies thereof shall be furnished to the Contractor free of cost. The Contractor shall provide and make at his own expense any further copies required by him. At the completion of the Works, the Contractor shall return to the Employer all drawings provided under the Contract.

8.2. One copy of Drawings to be kept on Site

One copy of the Drawings furnished to the Contractor as aforesaid shall be kept by the Contractor on the Site and the same shall at all reasonable times be available for inspection and use by the Engineer and by any other person authorized in writing by the Engineer.

8.3. Disruption of Progress

The Contractor shall give written notice to the Engineer whenever planning or progress of the Works is likely to be delayed or disrupted unless any further drawing or order, including a direction, instruction or approval, is issued by the Engineer within a reasonable time. The notice shall include details of drawing or order required and of why and by when it is required and of any delay or disruption likely to be suffered if it is late.

WORK BOOK

The Contractor shall maintain a Work Book at the Site with numbered pages, in one original and two copies. The Engineer shall have full authority to issue new orders, drawings and instructions to the Contractor, from time to time and as required for the correct execution of the Works. The Contractor shall be bound to follow such orders, drawings and instructions.

Every order shall be dated and signed by the Engineer and the Contractor, in order to account for its receipt.

Should the Contractor want to refuse an order in the Work Book, he shall so inform the Employer, through the Engineer, by means of an annotation in the Work Book made within three (3) days from the date of the order that the Contractor intends to refuse. Failure by the Contractor to adhere to this procedure shall result in the order being deemed accepted with no further possibility of refusal.

The original of the Work Book shall be delivered to the Employer at the time of Final Acceptance of the Works. A copy shall be kept by the Engineer and another copy by the Contractor.
PERFORMANCE SECURITY

a) As guarantee for his proper and efficient performance of the Contract, the Contractor shall on signature of the Contract furnish the Employer with a Performance Security issued for the benefit of the Employer. The amount and character of such security (bond or guarantee) shall be as indicated in the Contract.

b) The Performance Bond or Bank Guarantee must be issued by an acceptable insurance company or accredited bank, in the format included in Appendix I to these General Conditions, and must be valid up to twenty-eight days after issuance by the Engineer of the Certificate of Final Completion. The Performance Bond or Bank Guarantee shall be returned to the Contractor within twenty-eight days after the issuance by the Engineer of the Certificate of Final Completion, provided that the Contractor shall have paid all money owed to the Employer under the Contract.

c) If the surety of the Performance Bond or Bank Guarantee is declared bankrupt or becomes insolvent or its right to do business in the country of execution of the Works is terminated, the Contractor shall within five (5) days thereafter substitute another bond or guarantee and surety, both of which must be acceptable to the Employer.

INSPECTION OF SITE

The Contractor shall be deemed to have inspected and examined the site and its surroundings and to have satisfied himself before submitting his Tender and signing the Contract as to all matters relative to the nature of the land and subsoil, the form and nature of the Site, details and levels of existing pipeline lines, conduits, sewers, drains, cables or other existing services, the quantities and nature of the work and materials necessary for the completion of the Works, the means of access to the Site, and the accommodation he may require, and in general to have himself obtained all necessary information as to risk contingencies, climatic, hydrological and natural conditions and other circumstances which may influence or affect his Tender, and no claims will be entertained in this connection against the Employer.

SUFFICIENCY OF TENDER

The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his Tender for the construction of the Works and of the rates and prices, which rates and prices shall, except in so far as it is otherwise provided in the Contract, cover all his obligations under the Contract and all matters and things necessary for the proper execution and completion of the Works.

PROGRAMME OF WORK TO BE FURNISHED

Within the time limit specified in the Contract, the Contractor shall submit to the Engineer for his consent a detailed Programme of Work showing the order of procedure and the method in which he proposes to carry out the Works. In preparing his Programme of Work the Contractor shall pay due regard to the priority required by certain works. Should the Engineer, during the progress of work, require further modifications to the Programme of Work, the Contractor shall review the said program. The Contractor shall also whenever required by the Engineer submit particulars in writing of the Contractor's arrangements for carrying out the Works and of the Constructional Plant and Temporary Works which the Contractor intends to supply, use or construct as the case may be. The submission of such program, or any modifications thereto, or the particulars required by the Engineer,
shall not relieve the Contractor of any of his duties or obligations under the Contract nor shall the incorporation of any modification to the Programme of Work either at the commencement of the contract or during its course entitle the Contractor to any additional payments in consequence thereof.

WEEKLY SITE MEETING

A weekly site meeting shall be held between UNDP Project Coordinator or engineer, if any, the representative of the Contractor and the Engineer or the Engineer's Representative, in order to verify that the Works are progressing normally and are executed in accordance with the Contract.

CHANGE ORDERS

a) The Engineer may instruct the Contractor, with the approval of the Employer and by means of Change Orders, all variations in quantity or quality of the Works, in whole or in part, that are deemed necessary by the Engineer.

b) Processing of change orders shall be governed by clause 48 of these General Conditions.

CONTRACTOR'S SUPERINTENDENCE

The Contractor shall provide all necessary superintendence during the execution of the Works and as long thereafter as the Engineer may consider necessary for the proper fulfillment of the Contractor's obligations under the Contract. The Contractor or a competent and authorized agent or representative of the Contractor approved in writing by the Engineer, which approval may at any time be withdrawn, shall be constantly on the site and shall devote his entire time to the superintendence of the Works. Such authorized agent or representative shall receive on behalf of the Contractor directions and instructions from the Engineer. If the approval of such agent or representative shall be withdrawn by the Engineer, as provided in Clause 17(2) hereinafter, or if the removal of such agent or representative shall be requested by the Employer under Clause 17(3) hereinafter, the Contractor shall as soon as it is practicable after receiving notice of such withdrawal remove the agent or representative from the Site, and replace him by another agent or representative approved by the Engineer. Notwithstanding the provision of Clause 17(2) hereinafter, the Contractor shall not thereafter employ, in any capacity whatsoever, a removed agent or representative again on the Site.

CONTRACTOR'S EMPLOYEES

a) The Contractor shall provide and employ on the Site in connection with the execution and completion of the Works and the remedying of any defects therein:

i. Only such technical assistants as are skilled and experienced in their respective callings and such sub-agent foremen and leading hands as are competent to give proper supervision to the work they are required to supervise, and

ii. Such skilled, semi-skilled, and unskilled labour as is necessary for the proper and timely execution and completion of the Works.

b) The Engineer shall be at liberty to object to and require the Contractor to remove forthwith from the Works any person employed by the Contractor in or about the execution or completion of the Works, who in the opinion of the Engineer is misconducting himself, or is incompetent or negligent in the proper performance of his duties, or whose employment is otherwise considered reasonably by the Engineer to be undesirable, and such person shall not be again employed on the Site without the
written permission of the Engineer. Any person so removed from the Works shall be replaced as soon as reasonably possible by a competent substitute approved by the Engineer.

c) Upon written request by the Employer, the Contractor shall withdraw or replace from the Site any agent, representative or other personnel who does not conform to the standards set forth in paragraph (1) of this Clause. Such request for withdrawal or replacement shall not be considered as termination in part or in whole of this Contract. All costs and additional expenses resulting from any withdrawal or replacement for whatever reason of any of the Contractor's personnel shall be at the Contractor's expense.

**SETTING-OUT**

The Contractor shall be responsible for the true and proper setting out of the Works in relation to original points, lines and levels of reference given by the Engineer in writing and for the correctness of the position, levels, dimensions and alignment of all parts of the Works and for the provision of all necessary instruments, appliances and labor in connection therewith. If, at any time during the progress of the Works, any error shall appear or arise in the position, levels, dimensions or alignment of any part of the Works, the Contractor, on being required so to do by the Engineer, shall, at his own cost, rectify such error to the satisfaction of the Engineer.

**WATCHING AND LIGHTING**

The Contractor shall in connection with the Works provide and maintain at his own cost all lights, guards, fencing and watching when and where necessary or required by the Engineer or by any duly constituted authority for the protection of the Works and the materials and equipment utilized there for or for the safety and convenience of the public or others.

**CARE OF WORKS**

a) From the commencement date of the Works to the date of substantial completion as stated in the Certificate of Substantial Completion, the Contractor shall take full responsibility for the care thereof and of all Temporary Works. In the event that any damage or loss should happen to the Works or to any part thereof or to any Temporary Works from any cause whatsoever (save and except as shall be due to Force Majeure as defined in Clause 66 of these General Conditions), the Contractor shall at his own cost repair and make good the same so that, at completion, the Works shall be in good order and condition and in conformity in every respect with the requirements of the Contract and the Engineer's instructions. The Contractor shall also be liable for any damage to the Works occasioned by him in the course of any operations carried out by him for the purpose of complying with his obligations Clause 47 hereof.

b) The Contractor shall be fully responsible for the review of the Engineering design and details of the Works and shall inform the Employer of any mistakes or incorrectness in such design and details which would affect the Works.

**INSURANCE OF WORKS, ETC.**

Without limiting his obligations and responsibilities under Clause 20 hereof, the Contractor shall insure immediately following signature of this Contract, in the joint names of the Employer and the Contractor (a) for the period stipulated in Clause 20(1) hereof, against all loss or damage from whatever cause arising, other than cause of Force majeure as defined in clause 66 of these General Conditions, and (b) against loss or damage for which the Contractor is responsible, in such manner
that the Employer and the Contractor are covered for the period stipulated in Clause 20 (1) hereof and are also covered during the Defects Liability Period for loss or damage arising from a cause occurring prior to the commencement of the Defects Liability Period and for any loss or damage occasioned by the Contractor in the course of any operations carried out by him for the purpose of complying with his obligations under Clause 47 hereof:

a) The Works, together with the materials and Plant for incorporation therein, to their full replacement cost, plus an additional sum of ten (10) per cent of such replacement cost, to cover any additional costs of and incidental to the rectification of loss or damage including professional fees and the cost of demolishing and removing any part of the Works and of removing debris of whatsoever nature;

b) The Contractor's equipment and other things brought on to the Site by the Contractor to the replacement value of such equipment and other things;

c) An insurance to cover the liabilities and warranties of Section 52(4);

Such insurance shall be effected with an insurer and in terms approved by the Employer, which approval shall not be unreasonably withheld, and the Contractor shall, whenever required, produce to the Engineer the policy or policies of insurance and the receipts for payment of the current premiums.

DAMAGE TO PERSONS AND PROPERTY

The Contractor shall (except if and so far as the Contract provides otherwise) indemnify, hold and save harmless and defend at his own expense the Employer, its officers, agents, employees and servants from and against all suits, claims, demands, proceedings, and liability of any nature or kind, including costs and expenses, for injuries or damages to any person or any property whatsoever which may arise out of or in consequence of acts or omissions of the Contractor or its agents, employees, servants or subcontractors in the execution of the Contract. The provision of this Clause shall extend to suits, claims, demands, proceedings and liability in the nature of workmen's compensation claims and arising out of the use of patented inventions and devices. Provided always that nothing herein contained shall be deemed to render the Contractor liable for or in respect of or with respect to:

a) The permanent use or occupation of land by the Works or any part thereof;

b) The right of the Employer to construct the Works or any part thereof on, over, under, or through any land.

c) Interference whether temporary or permanent with any right of light, airway or water or other easement or quasi-easement which is the unavoidable result of the construction of the Works in accordance with the Contract.

d) Death, injuries or damage to persons or property resulting from any act or neglect of the Employer, his agents, servants or other contractors, done or committed during the validity of the Contract.

LIABILITY INSURANCE

23.1. Obligation to take out Liability Insurance

Before commencing the execution of the Works, but without limiting his obligations and responsibility under Clause 20 hereof, the Contractor shall insure against his liability for any death, material or physical damage, loss or injury which may occur to any property, including that of the
Employer or to any person, including any employee of the Employer by or arising out of the execution of the Works or in the carrying out of the Contract, other than due to the matters referred to in the proviso to Clause 22 hereof.

23.2. Minimum Amount of Liability Insurance

Such insurance shall be effected with an insurer and in terms approved by the Employer, which approval shall not be unreasonably withheld, and for at least the amount specified in the contract. The Contractor shall, whenever required by the Employer or the Engineer, produce to the Engineer the policy or policies of insurance and the receipts for payment of the current premiums.

23.3. Provision to Indemnify Employer

The insurance policy shall include a provision whereby, in the event of any claim in respect of which the Contractor would be entitled to receive indemnity under the policy, being brought or made against the Employer, the insurer shall indemnify the Employer against such claims and any costs, charges and expenses in respect thereof.

ACCIDENT OR INJURY TO WORKMEN

a) The Employer shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the employment of the Contractor or any sub-Contractor, save and except an accident or injury resulting from any act or default of the Employer, his agents or servants. The Contractor shall indemnify, hold and save harmless the Employer against all such damages and compensation, save and except as aforesaid, and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

b) Insurance Against Accident, etc., to Workmen

The Contractor shall insure against such liability with an insurer approved by the Employer, which approval shall not be unreasonably withheld, and shall continue such insurance during the whole of the time that any persons are employed by him for the Works and shall, when required, produce to the Engineer such policy of insurance and the receipt for payment of the current premium. Provided always that, in respect of any persons employed by any subcontractor, the Contractor's obligation to insure as aforesaid under this sub-clause shall be satisfied if the subcontractor shall have insured against the liability in respect of such persons in such manner that the Employer is indemnified under the policy but the Contractor shall require such subcontractor to produce to the Engineer when required such policy of insurance and the receipt for the current premium, and obtain the insertion of a provision to that effect in its contract with the subcontractor.

REMEDY ON CONTRACTOR'S FAILURE TO INSURE

If the Contractor shall fail to effect and keep in force any of the insurances referred to in Clauses 21, 23 and 24 hereof, or any other insurance which he may be required to effect under the terms of the Contract, the Employer may in any such case effect and keep in force any such insurance and pay such premium as may be necessary for that purpose and from time to time deduct the amount so paid by the Employer as aforesaid from any monies due or which may become due to the Contractor, or recover the same as a debt due from the Contractor.
COMPLIANCE WITH STATUTES, REGULATIONS, ETC.

a) The Contractor shall give all notices and pay all fees and charges required to be given or paid by any national or State Statutes, Ordinances, Laws, Regulations or By-laws, or any local or other duly constituted authority in relation to the execution of the Works or of any Temporary Works and by the Rules and Regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the Works or any Temporary Works.

b) The Contractor shall conform in all respects with any such Statutes, Ordinances, Laws, Regulations, By-laws or requirements of any such local or other authority which may be applicable to the Works and shall keep the Employer indemnified against all penalties and liabilities of every kind for breach of any such Statutes, Ordinances, Laws, Regulations, By-laws or requirements.

27. FOSSILS, ETC.

All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the Site of the Works shall as between the Employer and the Contractor be deemed to be the absolute property of the Employer and the Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing or damaging any such article or thing and shall immediately upon discovery thereof and before removal acquaint the Employer of such discovery and carry out at the expense of the Employer the Engineer's orders as to the disposal of the same.

28. COPYRIGHT, PATENT AND OTHER PROPRIETARY RIGHTS, AND ROYALTIES

a) The Contractor shall hold harmless and fully indemnify the Employer from and against all claims and proceedings for or on account of infringement of any patent rights, design trademark or name or other protected rights in respect of any Plant, equipment, machine, work or material used for or in connection with the Works or Temporary Works and from and against all claims, demands proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto, except where such infringement results from compliance with the design or Specification provided by the Engineer.

b) Except where otherwise specified, the Contractor shall pay all tonnage and other royalties, rent and other payments or compensation, if any, for getting stone, sand, gravel, clay or other materials required for the Works or Temporary Works.

29. INTERFERENCE WITH TRAFFIC AND ADJOINING PROPERTIES

All operations necessary for the execution of the Works and for the Construction of any Temporary Works shall, so far as compliance with the requirements of the Contract permits, be carried on so as not to interfere unnecessarily or improperly with the public convenience, or the access to, use and occupation of, public or private roads and footpaths to or of properties whether in the possession of the Employer or of any other person. The Contractor shall hold harmless and indemnify the Employer in respect of all claims, demands, proceedings, damages, costs, charges and expenses whatsoever arising out of or in relation to any such matters in so far as the Contractor is responsible therefor.
30. EXTRAORDINARY TRAFFIC AND SPECIAL LOADS

a) The Contractor shall use every reasonable means to prevent any of the roads or bridges communicating with or on the routes to the Site from being damaged by any traffic of the Contractor or any of his sub-contractors and, in particular, shall select routes, choose and use vehicles and restrict and distribute loads so that any such extraordinary traffic as will inevitably arise from the moving of plant and material from and to the Site shall be limited as far as reasonably possible and so that no unnecessary damage may be occasioned to such roads and bridges.

b) Should it be found necessary for the Contractor to move any load of Constructional Plant, machinery, preconstructed units or parts of units of work, or other thing, over part of a road or bridge, the moving whereof is likely to damage any such road or bridge unless special protection or strengthening is carried out, then the Contractor shall before moving the load on to such road or bridge, save insofar as the Contract otherwise provide, be responsible for and shall pay for the cost of strengthening any such bridge or altering or improving any such road to avoid such damage, and the Contractor shall indemnify and keep the Employer indemnified against all claims for damage to any such road or bridge caused by such movement, including such claim as may be made directly against the Employer, and shall negotiate and pay all claims arising solely out of such damage.

31. OPPORTUNITIES FOR OTHER CONTRACTORS

The Contractor shall in accordance with the requirements of the Engineer afford all reasonable opportunities for carrying out their work to any other contractors employed by the Employer and their workmen and to the workmen of the Employer and of any other duly constituted authorities who may be employed in the execution on or near the Site of any work not included in the Contract or of any contract which the Employer may enter into in connection with or ancillary to the Works. If work by other contractors of the Employer as above-mentioned involves the Contractor in any direct expenses as a result of using his Site facilities, the Employer shall consider payment to the Contractor of such sum or sums as may be recommended by the Engineer.

32. CONTRACTOR TO KEEP SITE CLEAN

During the progress of the Works, the Contractor shall keep the Site reasonably free from all unnecessary obstruction and shall store or dispose of any Constructional Plant and surplus materials and clear away and remove from the Site any wreckage, rubbish or Temporary Works no longer required.

33. CLEARANCE OF SITE ON SUBSTANTIAL COMPLETION

On the substantial completion of the Works, the Contractor shall clear away and remove from the Site all Constructional Plant surplus materials, rubbish and Temporary Works of every kind and leave the whole of the Site and Works clean and in a workmanlike condition to the satisfaction of the Engineer.

34. LABOUR

34.1 Engagement of Labour

The Contractor shall make his own arrangements for the engagement of all labour local or otherwise.

34.2 Supply of Water
The Contractor shall provide on the Site to the satisfaction of the Engineer an adequate supply of drinking and other water for the use of the Contractor's staff and work people.

34.3 Alcoholic Drinks or Drugs

The Contractor shall comply with Government laws and regulations and orders in force as regards the import, sale, barter or disposal of alcoholic drinks or narcotics and he shall not allow or facilitate such importation, sale, gift, barter or disposal by his sub-contractors, agents or employees.

34.4 Arms and Ammunition

The restrictions specified in clause 34.3 above shall include all kinds of arms and ammunition.

34.5 Holiday and Religious Customs

The Contractor shall in all dealings with labor in his employ have due regard to all holiday, recognized festivals and religious or other customs.

34.6 Epidemics

In the event of any outbreak of illness of an epidemic nature the Contractor shall comply with and carry out such regulations, orders, and requirements as may be made by the Government or the local medical or sanitary authorities for the purpose of dealing with and overcoming the same.

34.7 Disorderly Conduct, etc.

The Contractor shall at all times take all reasonable precautions to prevent any unlawful riotous or disorderly conduct by or amongst his employees and for the preservation of peace and the protection of persons and property in the neighborhood of the Works against the same.

34.8 Observance by Sub-Contractors

The Contractor shall be considered responsible for the observance of the above provisions by his Sub-Contractors.

34.9 Legislation applicable to Labor

The Contractor shall abide by all applicable legislation and regulation with regard to labour.

RETURN OF LABOUR, PLANT, ETC.

The Contractor shall, if required by the Engineer, deliver to the Engineer at his office, a return in detail in the form and at such intervals as the Engineer may prescribe showing the supervisory staff and the numbers of the several classes of labor from time to time employed by the Contractor on the Site and such information respecting Constructional plant as the Engineer may require.

MATERIALS, WORKMANSHIP AND TESTING

36.1 Materials and Workmanship
a) All materials and workmanship shall be of the respective kinds described in the Contract and in accordance with the Engineer's instructions and shall be subjected from time to time to such tests as the Engineer may direct at the place of manufacture or fabrication, or on the Site or at all or any of such places. The Contractor shall provide such assistance, instruments, machines, labor and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any materials used and shall supply samples of materials before incorporation in the Works for testing as may be selected and required by the Engineer. All testing equipment and instruments provided by the Contractor shall be used only by the Engineer or by the Contractor in accordance with the instructions of the Engineer.

b) No material not conforming with the Specifications in the Contract may be used for the Works without prior written approval of the Employer and instruction of the Engineer, provided always that if the use of such material results or may result in increasing the Contract Price, the procedure in Clause 48 shall apply.

36.2 Cost of Samples

All samples shall be supplied by the Contractor at his own cost unless the supply thereof is clearly intended in the Specifications or Bill of Quantities to be at the cost of the Employer. Payment will not be made for samples which do not comply with the Specifications.

36.3 Cost of Tests

The Contractor shall bear the costs of any of the following tests:

a) Those clearly intended by or provided for in the Contract Documents.

b) Those involving load testing or tests to ensure that the design of the whole of the Works or any part of the Works is appropriate for the purpose which it was intended to fulfill.

37 ACCESS TO SITE

The Employer and the Engineer and any persons authorized by either of them shall, at all times, have access to the Works and to the Site and to all workshops and places where work is being prepared or whence materials, manufactured articles or machinery are being obtained for the Works and the Contractor shall afford every facility for and every assistance in or in obtaining the right to such access.

38 EXAMINATION OF WORK BEFORE COVERING UP

No work shall be covered up or put out of view without the approval of the Engineer and the Contractor shall afford full opportunity for the Engineer to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The Contractor shall give due notice to the Engineer whenever any such work or foundations is or are ready or about to be ready for examination and the Engineer shall without unreasonable delay unless he considers it unnecessary and advises the Contractor accordingly attend for the purpose of examining and measuring such work or of examining such foundations.

39 REMOVAL OF IMPROPER WORK AND MATERIALS

39.1 Engineer's power to order removal
The Engineer shall during the progress of the Work have power to order in writing from time to time, and the Contractor shall execute at his cost and expense, the following operations:

a) The removal from the Site within such time or times as may be specified in the order of any materials which in the opinion of the Engineer are not in accordance with the Contract;

b) The substitution of proper and suitable materials; and

c) The removal and proper re-execution (notwithstanding any previous test thereof or interim payment therefore) of any work which in respect of materials or workmanship is not in the opinion of the Engineer in accordance with the Contract.

39.2 Default of Contractor in carrying out Engineer's Instructions

In case of default on the part of the Contractor in carrying out an instruction of the Engineer, the Employer shall be entitled to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be borne by the Contractor and shall be recoverable from him by the Employer and may be deducted by the Employer from any monies due or which may become due to the Contractor.

40 SUSPENSION OF WORK

The Contractor shall on the written order of the Engineer suspend the progress of the Works or any part thereof for such time or times and in such manner as the Engineer may consider necessary and shall, during such suspension, properly protect and secure the Works so far as it is necessary in the opinion of the Engineer. The Employer should be notified and his written approval should be sought for any suspension of work in excess of three (3) days.

41 POSSESSION OF SITE

41.1 Access to Site

The Employer shall with the Engineer's written order to commence the Works, give to the Contractor possession of so much of the Site as may be required to enable the Contractor to commence and proceed with the construction of the Works in accordance with the Program referred to in Clause 13 hereof and otherwise in accordance with such reasonable proposals of the Contractor as he shall make to the Engineer by notice in writing, and shall from time to time as the Works proceed give to the Contractor possession of such further portions of the Site as may be required to enable the Contractor to proceed with the construction of the Works with due dispatch in accordance with the said Program or proposals, as the case may be.

41.2 Way leaves, etc.

The Contractor shall bear all expenses and charges for special temporary way leaves required by him in connection with access to the Site. The Contractor shall also provide at his own cost any additional accommodation outside the Site required by him for the purpose of the Works.

41.3 Limits of the Site
Except as defined below, the limits of the Site shall be as defined in the Contract. Should the Contractor require land beyond the Site, he shall provide it entirely at his own expense and before taking possession shall supply the Engineer with a copy of the necessary permits. Access to the Site is available where the Site adjoins a public road but it is not provided unless shown on the Drawings. When necessary for the safety and convenience of workmen, public or livestock or for the protection of the Works, the Contractor shall, at his own expense, provide adequate temporary fencing to the whole or part of the Site. The Contractor shall not disturb damage or pull down any hedge, tree or building within the Site without the written consent of the Engineer.

42 TIME FOR COMPLETION

a) Subject to any requirement in the Contract as to completion of any section of the Works before completion of the whole, the whole of the Works shall be completed, in accordance with the provisions of Clause 46 and 47 hereof, within the time stated in the Contract.

b) The completion time includes weekly rest days, official holidays, and days of inclement weather.

43 EXTENSION OF TIME FOR COMPLETION

If, subject to the provisions of the Contract, the Engineer orders alterations or additions in the Works in accordance with Clause 48 hereof, or if circumstances constituting force majeure as defined in the Contract have occurred, the Contractor shall be entitled to apply for an extension of the time for completion of the Works specified in the Contract. The Employer shall, upon such application, determine the period of any such extension of time; provided that in the case of alterations or additions in the Works, the application for such an extension must be made before the alterations or additions in the Works are undertaken by the Contractor.

44 RATE OF PROGRESS

The whole of the materials, plant and labor to be provided by the Contractor and the mode, manner and speed of execution and completion of the Works are to be of a kind and conducted in a manner to the satisfaction of the Engineer. Should the rate of progress of the Works or any part thereof be at any time in the opinion of the Engineer too slow to ensure the completion of the Works by the prescribed time or extended time for completion, the Engineer shall so notify the Contractor in writing and the Contractor shall thereupon take such steps as the Contractor may think necessary and the Engineer may approve to expedite progress so as to complete the Works by the prescribed time or extended time for completion. If the work is not being carried on by day and by night and the Contractor shall request permission to work by night as well as by day, then, if the Engineer shall grant such permission, the Contractor shall not be entitled to any additional payment. All work at night shall be carried out without unreasonable noise and disturbance. The contractor shall indemnify the Employer from and against any claims or liability for damages on account of noise or other disturbance created while or in carrying out the work and from and against all claims, demands, proceedings, costs and expenses whatsoever in regard or in relation to such noise or other disturbance. The Contractor shall submit in triplicate to the Engineer at the end of each month signed copies of explanatory Drawings or any other material showing the progress of the Works.

45 LIQUIDATED DAMAGES FOR DELAY

a) If the Contractor shall fail to complete the Works within the time for completion prescribed in the Contract, or any extended time for completion in accordance with the Contract, then the Contractor
shall pay to the Employer the sum specified in the Contract as liquidated damages, for the delay between the time prescribed in the Contract or the extended time for completion, as the case may be, and the date of substantial completion of the Works as stated in the Certificate of Substantial Completion, subject to the applicable limit stated in the Contract. The said sum shall be payable by the sole fact of the delay without the need for any previous notice or any legal proceedings, or proof of damage, which shall in all cases be considered as ascertained. The Employer may, without prejudice to any other method of recovery, deduct the amount of such liquidated damages from any monies in its hands due or which may become due to the Contractor. The payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Works or from any other of his obligations and liabilities under the Contract.

b) If, before the time for completion of the whole of the Works or of a Section of the Works, a Certificate of Substantial Completion has been issued for any part or Section of the Works, the liquidated damages for delay in completion of the remainder of the Works or of that Section may, for any period of delay after the date stated in such Certificate of Substantial Completion, and in the absence of alternative provisions in the Contract, be reduced in the proportion which the value of the part or Section so certified bears to the total value of the whole of the Works or Section, as applicable. The provisions of this Sub-Clause shall only apply to the rate of liquidated damages and shall not affect the limit thereof.

46 CERTIFICATE OF SUBSTANTIAL COMPLETION

46.1 Substantial Completion of the Works

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

46.2 Substantial Completion of Sections or Parts of the Works

In accordance with the procedure in Sub-Clause (1) of this Clause and on the same conditions as provided therein, the Contractor may request the Engineer to issue, and the Engineer may issue, a Certificate of Substantial Completion in respect of any Section or part of the Works which has been substantially completed and has satisfactorily passed any tests on completion prescribed by the Contract, if:
a) a separate time for completion is provided in the Contract in respect of such Section or part of the Works;

b) such Section or part of the Works has been completed to the satisfaction of the Engineer and is required by the Employer for his occupation or use.

Upon the issuance of such Certificate, the Contractor shall be deemed to have undertaken to complete any outstanding work during the Defects Liability Period.

47 DEFECTS LIABILITY

47.1 Defects Liability Period

The expression "Defects Liability Period" shall mean the period of twelve (12) months, calculated from the date of completion of the Works stated in the Certificate of Substantial Completion issued by the Engineer or, in respect of any Section or part of the Works for which a separate Certificate of Substantial Completion has been issued, from the date of completion of that Section or part as stated in the relevant Certificate. The expression "the Works" shall, in respect of the Defects Liability Period, be construed accordingly.

47.2 Completion of Outstanding Work and Remedy of Defects

During the Defects Liability Period, the Contractor shall finish the work, if any, outstanding at the date of the Certificate of Substantial Completion, and shall execute all such work of repair, amendment, reconstruction, rectification and making good defects, imperfections, shrinkages or other faults as may be required of the Contractor in writing by the Engineer during the Defects Liability Period and within fourteen (14) days after its expiration, as a result of an inspection made by or on behalf of the Engineer prior to expiration of the Defects Liability Period.

47.3 Cost of Execution of Work of Repair, etc.

All such outstanding work shall be carried out by the Contractor at his own expense if the necessity thereof shall, in the opinion of the Engineer, be due to the use of material or workmanship not in accordance with the Contract, or to neglect or failure on the part of the Contractor to comply with any obligation expressed or implied, on the Contractor's part under the Contract.

47.4 Remedy on Contractor's Failure to Carry Out Work Required

If the Contractor shall fail to do any such work outstanding on the Works, the Employer shall be entitled to employ and pay other persons to carry out the same, and all expenses consequent thereon or incidental thereto shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due or which may become due to the Contractor.

47.5 Certificate of Final Completion

Upon satisfactory completion of the work outstanding on the Works, the Engineer shall within twenty eight (28) days of the expiration of the Defects Liability period issue a Certificate of Final Completion to the Contractor. The Contract shall be deemed to be completed upon issuance of such Certificate, provided that the provisions of the Contract which remain unperformed and the Settlement of Disputes provision in the Contract shall remain in force for as long as is necessary to dispose of any outstanding matters or issues between the Parties.
48 ALTERATIONS, ADDITIONS AND OMISSIONS

1 Variations

The Engineer may within his powers introduce any variations to the form, type or quality of the Works or any part thereof which he considers necessary and for that purpose or if for any other reasons it shall, in his opinion be desirable, he shall have power to order the Contractor to do and the Contractor shall do any of the following:

(a) increase or decrease the quantity of any work under the Contract;

(b) omit any such work;

(c) change the character or quality or kind of any such work;

(d) change the levels, lines, positions and dimensions of any part of the Works;

(e) execute additional work of any kind necessary for the completion of the Works, and no such variation shall in any way vitiate or invalidate the Contract.

2 Variations Increasing Cost of Contract or altering the Works.

The Engineer shall, however, obtain the written approval of the Employer before giving any order for any variations which may result in an increase of the Contract Price or in an essential alteration of the quantity, quality or character of the Works.

3 Orders for Variations to be in Writing

No variations shall be made by the Contractor without an order in writing from the Engineer. Variations requiring the written approval of the Employer under paragraph (2) of this Clause shall be made by the Contractor only upon written order from the Engineer accompanied by a copy of the Employer's approval. Provided that, subject to the provisions of the Contract, no order in writing shall be required for any increase or decrease in the quantity of any work where such increase or decrease is not the result of an order given under this Clause but is the result of the quantities exceeding or being less than those stated in the Bill of Quantities.

4 Valuation of Variations

The Engineer shall estimate to the Employer the amount to be added or deducted from the Contract Price in respect of any variation, addition or omission. In the case of any variation, addition or omission which may result in an increase of the Contract Price, the Engineer shall communicate such estimate to the Employer together with his request for the Employer's written approval of such variation, addition or omission. The value of any variation, addition or omission shall be calculated on the basis of the unit prices contained in the Bill of Quantities.

49 PLANT, TEMPORARY WORKS AND MATERIALS

1 Plant, etc., Exclusive Use for the Works
All Constructional Plant, Temporary Works and Materials provided by the Contractor shall, when brought on the Site, be deemed to be exclusively intended for the construction and completion of the Works and the Contractor shall not remove the same or any part thereof (save for the purpose of moving it from one part of the Site to another) without the consent in writing of the Engineer which shall not be unreasonably withheld.

2 Removal of Plant, etc.

Upon completion of the Works the Contractor shall remove from the Site all the said Constructional Plant and Temporary Works remaining thereon and any unused materials provided by the Contractor.

3 Employer not liable for Damage to Plant

The Employer shall not be at any time liable for the loss of any of the said Constructional plant, Temporary Works or Materials save if such loss results from the act or neglect of the Employer, its employees or agents.

4 Ownership of paid material and work

All material and work covered by payments made by the Employer to the Contractor shall thereupon become the sole property of the Employer, but this provision shall not be construed as relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work or as waiving the right of the Employer to require the fulfillment of all of the terms of the Contract.

5 Equipment and supplies furnished by Employer

Title to any equipment and supplies which may be furnished by the Employer shall rest with the Employer and any such equipment and supplies shall be returned to the Employer at the conclusion of the Contract or when no longer needed by the Contractor. Such equipment when returned to the Employer shall be in the same condition as when delivered to the Contractor, subject to normal wear and tear.

50 APPROVAL OF MATERIALS ETC., NOT IMPLIED

The operation of Clause 49 hereof shall not be deemed to imply any approval by the Engineer of the materials or other matters referred to therein nor shall it prevent the rejection of any such materials at any time by the Engineer.

51 MEASUREMENT OF WORKS

The Engineer shall, when he requires any part or parts of the Works to be measured, give notice to the Contractor or the Contractor's authorized agent or representative who shall forthwith attend or send a qualified agent to assist the Engineer in making such measurement and shall furnish all particulars required by either of them. Should the Contractor not attend or neglect or omit to send such agent, then the measurement made by the Engineer or approved by him shall be taken to be the correct measurement of the work. The purpose of measuring is to ascertain the volume of work executed by the Contractor and therefore determine the amount of the monthly payments.
52 LIABILITY OF THE PARTIES

1 The Works shall not be considered as completed until a Certificate of Final Completion shall have been signed by the Engineer and delivered to the Employer stating that the Works have been completed and that the Contractor has fulfilled all his obligations under Clause 47 to his satisfaction.

2 The Employer shall not be liable to the Contractor for any matter arising out of or in connection with the Contract or the execution of the Works unless the Contractor shall have made a claim in writing in respect thereof before the giving of the Certificate of Final Completion and in accordance with the Contract.

3 Unfulfilled Obligations

Notwithstanding the issue of the Certificate of Final Completion, the Contractor shall remain liable for the fulfillment of any obligation incurred under the provisions of the Contract prior to the issuance of the Certificate of Final Completion and which remains unperformed at the time such Certificate is issued. For the purpose of determining the nature and extent of any such obligation the Contract shall be deemed to remain in force between the parties hereto.

4 Contractor Responsible

Notwithstanding any other provisions in the Contract documents, the Contractor shall be totally responsible for and shall bear any and all risks of loss or damage to or failure of the Works or any part thereof for a period of ten years after issuance of the Certificate of Final Completion, provided always that such risks, damage or failure result from acts, defaults and negligence of the Contractor, his agents, employees or workmen and such contractors.

53 AUTHORITIES

1 The Employer shall have the right to enter upon the Site and expel the Contractor therefrom without thereby voiding the Contract or releasing the Contractor from any of his obligations or liabilities under the Contract or affecting the rights and powers conferred on the Employer and the Engineer by the Contract in any of the following cases:

(a) If the Contractor is declared bankrupt or claims bankruptcy or court protection against his creditors or if the Contractor is a company or member of a company which was dissolved by legal action;

(b) If the Contractor makes arrangements with his creditors or agrees to carry out the Contract under an inspection committee of his creditors;

(c) If the Contractor withdraws from the Works or assigns the Contract to others in whole or in part without the Employer's prior written approval;

(d) If the Contractor fails to commence the Works or shows insufficient progress to the extent which in the opinion of the Engineer will not enable him to meet the target completion date of the Works;

(e) If the Contractor suspends the progress of the Works without due cause for fifteen (15) days after receiving from the Engineer written notice to proceed;
(f) If the Contractor fails to comply with any of the Contract conditions or fails to fulfill his obligations and does not remedy the cause of his failure within fifteen (15) days after being notified to do so in writing;

(g) If the Contractor is not executing the work in accordance with standards of workmanship specified in the Contract;

(h) If the Contractor gives or promises to give a present or loan or reward to any employee of the Employer or of the Engineer.

Then the Employer may himself complete the Works or may employ any other contractor to complete the Works and the Employer or such other contractor may use for such completion so much of Constructional Plant, Temporary Works and Materials, which have been deemed to be reserved exclusively for the construction and completion of the Works under the provision of the Contract as he or they may think proper and the Employer may at any time sell any of the said Constructional Plant, Temporary Works and unused materials and apply the proceeds of sale in or towards the satisfaction of any sums due or which may become due to him from the Contractor under the Contract.

2 Evaluation after Re-entry

The Engineer shall as soon as may be practicable after any such entry and expulsion by the Employer notify the Contractor to attend the necessary evaluation of the Works. In the event that for any reason the Contractor does not attend such evaluation the Engineer shall undertake the said evaluation in the absence of the Contractor and shall issue a certificate stating the sum, if any, due to the Contractor for work done in accordance with the Contract up to the time of entry and expulsion by the Employer which has been reasonably accumulated to the Contractor in respect of the Works he has executed in such case in accordance with the Contract. The Engineer shall indicate the value of the materials whether unused or partially used and the value of construction equipment and any part of the Temporary Works.

3 Payment after Re-entry

If the Employer shall enter and expel the Contractor under this Clause he shall not be liable to pay the Contractor any money on account of the Contract until the expiration of the Defects Liability Period, and thereafter until the costs of completion and making good any defects of the Works, damages for delay in completion (if any), and all other expenses incurred by the Employer have been ascertained and their amount certified by the Engineer. The Contractor shall then be entitled to receive only such sum or sums (if any) as the Engineer may certify would have been due to him upon due completion by him after deducting the said amount. But if such amount shall exceed the sum which would have been payable to the Contractor on due completion by him,. then the Contractor shall upon demand pay to the Employer the amount of such excess. The Employer in such case may recover this amount from any money due to the Contractor from the Employer without the need to resort to legal procedures.

54 URGENT REPAIRS

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

55 INCREASE AND DECREASE OF COSTS

Except if otherwise provided by the Contract, no adjustment of the Contract Price shall be made in respect of fluctuations of market, prices of labour, materials, plant or equipment, neither due to fluctuation in interest rates nor devaluation or any other matters affecting the Works.

56 TAXATION

The Contractor shall be responsible for the payment of all charges and taxes in respect of income including value added tax, all in accordance with and subject to the provisions of the income tax laws and regulations in force and all amendments thereto. It is the Contractor's responsibility to make all the necessary inquiries in this respect and he shall be deemed to have satisfied himself regarding the application of all relevant tax laws.

57 BLASTING

The Contractor shall not use any explosives without the written permission of the Engineer who shall require that the Contractor has complied in full with the regulations in force regarding the use of explosives. However, the Contractor, before applying to obtain these explosives, has to provide well arranged storage facilities. The Engineer's approval or refusal to permit the use of explosives shall not constitute ground for claims by the Contractor.

58 MACHINERY

The Contractor shall be responsible for coordinating the manufacture, delivery, erection and commissioning of plant machinery and equipment which are to form a part of the Works. He shall place all necessary orders as soon as possible after the signing of the Contract. These orders and their acceptance shall be produced to the Engineer on request. The Contractor shall also be responsible for ensuring that all sub-contractors adhere to such programs as are agreed and are needed to ensure completion of the Works within the period for completion. Should any sub-contracted works be delayed, the Contractor shall initiate the necessary action to speed up such completion. This shall not prejudice the Employer's right to exercise his remedies for delay in accordance with the Contract.

59 TEMPORARY WORKS AND REINSTATEMENT

The Contractor shall provide and maintain all temporary roads and tracks necessary for movement of plant and materials and clear same away at completion and make good all works damaged or disturbed. The Contractor shall submit drawings and full particulars of all Temporary Works to the Engineer before commencing same. The Engineer may require modifications to be made if he considers them to be insufficient and the Contractor shall give effect to such modifications but shall not be relieved of his responsibilities. The Contractor shall provide and maintain weather-proof sheds for storage of material pertinent to the Works both for his own use and for the use of the Employer and clear same away at the completion of the Works. The Contractor shall divert as required, at his own cost and subject to the approval of the Engineer, all public utilities encountered during the
progress of the Works, except those specially indicated on the drawings as being included in the 
Contract. Where diversions of services are not required in connection with the Works, the Contractor 
shall uphold, maintain and keep the same in working order in existing locations. The Contractor shall 
make good, at his own expense, all damage to telephone, telegraph and electric cable or wires, 
sewers, water or other pipes and other services, except where the Public Authority or Private Party 
owning or responsible for the same elects to make good the damage. The costs incurred in so doing 
shall be paid by the Contractor to the Public Authority or Private Party on demand.

60 PHOTOGRAPHS AND ADVERTISING

The Contractor shall not publish any photographs of the Works or allow the Works to be used in any 
form of advertising whatsoever without the prior approval in writing from the Employer.

61 PREVENTION OF CORRUPTION

The Employer shall be entitled to cancel the Contract and to recover from the Contractor the amount 
of any loss resulting from such cancellation, if the Contractor has offered or given any person any gift 
or consideration of any kind as an inducement or reward for doing or intending to do any action in 
relation to the obtaining or the execution of the Contract or any other contract with the Employer or 
for showing or intending to show favour or disfavour to any person in relation to the Contract or any 
other contract with the Employer, if the like acts shall have been done by any persons employed by 
him or acting on his behalf whether with or without the knowledge of the Contractor in relation to this 
or any other Contract with the Employer.

62 DATE FALLING ON HOLIDAY

Where under the terms of the Contract any act is to be done or any period is to expire upon a certain 
day and that day or that period fall on a day of rest or recognized holiday, the Contract shall have 
effect as if the act were to be done or the period to expire upon the working day following such day.

