

Программа Развития Организации Объединенных Наций
United Nations Development Programme



Tajikistan

Specifications & Performance Requirements

“Construction of TB Prison Hospital for 100 beds, to be located at Vakhdat prison”
Ref: 312/2010/RFQ/UNDP/GFATM/TB

TABLE OF CONTENTS

VII.1	THE GENERAL TECHNICAL CONDITIONS
VII.1.1	LOCATION OF WORKS
VII.1.2	GENERAL REQUIREMENTS
VII.1.3	DESCRIPTION OF WORKS
VII.1.4	SCOPE OF WORKS
VII.1.5	SITE INFORMATION
	VII.1.5.1 General
	VII.1.5.2 Natural Setting
	a) Climate
	b) Seismic Conditions
VII.1.6	GENERAL WORKS
VII.1.7	PROGRAMME OF WORK AND RECORDS
	VII.1.7.1 Programme of Work
	VII.1.7.2 Contractor's Record
	VII.1.7.3 Site Meetings
	VII.1.7.4 Work Progress Photographs
	VII.1.7.5 Payment
VII.1.8	MOBILISATION AND DEMOBILISATION
	VII.1.8.1 Scope
	VII.1.8.2 Mobilization
	VII.1.8.3 Maintenance of Contractor's Site and Work Facilities
	VII.1.8.4 Demobilization
	VII.1.8.5 Additional Items and Conditions
	VII.1.8.6 Measurement and Payment
VII.1.9	EQUIPMENT FOR WORK
VII.1.10	QUALITY CONTROL OF MATERIALS AND WORKMANSHIP
VII.1.11	STANDARDS
VII.1.12	SURVEY AND MEASURING EQUIPMENT
VII.1.13	MEASUREMENT OF WORK
VII.1.14	BASIC OF PAYMENT
VII.1.15	REMOVAL
VII.1.16	SETTING OUT
VII.1.17	SITE FACILITIES FOR THE ENGINEER
	VII.1.17.1 General
	VII.1.17.2 Methodology
	VII.1.17.3 Inspection Room
	VII.1.17.4 Employer's and Engineer's Site Office and Residence including Maintenance
VII.1.18	DUST AND MUD OR EXTRANEIOUS MATERIALS
VII.1.19	PROVISIONS FOR TRAFFIC
VII.1.20	COMPLETION DRAWINGS
VII.2	EARTH WORKS
VII.2.1	SCOPE OF WORK
VII.2.2	SUB-SOIL INVESTIGATION
VII.2.3	MATERIALS
VII.2.4	SOURCE OF FILL MATERIAL
VII.2.5	TESTING OF FILL MATERIAL
VII.2.6	PLACING AND COMPACTION
VII.2.7	COMPACTION CONTROL
VII.2.8	EQUIPMENT FOR EARTH WORK
	VII.2.8.1 Compaction Equipment
	VII.2.8.2 Watering Equipment
VII.2.9	CLEARING, GRUBBING AND REMOVAL OF TOP SUBSOIL
VII.2.10	EXCAVATION
VII.2.11	GENERAL INSTRUCTION FOR PREPARATION OF THE FOUNDATION PIT

VII.2.12	CUTTING, SUBGRADE PREPARATION AND COMPACTED FILL
VII.2.13	VII.2.12.1 SUB-GRADE PREPARATION
VII.2.14	BACK FILLING
VII.2.14	METHOD OF WORK, MEASUREMENT AND PAYMENT
VII.2.14.1	Setting Out and Surveying
VII.2.14.2	Clearing , Grubbing and Removal of Soft Subsoil
VII.2.14.3	Fill Material
VII.2.15	TURFING
VII.2.15.1	Description
VII.2.15.2	Material
VII.2.15.3	Constructed Method
VII.2.15.4	Measurement and Payment
VII.2.16	INSIDE ROADS
VII.3	BUILDING MATERIALS
VII.3.1	SCOPE OF WORK
VII.3.2	MATERIALS
VII.3.2.1	Cement
VII.3.2.2	Aggregates
VII.3.2.3	Reinforcing Steel
VII.3.2.4	Water
VII.3.2.5	Sand for Filling
VII.3.2.6	Admixtures
VII.3.2.7	Other Materials
VII.3.2.8	Imported Materials
VII.3.2.9	Testing
VII.3.2.10	Sampling of Materials
VII.3.2.11	Measurement of Materials
VII.3.2.12	Payment
VII.4	CONCRETE WORKS
VII.4.1	DESCRIPTION
VII.4.2	DESIGN OF CONCRETE MIX
VII.4.3	TRANSPORT, PLACING AND COMPACTION OF CONCRETE
VII.4.4	CURING OF CONCRETE
VII.4.5	WORKING IN EXTREME WEATHER
VII.4.6	FINISHING
VII.4.7	ADMIXTURE
VII.4.8	JOINTS IN CONCRETE
VII.4.19	TESTS
VII.4.10	CONCRETE SIGN -OUT FORMS
VII.4.11	MEASUREMENT AND PAYMENT
VII.5	STEEL REINFORCEMENT FOR STRUCTURES
VII.5.1	GENERAL
VII.5.2	BENDING OF REINFORCEMENT
VII.5.3	PLACING OF REINFORCEMENT
VII.5.4	JOINING AND SPLICING OF REINFORCEMENT
VII.5.5	MEASUREMENT AND PAYMENT
VII.6	FORMWORKS
VII.6.1	GENERAL
VII.6.2	FORMED SURFACE AND FINISH
VII.6.3	QUALITY OF SHUTTERING
VII.6.4	FORMWORK DESIGN
VII.6.5	PREPARATION OF FORMWORK BEFORE CONCRETING
VII.6.6	REMOVAL OF FORMWORK
VII.6.7	DISCOLORATION

	VII.6.8	CLEAN UP
	VII.6.9	NUMBER OF USES
	VII.6.10	FORMWORK (OR EXPOSED CONCRETE WORK)
	VII.6.11	MEASUREMENT AND PAYMENT
VII.7	PRE-CAST R.C.C STRUCTURES	
	VII.7.1	GENERAL
	VII.7.2	EQUIPMENT, MATERIALS AND PREPARATION OF MONOLITHIC DETAILS
	VII.7.3	MARKING OF MONOLITHIC DETAILS
	VII.7.4	HANDLING, TRANSPORTATION AND STORAGE
	VII.7.5	PLACING OF FLOOR SLABS
	VII.7.6	DEFECTIVES
	VII.7.7	MEASUREMENT AND PAYMENT
VII.8	MASONRY WORK	
	VII.8.1	SCOPE OF WORK
	VII.8.2	SAMPLES
	VII.8.3	MATERIAL
	VII.8.4	MORTAR
	VII.8.5	INSTALLATION AND WORKMANSHIP
	VII.8.6	COREBELLING, COPING, CORNICES, STRING, COURSE, ETC
	VII.8.7	MEASUREMENT AND PAYMENT
	VII.8.8	BRICK FLAT SOLING
	VII.8.8.1	Scope of Work
	VII.8.8.2	Description of Work
	VII.8.8.3	Measurement and Payment
VII.9	METAL WORKS	
	VII.9.1	SCOPE OF WORK
	VII.9.2	MATERIAL AND SHOP DRAWINGS
	VII.9.3	FABRICATION, ERECTION AND INSTALLATION
	VII.9.4	MEASUREMENT AND PAYMENT
	VII.9.5	METALLIC PIPES
	VII.9.5.1	Scope of Work
	VII.9.5.2	Preparatory Work
	VII.9.5.3	Storage
	VII.9.5.4	Fabrication and Installation
	VII.9.5.5	Measurement and Payment
	VII.9.6	METAL PROTECTION
	VII.9.6.1	Work Description
	VII.9.6.2	Cleaning
	VII.9.6.3	Materials
	VII.9.6.4	Painting
	VII.9.6.5	Measurement and Payment
	VII.9.7	Asbestos Cement Pipe
	9.9.7.1	General
	9.9.7.2	Requirements
	9.9.7.3	Measurement and Payment
	VII.9.8	PVC Pipe
	9.9.8.1	General
	9.9.8.2	Requirements
	9.9.8.3	Measurement and Payment
VII.10	WOOD WORKS	
	VII.10.1	SCOPE OF WORKS
	VII.10.2	GENERAL REQUIREMENTS
	VII.10.3	INSTALLATION
	VII.10.4	MEASUREMENT AND PAYMENT

