

**Postgraduate Medical Research Institute**

**University of GHANA**

**Medical School**

**General Specification**

**Kupe Architects-Engineers**

**March 1977**

**Copy No.**

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SECTION 7. GENERAL SPECIFICATION

Part 1. Special Conditions

SECTION 7. GENERAL SPECIFICATIONS

Part 1. Special Conditions

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7.1.1 Meaning of Terms      The following words wheresoever used in the contract shall have the meanings herein assigned to them. All other definitions shall appear in Part 1 of Section 4.

"Contractor" shall mean the party or parties to whom shall have been let a contract for the work to be done under these contract documents, and the legally appointed representatives, successors and assigns of said party or parties.

"Subcontractor" shall mean any party or parties having a direct contract with the Contractor for the performance of any part or parts of the work to be performed under the contract.

"Month" shall mean calendar month.

"Approved" or "approval" shall mean approved or approval in writing by the Architect or other authority herein specified.

When the words "shown", "indicated", "detailed", "specified" or words of similar import are used such words shall refer to the detailed specifications and the drawings unless expressly stated otherwise.

Where the words "directed", "permitted", "approved", "accepted", "required", "authorized" or words of similar import are used, such words shall refer to the direction, permission, approval, acceptance, requirement or authorization of the Engineer or Purchaser unless expressly stated otherwise.

- 7.1.2 Site Conditions and Investigation The location of the proposed building is to be at Legon campus of University of GHANA LEGON ACCRA GHANA. The Tenderer shall have personal knowledge of the location of the proposed work and shall acquaint himself with the actual conditions and requirements thereof, including labour conditions and labour rates and shall not claim at any time after the submission of the tender of the subsequent execution of the contract that there was any misunderstanding with regard to the conditions imposed by the contract, or prevailing at the site or in GHANA.
- 7.1.3 Inspection of Site The Contractor shall be deemed to have relied upon his own examination of the Site and to have informed himself fully and at his own expense as to all data, matters and things, local or otherwise, requisite to the fulfillment of the Contract. Failure to acquaint himself fully with all available information concerning conditions affecting the work will not relieve the Contractor of the responsibility for estimating the difficulties and costs of satisfactorily performing the work.
- 7.1.4 Materials and Labour All materials, equipments brought onto the site shall, from the time of their being so brought, vest in and be the property of the Owner, but shall remain at the risk of the Contractor except as provided in Article 16 "Force Majeure" of "General Conditions" until the final and formally acknowledged completion and acceptance of the Contract. Materials, plant and tools shall not be removed from the site except with the written permission of the Supervisor.
- 7.1.5 Remedy on Failure to Insure If the Contractor shall fail to effect and keep in force the third party insurance, the Owner may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the Owner from any moneys due or which may become due to the Contractor or recover the same as a debt from the Contractor.
- 7.1.6 Contractor's Records The Contractor will co-operate with the Supervisor and the Owner in the keeping of detailed records and accounts in connection with all matters relating to the performance of the work and the execution of the Contract. The manner of recording and accounting shall be as prescribed by the Owner and all the Contractor's records and accounts, in any way connected with the Contract, shall remain on site or at a place designated by the Owner and shall be made readily available to the Supervisor and the Owner at all times. The contractor shall provide the Supervisor and the Owner with such copies of all records and accounts as they may require without unreasonable delay. The Contractor shall keep all records and accounts safe at all times from theft and fire or loss from any other cause.

- 7.1.7 Supervisor's Authority The Supervisor's decision shall govern the interpretation of the contract and he shall be the sole judge of methods used and the quality and quantity of labour, workmanship, materials, plant, apparatus, equipment and appliances used or supplied by the Contractor pursuant to the contract. The Supervisor's decision of all such matters shall be final, being subject only to the terms of Article 13 "Arbitration" of Form of Contract Agreement. The Supervisor shall have authority to stop the progress of the work whenever, in his opinion, such stoppage may be necessary to ensure the proper execution of the work. In an emergency affecting or liable to affect the safety of life or property, the Supervisor shall have authority to stop the work and order such changes therein, or in the methods, plant, equipment and apparatus used by the Contractor and to order such work additional to the contract or otherwise as may, in his opinion, be necessary.
- 7.1.8 Owner's Right to Do Work In the event of the Contractor failing to meet the requirements of the Supervisor in the matter of labour, plant and materials, the Owner is hereby empowered to employ such additional labour, obtain such materials and additional plant as may be necessary for the successful prosecution of the work and the cost of so doing shall be dealt with as prescribed in Article 1.9 of Section 7 "Payments due from the Contractor". In such cases, the Owner shall pay wages or prices as he may think proper. Under such circumstances the Owner may use not only the labour, plant, materials or all of them supplied or procured under the terms of this Article but such labour or plant or materials as have been already supplied or provided by or on behalf of the Contractor. In the execution of the work under this clause until its completion, but Owner may use all the plant and materials hitherto provided by the Contractor. The Owner shall not be liable to the Contractor for wear or tear thereto, not for the loss, damage or destruction thereof, other than as may be provided for under the Contract.
- 7.1.9 Payments Due from the Contractor All costs, damages, or expenses, for which under the Contract the Contractor is liable to the Owner, may be deducted by the Owner from any moneys due or becoming due to the Contractor under the Contract, or may be recovered by action at law or otherwise from the Contractor.
- 7.1.10 Import Duty All codes and regulations shall be complied for any materials and goods to be imported. The Import Duty shall be included payable for imported materials and goods. The following procedures shall be observed in the ordering and obtaining of all imported materials in order to obtain such exemption from Import Duties as may be obtained by the Owner.
- a. A list giving the quantity of materials and goods and supplier's names shall be submitted to the Supervisor before placing the order.