63 NOTICES

1 Unless otherwise expressly specified, any notice, consent, approval, certificate or determination by 
any person for which provision is made in the Contract Documents shall be in writing. Any such 
notice, consent, approval, certificate or determination to be given or made by the Employer, the 
Contractor or the Engineer shall not be unreasonably withheld or delayed.

2 Any notice, certificate or instruction to be given to the Contractor by the Engineer or the Employer 
under the terms of the Contract shall be sent by post, cable, telex or facsimile at the Contractor's 
principal place of business specified in the Contract or such other address as the Contractor shall 
nominate in writing for that purpose, or by delivering the same at the said address against an 
authorized signature certifying the receipt.

3 Any notice to be given to the Employer under the terms of the Contract shall be sent by post, cable, 
telex or facsimile at the Employer's address specified in the Contract, or by delivering the same at the 
said address against an authorized signature certifying the receipt.

4 Any notice to be given to the Engineer under the terms of this Contract shall be sent by post, cable, 
telex or facsimile at the Engineer's address specified in the Contract, or by delivering the same at the 
said address against an authorized signature certifying the receipt.
64 LANGUAGE, WEIGHTS AND MEASURES

Except as may be otherwise specified in the Contract, English shall be used by the Contractor in all written communications to the Employer or the Engineer with respect to the services to be rendered and with respect to all documents procured or prepared by the Contractor pertaining to the Works. The metric system of weights and measures shall be used in all instances.

65 RECORDS, ACCOUNTS, INFORMATION AND AUDIT

The Contractor shall maintain accurate and systematic records and accounts in respect of the work performed under this Contract.

The Contractor shall furnish, compile or make available at all times to UNDP any records or information, oral or written, which UNDP may reasonably request in respect of the Works or the Contractor's performance thereof.

The Contractor shall allow UNDP or its authorized agents to inspect and audit such records or information upon reasonable notice.

66 FORCE MAJEURE

Force majeure as used herein means Acts of God, war (whether declared or not), invasion, revolution, insurrection or other acts or events of a similar nature or force.

In the event of and as soon as possible after the occurrence of any cause constituting force majeure, the Contractor shall give notice and full particulars in writing to UNDP and to the Engineer of such force majeure if the Contractor is thereby rendered unable, wholly or in part, to perform its obligations and meet its responsibilities under this Contract. Subject to acceptance by UNDP of the existence of such force majeure, which acceptance shall not be unreasonably withheld, the following provisions shall apply:

(a) The obligations and responsibilities of the Contractor under this Contract shall be suspended to the extent of his inability to perform them and for as long as such inability continues. During such suspension and in respect of work suspended, the Contractor shall be reimbursed by UNDP substantiated costs of maintenance of the Contractor's equipment and of per diem of the Contractor's permanent personnel rendered idle by such suspension;

(b) The Contractor shall within fifteen (15) days of the notice to UNDP of the occurrence of the force majeure submit a statement to UNDP of estimated costs referred to in sub-paragraph (a) above during the period of suspension followed by a complete statement of actual expenditures within thirty (30) days after the end of the suspension;

(c) The term of this Contract shall be extended for a period equal to the period of suspension taking however into account any special condition which may cause the additional time for completion of the Works to be different from the period of suspension;

(d) If the Contractor is rendered permanently unable, wholly or in part, by reason of force majeure, to perform his obligations and meet his responsibilities under the Contract, UNDP shall have the right to terminate the Contract on the same terms and conditions as provided for in Clause 68 of these General Conditions, except that the period of notice shall be seven (7) days instead of fourteen (14) days, and
(e) For the purpose of the preceding sub-paragraph, UNDP may consider the Contractor permanently unable to perform in case of any suspension period of more than ninety (90) days.

67 SUSPENSION BY UNDP

UNDP may by written notice to the Contractor suspend for a specified period, in whole or in part, payments to the Contractor and/or the Contractor's obligation to continue to perform the Works under this Contract, if in UNDP' sole discretion:

(a) any conditions arise which interfere, or threaten to interfere with the successful execution of the Works or the accomplishment of the purpose thereof, or

(b) the Contractor shall have failed, in whole or in part, to perform any of the terms and conditions of this Contract.

After suspension under sub-paragraph (a) above, the Contractor shall be entitled to reimbursement by UNDP of such costs as shall have been duly incurred in accordance with this Contract prior to the commencement of the period of such suspension.

The term of this Contract may be extended by UNDP for a period equal to any period of suspension, taking into account any special conditions which may cause the additional time for completion of the Works to be different from the period of suspension.

68 TERMINATION BY UNDP

UNDP may, notwithstanding any suspension under Clause 67 above, terminate this Contract for cause or convenience in the interest of UNDP upon not less than fourteen (14) days written notice to the Contractor.

Upon termination of this Contract:

(a) The Contractor shall take immediate steps to terminate his performance of the Contract in a prompt and orderly manner and to reduce losses and to keep further expenditures to a minimum, and

(b) The Contractor shall be entitled (unless such termination has been occasioned by the Contractor's breach of this Contract), to be paid for the part of the Works satisfactorily completed and for the materials and equipment properly delivered to the Site as of the date of termination for incorporation to the Works, plus substantiated costs resulting from commitments entered into prior to the date of termination as well as any reasonable substantiated direct costs incurred by the Contractor as a result of the termination, but shall not be entitled to receive any other or further payment or damages.

69 TERMINATION BY THE CONTRACTOR

In the case of any alleged breach by UNDP of the Contract or in any other situation which the Contractor reasonably considers to entitle him to terminate his performance of the Contract, the Contractor shall promptly give written notice to UNDP detailing the nature and the circumstances of the breach or other situation. Upon acknowledgement in writing by UNDP of the existence of such breach and UNDP' inability to remedy it, or upon failure of UNDP to respond to such notice within twenty (20) days of receipt thereof, the Contractor shall be entitled to terminate this Contract by giving 30 days written notice thereof. In the event of disagreement between the Parties as to the
existence of such breach or other situation referred to above, the matter shall be resolved in accordance with Clause 71 of these General Conditions.
Upon termination of this Contract under this Clause the provisions of sub-paragraph (b) of Clause 68 hereof shall apply.

70 RIGHTS AND REMEDIES OF UNDP
Nothing in or relating to this Contract shall be deemed to prejudice or constitute a waiver of any other rights or remedies of UNDP.

UNDP shall not be liable for any consequences of, or claim based upon, any act or omission on the part of the Government.

71 SETTLEMENT OF DISPUTES

In the case of any claim, controversy or dispute arising out of, or in connection with this Contract or any breach thereof, the following procedure for resolution of such claim, controversy or dispute shall apply.

1 Notification
The aggrieved party shall immediately notify the other party in writing of the nature of the alleged claim, controversy or dispute, not later than seven (7) days from awareness of the existence thereof.

2 Consultation
On receipt of the notification provided above, the representatives of the Parties shall start consultations with a view to reaching an amicable resolution of the claim, controversy or dispute without causing interruption of the Works.

3 Conciliation
Where the representatives of the Parties are unable to reach such an amicable settlement, either party may request the submission of the matter to conciliation in accordance with the UNCITRAL Rules of Conciliation then obtaining.

4 Arbitration
Any claim, controversy or dispute which is not settled as provided under clauses 71.1 through 3 above shall be referred to arbitration in accordance with the UNCITRAL Arbitration Rules then obtaining. The Parties shall be bound by the arbitration award rendered in accordance with such arbitration as the final adjudication of any such controversy or claim.

72 PRIVILEGES AND IMMUNITIES

Nothing in or relating to this Contract shall be deemed a waiver of any of the privileges and immunities of the United Nations of which UNDP is an integral part.
APPENDIX I: FORMATS OF PERFORMANCE SECURITY
PERFORMANCE BANK GUARANTEE

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

[INSERT FULL NAME AND ADDRESS OF RR or BUREAU/DIVISION DIRECTOR AT UNDP]

WHEREAS..................................................................................................................[INSERT NAME AND ADDRESS OF THE CONTRACTOR] (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No., dated, to execute...........................................................................

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized Bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby irrevocably affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of...........................................

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby irrevocably affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of...........................................

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed thereunder or of any of the Contract Documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until twenty eight calendar days after issuance of the Certificate of Final Completion.

SIGNATURE AND SEAL OF THE GUARANTOR
.................................................................................................................................

NAME OF BANK .........................................................................................

ADDRESS .................................................................................................

DATE .................................................................................................
PERFORMANCE BOND

By this Bond [INSERT NAME AND ADDRESS OF THE CONTRACTOR] as Principal (hereinafter called "the Contractor") and
...[INSERT NAME, LEGAL TITLE AND ADDRESS OF SURETY, BONDING COMPANY OR INSURANCE COMPANY] as Surety (hereinafter called "the Surety") are held and firmly bound unto
...[INSERT NAME AND ADDRESS OF EMPLOYER] as Obligee (hereinafter called "the Employer") in the amount of...

WHEREAS the Contractor has entered into a contract with the Employer dated for
...[INSERT TITLE OF CONTRACT AND BRIEF DESCRIPTION OF THE WORKS] in accordance with the documents, plans, specifications and amendments thereto, which to the extent herein provided for, are by reference made part hereof and are hereinafter referred to as the Contract.

NOW, THEREFORE, the Condition of this Obligation is such that, if the Contractor shall promptly and faithfully perform the said Contract (including any amendments thereto) then this obligation shall be null and void; otherwise it shall remain in full force and effect. Whenever the Contractor shall be, and declared by the Employer to be, in default under the Contract, the Employer having performed the Employer's obligations thereunder, the Surety may promptly remedy the default, or shall promptly:

(1) complete the Contract in accordance with its terms and conditions; or

(2) obtain a bid or bids from qualified Bidders for submission to the Employer for completing the Contract in accordance with its terms and conditions, and upon determination by the Employer and the Surety of the lowest responsible Bidder, arrange for a Contract between such Bidder and Employer and make available as work progresses (even though there should be a default or a succession of defaults under the Contract or Contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the Balance of the Contract Price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "Balance of the Contract Price", as used in this paragraph, shall mean the total amount payable by Employer to Contractor under the Contract, less the amount properly paid by Employer to Contractor; or

(3) pay the Employer the amount required by Employer to complete the Contract in accordance with its terms and conditions up to a total not exceeding the amount of this Bond.

The Surety shall not be liable for a greater sum than the specified penalty of this Bond.

No right of action shall accrue on this Bond to or for the use of any person or corporation other than the Employer named herein or the heirs, executors, administrators, successors and assigns of the Employer.

In testimony whereof, the Contractor has hereunto set his hand and affixed his seal, and the Surety has caused these presents to be sealed with his corporate seal duly attested by the signature of his legal representative, this......day of..............2007

SIGNED ON: SIGNED ON:

ON BEHALF OF: ON BEHALF OF:

NAME &TITLE: NAME &TITLE:
The following Special Conditions shall complement, supplement, or amend the General Conditions. Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions.

<table>
<thead>
<tr>
<th>Warranty/Guarantee</th>
</tr>
</thead>
<tbody>
<tr>
<td>x Applies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liquidated damages</th>
</tr>
</thead>
<tbody>
<tr>
<td>x Applies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>x Applies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum allowable time for completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>x Applies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNDP's Right to Vary Requirements during execution of contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>x Applies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liability Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>x Applies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Defects Liability</th>
</tr>
</thead>
<tbody>
<tr>
<td>x Applies</td>
</tr>
</tbody>
</table>
In view of the current prevailing situation of unrest in the Palestinian Territories, UNDP will not be held liable for any contractual claims arising out of or in connection with the consequences of the prevailing situation, including closures, strikes, curfew, and acts of war. This includes any claims for overhead expenses due to idle works, changes in the market cost of materials and/or equipment and related transportation or other costs. Accordingly, the contractor will only be entitled for the costs of executed works and supplied material and/or equipment, all based on the unit prices submitted in his original tender.

This contract is exempted from Value Added Tax (VAT) and accordingly no Value Added Tax will be paid under this contract. In the event that the Contractor fails to acquire the necessary tax clearances from the Tax Department, UNDP retains the right to encash the full amount of the Contractor's advance payment guarantee without prior notice, and if necessary terminate the Contract.

<table>
<thead>
<tr>
<th>Compliance with any other condition(s) required</th>
</tr>
</thead>
<tbody>
<tr>
<td>x Applies</td>
</tr>
<tr>
<td>In view of the current prevailing situation of unrest in the Palestinian Territories, UNDP will not be held liable for any contractual claims arising out of or in connection with the consequences of the prevailing situation, including closures, strikes, curfew, and acts of war. This includes any claims for overhead expenses due to idle works, changes in the market cost of materials and/or equipment and related transportation or other costs. Accordingly, the contractor will only be entitled for the costs of executed works and supplied material and/or equipment, all based on the unit prices submitted in his original tender.</td>
</tr>
</tbody>
</table>

| x Applies |
| This contract is exempted from Value Added Tax (VAT) and accordingly no Value Added Tax will be paid under this contract. In the event that the Contractor fails to acquire the necessary tax clearances from the Tax Department, UNDP retains the right to encash the full amount of the Contractor's advance payment guarantee without prior notice, and if necessary terminate the Contract. |

<table>
<thead>
<tr>
<th>Payments by UNDP/PAPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>x Applies</td>
</tr>
<tr>
<td>In the case of requesting an advance payment by the Contractor; the UNDP/PAPP shall pay the Contractor an advance payment up to 20% of the contract value upon signature of the contract between the UNDP/PAPP and the Contractor and submission of the following documents by the latter on behalf of UNDP/PAPP:</td>
</tr>
<tr>
<td>An irrevocable bank guarantee for the same value of the advance payment valid for the period of five (5) calendar months.</td>
</tr>
<tr>
<td>The required Performance Security as stipulated in this contract.</td>
</tr>
</tbody>
</table>

2. The amount of the advance payment if paid to the contractor shall be subject to a deduction of a **20% (twenty percent)** of the amount accepted for payment until the cumulative amount of the deductions so effected shall equal the amount of the advance payment. Should the cumulative amount of the deductions so made be lower than the amount of the advance payment after the date of substantial completion of the Works, UNDP may deduct the amount equal to the difference between the advance payment and the cumulative deductions from the payments due after substantial completion or may recover such amount from the bank guarantee.

3. On each payment, UNDP shall withhold a per centum of the invoice amount, up to a maximum of (10%) of the total price of the Contract for due performance of execution. Half of this amount (5%) shall be returned to the Contractor within Forty (40) days upon the substantial completion and taking-over of the Works, and the remaining (5%), will be retained as maintenance guarantee until the end of the one year defects liability period. The retained 5% maintenance guarantee can be replaced with maintenance bank guarantee for the same value and until the end of the defects liability period.
To: The procuring entity

Dear Sir / Madam,

Having examined the Bidding Documents, the receipt of which is hereby duly acknowledged, we, the undersigned, offer to execute the **Homework Center for the Beer Al Basha Village – Jenin District** in conformity with the said bidding documents for the sum of [total bid amount in words and figures] as may be ascertained in accordance with the Price Schedule attached herewith and made part of this Bid.

We undertake, if our Bid is accepted, to execute in accordance with the delivery schedule specified in the Schedule of Requirements.

We agree to abide by this Bid for a period of [number] days from the date fixed for opening of Bids in the Invitation to Bid, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

We understand that you are not bound to accept any Bid you may receive.

Dated this . . . . .day of . . . . [year].

................................. .................................
Signature  [in the capacity of]

Duly authorised to sign the Bid for and on behalf of .................................
Annex V.

Statement of Works

Construction of Homework Center for the Beer Al Basha Village – Jenin District

The Center involves the construction of a 300sq.m building consists of one storey, including the required finishing works as per the following Bills:

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Unit/Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill 1.</td>
<td>EXCAVATION WORKS</td>
<td>MC, M2 &amp; M3</td>
</tr>
<tr>
<td>Bill 2.</td>
<td>CONCRETE WORKS</td>
<td>MC &amp; MS</td>
</tr>
<tr>
<td>Bill 3.</td>
<td>Stone Works</td>
<td>MS</td>
</tr>
<tr>
<td>Bill 4.</td>
<td>CONCRETE BLOCK WORKS</td>
<td>MS</td>
</tr>
<tr>
<td>Bill 5.</td>
<td>PLASTERING</td>
<td>MS</td>
</tr>
<tr>
<td>Bill 6.</td>
<td>TILING, FLOORING AND MARBLE WORKS</td>
<td>MS</td>
</tr>
<tr>
<td>Bill 7.</td>
<td>CARPENTRY AND JOINERY WORKS</td>
<td>MS</td>
</tr>
<tr>
<td>Bill 8.</td>
<td>STEEL AND ALUMINUM WORKS</td>
<td>MS</td>
</tr>
<tr>
<td>Bill 9.</td>
<td>PAINTING WORKS</td>
<td>MS</td>
</tr>
<tr>
<td>Bill 10</td>
<td>INSULATION AND ROOFING</td>
<td>NO., MS</td>
</tr>
<tr>
<td>Bill 11</td>
<td>ELECTRICAL WORKS</td>
<td>NO.,MR</td>
</tr>
<tr>
<td>Bill 12</td>
<td>MECHANICAL WORKS</td>
<td>NO., MR</td>
</tr>
</tbody>
</table>

For details of each Bill and corresponding sub-bills, please refer to PRICE SCHEDULE “BILL OF QUANTITIES”

Please find attached the GENERAL AND PARTICULAR SPECIFICATIONS OF WORKS AND MATERIAL QUALITIES.
ANNEX V - A

GENERAL AND PARTICULAR SPECIFICATIONS OF WORKS AND MATERIAL QUALITIES.

(attached)
Annex VI.

Drawings (attached)
PRICE SCHEDULE (Bill of Quantities) Attached

1. The Price Schedule must provide a detailed cost breakdown for each item.

2. Technical descriptions for each proposed item must provide sufficient detail to allow UNDP to determine compliance of Bid with specifications as per Schedule of Requirements and Technical Specifications of this ITB.

3. All prices/rates quoted must be exclusive of all taxes, since the United Nations, including its subsidiary organs, is exempt from taxes.

4. In addition to the hard copy, if possible please provide also the information on CD.

Annex VIII.
GENERAL AND PARTICULAR SPECIFICATIONS OF WORKS AND MATERIAL QUALITIES

INDEX

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SECTION A - GENERAL</td>
<td>3-1</td>
</tr>
<tr>
<td>SECTION B - EXCAVATION, EARTH WORKS AND ROAD WORKS</td>
<td>3-15</td>
</tr>
<tr>
<td>SECTION C - CONCRETE WORKS</td>
<td>3-33</td>
</tr>
<tr>
<td>SECTION D - BLOCKWORKS</td>
<td>3-59</td>
</tr>
<tr>
<td>SECTION E - STONWORKS</td>
<td>3-63</td>
</tr>
<tr>
<td>SECTION F - ROOFING AND WATERPROOFING</td>
<td>3-65</td>
</tr>
<tr>
<td>SECTION G - JOINERY AND IRONMONGERY</td>
<td>3-68</td>
</tr>
<tr>
<td>SECTION H - METAL WORKS</td>
<td>3-75</td>
</tr>
<tr>
<td>SECTION I - SANITARY INSTALLATIONS</td>
<td>3-81</td>
</tr>
<tr>
<td>SECTION J - FLOOR WALL AND CEILING FINISHES</td>
<td>3-88</td>
</tr>
<tr>
<td>SECTION K - GLAZING</td>
<td>3-103</td>
</tr>
<tr>
<td>SECTION L - PAINTING</td>
<td>3-106</td>
</tr>
<tr>
<td>SECTION M - ELECTRICAL WORKS</td>
<td>3-115</td>
</tr>
<tr>
<td>SECTION N - MECHANICAL WORKS</td>
<td>3-132</td>
</tr>
<tr>
<td>Division</td>
<td>Titles</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>A 1</td>
<td>Scope of work</td>
</tr>
<tr>
<td>A 2</td>
<td>Drawings</td>
</tr>
<tr>
<td>A 3</td>
<td>Contractor's price</td>
</tr>
<tr>
<td>A 4</td>
<td>Use and protection of site</td>
</tr>
<tr>
<td>A 5</td>
<td>Materials found on site</td>
</tr>
<tr>
<td>A 6</td>
<td>Temporary stormwater drainage</td>
</tr>
<tr>
<td>A 7</td>
<td>Shop drawings</td>
</tr>
<tr>
<td>A 8</td>
<td>&quot;As - Built&quot; drawings</td>
</tr>
<tr>
<td>A 9</td>
<td>Scaffolding</td>
</tr>
<tr>
<td>A 10</td>
<td>Protection</td>
</tr>
<tr>
<td>A 11</td>
<td>Separate Contracts</td>
</tr>
<tr>
<td>A 12</td>
<td>Definitions</td>
</tr>
<tr>
<td>A 13</td>
<td>Standards</td>
</tr>
<tr>
<td>A 14</td>
<td>Materials generally</td>
</tr>
<tr>
<td>A 15</td>
<td>Contractor to verify site measurement</td>
</tr>
<tr>
<td>A 16</td>
<td>Samples</td>
</tr>
<tr>
<td>A 17</td>
<td>Cutting and patching</td>
</tr>
<tr>
<td>A 18</td>
<td>Site offices, Latrines, etc.</td>
</tr>
<tr>
<td>A 19</td>
<td>Attendance on the engineer</td>
</tr>
<tr>
<td>A 20</td>
<td>Testing</td>
</tr>
<tr>
<td>A 21</td>
<td>Temporary buildings</td>
</tr>
<tr>
<td>A 22</td>
<td>Temporary works and reinstatement</td>
</tr>
<tr>
<td>A 23</td>
<td>Water for the works</td>
</tr>
<tr>
<td>A 24</td>
<td>Electricity for the works</td>
</tr>
<tr>
<td>A 25</td>
<td>Provision of plant and tools</td>
</tr>
<tr>
<td>A 26</td>
<td>Temporary barriers, fencing, etc.</td>
</tr>
<tr>
<td>A 27</td>
<td>Inconsistency in contract documents</td>
</tr>
<tr>
<td>A 28</td>
<td>Errors in computing contract documents</td>
</tr>
<tr>
<td>A 29</td>
<td>Site meetings</td>
</tr>
<tr>
<td>A 30</td>
<td>Daily Reports</td>
</tr>
<tr>
<td>A 31</td>
<td>Access for the Engineer</td>
</tr>
<tr>
<td>A 32</td>
<td>Setting out and levelling</td>
</tr>
<tr>
<td>A 33</td>
<td>Programme to be finished</td>
</tr>
<tr>
<td>A 34</td>
<td>Cancellation due to slow progress</td>
</tr>
<tr>
<td>A 35</td>
<td>Delays</td>
</tr>
<tr>
<td>A 36</td>
<td>Non productive time</td>
</tr>
<tr>
<td>A 37</td>
<td>Safety, Health and welfare</td>
</tr>
<tr>
<td>A 38</td>
<td>Contractors' site Representative</td>
</tr>
<tr>
<td>A 39</td>
<td>Attendance</td>
</tr>
<tr>
<td>A 40</td>
<td>Official visitors</td>
</tr>
<tr>
<td>A 41</td>
<td>Care of the works, etc.</td>
</tr>
<tr>
<td>A 42</td>
<td>Work at completion</td>
</tr>
</tbody>
</table>
SECTION A

GENERAL

A 1 SCOPE OF WORK

These Specifications cover all the works necessary for the construction of Old House in Jericho includes testing and commissioning of all equipment and maintaining the whole works.

A 2 DRAWINGS

A list of Contract Drawing available at the date of tender is included on the front page of the Drawing Book and at the end of these Specifications

A 3 CONTRACTOR’S PRICE

The Contractor's price shall include for all materials labour and plant requirements necessary for the completion of the Contract in accordance with the Contract Drawing and specifications with exception only of items supplied by the Employer.

A 4 USE AND PROTECTION OF SITE

The Contractor shall take such measures and exercise such are to protect the Site as shown on the Site Plan during the course of the Works as directed by and to the entire satisfaction of the Engineer.

All temporary buildings and work areas such as Site Offices, Workshops, Store Buildings and Yards, Living Accommodation, Messrooms, etc. shall be constructed in position approved by the Engineer.

The contractor shall confine his apparatus, the storage of materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the Engineer. The Contractor shall erect suitable temporary fences as required by the Engineer.

The Contractor shall not load or permit any part of the structures to be loaded with a weight that will endanger its safety.

On commencement of the Contract, the Contractor shall clear the Site and adjacent area of all rubbish and debris to the satisfaction of the Engineer.
USE AND PROTECTION OF SITE (Cont'd)

Upon completion of the Contract, the Site and any adjacent areas affected by the building operation shall be properly cleared of all temporary works, debris and other rubbish and all disturbed works and ground made good to the entire satisfaction of the Engineer.

A 5 MATERIALS FOUND ON SITE

Any sand, gravel or other building material found on the Site shall not be used in the execution of the Works without the prior written consent of the Engineer, which shall not be unreasonably withheld.

A 6 TEMPORARY STORMWATER DRAINAGE

The Contractor shall ensure that the whole of the Site is kept free from the risk of stormwater flooding and shall provide such temporary ditches, gullies and the like as may be necessary and shall at completion of the Works backfill such excavation and make good all works disturbed.

A 7 SHOP DRAWINGS

If at any time before the commencement or during the progress of the work it appears to the Contractor that for the proper execution of specific part of the works, shop drawings are necessary, these drawings shall be prepared by the Contractor and submitted to the Engineer for approval. On the other hand, the Engineer shall have authority to order at any time and the Contractor agrees to provide any number of shop drawings which in the opinion of the Engineer are necessary for the proper execution of a specified work, the Contractor shall not proceed with the above mentioned work unless these shop drawings are approved by the Engineer.

Shop drawings shall be fully detailed and drawn to proper scale.

Unless otherwise specifically required in the drawings or Specifications, shop drawings shall be supplied in four copies with dark lines on a white background.

Shop drawings shall be approved or returned to the Contractor for alternation or amendment within four (4) weeks of their receipt by the Engineer. Shop Drawings returned for alternation or amendment shall be resubmitted for approval. Altered or amended shop drawings shall show the nature of the alternation or amendment in a revision block on the drawings with a revision number or letter and the date of the revision.
SPECIFICATIONS  
GENERAL

A 8  " AS BUILT " DRAWINGS

All prints of the Drawings, where required, shall be corrected by the Contractor and submitted to the Engineer for approval as the works proceed. Upon the completion of the Works, the Contractor shall prepare a completely new set of drawings for the project as executed and submit same in duplicate to the Engineer for approval.

When approved by the Engineer, the Contractor shall submit one transparency and six copies of all drawings duly marked "As-Built". The final payment shall not be made except for the actual works that have been completed in accordance with the Specifications and have been duly presented on the "As-Built Drawings".

The Contractor shall not be entitled to any extra payment or extension of time for the correction, preparation and supplying of the above mentioned drawings and transparencies.

A 9  SCAFFOLDING

The Contractor shall provide, erect, maintain, and dismantle any clear away at completion proper and adequate scaffolding including that required for Sub-Contractors and Specialists. Putlong holes shall be made good to match the adjacent surface as the scaffolding is dismantle. The Contractor shall be entirely responsible for all safety precautions in connection with the scaffolding and for its entire sufficiency for the work.

A 10  PROTECTION

In the pursuance of his obligations under the Conditions of Contract, the Contractor shall wherever required or directed by the Engineer cover up and protect the Works form the weather and from damage by him or other workmen performing subsequent operations. He shall provide all necessary dustsheets, barriers and guard rails and clear away same at completion.

The Contractor shall take all reasonable and proper steps for the protection of all places on or about the Works, which may be dangerous to his workmen or any other persons or to traffic. The Contractor shall provide and maintain warning signs, red warning lamps and barricades as necessary in all such places.
A 11 SEPARATE CONTRACTS

The Employer reserves the right to let other separate contracts in connection with the work under similar conditions. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and co-ordinate his work with theirs.

If any part of the Contractor's work depends for proper execution or results upon the work of any other contractor, the Contractor shall inspect and promptly report to the Engineer and defects in such work shall render it unsuitable for such proper execution and results.

His failure so to inspect and report shall constitute an acceptance of the other Contractor's Works as fit and proper for the reception of this work, except as to defects which may develop in the other Contractor's work after the execution of his work.

To ensure the proper execution of his subsequent work, the Contractor shall measure work already in place and shall at once report to the Engineer any discrepancy between executed work and the Drawings.

A 12 DEFINITIONS

"Approved "directed "selected" means the approval, direction or selection by the Engineer.

"Instructions means the instructions in writing of the Engineer or Engineer's Representative unless specified otherwise.

"Manufacturer's Recommendation" means the Manufacturer's recommendations or instructions, printed or in writing and current at the date of tender.

" Or approved equal" means that materials of different manufacturer may be substituted if proper approval has been obtained. The rates or prices will be held to be based on the materials specified.

Where an item is denoted as N.I.C. on the Drawings it shall mean that item indicated is not included in the Contract.

Where the terms Architect or Engineer is used in this Contract they shall have the same meaning.

Where the terms Architect's Representative or Engineer's Representative are used they shall have the same meaning.
In the Contract reference is made to the Standards, Codes of practice and Specifications issued by the following organizations, hereinafter referred to by the following abbreviations:

**AASHO** Means the American Association of State Highway Officials.

**ACI** Means the American Concrete Institute.

**AFNOR** Means the Association Francaise de Normalisation.

**AISC** Means the American Institute of Steel Structure.

**ASA** Means the American Standards Association.

**ASHRAE** Means the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

**ASTM** Means the American Society for Testing and materials.

**AWWA** Means the American Water Works Association.

**B S** Means the British Standards Institution.

**CMA** Means the Cable Manufacturers Association.

**DIN** Means the Deutscher Normanusschuss.

**NEMA** Means the National Electrical Manufactures’ Association.

**NFPA** Means the National Fire Protection Association.

**VDE** Means the Verband Deutscher Electrotechniker.

These references shall in every case be deemed to include the latest edition or issue of such standards.

The Contractor upon receiving instructions shall supply the Engineer’s Representative with single copies of all standards referred to on the Drawings or Specification and shall arrange for further copies for his own use.
A 14 MATERIALS GENERALLY

All materials and manufactured goods are to be the best of their respective kinds and as described in the Specifications and the Contractor shall submit for the approval of the Engineer a list of names and addresses of the manufacturers, the trade marks and types of all materials and articles he proposes to employ together with all specifications and descriptions that may be required in this connection before any orders are placed. Samples are to be provided if requested by the Engineer. Where a particular proprietary product, supplier's catalogue is referred to in the Specifications or shown on the drawings the material specified may be obtained from another source provided it is similar, equal and approved by the Engineer.

If during the course of the Contract certain materials required for use in the Works should be unobtainable despite the best efforts of the Contractor, then the Contractor may offer for the approval of the Engineer substitute materials.

The use of these substitute materials shall be at the sole discretion of the Engineer.

In the event of the acceptance of the substitute materials a suitable price reduction shall be made in the respect of decrease in quality or value but no price addition shall be made in respect of increase in quality or value.

In the event of refusal of the substitute materials the Contractor shall not be relieved of any of his obligations under the Contract and shall be solely liable for any delay or loss occasioned by his failure to provide materials as specified.

Where manufacturers recommendations have been entered into the contract documents, it is for the purpose of giving an indications to the contractor of the Engineer’s intentions on the application and use of the material.

It is deemed that the successful Contractor will make direct contact with the manufacturer m to ensure that he is carrying out the works in accordance with their recommendations.

A 15 CONTRACTOR TO VERIFY SITE MEASUREMENTS

The Contractor shall check and verify all site measurements wherever requested by other specialist contractors or by nominated or other sub-contractors to enable the to prepare their own shop drawings, and pass on the information with sufficient promptness as will not in any way delay the Works. A copy of all such information passed or shall be given to the Engineer.
A 16 SAMPLES

The Contractor shall furnish for approval, with reasonable promptness all samples of materials and workmanship required by the Engineer. The Engineer shall check and approve such samples with reasonable promptness for conformance with the design concept of the works and for compliance with the information given in the Contract Documents. The Work shall be in accordance with approved samples.

a) All material samples shall be delivered to the Engineer’s office with all charges in connection with therewith paid by the Contractor.

b) Duplicate final approval samples, in addition to any required for the Contractor’s use, shall be furnished to the Engineer.

c) Samples shall be furnished so as to delay fabrication allowing the Engineer reasonable time for consideration of the sample submitted.

d) Each sample shall be properly labelled with the name and quality of the material, manufacturer’s name, name of project, the Contractor’s name and the date of submission and the Specification number to which the sample refers.

A 17 CUTTING AND PATCHING

The Contractor shall be responsible for all cutting, patching and making good in all trades for all work and his prices will be deemed to include for all such cutting and patching and making good.

A 18 SITE OFFICES, LATRINES, ETC.

The Contractor shall provide and maintain on the Site for the duration of the Contract the following:

a) A temporary office for the accommodation of his Agent/Engineer and Staff, including all necessary sanitary facilities, such offices shall be open at all reasonable hours to receive instructions, notices or other communications. Telephone and Electric installations shall also be provided.

b) A suitable and adequate temporary office shall be provided and furnished by the Contractor for the sole use of the Engineer and his staff. Such office shall be to the approval of the Engineer.

c) Adequate fire fighting equipment to the approval of the Local Fire Authority and the Engineer.
d) An approved sign board, written in Arabic and English. The size of signboard and lettering including to wordings shall be as directed by the Engineer.

3-7

SPECIFICATIONS

GENERAL

A 19 ATTENDANCE ON THE ENGINEER

The Contractor shall for the duration of the Contract supply sufficient attendance for the Engineer’s supervisory staff and shall maintain and pay all water, electricity, and telephone charges shall keep the Site Office and supervision cabins in a clean and sound condition at all times.

The Contractor shall be responsible for the security of the Site Office and its contents at all times and shall employ watchman for this purpose

A 20 TESTING

The Contractor shall allow in his rates and prices for the cost of carrying our tests necessary for compliance with the Specification in independent laboratories outside the Site.

A 21 TEMPORARY BUILDINGS

The Contractor shall provide and maintain on the Site sheds, offices, messrooms, sanitary accommodation and other temporary works of any kind whatsoever for the Contractor’s supervisory staff and work people and for Sub-Contractor’s staff employed upon the works.

The Contractor’s site office shall be open during working hours to receive instructions notices or other communications.

Sheds shall be suitable to store all materials equipment and furniture which in the opinion of the Engineer needs protecting from the weather.

The Contractor shall provide and maintain in approved positions on the Site Adequate sanitary accommodation for his staff workmen and sub-Contractors. This sanitary accommodation shall be kept in a clean and orderly condition to the approval of the Public Health Authority and the Engineer to ensure that no nuisance is caused.
The Contractor shall provide and maintain all temporary roads and tracks necessary for movement of plant and materials, and clear same away at completion and make good all works damaged or disturbed.

The Contractor shall submit drawings and full particulars of all Temporary Works to the Engineer before commencing same. The Engineer may require modifications to be made if he considers them to be insufficient and the Contractor shall give effect to such modifications but shall not be relieved of his responsibilities for the sufficiency thereof.

The Contractor shall divert as required, at his cost and to the approval of the Engineer, all public utilities encountered during the progress of the Works, except those specially indicated on the drawings as being included in the Contract.

Where diversions of services are not required in connection with the permanent Works, the Contractor shall uphold, maintain and keep the same in working order in existing locations.

The Contractor shall make good, at his own expense, all damage to telephone, telegraph and electric cable or wires, sewers, water, or other pipes except where the Public Authority or Private Party Owning or responsible for the same elects to make good the damage. The cost incurred in so doing shall be paid by the Contractor to the Public Authority or Private Party in demand.

All injury to the surface of the land, to the beds if water courses, projecting banks, etc. where disturbed by the Works (other than where specifically ordered by the Engineer) shall be repaired by the Contractor or the authorities concerned, at the Contractor’s expense. All such making good shall be to the approval of the Engineer.

All requirements detailed above shall be provided and maintained at the expense of the Contractor.

The Employer shall not be liable for loss or injury to and Temporary Works.

A 23 WATER FOR THE WORKS

The Contractor shall make all necessary arrangements and provide all water for the proper execution of the Works, together with all transport temporary plumbing, storage and
distribution, pay all charges and alter adapt and maintain temporary work as necessary remove and make good at completion.

SPECIFICATIONS

A 24 ELECTRICITY FOR THE WORKS

The Contractor shall make all necessary arrangements and provide all artificial lighting and power for the proper execution and security if the Works and its protection.

With all meters temporary wiring and fittings, pay all charges and alter, adapt and maintain the temporary works as necessary and remove and make good at completion.

A 25 PROVISION OF PLANT AND TOOLS

The Contractor shall provide and install all necessary hoists, ladders, scaffolding. Staging, tackles, tarpaulins, tools, vehicles, and other plant (mechanical and otherwise) and allow for altering adapting and maintaining them in good condition as necessary and eventually removing from site and making good.

A 26 TEMPORARY BARRIERS, FENCING ETC...

The Contractor is to provide all temporary barriers, fencing, hoarding, guard rails, gates, and the like as may be necessary to protect the public and others, for proper execution of the Works and shall remove and clear away at completion of the Works and make good all work disturbed.

A 27 INCONSISTENCY IN CONTRACT DOCUMENTS

The Contractor shall execute the Works according to the provisions of the Contract Documents. Any work indicated in one of the documents but omitted and/or stated in one or more of the other documents shall be treated as though it were included in all of them.

If any two documents of the Contract conflict as to the quality of the work to be carried out, the discrepancy shall be brought to the notice of the Engineer, who shall instruct the Contractor which of the two conflicting documents to regard as correct.

If the Contractor should discover that any work has been omitted and/or not indicated entirely or partially from all the documents, but that such work is essential to the safety or proper functioning of the works, he shall report the facts immediately to the Engineer. If the work is something which in the opinion of the Engineer could not have been foreseen by an
experienced Contractor, the Engineer should issue to the Contractor a variation order stipulating the details of the work to be done.

Save as aforesaid in the above paragraph, no additional payment shall be made in respect of work carried out in connection with discrepancies between the various Contract Documents.

3-10

SPECIFICATIONS
GENERAL

A 28 ERRORS IN COMPUTING CONTRACT DOCUMENTS

The Contractor shall be responsible for any error which he makes in computing any quantities of material and labour required or costs involved or through any lack of knowledge of the Site or misunderstanding of anything shown or implied on the Drawings or in the Specifications and/or the Bills of Quantities.

The Contractor must refer any discrepancy in the Drawings or the Specifications to the Engineer before proceeding in any of the Works otherwise the decision of the Engineer as to the interpretation of the discrepancy will be final. Any item or items of work not specifically shown on the Drawings or referred to in the Specifications but which would be necessary for the proper construction of the works in accordance with the best practice is implied and must be included for as incidental to the Contract Sum. Any item for which the Contractor has not inserted a price in the Bills of Quantities shall be deemed to be covered by other prices or rates therein.

A 29 SITE MEETINGS

During the course of the Works, site progress meetings shall be held at regular intervals at least once every two weeks in the presence of the Engineer for the purpose of co-ordinating the Contractor’s work and to insure that full compliance with the various sequences of the contract are maintained. Minutes of such Site meetings will be recorded, copies will be distributed to all persons concerned and full effect shall be given to all instructions contained therein.

Prior to such meetings the Contractor shall give to the Engineer’s representative details in writing of that portion of the Works he proposes to construct during the coming two weeks with details of the plant and methods he proposes to employ. These proposals shall be discussed at the meeting and no work based on such proposals shall proceed without the approval of the Engineer’s Representative.

The Contractor shall have no claim against the Employer for costs incurred by him in changing the method of working or in the provision and use of other additional plant.

A 30 DAILY REPORTS
The Contractor shall deliver daily to the Engineer's Representative a report as to the number of workpeople employed on the Works in each Trade and copies of delivery notes of all materials and goods to the Site during the day.

A 31 ACCESS FOR THE ENGINEER

The Contractor shall provide at all times during the execution of the Works and the Maintenance Period proper means of access with ladders, gangways etc., and the necessary attendance to move and adapt same as directed for the inspection or measurement of the Works by the Engineer or the Engineer's Representative.

A 32 SETTING OUT AND LEVELLING

Prior to commencement of any site work the Contractor shall arrange to record on an approved grid existing site ground levels and agree with the Engineer's Representative the accuracy thereof by preparing a record drawing signed by the Contractor's Agent and the Engineer's Representative. The Contractor shall set out and level the Works and obtain the approval of the Engineer's Representative before commencing construction.

A 33 PROGRAMME TO BE FURNISHED

The Contractor shall prepare a programme for the Works, including the work of subcontractors and other work concurrent with the Contract, using the critical path network method. The Contractor shall submit three (3) copies of programme to the Engineer with his tender. Submission of programme will not relieve the Contractor of his obligations to apply in writing for instructions as required by the Conditions of Contract. Receipt of programmes by the Engineer shall neither affect the Contract completion date nor relieve the Contractor of his responsibility to complete the Works by this date. The Contractor shall review the programme once each month to take account of any circumstances which arise affecting the progress of the Works, and shall produce a revised programme and submit copies to the Engineer.

A 34 CANCELLATION DUE TO SLOW PROGRESS

If the Engineer shall be of the opinion that having regard to the state of the Works at any time, the Contractor will be unable to complete any section of the Works by the time specified or by such extension thereof as he may be entitled to under the Contract and the Contractor has failed to carry out steps and to expedite the work in accordance with the Conditions of Contract or, if the Engineer is of the opinion
that such steps are inadequate, the Engineer may, by written order omit the whole or any part of the uncompleted work included in that section and the Employer shall be at liberty to execute such omitted work by his own workman or by other Contractors. If the cost of such omitted or uncompleted work shall exceed the sum which would have been payable to the Contractor on the completion of the said work, then the Contractor shall, upon demand, pay to the Employer the amount of such excess and it shall be deemed a debt due by the Contractor to the Employer and shall be recoverable accordingly.

3-12

SPECIFICATIONS
GENERAL

A 35 DELAYS

The Contractor will be deemed to have allowed for all delay caused by difficulty in obtaining labour and materials or by suspension of part or the whole of the Works due to adverse and inclement weather conditions.

A 36 NON-PRODUCTIVE TIME

The Contractor shall allow for all costs incurred by non-productive time and all other expenses in connection with overtime.

A 37 SAFETY, HEALTH AND WELFARE

The Contractor shall comply with enactments regulations and working rules relating to safety health and welfare of workpeople.

A 38 CONTRACTOR'S SITE REPRESENTATIVE

The Contractor’s Representative in charge of the Works shall be a duly graduated Engineer having at least Three (3) years experience in the superintendence of similar works and shall be required to have a proper command of the Arabic and English languages.

A 39 ATTENDANCE

The Contractor shall allow for and be responsible for the general attendance of one trade upon another.

A 40 OFFICIAL VISITORS

The Contractor shall at all times when authorized by the Engineer give free undisputed access and all facilities to any authorized employee of the Employer, any representative of the U.N.D.P. or any person authorized by the U.N.D.P. wishing to view or inspect any part of the Works or the materials to be incorporated therein.
A 41 CARE OF THE WORKS, ETC.