VII.11	PLASTERING, PAINTING, FLOORING AND DECORATION WORKS
VII.11.1	PLASTERING
VII.11.2	PAINTING
VII.11.3	DAMP PROOF COURSE
VII.11.4	ARTIFICIAL PATENT STONE FLOORING
VII.11.5	FLOORING
VII.11.6	DECORATION WORKS
VII.11.7	MEASUREMENT AND PAYMENT
VII.11.8	BILL OF PREMISES FINISHING, SPECIFICATION OF FLOORS
VII.12	PLUMBING AND PIPE LAYING
VII.12.1	SCOPE
VII.12.2	GENERAL REQUIREMENTS
VII.12.3	APPROVAL AND LIST OF MATERIALS, FIXTURES AND EQUIPEMNT
VII.12.4	MATERIALS AND EQUIPMENT
VII.12.5	WATER PIE, FITTING AND CONNECTIONS
VII.12.6	SEWAGE AND RAIN WATER PIPING, FITTING AND CONNECTIONS
VII.12.7	CLEANOUTS, TESTA, TRAPS, SLEEVES, VALVES, ETC
VII.12.8	TOILET FIXTURES
VII.12.9	INSPECTION AND TESTS
VII.12.10	MEASUREMENT AND PAYMENT
VII.13	WATER SUPPLY AND SEWERAGE
VII.13.1	GENERAL DATA
VII.13.2	SPECIFICATIONS OF THE EQUIPMENT AND MATERIALS
VII.14	HEATING AND VENTILATION
VII.14.1	GENERAL DATA
VII.14.2	HEATING
VII.14.3	VENTILATION
VII.14.4	SPECIFICATIONS OF THE EQUIPMENT FOR HEATING AND VENTILATION
VII.15	POWER SUPPLY
VII.15.1	POWER SUPPLY
VII.15.2	SPECIFICATIONS OF THE EQUIPMENT AND MATERIALS FOR POWER SUPPLY
VII.15.3	SPECIFICATIONS OF THE EQUIPMENT FOR THE EXTERNAL ELECTRICAL NETS AND BOILER ROOM
VII.16	FIRE ALARM
VII.15.1	FIRE ALARM
VII.15.2	SPECIFICATIONS OF THE EQUIPMENT AND MATERIALS
VII.17	GLASS AND GLAZING
VII.17.1	GLASS
VII.17.2	GLAZING
VII.17.3	MIRROR
VII.17.4	DEFECTS AND BRAKAGE
VII.17.5	CLEANING
VII.17.6	MEASUREMENT AND PAYMENT
VII.18	PROVISIONAL SUMS
VII.18.1	DAY WORK
VII.18.2	SPECIAL GRASS COVER
VII.18.3	MEASUREMENT AND PAYMENT
VII.19	HOSPITAL LIFT
VII.20	ENVIRONMENTAL MANAGEMENT PLAN

VII.1 GENERAL TECHNICAL CONDITIONS

DESIGN DOCUMENTATION

The design documentation for Construction of building for tuberculous prison hospital for 100 beds of the entity я/c 3/13 of Ministry of Justice of the Republic of Tajikistan in Vahdat city has been developed by the LLC "Kapitel", Tajikistan hired by the UNDP under separate contract, which will be the author-supervisors. The Engineer-Monitor will be responsible to provide construction work supervision. According to the Engineer-Monitor's Terms of Reference construction work supervision during the construction phase will include the following activities:

1. Permanently be in object.
2. Observation of the construction works performed by Contractors and daily record in Supervision book.
3. Review and check against contractual obligations of contractors' documents (including drawings), implementation schedules, site organization and planning, on-site staff complement), insurance and bonds.
4. Control of compliance works to be performed with the design documentation.
5. Control of quality, quantity and terms of the works to be completed.
6. Control of quality of construction materials to be provided and applied by Contractor, including testing of building materials and construction elements to ensure adherence to norms.
7. Inspect of compliance dissembled works with the project and confirm Acts of dissembled works.
8. Inspect all implementation documents of the objects.
9. Accept works performed and confirm Acts of executed works including checking the quantities in the periodic bills submitted by the contractor and reviewing the requests for payments to check for accuracy.
10. In case of non-observance of the Contract conditions by Contractor inform UNDP Engineer.
11. Problem-solving related to local conditions, population, authorities etc. In case of problems was not solved in the local level – inform UNDP Engineer.
12. If amendment to design documentation is necessary, provide appropriate suggestions to the UNDP Engineer for his consideration and / or interact with the design author to obtain their relevant input
13. Weekly submission results of the object monitoring to the UNDP Engineer in form approved.
14. Submission monthly written reports on works supervision.
15. Inspect completed work including provisional acceptance and handing over
16. Organize site meetings with contractors, consultants and client (UNDP) and after the meeting issue minutes of the meeting.

VII.1.1 LOCATION OF WORKS

The construction site is located in the east part in territory of the entity я/c 3/13 of Ministry of Justice of the Republic of Tajikistan. The construction site of the hospital borders with: from north – road; from east – two-floor hospital building; from south – territory of the entity я/c 3/13 of Ministry of Justice of the Republic of Tajikistan; from west – concrete channel. The site relief is smooth with small slope $i=0,03$ from the northeast to southwest. The vertical planification finished by method of red horizontal with cut 0,5m.

VII.1.2 GENERAL REQUIREMENTS

These Specifications shall be read in conjunction with various other documents forming the Contract namely Invitation for Bids, Instruction to Bidders, Bidding Data, General Conditions of Contract, Bill of Quantities and Drawings and other related documents together with any addenda issued in accordance with the Bidding Documents.

The Specifications, in accordance with which the entire works described hereinafter shall be constructed and completed by the Contractor, shall comprise the followings:

Section VII.1:	General Technical Conditions
Section VII.2:	Earth Works
Section VII.3:	Building Materials
Section VII.4:	Concrete Monolith RCC Works
Section VII.5:	Steel Reinforcement for Structures
Section VII.6:	Form Works
Section VII.7:	Pre-cast RCC Structures
Section VII.8:	Masonry Works
Section VII.9:	Metal Works
Section VII.10:	Wood Works
Section VII.11:	Plastering, Painting, Flooring and Decoration Works

Section VII.12:	Plumbing and Pipe Laying
Section VII.13:	Water Supply and Sewerage
Section VII.14:	Heating and Ventilation
Section VII.15:	Power Supply
Section VII.16:	Fire alarm
Section VII.17:	Glass and Glazing
Section VII.18:	Provisional Sums
Section VII.19:	Hospital Lift
Section VII.20:	Environmental Management Plan

VII.1.3 DESCRIPTION OF WORKS

The work consists of Construction of building for tuberculous prison hospital for 100 beds of the entity я/c 3/13 of Ministry of Justice of the Republic of Tajikistan in Vahdat city and other supporting infrastructures.

VII.1.4 SCOPE OF WORKS

The building of the tuberculous prison hospital for 100 beds is three floors with basement floor, quadrangle form, dimensions in axis 36,000x14,400m. The main entrance to the building is planned in the central part of the building, in axis 4-5. Connection between the floors will by pair of stairs located symmetrically in axis 2-3 and 6-7.

In the first floor located vestibule, working rooms, lunch hall, patients' rooms, bathroom unit. In the second floor located hall in axis 4-5, patients' rooms, room for staff and physician, as well as bathroom unit. The utility room and working spaces are located in basement floor.

The building of the tuberculous prison hospital for 100 beds comprises 24 patients' rooms and boxes, in particular patients' rooms for 6 beds – 14 pcs., patients' rooms for 3 beds – 4 pcs. and boxes for 2 beds – 6 pcs. Total 24 pcs. patients' rooms and boxes for 108 beds.

Also it is planned construction of transformer substation, fire reservoirs, water tower, yard toilet, chlorinator, watch tower, catchpit, water supply external nets, sewerage, power supply etc. in the territory of hospital. The type of construction works are as follows:

- Earth works
- Concrete works
- Brick works
- RCC prefabricated slabs etc.
- Finishing works
- Carpenter's work
- Installation of metal structures
- Glass works
- Electro-mechanical works and sanitaryware
- Ventilation and heating.

In addition to the above, the work to be carried out under this project consists of the various items as generally described in volumes of the Tender Documents, drawings as well as in the Bills of Quantities.

VII.1.5 SITE INFORMATION

VII.1.5.1 General

The information given hereunder and provided elsewhere is given in good faith by the Employer but the Contractor shall satisfy himself regarding all aspects of site conditions and no claim will be entertained on the plea that the information supplied by the Employer is erroneous or insufficient.

The locations of the Works and the general site particulars are as shown on the Drawings.

Whereas the right-of-way to the construction sites and other works shall be provided to the Contractor by the Employer. The Contractor shall make his own arrangement for the land required by him for his site offices, worker's camps, stores, etc. However, if Government land is available for this purpose, the Contractor may utilize the land after obtaining written permission from the Engineer-Monitor, provided he gives undertaking to this effect that he will remove forthwith his structures at his own costs as and when asked by the Engineer-Monitor. In

any case the Contractor will have to dismantle these structures and clean off the site within one month of completion of maintenance period.

The location and arrangement of all facilities such as office, stores, working areas, worker's camps, etc. shall prior to establishment by the Contractor be approved by the Engineer-Monitor and the Contractor shall sufficiently earlier than commencement of the establishment of such facilities forward written request to the Engineer-Monitor for approval. The request for approval shall be accompanied by plans, sketches & descriptions of the layout and arrangement of all facilities proposed in sufficient detail to allow the Engineer-Monitor to judge the relevance and adequacy of the proposed facilities.