- b. The order shall then be placed to the approved Supplier instructing him to consign the materials and goods to University of GHANA Medical School. Copies of the orders shall be handed to University of GHANA Medical School and to the Supervisor.
- c. The supplier shall then send the dispatch note of fulfilling the order to University of GHANA Medical School (the consignee) and to the Contractor.
- d. The contractor's order copy, duly stamped and endorsed by the Supervisor shall be sent to the University of GHANA Medical School's expeditor.
- e. When University of GHANA Medical School is notified of the arrival of the materials and goods in GHANA, the Contractor shall be so informed by them. Transport, labour, etc. shall be organized for its collection, and University of GHANA Medical School shall be informed of the arrangements for collection.
- f. The Goods shall then be cleared through Customs by University of GHANA Medical School's expeditor. All handling required and payment of duty stamps shall be borne by the Contractor.

7.1.11 Wages and  
Conditions  
of Employ-  
ment

- a. The engagement of all labour including the transport, housing, feeding and payment thereof shall be arranged by the Contractor.
- b. All Safety, Health and Welfare Regulations shall be properly observed by the Contractor.
- c. No alcoholic liquor or drugs shall be imported, sold, given, bartered or otherwise by the Contractor, his Sub-Contractors, agents or employees in accordance with the Statutes Ordinances and Government Regulations or Orders in force.
- d. No arms or ammunition of any kind shall be given, bartered or otherwise to any person by the Contractor.
- e. All local holidays shall be observed in dealings with labour.
- f. In case of any outbreak of illness of an epidemic nature, such regulations, orders and requirements as may be made by the Government, the local medical or sanitary authorities shall be complied.
- g. Reasonable precautions shall be taken to prevent any unlawful, riotous or disorderly conduct by or amongst the Contractor's employees, persons and property in the neighbourhood of the works shall be protected against the same.

- h. Foreign employees shall be engaged in accordance with the regulations and requirements of the Immigration Department.
- i. Any person guilty of dishonesty or attempted dishonesty to the institute or of disobedience of the regulations or of bad behavior shall be dismissed.
- j. Complete records of all employees giving their names and permanent records shall be kept for the inspection of the Supervisor.

7.1.12 No Night Work

No work shall be carried out on Site during the night without the permission in writing of the Supervisor when the work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the work in which case the Contractor shall immediately advise the Supervisor

7.1.13 Medical

The Contractor shall provide all necessary medical facilities, attendance and supplies for his labour force in accordance with the Specifications and all government rules and regulations and all other statutory requirements to the satisfaction of the appropriate government departments, the Supervisor and the Owner.

7.1.14 Provisional Sums

In any case where the Contract Price includes provisional sums for meeting the expense of extra work or for work to be done or materials to be supplied and for labour at the Site, such sums shall be expended or used, either wholly or in part, or be not used, at the discretion of the Supervisor and entirely as he may decide and direct. If no part or only part thereof is used, then the whole or the part, as the case may be, not used shall be deducted from the Contract Price.

7.1.15 Inspection during and on Completion of the Work

All work to be performed and plant to be supplied under the Contract shall at all times be subject to inspection by the Owner, the Supervisor or his authorized representatives or his appointed inspectors. The Contractor shall provide every facility as required by the Supervisor, or any one of the said inspectors for examining, inspecting and testing said work and plant. The Contractor shall notify the Supervisor before beginning any operation or before resuming any operation which may have been previously suspended for any reason, so as to enable him to arrange for the necessary inspection. The Supervisor will specify the amount of advance notice required to provide for the proper inspection of any work or plant. The Officer of the Finance Ministry of Japan may inspect the work during and on completion.

All work and plant condemned by the Supervisor or inspectors shall be made good or replaced to the satisfaction of the Supervisor. The Contractor shall be liable for the replacement or repair of defective work or plant, as required by the Supervisor, up to the time of the final acceptance by the Owner of all work performed under the contract. All work and other property



which is disturbed, injured, damaged or destroyed in the course of removal of the condemned work shall be promptly repaired and made good to the Supervisor's satisfaction. All costs incurred in making good or replacing condemned work shall be dealt with in the manner prescribed in Article 1.9 of Section 7 "Payments Due from the Contractor".

If the specifications, the Supervisor's instructions, laws, ordinances or any public authority require any work to be tested or approved, the Contractor shall give the Supervisor adequate notice of his readiness for inspection, and if the inspection is by an authority other than the Supervisor, of the date and time fixed for such inspection. Inspection by the Supervisor will be promptly made. If any such work should be covered up, or otherwise made inaccessible, without the approval or consent of the Supervisor, it shall, if required by the Supervisor, be uncovered and made accessible for examination. Restoration of any cover as required in the finished work shall be made to the Supervisor's satisfaction.

Where required, the Contractor shall furnish a complete written statement of the origin, composition and manufacture of all materials to be supplied and shall furnish samples thereof, for testing examination and approval purposes. The materials actually used in the work shall be in accordance with approved samples. The Contractor shall not be permitted to change the source of supply of materials without the written authorization of the Supervisor. The inspection herein provided for shall in no way relieve the Contractor of full responsibility for the quality, character, and proper operation and performance of the completed work or any part of it, until the Owner shall formally accept the same as provided by the contract.

If the Owner shall waive the right of inspecting and testing as herein provided, it shall in no way relieve the Contractor of full liability for the quality, character, proper operation and performance of the completed work, and every part of it, nor shall it prejudice or affect the rights of the Owner set forth in the contract.

7.1.16 Units of  
Measurement

The metric system of measurement shall be used exclusively on this contract.

7.1.17 Drawings  
and  
Specifi-  
cations

Drawings and specifications are intended to complement each other, so that if anything is shown on the drawings, but not mentioned in the specifications, or vice versa, it is to be furnished and built as though specifically set forth in both. If any discrepancies occur in the drawings, or specifications, the same shall be referred to the Supervisor before proceeding with the work, and the Supervisor's decision on such discrepancies shall be final.