The Contractor shall keep all persons (including those employed by Sub-Contractors) under control and within the boundaries of the Site. He will be held responsible for the care of the existing premises and of the works generally until their completion, including all work executed and materials, good and plant (including those Sub-Contractors and Suppliers) deposited on the Site; together with all risks arising from the weather, carelessness of work people, damage or loss by theft or any other cause; and he shall make good at his own expense or such damage and lose.

A 42 WORK AT COMPLETION

The Contractor shall clean the Works thoroughly inside and out removing all splashes, deposits, rubbish and surplus material. The Contractor shall remove all temporary markings, coverings and protective rappings unless otherwise instructed.

The Contractor shall touch up minor faults in painted surfaces carefully matching colour and brushing out edges. He shall repaint badly marked areas back to suitable breaks and junctions.

The Contractor shall adjust, ease and lubricate all doors, windows, drawers hardware, equipment, appliances controls and other moving parts as necessary to ensure easy and efficient operations.

The Contractor shall leave the Works secure with all access locked. He shall account for all keys and shall hand over to the Employer with itemized schedule signed by the Employer as receipt.
### SECTION B - EXCAVATION, EARTH WORKS AND ROAD WORKS

<table>
<thead>
<tr>
<th>Division</th>
<th>Titles</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B - 1</td>
<td>General</td>
<td>3 - 15</td>
</tr>
<tr>
<td>B - 2</td>
<td>Soil Information</td>
<td>3 - 15</td>
</tr>
<tr>
<td>B - 3</td>
<td>Materials</td>
<td>3 - 15</td>
</tr>
<tr>
<td>B - 4</td>
<td>Site Preparation</td>
<td>3 - 16</td>
</tr>
<tr>
<td>B - 5</td>
<td>Setting out</td>
<td>3 - 17</td>
</tr>
<tr>
<td>B - 6</td>
<td>Excavation</td>
<td>3 - 17</td>
</tr>
<tr>
<td>B - 7</td>
<td>Planking and Structting</td>
<td>3 - 18</td>
</tr>
<tr>
<td>B - 8</td>
<td>Keeping Excavation Free From Water</td>
<td>3 - 18</td>
</tr>
<tr>
<td>B - 9</td>
<td>Storing Of Suitable Excavated Material</td>
<td>3 - 19</td>
</tr>
<tr>
<td>B - 10</td>
<td>Disposal of unsuitable and surplus excavated material.</td>
<td>3 - 19</td>
</tr>
<tr>
<td>B - 11</td>
<td>Excavation For Foundation</td>
<td>3 - 19</td>
</tr>
<tr>
<td>B - 12</td>
<td>Excavation For Trenches</td>
<td>3 - 19</td>
</tr>
<tr>
<td>B - 13</td>
<td>Backfill And Fill</td>
<td>3 - 21</td>
</tr>
<tr>
<td>B - 14</td>
<td>Bed Of Hardcore</td>
<td>3 - 21</td>
</tr>
<tr>
<td>B - 15</td>
<td>Placing Of Agricultural Soil, Gravel</td>
<td>3 - 21</td>
</tr>
<tr>
<td>B - 16</td>
<td>Excavation Of Cuttings in Carriage Way</td>
<td>3 - 22</td>
</tr>
</tbody>
</table>
SECTION B

EXCAVATION - EARTH WORKS AND ROAD WORKS

B 1

GENERAL

The Contractor shall carry out all excavations, filling, backfilling and all other earthworks required in whatever material may be encountered.

The Works shall be executed accurately to the dimensions, levels, lines and profiles as indicated on the drawings or directed by the Engineer.

The Contractor shall reconstruct to the proper level and profile any filled areas which settle or spread during the execution of the work or during the maintenance period.

The Contractor shall drain and dewater the underground water to a level below the excavation by lowering the water table with a proper drainage and dewatering system approved by the Engineer.

B 2

SOIL INFORMATION

The Contractor shall be deemed to have visited the Site of Works and satisfied himself as to the nature of the ground and made himself conversant with the local conditions to be encountered during the execution of the Contract. The contractor is requested to perform a soil test to determine the nature and bearing capacity of the soil surface as directed by the Engineer.

B 3

MATERIALS

B 3.01 Backfill and Fill

Backfill and fill shall be a structurally sound material such as: less than 1 gravel or native soil free of rocks, lumps, vegetables and other organic materials obtained
from suitable excavated material and/or from approved borrow pits.

B 3.02 Water

Water shall be clean potable water as specified under “Concrete Work”

B 3.03 Concrete

Concrete used as fill for making up the correct level areas of over-excavation shall be, where required by the Engineer of Class "B" as specified under "Concrete Work".

B 3.04 Hardcore

Hard-core under floor paving, etc... ) (Where shown on the drawings or as directed by the Engineer) shall consist of tough, sound and durable rubble stones (maximum 150mm), free from coatings, drys, seems or flows of any character. Fine aggregate for blinding the interstices of hard-core bed shall be as described in “Concrete Work”.

B 3.05 Agricultural Soil, Gravel and Sand Fill

Agricultural soil shall be first choice top soil rich in organic materials and free from roots, stones and rubbish suitable for plantation and shall be obtained from an approved source. Gravel fill shall consist of graded gravel 50mm. Down to 20mm. And blinded with clean coarse sand.

3-15

SPECIFICATIONS
EXCAVATIONS

B 4 Site Preparation

B 4.01 Existing Public Utilities

The Contractor shall ascertain the whereabouts of all existing public utilities on the site, both above and below ground. Such utilities shall be removed, sealed or rerouted in a manner prescribed by the Public Authorities concerned at the Contractor’s own expense. The Contractor shall also be held responsible for all damages entailed on any of the public utilities adjacent to the Site resulting from the Works.

B 4.02 Removal of Existing Structures and Other Obstructions

This work shall include, but not be limited to, the removal of existing structures and other obstructions interfering with the Works. The Salvaging of any of these materials for the use of the Employer shall be as
directed by the Engineer and unwanted materials shall be disposed off the Site in a satisfactory Manner at the Contractor’s expense.

B 4.03 Cleaning and Grubbing

The Contractor shall perform the clearing and grubbing (if any) of top soil consisting mainly of loose soil, vegetable and organic matters, drift sand, unsuitable soil and rubbish by scarifying the areas to be excavated and side-walks to a minimum depth of 300mm from the natural ground level. All materials resulting from the above operations shall be removed from the Site, loaded and transported and off loaded spread and levelled to approved dumps as directed by the Engineer.

3-16

SPECIFICATIONS

EXCAVATIONS

B 5 SETTING-OUT

The Contractor shall stakeout the work as shown on the Drawings and secure the Engineer’s approval of his stakeout before proceeding with construction. If, in the opinion of the Engineer, modification of the line or grade is advisable before or after stake-out the Engineer will issue detailed instructions in writing to the Contractor for such modification and the Contractor shall revise the stake-up for further approval in accordance with the relevant Clause of the Conditions of Contract.

B 6 EXCAVATION

B 6.01 General

Excavation in any material whatsoever found including rock to reduce levels and to form foundations, bases, trenches, septic tanks, cesspools, pits and the like to depths shown on the drawings or as directed by the Engineer.

Completely remove all existing obstructions in the line of excavations such as wall, slabs, curbs, steps and the like.

Trim excavations to required profiles and levels. Remove all loose material.

Level and well ram and consolidate surface of ground and bottom of all excavations to receive concrete foundations, beds, etc.

Bottoms of excavations shall be approved by the Engineer’s
Representative before any concrete is laid.

Should the Contractor excavate deeper than is shown on the drawings or required by the Engineer’s Representative to obtain a solid bottom he must fill up excavation to the proper level with concrete Class B at his own expense.

B 6.02 Excavation in Rock

Rock shall be defined as boulders, exceeding 0.25m³ in volume or any kind of stone or rock formation which in the opinion of the Engineer’s Representative requires for its removal drilling and blasting wedging, wedging or breaking up with power-operated hard tool.

The definition shall exclude any soft or disintegrated rock which can be removed with a hard pick or mechanical excavator or shovel or loose, shaken or previously blasted rock or broken stone in rock fillings or elsewhere.

3-17

SPECIFICATIONS

EXCAVATIONS

Blasting by explosives shall not be permitted without obtaining the written approval of the Engineer. If such approval is given the Contractor shall be solely responsible for:

1 - Obtaining permits, keeping record.
2 - Storing permits, keeping record.
3 - Taking all necessary precautions in compliance with the regulations pertinent to the use of Explosives.
4 - Any damage that may occur due to the blasting operations where rock is encountered it shall be carefully excavated and the Contractor shall not be entitled to additional compensation unless otherwise specified in the Bills of Quantities.

B 7 PLANKING AND STRUTTING

The terms “planking and strutting” will be deemed to cover whatever methods the Contractor elects to adopt for shoring the sides of excavation and also for planking and strutting the excavations against the sides of adjoining buildings, public roadways, etc. The Contractor will be held responsible for shoring the sides of all excavations, adjoining building and the like and no claim for additional excavation, concrete or other material or workmanship will be considered in this respect.

In the event of any collapse occurring the excavations, the Contractor shall re-excavate and re-instate such excavations at his own expense. No additional excavations will be paid or should the Contractor batter the sides of the excavations.

B 8 KEEPING EXCAVATIONS FREE FROM WATER
All excavations shall be kept clear of water by pumping or bailing or by well-point dewatering, but the latter system shall not be employed if any danger exists of withdrawing water from the foundations of the adjoining buildings and such water shall be discharged clear of the works and the method adopted shall in no way contravene the regulations of the Local Authorities.

The system or systems to be employed shall be approved by the Engineer. Such approval if given shall not waive the Contractor's responsibilities and liabilities under the Contract.

Particular attention shall be paid to the installation of sheeting and shoring as may be necessary for the protection of the work and for the safety of personnel and public.

SPECIFICATIONS
EXCAVATIONS

B 9
STORING OF SUITABLE EXCAVATED MATERIAL

During excavation, materials suitable for backfill and fill shall be stockpiled on the Site at sufficient distance from the sides of the excavation to avoid overloading and prevent caveins or mixing with the concrete during the construction of foundations.

B 10
DISPOSAL OF UNSUITABLE AND SURPLUS EXCAVATED MATERIAL

Upon the order of the Engineer, all unsuitable and surplus excavated materials shall be immediately removed. Loaded and transported off the site area by the Contractor to approved dumps and he shall abide by the relevant local regulations.

B 11
EXCAVATION FOR FOUNDATIONS AND SUB-STRUCTURE

The Contractor shall excavate to reach a suitable strata accepted by the Engineer or as shown by the Drawings during excavation for foundations, the bottom layer of excavation of minimum 200mm in thickness, shall be left undisturbed and subsequently removed manually only when the concrete in blinding is about to be placed in order to avoid softening or deterioration of the surfaces of the excavation.

Bottom of all excavations shall be formed to correct levels as shown on the Drawings or as directed in writing.
by the Engineer and shall be trimmed, levelled and well cleaned before pouring and concrete.

In the event of the contractor excavating deeper than the levels required, he shall make the difference between levels with concrete class “B” at his own expense.

After each excavation is complete, the Contractor shall notify the Engineer to that effect, and no concrete shall be placed until the Engineer has approved the excavation and the character of the foundation material.

**EXCAVATION FOR TRENCHES**

**B 12.01 General**

The Contractor shall provide all forms and bracings, and excavate trenches necessary to install all drainage, sewer water supply, electrical and telephone cables to the lines and grades complete in strict conformity with these specifications, applicable drawings and/or as directed by the Engineer.

**B 12.02 Grading**

The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its length, except for the portions of the pipe where it is necessary to excavate for bell-holes and for proper sealing of joints. Bell-holes and depressions for joints shall be dug after the trench has been graded.

Share shall be taken not to excavate below the depths indicated. Where rock shall be excavated to the required depth. Uneven surface of the bottom trench shall be excavated 15mm deeper. Such depth, if in rock, shall be back-filled with concrete Class “B” as specified under “Concrete Work” and when in earth, shall be back-filled with approved sand at the Contractor’s own expense.

Whenever unstable soil, which in the opinion of the Engineer, is incapable of properly supporting the pipe or duct is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trenchy back-filled to the proper grade with sand, fine gravel or other suitable material approved by the Engineer.

The width of the trench for Drainage at and below the top of the pipe shall be such that the clear space between
the barrel of the pipe and the trench wall shall be 20mm on each side of the pipe. The width of the trench above that level may be as wide as necessary for sheeting and bracing and the proper performance of the work.

Trench for Water Supply System shall be of a depth to provide minimum cover over the top of 300mm and avoid interference of water lines with other utilities. Width of trench shall be a maximum of 200mm on each side of the pipe.

The width of trenches for electrical and telephone cables shall be as specified in their relative section. Banks may be sloped or widened to facilitate placement of cables, but not to an extend that will cause interference with other utilities.

Excavation for appurtenant structures for manholes, septic tank, percolating pit and similar structures shall be sufficient to allow a minimum of 300mm of clear space between their outer surfaces shoring timbers which may be used to protect the banks.

### BACKFILL AND FILL

Approved suitable excavated material as specified under "MATERIALS" shall be used in the backfilling and filling next to footings, foundations underground structures, under sub-floors, etc... and shall be laid in layers not exceeding 200mm and compacted with compaction equipment, as approved by the Engineer. Moisture content shall be adjusted as directed by the Engineer and 95% of dry weight compaction accordance to ASTM: D1557-70 shall be achieved.

Should the quantity of the excavated material be not sufficient for the process of backfill and fill, the Contractor shall obtain the quantity required of such backfill and fill from approved borrow pits and transport same to the Site of work at his own expense.

No backfill shall be executed until the footings, foundations, etc., have been inspected, measured and approved by the Engineer.

Trenches should be backfilled until all required tests are performed and until the Engineer has verified that the Utility systems have been installed in accordance with the
Specifications and the Drawings. The backfill in the pipe zone must be placed and completed so as to provide and maintain adequate and even support around the pipe wall. If mechanical compaction equipment is needed, care must be taken to prevent direct contact with the pipe.

**BED OF HARDCORE**

The bed of hard-core, where shown on the Drawings or as directed by the Engineer shall be of an approved rubble stone as specified under “MATERIALS” and shall be laid under floor pavings. The rubble stone for hard-core shall be hand-packed with sharp edge upward and wider (natural face) laid on the ground. The interstices of hard-core bed shall be filled with approved fines, wetted sufficiently and well consolidated. The thickness of the hard-core bed shall be as shown on the Drawings.

**PLACING OF AGRICULTURAL SOIL, GRAVEL AND SAND**

The agricultural sifted soil as specified under “MATERIALS” shall be spread in the flower boxes and beds to the thickness shown on the Drawings after thorough watering and on a bed of 100mm thick graded gravel blinded with clean coarse sand to the satisfaction of the Engineer.

**EXCAVATIONS**

**EXCAVATIONS OF CUTTINGS IN CARRIAGE WAYS**

1- Hauling of material from cuttings or borrow pits to the embankments or other areas of fill shall proceed only when sufficient compaction plant is operating at the place of disposal to ensure compliance with the requirements of specifications.

2- Any excess depth excavated below formation level tolerance shall be made good by back filling with suitable material of similar characteristics to that removed, compacted in accordance with specification.

3- The slopes of cuttings shall be cleared of rock fragments which move when prized by a crow bar.

4- Construction traffic shall not use the surface of the bottom of a cutting unless the cutting is in rock or the Contractor maintains the level of the bottom surface at least 30cm above formation level. Any damage to the sub-grade arising from such use of the surface shall be made good by the Contractor at his own expense, with material having the same characteristics as the material which has been damaged.
FILLING AND FORMING OF EMBANKMENTS AND OTHER AREAS OF FILL

1- Embankments and other areas of fill shall be formed of material defined as “suitable material”.

2- All earthworks material placed in or below embankments, below formation level in cuttings or else wherein the works shall be deposited and compacted as soon as practicable after excavation in layers of thickness appropriate to the compaction plant used or as a permitted departure therefrom. Embankments shall be built up evenly over the full width and shall be maintained at all times with a sufficient camber and a surface sufficiently even to enable surface water to drain readily from them. During the construction of embankments, the Contractor shall control and direct constructional traffic uniformly over their full width. Damage to compacted layers by constructional traffic shall be made good by the Contractor.

3- In areas of shallow filling where after removal of topsoil the ground level is within 30ccm of formation level constructional traffic shall not use the surface unless the Contractor brings up and maintains the surface level at least 30cm above formation level. Any damage to the sub-grade arising from such use shall be made good by the Contractor at his own expense with material having the same characteristics as the damaged materials.

COMPACTION OF EMBANKMENTS AND OTHER AREAS OF FILL

1- All materials used in embankments and as filling elsewhere shall be compacted as soon as practicable after deposition.

2- Variation from the method of compaction stated below or the use of plant not included therein will be permitted only if the Contractor demonstrates at site trials that a state of compaction is achieved by the alternative method equivalent to that obtained using the approved methods. This procedure shall be agree and approved by the Engineer.

3- The Engineer may at any time carry out comparative field density tests determined in accordance with S. S. 1377 test No. 14 on material, which he considers has been, inadequately compacted. If the test results when compared with the results of similar tests made on adjacent approved work in similar materials carried out in accordance with specification, show the state of compaction to be inadequate and this held to be due to failure of the Contractor to comply with the requirements of
the Contract, the Contractor shall carry out such further work as the Engineer may decide is required to comply with the terms of the Contract.

5- The Contractor shall not less than 24 hours before he proposes to carry out compaction processes during periods of overtime, apply in writing to the Engineer for permission to do so.

B 19 ROAD WORKS

B 19.01 OVERALL REQUIREMENTS

A) Horizontal alignments, surface levels and surface regularity of pavement courses:

1- Horizontal alignments shall be determined from one edge of the carriage way pavement surface as shown on the Drawings. The edge of the carriageway as constructed and all other parallel alignments shall be correct within a tolerance of 15mm there from.

2- The levels of pavement courses shall be determined from the true pavement surface, which shall be the surface of the wearing
course from flexible pavements calculated from the carriage way vertical profile and cross falls as sown on the Drawings. The vertical depth below the true pavement surface at any point on the constructed surface of the formation or pavement courses shall be within the appropriate tolerances stated below:

- Base course tolerance = __ 10 mm
- Road base tolerance = __ 15 mm
- Sub-base tolerance = __ 20 mm
- Formation tolerance = __ 25 mm

3- The surface level of the laid wearing course shall not deviate vertically at any point from the true pavement surface by more than 10mm.

4- For checking compliance with the above tolerances, measurements of surface levels will be taken at a grid of points 20 meter centers longitudinally and at 2 meter centers trans-versely starting one meter from the edge of the carriage way.

5- Compliance with tolerance shall be tested by rolling straight edge, operated parallel to the center line of the carriage way and one meter from the near side edge of each lane of carriage way.

3-25

SPECIFICATIONS
EXCAVATIONS

6- For lengths less than 100 meter the laid pavement surface and the surface of the base course shall be tested with a 4 meter straightedge placed parallel to the centerline of the road. The laid pavement surface and the surface of the base course shall have no greater depression under the straightedge than 10mm and 10mm respectively.

7- Where any tolerance is exceeded the Contractor shall determine the full extent of the area which is out of tolerance and shall make good by rectifying the surface of the pavement course or formation in the manner described below:

a- Formation level:
   If the surface is too high it shall be re-trimmed and re-compacted. If the surface is too low the deficiency shall be corrected by the addition of fresh
suitable material of the same classification laid and compacted to specification.

b- Roadbases and Sub-bases:
Where this consist of unbound material the top shall be scarified, reshaped, with added material as necessary, and recompacted all to specification. The area treated shall normally be not less than 30 meter long and 2.5 meter wide or such less length to be determined by the Engineer as necessary to obtain compliance with specification.

B) Use of surfaces by constructional traffic:
1- Constructional traffic used on pavement under construction shall be suitable in relation to the thickness of the courses it traverses so that damage is not caused to sub-grade or the material already constructed.

2- The wheels or tracks of plant moving over the various pavement courses shall be kept from deleterious materials.

C) Transporting, laying and compacting of road pavement materials containing Tar or Bitumen Binder.
1- Bituminous materials shall be transported in clean vehicles and shall be covered over when in transit or a waiting tripping. The use of dust, Oil or water in the interior of the vehicles to facilitate discharge of the mixed materials is permissible but the amount shall be kept to a minimum and excess shall be removed by tipping or brushing.

3- The mixed material shall as soon as possible after arrival at the site be supplied continuously to the paver and laid without delay. The rate of delivery of material to the paver shall be so regulated as to enable the paver to be operated continuously and it shall be so operated whenever practicable

3- The rate of travel of the paver and its method of operation shall be adjusted to ensure an even and uniform flow of material across the full laying width, freedom from dragging or tearing of the material and minimum segregation.

4- The material shall be laid generally in conformity with the recommendations for laying in the British Standard to which it has been made.
5- Hand laying of any bituminous material will be permitted only in the following circumstances:
   a. For laying regulating courses of irregular shape and varying thickness.
   b. In confined spaces where it is impracticable for a paver to operate.
   c. For footways.

6- Material shall be compacted as soon as rolling can be effected without causing undue displacement of the mixed material and while this has at least the minimum rolling temperature stated in the appropriate British Standard. The material shall be uniformly compacted by an 8-10 tons smooth wheel roller having a width of roll not less than 45cm, or by a mult-wheeled pneumatic tyred roller of equivalent weight except that wearing course and base course material shall be surface finished with a smooth wheel roller.

7- The material shall be rolled in a longitudinal carriageway over lapping on successive passes by a pneumatic tyred roller, at least the nominal width of the tyre.

8- Hand-raking of wearing course material which has been laid by a paver and the addition of such material by handspreading to the paved area for adjustment of level will be permitted only in the following circumstances:
   a- At the edges of the layers of material and at gullies and manholes.
   b- Where otherwise directed by the Engineer.

9- Rollers shall not stand on newly laid material while there is a risk that it will be deformed thereby.

10- a. By heating the joint with an approved joint heater at the time when the additional width is being laid but without cutting back or coating with binder. The heater shall raise the temperature of the full depth or the wearing course to figure within the rolling temperature range specified for the material and for a width not less than 75mm on each side of the joint. In this case, however the Contractor shall have available for use in the event of breakdown, equipment necessary for operating method (c).
b. By using two or more pavers operating in echelon where there is practicable and in sufficient proximity for adjacent widths to be fully compacted by continuous rolling or by using a multiple-lane-width payer.

c. By cutting back the exposed joints to a vertical face of not less than the specified thickness, discarding all loosened material and cooling the vertical face completely with a grade of hot tar or hot bitumen suitable for the purpose before the next width is laid.

11- Base course material shall not remain uncovered by either the wearing course or surface treatment whichever is specified in the Contract for more than 3 consecutive days after being laid.

B 19.02 SUB-BASE AND ROAD BASE

A. Constructions requirements for materials of base and sub-grade.

1- Transport vehicles carrying plant mixed material shall have a capacity suited to the output of the mixing point and the site conditions and be capable of discharging cleanly. Material when mixed shall be removed at once from the mixer, transported directly to the point where it is to be laid and protected from the weather both during transit from the mixer to the laying size and whilst tripping.

SPECIFICATIONS

EXCAVATIONS

2. All material shall be placed and spread evenly. Spreading shall be undertaken either concurrently with placing or without delay. Roadbase material shall be spread using a paving machine or spreader box operated with a mechanism which levels off the material to an even depth. Except where otherwise specified in individual clauses, the material shall be spread in one layer so that after compaction the total thickness is as specified.

3- Compaction shall be completed as soon as possible after the material has been spread.
4- Special care shall be taken to obtain full compaction in the vicinity of both longitudinal and transverse.

5- The surface of any layer of material shall be on completion of compaction be well closed, free from movement under compaction plant and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

6- Compaction shall be carried out by the method specified in the table page ()

B) Granular sub-base and Road Material:

1- It shall comprise natural sands, gravels, crushed rock. The material shall be well graded and lie within the following grading limits:

<table>
<thead>
<tr>
<th>B.S. Sieve Size</th>
<th>Percentage by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 in</td>
<td>100</td>
</tr>
<tr>
<td>1 1/2 in</td>
<td>85 - 100</td>
</tr>
<tr>
<td>3/8 in</td>
<td>45 - 100</td>
</tr>
<tr>
<td>3/16 in</td>
<td>25 - 85</td>
</tr>
<tr>
<td>No. 25</td>
<td>8 - 45</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 - 10</td>
</tr>
</tbody>
</table>

The particle size shall be determined in accordance with B.C. 1377.

2- The material passing no. 36B.S. sieve, when tested in accordance with B.S. 1377 shall have a plasticity index of less than 6.

3- The material shall be laid and compacted to the requirements of specifications at a moisture content within the range one percent above to 2 percent below the optimum percentage determined in accordance with vibrating hammer method test in B.S. 1377

4- On completion of roadbase and until any surfacing is laid on it, the finished surface shall be maintained free from potholes, ruts and undulations, irregularities depressions, loose material or other defects.
5- Paved hard shoulders shall be constructed of the materials and to the dimensions described in the contract. Alternatively if agreed by the Engineer the Contractor may construct hard shoulders to the same specification as the carriage way pavement.

**FLEXIBLE SURFACING**

A) Rolled Asphalt for Base:
1- This material shall be made in accordance with the requirements of B.S. 594 for base course mixtures subject to the under mentioned proviso relating to blastfurnace slag. It shall be laid and compacted to relevant clauses.

2- Coarse aggregate content 65 percent. When the bulk density of the slag coarse aggregate is less than 80lb per cubic foot, the coarse aggregate content shall be reduced to 55 per cent.

3- Petroleum bitumen in accordance with B.S. 594 of penetration as described in the contract.

B) Rolled Asphalt Wearing Coarse:
1- Rolled asphalt wearing coarse shall be in accordance with the general requirements of B.S.594.

2- Asphalitic Cement:
   a. Equal proportions by weight of petroleum bitumen of appropriate penetration and refined asphalt or/
   b. Pitch/Bitumen to the following specifications: A mixture of 75-80 percent of petroleum bitumen with 20-25 percent of a coal tar pitch produced by straight running predominately from a vertical retort crude source.

3- SPECIFICATIONS

EXCAVATIONS

The softening point of the pitch shall lie between 55 C and 80 C and the petroleum bitumen shall have a penetration conforming to the requirements of B.S.594 tables 1, 2 or 3 as described in the Contract. The Engineer may require, from time to time, certificates confirming that the mixture has a salability index not higher than 1.2 when tested according to the method described in the Road Research Laboratory Research Note No. RN/4112. The use of density-gradient column
in a storage stability test for pitch/bitumen mixtures; or

c. Petroleum Bitumen.

3- Content of coarse aggregate for new works 3 percent by weight.

4- Binder Content/ Bulk of Blast furnace Slag Relationship.
When the coarse aggregate is blastfurnace slag the binder content shall be related to the bulk density of the aggregate. When the bulk density is less than 87lb per cubic foot (1400Kg/M3) rounded to the nearest 1lb per cubic foot (16Kg/M3) the soluble bitumen content shown in the following table:

<table>
<thead>
<tr>
<th>Aggregate</th>
<th>Aggregate</th>
<th>Aggregate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse</td>
<td>Soluble</td>
<td>No.200 B.S.</td>
</tr>
<tr>
<td>Aggregate</td>
<td>binder</td>
<td>Sieve</td>
</tr>
<tr>
<td>retained on No. 7 B.S.</td>
<td>Sieve</td>
<td></td>
</tr>
<tr>
<td>No. 200 B.S.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aggregate</th>
<th>Sieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>Crushed rock</td>
<td>7.9</td>
</tr>
<tr>
<td>Blast furnace slag</td>
<td>8.0</td>
</tr>
</tbody>
</table>

Shall be increased as shown below in the table and the percentage of aggregate passing the No.7 B.C. Sieve and retained on the No. 200 B.S. Sieve correspondingly reduced. Slag having a bulk density of less than 68lb per cubic foot shall not be used.

<table>
<thead>
<tr>
<th>Bulk density of slag</th>
<th>Addition to specified percentage of soluble bitumen content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lb/ft3</td>
<td>New Works</td>
</tr>
<tr>
<td>87 and above</td>
<td>Nil</td>
</tr>
<tr>
<td>81-86</td>
<td>0.1</td>
</tr>
<tr>
<td>74-80</td>
<td>0.2</td>
</tr>
<tr>
<td>68-73</td>
<td>0.3</td>
</tr>
</tbody>
</table>

---

C) Bituminous Sprays:

1- When it is necessary to prepare a surface for the application of a bituminous spray and to undertake the spraying and any specified binding, this shall be done in accordance with the recommendation of the Ministry of Transport Road notes relating to surface dressing in so far as they apply to work to be undertaken. The work shall also be undertaken in
accordance with the under-mentioned general requirements and any specific requirements as described in the Contract.

2- The Engineer may require the contractor to provide a certificate stating that a particular binder distributor has been tested since the previous surface dressing season and that the test indicates conformity of the requirements for B.S.1707 for hot binder distributors or with the requirements of B.S. 3236 for emulsion distributors.

3- Before spraying is commenced, the surface shall be freed of all loose material. The surface as a whole shall be dry and any damp areas shall be completely free from standing water.

4- Binding material, where required by the contract, shall consist of a commercial grade of hard clean crushed rock or slag fine aggregate or sand; it shall contain not more than 15 percent retained on a ¼ inch B. S. Sieve.

5- Unless the Engineer permits otherwise, all loose material on the sprayed surface, including any building material, shall be removed before any further layer of the pavement is laid.

B 19.04 SIGNS AND ROAD MARKINGS

A) Permanent Traffic signs and information signs:
   1- Permanent traffic signs shall be either externally or internally illuminated, reflecting or non-reflecting as described in the Contract and the local standards.
   2- Where illumination is to be provided, this shall be by lamps of tungsten filament or fluorescent type complying with B.S. 873. Where reflectorisation is required the means shall be of approved type all as described in the Contract.
   3- Signs shall be erected with approved fittings on posts made from rectangular or tubular steel. The construction and supports of large signs shall be as described in the Contract.

3-32

INDEX

SECTION C - CONCRETE WORK

<table>
<thead>
<tr>
<th>Division</th>
<th>Tiles</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C - 1</td>
<td>Scope</td>
<td>3 - 33</td>
</tr>
<tr>
<td>C - 2</td>
<td>Applicable Tests and Codes</td>
<td>3 - 33</td>
</tr>
<tr>
<td>C - 3</td>
<td>Materials</td>
<td>3 - 33</td>
</tr>
<tr>
<td>C - 4</td>
<td>Composition of concrete</td>
<td>3 - 40</td>
</tr>
<tr>
<td>C - 5</td>
<td>Proportions</td>
<td>3 - 42</td>
</tr>
<tr>
<td>C - 6</td>
<td>Concrete compression &amp; slump tests</td>
<td>3 - 43</td>
</tr>
<tr>
<td>C - 7</td>
<td>Measurement of materials</td>
<td>3 - 44</td>
</tr>
<tr>
<td>C - 8</td>
<td>Mixing of concrete</td>
<td>3 - 44</td>
</tr>
<tr>
<td>C - 9</td>
<td>Handling and placing concrete</td>
<td>3 - 47</td>
</tr>
<tr>
<td>C - 10</td>
<td>Precast concrete blocks [Y-Tong] for ribbed slabs.</td>
<td>3 - 50</td>
</tr>
<tr>
<td>C - 11</td>
<td>Formwork</td>
<td>3 - 51</td>
</tr>
<tr>
<td>C - 12</td>
<td>Reinforcement</td>
<td>3 - 53</td>
</tr>
<tr>
<td>C - 13</td>
<td>Curving and protection</td>
<td>3 - 56</td>
</tr>
<tr>
<td>C - 14</td>
<td>Exposed concrete[fair face] surfaces</td>
<td>3 - 57</td>
</tr>
<tr>
<td>C - 15</td>
<td>Monolithic smooth finish surfaces</td>
<td>3 - 58</td>
</tr>
</tbody>
</table>

**SECTION C**

**CONCRETE WORK**

C 1 **SCOPE**

This section describes and specifies work required for plain and reinforced concrete, including formwork.
intended to be used for the Project under the Contract in accordance with the Drawings, Bills of Quantities and as directed by the Engineer.

At the beginning of each month, the Contractor shall submit to the Engineer his concreting programme for that month, stating the pouring dates, so that adequate checking and supervision can be provided before and during the pouring operation. No pouring shall be allowed unless the Engineer has been given a week-advanced notice of the intention to pour.

C 2

APPLICABLE TESTS AND CODES

Prior to commencement of concrete work, the Contractor shall submit samples to the Engineer before sending them to the laboratories for testing, to establish the probability of the materials passing tests for specified requirements.

After the Engineer is convinced that the samples with their sources are truly representative samples and sufficient materials are available on the Site for the completion of all concrete works under the Contract, the samples shall be approved and sent to the laboratories for testing. Upon the Engineer’s request, the Contractor shall have the tests made, at his own expense in the laboratories approved by the Engineer.

All concrete aggregates, cement and water shall be sampled and tested as frequently as deemed necessary by the Engineer. All tests samples shall be obtained in accordance with the latest editions of the American Society for Testing and Material (ACI) Code or any equally approved standard.

C 3

MATERIALS

C 3.01 Cement

(A) General

Cement shall be Portland Type originating from approved manufacturers in sealed and labelled bags,
each 50 kgs. Not capacity, name and brand of the manufacturer shall plainly be identified thereon and Delivered to the Site in good condition Cement delivered in bulk shall be accepted only if a central mixing plant is used. The Quality of cement shall conform to the Standard Specification for PORTLAND CEMENT of ASIM Designation: C150-74 Type I- for use in general concrete construction and Type V- for use when high sulphate resistance is desired.

(B) Storage of Cement

All cement shall be stored in suitable weatherproof and approved storage sheds which will protect the cement from dampness. Storage sheds shall be erected in locations approved by the Engineer. Provision for storage shall be ample, and the consignment of cement as received shall be separately stored in such a manner as to provide easy access for the identification and inspection of each consignment Cement shall be used in the order of its delivery to site, new deliveries shall not be used unless the cement from earlier deliveries has been completely used. Stored cement shall meet the test requirements at any time after storage when a re-test is ordered by the Engineer all the expense of the Contractor.

The Contractor shall keep accurate records of the deliveries of cement and of its use in the work. Copies of these records shall be supplied to the Engineer in such form as may be required.

(C) Rejection

The Contractor shall notify the Engineer of dates of delivery so that there will be sufficient time for sampling the cement either at the mill or upon delivery.

The provisional acceptance of the cement at the mill shall not deprive the Engineer of the right to reject on a reset of soundness at the time of delivery of the cement to the Site.

Package of cement varying by 5 percent or more from the specified weight shall be rejected and if the average weight of packages in any consignment, as shown by weighing 50 packages taken at random, is less than that specified, the entire consignment
shall be rejected and the Contractor shall remove it forthwith from the Site at his own expense and replace it with cement of satisfactory quality. Stale cement or cement reclaimed from cleaning bags shall not be used and cement which for any reason has become partially set, or contains lump or caked cement, shall be rejected.

C 3.02 Aggregates
(A) General Requirements
All aggregates shall consist of tough, hard, durable uncoated particles. The Contractor shall be responsible for the processing of this material to meet the requirements of the Specifications. Approval of aggregate quality and/or gradation shall not waive the responsibility of the Contractor to provide concrete of having the minimum strength specified.

(B) Storage
Coarse and fine aggregates shall be delivered and stored separately on site in such a manner as to prevent segregation and contamination or the admixture of foreign materials. Aggregate which has become segregated or contaminated with foreign matter during storage or handling will be rejected and shall be removed and replaced with material of acceptable quality at the Contractor's expense. Aggregates of the quality and colour selected shall be stored in sufficient quantity to avoid interruption of concreting work at any time.

C 3.03 Fine Aggregate
(A) General Requirements
All fine aggregate shall conform to Standard Specification for Concrete Aggregates of ASIM Designation: C-33 and also to the detailed requirements give in Table 300 A (appended herebelow). It shall not contain harmful materials such as iron pyrites, coal, mica, and shale. Alkali, coated grains, or similar laminated materials such as soft and flaky particles, or any material which may attack the reinforcement, in such a form and in sufficient quantity to affect adversely the strength and durability of the concrete. Fine Aggregate passing sieve No. 4 shall not contain any voided shells. Fine aggregates shall be washed thoroughly with demineralized water to ensure compliance with the appropriate requirements and limitations of the specifications.

The Contractor shall provide and maintain for this proposes sand-washing plant and equipment.

Fine Aggregate from different sources of supply shall not be mixed or stored in one pile nor used
alternately in the same class of construction or mix.

### Table 300 A

<table>
<thead>
<tr>
<th>Grading :</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve</td>
<td>Passing</td>
</tr>
<tr>
<td>3/8</td>
<td>100</td>
</tr>
<tr>
<td>No. 4</td>
<td>95 - 100</td>
</tr>
<tr>
<td>8</td>
<td>80 - 100</td>
</tr>
<tr>
<td>16</td>
<td>50 - 85</td>
</tr>
<tr>
<td>30</td>
<td>25 - 60</td>
</tr>
<tr>
<td>50</td>
<td>10 - 30</td>
</tr>
<tr>
<td>100</td>
<td>2 - 10</td>
</tr>
<tr>
<td>200</td>
<td>0 - 3</td>
</tr>
</tbody>
</table>

Fineness modulus

<table>
<thead>
<tr>
<th>Organic Impurities</th>
<th>The color shall have an intensity not darker than two-thirds the intensity of the standard color solution. (Not darker than Plate 2 as determined by the Standard Method of Test for Organic Impurities in Sands for Concrete of ASTM Designation C - 40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorides soluble in dilute Nitric Acid</td>
<td>Not more than 0.10 percent by weight when expressed as sodium chloride (NaCl).</td>
</tr>
<tr>
<td>Total Acid soluble sulphates</td>
<td>Not more than 0.50 percent by weight when expressed as sulphur trioxide (SO3)</td>
</tr>
<tr>
<td>Silt</td>
<td>Not more than 2 percent</td>
</tr>
<tr>
<td>Mortar strength</td>
<td>Compression ratio not less than 95 percent.</td>
</tr>
<tr>
<td>Soundless</td>
<td>Weighted average loss when subjected to 5 cycles of the soundless test using magnesium sulfate, not more than 10 percent.</td>
</tr>
</tbody>
</table>

3-36

SPECIFICATIONS

CONCRETE WORK

C 3.04 Coarse Aggregate

(A) General Requirements
All coarse aggregate for concrete shall conform to Standard Specifications for Concrete Aggregates of ASTM Destination: C-33 Coarse aggregate shall consist of gravel, crushes gravel, or crushed stone, having hard, strong durable pieces, free from adherents. It shall not contain harmful materials such as iron pyrites, coal, mica, alkali, laminated materials, or any material which may attack the reinforcement, in such a for or in sufficient quantity to affect adversely the strength and durability of the Concrete. Coarse aggregates shall be washed thoroughly with demineralized water to ensure compliance with the appropriate requirements and limitations of the specifications. The Contractor shall provide and maintain for this purpose approved washing plant and equipment.

(B) Deleterious Substances

The amount of deleterious substances shall not exceed the following limits:

<table>
<thead>
<tr>
<th>Deleterious Substances</th>
<th>Max. Permissible Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent by Wt.</td>
</tr>
</tbody>
</table>

- Soft fragments ............. 2.0
- Coal and lignite .......... 0.5
- Clay lumps ................. 0.25
- Materials passing the No.200 sieve 1.0
- Thin or clognated pieces(length greater than 5 times average thickness) 4.0
- Other local deleterious substances 0
- Chlorides soluble in dilute Nitric acid when expressed as Sodium Chloride (NaCL) 0.05
- Total acid soluble sulphates when expressed as sulphur trioxide (S03) 0.5

(C) Percentage of Wear

Coarse aggregate shall conform to the following requirements:
Percentage of wear, Los Angeles test, not more than ............ ............ 30

3-37

SPECIFICATIONS
CONCRETE WORK

(D) Grading
Coarse aggregate, when tested according to the requirements of ASTM, shall meet the following gradation and shall be uniformly graded within the limits stated in Table 1 herebelow:

Table 1

<table>
<thead>
<tr>
<th>ASTM Passing</th>
<th>Percentage by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grading</td>
<td>Grading</td>
</tr>
<tr>
<td>(3/4&quot; to No.4)</td>
<td>(1&quot; to No.4)</td>
</tr>
<tr>
<td>2 1/2 inch</td>
<td>-</td>
</tr>
<tr>
<td>2 inch</td>
<td>-</td>
</tr>
<tr>
<td>1 1/2 inch</td>
<td>100</td>
</tr>
<tr>
<td>1 inch</td>
<td>95 - 100</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>20 - 55</td>
</tr>
<tr>
<td>1/2 inch</td>
<td>0 - 10</td>
</tr>
<tr>
<td>No. 4</td>
<td>0 - 1</td>
</tr>
<tr>
<td>No. 8</td>
<td>0 - 5</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 - 1</td>
</tr>
</tbody>
</table>

(E) Combined Aggregate

Approved fine and coarse aggregate on each batch of concrete shall be combined in proportions as approved by the Engineer, according to test results giving the required compressive concrete stress as specified per type of Concrete.

The combined aggregate gradation using the 3/4 in. to No. 4 gradation shall be used for concrete members with reinforcement to close or permit proper placement and consolidation of the concrete. Change from one gradation to another shall not be made during the progress of the work unless approved by the Engineer. Such changes are admitted only after being proved by test results.

C 3.05 Aggregate for Mortar

(A) General Requirements

Aggregate for mortar shall conform to the Standard Specification for Aggregate for Masonry Mortar of ASTM Designation: C-144 and shall consist of hard, strong, durable uncoated mineral or rock particles, free from injurious amounts of organic or other deleterious substances.
(B) **Organic Impurities**

Fine aggregate for mortar when subjected to the Calorimetric test for organic impurities and producing a color darker than the standard color shall be rejected.

C 3.06 **Water**

(A) **Quality of Water**

Water for mixing of concrete shall be fresh, clean and free from injurious amounts of oil, acid, or any other deleterious mineral and/or organic matter. It shall not contain chlorides such as sodium chloride in excess of 700 ppm. It shall not contain any impurities in amount sufficient to cause a change in the time of setting of Portland Cement of more than 10 percent, nor a reduction in compressive strength of mortar of more than 5 percent compared to results obtained with distilled water.

The PH of the water for mixing and curing of concrete shall not be less than PH 4.5 or more than PH 8.5.

(B) **Tests for Water**

When required by the Engineer the quality of the mixing water shall be determined by the Standard Method of Test for quality of water to be used in concrete, as specified in B.S. 3148: 1959 Tests for Water for Making Concrete.

In sampling water for testing, care shall be taken to ensure the containers are clean and that samples are representative.

C 3.07 **Admixtures**

Admixtures in concrete shall be used only when approved by the Engineer and shall conform to the requirements of the ASTM Standard Specifications Designation c-494-68 for Water Reducing and Retarding Admixtures, and C-260-69 for Air entraining Admixtures for Concrete, and waterproofing and watertightening.

The Contractor shall ensure that the admixture supplied for use in the work is equivalent in composition to the admixture subjected to test under this Specification. Tests shall be made whenever practicable using the cement, aggregates, admixtures proposed for specific work, because the specific effects produced by chemical admixtures may vary with the properties of the other ingredients of the concrete.
The specific effects produced by chemical admixtures may vary with the properties of the other ingredients of the concrete.