The Bidders shall note that the above shall apply also for materials to be used for construction works and the Contractor shall make his own arrangement with respects to permits, royalty payments, easement for source areas, stockpile areas and all other requirements as stated in Technical conditions for material contained in Section VII.2 of this Volume. Unit prices for the items in the Bill of Quantities shall include the cost of all such expenses and nothing extra shall be payable on this account.

The Bidders shall inspect the sources of materials etc. before quoting their rates for the work to assess the availability of materials in required quantity and quality.

The Employer shall not bear any responsibility for non-availability of the materials in sufficient quantity and/or quality and will not entertain request/claim for increase of tender prices/rates and/or any extension of time for completion of the Works on this account.

VII.1.5.2 Natural Setting

a) Climate

Project sites come under the belt of insufficient moisture climate with warm summer and moderately mild winter. The average air temperature is +14°C - +16°C. The rainfall of the cold period is 70% of annual norm. The average July temperature is +26 - +28°C, maximum temperature is +44°C, average monthly temperature in January is -4°C.

b) Seismic Conditions

According to the seismic map of the Republic of Tajikistan the seismic activity of the site makes 9 points on Richter scale. The foundation soils – according to the geological conclusion loams pocket I type. III category of complexity of engineering-topographic works.

VII.1.6 GENERAL WORKS

The Contract Documents are intended to cover the supply of all materials and the execution of all works necessary to complete the Works. Should there be any details of construction or materials which have not been referred to in the Specifications or in the Bill of Quantities and Drawings but the necessity for which may reasonably be implied or inferred there or which are usual or essential to the completion of all works in all trades, the same shall be deemed to be included in the rates and prices quoted by the Contractor in the Bill of Quantities.

VII.1.7 PROGRAMME OF WORK AND RECORDS

VII.1.7.1 Programme of Work

Immediately upon Contract coming into force the Contractor shall systematically analyze the documentation in order to ascertain aspects affecting the work under the Contract and shall before the Contract signature, submit a reproducible transparency of a detailed critical path network programme which shall meet the following requirements.

- i. the programme shall be a critical path network programme and shall clearly indicate the intended approach to the works and correspond with agreed construction time.
- ii. the network shall accurately represent the Contractors programme for carrying out the work.
- iii. the duration of each activity shall have one (1) time estimate expressed in working days. This activity duration should, as a general rule, not exceed fifteen (15) working days.
- iv. the Contractor shall ensure that the total resources required for the execution of the work in accordance with the programme will be at all times within the level of resources which he can provide.
- v. Each activity shall be represented by a description referring to a specific portion of the works which will permit its easy and accurate identification (element, section, location, equipment, schedule, item, etc.).
- vi. lead time for supply of information by the Employer and Engineer-Monitor shall be represented separately from the site activity for the items in question. These lead times shall comply with any relevant provisions of the Contract. Such lead times may be presented either on the programme documents or in separate schedule form and shall not refer to a date earlier than the corresponding date in the construction programme included in the tender documents significant off-site

- activities such as prefabrication carried out by the Contractor, or by a Sub-Contractor shall be expressed as separate network activities.
- vii. the programme shall make due allowances for prevailing climate of the site and at all works areas and periods of planned stand-down of equipment and workforce shall be clearly identified and shown.
- viii. the programme shall be based on completion of the Works within the period stipulated in the Contract Document.

Analysis

A time analysis of the network is required and shall be shown as an integral part of the network diagram clearly showing activity early and late start times.

Approved Programme Status

After the approval of the construction programme by the Engineer-Monitor, it will become basis for the management according to the Contract conditions, which is stated in General conditions of Contract "start and delays". No any amendments and changes to the construction programme shall be included without prior approval of Engineer-Monitor.

Progress Monitoring and Status Assessment

At fortnightly intervals throughout the duration of construction and on a date to be agreed by the Engineer-Monitor and the Contractor, the Contractor's representative and the Engineer-Monitor shall meet on site for the purpose of monitoring progress in relation to the programme and agree as to the status of progress in the works. At suitable intervals, such meetings may be convened by the Employer on issuance of prior notice to all concerned.

In the absence of agreement as to the status of the progress of the Works, it shall be as determined by the Engineer-Monitor.

Progress and status information shall be analyzed monthly and a new time analysis to be produced by the Contractor. This shall then become the basis of evaluation of progress at the following monitoring meeting. It shall also be used as a basis for assessment of delay.

Extension of Time for Completion

Any claim by the Contractor for extension of time must make reference to the critical activities of the Construction Programme and must clearly show how the alleged delays have effected the date for practical completion as required by the Contract.

All extension of time granted to the Contractor shall be incorporated in the Monthly Time Analysis following the granting of the extension.

Extension of time for adverse climatic conditions will only be granted by the Engineer-Monitor if the climate conditions giving rise to the claims for extension of time have been proved by the Contractor to

- i. have adversely affected the Contractor's Progress of Work on Critical Activities as defined by the Approved Construction Programme.
- ii. the climatic conditions referred to have been extreme considering the time of the year and the location of the work. In determination of weather or not the climatic conditions referred to can be considered extreme, records kept by the Meteorological Department, Tajikistan shall be used as guideline.

Any extension of time allowed by the Engineer-Monitor will be subject to satisfactory construction and maintenance of such facilities as haul roads and satisfactory operation of drainage of areas to meet the specified conditions of the Contract. The extension of time allowed will also depend on the Contractor's diligent and efficient efforts to minimize the time lost, to protect the Works, and restore the Works for the earliest resumption of work, and to work extra or extended shifts as necessary.

VII.1.7.2 Contractor's Record

a. Works Diary

- i. The Contractor shall maintain on the Site a Works Diary, in a form approved by the Engineer in which on each working day the details - as required by the form of the Diary - will be recorded, such as weather conditions, the number and category of workers employed by the Contractor. Plant and Equipment used, quantities of materials received on Site and used in the various parts of the Works, the progress in the execution of the Works, etc. The Contractor shall also record in the Works Diary the Engineer-Monitor's remarks, instructions and decisions covering the execution of the Works.
- ii. The nearest meteorological station accepted by the Engineer-Monitor shall be the competent authority for the purpose of determining the weather condition at the Site;

- iii. Daily the Contractor shall supply to the Engineer-Monitor any information requested by him in connection with the execution of Works;
- iv. The Engineer-Monitor and the Contractor shall sign the Works Diary at time of the site visit and the Engineer may enter his remarks, if any, in the space provided therefore in the Diary, a copy of the Works Diary shall be given to the Engineer-Monitor after signing thereof;
- v. All notices, Instructions and decisions of the Engineer-Monitor recorded in the Works Diary shall be deemed as having been served on the Contractor in writing and shall be binding on the Contractor accordingly;
- vi. Entries in the Works Diary, shall be evidence between the parties of the facts stated therein, but shall not by themselves be a ground for any claim for payment under this Contract;
- vii. The submission to and approval by the Engineer-Monitor of such documents and of such particulars shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

VII.1.7.3 Site Meetings

At times and on dates to be determined by the Engineer-Monitor regular meetings shall be held at the Engineer-Monitor's Site office. These meetings shall be attended by the Engineer-Monitor, who will chair each meeting, the Employer's representative(s), the Contractor's approved nominee and the author supervisor and the representatives of such Specialist as the Engineer-Monitor may direct to be present.

Minutes of Site Meetings shall be taken and circulated by the Engineer-Monitor to attendees of the meeting within 5 days.

VII.1.7.4 Work Progress Photographs

Notwithstanding the provisions of General Conditions of Contract the

- i. Contractor shall arrange to pay all costs associated with the provision of ten (10) colour photographs to be taken by a professional photographer every fortnight. The photographs shall show parts of the Works as determined by the Engineer-Monitor as will best record those parts and progress of the execution of the works.
- ii. Four (4) prints, 250 x 200 mm, of each such photograph on first quality glossy paper shall be submitted promptly to the Engineer-Monitor. On the back face of each print the Contractor shall record that part of the Works shown in the photograph, the date the photograph was taken and the name and address of the photographer.
- iii. Within ten (10) days of the date of Practical Completion the Contractor shall supply to the Engineer-Monitor four (4) prints, 250 x 200 mm colour prints each of photographs of the Works taken as directed by the Engineer-Monitor. All those photographs shall be taken by a professional photographer approved by the Engineer and all the prints shall be on first quality glossy paper.

The Contractor shall further arrange to take colour photographs of various stages/faces of work including interesting and novel features of the work as directed by the Engineer-Monitor. He shall supply two color photo prints of each of the photograph taken to the standard postcard size. He shall also supply the negatives in a 35 mm size. These will serve as a permanent record of the works.

The Contractor shall mount all the photographs in suitable album of good quality and supply the album to the Engineer.

VII.1.7.5 Payment

The requirement of Clause VII.1.7 shall be met by the Contractor under his general obligation under the Contract and payment shall be made for compliance with above requirements as indicated in BOQ.

VII.1.8 MOBILIZATION AND DEMOBILIZATION

VII.1.8.1 Scope

It includes the supply at the Site of all equipment required for the execution of the Works, together with everything necessary to maintain the said equipment and performance of maintenance during the construction period. On completion of the works all equipment and materials shall be removed including cleaning up of the premises.