Large scale drawings shall have preference over smaller scale drawings and figured dimensions shall have preference over scaled dimensions.

The Contractor shall at all times keep a copy of the drawings and specifications on the site. Such drawings and specifications must be the latest revised issue received and must bear the Supervisor's stamp of the approval.

In addition to the drawings and specifications attached hereto, the Supervisor will, during the progress of the work, furnish additional drawings, specifications, and instructions as may be necessary, in the opinion of the Supervisor, for the purpose of the proper and adequate execution and maintenance of the work, and the Contractor shall make his work conform to all such drawings, specifications, and instructions. Such drawings, specifications and instructions shall be deemed to be part of the contract documents.

7.1.18 Discrepancy In case any discrepancy is found among the various contract documents, the Contractor shall base his tender on the contract documents in the following order of precedence.

- (1) Form of Contract Agreement
- (2) General Conditions of Contract
- (3) Special Conditions
- (4) Preliminaries
- (5) Drawings
- (6) Particular Specifications
- (7) Standard General Specifications

7.1.19 Protection of Waterways, Irrigation and Forestry Navigable water shall be protected from the work and any conduct relating to the work. All rules and regulations of the respective government department in control of waterways shall be duly observed. Free flow of water in the irrigation canals or ditches shall be protected at all times during the work.

All regulations of the Forestry Department or other authorities having jurisdiction over forest shall be observed. Care shall be taken not to damage trees or other vegetation outside the site of the work. Care shall also be taken to prevent and suppress forest fires, and the Contractor, Sub-Contractor and his employees both independently and at the request of the forest officials shall help prevent and suppress forest fires.

SECTION 7. GENERAL SPECIFICATION

Part 2. Preliminaries

SECTION 7. GENERAL SPECIFICATIONS

## Part 2. Preliminaries

1. Safeguard The works, material and temporary facilities shall be guarded against damage or theft. All necessary watching and lighting shall be provided.
2. Maintenance of Roads Access roads, whether public or private, shall be maintained and any damage caused during construction shall be repaired and necessary temporary roads shall provided and maintained. All costs shall be borne by the contractor.
3. Boundary of the Work Site All areas not affected by the works shall be kept clear of workers, materials, etc.
4. Temporary Fence Temporary fence shall be constructed with wooden pole and wooden board or wire in such a manner as to protect the public and adjacent property.
5. Water Fresh water, plumbing services, connections, storage, etc. shall be provided and maintained. All costs for fees and charges shall be borne by the Contractor.
6. Electricity Lighting and power of sufficient capacity, temporary distribution mains, transformers, and all other equipments shall be provided and maintained. All costs for fees and charges shall be borne by the Contractor.
7. Scaffolding All scaffolding necessary for the proper execution of the works shall be provided.
8. Sign Board Sign board shall be placed and maintained in a position agreed with the Supervisor. The names and addresses of the Project, the Donor, the Architect and the Contractor shall be indicated on the board. The sign shall be two (2) meters wide by two (2) meters long faced with sheet metal and painted in colors and lettering as approved by the Supervisor.
9. Temporary Buildings Temporary contractor's and subcontractor's office, storage for materials, goods, etc. for the use of the workers and sheds for watchmen shall be provided and maintained.
10. Temporary Facilities Latrines and other necessary sanitary equipments shall be provided and maintained.

11. Clearing All preliminary works stated above shall be removed and cleared as directed by the Supervisor before completion.
12. Protective Outfits Protective outfit such as helmets, clothing, boots, etc. shall be provided for the use of the owner and other visitors.
13. Protection The works and any adjoining properties shall be protected from inclement weather. Any loss or damage caused by weather, the carelessness or lack of skill of the workers, accident or otherwise shall be repaired by the Contractor to the satisfaction of the supervisor and the owners of such adjoining property that are affected.
- The work shall be suspended for such time as may be directed and/or approved by the Supervisor if the specified quality of work is difficult to maintain during inclement weather.
14. Cleaning The works and site shall be cleaned to the satisfaction of the Supervisor during the construction and at completion.
15. Ceremonies A provisional sum of \_\_\_\_\_ for foundation stone laying and other ceremonies shall be allowed.
16. Contingencies A provisional sum of \_\_\_\_\_ for contingencies to be used as directed by the Architect shall be allowed.

SECTION 7. GENERAL SPECIFICATION

Part 3. Architectural General Specification

## Part 3. Architectural General Specification

I n d e x

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| 1. General                    | 12. Carpentry           |
| 2. Preliminary Work           | 13. Roofing             |
| 3. Earth Work                 | 14. Metals              |
| 4. Pile and Hardcore          | 15. Mortar and Plaster  |
| 5. Concrete and Form Work     | 16. Metal Sash and Door |
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| 8. Concrete Blocks and Bricks | 19. Painting            |
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| 10. Masonry Work              | 21. Miscellaneous       |
| 11. Tile Work                 |                         |

1. General

- 1.1 Principle This specification is based on the latest Japan Industrial Standard (JIS) and Japan Architects Standard Specification ( JASS ).
- 1.2 Definition Work shall be complied by this specification unless otherwise stated in the particular specification.
- 1.3 Architect The word "ARCHITECT" refers to Kume Architects-Engineers.
- 1.4 Supervisor The word "SUPERVISOR" refers to the Authorized Representative of the Architect. This Supervisor shall direct, inspect and approve the work in accordance with the specifications.
- 1.5 Owner The word "OWNER" refers to that individual, partnership or corporation mentioned as such in the contract.
- 1.6 Contractor The word "CONTRACTOR" refers to that individual, partnership or corporation mentioned as such in the contract.
- 1.7 Superintendent The word "SUPERINTENDENT" refers to the Authorized Representatives of the Contractor and Sub-contractors.
- 1.8 Discrepancy If any discrepancy is found between the various contract documents and the requirements of any ordinances, regulations or by-laws which apply to the works, inform the supervisor and subsequently the contractor shall base his tender on the contract documents in the following order of precedence:

- A. The Conditions of Contract.
  - B. The Specifications.
  - C. Any schedule of finishes, doors, windows, etc.
  - D. Any information in writing on the drawings.
  - E. Any information shown on the drawings but not in writing.
- He shall submit a note of any such discrepancies with his tender.
- 1.9 Minor Change The architect shall have authority to direct minor changes in the work without an adjustment in the contract cost and the contract time. Such changes shall be binding on the owner and the contract.
- 1.10 Alteration The owner may order changes in the design work not covered in the above items (7) and (8), within the general scope of the contract. In that case the contractor shall prepare the cost estimate of the above changes, and that cost estimate shall be approved by the owner before the start of the work.
- The cost estimate shall be based on the unit prices of the corresponding works and the rate of preliminary work and overhead expense in the contract, unless otherwise stated in the particular specification. With the Owner's approval of the estimate, the contract sum shall be changed.
- 1.11 Construction Schedule and Execution Plan The contractor shall prepare and submit to the supervisor for approval of a schedule and an execution plan of temporary facilities, stock yards, etc., before the start of the work. The contractor shall also submit to the supervisor for approval of work experience of his chief superintendent and subcontractor's lists.
- 1.12 Shop Drawing The contractor shall prepare and submit to the supervisor in time for approval and correction of shop drawings, setting drawings and models.
- 1.13 Material
- A. All materials shall be new when delivered to the site, and stored with care and properly protected with approval of the supervisor. However, those materials rejected must immediately be replaced.
  - B. The materials stated in the particular specification to be tested shall be selected with attendance of the supervisor and sealed, marked, and tested in the approved laboratory. The results shall be submitted to the supervisor for approval.
  - C. Standard of inspection and test shall be in accordance with JIS, unless otherwise specified, or directed by the supervisor.
  - D. Cost of inspection and test shall be borne by the contractor.
  - E. Samples called for shall be submit to the supervisor for approval.
- 1.14 Material to be provided The materials to be provided shall be stated in the particular specification. The above materials shall be inspected by the supervisor when delivered and stored by the contractor.



- 1.15 Performance Inspection All works shall be inspected and approved by the supervisor in the designated stages of progress. Those works unable to inspect after completion shall be inspected during the execution.
- 1.16 Nominated Subcontractor All the contractors and concerns shall plan and cooperate in right order for execution of the work.
- 1.17 Permit and License The contractor shall apply, obtain and pay for all permits and licenses for execution of the work.
- 1.18 Order of the construction premise The contractor shall secure order of laborers and protect from fires and thefts and accidents at the premises according to the law and regulations concerned. The contractor shall be held responsible for all the damages before delivery and acceptance of the work and repair the work to its original conditions. The construction permises shall be kept in order and shall be cleaned up with reasonable frequency.
- 1.19 Protection The contractor shall properly protect all works and continuously maintain adequate means to protect adjacent properties and roads and the public from danger.
- 1.20 Report The contractor shall submit the necessary reports to the supervisor on the work progressed, laborers attended, materials delivered, weather and so forth.
- 1.21 Cleaning on completion On completion the buildings and premises shall be left clean.
- 1.22 Final Inspection Before delivery of the buildings, the owner shall inspect the work with attendance of the architect and the contractor. Any work uncompleted or defected shall be completed or corrected by the contractor for further inspection and acceptance before delivery date in the contract.
- 1.23 As-Built Drawing The contractor shall prepare and submit as-built drawings of plot plan, floor plans, detail sections, mechanical, electrical and other drawings directed by the supervisor within one week from delivery of the buildings.
- 1.24 Delivery of the Building The contractor shall prepare and submit all required execution drawings to the supervisor.
- 1.25 Construction Photograph The contractor shall prepare and submit photographs of progress and completion of construction.

- 1.26 Guarantee The contractor shall be responsible for faulty materials and workmanship even after the delivery of the buildings and shall repair any defects due hereto and pay for any damage to other work resulting therefrom, unless otherwise specified. As to the water-proofing work, the contractor together with the sub-contractor shall submit the joint surety together with the as-built drawings. The number of the joint surety shall be one copy to the owner and one to the supervisor, unless otherwise specified.
- 1.27 Construction Ceremony The contractor shall prepare and perform all ceremonies at the request of the owner, unless otherwise specified. Actual cost for the ceremonies shall be borne by the owner.
- 1.28 Contract Work shall be bound by the Contract Agreement.

## 2. Preliminary Work

- 2.1 Site The site shall be surveyed and confirmed before the start of work. The contractor shall submit the survey drawing of the site and report the existing water pipes, gas pipes, electricity wires, telephone wires and other underground services to the supervisor.
- 2.2 Temporary Fence and Sign Board The temporary fence surrounding the premises shall be provided during the construction as stated in the particular specification. Construction sign board shall be provided as directed by the supervisor.
- 2.3 Staking-out, Lay-out, and Bench Mark
- A. The building position shall be confirmed by staking-outs with attendance of the supervisor.
  - B. The stake-boards shall be erected at designated position to indicate the accurate lines and levels during the progress of construction.
  - C. The bench marks shall be placed firmly and secured.
- 2.4 Scaffolding
- A. The scaffolds shall be erected safe and convenient for the execution and supervision of the work and maintained and inspected periodically for safety. The supervisor shall direct the erection and dismantling.
  - B. The materials and structures shall conform to the law and regulation concerned and directed by supervisor.
  - C. The structural design and information or samples of the pipe, hanging and other scaffoldings, which support heavy load, shall be reported and approved by the supervisor for use.
- 2.5 Storage and temporary office
- A. These temporary buildings shall be erected in premises according to the law and regulation concerned, unless otherwise specified.