Admixture that contain relatively large amounts of chloride shall accelerate corrosion of reinforcing steel and shall be the cause of rejection.

Water reducing and retarding admixtures shall comply with the physical requirements of ASTM tests and shall be approved in writing by the Engineer.

When the admixture is delivered in packages or containers, the proprietary name of the admixture, the type and the weight or volume shall be plainly marked thereon. Similar information shall be provided in the shipping advises accompanying packaged or bulk shipments of admixtures.

The admixture shall be stored in such a manner as to permit easy access for proper inspection and identification of each shipment, and in a suitable weather-tight stores that will protect the admixture from dampness.

Costs of such admixtures, sampling and testing shall be at the Contractor’s expense.

**COMPOSITION OF CONCRETE**

The cement content, coarse aggregate size, water content, consistency and the approximate weights of fine and coarse aggregate (saturated surface-dry basis) for the class of concrete shall be within the requirements of Table I and II Below.

The weight of fine and coarse aggregate given in Table II below are based on the use of aggregates having bulk specific gravities, in a saturated surface-dry condition, 2.65-5%. For reasonably well graded materials of normal physical characteristics, the use of the below indicated proportions, together with specified water content to obtain the required consistency, will result in concrete of the specified cement content, plus or minus two (2) percent.

For aggregate having specified gravities outside the ranges indicated in the Table II below, the weights shall be corrected by multiplying the weights shown in Table II below by the ration of the specific gravity of the aggregate and 2.65.
The relative weights of fine and coarse aggregate per sack of cement given in Table II below are based on the use of natural sand having a fineness modulus within the range of 2.70 and 2.90 and methods of placing which do not involve high frequency vibration. When sharp, angular manufactured sands, or extremely coarsely graded sands are used, the relative amount of fine aggregate should be increased. For finer sands the relative amount of fine aggregate should be decreased. In general, the least amount of sand which will insure concrete of the required workability for the placing conditions involved should always be compensated for by changing the weight of coarse aggregate in the opposite direction by a corresponding amount.

### Table I

<table>
<thead>
<tr>
<th>Class of Concrete</th>
<th>Compressive Strength At 28 Days (in Kg/cm²)</th>
<th>Minimum Cement Content Kgs</th>
<th>Coarse Aggregate Size</th>
<th>Max. Water Content Liters</th>
<th>Consistency Range in mm Per Bag</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>250</td>
<td>375</td>
<td>3/4in.or 1in.-No.4</td>
<td>27</td>
<td>50-100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>as required by the Engineer</td>
<td></td>
<td>75-125</td>
</tr>
<tr>
<td>B</td>
<td>200</td>
<td>350</td>
<td>Ditto</td>
<td>27</td>
<td>50-100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>33-125</td>
</tr>
<tr>
<td>C</td>
<td>150</td>
<td>250</td>
<td>2in.-No 4</td>
<td>30</td>
<td>25-50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50-75</td>
</tr>
</tbody>
</table>

### Table II

<table>
<thead>
<tr>
<th>Class of Concrete</th>
<th>Compressive Strength At 28 Days Kg/cm²</th>
<th>Approximate Weight (Saturated Surface-Dry) of Fine and Coarse Aggregate Per Sack (50Kgs) of Cement</th>
<th>Rounded Coarse Aggregate Kgs</th>
<th>Angular Coarse Aggregate Kgs</th>
<th>Fine Kgs</th>
<th>Coarse Kgs</th>
<th>Fine Kgs</th>
<th>Coarse Kgs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>250</td>
<td>40 170 95 150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>210</td>
<td>95 180 100 160</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>140</td>
<td>140 370 160 340</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table II is given for indicative purposes and is not binding.
The total sodium chloride content of any materials used for making concrete shall be less than:
- For mass concrete .............. 1.5 percent
- For reinforced concrete .......... 0.7 percent
Expressed as a percentage, by weight of the cement. In calculations made under the provisions of this clause, any chloride, other than sodium chloride in the materials shall be converted to the equivalent of sodium chloride and be added to the amount of sodium chloride. The sulphate content shall not exceed 0.03 percent by weight of the cement.

C 5

PROPORTIONS

C 5.01 General

After the materials provided by the Contractor have been accepted for the works, the proportions and equivalent batch weights shall be determined which will produce concrete having not less than the strength required.

C 5.02 Trial Mixes

The actual proportions shall be determined on the basis of trial mixes made by the Contractor and conducted with the content being determined by means of yield test in accordance with American Society for Testing Material (ASTM) Designation (C-138). The proportions will be such as to required (within a tolerance of plus or minus one (1) percent, the cement content shown in Table I as the minimum cement content, provided, however, that if the materials supplied by the Contractor are of such a nature or are so graded that proportions based on the minimum cement content cannot be used without exceeding the maximum allowable water content specified in Table I, the proportions will be adjusted so as to require the least amount of cement which will produce concrete of the required plasticity and workability without exceeding such maximum allowable water content. No additional compensation will be made for the increase in quantity of cement required.

C 5.03 Contents

The mixes required will be designated in kilograms of fine and coarse aggregate exclusive of free water, per sack (50 Kilograms) of cement and in liters of total mixing water per sack of cement on the basis of the required amount of cement per cubic meter of concrete.
C 5.04 Batch Weights

Since the proportions are designated in terms of aggregate in surface-dry condition, the equivalent batch weights to be used in the work shall be corrected periodically to take into account the actual moisture content of the aggregates at the time of use.

C 6 CONCRETE COMPRESSION AND SLUMP TESTS

C 6.01 Cubical Test

The Compression Strength of Concrete shall be obtained according to cubical tests locally done. Test cubes made in the field shall have a dimension of 10cm, At least 3 separate batches of concrete shall be made for trial and these shall be tested for compliance with the requirements of the table below, at least 3 test cubes being made from each batch of concrete. Once a mix is approved no substantial change in the materials or proportions of materials being used shall be made without the approval of the director of works who may then require further trial mixes to be produced. The compressive strength of the concrete will be taken as the arithmetic mean of the strength of all the cubes tested. The following table will be used to compare test results:

<table>
<thead>
<tr>
<th>Kind of Concrete</th>
<th>Mean value at 28 days</th>
<th>Minimum Individual Value at 28 days</th>
<th>Mean value at 28 days</th>
<th>Minimum Individual Value at 28 days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kg / cm²</td>
<td>Kg / cm²</td>
<td>Kg / cm²</td>
<td>Kg / cm²</td>
</tr>
<tr>
<td>B - 150</td>
<td>190</td>
<td>130</td>
<td>180</td>
<td>120</td>
</tr>
<tr>
<td>B - 200</td>
<td>240</td>
<td>180</td>
<td>230</td>
<td>170</td>
</tr>
<tr>
<td>B - 300</td>
<td>340</td>
<td>280</td>
<td>330</td>
<td>270</td>
</tr>
</tbody>
</table>

Table of Compressive Strength results of samples of concrete at 28 days. (Mixed by Weight)
C 6.02 Slump Tests

Slump tests shall be carried out periodically to ensure the appropriate water cement ratio in accordance with the Standard Method of Test of Slump of Portland Cement Concrete of the ASTM Designation: C-143.

C 6.03 Test of Hardened Concrete in the Structure

Where the results of specimens indicate that the concrete does not meet specification requirements, core boring tests conforming to the current issue of ASTM Designation: C-42 shall be performed, as directed by the Engineer, all at the Contractor’s expense.

C 7 MEASUREMENT OF MATERIALS

Materials shall be measured by weight, except as otherwise specified or where other methods are specifically authorized by the Engineer. The apparatus provided for weighing the aggregates and cement shall be suitably designed and constructed for this purpose. Each size of an aggregate and the cement shall be weighed separately. The accuracy of all weighing devices shall be such that successive quantities can be measured to within 1% of the desired amount. Cement in standard packages (sack) need not be weighed. The mixing water shall be measured by a measuring device susceptible of control accurate to plus or minus half percent of the capacity of the tank but not exceeding 2 liters. All measuring devices shall be subject to the Engineer’s approval.

Where volumetric measurements are exceptionally authorized by the Engineer for projects where the amount of concrete is small, the weight proportions shall be converted to equivalent volumetric proportions. In such cases, suitable allowance shall be made for variations in the moisture condition of the aggregates, including the bulking effect in the fine aggregate.

C 8 MIXING OF CONCRETE

C 8.01 General

Unless otherwise authorized by the Engineer, concrete shall be machine mixed.

The mixing of concrete or mortar shall not be permitted when the temperature is above 40 C or when the temperature is below 5 C.
C 8.02 Mixing on Site

Concrete shall be thoroughly mixed in a batch mixer conforming to the requirements of B.S. 1305 Batch type concrete mixers which will ensure a uniform distribution of the materials throughout the mass.

The mixer shall be equipped with adequate storage and a device for accurately measuring and automatically controlling the amount of water used on each batch. Preferably mechanical means shall be provided for recording the number of revolutions for each batch and automatically preventing the discharge of the mixer until the materials have been mixed within the specified minimum time.

The entire contents of the mixer shall be removed from the drum before materials for a succeeding batch are placed therein.

All concrete shall be mixed for a period of not less than 1 ½ minutes after all materials, including water, are in the mixer. During the period of the mixing the mixer shall operate at the speed for which it has been designed, but this speed shall be not less than 14 nor more than 20 revolutions per minute.

The first batch of concrete material placed in the mixer shall contain sufficient excess of cement, sand and water to coat the inside of the drum without reducing the required mortar content of the mix. Upon the cessation of mixing for a considerable period, the mixer shall be thoroughly cleaned.

C 8.03 Truck Mixing

Truck mixers, unless otherwise authorized by the Engineer, shall be of the revolving drum type, watertight, and so constructed that the concrete can be mixed to ensure a uniform distribution of materials throughout the mass. All solid materials for the concrete shall be accurately measured in accordance with Section C.7 and charged into the drum at the proportioning plant. Except as subsequently provided, the truck mixer shall be equipped with a tank for carrying mixing water. Only the prescribed amount of water shall be placed in the tank unless the tank is equipped with a device by which the quantity of water added can be readily verified. Truck mixers may be required to be provided with means by which the mixing time can be readily verified by the Engineer.
The maximum size of batch in truck mixers shall not exceed the maximum rated capacity of the mixer as stated by the manufacturer and stamped in metal on the mixer. Truck mixing shall be continued for not less than 50 revolutions after all ingredients including the water, are in the drum. The speed shall not be less than 4 r.p.m., nor more than a speed resulting in a peripheral velocity of the drum of 70 meters per minute.

Nor more than 100 revolutions of mixing shall be at speed in excess of 6 r.p.m. Mixing shall begin within 30 minutes after the cement has been added either to the water or aggregate. When cement is charged into a mixer drum containing water or surface-wet aggregate and when the temperature is above (33 C) is used this limit shall be reduced to 1245 minutes; the limitation on time between the introduction of the cement to the aggregates and the beginning of the mixing may be waived when, in the judgement of the Engineer, the aggregates are sufficiently free from moisture, so that there will be no harmful effects on the cement.

C 8.04 Partial mixing at the Central Plant

When a truck mixer provided with adequate mixing blades is used for transpiration, the mixing time at the mixing plant may be reduced to 30 seconds and the mixing completed in the truck mixer. The mixing time in the truck mixer shall be as specified under the Section C.8.3 for truck mixing.

C 8.05 Plant Mix

Mixing at a central plant shall conform to the requirements for mixing at the Site and shall conform to the applicable requirements of the Standard Specification for Ready-Mixed Concrete of ASTM Designation: C-94.

C 8.06 Time of Hauling and Placing Concrete

If the distance from the mixing plant to the construction Site is so great that between the time of mixing and pouring the concrete, the temperature is below 40 C and the travelling time is more than 30 minutes, truck mixers must be employed.

When truck mixers are used, concrete shall be discharged and placed in its final position in the forms within thirty (30) minutes after water is first added to the mix.
C.07 Delivery

The rate of delivery of concrete during concreting operations shall be such as to provide for the proper handling, placing and finishing of the concrete. The rate shall be such that the interval between batches shall not exceed 20 minutes. The methods of delivering and handling the concrete shall be such as will facilitate placing with the minimum of rehandling and without damage to the structure of the concrete.

C.08 Retempering

The concrete shall be mixed only in such quantities as are required for immediate use and any concrete which has developed initial setting shall not be used. Concrete which has partially hardened shall not be retempered or remixed.

C 9 HANDLING AND PLACING CONCRETE

C.01 General

Prior to pouring concrete in any structure, the Contractor shall secure a written order to commence from the Engineer. In preparation for the placing of concrete all sawdust, chips, and other construction debris and extraneous matters shall be removed from the interior of forms, struts, stays and braces, serving temporarily to hold the forms in correct shape and alignment, pending the placing of concrete placing has reached an elevation rendering their service unnecessary. These temporary members shall be entirely removed from the forms and not buried in the concrete. Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. The use of long troughs, chutes and pipes for conveying concrete from the mixer to the forms shall not be permitted unless the authorization in writing of the Engineer is obtained. In case an interior quality of concrete is produced by the use of such conveyers, the Engineer may order discontinuance of their use and the substitution of a satisfactory method of placing. Open troughs and chutes shall be of metal lined and shall be of rounded cross section to avoid the accumulation of concrete in corners. The chutes shall be equipped with baffles or be in short lengths that reverse the direction of movement. The slope shall be steep enough (1 vertical to 2 or 2 ½ horizontal) to permit flow requiring a slump greater than specified or required for placement.
All chutes, troughs and pipes shall be kept clean and free from coating of hardened concrete by thoroughly flushing with water after each run. Water used for flushing shall be discharged clear of the structure. When placing operations would involve dropping the concrete more than 1.50 meter, it shall be deposited through sheet metal or other approved pipes. As far as practicable, the pipes shall be kept full of concrete during placing and their lower ends shall be kept buried in the newly placed concrete. After initial setting of concrete, the forms shall not be jarred and no strain shall be placed on the ends of reinforcement bars which project.

**C 9.02 Hot Weather Concreting**

The temperature of concrete when placed shall not exceed 27°C. When the relative humidity is 50 percent or less and shall not exceed 32 °C. For values of relative humidity between 50 percent and 70 percent, the max temperature of concrete shall be found by interpolation.

In lieu of above, the temperature of concrete when placed shall not exceed 32 °C, regardless of the relative humidity.

The Contractor shall comply with the above requirements by the following procedures:

- Cooling the mixing water and/or replacing 50% of the mixing water by crushed ice. When crushed ice is used it shall be stored at a temperature that will prevent formation of lumps. The ice shall be completely melted by the time mixing is completed.

- Shading aggregate stockpiles and/or keeping moist by sprinkling them with water.

- Cement shall not be used if its temperature exceeds 77 °C.

- Painting the mixer drum white and spraying it with cool water or shading the mixer from direct sunrays.

- Maintaining the mixing time and delivery time to the minimum acceptable.

- Sprinkling of forms sub-grade and reinforcement with cool water prior to placement of concrete.
Water reducing and retarding admixture shall be used in all concrete work when the temperature of concrete exceeds 27 °C. The water cement ratio inclusive of free surface moisture on aggregates and any admixtures shall be kept to a minimum.

C 9.03 Vibrating Concrete
Concrete, during and immediately after depositing, shall be thoroughly compacted. The compaction shall be done by mechanical vibration subject to the following provisions:

- Vibration shall be internal unless special authorization of other methods is given by the Engineer or as provided herein.

- Vibration shall be of a type and design approved by the Engineer. They shall be capable of transmitting vibration to the concrete at frequencies of not less than 4500 impulses per minute.

- The intensity of vibration shall be such as to visibly affect mass concrete of 25mm slump.

- Contractor shall provide a sufficient number of the vibrators to properly compact each batch immediately after it is placed in the forms.

- Vibration shall be manipulated so as to thoroughly work the concrete around the reinforcement and embedded fixtures, and into the corners and angles of the forms.

- Vibration shall be applied only by experienced operators under close supervision, at the point of deposit and in the area of freshly deposited concrete. The vibrators shall be inserted and withdrawn out of the concrete slowly. The vibration shall be of sufficient duration and intensity to thoroughly compact the concrete, but shall not be continued so as to cause segregation. Vibration shall not be continued at any point to the extent that localized areas of grout are formed.

- Application of vibration shall be at points uniformly spaced and not farther apart than twice the radius over which the vibration is visibly effective.

- Vibration shall not be applied directly or through the reinforcement to sections or layers of concrete which have hardened to the degree that the concrete ceases to be plastic under vibrations. It shall not be used to make concrete flow in the forms over distances so great as to cause segregation, and vibrators shall not be used to transport concrete in the forms.
- Vibrator shall be supplemented by such spading as it necessary to ensure smooth surface and dense concrete along form surfaces and in corners and locations impossible to reach with the vibrators.

- The use of implements such as compressors which are likely to disturb or disarrange reinforcement or formwork shall not be permitted.

Concrete shall be placed in horizontal layers not more than 300mm thick as hereinafter provided. When less than a complete layer is placed in one operation, it shall be terminated in a vertical bulkhead. Each layer shall be placed and compacted before the preceding batch has taken initial set to prevent injury to the green concrete and avoid surfaces of separation between the batches. Each layer shall be compacted so as to avoid the formation of a construction joint with preceding layer which has taken initial set.

When the placing of concrete is temporarily discontinued, the concrete after becoming firm enough to retain its form, shall be cleaned of laitance and other objectionable material to a sufficient depth to expose sound concrete. To avoid visible points as far as possible upon exposed faces, the top surface of the concrete adjacent to the forms shall be smoothed with a trowel.

Immediately following an approved discontinuance of placing concrete all accumulations of mortar splashed upon the reinforcement bars and the surfaces of forms shall be removed. Dried mortar chips and dust shall not be puddled into the unset concrete. If the accumulations are not removed prior to the concrete becoming set, care shall be exercised not to injure or break the concrete steel bond at and near the surface of the concrete while cleaning the reinforcement bars.

C 10.01 PRECAST HOLLOW CONCRETE BLOCKS [HOURDIS] FOR RIBBED SLABS:

Material and Manufacture

Aggregate shall be sized, graded, proportioned and thoroughly mixed in a batch with such proportions of cement and clean water as to produce a homogeneous concrete mixture. However, in no case shall the proportion of cement in the mixture be less than five (5) standard [each weighing 50 Kgs] per cubic meter of concrete.
Precast hollow concrete blocks (hourdis) for a ribbed slab shall be manufactured in approved vibrated, machine. If for any reason the strength requirements is not achieved,

**C 10.02 Workmanship**

Precast hollow concrete blocks (hourdis) shall be laid exactly in a line with the cells on the long dimensions. Close edge blocks shall be used at the end; the dimensions of the ribs and size of reinforcing bards shall be exactly according to the Structural Drawings. In narrow width specially made half blocks shall be used and full block shall not be used along their length (with the calls along the long dimensions of the rib.)

The blocks are to be laid on adequate forms. All blocks shall be cleaned and thoroughly wetted with clean water before the concrete is poured and labourers shall not be allowed to walk on them. Any block found to be defective or damaged during concreting operations shall be removed and replaced before pouring the concrete, all at the Contractor’s expense.

**C 11 Formwork**

**General**

The Contractor shall be responsible for the design and stability of the formwork. The Contractor shall submit a full program of work indicating the various phases for the erection and removal of forms and the manner in which he intends to execute all concrete works.

**C 11.02 Material**

All forms shall be of wrought lumber and shall be built mortar tight and of sufficient, rigidity to prevent
distortion due to the pressure of the concrete and other loads incident to the construction operations. Forms shall be constructed and maintained so as to prevent warping and the opening of joints due to shrinkage of the lumber.

SPECIFICATIONS
CONCRETE WORK

The forms shall be substantial and unyielding and shall be so designed that the finished concrete will conform to the proper dimensions and contours. The Contractor shall take into consideration the effect of vibration on the formwork, and shall be responsible for any damage or default resulting thereof.

C 11.03 Workmanship

Forms shall be inspected by the Engineer prior to installation of reinforcement.

The number of spacing of the form struts and braces shall be such that the forms will be braced rigidly and uniformly lock joints between form sections shall be free from play or movement.

The shape, strength rigidity, watertightness and surface smoothness of re-used forms shall be maintained at all times. Any warped or bulged lumber must be resized before being re-used. Forms which are unsatisfactory in any respect shall not be re-used.

Metal ties or anchorages within the forms shall be so constructed as to permit their removal to a depth of at least 40mm from the face within injury to the concrete. In case ordinary wire ties are permitted, all wires, upon removal of the forms, shall be cut back at least 10mm. From the face of the concrete with chisels or nippers for green concrete, nippers are necessary. All fittings for metal ties shall be of such design that the cavities produced upon their removal are the smallest possible. The cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in colour.

All forms shall be treated with oil and saturated with water immediately before placing the concrete. For members with exposed faces, the forms shall be treated with approval oil to prevent the adherence of concrete.

Any material which will adhere to or discolour the concrete shall not be used.

The Contractor shall provide means for accurately measuring the settlement of the forms during placement of
the concrete and shall make all necessary corrections as directed by the Engineer

3-52

SPECIFICATIONS
CONCRETE WORK

C 11.04 Removal of Form-work

In the determining of the time for removal of forms, consideration shall be given to the location and character of the structure, the weather and other conditions influencing the setting of the concrete and the materials used in the mix. In general, the forms of any positions of the structure shall not be removed until the concrete is strong enough to prevent injury to the concrete.

When the forms are removed, unless otherwise directed by the Engineer, forms shall remain in place for the following specified period of time:

- Centering under beams : 21 days
- Floor slabs : 21 days
- Walls, sides of beams and other vertically formed surfaces : 3 days

Method of form removal likely to cause overstressing of the concrete shall not be used. In general, the forms shall be removed from the bottom upwards. Forms and their supports shall not be removed without the written approval of the Engineer. Supports shall be removed in such a manner as to permit the concrete to uniformly and gradually take the stresses due to its own weight. Centers shall be gradually and uniformly lowered in such a manner as to avoid injurious stresses in any part of the structure.

The Contractor shall include in his prices for any formwork which may have to be left in position due to the impossibility of removal of same.

C 12 REINFORCEMENT

C 12.01 General

The Contractor shall prepare for his own use bar bending Schedules from the information given on the Drawings and in these Specifications. These Schedules shall be submitted to the Engineer for approval which shall in no
way release the Contractor of his responsibility for the correctness of these Schedules.

All reinforcement shall be placed strictly in accordance with the Drawings and as instructed in writing by the Engineer. Nothing shall be allowed to interfere with the required disposition of the reinforcement, and the Contractor shall ensure that all parts of reinforcement are placed correctly in position and are temporarily fixed where necessary to prevent displacement before or during the process of tamping and ramming the concrete in place. The ties, links or stirrups connecting the bars shall be taut so that the bars are properly braced the inside of their curved part small be in actual contact with the bars, around which they are intended to fit.

3-53

SPECIFICATIONS
CONCRETE WORK

Placed correctly in position and are temporarily fixed where necessary to prevent displacement before or during the process of tamping and ramming the concrete in place. The ties, links or stirrups connecting the bars shall be taut so that the bars are properly braced the inside of their curved part small be in actual contact with the bars, around which they are intended to fit.

C 12.02 Type and Quality of Steel Reinforcement

A - Hot-Rolled Steel Plain Rods and Bars

Hot rolled steel plain rods and bars shall conform to the strength requirements and minimum elongation of the Standard Specification for Deformed Billet-Steel Bars of Grade 40 with minimum yield strength 2400Kg/cms (35000 psi) for concrete Reinforcement of ASTM Designation (A-615) or equivalent.

B - Deformed Steel Rod and Bars

Deformed steel and bars shall conform to the requirements of the Standard Specification for Deformed Billet-Steel Bars of grade 60 with minimum yield strength 4200 kg/cm2 (60000 psi) for concrete reinforcement of ASTM Designation (A-615) or equivalent.

C 12.03 Wire

Wire for bending reinforcement bars shall be of soft black annealed mild steel wire. The diameter of the Wire shall not be less that 16 S.W.G. (1.6mm) and the binding shall be twisted tight with proper pliers. The free ends of the binding wire shall be bent inwards.

C 12.04 Order Lists

Before ordering material, all order lists and bending diagrams detailed in accordance with the latest revision of AGI Building Code shall be furnished by the Contractor
for the approval of the Engineer, and no material shall be ordered until such lists and steel bending diagrams have been approved. The approval of order lists and bending diagrams by the Engineer shall in no way relieve the Contractor of his responsibility for the correctness of such lists and diagrams. Any expenses incurred to the revision of material furnished in accordance with such lists and diagrams to make and comply with the design drawings including cut and waste shall be borne by the Contractor.

3-54

SPECIFICATIONS
CONCRETE WORK

C 12.05 Protection of Material
Steel reinforcement shall be protected at all times from injury. When placed in the work, it shall be free from dirt, detrimental scale, paint, oil, loose, rust, grease or other foreign substances.

C 12.06 Fabrication
Bar reinforcement shall be bent to the shapes shown on the Drawings and Steel Bending (Diagrams), Bending dimensions and scheduling of bars for the reinforcement of concrete. All bars shall be bent cold, unless otherwise permitted by the Engineer. No bars partially embedded in concrete shall be bent except as shown on the plans or specifically permitted by the Engineer.

C 12.07 Placing and Fastening
All steel reinforcement shall be accurately placed in the position shown on the Drawings and firmly held during the placing and setting of concrete. Bars shall be tied at all intersections except where spacing 300mm in each direction, in which case alternate intersections shall be tied.

Distance from the forms shall be maintained by means of stays, blocks ties, hangers, or other approved supports. Blocks for holding reinforcement from contract with the forms shall be precast mortar blocks of approved shapes and dimensions or approved metal chairs. Metal chairs which are in contact with the exterior surface of the concrete shall be galvanized. Layers of bars shall be separated by precast mortar blocks or by other equally suitable devices. The use of pebbles, pieces of broken stone or brick, metal pipe and wooden blocks shall not be permitted. Reinforcement in any member shall be placed and then inspected and approved by the Engineer before
the placing of concrete begins. Concrete placed in violation of this provision may be rejected and its removal is required.

C 12.08 Splicing

All reinforcement shall be furnished in the full lengths indicated on the Drawings. Splicing bars, except where shown on the drawing, will not be permitted without the written approval of the Engineer. Splices shall be staggered as far as possible.

Additional splices, other than those shown on the Drawings; and allowed by the Engineer, shall be at the Contractor’s own expense.

The cost of all supports for holding reinforcement bars shall be borne by the Contractor.

3-55

SPECIFICATIONS
CONCRETE WORK

C 13 CURING AND PROTECTION

C 13.01 Water Curing

All concrete shall be cured for a period of time required to obtain the full-specified strength but not less than seven (7) consecutive days. Unformed surfaces shall be covered with sand burlap, or other approved fabric mats kept continually wet. If the forms are removed before the end of the curing period, curing shall be continued as on the uniformed surfaces. When burlap, sand or other approved fabric materials are used, they shall not cause any undesirable finish such as rough surface and discolouring where exposed to light. Unhardened concrete shall be protected from heavy rains or flowing mechanical injury and the Contractor shall submit for the Engineer’s approval his construction procedure which is designed to avoid such an eventually. No fire or excessive heat shall be permitted near or in direct contact with concrete at any time. Water for curing shall conform to Section C 3.6.

C 13.02 Curing with Curing Media

Curing medium shall meet all requirements of the specifications for Liquid Membrane-Forming Compounds for Curing Concrete of ASTM Designation: C-309 and test for water retention by concrete curing materials of ASTM Designation: C-156.

The compound shall be applied to the concrete surface by means of a sprayer, roller or lamb’s wool applicator and shall be sprayed on. Ample time be allowed for the concrete surface to harden and to prevent any damage. The compound shall give a drying time not to exceed thirty minutes, and shall be applied undiluted directly from the manufacturer’s labelled container in accordance with the
manufacturer’s directions and to the satisfaction of the Engineer.

The compound shall be completely compatible with adhesives, joint sealants and cement grout.

C 13.03 Payment

No separate payment shall be made for curing with water or with curing media. The cost of such curing shall be deemed to be included in the Unit Prices of "CONCRETE WORK".

C 14 CONCRETE [FAIR FACE] EXPOSED SURFACES

C 14.01 Formwork

Formwork for exposed concrete surface shall conform to the applicable requirements of Section C 14, in addition to those Specifications.

All concrete surfaces that are to be left exposed to view as a finished surface except for precast concrete units, shall be produced by vertical metal shuttering.

The quantity of the surface of concrete exposed to view shall be consistent throughout the Project and the following methods shall be adopted to obtain the required finish.

- Metal forms of an approved type for precast units

The Contractor may submit alternative proposals for the Engineer’s approval if he so desires.

The Contractor is to submit to the Engineer for his approval shuttering details and sequence of operation relating to fair face concrete work. Sample panels shall be constructed for all their face concrete finishes and following the Engineer’s approval the panels will remain on site and constitute a standard which must be maintained throughout the duration of the Contract.

C 14.02 Coating Forms with Mineral Oil
In addition to the above forms or linings, the forms shall be coated before placing reinforcement with an approved colourless mineral oil free of kerosene.

All surplus oil on form surfaces and any oil on reinforcing steel shall be removed.

c 14.03 Samples and Workmanship

The Contractor shall submit for approval a sample panel not less than 600x1200mm to demonstrate the quantity of the exposed concrete produced by forms at his own expense.

The quantity of the finished work shall be measured against the quality of the approved sample panel and the work of inferior quality shall be repaired or replaced as directed by the Engineer without any additional cost.

SPECIFICATIONS
CONCRETE WORK

c 14.03 Samples and Workmanship (Cont’d)

The quality of the finished surfaces shall be uniform in colour and consistency, whether in colour or in texture, in any of the finished surfaces, the Engineer may order the repair or the demolition of the portion of concrete work and the reconstruction of same at the expense of the Contractor and the Contractor shall have no right to claim for any expenses or time delay incurred.

Alternatively the Engineer may order the Contractor to plaster all exposed surfaces and bush-hammer the entire area of, concrete in the Project so as to render all exposed surfaces of concrete consistent throughout the Project at the Contractor’s own expense.

C 15 MONOLITHIC SMOOTH FINISH SURFACES

All concrete surfaces which are not in acceptance condition and which are required to be surface-finished as designated herein, shall be rubbed to a smooth and uniform texture with a carborundum brick and clear water as soon as the forms are removed and the concrete is ready to hone. The loose material formed on the surface shall be removed as soon as it dries by rubbing the surface with burlap or other approval material. A cement wash shall not be used.
Concrete surface shall be free from honeycombing, air holes, fins and projections arising from defective mixings, placing or formwork. When the formwork has been stuck off, the surface of concrete shall be left untouched until inspected by the Engineer. Any defective concrete work shall at the discretion of the Engineer be demolished completely and rebuilt or cut out and made good with concrete of the same proportions as the original. Such rectifications shall be to the satisfaction of the Engineer and at the Contractor’s own expense.
SECTION D

B L O C K W O R K

D 1  SCOPE

These Specifications cover the supply if materials, manufacturer and workmanship of concrete blocks intended to be used for the construction of blockwalling, partitions, facings, claustras, etc., required for the Project in accordance with the Drawings, Bills of Quantities and as directed in writing by the Engineer.

D 2  MATERIALS

D 2.01  Cement

Cement for solid or hollow blocks and mortar shall be ordinary Portland Cement ASTM Designation C 150-74 and white cement ASTM: c 91-71.

D 2.02  Aggregates

Aggregate or solid and hollow concrete blocks and mortar shall conform to the requirements for the aggregates in the “CONCRETE WORK” Section.

D 2.03  Water

Water to be used in blockwork shall conform to the requirements specified for water in the “CONCRETE WORK” Section.
D 2.04 Lime

Lime shall be non-hydraulic lime complying in all respects with B.S. 8980, and shall be prepared in accordance with the appropriate requirements of British Standard Code of Practice 121: Part 1: 1973, latest revision.

The Contractor must satisfy himself by analysis or otherwise that the ground lime is not adulterated or air-slaked.

Factory produced, dry hydrated, non-hydraulic or semi-hydraulic lime, ready for use, shall be mixed with sand and made into coarse mix or be soaked to putty by mixing with water and allowing to stand not less than (16) sixteen hours before use.

The lump or ground non-hydraulic or quicklime shall be slaked, run to putty and matured for not less than two (2) weeks.

3-59

SPECIFICATIONS

BLOCKWORK

D 3 MANUFACTURE OF CONCRETE BLOCKS

Aggregate shall be so sized, graded, proportioned and thoroughly mixed in a batch mixer with such proportions of cement and water as to produce homogeneous concrete mixture. However, in no case shall the proportion of cement in the mixture be less than five (5) standard bags (each weighing 50 kgs) per cubic meter of concrete.

Precast concrete blocks shall be manufactured in approved vibrated machines. If for any reason the strength requirements is not achieved, the cement shall be increased at the Contractor’s own expense. The water used in the mix shall be clean and of a sufficient quantity to allow complete hydration of the cement without providing an excess when moulding.

Concrete blocks shall be hard, sound, durable, sharp, rect-angular shape, clean with well define arises free from racks and flaws or other defects.

Concrete blocks shall be either obtained from an approved local factory or manufactured on the Site. If manufactured on Site, the blocks shall be pressmoulded in approved moulds and vibrating presswire machines with a minimum of 2800 cycles per minute.
Blocks manufactured on the Site shall be cured in the shade by being kept thoroughly moist with water applied by sprinklers or other approved means for a period of at least seven (7) days. The blocks shall be stocked on a clean and level platform free from earth or other impurities during the curing process, and shall be stocked in honeycomb fashion after curing. The blocks shall not be used prior to one (1) month after the date of manufacture, not shall any block be used that have not been inspected and approved by the Engineer.

Concrete blocks (solid or hollow) shall be of the following dimensions:
- **Height** = 200 mm + 1% Tolerance
- **Length** = 400 mm + 1% do.
- **Width** = As required + do.

The nominal width of blocks shall be as indicated on the Drawings and as directed in writing by the Engineer.

Hollow concrete blocks shall comply with the following requirements:

Compressive strength at Twenty-Eight (28) Days over Cross-Sectional Area:

a) **Load-Bearing Walls**
   - 60 kgs/cm² average of 12 blocks
   - 50 kgs/cm² minimum for any block

b) **Non-Load-Bearing Walls**
   - 30 kgs/cm² average if 12 blocks
   - 25 kgs/cm² minimum for any block

**Water Absorption**
- 20% or less of dry weight

The design of the cavities and webs of the hollow concrete blocks shall be submitted to the Engineer prior to manufacture. The thickness of the face shell and of the membrane of solid portions shall be nowhere less than forty (40). The combined thickness of the solid portions shall be not less than one fourth (1/4) of the width and length of the block respectively.

**MORTAR**

Mortar shall be prepared in the following proportions with the addition of the minimum quantity of clean water for workability.

Cement and sand mortar (1:3) shall be composed of one part cement to three parts of sand by volume.
Hydrated lime up to 1/4(one quarter) by volume of the dry cement may be added for bedding blocks, upon the approval of the Engineer, to improve workability without appreciably reducing the strength.

The ingredients for cement and sand shall be measured in proper clean gauge boxes and the mixing shall be carried out by means of an approved mechanical batch mixer.

In the cast of cement-lime mortar, the sand and lime shall be mixed first and the cement added. It shall be assumed that the lime has not increased the bulk of the sand.

Cement mortars shall be used within thirty

WORKMANSHP

All blockwork shall be set out built to the respective dimensions, thickness and heights shown on the Drawings and/or instructed in writing by the Engineer.

All walls and partitions, where shown on the Drawings without indicating the type of the block to be used, shall be built in hollow concrete blocks, unless otherwise directed in writing by the Engineer.

The blocks shall be well soaked before being used and the tops of walls left off shall be wetted before work is recommenced. All blocks shall be well buttered with mortar before being laid and all joints shall be in uniform manner and shall not exceed 10mm, no one portion being raised more than 1.00m above another at one time, and wall of partition necessarily left at different levels, must be racked back. All perpends, quoins, internal and external angles, etc. properly bonded together and levelled round. All blockwork shall be plumbed vertically.

The surface of the walls and partitions prepared for plastering, shall have the joints raked out 20mm from the face of the wall to form key for the plaster.

All blockwalls shall be bonded to reinforced concrete columns by means of wall ties, complying in all respects with B.S. 1243 latest edition. The ties shall be minimum 200mm long of which 100mm shall be embedded in the re-d
concrete column and the remainder set into the block wall at the rate of two (2) ties per meter. Partitions shall be bonded to main wall by toothing at every fourth course into main wall to a depth of not less than 100mm.

All walls and partitions shall be properly cured by sprinkling water for a period not less than three (3) days after completion of laying the course.

Walls and partitions terminating against soffits of beams or slabs shall be lightly wedged with metal wedges after mortar in bed joints has attained its initial set, and the joint packed with mortar.

Cut and fit blockwork next to reinforced concrete door, window, jambs and sills, and form chases for the ends of the door and window lintels. No hollow blocks shall abut any built-in fixtures e.g. door and window frames, apertures, louvers, etc.

The cavity between skins of blockwork shall be 100mm (nominal) wide and kept clear of mortar dropping throughout the construction of the hollow walls. The skins of hollow walls are to be tied together with butterfly twist type galvanized steel wire to the approval of the Engineer and built into each skin one meter apart horizontally and every alternate course, staggered.
E 1  **Scope**

These Specifications cover stonework building intended to be used for external walls, required for the Works in accordance with the Drawings, Bills of Quantities and as directed in writing by the Engineer.

It also covers the copings covering the parapet of the roof.

E 2  **Materials**

Stone building to walls shall be durable, local stone, Mizzi yahoudi or Mizzi Hilou of a quality suitable to
ensure permanence in the structure. It shall be (Toubzeh) dressed, free from cracks, seams, holes, shakes, objectional irregularities of colour, impurities, structural weaknesses and other defects that would tend to increase unduly the deteriorations from natural causes.

All stones shall be selected well in advance of the time required. Samples of stone materials and dressing shall be submitted for the Engineer’s approval 30 days before delivery of any such material to Site.

Mortar for all masonry shall consist:

1 part cement

6 parts of fine aggregates

All copings for covering the parapet shall be durable, local stone as mentioned above. The height and width of copings will be as specified on the Drawings.

---

**Workmanship**

Walls shall be carried up in a uniform manner no one portion being allowed to rise more than four courses above one another at one time. The total thickness of stone building and concrete backing shall be 30cm as shown on Drawings.

All stone shall be hand placed. Courses shall be solidly bedded with full mortar beds and joints fully squeezed out. All stones shall be cleaned and thoroughly wetted before setting.

To ensure even and regular width of beds and joints when setting stones, the Contractor shall use hardwood wedges.
to ensure close and regular fitting between beds and joints.

All stones shall be solidly bedded and jointed in mortar. Copings shall be fixed on the top of the parapet by mortar.

At completion of masonry walls, joints shall be cleaned wetted and pointed with mortar composed of: part white cement and two parts of very fine crushed stone sand tinted to the colour selected.

The Contractor, when executing, shall ensure that the mortar is pressed tight into the joints by means of approved tools for pointing.

Care shall be exercised to avoid spreading in the faces of the stones.

The Contractor shall set up samples for the Engineer’s approval before executing any pointing.
SECTION F

ROOFING, WATERPROOFING AND THERMAL INSULATION

F 1

SCOPE

These specifications cover, waterproofing, roofing and thermal insulation, to be used for underground structures floors and roof decks required for the Works in accordance with the Drawings, Bills of Quantities and as directed in writing by the Engineer.

F 2

MATERIALS

F 2.01 Dampproofing

All substructures, floors of ground floor of kitchens + bathrooms have to be painted with a liquid waterproofing.
F 2.02  Waterproofing of exterior walls

This will be added to the exterior plastering of walls. An integral concrete waterproofing compound that will reduce moisture absorption in the plastering mixture.

F 2.03  Waterproofing of the roof

A sloping screed consisting of lightweight concrete screed shall conform to B.S.3797: lightweight aggregate for concrete. The lightweight aggregate shall be such a Vermiculite, Alveolite, etc... aggregate of an exfoliated micaceous mineral aggregate incombustible and chemically inert, obtained from an approved manufacturer, graded and mixed in accordance with the manufacturer’s instructions.

The lightweight aggregate shall be delivered to the Site in the manufacturer’s sealed and branded containers which shall be clearly marked to show the grade of lightweight aggregate contained therein. They shall be stored in a covered shed with floor raised off the ground and bags stacked not more than 3.00 meters high.

Mixing Proportions

The lightweight concrete screeds shall be measured, mixed applied and cured in accordance with the manufacturer’s instructions and to the satisfaction of the Engineer.

Gauges boxes shall be used for the measurement of lightweight aggregate and the following mixing table shall be strictly observed.

<table>
<thead>
<tr>
<th>Nominal Mix</th>
<th>Lightweight Aggregate Meter</th>
<th>Cement Contents</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 : 1</td>
<td>1.00 Cube</td>
<td>150 Kgs.</td>
<td>44 gallons [200 Litres]</td>
</tr>
</tbody>
</table>

F 2.04  Waterproofing

An application of a bituminous waterproofing consisting of an unknown polyester reinforcement (250 grm/m² minimum) incorporated in thermofusible elastomeric bitumen.
Workmanship

Prior to the beginning of the roofing works, the Engineer and the roofing superintendent shall proceed to the inspection and approval of the receiving surfaces, the upstands at roof edges, the drains, vent pipes and other venting devices, the construction joints etc.

The general contractor will be notified in written of all defects of the flat surfaces or details and work shall not proceed until such defects have been corrected.

One coat of primer is painted over all the surface.

Installation of the bituminous layers shall be carried out in conformity with the manufacturer’s specifications and using propane torch welding only.

Asphalt coatings shall be softened but not melted as to avoid superheating using a single-nozzle torch of adequate size. Rolls shall overlap 75mm on sides and 150mm at ends. All inadequately welded seams will be refused. All superheated areas or parts will be refused and will require adequate repair in accordance with the degree of deterioration of the membrane.

Air blisters, wrinkles impact and tearing marks and protective granules pounding marks are not admissible. Should these defects occur roofing works shall be carried out again.

Bituminous Flashings

A plain underlay bonded to the support with previously applied primer coating or welded to it with propane torch. This underlay shall be unrolled parallel to the upstanding element in one meter width extending 150mm onto the current surface underlay.

Apply the current surface-finishing layer onto the flashing underlay and then recover with the flashing-finishing layer extending 200mm onto the current finished surface.
This layer shall be welded with propane torch in full adherence that no air is entrapped between layers. Side and end laps shall be staggered over underlay seams and 75mm wide.
SECTION G
JOINERY AND IRONMONGERY

G 1
GENERALLY

Joiner’s work shall be carried out in accordance with the drawings and the principles of first joinery construction. Unless specifically stated otherwise sizes on drawings are finished sizes.

G 2
TIMBER GENERALLY

Timber shall comply in all respects with B.S. 881/589 for Nomenclature of Commercial Timbers including Sources of
Supply, and B.S. 1186 quality of timber and workmanship in joinery, latest editions.