VII.1.8.2 Mobilization

Mobilization shall include the following:

- i. Assemble, preparation and loading for shipment of all equipment at the Contractor's home station or source of supply,
- ii. Transportation of equipment and material from the home station or source of supply to the Site,

- iii. Unload and install, ready for use, all equipment and whatever else required for the execution of the Works,
- iv. Installation of all telephone and communication systems, electricity and water supply lines, including their reading meters, construction of all temporary roads, fences and sanitary facilities necessary for the execution of the Works,
- v. Establishment of Contractor's site facilities including offices, worker's camps, stores, working areas, test facilities, lay-down areas, maintenance workshops as well as surveying, testing and opening of material source areas, etc,
- vi. The payment of all duties, taxes, levies, fees etc, required under the Contract for the completion of above items.

VII.1.8.3 Maintenance of Contractor's Site and Works Facilities

Scope

This item refers to the maintenance for the duration of the contract of the contractor's site and work facilities including but not limited to facilities mentioned above and shall include the following:

- a. Keeping the site neat clean and including removal from time to time all debris, rubbish and waste so that the Site and works are always in a neat and orderly condition.
- b. The cost of insurance as required in the Contract.
- c. Payments of Sundry expenses, such as all fees and permits for water, electricity, telephone and others.

VII.1.8.4 Demobilization

Demobilization shall include the following:

- i. The dismantling, preparation and loading for removal and shipment of all Contractor's equipment at the Site,
- ii. The transportation of all above equipment and materials from the Site to the home station or elsewhere outside the Site,
- iii. Dismantling and removing of all temporary buildings and structures, unless requested by the Engineer in writing to retain any such buildings or structures,
- iv. The clean up of the Site and work area in a satisfactory manner and removal of material, debris, waste, etc. from the area.

VII.1.8.5 Additional Items and Conditions

The Contractor must study all Bidding Documents and shall include in his itemized unit prices allowances for any work and services not specially itemized above or in any other pay item in the Specifications and Bill of Quantities. The contractor will finish / execute all the items already mentioned in the BOQ's completely to the satisfaction of the Engineer Monitor / as per the established engineering practices. BUT, in case an item is added / altered / substituted the rates of the new item will be worked out as follows:

Rates for extra / altered / substituted items

- (i) The contractor shall execute the extra/substituted items as ordered by the Engineer in writing which may be required for proper completion of work. The rates of such items shall be derived/ paid in the following manner; but the payment shall be made by considering the lowest rate only as decided by the Engineer.
- (ii) If the rates of the additional, altered or substituted work are specified in the contract for the work, the contractor is bound to carry out the additional altered or substituted work at the same rates as are specified in the contract for the work.
- (iii) If the rates for additional, altered or substituted work are not specifically provided in the contract for the work, then such rates will be derived from the rates for a similar class of work as specified in the contract for the work.
- (iv) If the rates for altered, additional or substituted work cannot be determined in the manner specified above in clause (ii) – (iii), then the rates will be settled on the basis of actual vouchers of prevailing market cost plus labour, and 15% contractor's profit, supervision and overhead charges.
- (v) Analysis of rates, for extra items are to be submitted by the contractor before commencement of work.

VII.1.8.6 Measurement and Payment

The dates of payment for these items shall be according to schedules submitted by the Contractor and approved by the Engineer-Monitor.

VII.1.9 EQUIPMENT FOR WORK

The following conditions regarding use of equipment at work also shall be satisfied:

- i. The Contractor shall be required to give a trial run of the equipment for establishing their capability to achieve the laid down Specifications and tolerance of the Engineer-Monitor before commencement of the work,
- ii. All equipment provided shall be of proven efficiency and shall be operated and maintained at all times in good working conditions throughout the Contract,
- iii. No equipment shall be removed from site without permission of the Engineer-Monitor.

VII.1.10 QUALITY CONTROL OF MATERIALS AND WORKMANSHIP

The Contractor shall be responsible for the quality of the works for the entire construction work within the Contract. He shall, therefore, have his own independent and adequate set-up for ensuring the same.

The Contractor shall submit to the Engineer-Monitor prior to commencement of Work on Site a detailed proposal for providing Quality Assurance and Control of the Work.

The proposal shall give details of the following:

- i. Quality Assurance organizational arrangement with Names, Qualifications and Work Experiences for all staff proposed for Quality Assurance and Control,
- ii. Procedures to be followed in the task of Quality Assurance and Control,
- iii. Name, Address of all Sub-contractor and independent testing laboratories proposed or engaged for Quality Control.

The proposal submitted by the Contractor shall be subject to the approval by the Engineer-Monitor prior to any Work commencing. Upon approval by the Engineer-Monitor, the Quality Assurance set-up shall not be altered in any way by the Contractor without prior approval by the Engineer-Monitor. This includes any replacement of staff allocated by the Contractor for this task.

For cement, mild steel, high tensile steel, pre-cast concrete and similar other materials required tests are to be carried out at the manufacturer's plants or at the approved laboratories, the cost of samples, sampling, testing and furnishing of test certificates shall be borne by the Contractor. He shall also furnish the test certificates to the Engineer-Monitor.

For testing of concrete at site during construction, arrangement for supply of samples, sampling, testing and supply of test results shall be made by the Contractor as per the frequency and number of tests as stipulated in these Specifications or as approved by the Engineer-Monitor

The method of sampling and testing of materials shall be as required under relevant Clauses stipulated in these Specifications or as approved by the Engineer-Monitor. The contractor should carry out the samplings and tests as specified in Tajikistan's / SNIP / GOST's relevant codes. The Engineer –Monitor should have the right to conduct additional tests if he so desires. These additional tests should also be carried by the contractor at his own cost.

Where the Engineer-Monitor considers that in the interest of quality control of materials or workmanship, modifications, if any are necessary, such modifications shall be carried out by the Contractor.

The Engineer-Monitor shall inspect the works from time to time during and after construction and get the quality of the works tested (by himself, by his Testing and Quality Control Units or by any other agency deemed fit by him) .In the absence of clear indications and frequency of tests for any item, procedures and tests as directed by the Engineer-Monitor shall be followed.

The Contractor shall provide necessary cooperation and assistance in obtaining the samples for tests and carrying out the field tests as required by the Engineer-Monitor from time to time. This may include provision of labour, attendance & assistance necessary in connection with the tests. The prices quoted in the tenders shall be deemed to include all costs related to such provision.

For Testing of samples of soil, soil mix, granular material and mix, aggregates, cores etc. samples in the required quantity and form shall be supplied to the Engineer-Monitor by the Contractor at his own cost.

The rate quoted for various items of work in the Bill of Quantities shall be deemed to be inclusive of all costs arising out of the requirements in the above Clauses

VII.1.11 STANDARDS

In the absence of any definite provisions in the Specifications on any particular issue, reference shall be made to the intergovernmental GOSTs, or equivalent International Standards. In case of any dispute arising out of the interpretation of the above, the decision of the Engineer-Monitor shall be final and binding on the Contractor.

All the Codes of practice, Standards and Specifications applicable shall be the latest edition with all corrections and incorporation as on day 30 before the Bid submission date. The Contractor shall keep on site a copy of all Standard Codes of Practice and Specifications referred to and shall further provide one additional copy to the Engineer-Monitor.

VII.1.12 SURVEY AND MEASURING EQUIPMENT

The Contractor shall furnish necessary surveying Instruments and equipment, stakes, pegs, poles and all other necessary items for the sole use of the Engineer-Monitor. The instruments shall be in good working condition and shall include but not limited to:

- Theodolite with tripod, type (2T-5K) or equivalent,
- Levels with tripod, type (N-3) or equivalent,
- Four (4) Steel measuring tapes, each fifty-meter long
- Leveling staffs with divisions in metre and centimetre and containing leveling Bubble,

These instruments/ equipment shall be made available to the Engineer-Monitor within 30 days after the date of the Letter of Acceptance. These shall be the property of the Employer and Contractor shall be responsible for their true & proper maintenance during construction period..

The above shall be provided under the general obligation of the Contractor and payment shall be made as indicated in the Bills of Quantities.

VII.1.13 MEASUREMENT OF WORK

Unless stated to the contrary, any thickness, area or volume in any item of work shall be measured only on finished work.

VII.1.14 BASIS OF PAYMENT

The payments for various items shown in the Bill of Quantities shall constitute full compensation for performing all of the requirements of the Contract for the item of work as specified including furnishing all necessary materials, labour, tools, equipment, supplies and incidentals.

VII.1.15 REMOVAL OF ELECTRIC/ TELEPHONE POLES

The work of removal of electric/ telephone poles and/or there like, where required, can only be done by the appropriate Authority. The Contractor may be required to provide assistance to such Authorities. Such assistance shall be provided under the general obligation of the Contractor and no separate payment shall be made for this.

VII.1.16 SETTING OUT

The Contractor shall establish working bench marks tied with the bench marks established already at site in the area soon after taking possession of the site. The working bench marks shall be at or near site. The working bench marks/levels shall be approved by the Engineer-Monitor.