- B. The supervisor's office and contractor's office shall be provided. The office shall be equipped with electric lights, water supply and other necessary services together with furnitures:  
(desks, chairs, side tables, drawing boards, book shelves, sample shelves, black board, etc.).  
The plan and structural design of the above office shall be submitted for approval of the supervisor.
- C. Explosive storage shall be isolated from other buildings and erected in accordance with law and regulation concerned. Its structural design and finishes shall be fire-proofed and all the doors shall be provided with locks. Fire-extinguisher shall be furnished.
- 2.6 Construction Machine  
Construction machine shall be approved by supervisor and provided and maintained.
- 2.7 Temporary Service  
Temporary services, as water supply, drainage, sanitary, gas, light, power, telephone, etc. shall be approved by supervisor and provided and maintained.
- 2.8 Safety Precaution
- A. Safety precaution for explosion, fire, pollution, noise, windstorm, etc. in and out of premises shall be taken in accordance with law and regulation concerned. The contractor shall be held responsible for any damages to adjacent properties and the public.
- B. Photographs of existing conditions of adjacent properties shall be taken to avoid any disputes arising from possible damages or changes.
- 2.9 Dismantling of temporary facility
- A. A part or whole of temporary facilities shall be dismantled and removed from the premises if supervisor recognizes that the above facilities obstruct the progress of work.
- B. All temporary facilities shall be dismantled and removed from premises as directed by supervisor before completion. Temporary facility areas should be leveled and cleaned.
- 2.10 Payment  
Cost for all items listed in preliminary work shall be borne by the contractor.

### 3. Earth Work

- 3.1 Site Clearing
- A. All obstacles within promises shall be disposed and cleared as directed by the supervisor.
- B. All debris left from dismantling of the previous use of the property shall be disposed and cleared with approval of the supervisor.
- C. Existing plants to be remained shall be protected from damages.
- D. All plants obstructing the work shall be removed to the designated places, unless otherwise directed by supervisor.

- E. All plant roots shall be disposed.
  - F. All other items in a way of the work shall be removed as directed by supervisor.
- 3.2 Excavation Method      The method for excavation shall be submitted for approval of the supervisor.
- 3.3 Excavation
- A. Excavation shall be performed to the required elevations and the dimensions shown on the drawings. Excavated bed for footings and piers shall not be below grade indicated unless otherwise specified.
  - B. Excavated area shall be protected from any water flowing in.
  - C. Sides of excavation shall be shored or inclined to retain excavation unless otherwise specified.
  - D. Excavation near adjoining structures shall be executed with care so as not to damage those structures.
  - E. Elevation of excavation shall be measured from the designated level; One point at every 2-4 m for trench excavation, one point at every 4 m<sup>2</sup> for area excavation.
  - F. The dimensions, of excavation shall be inspected for accuracy.
  - G. Excavated bed and soil conditions shall be inspected.
  - H. All excavated materials shall be at the discretion of the supervisor, unless otherwise specified.
  - I. Any obstacle such as water supply pipes in the course of excavation shall be treated with instruction of the supervisor.
- 3.4 Removal of Water
- A. Plan and calculation of water removal shall be submitted for approval of the supervisor.
  - B. Trench, well and other mechanical means shall be provided to keep excavation area free from water at all times.
- 3.5 Backfill      The backfill of suitable excavated soils or other materials approved by the supervisor shall be placed in horizontal layers of 300 mm in thickness. Each layer shall be compacted by hand or other mechanical means to the required density. Extra fill for settlement shall be placed where directed by supervisor.
- 3.6 Fill      Suitable excavated soils or other materials approved by the supervisor shall be used for filling and compacted by hand or other mechanical means to the required density, unless otherwise specified. Level of fill shall be shown in drawings unless otherwise directed by the Supervisor.
- 3.7 Grading      Premises shall be cleared and level with suitable materials unless otherwise specified.
- 3.8 Surplus Earth      Surplus earth shall be removed from premises, unless otherwise specified.

- 3.9 Shoring Method The plan of earth bearing shall be submitted for approval of the supervisor.
- 3.10 Sheet Piles
- A. Sheet piles shall be driven vertically on line.
  - B. The joint of wood and steel sheet piles shall be tight and secured from soil seeping in case of weak soil.
  - C. The joint of sheet piles shall not necessarily be closed in case of dry hard soil.
  - D. The back soil of pile planks shall not unnecessarily be disturbed in case of driving piles proceeding together with excavation.
  - E. The back of horizontal planks shall be filled and compacted immediately after placed and shall be inspected for weak compaction during its use.
  - F. The depth of embedment of sheet piles shall be driven enough to avoid heaping.
  - G. Heaping shall be immediately cared by sand bags or other means.
  - H. The use of special sheet piles or method of such kind necessity from the soil condition of site shall be approved with submittance of the execution plans as stated in the particular specification.
- 3.11 Wale and Bracing
- A. Sheet piles shall be supported by suitable wales and bracings.
  - B. Wales and bracings shall be firmly supported.
  - C. Cross bracings for shorings shall be lower at center to avoid supports from rising.
  - D. Cross bracings and wales shall not be loaded during execution.
  - E. The clearance between under ground structure and shoring shall be amply spaced and wales and braces shall not be placed to obstruct execution of work.
- 3.12 Dismantling of Shoring
- A. Shoring shall be dismantled with no interference to construction.
  - B. Space between sheet piles and structure shall be backfilled with suitable soil or sand prior to removal of braces and wales.
  - C. Removal of sheet piles shall be planed and executed with approval of the supervisor to prevent caving in or displacement of adjacent soil. Void left from the sheet piles shall be immediately filled with sand and water.
- 3.13 Record of Building Settlement
- A. The settlement of building shall be recorded periodically and continuously with sea level as reference after lean or slab concrete poured as directed by the supervisor.
  - B. Recording plans and explanation drawings shall be prepared and submitted for approval, and the recording time shall be directed by the supervisor.