Timber shall be of an approved variety and quality suitable for the purpose for which it is to be used and equal to samples approved by the Engineer.

All timber shall be properly seasoned and shall be planed square, straight and true and shall be free from the following defects.

- Sapwood slits, ring shakes and soft pith.
- Checks exceeding 1.5mm wide.
- Checks exceeding 1.5mm wide.
- Checks more than half the thickness of the timber in depth.
- Knots exceeding 20mm mean diameter.
- Knots exceeding half the width of the surface.
- Decayed or dead knots unless cut out and plugged.
- Loose knots or knot unless cut out and plugged.
- Pitch pockets.
- Decay and insect attack including pinworm holes.

Timber shall be pressure impregnated by a method to be approved by the Engineer. The timber is to be of the correct moisture content specified in B.S. 1886 Part 1 and shall be free from surface moisture and dirt. Treatment is to be carried out after all cutting and shaping is completed and care is to be taken to avoid damage to surfaces of treated timber in subsequent handling. If treated timber is unavoidably cut or damaged a liberal application of preservative is to be made to damaged surfaces.

Samples of every type which the Contractor proposes to use in the Works shall be sent to the Engineer for his approval. Each sample shall be labelled and the label shall state the species of the timber and the purpose for which it is to be used. Timber used in the Works shall be equal in strength characteristics and appearance to the approved samples.

In jointed panels each piece shall be of the same species. Joinery for staining or polishing has all surfaces of the same species and same character of grain running in the same direction.

All plugs inserted after cutting out defects shall be the full depth of the hole and the grain of the plug shall run in the same direction as the grain of the piece.
Timber connectors where used shall be two single-sided toothed plates (round or square) for demountable joints or one double sided toothed plate (round or square) for permanent joints to conform with B.S. 1579, latest addition.

Timber shown to be plugged to wall shall be properly and securely fixed by means of raw-plastic or hardwood plugs cut on the twist.

Nails shall be in accordance with B.S. 1202 Steel nails and screws shall conform to B.S. 1210 Wood Screws, of latest edition.

Timber to be used for each position of the Works shall be as indicated on the drawings and as stated in the Bill of quantities. In general joinery exposed work shall be executed in first grade hardwood as hereinafter specified.

All grounds and other timber to be built into concrete or blockwalls or otherwise covered shall first be coated all over with approved wood preservative, suitable for the position in which the member is to be incorporated.

G 3

SOFTWOOD

Softwood shall be Douglas fir, longleaf pine, European redwood or other approved softwood unless otherwise shown on the drawings.

Blocking timbers or the like shall be Russian whitewood "Shuh" or other equal and approved.

Where pine is required it shall be Parara Pine from South America of the sizes indicated on the drawings.

G 4

HARDWOOD

Hardwood shall be Teak, Canadian clear, Canadian Yellow Birch, Merranti, “Zeine” first grade dense timber or other equal and approved.

Where mahogany is required it shall be first quality Honduras mahogany of sizes indicated on the drawings.

Where beech is required it shall be first quality European of the sizes indicated on the drawings.

G 5

PLYWOOD
Plywood shall consist of an old number of plies arranged so that the grain of each layer is at right angles to the grain of the adjacent layer or layers. The plies shall be not pressed during adhesion and shall have a finished thickness as shown on drawings, or shall have refinished plywood 7mm thick such as obtained from vitrus-Werke and Simpson or equivalent.

In the case of plywood having 3 plies the core shall be not more than 60 percent of the total thickness.

In plywood having more than 3 plies the faces and all plies with the grain running in the same direction as the faces shall have a combined thickness of between 40 percent and 65 percent of the total thickness of the ply.

The plywood shall be free from end joints (including scarf-joints in veneers), overlaps in core veneers, dead knots, patches and plugs, open defects, depressions due to defects in core, insect attack (except isolated pinworm holes through face veneers only), fungal attack and from discolouration differing from that normally associated with species.

All plywood shall be of Exterior Grade and shall conform to the applicable requirements of” B.S. 1455 “Ply-wood manufactured from tropical hardwoods “ and B.S. 3493” information about plywood”.

**BLOCKBOARDS OR LATTE AND LAMINBOARD**

Blockboards and laminboard shall be of an approved manufacturer and guaranteed not to warp or change in size or suffer any kind of deformation. It shall be of timber specified and glued with anti-insect synthetic resin waterproof glue all through. All strengthening boards shall be fixed during manufacture.

Blockboard and laminated shall conform to the requirements of B.S. 3444 “Blockboard and Laminboard” and B.S. 3583” Information about Blockboard and Laminboard”.

**VENEERS**

Timber for face veneer shall generally be first grade hardwood as indicated on the Drawings and/or in the Schedule of Doors obtained from an approved supplier.
The face veneers shall be hard, durable, and capable of being finished easily to a smooth surface, they shall be free from knots, worm and beetle holes, splits, dote, glue stains, filling and inlay of any kind or other defects.

The face veneers shall be applied to one or both sides of wood panels as shown on the Drawings.

Adhesives shall comply with the requirements of B.S. 1203 synthetic resin adhesives for plywood (Phenolic and amino- plastic) and shall ensure proper adhesion between plies.

G 8 PLASTIC LAMINATE

The plastic laminate facings conforming to B.S. 2572 Phenolic laminated sheet minimum 1.5mm shall be similar to Formica, Panelyte, Perstrop or other approved equal obtained from an approved manufacturer.

Colour and pattern shall conform to the sample approved by the Engineer.

Plastic laminate sheets shall be applied with a waterproof heat resistant adhesive of a type recommended by the plastic laminate manufacturer.

G 9 MANUFACTURE AND WORKMANSHIP

G 9.01 General

All Carpenter and Joiner Work shall be accurately set out, framed and executed in accordance with the detailed Drawings.

Joinery work shall be constructed to detailed drawings. Joints shall be made so as to comply with B.S. 1186 Part 2.

Joinery shall be cut and framed at an early stage, but shall not be glued or wedged until building is ready to receive it.

Framed work shall be properly morticed and renoned, wedged, glued and cramped together and dowelled where necessary. All external joinery work shall be put together with waterproofing glue.

The use of nails for fixing any items of joinery will not be permitted. Springs may be used for glazing beads only.
All screws shall be countersunk and puttied and all springs shall be punched and puttied.

All joinery such as architraves, beads etc. required to fit against the contour of irregular surfaces shall be accurately scribed to ensure a close connection.

All joinery which is to be polished, varnished or painted shall be finished smooth and clean by rubbing down with fine glasspaper.

G 9.02 Doors

Doors shall be to sizes shown on the Drawings. Doors hung folding shall have meeting beads screwed on. Glazing bars if required shall be of twice rebated section.

Flush doors shall be core framed up in softwood and covered with 6mm thick ordinary plywood or as shown on the Drawings.

The horizontal framing members shall have ventilation holes drilled in the vertical direction to avoid damage due to expansion of trapped air.

Hardwood edging shall be securely joined and dowelled to the framing all round the exposed edges and shall be splayed or rebated to take the edge of the plywood facing. Lock rails of fixing blocks shall be built into the framing and their positions marked on the facing.

Glazing beads shall be of hardwood (beech or the like) moulded and screwed as detailed on the Drawings.

Doors and joinery items etc. shall be carefully and accurately fitted to give a uniform clearance of not more than 3mm all round.

G 9.03 Fittings Generally

Shelves, divisions, counter tops, panels, drawers and the like shall be of the dimensions and sizes shown on the drawings and shall be screwed to bearers, framing or brackets.

Blockboards in shelves, divisions, counter tops, panels, drawings and the like shall have hardwood lipped to all edges.

Prefabricated fittings and fixtures such as floor and wall cabinets, cupboards, counters and the like shall be
of the size, type and dimensions shown on the drawings and shall be fabricated of the materials shown on the drawings and described in the Specification. The fittings, etc. shall be accurately constructed. The doors, drawers, etc. shall all fit and open and close smoothly.

Before starting repetitive fabrication of any component, prototypes shall be prepared and approved.

All components shall be made to B.S. 1186: Part 2.

Prefabricated fittings and fixtures shall be fixed in the positions indicated on the drawings after all floor, wall and ceiling surfaces have been formed or constructed. All work next to walls, floors and ceilings shall be soundly fixed and scribed to fit snugly against same.

The Contractor shall construct such ground works as are necessary to provide a suitable base and fixing for the prefabricated joinery works.

All blockboards in prefabricated fittings and fixtures shall have hardwood lipping to all edges.

Prefabricated fittings and fixtures shall be complete with hardware as shown on the drawings or as approved by the Engineer.

**G 9.04 Veneering and Finishes**

Veneering and finishes to doors, etc. shall be in accordance with the Drawings and as directed in writing by the Engineer.

The decorative veneer shall be laid at right angles to the grain of the face whether based on plywood or blockboards. Undulations shall be smoothed out by sanding or scraping and the moisture content of the panel and veneer matched to reduce differential shrinkage.

Laminated plastic sheets which are used as facing veneer on plywood or blockboard shall be applied with a waterproof, heat resistant adhesive of a type recommended by the manufacturer of laminated plastics.

Finishes with paint to faces of doors and cupboards shall be enamel oil paint as specified under Section "PAINTING AND DECORATING".

---

**SPECIFICATIONS**

**JOINERY & IRONMONGERY**

**G 10 INSPECTION**

Facilities shall be given to the Engineer for the inspection of all joinery works in progress in the shops and on the Site.
TRANSPORT AND PROTECTION
The joinery shall be kept well protected during transit and shall be handled and packed carefully to avoid its being damaged and shall be covered and kept clear of the ground where on the Site.

MAKING GOOD ALL DEFECTS
Should any shrinkage or warping occur or any other defects appear in the joinery work before the end of the defects liability period, all defective work shall be taken down and renewed to the entire satisfaction.

IRONMONGERY
Ironmongery shall be first quality to be obtained from an approved manufacturer as specified.

The Contractor shall submit a schedule of ironmongery for the approval of the Engineer before placing any supply order. The Engineer’s approval of such schedule shall not relieve the Contractor from furnishing all items of hardware required under the Contract.

MASTER-KEYING
The Contractor shall set up the locks for a system of master keying. Two change keys shall be furnished for each lockset.

PROTECTION AND DEFECTIVE WORK
All joinery work shall be protected from damage during the course of the work and when handed over shall be to the entire satisfaction of the Engineer. Before handing over the Contractor shall ensure that all doors, fittings, etc. work easily and shall make all necessary adjustments including those needed during the maintenance period. Any joinery that splits, shrinks or warps from want of seasoning, unsoundness or bad workmanship shall be removed and replaced at the Contractor's expense. Ironmongery shall be over hauled, cased and oiled before handing over and all paint, etc. Shall be removed and left in a clean and perfect working order.
<table>
<thead>
<tr>
<th>Division No.</th>
<th>Titles</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>H - 1</td>
<td>Scope</td>
<td>3 - 75</td>
</tr>
<tr>
<td>H - 2</td>
<td>Materials</td>
<td>3 - 75</td>
</tr>
<tr>
<td>H - 3</td>
<td>Manufacture</td>
<td>3 - 76</td>
</tr>
<tr>
<td>H - 4</td>
<td>Workmanship</td>
<td>3 - 78</td>
</tr>
<tr>
<td>H - 5</td>
<td>Balustrades and Railing</td>
<td>3 - 80</td>
</tr>
</tbody>
</table>
H -1  **SCOPE**

These Specifications cover ferrous and non-ferrous works intended to be used in the Project all in accordance with the Drawings and as directed by the Engineer.

H -2  **MATERIALS**

H -2.01  **Steel**

Steel plates, and structural steel shaped sections shall conform to the requirements of B.S. 4 latest edition for structural sections, Part 1 Hot rolled sections and Part 2 Hot-rolled hollow sections (Metric Series).

H -2.02  **Bolts and Nuts**

Bolts and nuts shall conform to the requirements of B.S. 4190: I.S.O. metric black hexagon bolts, screws and nuts.

H -2.03  **Washers**

Plain washers shall be made of steel. Taper or other specially shaped washers shall be made of steel or malleable cast iron and shall conform to the requirements of B.S. 4230 Metal washers for general engineering purposes.

H -2.04  **Galvanized Steel Pipes**

Galvanized steel pipes shall conform to the requirements of B.S. 1387 – I.S.O. "Medium Series".

H -2.05  **Paint**

Paint for Metalworker shall comply with the applicable requirements as specified under “PAINTING”.

H -2.06  **Aluminium**

All aluminium elements shall be manufactured of extruded sections of aluminium alloy, mechanically jointed. Fittings shall be aluminium alloy in accordance with B.S. 1331 the latest edition.

All parts and members shall be of aluminium commercial quality like (Al - Mg - Si) heat treated, free from defects impairing its strength and durability and containing not more than 0.4% copper. All exposed surfaces shall be polished to a mirror-like surface, free from defects, and shall be light etched and anodized in a dark brown finish as shown on Drawings and as directed in writing by the Engineer.
Aluminium shall be treated to comply with B.S. 1615 and B.S. 2987 to provide an anodization not less than 25 microns thickness.

All aluminium sections shall present clear straight and sharply define lines and shall be free from defects and imperfections that may impair their strength.

All screws, bolts and other necessary accessories shall be of aluminium or other non-corrodable material and shall match in colour and consistency the finish of the anodized aluminium.

Aluminium elastic glazing beads shall be provided to all windows and doors which are assembled by pressure to fit with the relevant groove in the profile.

The glazing bars shall be treated or interlaced at points of intersections and machine tenonned to frame.

**H 3**

**MANUFACTURE**

**H 3.01 General**

The Contractor shall be responsible for the correctness and accuracy of the dimensions of the finished articles.

He shall therefore carefully check the dimensions indicated on the Drawings, verify any change ascertain the sizes at Site which will enable him to prepare Final working Drawings for fabrication and erection purposes. Such drawings shall be submitted to the Engineer for his verification and approval.

Fabrication Orders can only be placed after Contractor has obtained in writing the approval of the Engineer on the above Drawings.

The steel sections where specified to be factory rustproof shall be rustproofed by hot dip galvanized, metalizing or sheradizing process. The rustproofing shall be sufficient to withstand the 72 hours salt-spray test as provided for in B.S. 1391. If the rustproof coating shall be damaged during the progress of work, the damaged part shall be recoated to minimum the original thickness to the satisfaction of the Engineer.
**METAL WORK**

**H -3.02  Flush Steel Door and Frame**

Flush steel door shall be fabricated of hot rolled steel sections for framed skeleton with diagonal bracings and lined both faces with sheet steel of thickness as shown on Drawings or stated in the Bills of Quantities, riveted to framed skeleton as shown on the Drawings. The Frame shall be made of hot-rolled steel sections and shall be provided with No. 8 anchors, one end welded to frame and other end dovetailed.

**H -3.03  Hollow Metal Door Frames**

Hollow metal door frames shall be purpose made to the profiles and sizes shown on the drawings and obtained from an approved manufacturer. The doorframes shall be from 1,5mm thick twice laminated steel.

The frames shall be stored in a clean, dry place, off the ground and protected from the weather.

The frames shall be free of all dents, bumps, slits, and cracks and any defective frames shall be made good or replaced at the Contractor’s own expense.

**H -3.04  Aluminium Windows, Doors**

The anodized aluminium windows and doors etc... with all necessary accessories and fittings shall be of the pattern, design, dimensions and thickness shown on the Drawings and obtained from an approved manufacturer.

Prints of shop Drawings for aluminium Windows, doors, frames, etc... showing the dimensions, sizes, thickness, materials, finishes, joinings, attachments, fasteners and the relation of this section to adjoining work, shall be submitted to the Engineer for approval before ordering any material. All work shall be fabricated and erected in accordance with the approved Drawings.

All aluminium windows, doors, frames, etc... shall be factory assembled and reinforced according to the Drawings, complete with hinges, glazing gaskets and anchors. The only Site work allowed on aluminium units is fixing in position and glazing. The finished surfaces shall present a clear surface free from alloy defects, scratches, or other surface blemishes.
H -4 WORKMANSHIP

H -4.01 Steel Elements

All steel parts shall be accurately set out, cut, framed, assembled and executed using proper bolts or welding electrodes. All cur parts shall be sawn cut, no oxygen burning shall be permitted except for pipe supports. All welding shall be electrical welding, clean and of proper workmanship. All cut parts and welded sections shall be ground, even and filed smooth with rounded edges.

All steel members in contact with the soil shall be painted with two (2) coats of protective asphalt paint. All doors, frames, staircases, etc. shall be given at least one (1) coat of approved rust inhibiting primer before delivery to Site.

Frames for doors and windows shall be provided with not less than (3) adjustable type anchors on each jamb, maximum distance between anchors shall be eight hundred (800mm).

All joints shall be machined to a close fit and all pins and screws shall be countersunk and dressed flush after assembly.

Forging shall be sharp and true curbs and intersections, members of the same size shall be halved together.

The plain surfaces shall be smooth, free from warp or buckle. Moulded members and mitres shall be clean, cut, straight and true. Construction joints shall be welded their full length and cleaned off flush on exposed surfaces.

All work shall be erected plumb and true to lines and rigidly secured to wall, floors or ceilings as shown on Drawings and to the satisfaction of the Engineer.

Hardware for steel doors, etc. shall be as specified under JOINERY & IRONMONGERY.

H 4.02 Aluminium Windows and Doors

The Contractor shall furnish and install all aluminium units as indicated on the Drawings. Workmanship and installation shall be in accordance with recommended standard of First Class Aluminium Manufacturers.

All aluminium work shall be performed in a shop where grade of metalwork is of recognized quality acceptance to the Engineer. All items shall be installed plumb, straight, square level and in proper elevation, plane location and
level and in proper elevation, plane and alignment with other work. All work shall be designed for adjustment to field variations, fitted with proper joints and intersections, adequately anchored in place, strictly in accordance with best practice.

Where aluminium surfaces come in contact with metals other than stainless steel, zinc, white bronze or small areas of other metals compatible with aluminium surfaces they shall be kept from direct contact with such parts by painting the dissimilar metal with a prime coat of zinc-chromate primer or other suitable primer, followed by one or two coats of aluminium metal-masonry paint or other suitable protective coating, excluding those containing lead pigments or a non-absorptive tape or gasket shall be placed between aluminium and dissimilar metals. Steel anchors and connecting members shall be hot dip galvanized or zinc plated after fabrication.

Aluminium surfaces in contact with lime mortar, concrete, plaster or other masonry materials, shall be painted with alkaline-resistant coatings such as heavy-bodied bituminous paint or waterwhite methacrylate lacquer.

Aluminium in contact with wood or absorptive materials which may become repeatedly wet shall be painted with two coats of aluminium metal-and-masonry paint or a coat of heavy-bodies bituminous paint. Alternately paint the wood or other absorptive material with two coats of aluminium house paint and seal joints with a good quality of caulking compound.

Where aluminium is in contact with treated, wood shall be treated with pentachlorophenol, 5% minimum concentration or approved equal, followed with the protective measures described for aluminium in contact with wood or other absorptive materials.

The aluminium work shall be designed and anchored to that the work will not be distorted nor the fasteners overstressed from the expansion and contraction of the metal.

Before shipment from the factory, aluminium surfaces requiring protection shall be given a coating which will protect the metal during construction in areas where appearance of the finish on aluminium items is important, a coating of methacrylate type lacquer shall be applied as specified hereinafter.
Apply two sprayed coats of water-white methacrylate lacquer having a total minimum thickness of 0.015mm, which when applied to the aluminium surface shall be capable of withstanding the action of lime mortar for a period of at least one week in an atmosphere of 100% relative humidity at 40 °C, the action of 10% (by weight) muriatic acid for a period of six hours at 20 °C, and the action of atmospheric weathering for a period of 12 months. The coating shall be applied in the manufacturer’s plant to the exposed surfaces of all aluminium components subject to staining from alkaline mortar and plaster, abrasion and other construction abuses. Before application of lacquer, the manufacturers shall remove all fabrication compounds, moisture, dirt accumulations and other foreign materials to ensure proper lacquer adhesion.

Upon completion, the Contractor shall clean all aluminium work as required by removing protective tape or other coating, using mild soap or detergents and clear petroleum spirits.

Acids, caustics and abrasives not be used. Where cleaners are used to remove excess sealings compounds care shall be exercised to prevent damage to seals or staining or damage to adjacent work.

The Contractor shall be responsible for the protection of all aluminium work until the completion of the works, and only units in perfect working order and in perfect condition shall be accepted.

H -4.03 Hollow Metal Door Frames

Hollow metal door frames shall be fixed and shown on the drawings all in accordance with the manufacturer’s printed instructions and flushed up solid with plain concrete or cement mortar.

The rates for hollow metal door frames are to include for the supply and assembly of the complete unit including all necessary holes for hinges and lock, cutting off torsion threshold bar if necessary and fixing in walls in accordance with the manufacturer’s printed instructions and plain concrete or mortar filling as shown on the drawings.

H 5 BALUSTRADES AND RAILING

Balustrades and railings shall be of the materials and made to the sizes, dimensions and designs shown on the drawings.
## SECTION I  SANITARY INSTALLATIONS

<table>
<thead>
<tr>
<th>Division No.</th>
<th>Titles</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I - 1</td>
<td>General</td>
<td>3 - 81</td>
</tr>
<tr>
<td>I - 2</td>
<td>P.V.C. Pipes</td>
<td>3 - 82</td>
</tr>
<tr>
<td>I - 3</td>
<td>Domestic Water Piping</td>
<td>3 - 82</td>
</tr>
<tr>
<td>I - 4</td>
<td>Manholes</td>
<td>3 - 85</td>
</tr>
<tr>
<td>I - 5</td>
<td>Clean out Boxes</td>
<td>3 - 86</td>
</tr>
<tr>
<td>I - 6</td>
<td>Clean out Openings</td>
<td>3 - 86</td>
</tr>
<tr>
<td>I - 7</td>
<td>Floor Drain</td>
<td>3 - 86</td>
</tr>
<tr>
<td>I - 8</td>
<td>Roof Drain</td>
<td>3 - 86</td>
</tr>
<tr>
<td>I - 9</td>
<td>Water Tanks</td>
<td>3 - 86</td>
</tr>
<tr>
<td>I - 10</td>
<td>Fixtures</td>
<td>3 - 86</td>
</tr>
</tbody>
</table>
SECTION I
SANITARY INSTALLATIONS

I - 1 GENERAL

a. Scope of work

The Contractor shall furnish all labour, materials equipments, tools, appurtenances, services and temporary work to provide complete the several plumbing and drainage systems all in perfect working order.

This work shall include but not be limited to the following:
- Sanitary fixtures.
- Water supply systems including cold water services.
- Soil, waste and ventilating systems.
- Rain water services.
- External gravity sewer net work.
- Testing of all piping systems and equipment and other devices to demonstrate that the entire installations are in perfect working order.

All fixtures and materials shall be brand new bearing stamped ratings as required and must be approved by the engineer prior to their use.

b. General description of the work

The sanitary works shall consist of all water supply to and water discharge from all the sanitary fixtures.

City water is stored in steel water tanks at the roof of the building. Water distribution to all floors is by gravity from these roof tanks.

Drainage of all floors is discharged by gravity from individual points to risers which are inter connected to a system of manholes which will be later discharged to a local sewage treatment plant. Rain water is collected from roof and discharged out of the building by means of risers.

c. Working drawings and ordering

Immediately the contract has been awarded, the Contractor shall prepare detailed working drawings showing exact position of all sanitary fixtures and position and size of all water pipe work and drainage, soil, waste and vent piping, clearly indicated fittings proposed. These drawings, when approved by the engineer, shall be used for ordering purposes.
I 2. P.V.C PIPES

a. Supply and installation of 2", 4", & 6" P.V.C. pipes as manufactured by "Psalm" as shown in drawings either within slab and wall or exposed and hung under ceiling.

b. P.V.C. pipes and fittings such as elbow, T, Trap shall be spigot and socket, and jointed by rubber seal ring.

c. Clean out opening must be provided where shown on drawings and where required.

d. All riser branches must be provided by elbow or nipple with gate and with T with opening at point of conic-tin with branches.

e. P.V.C. pipes and fittings shall be fixed in shaft by means of approved galvanized, two pieces, holderbates of pipe fixed vertically and at not more than 2m. centers on pipes fixed horizontally. Horizontal 4" and 6" P.V.C. pipe in pipe turned must be approved clamp.

f. Slope of drain pipes to be 1cm/mr unless noted other- wise.

g. Vent for sewage pipes to be 1 meter above finished roof and including wire dome grating.

h. Where vent pipes penetrate roof slabs, sleeve must be provided above it, and roof finishes and water proofing, must be carried up around the pipe and covered with sleeves to prevent water penetration, all to the approval of the Engineer.

i. For testing soil and waste stack the system shall be subjected to water test prior to being covered and also tested for water tightness after back filling. On any section of pipe under test the head of water applied shall not be less than 3 meter and not more than 6 meter. Test shall be rectified and the test re-applied to the complete satisfaction of the Engineer.

I 3 DOMESTIC WATER PIPING

a. Pipe Installation
All piping shall be properly supported or suspended on stands, clamps, hangers, etc. of approved design. Supports shall be designated to permit free expansion and contraction while minimizing vibration. Pipes shall be anchored as directed by means of steel clamps securely fastened to the pipe and rigidly attached to the building structure. Screw threads shall be cut clean and true and joints made tight without caulking. No bushing shall be used. Reducing fittings shall be used to change pipe size, and reductions to be made with eccentric reducers short radius fittings shall not be used.
The drawings indicate generally the size and location of piping as designed for space conditional ceiling heights and may not be changed until coordinated with other contractors. Pipe work shall confirm fully of the following requirements:

- Piping shall be properly graded to secure easy circulations and prevent noise and water hammer. As much pitch as space conditions allow must be given. Capped dirt pockets to be installed at all riser heel, low points, and other places where dirt may accumulate must be provided. Allowance must be made for proper provision for expansion and contraction in all portions of pipe work to prevent undue strain in piping. Expansion joints to be installed as directed by the Engineer.

- All fittings such as elbows, tees, bushes, etc. shall be of best quality, foreign made or local made [Class A] according to local standard with smooth interior surfaces. Approved screw unions with bronze or steel bodies and ground brass taper or spherical joints shall be installed at trapes instruments, etc. and where else directed to permit easy connection and disconnection. Final connection to all equipment and fixtures shall be made in a manner that will permit the complete removal of any fixture or any piece of equipment without cutting of pipeline. If after the plant is in operation any system do not circulate quickly and noiselessly [due to trapped or airbound connections]. The Contractor shall make proper alternations in these defective connections. If connections are concealed in furring floors or ceilings, the contractor shall bear all expenses of tearing up and rebuilding construction and finish.

- All main shall have a slope of not less than 5mm in 3 meters in direction of flow. All branches shall have a slope of not less than 1mm in 3 meters towards the main. All branches from mains shall be connected at the angle of 45 if possible. Each piece of pipe and each fitting shall be carefully inspected on the inside to see that there is not defective workmanship on the pipe or obstructions in the pipes or fittings. Joints in all screwed piping shall be made with red load and boiled in seed oil, completely covered the male threads.

- Straight elbows, bushing, long screws or bull head tees shall not be installed, and all offsets shall be made with fittings. Pipes shall not be bend at any time.
Pipe work shall be installed in manner to allow for ease of air escape and system draining. It shall be endeavoured to obtain this naturally by gravity.

However, where conditions don’t permit it an automatic air vent shall be installed at all air pocket locations and drain gate valves shall be supplied and installed at all low points and risers legs or as shown on drawing. Before turning the project over to owner, contractor shall thoroughly disinfect the entire water system, include underground main. Systems shall be thoroughly flushed of all dirt and foreign matter.

Pipes material is galvanized steel “blue sign” local made “class A”.

All pipe fittings such as elbow, tee, reducer, union, etc. shall be galvanized forged steel of the same quality of the pipe. Pipes and fittings shall be suitable for threaded connections.

b) Hangers, supports, anchors, etc.

The Contractor shall provide suitable and substantial hangers and supports for all piping. Piping shall be carried by pipe hangers supported from concrete insets. In general supports for pipes shall be not more than 2.5m, apart for 2” and smaller pipes according to the conditions of the job and directions of the engineer. Copper piping shall have hanger every 1.5 meter. All vertical piping be supported by heavy pipe clamps resting on the building structure. No piping shall be hung from other piping and all hangers shall be of heavy construction suitable for the size of pipes supported. All horizontal pipes shall be supported by split ring hangers of malleable iron, with sockets for hangers of solid rod the length of each shall be adjustable. All vertical pipe line passing up through the building shall be hung from each floor of the building. Malleable iron clamps of sample size bolted around the pipes, shall be used for these supports. These pipes shall be secured midway between the floor and the ceiling of each story by means of malleable iron, solid hangers around the pipe and fastened to adjacent walls by means of inverted bolts cast in concrete walls anchors shall be separate and independent from all hangers and supports. All anchors shall be of heavy angle iron construction and suitable in every way for the work, and shall be installed where necessary or as directed by the architect.

c) Valves

Hand valves and check valves shall be of an approved quality “KIM” or equivalent and shall be furnished and installed as shown on the drawings or as directed during construction.
The Contractor shall include for the finishing the required valve tag and a schedule of valves with a schematic drawing showing position of each. The drawing shall be glazed, framed and hung in the machine room.

SPECIFICATION
SANITARY INSTALLATIONS

d) Float Valves
Supply and install all float valves as shown on the drawings and wherever specified in this book of specifications. Float valves shall be all bronze, screwed ends, float operated. Float shall be all copper and mounted at the end of a brass or copper rod, which actuates valve operation.

e) Cleaning of Pipe
During constructions, the contractor shall cap all lines so as to prevent the entrance of sand, dirt, etc. All pipe, fittings, valve etc. shall be cleaned of grease, dirt, scale and foreign material before installation.

Before turning the project over to the owner all piping system shall be thoroughly cleaned following the hereinafter specified instructions:

- Piping shall be cleaned by operating system at normal operating pressure approximately 48 hours, wasting the condensate. At the end of the 48 hours period, contractor shall clean all strainers by removing baskets and flushing with clean water. Blowing down through strainer blow down valve will not be acceptable.

f) Testing
The piping system shall be tested by accepted method and under 150 psi hydrostatic pressure. Test shall be maintained under inspection by consulting engineer for period of not less than 8 hours. No part of piping system shall be repeated after leaks are corrected. No part of piping system shall be covered or concealed until it has been tested, inspected and approved by engineer.

MANHOLES

a. All manholes shall be built from concrete or solid brick laid on 10cm. Concrete base over a 15cm. Hard-core, dimensions and level of inverts of manhole are shown on drawings.

b. Work shall include excavation, back filling, concrete base, hard-core installation, reinforced concrete cover slab, benching and rendering internally.

c. Benching of manholes to be semi circular of diameter equivalent to adjacent pipes and to be rendered and plastered perfectly smooth, inclination in manhole to be 2cm minimum.
d. Manholes over 1 meter deep shall be supplied by Cast iron steps well anchored to the concrete walls at a spacing of 30cms.
e. Manholes exceeding 2 meters deep shall be reinforced concrete base and walls cast in place as shown in drawings.

3-85

SPECIFICATIONS
SANITARY INSTALLATIONS

I-4 MANHOLES (CONT'D)
f. Drop manholes exceeding 2 meters to be also of reinforced concrete base above.

I-5 CLEAN - OUT BOXES

Clear-out boxes shall be approved quality P.V.C. 4”/2”. They shall be provided with air tight, sealing cover of chrome plated bronze.

I-6 CLEAN - OUT OPENINGS
a. Clean out opening is exposed P.V.C. soil and waste pipes shall be provided where shown on drawings and where required.
b. All elbows for under ceiling piping connection shall be provided with gates.

I-7 FLOOR DRAIN

Floor drain shall be obtained from an approved manufacturer P.V.C. 4”/2” minimum water seal complete with chrome plated duty strainer tightly sealed to drain body. All 2” P.V.C. drain pipes are connected to floor trap by rubber sealed record fittings.

I-8 ROOF DRAIN

Each roof drain shall be of P.V.C. pipe constructed with no trap, having and integral flange and wire Dome type strainer, fixed by screwing into the drain body. Rain drain shall be installed as shown on drawings.

I-9 WATER TANKS

Tanks shall be constructed of anti-corrosive steel sheet of 0.08mm thickness. The work shall include installation on steel bases and also connection of galvanized pipes from the main public pipe with a water meter, valves and installation of diaphragm ball valve. Also the supply pipe from the tanks includes a vent pipe. A test will be made against any leakage or defect and according to the approval of the Engineer.

I-10 PLUMBING FIXTURES
Contractor shall supply and install the plumbing fixtures. All fixtures shall be set true and level. All necessary supports for fixtures shall be installed before plaster work. All exposed connections and fittings shall be of chromium plated brass. All nipples through wall to fixture connections shall be copper with compression connections.

3-86

SPECIFICATIONS
SANITARY INSTALLATIONS

I-10 PLUMBING FIXTURES [COND'T'D]

No water supply shall be less than 1/2".

a. Supply and installation of wash basin, porcelain local made class “A” size 56x41, with chrome plated cold water faucet, size ½” of approved manufacturer such as [Grohhe or equivalent] including chrome P-trap same kind of faucet connected with over flow and with the floor trap by plastic P.V.C. pipe 2” and with chain and rubber plug. Height of basin 80 cm. From floor.

b. Supply and install of porcelain W.C. bowel including internal S-Siphon local made class “A” or equivalent. The price includes plastic flushing tank, plastic W.C. seat cover of heavy duty such as [Keter], chrome plated angle valve ½” chrome plated flexible hose ½“. The W.C.’s connected with the 4 inch P.V.C. main sewage pipes, connecting the flushing tank to main cold water line by ½” galvanized pipe. W.C. bowls shall be fixed to floor—by cadmium screws and tightly grouted.

c. Supply and installation of best quality class “A” Porcelain laundry sink of size 60x39x36cm with chrome plated cold water faucet size ½” of approved manufacture such as [Grohhe or equivalent] including 2” plastic P-trap connected with the floor by P.V.C. pipe 2”, and with chain and rubber plug. The price includes connection to cold water mainline by ½” galvanized steel pipe. Height of sinks 60 cm from floor.

d. Supply and installation of stainless steel kitchen single sink size 100x56cm including the supply of chrome plated cold water faucet of approved quality [Grohhe or equivalent] connected to cold water mainline by ½” galvanized steel pipe and connected to floor drain trap by 2” P.V.C. pipe.
INDEX

SECTION J  FLOOR WALL AND CEILING FINISHES

<table>
<thead>
<tr>
<th>Division No.</th>
<th>Titles</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>J - 1</td>
<td>General</td>
<td>3 - 88</td>
</tr>
<tr>
<td>J - 2</td>
<td>Materials generally</td>
<td>3 - 88</td>
</tr>
<tr>
<td>J - 3</td>
<td>Plaster Work</td>
<td>3 - 90</td>
</tr>
<tr>
<td>J - 4</td>
<td>Waterproofing plaster to all external walls</td>
<td>3 - 92</td>
</tr>
<tr>
<td>J - 5</td>
<td>Tyrolean Plaster (fine grain)</td>
<td>3 - 93</td>
</tr>
<tr>
<td>J - 6</td>
<td>Beds and backings</td>
<td>3 - 94</td>
</tr>
<tr>
<td>J - 7</td>
<td>Cement screed to channels</td>
<td>3 - 94</td>
</tr>
<tr>
<td>J - 8</td>
<td>Precast terrazzo tiling</td>
<td>3 - 95</td>
</tr>
<tr>
<td>J - 9</td>
<td>Ceramic floor tiling</td>
<td>3 - 96</td>
</tr>
<tr>
<td>J - 10</td>
<td>Glazed wall tiles</td>
<td>3 - 96</td>
</tr>
<tr>
<td>J - 11</td>
<td>Ployvinyl chloride floor tiling</td>
<td>3 - 97</td>
</tr>
<tr>
<td>J - 12</td>
<td>Marble floor tiling</td>
<td>3 - 98</td>
</tr>
<tr>
<td>J - 13</td>
<td>Marble thresholds</td>
<td>3 - 99</td>
</tr>
<tr>
<td>J - 14</td>
<td>Protection and cleaning marble</td>
<td>3 - 99</td>
</tr>
<tr>
<td>J - 15</td>
<td>Floor dressing</td>
<td>3 - 99</td>
</tr>
<tr>
<td>J - 16</td>
<td>Floor sealing</td>
<td>3 -100</td>
</tr>
<tr>
<td>J - 17</td>
<td>Suspended ceiling</td>
<td>3 -100</td>
</tr>
<tr>
<td>J - 18</td>
<td>Protection and cleaning</td>
<td>3 -102</td>
</tr>
</tbody>
</table>
SECTION J

FLOOR, WALL AND CEILING FINISHING

J 1 GENERAL

This section of the specifications covers plasterwork and other floor, wall and ceiling finishes intended for the works all in accordance with the Drawings, Bills of Quantities and as directed by the Engineer.

The Contractor shall attend upon other trades and protect all work specified under this section from damage during subsequent operations. Make good any defects, clear away debris upon completion clean throughout and leave all work in perfect condition to the satisfaction of the Engineer’s representative.

The Contractor shall be responsible for the design and stability of the scaffolding and for all safety precautions in connection with works specified under this Section.

Damaged or defective materials shall not be used in the works. Any defective materials or materials damaged during or after installation shall be removed and replaced at the Contractor’s expense.

J 2 MATERIALS GENERALLY

The cement and water used for plastering shall be as before described in Section C -Concrete Work and the sand shall be as before described in Section D - Blockwork.

White (Nonstain) cement for tinted plaster shall conform to the requirements of the Standard Specification for Masonry Cement of the ASTM Designation (C-91) latest edition.

Lime shall be imported and of the hydrate type complying with Class B of B.S. 890.

Marble chippings shall be irregular in size and roughly cubical in shape. Samples shall be submitted to the Engineer for approval. Sizes shall be as required by the Engineer and as selected from the following table next page:
Any pigments or colouring materials incorporated in mortar shall comply with B.S. 1014:1961.

Waterproofer additives shall be to the approval of the Engineer. The materials shall be delivered in containers bearing the name of the manufacturer and the instructions for use.

Angle beads, casing beads and shop beads where shown on the drawings shall be galvanized steel 26 gauge or pressed steel 24 gauge complying with B.S. 1246.

Metal lath for use in plaster shall be plain expanded metal type complying to B.S. 1369, weighing not less than 1 kg/sq.m. All metal lathing shall be zinc coated.

Metal lath shall be secured to the carcass and blockwork by means of galvanized steel nails. If the wire for securing metal lath is to be used it shall be of zinc coated wire not less than 1.2mm in diameter.

Plaster expansion joint strips, where shown on the Drawings or indicated in the Bills of Quantities, shall be of aluminium channels maximum size 20x20mm and 1mm.

<table>
<thead>
<tr>
<th>B.S. Sieve</th>
<th>Approximate mm</th>
<th>Inches</th>
<th>Marble Chippings</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>13.00</td>
<td>1/2</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>10.00</td>
<td>3/8</td>
<td>95 - 100</td>
</tr>
<tr>
<td>-</td>
<td>5.00</td>
<td>3/16</td>
<td>25 - 60</td>
</tr>
<tr>
<td>7</td>
<td>2.40</td>
<td>0.095</td>
<td>5 - 30</td>
</tr>
<tr>
<td>14</td>
<td>1.20</td>
<td>0.047</td>
<td>0 - 10</td>
</tr>
<tr>
<td>25</td>
<td>0.60</td>
<td>0.024</td>
<td>-</td>
</tr>
<tr>
<td>52</td>
<td>0.30</td>
<td>0.012</td>
<td>-</td>
</tr>
<tr>
<td>100</td>
<td>0.15</td>
<td>0.006</td>
<td>-</td>
</tr>
</tbody>
</table>
Thick and shall be perforated at side to form a suitable bond to plaster.

SPECIFICATIONS
FINISHINGS

J 3

PLASTERWORK

J 3.01 Mixing of Ingredients

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 the mixing of each batch and kept free of plaster from previous mixes. Plaster shall be thoroughly mixed with the proper amount of water until uniform in colour and consistency. Retempering will not be permitted and all plaster which has begun to stiffen shall be discharged.

All plastering shall be executed in a neat workmanlike manner and internal and external angles shall be true, straight and plumb. Plaster shall be made good adjacent to wood or metal frames, skirting and around pipes or other fittings.

All tools, implements, vessels and surfaces shall at all times be kept scrupulously clean and strict precautions shall be taken to avoid the plaster or other materials becoming contaminated by pieces of partially set material which would tend to retard or accelerate the setting time.

J 3.02 Preparation of Surfaces

All surfaces to be plastered shall be clean and free from dust, grease, loose or projecting mortar and all traces of salts are to be thoroughly sprayed with water, but all free water shall be allowed to dry and disappear from the surface before the plaster is applied.

Plastering shall not be commenced until the background has been suitably prepared. Blockwork joints shall be
deeply raked out, efflorescence brushed off and all dust and foreign matter removed.

Before plastering is commenced all junctions between differing materials shall be reinforced. This shall apply where wall join columns and beams, particularly where flush, and similar situations where cracks are likely to develop and as directed by the Engineer. The reinforcement shall consist of strip of galvanized wire mesh (10 to 15mm hexagonal mesh) 15cm wide which shall be plugged, nailed or stapled as required at intervals of not exceeding 45cm at both edges.

3-90

SPECIFICATIONS
FINISHINGS

On all external surfaces and on all smooth internal surfaces spatter dash of cement and sand which shall contain 500 kgs of cement per one meter cube of sand shall be applied and allowed to dry before rendering is commenced. All surfaces of walls shall be wetted immediately prior to applying the first coat of rendering and this shall be allowed to thoroughly dry out before the next coat is applied.

The Contractor shall from vertical guide screeds 5cm wide. The spacing shall not exceed 1.50 meters.

The screeds shall be plumb and in the same plane with each other. The sides of the screed shall be kept rough to bond with plaster, the surface shall be smooth.

The finished surface shall be true to shape and angle even in all directions, with straight arises free of cracks and trowel marks and to the entire satisfaction of the Engineer.

J 3.03 Application of Coats
a) Base-Coat (Rendering)

After the application of the spatterdash “rasheh” the base coat shall be applied after the spatterdash coat has set but in no case earlier than 24 hours after the application of the spatterdash coat.

When applied to masonry or to concrete surfaces the base coat shall be applied with sufficient force to prevent air pockets and to secure a good bond.

The base coat shall be lightly scratched in both directions to provide a key for the finishing coat and shall be kept moist with a fog spray for 2 days and then allowed to dry out.

b) Finishing Coat
Shall not be applied until the rendering or base coat has seasoned for seven days; just before the application of the finish coat, the rendering or base coat shall be wetted evenly with a fog spray. Where cement plaster with a smooth trowelled finish is specified or indicated on the drawings, the finish coat shall be first floated to a true even surface, then trowelled in a manner that will force the sand particles down into the plaster and with the final trowelling, leave the surface finished smooth and free from rough areas, trowel marks, checks or other blemishes.

J 3.04 Proportions for Internal and External Plaster

Internal and external plaster shall be composed of 400kg of cement per one cubic meter of salt free sand.