The lines and levels of formation, side slopes, drainage, shall be carefully set out and frequently checked, ensuring that correct gradients and cross sections are obtained everywhere.

VII.1.17 SITE FACILITIES FOR THE ENGINEER-MONITOR

VII.1.17.1 General

The site facilities specified herein after and as itemized in the Bill of Quantities shall be provided by the Contractor for the exclusive use of the, the Engineer-Monitor. These facilities provided under the Contract shall be used by the Engineer-Monitor for work which may be within as well as outside the limits of the Contract, without any obligation to the Contractor. All items provided shall be new, generally of first class quality.

Engineer-Monitor's Site Offices will be rented by Contractor.

VII.1.17.2 Methodology

Within 15 days of receiving the letter of acceptance, the Contractor shall submit to the Engineer-Monitor the address, and site plan of proposed house.

Within 7 days of receipt of the proposal, the Engineer-Monitor shall inspect house and give approval. The Contractor shall proceed forthwith to supply furniture and equipment as per approved list, and shall complete the said facilities and hand over to the Engineer-Monitor within 30 days thereafter.

Prior to taking over the facilities the Engineer-Monitor may prepare a snag list thereof, whereupon the Engineer-Monitor may occupy the facilities but may withhold payment therefore or part thereof until the Contractor remedies and makes good the said snags.

VII.1.17.3 Inspection Room

The provisions of Clauses VII.1.17.1 and VII.1.17.2 herein before shall generally apply for the Inspection room. The Inspection room shall remain the property of the Contractor.

The Inspection room shall be erected on the site of works. Room shall have a minimum clear floor area of 25 m².

These shall have secured well fitted doors with lock. Room shall be provided with an overhead water tank, faucet and an enclosed toilet and kitchen. Services shall include water supply and sewage disposal system, adequate electric light and fan.

Furniture shall include a clerical desk, drawing table 2 m x 1 m with plan drawers under a steel lockable cupboard, a stool, a 1 m² table and four chairs together with an electric kettle, utensils and crockeries for the kitchenette, all as approved by the Engineer-Monitor.

Measurement

The cost of providing and maintaining the room and running the services thereof shall be paid by Contractor.

Rates & Payments

The rates quoted shall be the full compensation for supplying and maintaining all items specified, dismantling & re-erecting or transporting as such as appropriate and running the services etc., inclusive of all taxes, labour, consumable incidentals and Contractor's overheads.

VII.1.17.4 Engineer-Monitor's Site Office and Residence including Maintenance

The provision of Clause Nos. VII.1.17.1 and VII.1.17.2 herein before shall generally apply for the office and residence for Engineer-Monitor.

According to the Engineer-Monitor's instruction the location of office building shall be at Vahdat city or Dushanbe city. The location of buildings shall be at nearby site area, in Vahdat city. The office will be rented by contractor for construction period, and the two months at end of defects liability period

The office buildings shall have a floor area not less than 25 square meter.

Measurement

Office and Residence buildings shall be measured in number of office and residence building actually rented and accepted by the Engineer-Monitor.

Payment

The cost or the rent of the Office and Residence building/house measured as above shall be deemed to have been included in the quoted rates in this tender for various items and nothing extra shall be paid under these items.

VII.1.18 DUST AND MUD OR EXTRANEIOUS MATERIALS

The Contractor shall take all reasonable steps to minimize dust nuisance during the construction of the works. All existing highways and roads used by vehicles of the Contractor or any of his Sub-Contractors or suppliers of materials or plant and similarly any new roads which are part of the works and which are being used by traffic, shall be kept clean and clear of all dust/mud/extraneous materials dropped by the said vehicles. Similarly, all dust/mud/extraneous materials from the works spreading on these roads shall be cleared by the Contractor.

Clearing shall be effected immediately by manual sweeping and removal of debris, or, if so directed by the Engineer-Monitor, by mechanical sweeping and clearing equipment, and all dust, mud and other debris shall be removed entirely from the road surface.

Any structural damage caused to the existing roads by the Contractor's constructional equipment shall be made good.

All these activities shall be deemed to be the General Obligations of the Contractor and no separate payment shall be made for this.

VII.1.19 PROVISIONS FOR TRAFFIC

In carrying out the works, it is mandatory that the Contractor must not be a hindrance to the traffic on public roads. If occasion should arise the responsible authorities will introduce traffic regulating measures and the Contractor shall under his general obligations under the Contract co-operate with and render such assistance as is required by such responsible authorities.

VII.1.20 COMPLETION DRAWINGS

After final completion of the work, but before final acceptance thereof, the contractor shall provide the complete sets of “as-built” drawings based upon the recorded set of the drawings, marks to show the details of construction, as actually accomplished and recorded shop drawings and other submittals, in the number and from as required by the contract documents.

VII.2 EARTH WORKS

VII.2.1 SCOPE OF WORKS

The work includes the furnishing of all materials and equipment for performing all operations necessary for accomplishing all excavating, removal of surplus materials away from site, compacting, grading work and trenching & back-filling, which are shown and noted on the drawings and specified herein.

VII.2.2 SUB-SOIL INVESTIGATION

Any sub-soil investigation conducted by the Design Institute will be made available for the Contractor's review. The Engineer-Monitor assumes no responsibility regarding the correctness of these data and makes them available solely for information. It is the responsibility of the Contractor to verify all Sub-surface conditions prior to submitting Bid.

VII.2.3 MATERIALS

Material for the earth work shall consist of soil materials approved by the Engineer-Monitor. The material shall contain no debris, waste, any form of vegetation, peat soils or others deleterious of objectionable matters. All materials brought to the site shall be stockpiled and stored carefully in a systemic manner so as to prevent deterioration or mixing of materials. Materials which have suffered intrusion and deterioration due to improper storage shall not be used in the permanent work.

VII.2.4 SOURCE OF FILL MATERIAL

The sources of the materials shall be selected by the Contractor, but approved by the engineer before the materials are used in the work. For this purposes, the Contractor shall furnish all relevant test data for representative samples from each source area and also give opportunities for the Engineer-Monitor to visit the source areas. The number of representative samples to be tested by the Contractor shall not be less than two for each type of material in each source area. Notwithstanding approval of sources of materials, materials are brought to the work site for construction, shall be subject to acceptance or rejection by the Engineer-Monitor based on quality control tests to be performed before use in construction as specified.

VII.2.5 TESTING OF FILL MATERIAL

The physical properties and engineering characteristics of the materials mentioned in these specifications shall be established through appropriate test on representative samples collected in such manner and at such frequency as decided by the Engineer-Monitor. The test shall be carried out in accordance with test methods in these specifications after taking into account the appropriateness of the test methods for particular applications under consideration.

The soil material shall be tested in accordance with standards mentioned in Clause 9.1.11:

- i) Determining the plastic limit and plasticity index of soils,
- ii) Moisture density relationship of soils using 2.5 Kg rammer and 305 mm drop,
- iii) Density of soil in place by sand cone method,
- iv) Moisture content determination,
- v) Determination of organic content in soils by loss of ignition,
- vi) Determination of the particle size distribution.

The Contractor shall use only such materials in construction as conform to the requirements regarding composition, grading, physical properties and engineering characteristics as specified for different kind of materials. For this purpose pre-construction control tests of soil shall be carried out on representative samples collected at random of materials brought to material site or at stockpiles.

A fresh series of construction control tests shall be started whenever there are changes in the source of the materials or in the appearance of the materials as visually assessed by the Engineer-Monitor.

Additional number and type of construction control tests shall be carried out if it is considered to be necessary to do so by the Engineer-Monitor for monitoring the variability and suitability of the materials brought to work site or to stockpile by the Contractor.

Moisture content tests shall be repeated whenever the moisture content of the material changes due to drying and wetting or if there is uncertainty in the results of earlier tests.

VII.2.6 PLACING AND COMPACTION

Placing and compaction material shall be carried out in layers of uniform thickness using approved equipment and methods.

The compaction parameters, optimum moisture content, maximum dry density, type of compactor, and number of passes, etc. shall be the results of trials on experimental sections of area constructed with different type of soils. The maximum thickness of each compacted layer shall be determined by field trial compaction so that the required compaction can be obtained. Layer thickness must not exceed 0.30 m (compacted).

Before compaction commenced, each layer of materials shall be brought to a state of uniform composition, texture and moisture content by thorough mixing and addition of water or drying as required. Any clods or hard lumps in the fill materials shall be broken to sizes not exceeding 50 mm before compaction.

The Contractor shall be deemed to have taken account of the fact that the materials encountered may vary widely with respect to their in situ moisture content and the moisture content at which the materials are to be compacted as specified separately for each type of material. Accordingly, the materials may have to be wetted by adding water and dried to the required degree, along with intimate mixing of the entire mass of the materials.