4. Pile and Hardcore

## 4.1 Scope

- 4.1.1 Definition
- A. Foundation refers to that part of structure which transfers force from columns, walls, ground sills, struts, etc. to ground, piles, or hardcore.
  - B. Pile and hardcore refers to that part of structure which supports foundation.
- 4.1.2 General Note
- A. Execution plan shall be submitted for approval of the supervisor.
  - B. Care shall be taken to minimize vibration and noise, etc. in the neighborhood. The contractor shall be responsible for any trouble arising from it.

## 4.2 Prefabricated Reinforced Concrete Pile

- 4.2.1 Material
- A. Reinforced concrete pile shall conform to the requirements of JIS A5210 and 28 days strength.
  - B. Prestressed concrete pile shall conform to the requirements of JIS A533.
  - C. Autoclave concrete pile shall be high strength pile cured in the autoclave.
  - D. Pile shall be driven to required length. Bearing capacity of pile shall be calculated as directed by the supervisor.
  - E. Pile length, diameter, thickness, joints, bearing capacity and numbers shall conform to structural drawings.
- 4.2.2 Transportation and Handling
- A. Care shall be taken to protect piles during transportation, loading and unloading.
  - B. Pile shall not be placed more than 3 layers on platform.
  - C. Care shall be taken not to exceed allowable stress when lifting and placing.
  - D. Other handlings shall conform to JIS A7201.
- 4.2.3 Pile Driving Equipment
- A. Pile driving equipments shall be diesel hammer or steam hammer approved by the supervisor. Drop hammer may be used when number of piles is a few or pile length is short. It shall be raised and released at the height less than 2 M above the pile.
  - B. Pile cap shall be of steel with appropriate cushion inserted to protect the head.
  - C. Dolly shall be of steel with enough length and be able to extract without imparing the head of the pile.
  - D. Other equipments and methods shall be approved by the supervisor unless otherwise stated.
- 4.2.4 Pile Driving
- A. Preparation
    - (1) Piling layout and schedule which contain driving method, delivery schedule, pile numbers and piling procedure shall be submitted.

- (2) Position of all piles shall be marked and inspected by the supervisor.
    - (3) Benchmarks shall be provided at the secured places.
  - B. Test pile shall be driven with attendance of the supervisor. Level shall be placed at 10 M away from the test pile for recording unless otherwise recorded.  
Test pile of specified bearing capacity shall be used for building.
  - C. Piling shall conform to JIS A7201 and shall be done by the contractor at his responsibility.
  - D. Pile shall be checked for uprightness from two axial directions before driving.
  - E. Additional pile shall be directed by the supervisor in case pile is damaged or bearing capacity is affected.
  - F. The following cases shall be immediately reported to the supervisor.
    - (1) Unable to drive to designated depth.
    - (2) Unable to obtain required bearing capacity at required depth.
- 4.2.5 Penetration Record
  - A. Each pile shall be recorded for bearing capacity at its final penetration.
  - B. Pile shall be marked for easy recording.
  - C. The amount of penetration shall be determined by the average of every 5 to 10 driving.
- 4.2.6 Load Test
  - Load test shall be stated in the particular specification.
- 4.2.7 Protection
  - All piles driven shall be protected from damage.
- 4.2.8 Pile Head
  - Pile head shall be leveled as specified in drawings. Care shall be taken not to damage pile head when cutting extra length.
- 4.2.9 Performance Record
  - A. According to pile numbers in layout, date driven, time spent, depth driven, bearing capacity at final penetration, rebound, etc. on each pile shall be recorded and submitted to the supervisor.
  - B. Pile driving equipment shall be inspected and recorded to the supervisor for its performance and submitted.
- 4.2.10 Pile Length
  - Alteration of pile length, if necessary by the ground conditions, shall be settled with a unit price per length in the contract.
- 4.3 Steel Piles
  - 4.3.1 Material
    - A. Pipe pile shall conform to JIS A5525 and H shape-pile shall conform to JIS A5526.
    - B. Steel for pile shall be inspected according to JIS.
    - C. Test inspection data on chemical analysis and tension test of manufacturer shall be submitted if required by the supervisor.

- D. Reinforcing material for pile head, joints and pile toe shall be the same quality as the pile, which conform to JIS, unless otherwise stated.
  - E. Pile shall be free from rust, dust, oil, etc. and painted twice with Epoxy-Cortar Paint and dried and cured for over 10 days.
- 4.3.2 Transportation and Handling
- A. Transportation and handling shall be done with care so as not to damage piles. Deformed pile shall be corrected unless otherwise directed by the Supervisor.
  - B. Any damage on paint of pile shall be corrected.
- 4.3.3 Piling Equipment
- A. The following piling equipments shall be furnished unless otherwise stated.
    - (1) Drop Hammer - Weight of hammer of more than 2.5 ton  
Drop height of less than 2 m.
    - (2) Diesel Hammer - Larger than type  
Delmach-22.
    - (3) Steam Hammer - Larger than 3 ton
    - (4) Vibration Hammer - over 3.5 ton
- 4.3.4 Pile Driving Refer to 4.2.4.
- 4.3.5 Record
- A. Designated pile shall be marked for measuring of penetration.
  - B. Record shall be made on all items listed below with attendance and approval of the supervisor. Further, each record shall be reported to the supervisor for his instruction.
    - (1) Ram weight of pile driver, stroke, number of strokes per minute and rebound.
    - (2) Average penetration of a stroke for each 50 cm of total length of pile.
    - (3) Time for lifting, pitching and driving and running time of equipment for driving.
    - (4) Accuracy on position of pile head -  
Piling shall be stopped in case pile is deformed or noticeable change in the amount of penetration is detected and work shall be resumed with direction of the supervisor.
    - (5) Performance record shall refer to 4.2.9.
- 4.3.6 Test Pile
- Suitable length of test piles shall be driven to determine necessary length of all other piles. The extra length of pile shall be cut off and cut pieces may be welded, reinforced and used for shorter piles.
- 4.4 Other Pile
- The following pile methods shall be specified in the particular specification.
- A. Pedestal Pile
  - B. Benoto
  - C. Earth Drill
  - D. Wood Pile
  - E. Sand Pile
  - F. Reverse Circulation Pile