Plastering shall be applied in two (2) coats unless otherwise specified or indicated on the drawings.

Finishing coat shall have a reasonably uniform thickness of approximately 5mm.

Screed shall be laid and ruled as necessary to allow for a total thickness of 15mm for external and internal plaster and the rendering shall be applied to the required thickness.

The metal grid system shall be a patent system suitable for use with in-situ plaster and expanded metal lathing and shall have, flat metal hangers to suit suspended ceilings depths as shown on the drawings and described in the Bills of Quantities. The system shall include all main and cross runners, necessary splicers, hangers, clips and wall mounting next to walls. The system shall be installed complete in accordance with the manufacturer’s instructions.

The metal grid suspension system shall be concealed and shall allow for the whole of the ceiling to be demountable.

All concealed ferrous metal members such as channel runners, z-bars, clips and splines shall have an approved corrosive-resistant finish.

J 3.05 Metal Lath

At all junctions of dissimilar materials (i.e. concrete and blockwork or steel elements) the joint shall be covered by metal lath strips not less than 200mm in width securely fixed to the surface.

J 4 WATERPROOFING PLASTER TO ALL EXTERNAL WALLS
Mixing of plaster ingredients and preparation of surfaces to be plastered with waterproofing plaster shall be as specified above.

Rendering coat shall contain 450kg. of Ordinary Portland Cement per cubic meter of clean coarse salt free sand and with admixture of waterproofing compound as specified added in accordance with the printed instructions of the manufacturer, shall be applied and the surfaces shall be trowelled hard smooth and allowed to dry. All surfaces of plastered areas shall be cured for a minimum of 7 days.

SPECIFICATIONS
FINISHINGS

J 5

TYROLEAN PLASTER (FINE GRAIN)

J 5.01 General
The tyrolean plaster shall be executed to the extent shown on the Drawings and as directed by the Engineer.

The contractor shall provide sample(s) of Tyrolean plaster for the approval of the Engineer prior to commencement of Tyrolean work.

J 5.02 Mixing
Cement and aggregate for each batch shall be accurately measured and mixed dry until evenly distributed and the mass is uniform in colour. All batches shall be of such size that they can be entirely used within half an hour. Mechanical mixers of an approved type shall be used for mixing tyrolean plaster, except when hand mixing of small batches is specifically approved by the Engineer. Mechanical mixers, mixing boxes and tools shall be cleaned after mixing each batch and kept free of tyrolean mortar from previous mixes. Water content shall be maintained at a minimum. Mixing shall be continued until plasticity is obtained.

J 5.03 Proportions
Proportions of materials for tyrolean, by volume shall be as follows:

a) Scratch Coat
   1 part Ordinary Portland Cement
   3 parts fine aggregate

b) Finish Coat
   1 part of white Portland cement
   3 parts fine selected aggregate

No lime shall be allowed in either scratch or finishing coat, scratch coat shall be set on spatterdash.

J 5.04 Application of Tyrolean
a) Workmanship
Surfaces to receive tyrolean shall be clean, free from dust, dirt, oil, or other particles that might interfere with a satisfactory bond. Surfaces to receive tyrolean shall be evenly dampened (not soaked) with a fog spray before tyrolean is applied. If surfaces become dry in spots, the dry areas shall be dampened again to restore uniform suction. Tyrolean coats shall be applied continuously in one general direction without allowing mortar to dry at edges. Edges to be jointed shall be dampened slightly to produce a smooth confluence. Tyrolean unless otherwise shown or specified shall be two coats work not less than 20mm. thick (i.e. spatterdash, crotch coat and one tyrolean coat).

3-93

SPECIFICATIONS
FINISHINGS

All exterior corners of tyrolean shall be slightly rounded. Tyrolean on soffit surfaces shall be pitched forward to form a drip.

b) **Scratch Coat**

Shall be approximately 14mm. thick and shall be applied under sufficient pressure to form good keys and shall be brought to a plumb true even surface. The scratch coat shall be damp-cured 48 hours before the finish coat is applied under sufficient pressure to form good keys and shall be brought to a plumb, true even surface. The scratch coat shall be damp-cured 48 hours before the finish coat is applied.

c) **Finish Coat**

Shall be approximately 6mm, thick. Surfaces of the scratch coat shall be dampened several hours before the finish coat is to be applied. Additional dampening at time of application shall be by fogspraying. Dampening by brush will not be permitted. When measure with a 2meter long, straight-edge applied in all directions the finish surface shall not vary from a true plane by more than 1.5mm. The finishing coat shall be applied by means of a proper spraying machine and the degree of the finishing coat shall be determined by the Engineer.

J 6

**BEDS AND BACKINGS**

Cement and sand beds and bedding under floor finishings and backing behind wall and column finishings shall be cement and sand (1:3) mix by volume unless otherwise specified.

J 7

**CEMENT SCREED TO CHANNELS**

Cement screed shall, unless otherwise ordered by the Engineer, consist of one part of Ordinary Portland Cement to four parts of sand by volume. Ingredients shall be
proportioned and mixed specified under concrete work and laid to falls with smooth trowelled finish as shown on the Drawings.

3-94

SPECIFICATIONS
FINISHINGS

J 8

PRECAST TERRAZZO TILING

Precast terrazzo units shall be firmed with a (1:2 ½) mix of white or tinted Portland cement and granular marble chippings for the toping (wearing layer) it on cement and sand backing (1:5) mix shall be obtained from an approved manufacturer. These units shall be cast in heavy steel mould under pressure to the proportions and sieve sizes approved by the Engineer. The thickness of waring layer shall not be less than 10mm and the pattern and dimensions shall be as shown on the drawings and/or stated in the Bills of quantities.

Grinding shall be done wet by means of a No. 50 carborundum stone. Filling shall be carried out with a neat cement grout of the same colour as the facing mix and this shall be worked into the surface with a wooden scraper to fill all voids and air holes. Surplus grout shall be removed with a dry cloth. After a minimum period of 24 hours, polishing shall be carried out wet by means of a No. 140 Carborundum stone.

Terrazzo units shall be cured by totally immersing them after the initial set has been taken place in a tank of clean water for at least 24 hours.

The precast terrazzo units shall be laid on a bed of sand with a (1:3) mix of cement and sand mortar with admixture of lime.

The grout shall consist of neat cement of a colour to match the tiling. Any surplus grout shall be cleaned off the face of the tiling and surrounding surfaces immediately and all tiling shall be carefully cleaned off.

All terrazzo surfaces shall be polished on completion. Large areas such as floors shall be wet polished by means of approved machine using a No. 140 Carborundum wheel.
Any surfaces too small for convenient machine polishing may be polished by hand using a No. 140 Carborundum stone and water. Care must be taken during any polishing operation not to damage any angles or arises.

All units shall be well shaped with straight edges perfectly flat and free from defects which affect appearance or serviceability.

Chipped units or units with cracks or other defects will not be accepted and if laid in place the Contractor shall replace the defective units at his own expense to the satisfaction of the Engineer.

3-95

SPECIFICATIONS
FINISHINGS

CERAMIC FLOOR TILING

Ceramic floor tiles shall be first quality vitreous clay non-slip tiles with keyed backs and a minimum 8mm thick of the sizes indicated on the drawings to comply with B.S.1286 type B and shall be obtained from an approved manufacturer. The colour and pattern of the ceramic tiles shall be selected by the Engineer. Samples shall be submitted to the Engineer for his approval prior to order.

Ceramic Floor tiles shall be laid on top of cement sand screed (1:3) mix of predetermined level such that total thickness of screed bonding layer and tiles shall be as shown on the drawings or mentioned in the Bills of Quantities with a minimum of cutting. The tiles shall be thoroughly soaked in water for a minimum of twenty-four (24) hours before laying. Tiles and skirtings shall be bedded in cement and sand (1:3) mix with addition of approved plasticisers.

All joints shall be as close as possible and shall in no case exceed half (0.5) mm in width on face. Tiles shall be neatly cut and fitted around pipes and other obstructions.

A thick creamy slurry of neat white or tinted cement mixed with sufficient water shall be brushed over the floor until all joints are thoroughly filled.

The surface of the floor shall be very gently rubbed with a wood block to bring tile surface to true planes, excess slurry shall be removed, and the floor shall be rubbed with burlap to clean the tiles and finish the joints to the satisfaction of the Engineer.
GLAZED WALL TILES

Glazed tiles shall be best quality white or coloured glazed ceramic tiles to the sizes approved by the Engineer conforming to B.S. 1281 and shall be obtained from an approved manufacturer. Coloured or patterned tiles shall be as selected by the engineer.

Cement and sand (1:4) nominal mix plaster ten (10) mm thick shall be laid as base for wall tiling. The surface of plaster shall be scratched in an approved manner, when be well wetted before the tiling is applied. Plaster shall be cured for five (5) days before starting application of tiling.

All tiles shall be immersed in clean deminerakized water for twenty-four (24) hours and all surplus water drained off before bedding.

Tiles shall be set in cement and sand mortar (1:4) mix, to a true vertical face with continuous horizontal and vertical joints. Joints shall be straight, level, perpendicular and of even width not exceeding 1.5mm. The vertical joints shall be maintained plumb for the entire true level and plant by uniformly applied pressure under a straight edged or rubber-faced block, misfits as well as damaged or defective tiles shall be removed and replaced by and at the Contractor’s expense.

The external, internal angles, top edges and side edges of glazed wall tiling shall be formed with rounded edges tiles.

Joints in glazed wall tiles, after the edges of tiles have been thoroughly wet, shall be grouted with a plastic mix of neat white or coloured cement immediately after a suitable area of tile has been set.

The joints shall be tooled slightly concave and the excess mortar shall be cut off and wiped off with a damp cloth from the face of tile, before it sets hard.

Interstices or depressions in the mortar joints after the grout has been cleaned from the surface shall be roughened at once and filled to the spring line of the cushion edge before the mortar begins to harden.

Where tiling abuts against wood or metal frames or other tiling at angles and around pipes, etc. it shall be carefully cut and fitted to form a close neat joint. Open
irregular joints filled with cement and sand or plaster will not be permitted.

Immediately after the grout has had its initial set, glazed wall tile surfaces shall be given a protective coat of a non-corrosive soap or other approved method of protection and joints cured for 71 hours.

POLYVINYL CHLORIDE FLOOR TILING

Polyvinyl chloride (PVC) tiles shall be flexible homogeneous vinyl tiles manufactured according to B.S. 3261-60, the tiles shall be 300x300x3mm thick of matt finish and of colour as approved by the Engineer, unless otherwise directed. Edges shall be factory prepared to receive hot welding during laying.

Skirting shall be coved type and of height as shown on the Drawings and/or stated in the Bills of Quantities.

PVC tiles shall be bedded in polyvinyl chloride binder on dry surfaces of concrete tiles according to the manufacturer’s instructions at the recommended rate. Hot welding of tiles joints shall be carried out according to recommendations of tile manufacturers.

Dampness of surface in contact must be prevented during tiling.

MARBLE FLOOR TILING

Marble slabs for flooring, skirtings and the like shall be first quality Bethlehem Marble obtained from an approved supplier.

The marble slabs shall be of the dimensions and thickness shown on the drawings and in the Bills of Quantities and shall be uniform in colour and texture, smooth and free from voids, earth veins, lamination and the like, and shall be of an approved colour and to the pattern and sizes shown on the drawings.

Samples of marble slabs shall be submitted to the Engineer for approval prior to order.

Marble slabs shall be cut square, true and shall be uniform in shape and thickness. Mortices shall be carefully cut without causing any damage to marble, and rebates shall be carefully formed by special machines to the width and depth required to the satisfaction of the Engineer.
Marble slabs for floor finish and marble treads shall be laid on a bed of sand with cement and sand mortar (1:3) mix.

All marble slabs shall be backed with stain proofing in accordance with the manufacturer's instructions.

Marble skirtings and risers shall be bedded with same mix as for floor marble but without the bed of sand.

All joints shall be thoroughly grouted with unstained cement and cleaned well before it sets hard.

All exposed faces and edges of marble shall be polished smooth, free from scratches or other defects and properly protected from damage by means of timber casings.

All workmanship shall be of the best of its kind and shall be carried out in a manner satisfactory to the Engineer.

**SPECIFICATIONS**

**FINISHINGS**

**J 13**

**MARBLE THRESHOLDS**

Unless otherwise shown on the drawings or stated in the Bills of Quantities, marble thresholds shall be first quality carrara marble obtained from an approved manufacturer. Thresholds shall be of the thickness and widths shown, of one piece and full length if the opening, levelled on both sides with hone finish on all exposed surfaces. Ends of thresholds shall be fitted accurately to jambs.

**J 14**

**PROTECTION AND CLEANING MARBLE**

Great care shall be taken to protect delivered and erected marble from chipping and staining during the course of the work. Delivered marble shall be stored in a water from area on raised platforms and shall be covered with tarpaulins or similar material until required for use.

Erected work shall be protected at corners, etc., with non-staining wood formwork, boards, etc. Floors shall be protected with suitable boarding, etc, after laying. Any work damaged or stained at the time of handing over shall be replaced or cleaned as required by the Engineer.

After completion of setting, all marble work shall be thoroughly cleaned by scrubbing with fibber brushes and mild alkaline solution that contains no caustic or harsh fillers. The use of wire brush or acid solution will not be permitted. Cleaning shall begin at the top of the building and proceed downwards. Upon completion all marble shall be left clean and free from stains or traces.
of cleaning fluid and with all joints pointed and to the entire satisfaction of the Engineer.

J 15

FLOOR DRESSING

The granular abrasive powder shall be trowelled into the finishing surfaces of the screed applied as desired hereinabove, working out of the dressing shall strictly conform to the method of application recommended by the manufacturer of material.

3-99

SPECIFICATIONS
FINISHINGS

J 16

FLOOR SEALING

The floor seal shall be applied on the surface of screed which has been prepared and applied as described hereinabove. Screed shall be cured for a minimum of five (5) days before application of floor seal.

The priming and the working out of the floor seal shall be strictly conform to the method of application recommended by the manufacturer of the material.

J 17

SUSPENDED CEILINGS

J 17.01 General

The Contractor shall provide shop drawings to show the final layout and sizes of members of all suspension systems and to coördinate the design and work of suspended ceilings with other trades to provide for the reception and installation of outlets, fixtures, diffusers, etc, pertaining to mechanical or electrical work, all to the Engineer’s approval before any work is commenced.

J 17.02 Materials

a) Acoustical Materials

Acoustical materials shall be non-combustible conforming with the requirements of the American Federal Specifications SS-A=118b and shall be

Acoustical ceiling tiles or panels shall be as manufactured by “ROCKWOOL CO.”, OR “ARSTRONG CORK COMPANY Ltd.” Or Johns Manville” and/or approved equivalent.

Acoustical ceiling tiles or panels shall be of the size thickness, whether perforated or non-perforated, design and finishes shown on the Drawings and/or stated in the Bills of Quantities.

Samples of acoustical ceiling tiles or panels in suspension system members, with catalog data, shall be submitted to the Engineer for approval.

3-100 SPECIFICATIONS FINISHINGS

b) Aluminium Ceiling Panels
Aluminium ceiling panels shall be similar to “luxalon Aluminium Panel Ceiling, the product of “Hunter Duglas” or “MIRAWAL DAMPA Aluminium Acoustical Ceiling Systems, the product of MIRAWAL COMPANY” and or approved equivalent.

Aluminium ceiling panels shall be of the size, thickness whether perforated or non-perforated, design or type and finishes shown on the drawings and/or stated in the Bills of Quantities.

Samples of aluminium ceiling panels with carriers shall be submitted to the Engineer for approval prior to order.

c) Plain Asbestos Cement Panels
Plain asbestos cement panels, shall be minimum 8mm, thick of an approved manufacturer. Asbestos cement sheets shall meet the requirements of B.S. 4036 “Asbestos cement fully compressed flat sheets”. Panels shall be of the non-perforated type.

d) Metallic Grid, Hangers and Fixing Accessories
All suspension members, hangers, wires, strips, clips, clamps, etc., shall be of the sizes and types recommended by the manufacturer of the suspended ceiling systems.
The metal grid for suspended ceilings shall be either concealed or exposed system as indicated on the Drawings and/or stated in the Bills of Quantities.

The exposed metal grid system for suspended ceilings shall be made of aluminium sections or factory hot doped galvanized steel sections and the concealed system shall be made of steel sections painted with approved rust inhibitive primer as recommended by the manufacturer of suspended ceilings and approved by the Engineer.

**J 17.03 Workmanship**

Acoustical materials shall be installed under temperature and humidity conditions similar to those which will exist when the building is occupied. They should not be installed when buildings are damp and cold or dry and hot. Plastering floor and wall cladding shall be completed and allowed to dry before the installation of acoustical materials commences. All windows and doors shall be in place and glazed. Poured or precast concrete or similar roof decks shall be thoroughly dry.

---

**3-101**

**SPECIFICATIONS**

**FINISHINGS**

Buildings shall be examined before beginning work to determine that it is properly enclosed and the structure is in proper condition to receive acoustical material and/or suspension system. Areas shall be from cleaned and uninterrupted for free movement or rolling scaffold.

All products covered by these specifications shall be installed in accordance with the latest edition of the approved manufacturer’s specifications.

All acoustical materials and suspension systems shall be installed by skilled labour, thoroughly experienced with this type of installation and in strict conformity with the manufacturer’s specifications and to the approval of the Engineer.

Suspended ceilings shall be constructed in accordance with the details and instructions supplied by the manufacturer and approved by the Engineer. The grid shall be constructed to true level and to produce a perfect alignment of the joints truly parallel to the buildings lines, and completely free from waviness.

Special access hatches as required shall be provided next to air conditioning and ventilation units and wherever required by the Engineer. Mounting details shall be applied for the surrounding edge of lighting fixtures and air inlets and outlets and edge of ceiling.
After the installation of the panel carriers for the aluminium ceiling panels, the panels shall be clipped onto the carriers without the use of any tools.

Plain asbestos cement panels for closing and gaps of suspended ceilings and access panels to gear boxes or ducts shall be cut to true sizes and screwed to galvanized steel angle framing in accordance with the manufacturer’s directions and to the satisfaction of the Engineer.

Following installation, the Contractor shall clean soiled or discoloured surfaces of units, remove and replace any unit which is damaged or improperly installed to the satisfaction of the Engineer.

**PROTECTION AND CLEANING**

All wall, floor and ceiling finishes shall be protected from damage until the completion of the Works. Should any damage be caused it shall be made good to the satisfaction of the Engineer at the Contractor’s expense.

All floors, skirtings and unpainted wall finishing shall be cleaned and left perfect on completion.

3-102

**INDEX**

**SECTION K GLAZING**

<table>
<thead>
<tr>
<th>Division</th>
<th>Titles</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>K – 1</td>
<td>Scope</td>
<td>3 - 103</td>
</tr>
<tr>
<td>K – 2</td>
<td>Materials</td>
<td>3 - 103</td>
</tr>
<tr>
<td>K – 3</td>
<td>Workmanship</td>
<td>3 - 104</td>
</tr>
<tr>
<td>K – 4</td>
<td>Protection and cleaning</td>
<td>3 - 105</td>
</tr>
<tr>
<td>K – 5</td>
<td>Method of measurement</td>
<td>3 - 105</td>
</tr>
</tbody>
</table>
SECTION K

GLAZING

K 1

SCOPE

These specifications cover Glazier work intended for the glazing of doors, windows, etc. for the project in accordance with the schedule of Doors and Windows Drawings, Bills of Quantities and as instructed in writing by the Engineer.

K 2

MATERIALS

K 2.01 General

All glazing shall conform to the requirements of B.S. 952 and shall be of uniform thickness free from waviness, air bubbles and all other defects; they shall be of first quality such as manufactured by “PILKINGTON”, SAINT GOBAIN” or approved equivalent.

All glass shall be delivered to Site in proper containers with maker’s name, guarantee, type of glass and thickness or weight of glass attached to the outside of the containers.

K 2.02 Clear Sheet Glass
Clear sheet glass shall be transparent, flat, relatively thin glass having a glossy, fire-finished, plain and smooth surface. The defects permitted in the central area of the type of glass are a few seeds, an occasional large seed not more than 6mm long, faint strings or lines, and very light scratches and other surfaces defects detected only by close scrutiny. No pane (separate piece of glass) shall contain all of these defects and those present may not be clustered when in the central area. In general, the central area of light shall be as free from defects as possible and the appearance of the light as a whole shall be such that there is no perceptible interference with sight through the glass.

The clear sheet glass shall not weigh less than 10 kg/m² when 4mm thick and not less than 15 kg/m² when 6mm thick.

**K 2.03 Polished Plate Glass**

Polished plate glass shall be of light and/or medium bronze colour and shall have its two surfaces perfectly flat and parallel so that they provide undistorted vision and reflection. Polished plate or float glass shall not weigh less than 10 kg/m² when 4mm thick and not less than 15 kg/m² when 6mm thick. The respective weights of the 8, 10 and 12mm thick polished plate glass shall be as manufactured by “PILKINGTON”, “SAINT GOBAIN” or approved equivalent.

**K 2.04 Putty**

Putty for glazing to wood other than non-absorbent hardwood shall be tropical grade wood glazing. Putty for glazing to metal and non-absorbent hardwood shall be tropical grade metallic glazing.

**K 2.05 Neoprene**

Mirror glass shall be 6mm thick or as shown on the Drawings or stated in the Bills of Quantities. It shall be of selected quality plate glass silvered on one side, electro- copper-backed followed by a coating of shellac varnish and painted to the satisfaction of the Engineer.

Tempered float glass shall have been subjected to a special tempering process. Security glass shall be used in places and thickness as shown on the Drawings it shall impact mechanical strength comparatively light weight and impact resistance characteristics. When under terrific impact, it shall disintegrate into innumerable small, blunt-edged fragments and not into sharp-like ordinary glass.

**SPECIFICATIONS GLAZING**

Mirror glass shall be 6mm thick or as shown on the Drawings or stated in the Bills of Quantities. It shall be of selected quality plate glass silvered on one side, electro-copper-backed followed by a coating of shellac varnish and painted to the satisfaction of the Engineer.

Tempered float glass shall have been subjected to a special tempering process. Security glass shall be used in places and thickness as shown on the Drawings it shall impact mechanical strength comparatively light weight and impact resistance characteristics. When under terrific impact, it shall disintegrate into innumerable small, blunt-edged fragments and not into sharp-like ordinary glass.

**K 2.04 Putty**

Putty for glazing to wood other than non-absorbent hardwood shall be tropical grade wood glazing. Putty for glazing to metal and non-absorbent hardwood shall be tropical grade metallic glazing.

**K 2.05 Neoprene**

Mirror glass shall be 6mm thick or as shown on the Drawings or stated in the Bills of Quantities. It shall be of selected quality plate glass silvered on one side, electro-copper-backed followed by a coating of shellac varnish and painted to the satisfaction of the Engineer.

Tempered float glass shall have been subjected to a special tempering process. Security glass shall be used in places and thickness as shown on the Drawings it shall impact mechanical strength comparatively light weight and impact resistance characteristics. When under terrific impact, it shall disintegrate into innumerable small, blunt-edged fragments and not into sharp-like ordinary glass.

**K 2.04 Putty**

Putty for glazing to wood other than non-absorbent hardwood shall be tropical grade wood glazing. Putty for glazing to metal and non-absorbent hardwood shall be tropical grade metallic glazing.

**K 2.05 Neoprene**
Neoprene strips for aluminium elements shall be supplied by the manufacturer of aluminium elements. Neoprene strips shall be stored in a safe location and shall be protected from the sun and excessive heat.

K 2.06 Bead Glazing in Aluminium Frames

The bead glazing in aluminium frames doors and windows shall be special P.V.C. sections that fit into the aluminium frame and hold it firmly in position. Approved special mastic possessing the required adhesion and elasticity shall be used. In the case of heads where one end is free, mastic alone shall not be allowed, additional cleats of timber or metal shall be used to secure the proper fixing of the glass.

K 3 WORKMANSHIP

K 3.01 General

Prior to proceeding with any work, the Contractor must take all necessary measurements on Site to verify and supplement dimensions and conditions shown on the Drawings and the Schedule of Finishes.

3-104

SPECIFICATIONS

GLAZING

The Contractor shall protect all glazing work from damage during subsequent operations, made good any defects, clear away upon completion, clean throughout and leave all work in perfect condition to the satisfaction of the Engineer.

All accessories and other items essential for the proper execution of the glazing work, though not specifically shown on the Drawings or specified, shall also be provided under this chapter.

The Contractor shall fix all glass frames with all the required gaskets, clips, points, etc. all glass panes shall have rounded edges to prevent any damage to the gasket. All glass shall be cleaned by the Contractor before completion of the works.

K 3.02 Glazing to Metal

Only glazing to metal with beads shall be permitted. The rebates shall be previously treated as specified under “PAINTING” and the bedding putty inserted. The glass
shall be embedded in the putty and secured by the beads. The bedding out shall be trimmed off level with the sight line to form a neat putty and painting shall be carried out.

K 3.03 Glazing without Putty

Where specified, flannel, felt, asbestos, rubber. Neoprene or similar materials shall be used in place of putty for internal glazing in conjunction with beads. The material should be so fitted as to cover all parts of the glass which will be covered by the rebate and beads.

K 3.04 Fixing of Mirrors

Mirrors shall be fixed to walls with rubber sleeves and chromium plated dome-headed screws driven into rawl plugs set into walls.

K 4 PROTECTION AND CLEANING

The Contractor shall protect all glazing work until completion, replace all cracked or broken glass and clean all glazing on both sides and all mirrors before handing over.

K 5 METHOD OF MEASUREMENT

Glass panes shall be measured net as executed.
SECTION L

PAINTING

L 1

SCOPE

The Specifications cover paint work to exposed concrete and plastered surfaces, wood work, ferrous and non-ferrous surfaces in accordance with the Schedule of Finishes, Drawings, Bills of Quantities and as directed in writing by the Engineer.

The term “Paint” as used herein includes emulsions, enamels, lacquers sealers and other coatings, organic or inorganic, whether used as prime intermediate of finish coats.

All painting works shall be applied by skilled workmen experienced in this work.

L 2

MATERIALS

L 2.01 Materials in General
The materials to be used shall be of the best quality and of approved types, obtained from an approved manufacturer(s).

All paints shall comply with the following requirements:

a) The product shall be thoroughly mixed and ground.

b) The colour of the paint shall match the approved sample.

c) Paint shall show no evidence of cracking, chipping or flaking.

d) Paint in the containers during and after application shall not be abnormally pungent, offensive or disagreeable.

e) Paint shall show easy brushing, good flowing and spreading and levelling properties. These properties shall be demonstrated on test specimens at the request of the Engineer. Coats that have any noticeable pull under a large brush and that show poor spreading and flowing properties will not be acceptable.

f) Paint shall dry to a uniform, smooth, flat or semigloss finish under ordinary conditions or illumination and wearing. There shall be no laps, skips, high-lighted spot or brush marks. Tinted paints shall dry to a uniform colour.

g) Recoating of a previous painted surface shall produce no lighting softening or other film irregularities.

3-106

SPECIFICATIONS
PAINTING

L 2.02  Flintcoat Protective Coating

Flintcoat protective coating on fire escape staircase floors shall be coloured, “Decoralt” the product of “Flintcoat” or approved equivalent. It shall be especially compound acrylic resin latex colour coating, heavy bodied, flexible and abrasive resistant.

L 2.03  Knotting

Shall be composed of dissolving shellac or other resin remains unaffected by the resinous materials in the timber leaching into the paint film and causing discoloration or defective drying

L 2.04  Mordant Solution
Shall be composed of a solution slightly acidic in nature and containing solvents, for applying to new smooth metallic surface to remove grease, organic soaps and provide a physical key and shall be obtained from an approved supplier.

L 2.05 Fillers
Shall be "Polyfilla", Alabastine or approved equal.

L 2.06 Stopping
Shall be hard stopping composed of white load paste, gold size (oleo resinous medium) and other fillers obtained from an approved supplier.

L 2.07 Putty Filler
Shall be composed of white lead and dry filler mixed with pure linseed oil, the content of the white lead shall be not less than ten percent (10%) of the mixture by volume and shall be obtained from an approved supplier.

L 2.08 Thinners
Shall be approved turpentine or white spirit, except where the paints are specified to be water thinered, fresh water shall be used.

L 2.09 Stain for woodwork shall be of an approved branch of oil stain complying with B.S. 1215.

L 2.10 Shall be pure tinty colour that will easily dessilve and mix with the various coatings and shall conform to the requirements of B.S. 1014: 1961 "Pigments for cement, magnesium oxychloride and concrete".

L 2.11 Rust Inhibitor
Shall be “galvanized” primer, manufactured by “Seconrastic ltd. Brackwell Berks, England” or Crown Chorinated Rubber Zinc Rick Primer-Product Data Sheet No. 56, manufactured by the Walpamur Co. Ltd., Darwen Lance and/or approved equivalent.

L 2.12 Primers
Primers applied to surfaces of different materials shall be as follows:

a) Interior or exterior plastered surfaces: Alkali resistant primer as recommended by the manufacturer.

b) Ferrous Surfaces: Lead based or zinc Chromate and Calcium Plumbate as recommended by the manufacturer.

c) Non-ferrous surfaces: Mordant solution of an approved brand and rust inhibiting primer.


L 2.13 Undercoating Paints

For exterior or interior shall be as follows:

a) 2 coats of whitewash or colorwash as shown on the Schedule of Finishes and the Drawings.

b) White lead bases undercoating in accordance with B.S. 2525: Colours shall be similar to the finishing paint.

c) Other undercoating paints to be applied as recommended by the manufacturers of the finishing paint.

L 2.14 Finishing Paints

Shall be as follows unless otherwise indicated on the Drawings:

a) Interior plastered surfaces and exposed concrete surfaces as shown on the Schedule of Finishes and the Drawings.

b) Exterior exposed and plastered surfaces as shown on the Drawings.

c) Plastered surfaces of toilet.

3-108
let, kitchen etc. ditto } interior use of an approved colour and supplier.

d) Interior or exterior ferrous and non-ferrous surfaces. ditto } R.I.W.No.424 Chlorinated rubber paint interior or exterior grade, manufactured by "R.I.W. protective Product Co. Ltd. 25 Whitehouse Rd.Croydon" or "Detel Products Ltd., South Ruuslip, iddlesex, England" or Crown chlorinated finish-Product ata Sheet 7 as manufactured by the Walpamur Co. Ltd. Darwen Lancs" and orquivalent.

e) Interior woodwork surfaces other than hardwood } Oil paint semi-gloss finish of an approved manufacturer.

f) Hardwood surfaces } Approved oil stain and ducco spray, or flat enamel paint.

L 3 WORKMANSHIP

L 3.01 General

The Contractor shall submit to the Engineer for approval the brand and quality of the paints he proposes to use.

If approval is given to a brand of paint the Contractor shall use the primers, undercoats etc. manufactured or recommended by the manufacturers of that brand.

3-109 SPECIFICATIONS PAINTING

All paints to be used under this contract shall be delivered and stored on the Site in sealed, labelled containers, a minimum of 30 days prior to application by the Contractor that the material is at the Site, samples of each material shall be obtained at random from sealed container by the Engineer in the presence of an authorized representative of the Contractor.

Samples shall be clearly identified by commercial name, type of paint and intended use. If judged necessary by the Engineer the paint samples may be tested in a laboratory designated by the Engineer at the Contractor's expense,
Complete colour charts for the paints to be used shall be submitted to the Engineer for approval.

Pigmented paints shall be furnished in containers not larger than 25 kgs. All paints shall be produced that have a minimum of 2 years satisfactory field services.

Mixing and application of paint shall be in accordance with the Specifications of the manufacturers concerned and to the approval of the Engineer.

The mixing of paints etc… of different brands before or during application will not be permitted. No dilution of painting materials shall be allowed except strictly as detailed by the manufacturers and as approved by the Engineer.

Hardware, hardware accessories, machine surfaces, plates, lighting fixtures and similar items in place prior to cleaning and painting, which are not intended to be painted, shall be removed or protected prior to painting operations and repositioned upon completion of painting work as directed by the Engineer.

Equipment adjacent or against walls shall be disconnected by workmen skilled in these trades and moved to permit the wall surfaces to be painted, and following completion of painting shall be replaced and reconnected.

Cleaning solvents shall be of low toxicity. Cleaning and painting shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet or newly painted surfaces.

Brushes, pails, kettles, etc… used in carrying out the work shall be clean and free from foreign matter. They shall be thoroughly cleaned before being used for different types or classes of material.

3-110 SPECIFICATIONS
PAINTING

No exterior or exposed painting shall be carried out under adverse weather conditions such as rain, extreme humidity, dust storms, etc.

Painting shall preferably be shaded from direct sun light to avoid blistering and wrinkling. Wherever possible, painting of exterior surfaces shall “follow” the sun such that it is carried out in shadow.

Edges, corners, crevices, welds and rivets shall receive special attention to insure that they receive an adequate thickness of paint.
All cracks and holes shall be cut out properly square and made good with suitable hard plaster or cement sand mix as appropriate such repaired portions being allowed to dry out and sandpapered smooth.

**L 3.02**

**Plastered Surfaces with Emulsion or Enamel Paint**

Such works shall be allowed to dry out completely before carrying out the painting operation. Plaster applied in the winter season shall be at least five weeks old and that applied in the summer shall be at least two weeks old before commencing painting operations.

Preparation of surfaces shall consist of vigorous brushing and rubbing down to remove loose surface material and dust.

Surfaces shall then be left for a week to determine whether efflorescence reappears in which case it shall be brushed off dry and a further waiting period of one week allowed.

Alternatively, the surfaces may be neutralized by brushing on a solution of 3 percent phosphoric acid and 2 percent zinc chloride and removing all loose particles after drying. No painting shall be carried out until the Engineer is satisfied that no efflorescence is occurring.

Where required by the Engineer one or two coats of “Alkali resistant” primer shall be applied, sufficiently thinned to penetrate the surface.

All plastered and concrete surfaces shall be twice stopped with approved putty filler. The first coat of stopping shall be applied after the primer coat dried out completely and the second coat after the first undercoat application. Each coat of stopping shall be allowed to dry and harden thoroughly and shall then be rubbed by sandpaper until smooth surface is achieved.

A minimum of two (2) approved undercoats recommended by the manufacturers of finishing coat shall be applied by brushing well into the surface. Each coat shall be allowed to dry and harden thoroughly before the next coat is applied.

The finishing coat of paint shall be applied after the completion and testing of the mechanical and electrical works.
Ferrous Surfaces

Surfaces shall be thoroughly cleaned to remove and dirt, wire brushed and scraped to remove scale and rust. One coat of approval putty shall be applied on the surfaces and left to dry for at least twenty four (24) hours, surfaces shall then be rubbed by sandpaper or other approved means before primer is applied.

One coat of rust inhibiting “Galvanized” primer or other approved equal shall be applied by brushing well into the surface and shall be allowed to dry and harden thoroughly before the application of subsequent coats.

If ferrous works delivered primed, the surfaces shall be examined to ascertain that the primer coat is hard. If not satisfactory the primer coat shall be removed and the surfaces cleaned to remove grease and dirt and reprimed as described above for ferrous. Abraded spots on shop-coated surfaces shall be wire-brushed and touched up with same materials as the shopcoat.

The under-coat and finishing coat shall be chlorinated rubber paint interior or exterior grades and used all in accordance with the directions of the approved manufacturer.

Chlorinated rubber paint, interior or exterior grades, shall not be applied in damp, foggy or freezing weather or to any surface which is not perfectly dry. Ferrous surfaces shall be thoroughly cleaned free of all rust, scale, dirt, oil and grease, etc...

Brush application is recommended although this material may be sprayed if desired, only special thinners produced by the approved manufacturer may be added to achieve the spraying consistency required.

Special approved thinners may be used for cleaning brushes after use.

Non-Ferrous Surfaces

Galvanized steel surfaces to be painted shall be solvent-cleaned or painted with mordant solution before the
application of paints as described above for ferrous surfaces.

L 3.05 Wood Surfaces

Wood surfaces except surfaces to be given natural finish or other finish specified shall be primed, undercoated twice with undercoating paint as recommended by the manufacturer of finishing coat and final coat with semi-gloss enamel paint of approved manufacturer.

Wood surfaces shall be scrubbed with abrasive paper to obtain a smooth surface. Surface mould where present shall be removed by washing, rubbing down and burning off as necessary. Oil wood shall be swabbed with white spirit. Resinous exudation and large knots shall be removed and replaced by approved filler or knot sealer and the surface shall be primed.

Parts of wood to be enclosed in walls shall be primed unless already impregnated with creosote or other preservative. Priming shall be brushed on and a minimum of two coats applied to end grain. After the primer coat is hard, all cracks, holes, open joints, etc. shall be made good with hard stopping and rubbed with fine abrasive paper. If the first process of stopping found to be unsatisfactory it shall be repeated after the first undercoating is applied and well it shall be repeated after the first undercoating is applied and well dried.

Priming of joinery shall be applied only on the site after the Engineer has approved such joinery and before it is fixed. The two undercoat paints shall be applied on wood doors, panels, etc. before they are fixed, to ensure that the bottom and top edge and sides are thoroughly painted. The finishing coat of paint to such wood doors, panels etc. shall be applied after fixing in position and as directed by the Engineer.

Wood surfaces specified as stained shall only be rubbed down with fine abrasive paper and two coats of oil stain ducco sprayed to the satisfaction of the Engineer.

L 3.06 Flintcoat Protective Coating

Wood surfaces specified as varnished shall be thoroughly cleaned down of all dirt, oil, grease, etc., and rubbed to a smooth finish, knots shall be treated with knotting and 2 coats of approved oil varnish applied.
Two coats of flintcoat Decoralt coloured coatings should be applied at normal dilution i.e.: two (2) columns Decoralt and one (1) volume water, using no primer. The first coat should be allowed to dry before applying the second one.

**L 3.07 Oil Stain Finish to Woodwork**

The stain finish to woodwork shall be an approved manufacturer’s oil stain system applied strictly in accordance with the manufacturer’s instructions.

All surfaces are to be thoroughly dry and cleaned and sanded down and all nail holes or similar defects shall be filled and levelled up with approved hard stopping.

The finish shall be applied in two coats. The first coat shall be pigmented stain wax brush applied. The surface shall be allowed to dry for 2-10 minutes and then rubbed with a cloth in rotary motion to remove excess stain and produce an even surface.

The first coat shall be allowed to dry completely before application of the second coat.

The second coat shall be natural (clear) stain wax, buffed.

The Engineer shall select the stain colour and the Contractor shall allow for preparing sample panels for the Engineer’s approval and these sample panels will provide the standard for the work.
SECTION M

ELECTRICAL WORKS

Electrical contractors are invited to quote for the supply of all labour and materials required for the completion of part of all the electrical installation.

M-1  GENERAL REQUIREMENT:-

1- Prerequisite Conditions:-
All applicable sections of the general Specifications are included by reference to the work required by this division of the specifications.

2- **Extend of Work:-**

a- The work shall include all necessary labour, materials, plant services machinery and appliances and at the Contractor’s own risk and expense, to deliver construct and install complete in good working condition the electrical installation in accordance with the drawings, specifications and bills of quantities. All materials and workmanship shall, except where otherwise directed, comply with the requirements and regulations of the appropriate local Electrical Authority, and I.E.E. and shall be subject to the approval of the Electrical Engineer.

b- Work shall also include: -

1- The procurement of and payment for all permits and licenses required for the performance of the work.
2- All hoists, scaffolds, staging, runways and equipment required for the performance of the work.
3- All job measurements and shop layouts required for the proper installation of material and equipment included in the work.
4- All lights, guards and signs as required by safety regulations applicable to the work.
5- The removal from the premises, as it accumulates, of all dirt and refuse resulting from the performance of the work.
6- All equipment under this heading shall be installed under competent supervisory service finished by this Contractor and where necessary this shall include the services of special erection and operation engineers.

3 - **Miscellaneous Conditions**

a. All installed material and equipment shall be new, shall be of the best quality and design, and shall be free from defects and imperfections.

b. All labour for the installation and adjustment of material and equipment shall be done by experienced
mechanics of the proper trade and all workmanship shall be first class.

c. Installed material and equipment included in the work shall be protected from dirt and damage and maintained in a clean condition during the performance of the work.

d. Apparatus, equipment and material required for the performance of the work shall be stored under requirements of applicable regulations and of direction from the Architect.

e. This Contractor shall cooperate with all other Contractors on the project, be responsible for prompt delivery of all materials and equipments and for the installation of all works under this division at a time and in a manner so that there will be no delay in the construction schedule.

f. Acceptance of the work shall be subject to the condition that all installed systems, equipment, apparatus and appliances included in the work shall operate and perform as designed and as selected with respect to efficiency capacity and quietness and shall operate and perform without producing objectionable noise within occupied areas of the building.

g. Acceptance of the work shall be subject to the conditions that any time within one year after date of final approval, any defective part of the work resulting from the supply of faulty workmanship or material shall be immediately amended, repaired or replaced as a part of the contract work without cost to the owner.

4 - POWER SUPPLY:

The system of distribution will be fed from a 230/400 volts 3-phase, 4 wire 50 Hz, system.

5 - SYSTEM OF DISTRIBUTION

The system of distribution to be used for lighting and power is to be the radial type, including branch circuits and ring circuits system where shown in drawings.
a - All electrical drawings are intended to cover the layout and design of the work, but are not to be scaled for exact measurements. Where special detail and dimensions are not shown on the drawings, this Contractor shall take measurements and make electrical layouts as required for the proper installation of electrical work so that interference with all other work will be avoided.

b - All drawings and specifications on the project are complementary, each set to all other sets, and they shall be used in combination for the execution of this work. Electrical work shown on any set drawings, including all architectural drawings for general work and equipment, and electrical work called for under any section of the project specifications, shall be considered as included in this work unless specifically excluded by inclusion in some other branch of the work. This shall include roughing in for fixtures and equipment as called for or inferred. This Contractor shall check all drawings and specifications for the project and shall be responsible for the installation of all electrical work.

7 - INSPECTION OF SITE

Contractor of this work shall inspect the Site, study existing conditions, check with the drawings and specification and be fully informed as to the work required the Contract.

8 - OPERATION AND MAINTENANCE INSTRUCTIONS:

a - This Contractor shall furnish all services as required for adequate verbal and printed instructions to the Owner's operating and maintenance personnel for operation and maintenance of all equipment and systems installed under this heading. Two complete copies of a service manual in hard back binders shall be furnished at the end of the project and shall include printed operating and maintenance instructions for systems specified under this heading, all approved shop drawings and all manufacturer's printed instructions for equipment operation and maintenance.

b - When the work is complete and at a time designed by the Owner, the Contractor shall furnish the services of a qualified instructor to instruct the Owner's personnel in the operation and maintenance the systems and equipment.
a - Contractor shall be required to keep a day to day record of changes in location of all equipment, conduit, and devices on one or more sets of contract drawings, underground utilities, use to be dimensioned from building walls, foundations or other readily indentifiable feature.

b - The Contractor shall record such changes in red ink on black line prints, the record prints shall be submitted to the Architect for approval prior to final payment.