Different layers in a particular stretch shall be constructed as per specifications one after another. In the time that might elapse between the acceptance of lower layer by the Engineer-Monitor and the placing of the overlaying layer, if any damages such as cracking, rutting, corrugations, pot holes, softening, etc. are caused to the lower layer due to whatever reasons, such damages shall be repaired by the Contractor at his own cost and approved by the Engineer-Monitor before start of placing of materials for the overlaying layer.

The side slopes and top surface of the embankment under construction shall be protected against rainfall erosion by adopting necessary drainage and erosion protection measures.

The Contractor shall submit his proposed method of protecting the construction to the Engineer-Monitor for approval prior to commencing work. The finished area shall be divided into control section. If the requirements to thickness and soil quality are not fulfilled the entire control section will be rejected. Depending on the results from the analyses the Engineer-Monitor will decide whether the layer shall be removed and replaced with new materials, complying with the specification.

VII.2.7 COMPACTION CONTROL

After the compaction of each layer of material, field dry density tests shall be carried out by the Contractor. For locating test points successive compaction segments, covering the entire area of work, shall be designated in advance of compaction and the length of any such segment of the constructed area shall not exceed 100 m.

Field density measurement shall be carried out on the compacted area at the rate of one set of tests per 1000 m². The locations shall be chosen through random sampling.

One set of tests shall consist of five determinations of field density. The mean dry density of a set of tests shall be equal to or exceed the specified value and the standard deviation shall not exceed 4 percent of the mean dry density, where standard deviation is defined as:

$$\delta = \sqrt{((X_1 - \bar{X})^2 + (X_2 - \bar{X})^2 + \dots + (X_n - \bar{X})^2) / (n - 1)}, \text{ where } \bar{X} = \text{Number of Experiment.}$$

If this requirement is not met the segment to which the set of density tests relates shall be treated as “non-acceptable”.

Further, the value of dry density from individual locations shall not be less than 95% of the specified value and if this condition is not met the entire work in the compaction segment to which the density determination relates shall be treated as “non-acceptable”.

Compaction segments found non-acceptable shall be re-compacted accompanied with scarifying and wetting/ drying for the entire thickness of the compacted layer for achieving the specified degree of compaction to be verified from repeated procedure of field dry density measurements.

VII.2.8 EQUIPMENT FOR EARTHWORKS

VII.2.8.1 Compaction Equipment

Mechanical equipment shall be used for compacting materials by rolling, tamping, and watering the materials before compaction. For other operations such as spreading, crushing, mixing and shaping, mechanical equipment, a combination of mechanical equipment and

manually operated tools and equipment may be used. The choice of equipment and the procedure of its use shall be subject to the approval of the Engineer-Monitor, based on its effectiveness proved by trial placing and compaction.

The Contractor shall note that different types of materials most likely require different types of compaction equipment and may include successive application hereof, for achieving the specified compaction.

For compacting along restricted areas e.g. immediately next to structures, smaller size compacting equipment may be required and the Contractor shall provide the same for.

The Contractor shall keep available a fleet of compaction equipment of the requisite types, sizes and numbers adequate for cohesive soils as well as for non-cohesive soils

All equipment shall be of modern construction established manufacturers and proven efficiency and shall be operated and maintained at all times by skilled operators.

VII.2.8.2 Watering Equipment

In order to achieve the right moisture content of soil before compaction water may have to be added to materials. Mechanically driven and operated water browsers with effective spray equipment shall therefore be available at all times.

VII.2.9 CLEARING, GRUBBING AND REMOVAL OF TOP SOIL

Unless otherwise ordered by the Engineer-Monitor, the base of the earth work area shall be prepared by clearing and grubbing the vegetation layer.

Clearing and grubbing consists of removing and depositing of all materials such as trees, brush, shrubs, stumps, structures, rubbish, etc. from within the limits of the areas as may be specified on the drawings or by the Engineer-Monitor. In each segment of the works clearing and grubbing shall be performed in advance of any earthwork operations.

Only such methods, tools and plants as approved by the Engineer-Monitor that will not affect the property to be preserved shall be adopted for work. All trees, stumps etc. shall be cut to a depth below ground level of 0.5 m. Also, all vegetation such as roots, undergrowth, grass and other deleterious material unsuitable for incorporation in the construction shall be removed.

All excavations below ground level arising out of the removal of the trees, stumps, etc. shall be filled with suitable material and compacted thoroughly.

All materials from clearing and grubbing operations shall be disposed outside the area of the work in approved dumping areas.

Trees, shrubs, any other plants, poles lines, fences, homesteads, monuments, graveyards, places of worship, pipelines and facilities within or adjacent to the work which are not be disturbed shall be protected from damage. The Contractor shall provide and install at his own expense suitable safeguards approved by the Engineer-Monitor for this purpose.

During clearing and grubbing, the Contractor shall take all adequate precautions against soil erosion, water pollution, etc. and where required undertake additional works to that effect. Before start of operations the Contractor shall submit to the Engineer-Monitor for approval, his work plan including the procedure to be followed for disposal of waste materials, including schedules for carrying out erosion control works as necessary and directed by the Engineer-Monitor.

VII.2.10 EXCAVATION

VII.2.10.1 Excavation for foundations, pits, trenches, footings, floor slabs, concrete walkway, roadway pavements, parking areas and aprons, and any other structures indicated as well as common excavation for grading purposes, shall be to the lines and levels required . The bottoms of all trenches shall be to grade, tamped firm, clean and free from all debris or foreign matter.

VII.2.10.2 Excavations shall be kept free from water at all times.

VII.2.10.3 If material below and beyond the required dimensions has been removed or disturbed due to unauthorized over excavation or for any other reason the space shall be placed, filled and compacted with selected material, as directed by the Engineer-Monitor, with no additional cost to the Employer.

VII.2.10.4 Excavated earth material which is suitable for compacted fill or backfill, as determined by the Engineer-Monitor shall be conditioned for reuse and properly stockpiled for later use as herein before specified under "Soil Materials".

VII.2.10.5 Abandoned sewers, piping, and other utilities encountered in the progress of excavating, shall be removed and the ends plugged with concrete or in any other manner which is acceptable to the Engineer-Monitor.

VII.2.10.6 Active sewers, water and gas pipes, electric power, light or telephone poles, conduits, or wires, and any other active utility lines encountered, shall be immediately reported to the Engineer-Monitor and authorities involved. The owner and proper authorities shall be allowed free access to take measures that they may deem necessary to repair. Relocate, or remove the obstruction as determined by the owner's representative to the satisfaction of the Engineer-Monitor.

VII.2.10.7 All debris and excess earth materials shall be removed from the site and disposed off as directed by Engineer-Monitor.

VII.2.10.8 Open excavations, trenches, and like shall be protected with fences, barricades, covers, and railings as required to maintain safe personnel and vehicular traffic passage. Freshly graded surfaces shall be protected from erosion until such time as permanent drainage and erosion control works have been installed.

VII.2.11 GENERAL INSTRUCTION FOR PREPARATION OF THE FOUNDATION PIT

According to the technical report of JSC "GIINTIZ" on engineering-geological survey, the construction side area is loamy soil based I type. Underground waters in depth up to 8m are not disclosed, which is excluding influence to the foundation soil.

Partial removing of the pocket nature of soil (according to the items 3.12, 3.13 SNIP 2.02.01-83 «Foundation of the buildings and structures») to be executed by constructing little water-permeable screen, t-1,5m from the local soil with optimal moisture $W=0,211$ and waterproof measures.

Soil laying to be done by max. 20cm ply with rolling by the self-propelled roller W-20tn and 8-10 times passage.

Consistency of the soil in dry condition on bottom part of compacted layer of whole pillow should be no less than 1,7 tn/m³, and backfilling to the foundation pockets no less than 1,6 tn/m³.

To avoid access of the rainfall from surrounding territory to the foundation pit, the foundation pit should be fenced by barrel with h-30cm.

The quality of the works will be controlled by the employer's technical inspection (Engineer-Monitor) and contractor. The works to be continued only after appropriate conclusion and permission of the inspection (Engineer-Monitor).

During the works performance should be guided by requirements of SNIP 3.02.01-87 «Earth constructions, grounds and foundations».

Note:

All the engineering communications (heating system, water-supply and sewerage, electrical lines, gas, connection etc.) located in the territory of designed hospital building are planning to be removed out of the construction site.

Before the excavation of foundation pit and dismantling of the above-mentioned communications, the representatives of the related services should be involved for the purpose of coordination of removing and providing normal functioning.

Timeout between the completion of foundation pit excavation, construction of the soil pillow and laying the foundation excluded. If the timeout was took place in the mentioned technology, before the start of the next following works the condition of the natural soil in foundation pit or already constructed soil pillow will be analyzed, and the works to be continued only after receiving designing data.

VII.2.12 CUTTING, SUBGRADE PREPARATION AND COMPACTED FILL

VII.2.12.1 Sub-grade Preparation

- i. The area to receive the building at least 60 cm to side the exterior line, shall not be over-excavated below the bottoms of footings, foundations, and floor slabs as indicated on the drawings. Sub-grade areas for ancillary buildings, roadways, parking areas, aprons and walkways and other structures shall not be over-excavated.
- ii. Perform all cutting, blading, and shaping as required to cut and shape the sub-grade to the grades or elevations indicated on the drawings.