- 4.5 Sand-Core
- A. Sand shall be placed to the required level and compacted with water. Thickness of sand-core exceeding 300 mm shall be compacted with water at every 300 mm.
  - B. Sand-core shall be properly cared so as not be displaced.
- 4.6 Gravel-Core
- A. Thickness of gravel-core shall be 50 mm unless otherwise specified.
  - B. Size of gravel shall be less than 45 mm in diameter, and coarse and fine gravel shall be properly mixed.
  - C. Gravel-core shall be placed in thickness designated and compacted by proper means.
- 4.7 Rock-Core
- A. Thickness of rock-core shall be 150 mm unless otherwise specified.
  - B. Rocks shall be hard and of proper size to be placed uniformly. The voids between rocks shall be filled with a binding agent (fine and coarse gravels).
  - C. Rock-core shall be placed in required thickness and compacted by proper means.

## 5. Concrete and Form Work

### 5.1 Materials

- 5.1.1 Cement
- A. Cement shall conform to JIS R5210 (Portland Cement) for Ordinary Portland Cement, JIS R5211 (Blast furnace cement), JIS R5212 (Silica Cement), and JIS R5213 (Fly-ash cement) of A-grade cement. The use and method of high-early-strength Portland Cement, moderate heat cement and mix cement of B and C grade shall be consulted for approval of the supervisor.
  - B. Cement shall be used afresh within 30 days after delivery. Cement stored over 30 days or affected by moisture shall be reported and approved by the supervisor before use.
- 5.1.2 Aggregate
- A. Aggregates shall be clean, hard, durable and free of dirt, organic impurities, or other undesirable admixtures.
  - B. Strength of aggregates shall be more than that of hardened concrete paste.
  - C. Shape of coarse aggregates shall be not be flat or slender.
  - D. Crushed stone shall conform to JIS A5005 (crushed stone for concrete work).
  - E. Light weight aggregate shall conform to JIS A5002 (structural light weight concrete aggregate), unless otherwise specified.
  - F. Fine aggregates shall conform to the organic impurities test by JIS A1105 (the method of organic impurities test for sand).
  - G. NaCl contents test shall be performed on fine aggregate with NaCl. The amount of NaCl contents shall not exceed 0.01% of absolute dry weight of fine aggregate.
  - H. Aggregates shall be a mixture of fine and coarse grains as stated in table 1-2. Sieve analysis test shall conform to JIS A1102 (The method of sieve analysis test for aggregates) and clean test shall conform to JIS A1103 (the method of clean test for aggregate).

- I. Large coarse aggregates shall be used with approval of the supervisor when reinforced concrete is such that concrete volume is large and the amount of reinforcement is small.

Table 1.2 Aggregate grains

<u>Size of Aggregates</u>		<u>Percentage of weight passing through in sieve analysis test</u>
Coarse Aggregate	Less than 40 mm	Over 90% in 40 mm sieve
	30	Under 90% in 30 mm sieve
	25	
	20	
Fine Aggregate	Less than 5	
	2.5	
	1.2	

- J. Aggregate not qualified to the above specification shall be approved by the supervisor for use.

## 5.1.3 Water

Water shall be clean, free of oil, acids, injurious amounts of vegetable matters, alkalies and other organic substances.

## 5.1.4 Handling and Storing

- A. Cement shall be piled no more than 10 bags and stored so as to permit easy inspection.  
 B. Fine and coarse aggregate shall be stored separately and protected from dirt, and other impurities. Care shall be taken not to disturb the proportion of grains in handling.

## 5.1.5 Test

- A. Materials shall be tested in accordance with direction of the supervisor as listed in Table 1.5.  
 B. Materials shall be tested by such agency as directed by the supervisor.  
 C. Concrete strength test shall be in accordance with direction of the supervisor, JASS 5-20-5 or unless otherwise specified.

Table 1.5 Materials test

<u>Materials</u>	<u>Test</u>	<u>No. of Tests</u>
Cement	Setting test, Strength test, Consistency test by JIS R5201	Once in every manufacturer. Once in every 2000 bags for strength test.

Table 1.5 Materials test - continued -

Aggregate	JIS A1102, JIS A1103 or JIS A1105 with direction of the super- visor NaCl contents analysis test.	Once in every delivery when materials of different qualities are delivered.
Water	Contents analysis test for salt, acid, alkalies, oil, organic substances with direction of the supervisor.	

## 5.2 Mixing

## 5.2.1 General

- A. Mixing of concrete shall be determined to obtain required strength, workability, consistency and durability.
- B. Mixing of concrete shall conform to this specification and, if directed, test mixing shall be done to determine strength and workability for approval of the supervisor.
- C. Any additives for concrete, such as AE (Air-Entraîne), dispersing and other agents shall be approved by the supervisor for use.
- D. Strength of concrete shall conform to JIS A1108 (Method of compressive strength test for concrete) of 28 days' compressive strength. Short-age-strength of concrete shall be determined in accordance with JASS, Table 5.20.5. (7-28 days strength of concrete).
- E. Water-Cement ratio of water tight concrete shall be less than 50%. However, slump of water-proofed concrete for roof shall be less than 15 cm.
- F. Specification for light-weight concrete for structure shall be stated in the particular specification.