10- CUTTING AND PATCHING: -

Any cutting of new construction which is required for the installation of electrical work after the construction of walls and floor slabs, shall be done by this Contractor. Cutting shall be done with extreme care so that the strength of the structure will not be endangered. Adequate protection shall be provided to prevent damage to adjacent areas. Patching and finishing of opening shall be the responsibility of the Electrical Contractor.

11- EXISTING EQUIPMENT: -

a - All existing equipment that indicated to be removed shall remain the property of the Owner if he so desires. Such equipment shall be removed by the Contractor and delivered to a point on the project site as designated by the Owner. Any equipment that the Owner does not desire to retain shall be promptly removed from the Site by this Contractor.

b - Any existing equipment or material that is to remain in service and is damaged by the Contractor during the course of the Contract, shall be repaired and refinished or replaced to the satisfaction of the Owner, at his discretion.

12- CONDUCT OF WORK: -

All work under this Contract which may interfere with the Owner’s Operation shall be done in such a manner and at such time as may be satisfactory to the Owner. Make temporary alternations and connections as required to execute work so that all services in the building are maintained with the minimum possible interruption. Temporary shutdowns shall be segregated and shall be of the shortest possible duration. All services shall be kept on continuous operation unless permissions are otherwise granted by the Owner. All temporary wiring shall be the responsibility of the Contractor at no additional cost of the Owner.
If anything necessary to the proper installation or operation of the electric system is omitted from the drawings or specifications, or bill of quantities, or indicated incorrectly, the Contractor shall call the attention of the electrical Engineer to these omissions or inaccuracy immediately before work proceeds. Should the Contractor shall fail to do so, he shall be held responsible and shall make good at his own expense such errors or any damage caused.

14- SAMPLES: -

Single samples of the following shall be submitted to Electrical Engineer by the Contractor before the work commences. Section of conduit, section of wire and cable, junction boxes, switches and plates, outlet box isolating switches, lamp holders, ceiling roses distribution boxes, circuits breakers, earth leakage relay and any fixtures supplied by the Contractor and other materials to be incorporated in the installation, the work done by the Contractor shall not vary in any manner from the samples submitted and approved without written permission from the electrical engineer.

15- LAYOUT: -

Before the Contractor commences the installation he shall discuss the exact timing and the whole layout in detail with the Engineer, in order to determinate the exact position of distribution boards, fittings and accessories, and the runs of cable and conduits unless instructions are given after the relevant section of the work is completed.

16- DRAWINGS: -

The design of the accompanied drawings and the quantities in the attached schedules are not definite and are subject to any variations made by the Electrical Engineer during constructions. No variations or amendments in the drawings and the specifications shall be made to the Contractor except as directed in writing by the Electrical Engineer who has the right to refuse all the materials and works which are not, in line with the drawings and specifications.
17- **TESTING:**

The Contractor shall make or cause to be made at his own expense and in the presence of the electrical engineer tests for perfect operation for installation, insulation resistance and earth continuity,

18- Tenderers for this work have the previous experience in this field of work and an official license of three phase installation from the Electric Company-Jerusalem District.

19- The Contractor should provide on his own expense and all risks insurance policy for his workers during all the period of his work.

20- The Contractor or his representatives should be on the Site or work daily for taking any instructions from the director of works.

21- The Owner reserves, the right to accept any tender, either as regards the whole of the work indicated therein, or as regards any one or, more parts so included. The Owner does not bind himself to accept the lowest of any Tender.
M - 2

MISCELLANEOUS WORK: -

1 - EQUIPMENT IDENTIFICATION AND LABELS

a - All electrical equipment, such as disconnect switches, motor starters, controls, pushbuttons, panelboards, and other similar items shall be adequately identified with labels. Labels shall clearly designate name and use of equipment. Labels shall be made with embossed plastic tape except where engraved plates are called for elsewhere in the specification or on the drawings.

2 - GROUNDING:

a - Grounding shall be in accordance with the local Electrical Authority requirements and regulations, and with the I.E.E. regulations.

b - All branch circuit conduit wiring shall include an insulated copper wire for grounding of all non-current carrying conductive surfaces of electrical equipment subject to person contact, and for every electrical outlet.

c - Earth Electrode must be provided. This to consist of 3 driven copper rods 1.5 meter long of standard type, and must be installed as near as possible to the main board. The earth wire has to be copper conductor as specified making loop connection between the rods and the earth (ground) bus bar, the distance between each rod and the other have to be at least 7 meters with a checking man hall at least 60cm depth.

d - Other similar P.V.C. copper conductor has to be bonded to the main water supply pipe from the earth bus bar.

3 - ADJUSTING, ALIGNING AND TESTING:

a - All electrical equipment furnished under this heading and all electrical equipment furnished by others shall be adjusted and tested by this Contractor.

b - Mechanism of all electrical equipment shall be checked for alignment with drive and adjusted as required. Protective devices and parts shall be checked and tested for specified and required application and adjusted as required. Adjustable parts of all lighting fixtures and electrical equipment shall be checked, tested and adjusted as required to produce the intended performance.
3 - ADJUSTING, ALIGNING AND TESTING [CONT'D]

c- Complete wiring system shall be free from short circuits and after completion the Contractor shall perform tests for insulation resistance in accordance with the requirements of the I.E.E.

b- The Contractor shall be held responsible for the operation, service and maintenance of all new electrical equipment, furnished by him, during construction and prior to acceptance by the Owner of the complete project under this Contract. All electrical equipment shall be maintained in the best operating condition including proper lubrication. Operational failure caused by defective material and/or labour covered under other headings or furnished by others.

4 - MOTOR AND OTHER CONTROL EQUIPMENT

a- This Contract shall install and mount miscellaneous disconnect switches and motor controls furnished by other Contractors in accordance with their instructions, wiring diagrams and approved shop drawings, but he shall be responsible for the operation of such devices only to the extent of proper mounting and wiring. Work shall include mountings and supports as required for all equipments including angle frames, steel plates, bars, bolts, etc. This Contract shall furnish and install all conduit, wire, etc., as required to connect all equipment furnished by him and other Contractors including motors, disconnect switches, starters, controls, pushbuttons, etc.

b- This Contractor shall perform all work required to rough in and connect to all equipment required electrical connections, except equipment that is furnished by the Owner which shall be roughed in only. This work shall be as indicated on drawings, by approved equipment shop drawings and by direction on the job.

c- The Electrical Contractor shall run feeders to control and motors as shown on drawings, make connections and install and wire all mechanical components, except temperature control, in accordance with wiring diagrams furnished by Mechanical Contractor. The Electrical Contractor shall coordinate with other traders involved for the proper coil voltages for control of magnetic starters and contractors.
5 - OPENING AND SETTING OF CONDUIT:

a - Work shall include the direction for other work as required to provide openings for the admittance into the building of material and equipment included in the work. Work shall include all cutting required for the installation of material and equipment included in the work.

b - Any cutting and/or patching of new construction which is required for the installation of Electrical work after new walls and floors have been constructed shall be the responsibility of the Electrical Contractor if the cutting and patching is due to errors or omissions on the part of the Electrical Contractors.

6 - EXCAVATION AND BACKFILLING:

a - This Contractor shall excavate as required for the installation of all underground work under this heading. Surplus material not needed for backfilling shall be deposited or distributed on the premises as directed. Trenches shall be of sufficient width and shall be cribbed or braced to prevent cave-in or settlement. Trenches close to walls and columns shall not be excavated without prior consultation with the Architect or his representative. Pumping equipment shall be furnished to keep trenches free of water. Dry earth shall be rammed into place at sides of conduits, leaving joints and top of conduits exposed until approved. After approval, all trenches for work installed by the Contractor shall be backfilled by him in 15cm layers of well-tamped dry earth in a manner to prevent future settlement. Rocks debris, bricks, and like material shall not be used for backfill. Where direct burial cable is installed the trenches shall have 5cm of medium sand installed in bottom of trench and put over the sand.

b - Any trenches improperly backfilled or where settlement occurs, shall be reopened to a depth required for the proper compaction, then refilled and compacted with the surface restored to the required grade.

c - As a part of this Contract, all roads, streets, and sidewalks damaged by the installation of building services or other work under this heading shall be repaired to the satisfaction of the authorities and regulations having jurisdiction.
1 - CONDUITS

- Conduit shall be installed for all wires and cables except where otherwise stated or directed. The conduits shall be P.V.C. pipe of the thinner type (Merikaf) or similar under plaster.
- of a fireproof plastic type should be used whenever exposed installations are used. And it shall Conduits be securely fastened in place with approved straps.
- Steel conduit should be used in the boiler, and elsewhere directed by the Electrical Engineer.
- No conduits used should have an internal diameter less that 13mm. The Conductors area within the conduit should not exceed 50% of the area of the conduit.
- The conduit has to be away from heat mechanical pressure.
- The contractor shall be responsible for ensuring that the conduits are so laid that water cannot infiltrate or accumulate at any point.
- The Contractor shall be responsible to ensure that placing of the conduit is done prior to pouring of concrete without delaying the concrete work.
- In conduit installation the Contractor should make all his effort to run all the pipes in horizontal or vertical lines and not inclined and to be at the same level from the floor in all rooms.
- The conduits should have at least cover of 2cm of plaster or concrete.
- Separate conduits have to be used for separate systems of different voltage.
- Conduits between any two connection boxes have to be of one piece with no connection in the pipes.
- Where finish wall surfaces are to be plastered, the Electrical Contractor shall cooperate with the General Contractor during construction of these walls and use care in the installation of all conduits and boxes so that wall surfaces will have a finished appearance.
- Conduit shall be installed to requirements of structure and to requirements of all other work on the project. Conduit shall be installed to clear all openings, depressions, pipes, ducts, reinforcing steel, etc., and conduit set in forms for concrete structure shall be installed in a manner that installation will not affect the strength of the structure.
1 - **CONDUITS (cont’d)**

n - All electrical work shall be protected against damage during construction and any work damaged or moved out of line after roughing-in shall be repaired and reset to the approval of the Electrical Engineer, without additional cost to the owner.

o - All conduits have to be approved by local standard.

2 - **PULL BOXES AND CONNECTION BOXES**

a - The contractor has to make his best to use the minimum number of these boxes.

b - All boxes should be of the same material as that of the conduits.

c - Boxes should be wide enough to contain easily all connections of cables.

d - Pull boxes and connection boxes should be installed all at the same level from ceiling.

e - All boxes should be covered.

f - Installed connectors should be used in all the connections inside the boxes.

g - Cables of different voltage should not be drawn or connected in the same connection box.

3 - **OUTLET BOXES**

a - Suitable outlet boxes shall be installed for all electrical service outlets, including plug receptacles. Lighting fixtures, switches.

b - Location of outlets on drawings is approximate and, except where dimensions are shown, exact location of outlets shall be taken from plans and details on general drawings or as directed by the Architect. Outlets shall be located generally from column centers and finished wall lines or to center of acoustical and decorative ceiling panels and to centers or joints of wall panels.

c - Outlets shall be installed in an accessible location.

4 - **SWITCHES**

a - Outlet boxes for switches are to be fixed 140cm above finished floor level and 12cm horizontally from the outside edge of the nearest door.

b - Switches should be of 10 amp. With different signs for emergency switches if used.

c - Switches should be of waterproof type DIG or equivalent for the bathrooms and where otherwise shown.
4 - SWITCHES (cont’d)

d - All switches should be all-installed rockers flush of Tadiran kind or equivalent.
e - Switches shall be wired in the phase lines only.
f - The neutral conductors shall not be broken.
g - Switches panels shall have a similar assembly to switches and it should be group-mounted in a common box if possible, and if it is without pilot tamp. Otherwise it has to be group-mounted in aluminium or stainless steel cover to the approval of the Engineer.

5 - SOCKETS

a - Boxes for sockets outlets are to be installed 60cm or, as shown in the drawings above finished floor level.
b - Socket should be of 13 amp. For the power socket with different color for socket and non-emergency.
c - Sockets should be of Tadiran kind or equivalent type.
d - Sockets in the boiler room should be industrial heavy duty.
e - Sockets in the bathrooms and where Therese shown shall be waterproof type DIG or equivalent.
f - All sockets shall be wired in the same manner with the phase always connected to the same pole [rightpole].

6 - WIRES, WIRING

a - All wires and cables, except where otherwise stated are to have a soft copper core, refined and tinned, with an electric conductivity of not less than 98% the core shall be insulated with rubber with braid for 600 volley service.
b - Samples, of cabling and wiring proposed the contractor, are to be submitted prior to commencement of the work. These must comply with the requirements of the I.E.E., and local standard to ensure a constant voltage in every part of the building.
c - All wires are to be standard. [for lighting and power, the neutral wire shall be different in color from the phase wires].
d - All wires shall be run on conduit and shall be continuous between outlets and boxes. At least 20cm of wire be left at outlets for fixture connections.
e - Where wire size is shown on drawings, or specified, it shall be the same size throughout the circuit.
f - Wiring inside panel boards shall be neat and well arranged, using appropriate lugs for termination and connection of conductors.
g - Joints in the cables or wires are not allowed to be made inside conduits.
6 - WIRES, WIRING [CONDT'D]

h - Wires are to be fixed to boards with an appliance ensuring perfect electrical contact, to the approval of the Electrical Engineer.

i - In drawing wires through conduits, no lubricant is permitted.

j - Cable shoes have to be used for wires of 6 sq. mm. or above.

k - All boxes and distribution boards have to be carefully cleaned from plaster and other foreign material before drawing any electric wires or cables.

l - Colours of the cables should be as follows:

a. Single phase circuits:
   - Brown for the phase
   - Black for the neutral
   - Green & Yellow or White for the earth
   - Blue for direct [switch Wires].

b. 3 Phase circuits:
   - Brown, Yellow & Blue for the threephase.
   - Black for the neutral
   - Green & Yellow or white for the earth

m - Cables

a - All the cables should be of the following type N.Y.Y. 5 or 4 cores, 11000 volt, plain annealed high conductivity copper wire conductors P.V.C. sheathed. Under Ground cables should be of type NYBY.

b - Colours of cores in the cable should be red, yellow, blue & black. Colours of the sheathes shall be black.

c - Cables terminations should be through brass cable glands. Glands should be complete with brass earth tags and steel locknuts.

d - Cable connection at both ends should be through cable shoes.

e - Cables should be covered with soft sand, concrete slabs and special warning in 3 languages.

n - Wire Size

a - Sizes of wires are shown in the drawings

b - The size of the earth cable for any circuit should be the same size as that of the phase or as shown on the drawings.

c - The size of the wire for the bells, loud speakers and sound outlets should not be less than 0.6sq.mm.

d - Size of wire for Fir Alarm should be at least 1.5 sq. mm.
7 - ELECTRICAL BOARDS

1 - a - All boards should be manufactured by a qualified factory who has a wide experience in this field.

b - The tenderer should supply with his tender complete drawings for each board which shows the electrical and mechanical design of the boards with dimensions.

c - Therefore, the contractor gets the approval of the engineer before he commences with the manufacturing of these boards.

d - Electrical boards should be erected complete with all conduits terminated to it before installation of any cable in the conduit.

2 - BODY

a - Electrical boards and panels shall be ready made otherwise it should be manufactured from 2mm steel sheet with all angles and channels needed for supporting and mounting the equipment, and it should be full finished steel with electrostatic painting. Colour should be beige.

b - All screws. Nuts and washers should be galvanized.

c - Boards to be designed with removable front plates for easy access to the interior for cabling up and maintenance.

d - A special compartment with separate cover shall be made for terminals, neutral and earth bars.

e - All panel boards shall be with doors.

f - All doors which have equipment mounted on them shall be shielded from inside with isolation sheets.

g - Distribution Boards in wet areas should be of waterproof type.

h - All electrical boards shall have spare space of at least 25% of their area.

3 - BUS - BARS

a - All bus bars shall be of hard drawn electrolytic copper.

b - Bus bars shall be supported by suitable bus bar insulator to protect the bars from any electrical, mechanical and dynamic stresses.

c - Bus bars shall be rated at a max. of 2 amps/sq. mm.
4 - **NEUTRAL AND EARTH BARS**
Suitable bars for neutral and earth shall be mounted on the top compartment of each board, for terminating the outgoing circuits on them. A bolt with suitable size shall be welded on the body of each board for earthing.

5 - **LABELS**
All circuits shall be labelled in English language. Labels shall be of the black sandwich type and engraved.

6 - **MAIN C.B.S**
These C.Bs shall be air insulated, adjustable, with magnetic and thermal protection, and have a min. rupturing capacity of 25 K.A. These C.Bs shall be of the best quality and preferably of the Simmons or NZM-type made K.L.M. in Germany or equivalent.

7 - **MINIATURE C.B.S, AUTOMATIC CHANGE OVER SWITCH, [MECHANICAL INTERLOCK] AND E.L.Rs.**
These M.C.Bs shall be of the air insulated type with magnetic and thermal protection and fixed adjustment, the main rupturing capacity if these M.C.Bs, shall not be less than /5 K.A. The M.C.Bsm type N and E.L.R. shall be of the best quality and preferably Simmons or K.L.M. made or equivalent. All E.L.R. shall be 4-pole with 0,03 amp. Sensitivity.

8 - **ON-OFF SWITCHES**
All these switches shall be hand operated, air insulated and able to withstand any load and fault conditions. These switches shall be Siemens type N. or K.L.M. made or equivalent.

9 - **INSTRUMENTS**
All the measuring shall be very accurate which have dimensions of 120x100 mm. and mounted on the boards. All amperemeters shall be with selector switches to measure the voltage between phases and between phases and the neutral.

10 - **CONNECTORS**
All outgoing shall be terminated on connectors mounted on the compartment of the boards. Connectors must have a copper strip between the wire and the screws. All connectors shall have special paper fixed on them for writing the names of the circuits. Connectors shall be of or best quality.
**8 - TELEPHONES**

a - 1" conduit should be installed from each telephone box to the telephone box in the floor where shown in drawing with galvanized wire installed within for the telephone company.

b - The telephone box should be 1 meter high from floor level.

c - Main conduits from the floor boxes and the operator have to be shown in drawings with a galvanized wire.

d - Telephones cables for the main boxes and the telephone outlet should be drawn with the presence of the telephone department.
### LIGHTING FIXTURES SCHEDULE

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESCRIPTION</th>
<th>MANUFACTURER</th>
<th>TYPE OF LAMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Single Fluorescent Fixture on ceiling similar to GAASH No. 0403</td>
<td>Local Made</td>
<td>Fl. 1x36 W</td>
</tr>
<tr>
<td>B</td>
<td>Double Fluorescent Fixture on ceiling similar to GAASH No. 0403</td>
<td>Local made</td>
<td>Fl. 2x36 W</td>
</tr>
<tr>
<td>C</td>
<td>Globe on ceiling with Incandescent lamp, Similar to GAASH No. 73321</td>
<td>Local Made</td>
<td>Fl. 1x75 W</td>
</tr>
<tr>
<td>D</td>
<td>Recessed spotlight (Recessed spotlight with reflector lamp and white colour)</td>
<td>Local Made</td>
<td>Fl. 1x60 W</td>
</tr>
</tbody>
</table>
SECTION N

MECHANICAL WORKS

CENTRAL HEATING SYSTEM

1 - GENERAL

01 - SCOPE OF WORK - GENERAL
The Contractor shall include for supply, delivery, installation, testing and commissioning as specified of central heating plants each complete in every respect together with the provision of all materials, labor, supervision, tools, ladders, trestles, scaffolding, temporary lighting offices, lockup, stores, equipment and matters of all kinds necessary for the efficient completion and safe operation of the works in the manner specified and to the complete satisfaction of the owner, or his duly appointed representative or supervisor.

02 - WORKS INCLUDED
The following works will be carried out free of charge:
A-Builders work, such as making good of holes in floors and walls, the provision of pipe, excavation and back filling if necessary and the forming of bases for machinery.
B-The contractor shall provide all necessary fixing, screws, anchors, bolts, brackets and where necessary position those ready for grouting in, where pipes pass through walls and floor. The contractor shall be further responsible of:
1 - The accurate making out of all positions of holes, machines and equipment foundation.
2 - All wiring and cabling necessary inside Boiler Rooms and electric panels.

03 - CONTRACTORS STAFF AND LABOUR
The contractor shall make his own arrangement for transport, accommodation and messing of his own staff and labor employed on the work.

04 - APPROVAL FOR CUTTING AND LABOUR
Before undertaking any work on site which includes the cutting away, notching or drilling of any of the permanent works, the contractor shall secure the approval of the owner or his duly appointed representative.

05 - SUPERVISION
The contractor shall engage the services of a qualified and competent foreman to supervise the execution of the works.

06 - MATERIALS AND WORKMANSHIP
All materials supplied under this contract and all works carried out shall be of best quality and in accordance with best modern practice. The owner or his engineer or the authorized supervisor has the right to examine all
materials and equipment before installation and to reject parts or whole if proven defective or not in agreement with specification. The local material shall be according to local standard.

3 - 132

SPECIFICATIONS
MECHANICAL WORKS

07 - TESTS ON COMPLETION
Upon completion of the installation, the whole of the circulating water system network shall be subjected to a hydraulic test of 150 psi and according to the instruction of the owner or his representative. Any leaks or defective pipes shall be fixed according to the instructions of the engineer who has the right to reject any defective part of the installation. Furthermore, the contractor shall submit a fully comprehensive technical report on the overall system operation and performance. The contractor shall provide at his own expense all such labor, apparatus and instruments as are necessary for the efficient execution of these tests and shall submit to the owner two copies of a report embodying the results of these tests.

08 - REMOVAL OF DEBRIS
The contractor shall promptly remove from the site all debris arising from the works and shall maintain the site in a clean and tidy condition to the satisfaction of the owner.

09 - MAINTENANCE INSTRUCTIONS
The contractor shall furnish to the owner upon handing over of the works latest edition of manufacturers maintenance instructions to all equipment supplied in this contract.

10 - COORDINATION OF WORK
The contractor, before commencing work, shall examine all adjoining work on which this work is in any way dependent for prefect workmanship according to the intend of this specification. It is to be noted that various other items of apparatus and equipment will be furnished and set under other contracts. The contractor shall familiarize himself with requirements to the other contractors and shall examine the plans and specifications covering these contracts.

11 - TENDER DRAWING
Drawing showing approximate locations of machines, pipe, together with details of services required are listed at the beginning of the specifications.

12 - WORKING DRAWINGS
Within six weeks of receiving notification that the contractor has been awarded the tender he shall submit to the engineer for approval two copies of the following:
a- Machine room layout showing exact size of machines.
b- Complete detailed dimensioned drawings of all foundations for machinery.
13 - AS INSTALLED DRAWINGS
Within the months of the final handing over the works, the contractor shall submit to the engineer two copies of fully dimensioned tracings showing full details of installed equipment, exact location of pipes with sizes, position of air vent, controls, etc. Furthermore, the contractor shall also submit two copies of boiler room valve charts with valves labeled clearly, one copy must be glazed formed and hung in each boiler room.

14 - WATER SUPPLY QUALITY AND TEMPERATURE
The water will be supplied from the city water main pipelines. The chemical analysis of water are to be verified by contractor. The temperature of water mains will vary from about 4 °C [39 °F] in winter to 30 °C [86 °F] in summer.

15 - INSTRUCTION FOR WORKING AND MAINTENANCE
Framed and glazed instructions for the working and maintenance for the installation. Framed and glazed straight line and wire diagrams of the electrical connections. They shall be of the black on a white type in which the diagram, lettering etc., appear black on a white ground and will not fade.

During the delivery and erection of the installation, the contractor shall keep on the work a thoroughly qualified and efficient supervisor and shall use well-trained workers. The supervisor shall represent the contractor in his absence and if he is found in the opinion of the owner representative, to be incompetent or instantive, shall have authority to require his removal from job. The Tenderer must be able to show that he has had successful experience in the complete erection, setting to work and maintenance of similar plants, employs competent personnel to handle this service and maintains locally adequate stocks of parts for replacement or emergency purposes. The maintenance service, to be carried out by the contractor during the guarantee period for the entire equipment described herein the Contractor also shall repair or replace at his own expense, any electrical or mechanical parts of the equipment which fail or show sign of considerable wear or in any way prove unsatisfactory, [beyond the limits of fair wear from ordinary usage] within a period of one year from the date of the final acceptance and taking over, through faulty manufacture or design or through defective material or workmanship.

16 - PAINTING
All painted surfaces of all supplies under this contract shall be thoroughly clean, smooth and given not less than
two coats of red lead or anti-corrosion paint and with two finishing coats of the best quality paint of compositions chosen and approved for their resistance to heat, oil or weather etc. as the case may require.

SPECIFICATIONS
MECHANICAL WORKS

2 - HEATING INSTALLATIONS

01 - WATER CIRCULATING PUMPS
The contractor shall supply and install a range of either “SALMSON” or “ARMSTRONG” centrifugal pumps as indicated on drawings and bills of quantities.
All pumps shall be centrifugal type single stage directly coupled to a squirrel cage, totally enclosed fan cooled induction motor by a flexible coupling.
The pump shall have cast iron casing, stainless steel shaft, and good quality bronze impellers. Each pump shall be fitted with pressure gauge. The gauges shall be equipped with approved type cocks in order to take readings when required.
Each pump shall be fitted with a check valve on the discharge and an approved type strainer in the suction. Furthermore, each pump shall include with it a shut-off gate valve in the suction and a globe valve in the discharge for balancing purposes. The pump heads shall be confirmed after equipment selection and drawings are complete.

02 - PIPING
All piping shall be properly supported or suspended on stands, clamps, hangers, etc., of approved design. Supports shall be designated to permit free expansion and contraction while minimizing vibration. Pipes shall be anchored as directed by means of steel clamps securely fastened to the pipe and rigidly attached to the building structure. Screw threads shall be cut clean and true and joints made tight without caulking. No bushing shall be used. Reducing fittings shall be used to change pipe size. The drawings indicated generally the size and location of piping as designed for space conditions, ceilings heights, and may not be changed until coordinated with other contractors. If it is seemed necessary to modify the piping system the contractor shall size the pipes on the basis of 3-7 fps. Velocity and recheck pump heads which are presently indicative and for purposes of an estimate. Pipe work shall confirm fully of the following requirements:
- Piping shall be properly graded to secure easy circulation and prevent noise and water hammer. As much pitch as space conditions allow must be given. Capped dirt pockets to be installed at all riser heel, low points, and other places where dirt may accumulate must be provided. Allowance must be made
for proper provision for expansion and contraction in all portions of pipe work to prevent undue strain in piping or machines. Expansion joints to be installed as directed by the engineer.

Pipe Installation [COND'T'D]
- All Fittings such as elbows, tees etc. shall be of best quality, foreign made or local made “Class A” according to the local standard with smooth interior surfaces. Approved screw unions with bronze or steel bodies and ground brass raper or spherical joints shall be installed at traps, instruments, etc. and where else directed to permit easy connection and disconnection. Final connection to all equipment and fixtures shall be made in a manner that will permit the complete removal of any fixture or any piece of equipment without cutting of pipe line. If after the plant is in operation any system do not circulate quickly and noiselessly [due to trapped or airbound connections], the contractor shall make proper alternations in these defective connections. If connections are concealed in furring floors or ceilings, the contractor shall bear all expenses of tearing up and rebuilding construction and finish.
- All main shall have a slope of not less than 5 mm in 3 meters in the direction of flow. All branches shall have a slope of not less than 1mm in 3 meters towards the main. Each piece of pipe and each fitting shall be carefully inspected on the inside to see that there is no defective workmanship on the pipe or obstructions in the pipes or fittings. Joints in all screwed piping shall be made with red lead and boiled in seed oil, completely covered the male threads.
- Straight elbows, bushing, long screws or bull head tees shall not be installed, and all offsets shall be made with fittings. Pipes shall not be bend at any time.
- Pipe work shall be installed in manner to allow for ease of air escape and system draining. It shall be endeavoured to obtain this naturally by gravity. However, where conditions do not permit it an automatic air vent shall be installed at all air pocket locations and drain gate valves shall be supplied and installed at all low points and risers legs or as shown on drawings.

B - Materials for pipings

<table>
<thead>
<tr>
<th>Service</th>
<th>Material</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot water for heating</td>
<td>Steel</td>
<td>Black schedule 40</td>
</tr>
<tr>
<td>Feed Water</td>
<td>Steel</td>
<td>Galvanized “Blue sign”</td>
</tr>
</tbody>
</table>
C - Hangers, Supports, Anchors, etc.

The contractor shall provide suitable and substantial hangers and supports for all piping. Piping shall be carried by pipe hangers supported from concrete inserts. In general supports for pipes shall be not more than 2.5m, apart for 2” and smaller pipes according to the conditions of the job and directions of the engineer. All vertical piping be supported by heavy pipe clamps resting on the building structure. No piping shall be hung from other piping and all hangers shall be of heavy construction suitable for the size of pipes being supported. All piping in the Boiler Room shall be provided with rubber in shear vibration eliminating hangers.

All horizontal pipes shall be supported by split ring hangers of malleable iron, with sockets for hangers of solid rod the length of each shall be adjustable. Under concrete slabs hanger rod shall be hung from cast iron inserts during concrete pouring, or by use of inserts chilled into concrete after the floor is poured.

Anchors shall be separate and independent from all hangers and supports. All anchors shall be of heavy angle iron construction and suitable in every way for the work, and shall be installed where necessary or as directed by the Engineer.

D - Valves

Hand valves and check valves shall be of an approved quality “KIM” or equivalent and shall be furnished and installed as shown on the drawings or as directed during construction. All valves for balancing purposes in pumps discharges shall be globe type. Other valves for shut-off purposes shall be gate type. Check valves in horizontal positions shall be 15 swing checks; valves in vertical position shall be balanced check valves of the low pressure drop type. The contractor shall also include for furnishing the required valve tag as well as a schedule of valves with a schematic drawing showing position of each. The drawing shall be glazed, framed and hung in the Boiler Room.

E - Strainers

All strainers in water lines shall be Y-pattern set in a horizontal run of the pipe. All strainers shall have cast iron or bronze bodies of sample strength for the pressure to which they are subject to under operation. They shall have removable cylindrical or
conical screens of nickel. They shall be of such a design as to allow blowing out of accumulate dirt and to facilities removal and replacement of a strainer screen without disconnections of the main piping.

3 - 137

SPECIFICATIONS
MECHANICAL WORKS

F - Automatic Air Vents
Supply and install all automatic air vents as shown on the drawings and wherever specified in this book of specifications.
Automatic air vents of the ball float type shall be installed at all high points in the piping. A ½" lock shield valve shall be directly installed ahead of each automatic air vent and a ¼" drain line shall be provided to discharge at a convenient point.

G - Thermometers
Supply and install all thermometers as shown on the drawings and wherever specified in this book of specifications.
Thermometers shall be of the bulb, mercury type 10" long with immersed bulb and brass protective shield. Graduations shall be on a white background in °C and °F.

H - Pressure Gauges
Supply and install all pressure gauges as shown on the drawings and wherever specified in this book of specifications.
Pressure gauges shall be of the Borden type 4" diameter with protective glass and stop pressure gauge cock. Graduations shall be in psi and kg/sq.cm.

I - Expansion Joints
Expansion Joints shall be supplied on hot water pipes. Expansion Joints shall be of the packless type and shall have a free movement equal to at least 150% of the calculated expansion of the pipe served. U-bends shall not be accepted as expansion joints. Expansion Joints should be provided wherever pipes cross the building expansion joint.

J - Union and Flanges
Union shall be provided on both sides of each piece of equipment, also where required to facilitate removal of valve for repair.

K - Cleaning of Pipe
During constructions, the contractor shall properly cap all lines so as to prevent the entrance of sand, dirt, etc. All pipe, fittings, valve etc. shall be cleaned of grease, dirt, scale and foreign material before installation.
Before turning the project over to the owner prior to start-up of any mechanical equipment, all piping
system shall be thoroughly cleaned following the hereinafter specified instructions:
Piping shall be cleaned by operating system at normal operating pressure approximately 48 hours, wasting the condensate. At the end of the 48 hours period, contractor shall clean all strainers by removing baskets and flushing with clean water.

L - Testing
The piping system shall be tested by accepted method and under 150 psi hydrostatic pressure. The test shall be maintained under inspection by consulting engineer for period of not less than 8 hours. If leaks develop, test shall be repeated after leaks are corrected. No part of piping system shall be covered or concealed until it has been tested, inspected and approved by engineer.

M - Balance of piping system
After installation is complete, entire hot water system shall be balanced to provide flows and temperature differentials across radiators, pumps to agree with values specified and shown on drawings.

03 - Pipe Insulation
All insulating materials required for piping, mechanical equipment shall be furnished and installed by the contractor. Insulation shall not be applied until all piping and equipment have been tested, approved and thoroughly cleaned. All insulation work shall present a neat appearing installation with smooth and uniform surface. All insulation joints shall be carefully fitted and lightly butted. Exposed edges and ends of all insulation shall be sealed and finished. Pipe insulation shall be rigid sections. Pipes above ground in Boiler Room, or outside heated areas, or under ground or under tiles, will be insulated with Armoflex or equivalent including all valves and fittings with 1” thickness minimum. All adjoining sections of the rigid pipe insulation shall be joined together with an approved adhesive tape and 10 cm wide plastic bands around insulated pipes, and shall be covered with a galvanized sheet metal jacket.

04 - RADIATORS
Contractor shall supply and install Cast Iron radiators as shown in plans. Radiators shall be of the following types only:
Either “Ideal Standard” Rafael 76/4
Or “Chappee” Savan S 4
Or “De Dietrich” Toudra TT 04
Radiator shall be wall mounted hooks anchored to wall, with air vents and valves, pipes connecting them to the main heating pipes. Before painting and mounting the radiators, they would be tested with all piping network.

3 - 139

SPECIFICATIONS
MECHANICAL WORK

05 - FAN COLL UNITS
The contractor shall supply and install as indicated on drawings a range of locally made Fan Coil Units “PEREG” or equivalent. The fan coil unit cabinet shall be constructed from best quality sheet steel branched for maximum rigidity and removable access panel. It shall be water and corrosion proof, internally insulated and shall be factory finished.

The coil shall be constructed from heavy gauge copper, three rows type, and aluminium fins not exceeding 12 fins/inch. The coil must be suitable for hot water heating system. Each fan coil unit must be provided with an approved type air vent. The fans shall be of the multiblade type statically and dynamically balanced and directly coupled to an electric motor suitable for 220V /1/50HZ electrical operation. Each unit shall be supplied with on-off three speed switch and built in thermostat factory fitted with two hand shut-off valves and one balancing valves. The fan coils must be mounted or hanged with approved supports and hangers, and rubber rings and joints to prevent vibrations.

06 - BOILERS
A - General Description
Contractor shall furnish and install packaged cast iron hot water boiler units as shown in the plans.

Boilers shall be of the following types only:
Either “Ideal Standard”
Or “Chappee”
Or “De Dietrich”

Capacities are as indicated on drawings and bill of quantities. Each unit shall be of three fire tube passes type with over all outside insulation and to include boiler fittings burner equipment and automatic controls. Both boiler and burner must be the product of the same manufacture or as approved by the Engineer to insure undivided responsibility and simplified servicing.

B - An adequate Vent connection shall be provided for venting air liberate within the boiler. A controlled volume air cushion shall be provided at the top of
the boiler to provide adequate air release area and
cushion any hydromatic surges imposed on the boiler.
This air space shall be fitted with an air vent,
connection designed to limit the maximum volume of
the space and vent the excess air.

C - Boiler fittings
1 - Relief valves shall be of ASME approved type.
   Their number and pressure shall be in accordance
   with code requirement.
2 - Drain connection to be provided on bottom
   centerline of shell near rear.
3 - Pressure and temperature gauges shall be
   installed
4 - A flue gas thermometer shall be mounted at the
   breeching collar
5 - Thermometer.
6 - Flow meter

D - Burner Equipment
Burner shall be of forced draft type equipped with
fuel arrangement for firing No. 2 oil. Blower shall
be fitted with an air inlet silencer to insure quiet
operation. Burner location and firing method to be
such that combustion takes place within the water-
backed furnace of the boiler. Vital Burner parts such
as fuel nozzles, flame scanner and ignition assembly
are to be enclosed in a protective steel housing.
Burner controls shall be modulating type and are to
include the following:
1 - Temperature limit control for automatic start
   and stop of burner operation.
2 - On modulating units a temperature actuated
   potentiometer control to vary firing as rate in
   relation to demand.
3 - Low water cut-off control to cause shut-down of
   unit when water level drops to minimum safe
   level.
4 - Air safety switch to prevent operation until
   sufficient combustion air is assured.
5 - An electronic type combustion flame safeguard
   and programming until provided pre-purge and
   post purge cycles with full protection against
   flame failure. Safety shutdowns shall require
   manual reset.
6 - Burner motor controller with thermal overload
   and under voltage protection.
7 - Control circuit fuse.

All controls to be panel mounted and so located on
the boiler as to provide ease of servicing the burner
and boiler without disturbing the controls, and also
located to prevent possible damage by water, fuel or
heat of combustion gases.
Controls connected to water or fuel shall be
installed outside the main boiler control panel.

E - Operating Manual
Instructions for installation, operation and maintenance of the boiler shall be contained in a manual provided with each boiler unit. Record of fire tests shall be included in this manual.

07 – C H I M N E Y S
The contractor shall furnish and install asbestos pipes chimney with all fittings such as socket and steel clamp, and shall supply and install the necessary horizontal and vertical sheet steel metal chimney connected between boilers and asbestos pipes. The sheet metal thickness shall not be less than 2 mm, and provided by suitable sliding doors for inspection and cleaning.

08 – F E E D W A T E R T A N K S
Supply and install galvanized sheet metal tanks of capacities as indicated on drawings. The tank of boiler room No.1 [for main building] will be installed on roof of first floor of the main building, and the tank of boiler room No.2 [for Annex] will be installed on roof of the boiler room itself. The water supply to the tanks will be from the existing main water tanks installed on roof of the main building, and through connection to nearby main distribution pipes. Each tank should be complete with cover, automatic float valve, 10x10 cm hardwood bearers, and all necessary fittings.

09 – F U E L T A N K S
Contractor shall furnish and install fuel tanks for the boilers. Fuel tanks should be made of steel sheets 4 mm thick with an overall sizes as indicated on drawings and bill of quantities, and should be furnished with all fittings and accessories [inlets, outlets, vents, level indicators, connections]. All walls of tanks should be properly braced on the inside. Two layers of anti corrosion primary coat should be applied on all external faces.

10 – T H E R M O S T A T I C V A L V E S
The Contractor shall supply and install at the high point inlet of each radiator a thermostatic valve “Danfoss”, angle type of built in sensor as indicated on drawings and bill of quantities. It should allow for maximum or minimum setting ranges (highest and lowest setting point) in addition to facility of locking the setting range at a fixed setting point.
Required room temperature is 20 ºC, with the possibility of changing the setting to any other required temperature. Valve thermostatic head must be exchangeable without having to drain the heating system.

11 - HEATING CONTROLLER AND PROGRAMMER

A - Supply and install in the Boiler room for each main loop of the main building an electronic controller and programmer “COSTER” type RTE353 with a three way modulating valve type 3FDN corresponding in size to that of related main flow and return pipe sizes of the loop together with the required electric motor, in addition to all shut off and regulating valves. The three-way valve should be installed on the suction side of the loop-circulating pump on the flow pipe as shown on drawings. Every controller includes one flow and one return sensor to be installed inside the flow and the return pipes in addition to an outside sensor installed on north or west wall. Controller also includes a weekly timer with daytime settings and nighttime settings and special knob for fixing daytime temperature, nighttime temperature in addition to the three-way valve movement whether fully open, fully closed or undergoing modulation. That is it should be possible for example to control the inside temperature between 7 am and 2 pm. And 20 ºC, then between 2 pm and 7 am. At 10 ºC. All this should be controlled through changing the temperature of flow water by mixing with return water through a three way modulating valve programmed through the suggested electronic controller. The exact room temperatures and time settings should be programmed for the seven days of the week according to the requirements of our client.

B - Supply and install for each sub loop of the Annex buildings an electronic controller and programmer “COSTER” type RMD 736 with a three way modulating valve type 3A corresponding in size to that of related main flow and return pipe sizes of the sub loop together with the required electric motor, in addition to all shut-off and regulating valves. The three way valve and sensor shall be installed on the return main pipe of the sub loop inside each Annex building together with the controller and accessories as shown on drawings to maintain a programmed maximum temperature of water in the return pipe at a point before mixing with the flow water through the three way valve and return to the Boiler room. The sensor should be installed at the mentioned point.

C - Supply and install a complete two boilers sequence controller “COSTER” consisting of regulator model RC2
and the motorized valves and all necessary probes, sensors and accessories causing the two boilers to function in sequence in accordance with the thermal load. A manual selector switch is to be supplied and installed to change the sequence order of the boilers to maintain equal running hours.

3 - 143

SPECIFICATIONS
MECHANICAL WORKS

Heating, Ventilation, and Air conditioning (HVAC):

Description of the system:

The HVAC system can be briefly described as follows:

The building, with the exception of the four courtrooms, is heated by means of a conventional central heating system consisting of two boilers situated in the basement level (272kW each). The heating water is circulated in a central heating water network by means of circulating pumps into free convection cast iron heating radiators placed in the designated heated areas. The building in general, with the exception of the courtrooms, has no cooling system. Meanwhile, the courtrooms are centrally cooled and heated by means of packaged heat pumps located on the roof of the building. There are four heat pumps varying from 14 to 17 ton capacity, each serving one courtroom. Each heat pump is equipped with additional water heating coil as heat supplement or stand by source in case respectively the heat pump fails to provide the required full heat load or the refrigeration cycle fails completely. The heat pump is selected to heat and cool 100% fresh air. To that effect, four exhaust fans, one four each courtroom, are introduced on the roof to expel the used air from within the courtrooms. In addition to the courtrooms exhaust system, there is a second exhaust system for the toilets only. No other exhaust or ventilation system is proposed in the building.

Heat Pump Package Unit:

The air conditioning units shall be of the packaged heat pump type, designed and manufactured for outdoor installation, and factory assembled, tested, packed and shipped, all with hermetic reciprocating compressor(s), and ready for hook-up and operation.
Unit shall be designed to meet CE standards listed under TUV and American standard listed under UL, and manufactured to ISO 9001. The unit shall be designed to handle 100% fresh air at 95 degree Feh. ambient temperature.

The unit casing shall be made of heavy gauge galvanized sheet metal coated with epoxy powder electro-statically oven-baked. The frames shall be made of high quality extruded aluminum profile. The evaporator side shall be of double skin; the outer skin made of 0.7mm galvanized sheet metal while the inner skin made of 0.9mm aluminum sheet, all stuffed with 1” thick injected polyurethane foam of 40 Kg/M3 density. The casing shall be mounted on heavy duty mounting chassis with lifting lugs. The chassis shall be isolated from the designated concrete pedestal by means of flex neoprene pads. The chassis shall be coated with multiple layer electro-statically oven-baked epoxy polyester. The casing shall have two access doors on each side of the unit for servicing purpose, being two door at the evaporator section and two doors at the condenser section. Each access door shall be fitted with two hinges and a lock with handle, and shall be constructed of the same designated material of the particular unit’s section, which is fitted in. The doors shall be tightly air sealed by means of high quality gasket. The fresh air intake shall be fitted with manual volume damper and 2” thick synthetic fiber media flat filter.