- iii. All underlying exposed subgrade soil shall be compacted with suitable compaction equipment. All exposed scarified soils shall be compacted to detect possible localized zones of soft soils.

VII.2.13 BACK FILLING

Back-filling shall not be placed against footings or building walls or other structures until approved by the Engineer-Monitor.

VII.2.14 METHOD OF WORK, MEASUREMENT AND PAYMENT

VII.2.14.1 Setting out and Surveying

a. Setting out by the Contractor

The limits of the school boundary shown on the drawings or in tables shall be marked by wooden pegs at suitable interval. The pegs shall be raised with the construction of the area.

b. Surveying by the Contractor

The Contractor shall carry out a survey of the existing ground level over the full width of the construction area. Profiles of the ground level shall be surveyed. The ground level shall generally be surveyed at 5 m interval along the profile however all sudden changes or irregularities in ground levels shall be surveyed.

The result of survey including all profiles shall be forwarded to Engineer-Monitor for approval and Engineer-Monitor may carry out his own check of such survey data if he decides. No earthwork has to be started till the survey has been approved.

The result of survey as approved by the Engineer-Monitor shall form the basis for calculating quantities of material placed in the construction area.

A detailed calculation of the earthwork quantities is to be submitted to the Engineer-Monitor for approval within one month of the Engineer-Monitor's approval of survey works.

VII.2.14.2 Clearing, Grubbing and Removal of Soft Soil

a. Method of Measurement

Clearing and grubbing shall be measured in m². The area shall be calculated on the basis of the width and length of the embankment.

Removal of soft soil shall be measured in m³. The volume shall be calculated on the basis of cross-sections taken before and after excavation at suitable intervals as approved by the Engineer-Monitor.

b. Basis of Payment

The works measured as above shall be paid for at the rates for each of the items listed below and shown in the Bill of Quantities.

The rates shall be full compensation for carrying out the required operations including all labour, materials, tools, equipment, and incidentals necessary to complete the work.

The rates for clearing and grubbing shall also cover the costs of excavation and backfilling, and for handling, salvaging, piling, and disposing of the cleared materials as specified. The rate shall cover the costs of cutting trees, and removal of stumps as well.

The rate for removal of soft soil shall include for excavation haulage and disposal of the soil at approved dumping areas, including stockpiling if necessary.

The rate for re-use of soft soil shall include for excavation haulage stockpiling, drying, mixing, testing, and for placing and compacting.

VII.2.14.3 Fill Material

a. Description

The work shall consist of placing of earth materials in accordance with the lines, grades, cross-sections and dimensions shown on the Drawings.

b. Method of Measurement

Volumes in cubic meters shall be computed by the average area method.

No account shall be taken of any reduction in original ground levels due to settlements during construction period. Deduction shall be made for any structures situated within the measured volume.

The volume of the finish layer to be paid shall be measured as compacted materials and computed from the prescribed cross section for top layer and the ground level.

Any reduction in volume of constructed area- material and reused soft soil from shrinkage due to compaction etc. shall not be accounted for.

c. Basis of Payment

The amount of completed and accepted works, measured as provided above, shall be paid for at the price per cubic meter as shown on the bill of the quantities. The rate shall be full compensation for carrying out the earthworks including: setting out, surveys, all materials, excavation and stockpiling loading and transportation of materials from stockpiles, transporting and spreading water, carrying out all placing, mixing with water, compaction, shaping, intermediate protection work of erosion, field trials, tests and all other procedures described herein and shall include all labour, tools, equipment and incidentals necessary to carry out the work.

d. Excavation and back filling

All excavation shall be measured between the outside lines of the element in plan. No extra measurement shall be allowed for excavation in excess of that shown in drawing. Measurement for back filling of trenches by using excavated materials shall be measured for payment.

e. Filling, Common or Compacted

Measurement shall be made for completed work in place and shall be determined by pre-work contour levels multiplied by average sections for fills. Back filling of foundation trenches and pits if not by using imported materials, shall not be measured for Payment.

VII.2.15 PLANTING

VII.2.15.1 Description

This work shall comprise of furnishing all topsoil, grass and fertilizers and placing and incorporating the same on school ground or other locations directed by the Engineer-Monitor or as shown on the drawings.

VII.2.15.2 Material

- a. Grass shall be suitable type as found in the locality of the work. Other grass types proved to grow well under the condition of the locality may also be used subject to the approval of the Engineer-Monitor.
- b. Fertilizer
Fertilizer shall consist of commercial materials as nitrogen-phosphate-potassium shared in ratio 16:6:12. The application rate shall be determined through soil analysis of soil samples taken from the area to be grassed.

VII.2.15.3 Construction Method

Grass bed preparation: The area to be grassed shall be brought to the required slope and cross section by filling reshaping eroded areas and refinishing slopes etc. The soil shall be loosened at a depth 10 cm. All clods larger than 25 mm in diameter shall be crushed. Where necessary, water shall then be applied.

To the soils shall then be added good quality topsoil available in the locality. The rate of application shall equivalent to 5 cm loose thickness mixed well into the loosened fill soil.

Fertilizer application: Fertilizer shall be spread and thoroughly incorporated into the prepared soil.

Planting of grass: Grass planting shall be started in proper time of reasonable season to ensure establishment of growth and shall not be performed when the ground is muddy or when the soil or weather conditions would otherwise prevent soil preparation and subsequent operations.

VII.2.15.4 Measurement and Payment

The grassing performed as per specification shall be measured in m² of finished and accepted work.

Additional watering required to maintain the plants in growing condition shall not be accounted for payment and shall be considered incidental to the work of turfing.

Basis of Payment

The work measured as above shall be paid for at the price per m² as shown in the Bill of Quantities, whose price shall be full compensation for carrying out work including: preparation of grass bed, fertilizing, supplying and planting of grass as specified, watering, maintenance and all other procedure described herein and shall include for all materials, labour, equipment, tools and incidentals necessary for carrying out the work.

VII.2.16 INSIDE ROADS

Access to school compound is necessary for the supply of water, electricity, furniture, equipment and food products, and the removal of dustbins.

The field roads are built on the normal ground level. Road alignment should be cleared from vegetation and loose soil layer by machine and then compacted using bulldozer or roller. The description and cross section of the roads are given in the drawings.

The method of payment is described in Bills of Quantities.

VII.3 BUILDING MATERIALS

VII.3.1. SCOPE OF WORKS

The works to be performed under this article include the manufacturing, transporting, placing, finishing and curing of all concrete as shown or noted on the drawings and as specified in the specifications.

VII.3.2 MATERIALS

General

All materials to be used in the work shall be supplied by the Contractor unless otherwise specified. The materials shall be in conformity with the requirements laid down in this section, in so far as any stipulation made herein conflicts or is inconsistent with any of the provisions of the GOST or equivalent international standard specification, the stipulation made herein shall always prevail. If any special material, not covered here, is required to be used, it shall conform to relevant GOST or equivalent, if any, or to the requirements specified by the Engineer-Monitor.

VII.3.2.1 Cement

a. Quality and Make

Cement shall be ordinary Portland cement type and sulphate resistant in accordance with GOST 22266-76 (ASTM C150 or B.S 12) unless otherwise instructed. The make and quality of cement to be used in the work shall be subject to the approval of the Engineer-Monitor. For each delivery of cement to the site the Contractor shall forward to the Engineer-Monitor a certificate to the effect that such cement was tested. The results of such tests shall meet the requirements of the relevant standards.

b. Tests

Notwithstanding such certificates, the Engineer-Monitor may require independent tests to be carried out on the cement stored at site, or require relevant tests to be carried out to determine its suitability for use in works as required by GOST 22266-75 or ASTM C150 or B.S 12.

Tests shall be carried out for:-

Fineness: 95% particles shall be less than 75 microns,

Duration and Compressive strength: In 3, 7 and 28 days- 13, 19 & 29 MPa.

Setting time: Initial setting not less than 45 minutes and final setting not more than 8 hours.

Soundness: ½ Kg Cement paste molded into 75 mm² pat of 25 mm thickness and then boiled in water for 5 hours. It should not swell, crack and disintegrate. After 24 hours it shall not allow any scratch on its surface with the thumbnail.

Sample for testing the compressive strength of cement shall be 70x70x70 mm cube. The ratio of cement and sand shall be 1:3.

Compressive strength of cement shall vary with the type of concrete used for construction. The recommended compressive strength of cement depending on concrete type is as follows:

Type of concrete	Type of cement (kg/cm ²)
B 7.5 (M-100)	300
B 15 (M-200)	400-500
B 25 (M-300)	500

In the above Table, M-100 refers to compressive stress of concrete 100 Kg/ cm². Depending on function of the concrete and reinforced concrete structures the appropriate type and quantity of cement shall be used to produce appropriate type of concrete.