## 5.2.2 Required strength and Mixed strength

- A.  $F_c$  (Required concrete strength) of structure shall be as follows, unless otherwise specified.

$F_c = 3 \times$  allowable unit stress sustained.

Loading =  $1.5 \times$  allowable unit stress temporary loading.

- B.  $F$  (Mixed concrete strength) shall be considered for the standard deviation of concrete strength as follows;

$$F = F_c + \sigma$$

$\sigma$  shall be referred to the table below unless otherwise directed by the supervisor.

Table 2.2 B  $\sigma$  (average deviation) of concrete strength for different grade of performing method.

<u>Grade</u>	<u>Performance</u>	<u><math>\sigma</math> (kg/cm<sup>2</sup>)</u>
A	Ready-mixed concrete of automatic bacher plant with perfect supervision and all tests.	25
B	Ready-mixed concrete of simple bacher-plant or on-site-mixed concrete with perfect supervision and all tests.	35
C	On-site-mixed concrete with ordinary supervision and some tests.	45

- C. In case the assumed average temperature is less than 15°C during concrete curing period (28 days from placement), F (Mixed concrete strength) shall be decided as follows;

$$F = F_c + \sigma + t \text{ (kg/cm}^2\text{)}$$

F: Mixed concrete strength (28 days' compressive strength) (kg/cm<sup>2</sup>)

$\sigma$ : Average deviation of concrete strength (kg/cm<sup>2</sup>)

t: Rectification value of concrete strength affected by temperature.

t (Rectification value of concrete strength affected by temperature) shall be complied with the following table 2.2 C. unless otherwise specified or directed by the supervisor. Furthermore, cement not listed on the Table 2.2 C shall be otherwise specified or directed by the supervisor.

Table 2.2 C Rectification value of concrete strength affected by temperature (kg/cm<sup>2</sup>)

<u>Class of Cement</u>	<u>Assumed average temperature during 28 days from placement of concrete.</u>		
	<u>10°C-15°C</u>	<u>5°C-10°C</u>	<u>2°C-5°C</u>
High-early-strength Portland cement.	15	30	40
Ordinary Portland cement blast furnace cement A-grade Fly-ash cement A-grade Silica cement A-grade.	20	40	50
Blast furnace cement B-grade Fly-ash cement B-grade Silica cement B-grade.	25	50	60

## 5.2.3 Concrete Slump

Designated slump of concrete shall be in compliance with the following Table 2-3, unless otherwise specified.

Table 2.3 Standard of designated slump

<u>Portion</u>	<u>Slump (cm)</u>	
	<u>without Vibration</u>	<u>with Vibration</u>
Foundation slab, beam	15-18	5-10
Column wall	18-21	10-15

## 5.2.4 Cement Strength

K (Cement strength) shall conform to JIS R5201 (Physical testing method of Cement) of 28 days compressive strength of material as follows;

- A. Cement delivered to site shall be tested as Table 1.5 to obtain 28 days compressive strength. However, 28 days compressive strength of cement may be obtained as following Table 2.4 (1) or dependable method to assume from short age strength test.

Table 2.4 A Formula to presume 28 days compressive strength of cement from short-age strength.

<u>Cement</u>	<u>Presume K28 (28 days compressive strength) from K7 (7 days compressive strength)</u>	<u>Presume K28 (28 days compressive strength) from K3 (3 days compressive strength) and K7 (7 days compressive strength)</u>
High-early-strength Portland cement	$K28 = 0.6K7 + 240$	$K28 = 0.65K7 - 0.25K3 + 280$
Ordinary Portland cement Blast furnace cement A-grade Fly-ash cement A-grade Silica cement A-grade	$K28 = K7 + 150$	$K28 = 1.2K7 - 0.4K3 + 160$

- B. Strength of cement shall be determined as stated above and K (Cement strength) shall be decided by following item (1) or (2), if the result of test shows greater value or less 20 kg/cm<sup>2</sup> of the following item (1) or (2).

- (1) Dependable average value of testing laboratory or research institute.
- (2) Less 30 kg/cm<sup>2</sup> of manufacturer's result of cement test.

However, cement shall be used within 2 months from manufacturing.

- C. K (cement strength) shall be decided as the result of item A, in case the value is lower than less 20 kg/cm<sup>2</sup> of item B-(1) or B-(2), unless better result is obtained from re-testing. The value of re-testing shall be also treated in the same manner as stated in item B-(1) and B-(2).
- D. Value of K (cement strength) shall be decided as table 2.4 D in case the value of test exceeds the maximum value shown on the table.

Table 2.4 D Maximum value of K (cement strength)

<u>Cement</u>	<u>Maximum value of K</u>
High-early strength Portland cement	400
Ordinary Portland cement	370
Blast furnace cement A-grade	
Fly-ash cement A-grade	
Silica cement A-grade	
Blast furnace cement B-grade	350
Fly-ash cement B-grade	320
Silica cement B-grade	

- E. Value of K (cement strength) shall be decided as less 20 kg/cm<sup>2</sup> of maximum value of K shown on table 2.4 D with approval of the supervisor, in case the test stated in item A is not able to perform.

5.2.5 Water-cement Ratio

- A. Water-cement ratio theory for F (Mixed strength of concrete); X (Water-cement ratio) to obtain F (Mixed strength of concrete) stated in Item 2.2.B shall be as follows in accordance with the K (cement strength) stated before;
  - (1) Formula below shall be applied for ordinary portland cement, High-early-strength portland cement, Blast furnace cement A-grade, Fly-ash cement A-grade, and Silica cement A-grade;

$$X = \frac{61}{\frac{F}{K} + 0.34} \text{ ( } \circ\text{/WT ) } \dots\dots\dots (2.5.A).$$

X; water-cement ratio ( °/WT )  
 F; mixed strength (kg/cm<sup>2</sup>)  
 K; cement strength (kg/cm<sup>2</sup>)