SPECIFICATIONS

MECHANICAL WORKS

The evaporator and condenser sections shall be designed to deliver their respective duties at optimum performance for all design conditions. Coils in both sections shall be manufactured from seamless copper tubes mechanically expanded into aluminum fins and coated with Accra-clad anti corrosion protection film. Additionally, the unit shall be equipped with an extra hot water heating coil in the evaporator section to be used when there exists a failure in the heat pump operation. Meanwhile, condenser coil shall have four rows in each 12-inch length, and the evaporator coil shall have four rows in each 10-inch length. The condenser coil outer face section shall have mechanical protection made of plastic mesh. Condenser fans shall be statically and dynamically balanced all of the propeller axial type with low dB noise operation. The fan motor shall be of the induction type with six poles, directly driving the propeller. The motor casing shall be of the totally enclosed squirrel cage type with class IP55 enclosure protection, with internal thermal current protection, and with class “F” insulation. On the other hand, evaporator fan shall be belt driven of the backward curved centrifugal type with double inlet and double width. The fan shaft shall be fitted on Bee block bearing with lubrication nozzle. The fan motor shall be enclosed in drip proof squirrel cage housing, with internal 4-pole class “F” winding and thermal current protection. All motors of 5.5kW capacity and above, utilized in the unit, shall be wired to take Star-Delta connection for the initial start-up. The evaporator fan discharge side shall be connected to the unit supply air outlet by means of flexible canvas connector. The driving belt shall be provided with belt guard for protection.

The refrigeration cycle of the unit shall be pressurized by reciprocating hermetic compressor(s) with suction gas cooled motor(s). The cycle line shall contains disposal type filter dryer,
thermostatic expansion valve, service valve on liquid line, charging point, and freon R-22 refrigeration cycle upgradable to R-407C refrigerant.

All moving and rotating parts and components within the unit shall be factory mounted on vibration isolators to ensure low noise and vibration operation.

The unit shall be provided with galvanized sheet metal drain pan for condensate water with drain outlet. The pan shall be externally coated with thermal insulation and internally with anti-fungal anti-corrosion coating. The drain plug shall be equipped with siphon to ensure easy draining of the condensed water vapor in the pan regardless to the negative pressure being built in the evaporator section.

The unit shall be equipped with the following components, all factory built:

- Weather proof, control and power panel integrated in the unit, ready to take all connections onto wire terminals.
- The control panel shall contain contractors for compressors and fans, microprocessor, 220-volt control circuit breaker, main power circuit breaker with door interlocked external handle for use during service and repair time.

3 - 145

SPECIFICATIONS
MECHANICAL WORKS

- The microprocessor shall be able to perform the following functions:
  • Display alarms for coded faults such as anti-frost, probe error, air flow, high/low pressure, compressor high thermal conditions.
  • General alarm output relay for units utilized more than one compressor.
  • Selection for manual re-store mode alarms re-setting.
  • Management of lead-lag compressors running time.
  • Temperature indication in the Celsius scale.
  • Remote ON-OFF cooling/heating
  • Control mechanism of cooling and heat pump mode.
  • Delay relays for the time between energizing and de-energizing of first and second compressors, for the minimum allowable stop time of the compressor after de-energizing, for the allowable number of starts per one time frame, and for the fan energizing/de-energizing time intervals.
  • Control the defrost cycle.
  • Control of condenser fan(s) by ON-OFF mechanism at low ambient temperatures according to the sense of the probe at the condenser air inlet.
  • Run the evaporator fan independently in case the heating water coil is in use to compensate the failure in the heat pump.

Exhaust Fans:
Exhaust Fans shall be of the centrifugal roof mounted blower type. They shall be tailored for high efficiency and extreme reliability in terms of air movement. They shall be supplied in a factory assembled, set and tested state.

The housing shall be made of heavy gauge zinc coated galvanized sheet metal to ensure long corrosion resistant life. The housing shall be stiffened by heavy-duty iron angle supporting frame. The unit shall be supplied at the seating bottom with sturdy support angles for easy assembly mounting on support surface. The whole assembly shall be mounted on spring type vibration isolators. The unit shall be coated with multi-coating enamel paint fit for galvanized surface adhesion. A drain outlet shall be fitted in the bottom of the blower housing. A gravity shutter shall be provided at outlet of fan.

The driven part of the unit shall be a belt driven blower of the backward inclined galvanized blades type, with single inlet single width. The blower shall be designed for low sound power level, all in accordance with the allowable dB level for courtrooms set in the latest edition of ASHRAE handbook.

The driving part shall be an electric motor of high quality induction type. The motor shall be of the open drip proof type with 6 poles, enclosed inside weatherproof housing within the body of the unit. The motor shall be equipped with weather proof power disconnect switch for service and maintenance purposes.

The motor torque shall be transferred to the blower by means of dual V-belts rotating on two properly aligned double grooved pulleys sized for 165% of the driven horsepower minimum. The driven pulley shall be attached to the blower shaft, which is restrained by two self-aligning pillow block bearings with lubrication nozzles. The shaft shall be made of solid steel, precision ground, polished, and treated for rust resistance. The shaft shall be sized to withstand a minimum of 125% of maximum designed operating speed.

The fans shall be electrically interlocked, each with its corresponding heat pump.

Duct Work:

Air duct shall be made of zinc coated galvanized sheet metal of top quality. The duct shall be manufactured and erected by qualified technicians, all in accordance with the latest SMACNA standards. The air supply duct sheet thickness shall not be under any circumstances less than 0.7mm, while the air exhaust duct sheet 0.5mm. The air supply duct laid in voids, shafts and above false ceiling shall be thermally insulated by 1” thick fiberglass insulation of 24Kg/M3 density minimum with reinforced aluminum vapor barrier. The same duct, when exposed on the roof, shall be protected by an additional outer skin of 0.5mm thick galvanized sheet metal. The seam lines shall be sealed by special water and weather proof mastic-silicone compound, being pre-approved by the Engineer. The duct works shall be connected to the designated equipment by means of factory made canvas flexible connectors to prevent the transmission of the equipment vibration to the air duct.
Silencers and Acoustic Lining:

The noise generated by the air conditioning and exhaust equipment on roof shall be eliminated by the introduction of silencers along the duct path and acoustic lining within the duct. Silencers shall be introduced at the discharge sides of the heat pumps, and at the suction side of the roof top exhaust blowers. Meanwhile, acoustic lining of 40Kg/M3 minimum density shall be introduced inside the air supply duct before and after the silencer in case the required low sound pressure level is not met by the silencer alone. The silencer shall be of the flanged square type with splitters, all in accordance with ASHRAE standard and as made by Sound Attenuators Ltd. The outer skin of the silencer shall be made of 0.7mm thick galvanized sheet metal, the inner skin shall be made of 0.5mm thick perforated galvanized sheet metal, and the filling in between and inside the splitters shall be made of fiberglass sheet with 48Kg/M3 density minimum. The final N/R level inside the courtrooms shall be within an acceptable range, as specified in latest edition of ASRAE handbook.

Air Diffuses and Grills:

All air supply diffusers as well as air supply and exhaust grills shall be made of aluminum profiles, all supplied with volume dampers. The color of the aluminum shall be coordinated with the Engineer prior to ordering the approved quantity.

Volume Dampers and Splitters:

Volume dampers and splitters shall be used for proper air balancing during commissioning. The main balancing of the CFM flow shall be carried out through the adjustment of the volume and splitter dampers’ blades. However, the fine tuning of the air flow out of the diffusers and grills shall be carried out by their respective dampers. The dampers shall be made of heavy gauge galvanized sheet metal, and their fittings shall be of top quality, all in accordance with SMACNA latest edition. All dampers with more than single leaf or blade, shall be of the opposite blade configuration. All dampers’ blades shall be provided with rubber seal at their edges to ensure air tightness during closing position. Meanwhile, the positioning of the dampers and splitters shall be in accordance with SMACNA instructions, even if such dampers are not shown on the drawings and/or are not stipulated in the Bill of Quantities. Anywhere a regular volume damper is fitted in the duct, an access door shall be fitted adjacent to it. The access door shall be supplied with hinges and ear type lock with relevant insulation, and sealing gasket, all in accordance with the latest SMACNA manual for sheet metal works.
<table>
<thead>
<tr>
<th>Division</th>
<th>Titles</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>N - 1</td>
<td>General</td>
<td>3 - 132</td>
</tr>
<tr>
<td>N - 2</td>
<td>Heating Installations</td>
<td>3 - 135</td>
</tr>
<tr>
<td>N - 3</td>
<td>Heating, Ventilation, and Air Conditioning (HVAC)</td>
<td>3 - 144</td>
</tr>
<tr>
<td>Item No</td>
<td>Description</td>
<td>Unit</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>1.01</td>
<td>Site Leveling. (Excavation of all Site including External Works). Cut and / or fill in any kind of soil, concrete, or asphalt; to the required Levels approved by the Engineer (Reduced Level). a) Cut to the reduced level. Including scraping of top soil and removal of extra unsuitable soil, debris and organic material. b) Back filling with excavated suitable soil, back filling material shall be applied on layers, 200 mm thick, watered and compacted to 95% according to modified AASHTO Density Test T-80.</td>
<td>M.C</td>
</tr>
<tr>
<td>1.02</td>
<td>Excavation and back filling for foundations; in any kind of soil, to the dimensions and levels shown in the drawings. Price to include back filling with excavated or imported soil and removal of extra and unsuitable soil. Back filling shall be on layers of 200 mm thick with watering and compacting to 95% to comply with modified AASHTO F.D.T. (T-80) up to the bottom of base course.</td>
<td>M.C</td>
</tr>
<tr>
<td>1.03</td>
<td>Imported Fill Import and fill with selected Imported Approved Fill; to the required levels as and where directed by the Engineer, only and for the quantities that are extra and above the quantities included in item 1.01 and 1.02 above. Filling shall be on layers not to exceed 200 mm thick. Price to include leveling, watering and compacting to 95% field density. Complying with Modified AASHTO Density Test T-80.</td>
<td>M3</td>
</tr>
<tr>
<td>1.04</td>
<td>Supply and spread 20 cm thick base coarse after compaction. Price to include leveling, watering and compacting to 95% field density. Complying with Modified AASHTO Density Test T-80.</td>
<td>M2</td>
</tr>
<tr>
<td><strong>Total Bill No 1</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bill No 2 | CONCRETE WORKS.
--- | ---
Preamble:
Rates of Concrete Works shall include:-
1. All form works and shuttering in any form, shape and size. Making chamfered and curved edges, allowing for and making grooves and slivers and the like; removal of forms and cleaning of all exposed tie wires and rods; making good the damaged surfaces and edges and all surface finishing.
2. Supplying, Casting, vibrating and curing as per specifications.
3. Approved additives and admixtures.
4. Incurred costs on Concrete Mix Designs, Sample taking, testing and providing test results certificates, storing and saving of samples, and preparation of bar bending schedules and workshops.
5. Supplying reinforcement of any grade, size and length as detailed in the drawings, storing on site including cutting, bending and fixing in position and providing all tying wires, spacers, shop drawings, testing and bar bending schedules.
6. Painting of exposed surfaces of underground reinforced concrete elements with two coats of Bituminous Emulsion like Bitucote from Sika or equivalent from Fosroc. Supply of Polyethylene sheets under ground slabs. (of 500 microns)
7. Steel bars used for alignment and fixing of reinforcement works, and extra steel added to assure proper detailing and safety.

Measurement of Concrete elements shall be the net dimensions as detailed in the drawings. All recesses, openings and voids shall be deducted.
Measurement shall be only for the seen surfaces of elements, overlapping and measuring items twice under separate headings shall not be allowed.
Slabs are measured in meter square from Center line of external masonry walls.
Steel Reinforcement is included in concrete price.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.01</td>
<td>Supply and Cast Reinforced Concrete Grade 'B 250'. With a minimum cement content of 300 Kg. per cubic meter For Slab on Hard Core. Including surface leveling, finishing, polyethylene sheets 500 micron, construction joints and all related works. a.Ten (10) cm thick Slab.</td>
<td>M.S</td>
<td>350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.02</td>
<td>Supply and Cast Plain Concrete, Blinding under foundations, footings &amp; tie beams (Grade 'B 150'). 10cm thick</td>
<td>M.S</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.03</td>
<td>Supply and Cast Reinforced Concrete Grade 'B 250'. With a minimum cement content of 300 Kg. per cubic meter. Price to include painting with two coats of water base bitumen like Betocoat from Sika or Fosroc for Foundations and foundations of stairs.</td>
<td>M.C</td>
<td>38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.04</td>
<td>Ditto but for ground beams</td>
<td>M.C</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.05</td>
<td>Supply and Cast Reinforced Concrete Grade 'B 250' with a minimum cement content of 300 Kg. per cubic meter for Reinforced Walls any thickness.</td>
<td>M.C</td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.06</td>
<td>Supply and Cast Reinforced Concrete Grade 'B 250' with a minimum cement content of 300 Kg. per cubic meter for stairs flights, landing, steps and ramps</td>
<td>M.C</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.07</td>
<td>Ditto but B 300 with a minimum cement content of 350 Kg. per cubic meter for Columns, where required.</td>
<td>M.C</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.08</td>
<td>Supply and Cast Reinforced Concrete Grade 'B 250' with a minimum cement content of 300 Kg. per cubic meter for suspended slabs. Price to include for projected beams, other beams projections, and drop beam, lay and arrange hollow concrete blocks 'Grade 35' for ribbed slabs, using closed end blocks as required by the engineer at all ends, edges, openings, services location etc. a). 25 cm. thick ribbed slabs. b)15 cm solid slab for staircases</td>
<td>M.S</td>
<td>280</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.09</td>
<td>Supply and cast plain Concrete with or without lump stone with or without shuttering.</td>
<td>M.C</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Bill No 2
**Bill No 3  STONE WORKS.**

**PREAMBLE.**

All Stone works shall be of local white stone of First Choice.

Material, size, and texturing shall be in accordance with detailed drawings and Engineer’s instructions and approval.

Stones shall be of net less than (5 cm. thick, 25 cm. high and of length ranging from 1.5 to 3 times the height.)

Stones shall be homogeneous in color and texturing and free of any defects.

Cutting, shaping and building of stone shall be in straight angles, no twisting, distortion or uneven sizes shall be allowed.

All cuttings shall be made using Manjal.

Measurement of all types shall be in Meter Square, for the net dimensions of the vertical plan of the elevations excluding openings of any area.

No measurement will be made for any recesses, projections or sides of stone piece

Measurement of door and window jambs and reveals, corner pieces, arches and the like is not applicable.

No allowances shall be made for stone pieces in any shape.

No allowances or extra rates shall be considered for stone courses in lintels, overhanging slabs and roof slab courses.

Taking all the above mentioned into account, measurement for stone cladding works will follow the shape of the cladded element.

Rates of stone works shall include:

- Supplying, storing, protection and removal of rejected and surplus materials.
- Shaping, cutting and fitting.
- Mortar and backing concrete (plain concrete and/or cement blocks and plain concrete).
- Galvanized steel ties, dowels, hangers, steel mesh and all tying tools.
- Erecting and dismantling of scaffoldings.
- Pointing and pointing materials of any type, and cleaning of walls.
- Lintels and other reinforced concrete elements embelished in the stone walls including reinforcement.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.01</td>
<td>Supply and build stone walls of 25-30 cm. thick, to the full length and height shown in the drawings. Jama'in first class and first quarry. Rough textured “Mlattash” for facades and smooth “Mattabeh” for door and window jambs and reveals. a) Stone walls with plain concrete and cement block backing. Concrete backing of plain concrete grade B-200 and cement block Grade 35 (10<em>20</em>40 cm). Including Polystyrene 2 cm thick panels. b) Stone walls with plain concrete backing B-200 (20-25 cm Thick) including parapet walls.</td>
<td>M.S</td>
<td>290</td>
<td>M.S 85</td>
<td></td>
</tr>
<tr>
<td>3.02</td>
<td>Ditto but Stone cladding over reinforced concrete elements. Price to include Concrete filling of plain concrete Grade B-200, steel mesh and all needed works.</td>
<td>M.S</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Bill No 3**

**Bill No 4  CONCRETE BLOCK WORKS**

**PREAMBLE.**

All works of this bill shall be of Concrete blocks Grade 35 of high quality standards and as per specifications.

Block works shall be measured in meter square. The net measurement of the seen elevations, excluding all openings and voids more than 0.1 M. S. in area.

No allowance for thickness used other than those shown in the drawings.

Rates of Block works include:

• Vertical and horizontal joints.
• Cement and mortar,
• Galvanized angles and butterfly ties.
• Closed end blocks at all ends, door and window jambs, reveals and the like.
• Pointing of the uncovered block surfaces.
• Concrete filling including reinforcing steel to cavities at quoins and door and window openings.
• Lintels and bond beams to the full length of the wall, 20 cm. high and in the same wall thickness of reinforced concrete grade B-200 with due reinforcement steel, on top of doors and windows or at the height of 2.00 M.
• and all needed to complete job as per drawings and specifications.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.01</td>
<td>Supply and Build Concrete Block Walls, “Grade 35” of any size blocks. a) Hollow Blocks (10 Ten) cm. thick. b) Hollow Blocks (20 Twenty) cm. thick.</td>
<td>M.S</td>
<td>250</td>
<td>M.S 100</td>
<td></td>
</tr>
</tbody>
</table>

**Total Bill No 4**
Bill No 5

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.01</td>
<td>Two Coats of Cement and Sand Plaster over one slurry coat to walls and ceilings and where required including metal Lath, angle beads, plaster stops and all required as per Specs and drawings.</td>
<td>M.S</td>
<td>1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Ditto for parapet from internal,</td>
<td>M.S</td>
<td>160</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Ditto but with Three coats for external walls, material to include quartz and pigments of approved color and water proofing additive (sika latex, foscroc or equivalent)</td>
<td>M.S</td>
<td>50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Bill No 5
## Bill No 6

### TILING, FLOORING AND MARBLE WORKS

**PREAMBLE.**

1. All tiling works (terrazzo, ceramics and marble) shall be measured net in square meters, deducting all openings and voids more than 0.25 m².
2. Skirting shall be measured in linear meter.
3. Marble works for steps and treads of stairs shall be measured as linear meter. The tread and the riser shall be measured as a single unit.
4. Parapet copping shall be measured in squared meter.
5. Marble works for stair flight’s skirting shall be measured in linear meter.
6. Rates shall include preparation of surfaces under tiles, finishing to falls and cross falls, special tile pieces for edges and the like, tile surface finishing, plastic spacers, point and cleaning and all incidental as per specifications.
7. Rates shall include also providing and mounting in place “School Title Marble Plate” of white clear local marble polished, finished and ingraved in the design provided by UNDP.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.01</td>
<td>Supply, Install and Finish Pre-cast Terrazzo Tiles, with Italian marble chipping # 6. Price to include bedding and jointing in cement and sand mortar, pointing with white cement, required sand fill, and on site grinding, polishing and cleaning. a. Size (30 x 30 x 2.7) cm, the price includes skirting size (30<em>7.5</em>1.5) cm</td>
<td>M.S</td>
<td>280</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.02</td>
<td>Supply and Install Local Marble Sills, Thresholds and Parapet Copping. (3 cm. thick). Set in cement mortar bedding price to include grouting, polishing of face and seen edges. a. Window Sills Size (15 - 37.5 x 3) cm. to S. Opening and balcony parapets. b. Door Thresholds Size (15 - 35 x 3) cm. to S. Opening. c. Parapet Copings Size (37.5 x 3) cm. to length of roof parapets.</td>
<td>M.S</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.03</td>
<td>Optional Supply and Install Local Marble Tiles (30) mm, Thick for stair landings. Price to include bedding cement mortar, grouting and on site polishing.</td>
<td>M.S</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.04</td>
<td>Optional Ditto but for Stair Landings Skirting (30 * 12 * 2&quot;) cm. for Stairs landings</td>
<td>M.R</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.05</td>
<td>Optional Ditto but for Steps and Treads of Stairs. Treads of 3 cm thick and Risers of 2 cm. thick, Note The Tread and Riser shall be measured and priced as a single unit</td>
<td>M.R</td>
<td>105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.06</td>
<td>Optional Supply and Install Local Marble, for Stair Flight Skirting and water stop pieces. Bedding in cement mortar in parallel setting and including the nosing line at an average height of 12 cm. and 20 mm. thickness price to include grouting</td>
<td>M.R</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.07</td>
<td>Supply and Install White Porcelain Glazed Wall Tiles, First choice and free from all defects. (Spanish made or equivalent).</td>
<td>MS</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.08</td>
<td>Supply and Install Non-Slip Ceramic Floor Tiles. First choice and free from all defects. (Spanish made or equivalent).</td>
<td>MS</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Bill No 6**
**Bill No 7**

**CARPENTRY AND JOINERY WORKS**

**PREAMBLE.**

Sizes of carpentry works given in the Bills of Quantities are finished sizes and shall be as per Drawings.

Sizes of doors and other items mentioned in the Bills of Quantities shall allow for tolerance to suit the structural openings shown in the Drawings.

- Wooden doors and pair of doors shall be measured in number for each structural opening, unless stated otherwise in the Bills of Quantities.
- Blackboards shall be measured in number or in squared meters as mentioned in the Bills of Quantities.
- Wall protection wooden rubbing rails shall be measured in linear meter.
- Cloth hangers and hanger wooden base shall be measured in number or in linear meter as stated in the Bills of Quantities.

Rates for carpentry and joinery work shall include:

- Shop and coordinated drawings.
- Frames, architrave, chalk holders and other holders and 20 cm. high “U” shape kick plates.
- Allowance for plastering and tiling and the like.
- Cutting and fitting around obstructions, bedding and painting.
- Grounds, blocking and backings.
- Plugging concrete, block work, and stone work, and making good.
- Ironmongery including cylindrical locks, handles, stoppers, screws, temporary fixing, re-fixing, oiling and adjusting.
- Providing two keys for each lock including tagging.
- Providing and fixing wall mounted wooden keys cabinet, (70*70*10) cm. varnish finished with all ironmongery including cylindrical lock.
- Providing and fixing Room Title Plate, Painted Steel (30*20) cm. mounted on wooden plate (35*25) with varnish finish.
- Steel legs, brackets, bearers and other supports including painting.
- Glass and glazing including cutting to size and putty.
- Fly screening including cutting to size.
- Preparing surfaces to receive finishes.
- Painting, varnishing, polishing, oiling, and the like, to any area or width in any location including work in multicolor and cutting in edges and putty.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.01</td>
<td>Supply &amp; Install Bottom Wooden Kitchen Cabinet. Cabinet’s Top shall be of Local Marble, 30 mm. thick with polished surface and seen edges. Cabinet Sides, Elevations, Partitions, Shelves and Drawers front-side shall be of 18 mm. thick Blockwood (latte), covered with 0.9 mm. Thick Laminated Plastic Veneer on both faces. Blackboard seen edges shall be framed with Hardwood (zan) bands size (18<em>10) mm. Edges of Drawer’s sides shall be covered with (12</em>10) mm. Hardwood (zan) frame. Rear sides of cabinets and drawer’s bottom shall be of 5 mm. thick Veneer covered with L.P.V. Price to include cabinet Ceramic flooring (20 * 20 * 0.6) cm., Ceramic skirting (20 * 10 * 0.6) cm., Ironmongery, handles, two coats of lacquer paint.</td>
<td>M.R</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.02</td>
<td>Supply and Fix Flush Panel Solid Core Doors 4.5 cm Thick single or double sashes. with (Frame). (4.5<em>10) cm. Edge strip banding of Hardwood (Sweden), with 5 mm. thick plywood veneer on both sides, door paneling to be of soft wood 3.5</em>3.5 cm. each 2.5 cm., frames of hardwood (Sweden) width according to the wall thickness’ and Allowance of 4 - 6 cm. thickness for plastering and tiling purposes, emerged in wood preservative before erection then</td>
<td>MS</td>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Bill No 7**

---

Engineering Unit - UNDP/PAPP
### STEEL AND ALUMINUM WORKS

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.01</td>
<td>Supply, fix and operate sliding Aluminum Windows. Extrusion Section 7000 or equal, two and half runs for horizontal and vertical partitions, with protective Electro statically applied polyester powder paint of 70-80 microns. In color approved by the Engineer. Price to include G. steel sub frame, 6 mm. Float clear glazing and all other accessories and fittings to complete works as per drawing and specifications.</td>
<td>M2</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.02</td>
<td>Supply and Install Window Protection Steel Grilles. As detailed in the drawings including fixation, accessories, welding, grinding &amp; smoothening. Price also to include oil painting three coats in addition to two primer coats</td>
<td>M.S</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.03</td>
<td>a. Stairs and Handrails Price to include Fixing complete, oil paint three coats in addition to primer coat. (Seen Height 20 cm.)</td>
<td>M.R</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.04</td>
<td>Supply and Fix Steel Doors including the frame. Doors are composed of 80<em>40 hollow steel external frame, 400</em>400 hollow steel for internal frame and partitions to be covered on both sides with sheet metal 2mm thick. Price to include fixing complete, ironmonger, cylindrical locks handles (Valley or equal), 6 mm. glazing, gaskets, Paint in three coats in addition to two primer coats.</td>
<td>MS</td>
<td>21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Bill No 8**
**Bill No 9**

**PAINTING WORKS**

Preamble:
Painting and decorating to walls, ceilings and the like shall be measured net in meter square.

Painting to other works shall be included in the related items.

Paints shall be supplied to site in sealed container, as approved by the Engineer, and site mixing shall not be permitted.

The Contractor rates shall include for supply of all materials, workmanship, samples, primers, surface preparation, protection of painted surfaces, application to all heights as required of works, repair of all damaged surface at the contractor's expenses, and all other requirements as stated in the Specifications.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.01</td>
<td>Supply and paint Emulsion PVA-Based Paint, for interior walls. Of high quality on one priming coat and two finishing coats, for application to walls, using putty.</td>
<td>M.S</td>
<td>850</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.02</td>
<td>Supply and paint Polycide paint for ceilings.</td>
<td>M.S</td>
<td>300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.03</td>
<td>Ditto but for external walls like (Weathershield from Delux or equivalent)</td>
<td>Ms</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.04</td>
<td>Supply &amp; paint Oil Paint for Walls. Of high quality. One priming coat, two coats of undercoat, third and the final coats of semi-gloss finish, using complete putty. (1.5 m. high).</td>
<td>M.S</td>
<td>120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Bill No 9**
**Bill No 10**  
**INSULATION AND ROOFING**  

Preamble:

All finishes shall be measured superficially net unless otherwise stated clearly.  
All finishes, except triangular shaped fillets and cement and sand lining to gutters, shall be measured superficially.  
Triangular shaped fillets and cement and sand lining to gutters shall be measured in linear meter, unless otherwise stated clearly.  
Rates for concrete and sand work shall include for:

- Hacking concrete, applying cement slurry or raking out joints of blockwork to form key. Application to any surface.  
- Forming bays including joints. Finish to edges and arises.  
- Making good around steel sections, pipes, tubes, bars, brackets, outlets, and the like.  
- Measurement for waterproofing shall be for sectional roof area only.

Rates for waterproofing and roof sheeting shall include for:

- Preparation of surface Cutting in edges. Overlaps, priming and treatment at the corners and floor drains.  
- Dressing over parapets and stub columns including forming groove to receive edge of elasticized bitumen membrane and sealing with elastic sealer.  
- Sheeting of any width or length.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.01</td>
<td>Plain Cast in Place Concrete Grade 'B-200' Screed to Roof, cast to falls not less than 40 mm. thickness in the lower point as shown on detailed drawings with smooth surface finish. All to comply with specifications and Engineers directions. The mix should include waterproofing additive from approved company</td>
<td>M.S</td>
<td>300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.02</td>
<td>Hunching and lining to the edges of roof screed and parapet, With slope 1: 1 to minimum height of 20 cm.</td>
<td>M.R</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.03</td>
<td>Supply and apply waterproofing membrane of bitumin rolls. (4.5 mm. thick. Density 180g per m.s. of reinforced polyester sheets) covered with layer of crushed white stone. with overlaps of not less than 10 cm. price to include primer coat, and all sheets flashing, For roof of main building and roofs of stair cases. Or Two layers of White acrylic paint from approved source.</td>
<td>M.S</td>
<td>350</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 10.04   | Supply and Fix (P.V.C.) Rain Water Pipes with all necessary fittings, tie rods and adhesive material .  
  a. Diameter 4” .5 mm. thick  
  b. Diameter 3”. 4.7 mm. thick | M.R | 25 | 15 |
| 10.05   | Supply and Fix Spigot Outlets with perforated cover (C.1) of heavy duty PVC to be fixed in reinforced concrete slabs to drain.  
  a. Diameter 4” .  
  b. Diameter 3” | NO | 4 | 2 |
## Bill No 11
### ELECTRICAL WORKS

**Preamble:**
All items price to include Supply, Installing, Connecting and testing unless otherwise indicated, the contractor are requested to have approval full coordinated work shop drawings before starting contract activities, the price also includes all works necessary to implement electrical works in approved manner.

The contractor intended to order main and final distribution panel boards according to approved manufacturer drawings.

The price to include submittals, catalogs, any manufacturer instruction.

The contractor should install and construct all works according to drawings, specification tender documents, and requirement of Electrical Co.

Contractor should also test & submit the electrical to the Electricity Co. & Municipality.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.01</td>
<td>Supply, Install, Connect and Testing of Factory Made and Assembled Main Distribution Board (MDB). Including panel board of 2mm thick painted galvanized metal sheet, (MCCB) Molded Case Circuit Breakers with Rupturing capacity (R.C) of 25 K.A., miniature circuit breakers MCB with Rupturing capacity of 6K.A, phase color identification labels, front plate to cover live parts and all accessories as per drawings, specifications. With all necessary work</td>
<td>NO.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) D.B.FL</td>
<td></td>
<td>NO.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.02</td>
<td>a) Supply, install and connect the following low voltage boards according the drawings and specifications. The size of the boards shall be the same height and depth of the nearest electrical board with 40cm width. -LVF</td>
<td>NO.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.03</td>
<td>Supply, Install and Connect Feeder Lines. a. Main feeder line from outside Elec. Manhole to MDB. Price to include PVC conduits and trenches as shown in the drawings. (4<em>16mm2 + 1</em>10mm2). XLPE cable. b. (5*6) mm sq. XLPE cable</td>
<td>M.R</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.04</td>
<td>Main Telephone. Feeder line. Price to include PVC conduits and trenches as shown in the drawings. 5 pair. Tele. Cable, wires of size (0.6mm2). From outside Tele. manhole to the distribution board, including wires, conduits, Junction Box Gewiss type or equal and all accessories as per drawings and specifications.</td>
<td>M.R</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.05</td>
<td>a) Supply, Install and Connect Lighting Points including 16 mm dia Conduits and 3x(1.5 mm2) Wires or cables up to the DB, and as required Light Switches (Gewiss type or equal S.P.S. # GW20 001) with all accessories as per drawings and specifications. b) Ceiling mounted fan (CHMC) with its variable speed transformer complete with its accessories ready for work.</td>
<td>NO.</td>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.06</td>
<td>Supply, Install and Connect the following Socket Outlets points including 3x (2.5mm 2) wires or cables, 16mm dia. conduits, and as required (Gewiss type or equal) sockets with all accessories up to DB as per drawings and specifications. a) 3 pin Single Phase 16 Amp socket. (Cat No. GW20 220)</td>
<td>NO.</td>
<td>35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
b) Ditto , but Water Proof | NO. | 4 |
c) 3 pin Single Phase 16 Amp socket (Cat No. GW20 220) , but Double. | NO. | 1 |
d) Telephone outlet Sockets up to Junction box. (Cat. No, GW20 232) includes conduits and 2 p. Tele. Cable, wires of Size (0.6mm2) | NO. | 21 |
e) Satellite outlet Sockets up to Junction box. (Cat. No, GW20 381) includes conduits and Cable. | NO. | 1 |

11.07 Supply, Install and Connect the following Lighting Fixtures (European type: to comply with specification) including bulbs or tubes, control gears p.f. correction capacitors and all accessories as per drawings and specifications .

b. 1*21 W Ceiling Mounted Lighting Fixture | NO. | 14 |
c. Ditto , but W.P | NO. | 6 |
d. 2*26 W Wall Mounted Lighting Fixture | NO. | 3 |

11.08 EARTHING SYSTEMS
Supply, Install and Connect a complete Earthing System :
a. (One OHM) ground resistance, including the connection of this system to the MDB by suitable cable and including plates, rods, excavation, back filling of all pits to obtain the required resistance , and including an inspection pit (Manhole) with medium duty cast iron cover, and all the accessories as per drawing and specifications. Grounding Resistance is to be measured at MDB.
b) Foundation Earthing system as shone on the drawings. 
c) Earthing ling to connect main water line to Earthing box in MDB.
d) Earthing manholes and boxes.

11.09 Supply material , and build electrical line manholes (60*60*80) cm.
Price to include excavation and backfilling, all concrete works, steel cover and all required as per Current Supplier instruction | NO. | 2 |

11.10 Ditto , but (40*40*60) Telephone manholes. | NO. | 2 |

11.11 Supply, install, and connect Prime Diesel Generator
- European or Japanese make
- Rated KVA: min. 16 KVA
- Phase: 3 phase
- Voltage: 380/220 volts
- Frequency: 50 Hz
- Electrical system, 12 VDC
- Air filter
- Battery(ies), rack, and cables
- Fuel: Diesel
- Alternator
- Control System
- Exhaust System
- Cooling System
- Circuit Breaker
- Automatic Voltage Regulator
Note: All generators are to pass a pre-inspection

JOB | 1 |

Total Bill No 11
## Bill No 12
### PLUMBING, SANITARY AND MECHANICAL WORKS

**Preamble:**
All water supply valves, facets and fixtures shall be measured in Number.

Supply networks pipes from on roof feeding tanks to supply fixtures shall be priced as lump sum.

Water tanks shall be measured in number.

Sanitary Fixtures shall be measured in number.

Drains, Floor Traps, Clean outs and the like shall be measured in number.

Internal sanitary sewers network shall be included in the rates of sanitary fixtures and appliances.

Vents and vertical stacks shall be measured in linear meter.

Manhole, Galleries and the like shall be measured in number.

External sewer pipes shall be measured in linear meter for each individual diameter and material.

Rates of all fittings, fixtures, appliances and pipe laying shall include:-

Supply of material, workmanship, installation, testing and commissioning.

Rates to include also all peace’s and fittings, including by passes, floats, cleaning outlets, automatic vents, vents and stack covers, valves and non return valves and the like needed to complete works as per specifications.

Excavation and cutting for all pipe laying works, holding back filling and all works connected with pipe laying.

All ties, sleeves, joints, tie bolts and rods, brackets and the like.

Rates to include Workshops, Coordinated and as-built drawings as approved by the Engineer.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.01</td>
<td>Supply and install UAP or equal 6&quot; UPVC pipes heavy duty BS 4660 between manholes with all required materials, sockets, rubber seals, etc. The price includes excavation, concrete cover [1:3:6] of at least 15 cm around the pipes including back-filling and disposal of surplus excavated materials. Excavation shall be to any depth, width, and in any type of soil or rock.</td>
<td>MR</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.02</td>
<td>Supply and install UAP or equivalent 4&quot; UPVC pipes heavy duty class to BS 4669 for the sewage and rain water. Price includes digging for pipes, supports, hangers and all rubber joints and sealants, and laying at least 8cm. concrete around underground pipes. Main piping in risers or above false ceiling or in corridor or in sanitary blocks are measured in meter run.</td>
<td>MR</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.03</td>
<td>Ditto but 3&quot; PVC for rain water on the roof.</td>
<td>MR</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.04</td>
<td>Ditto but 2&quot; PVC pipes for the Sanitary fixtures.</td>
<td>MR</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.05</td>
<td>Heavy duty chromium plated 4&quot; floor drain syphon trap with screw type screen, complete with all required fittings and connections using reduced &quot;T&quot; for connecting sanitary fixtures.</td>
<td>NO</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.06</td>
<td>Heavy duty chromium plate 4&quot; clean-out with screw type cover, complete with all required fittings and connections using reduced &quot;T&quot; for connecting sanitary fixtures.</td>
<td>NO</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.07</td>
<td>Supply and install Sewerage manholes, of internal diameter 60 cm and of various depth, to be constructed of precast circular concrete of 15cm minimum wall thickness, 15 cm bottom slab, 25 ton C.I. cover and C.I. steps for manholes of depth exceeding 100 cm. Price shall include for plain, coarse and fine concrete benching, plastering, excavating, backfilling and disposal of surplus excavated materials. Excavation shall be in any type of soil or rock.</td>
<td>NO</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>Description</td>
<td>Material</td>
<td>Price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------</td>
<td>--------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.08</td>
<td>Supply &amp; Install Porcelain sink of size 60 x 49 cm of approved quality for the Kitchens as shown in the drawings, to be placed in the Marble. Price shall include all fixation and hanging bracket, sealents, pedestal and all other required materials, including connection to drainage system.</td>
<td>NO 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.09</td>
<td>Supply &amp; Install Chromium plated mixer of approved quality with chromium plated handle. Price shall include connection to pexgol pipe.</td>
<td>NO 12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.10</td>
<td>Supply &amp; Install Porcelain W.C. bowl class &quot;A&quot; white color, with heavy duty white seat and cover. Price includes flush tank, hanging iron steel bracket, bolts and nuts, as well as flexible flush hose and valve and all related materials.</td>
<td>NO 6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.11</td>
<td>Supply &amp; Install Porcelain wall hung wash basin white color of size 50 x 45 cm such as Harsa. Price shall include all fixation and hanging bracket, pedestal and all other required materials, including connection to drainage system.</td>
<td>NO 6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supply and install Schedule 40 galvanized steel pipes &quot;Akko make or equal&quot; at riser, corridor, sanitary block, etc. To connect the existing water network with a new one for the laboratory with all necessary fittings such as elbows, Tees, unions, air vents, supports, hangers, shields, saddles, etc. All piping hung on wall, outside building, in riser, above false ceiling, and in sanitary block are measured in meter run. All pipes imbedded in walls shall be coated with 3-layers of extruded polyethylene. All pipe joints imbedded in walls shall be coated with thick asphalt layer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.12</td>
<td>- 1/2&quot; diameter pipe</td>
<td>MR 25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.13</td>
<td>- 3/4&quot; diameter pipe</td>
<td>MR 65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.14</td>
<td>- 1&quot; diameter pipe</td>
<td>MR 35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supply and install VIDOFLEX tube insulation material of minimum 13mm thickness, including all necessary accessories e.g. adhesive material etc. for hot water piping, complete with the insulation of all fittings e.g. elbow, &quot;T&quot;, union, etc. The price includes the supply and</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.15</td>
<td>- 1/2&quot; diameter pipe</td>
<td>MR 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.16</td>
<td>- 3/4&quot; diameter pipe</td>
<td>MR 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.17</td>
<td>- 1&quot; diameter pipe</td>
<td>MR 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.18</td>
<td>Supply, install and test plastic Pexgol pipes 22mm dia. Price to include Copper Adaptors, elbows, and all needed fittings and external sleeve tube 25mm dia. for protection of interior tubes.</td>
<td>MR 75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.19</td>
<td>Supply, install and test Pexgol pipes 16mm dia. Price to include Copper Adaptors, elbows, and all needed fittings and external sleeve tube 25mm dia. for protection of interior tubes.</td>
<td>MR 220</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>Description</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>-------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.20</td>
<td>Supply, install and test Copper Collectors1&quot; dia., as made by Giacomini or equal. Price shall be per opening (eye), and shall include for the required copper adaptors, hangers, supports, ties, air vents. Collectors shall be installed on walls, as shown on drawings in the corridor. The work shall be completed as specified and according to the Engineer's instructions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.21</td>
<td>Supply, install, connect and test a hot water solar system, of approved quality. Unit price shall include solar collectors of 6000 Kcal/h capacity, 120 litres hot water cylinder horizontal type with electric coil, all piping and connection till main water pipes (hot and cold) concrete base and all accessories needed as per drawings, specifications and engineers’ instructions. 12000 Kcal/h (two panels of 6000 Kcal/h)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.22</td>
<td>Supply, install, connect and test a plastic water tank (black color) of 1500 litres capacity, including metallic stand, painting, valves, float valve, union with all necessary fittings, piping and connections till main cold water piping and all accessories; all according to the engineers’ instructions and approval.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 12.23 | Supply and Build Percolating Pit, Septic Tank and Interceptor (As Detailed in the drawings Drawing # A-30). The price to include:- a. Excavation, in any type of soil, to the required depth and dimension shown in the drawings. Removal of extra and/or unsuitable soil. b. Back filling as per specifications and leveling of site around the structures to the levels shown in the drawings with approved imported selected fill. c. Cast in Place Concrete Grade 'B-150', for blinding under foundations and walls. d. R. Concrete Grade 'B-250', for foundations, beams, walls, suspended slabs, walls of percolating pit compartment of Interceptor and the like as per detailed drawings. Including Concrete treatment additives. e. Reinforcement Steel bars in Shape, length and diameter detailed on the drawings and approved shop drawings and bar bending schedule. f. Three coats of Plaster to walls and ceiling of Percolating Pit and Interceptor. Trowel 
| Job 1 | |

**Total of Mechanical Works:**

| Total Bill No 12 |  |
## Summary

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill 1</td>
<td>EXCAVATION WORKS</td>
<td></td>
</tr>
<tr>
<td>Bill 2</td>
<td>CONCRETE WORKS</td>
<td></td>
</tr>
<tr>
<td>Bill 3</td>
<td>Stone Works</td>
<td></td>
</tr>
<tr>
<td>Bill 4</td>
<td>CONCRETE BLOCK WORKS</td>
<td></td>
</tr>
<tr>
<td>Bill 5</td>
<td>PLASTERING</td>
<td></td>
</tr>
<tr>
<td>Bill 6</td>
<td>TILING, FLOORING AND MARBLE WORKS</td>
<td></td>
</tr>
<tr>
<td>Bill 7</td>
<td>CARPENTRY AND JOINERY WORKS</td>
<td></td>
</tr>
<tr>
<td>Bill 8</td>
<td>STEEL AND ALUMINUM WORKS</td>
<td></td>
</tr>
<tr>
<td>Bill 9</td>
<td>PAINTING WORKS</td>
<td></td>
</tr>
<tr>
<td>Bill 10</td>
<td>INSULATION AND ROOFING</td>
<td></td>
</tr>
<tr>
<td>Bill 11</td>
<td>ELECTRICAL WORKS</td>
<td></td>
</tr>
<tr>
<td>Bill 12</td>
<td>MECHANICAL WORKS</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Discount</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Discount Amount</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Net Total</strong></td>
<td></td>
</tr>
</tbody>
</table>

NET TOTAL SUM (in words) :

SIGNED AND SEALED :

AUTHOURIZED :

TITLE :

SIGNATURE :

DATE :