The Contractor shall arrange for samples to be provided either direct from the manufacturer or from cement stored at site, as directed by the Engineer-Monitor. Any cement which has been stored at the site for a period in excess of three months shall be retested before use. The cost of providing all samples and all testing shall be borne by the Contractor.

c. Rejected Cement

Any consignment or part of a consignment of cement which has deteriorated in any way or which does not comply with the specification, shall not be used in the works and shall be removed from the site by the Contractor at his own cost.

d. Delivery of Cement

Cement shall be transported, handled and stored in such a manner so as to avoid deterioration or contamination.

Bulk Delivery of Cement

The following requirements shall apply for supplies in bulk container:

- I. Containers shall be in good order and condition and shall be completely weather proof.
- II. Containers shall be sealed after filling and all apertures in containers shall be fitted with water tight closures.
- III. At each transfer or delivery point after each and every use and before being returned for refilling, all containers shall be completely cleaned out.
- IV. All containers shall be sealed duly and signed by a responsible person showing brand, type, net mass, date of filling, identification number or numbers relating to testing and certification at the point of dispatch viz. manufacturers works or any intermediate transfer point.

Cement Delivery in Bags

The following requirements shall apply for cement supplied in bags:

- i) Only sound undamaged cement bags not contaminated by moisture, oil or any other substance or substances shall be acceptable.
- ii) Each bag shall contain 50 kg of cement nominally. Variation in weight by more than 5% shall not be allowed. If the average weight of 50 bags taken at random from any one consignment is found to be less than the nominal mass, the whole consignment shall be rejected.
- iii) When delivered in bags every bag of cement shall be marked with type, name & brand of manufacture, date of manufacture and identification number relating to the testing and certification.
- iv) Cement shall not be re-bagged for use in works without prior approval. Re-bagging of damaged or broken bags shall not be permitted.

e. Storage and Handling of Cement

The storage and handling requirements of cement at site or at any intermediate transfer or storage point shall be as follows:

- i) All storage-points shall be arranged to permit easy access for proper inspection and definite identification of all cement in the storage.
- ii) Cement procured at different times shall be stored separately in batches and mixing shall not be permitted.
- iii) The Contractor shall provide temporary, well ventilated, dry, weather proof structures of sufficient capacity for storage which shall include a timber floor raised not less than 300 mm above the ground.
- iv) Cement shall be loaded/ unloaded under weather proof cover.
- v) At least once in every 3 months all storage bins and silos shall be drawn to be substantially empty.
- vi) Transportation, handling and storage shall be so designed, constructed and arranged to ensure the use or transfer of cement in chronological order of manufacture.
- vii) All handling & transportation equipment and storage bins shall be completely weather proof and dust proof.
- viii) At no time shall the temperature of cement exceed 60° C.

Records and Return

The Contractor shall prepare and maintain proper records at site in respect of the delivery, handling, storage and use of cement and these records shall be available for inspection by the Engineer at all times.

The Contractor shall make a monthly return to the Engineer-Monitor on the date corresponding to the interim certificate date, showing the quantities of cement received and issued during the month and in stock at the end of the month.

VII.3.2.2 Aggregates

a. Quality

Materials used as aggregates shall comply with the requirements of specifications. The materials shall be obtained from a source known to produce aggregates satisfactory for structural concrete. The aggregate shall be free from organic or other foreign matter and the permissible maximum salt contents, expressed as a percentage of the weight of aggregate, shall not be more than the following:

Aggregates	Sodium Chloride (NaCl)	Soluble Sulphite (as SO ₃ ,)
Fine aggregate	0.10%	0.25%
Coarse aggregate	0.05%	0.25%

Prior to the commencement of the work the Contractor shall provide the Engineer-Monitor with typical crushed and/or screened samples of each type of aggregate and shall obtain the Engineer-Monitor 's approval. These samples will be retained by the Engineer-Monitor for comparison with deliveries to the site during the work.

i) **Fine Aggregates**

Quartz and feldspar sand or sand extracted from rock species with diameter up to 5mm are used for concrete. Admixtures in sand shall not exceed the following:

- Clay or fine dust, by mixing 3%, in which clay 1%
- Sulphite, SO₃ 1%
- Mica by weight 0.5%.
- Clay in the form of separate lump is not acceptable.
- Gradation of fine aggregate for concrete shall be of following type:

Size of Sieve Holes, (mm)	Percent Passing (%)
5	85-100%
2.5	70-90%
1.2	45-80%
0.3	5-30%
0.15	0-10%

Fine aggregates shall be sharp, angular, hard & durable and approximately cubical in size. It shall be as far as possible pure SiO₂ (Silica) and may be natural sand or a blend of natural and manufactured sands.

Fine aggregates, if from different sources shall be blended for ensuring uniform grading and colour throughout.

ii) **Coarse Aggregate**

Gravel or crushed stone from crushing of hard and solid mountainous rocks or their mixture is recommended for concrete as coarse aggregates. The size of the coarse aggregate shall be with in the range of 5-40 mm. The size of gravel/ crushed stone (coarse aggregate) is determined by the size of the steel bar shall be used for construction.

The content of clay admixtures in coarse aggregate shall not exceed 1 %.

Gradation of coarse aggregate shall meet the following requirements:

Size of Sieves (mm)	Percent Passing by Weight (%)
The biggest size	95-100%
1/2 of the biggest size	40-65%
5 mm	0-10%

b. **Procurement/ Storage and Cleaning of Coarse Aggregates for Concrete**

The following works are undertaken for procurement/ storage and cleaning of aggregates for concrete:

- a) Quarrying,
- b) Processing (crushing, grading/classifying, washing),

c) Storage of finished product.

Aggregates divided into fractions (group of aggregates differentiated by sizes of different ranges) are used for increasing strength and quality of hydraulic concrete.

The quality of concrete depends on the number of fractions in aggregates. The quality is higher if the number of fractions is higher. Coarse aggregates shall be divided into the following fractions according to the size:

If size up to 40 mm, it shall be divided into 2 fractions	5-20 mm and 20-40 mm
If size up to 80 mm it shall be divided into 3 fractions	5-20 mm, 20-40 mm and 40-80 mm
If size up to 150 mm it shall be divided into 4 fractions	5-20 mm, 20-40 mm, 40-80 mm and 80-150 mm

Aggregates shall be washed for removing of admixtures. For Coarse aggregate of smaller size, the content of sand admixture shall not be not more than 3-5% and of bigger size shall not be more than 1-2%.

Gravel & Sand Mixture

Gravel & Sand mixture shall have the following ratio:

Size of the Biggest Gravel, Mm	Percent of Sand by Weight, (%)
20	40 to 45
40	35 to 40
80	30 to 35
150	25 to 30

Gravel & sand mixture without sieving is used for concrete of lower types (up to type B 7.5), and in this case the cement content shall be 10-15% higher than the cement used for the concrete with quality aggregates.

Coarse aggregate shall consist of hard, strong, durable, angular fragments of crushed stone, natural gravel, a mixture of natural and crushed gravel.

Coarse aggregates shall be considered as well graded having maximum dimension 3 times the minimum dimension.

c. Care and Storage of Aggregates

The handling and storage of aggregates to be used in concrete shall be such as to prevent segregation and admixture of foreign materials or detonation by any other means. The aggregates shall be preserved to contain their quality and fitness for use in the works. The aggregates shall be stored sufficiently far apart to prevent inter-mixing. Different kinds or sizes of aggregates shall be stored in separate stock piles placed on platform made of concrete, sheet metal, wood planks or other approved foundations. Different sizes of aggregates shall be measured separately and kept clean.

d. Processing

- i) Processing of raw materials include crushing, milling, and blending to produce fine and coarse aggregates shall be done at approved location in the approved manner. Proper screening and washing of the aggregates shall be ensured.
- ii) Water conforming to the specification shall be used for washing.
- iii) After washing fine aggregates shall be stored in stock piles for at least 72 hours: They shall be handled subsequently so as to ensure that fine aggregate delivered for the manufacture of concrete has a uniform and moisture content.
- iv) Surface materials of stock piles of fine aggregate which are substantially drier or wetter than the bulk of fine aggregate inside the pile, shall be excluded from use.

e. Tests

The Contractor shall take samples and test aggregates at frequently. Such tests shall include (but shall not be limited) to the following:

For Coarse Aggregates:

- Sieve Analysis,
- Clay and fine silt content,
- Ten percent fines content.

For Fine Aggregates:

- Sieve Analysis,
- Clay and fine silt content
- Organic impurities.

There shall be no restriction to the right of the Engineer-Monitor to make additional tests at any time.

The costs of providing samples and all tests shall be borne by the Contractor.

VII.3.2.3 Reinforcing Steel

a. Quality

For reinforcement of RCC constructions the steel bar meeting the requirements of GOST 5781-82/ equivalent international standard shall be used.

Hot rolled steel bar type A-I, A-II and A-III shall be used for the construction of reinforced cement concrete. Tensile and compressive stress of steel bar are:

Type and Class of Steel Bar	Stress of Steel Bar kg/cm ²	
	Tension	Compression
A-I	2100	2100
A-II	2700	2700
A-III	3400	3400

Rolled carbonaceous steel is used for accessories and couplings.

Selection of reinforcement is undertaken in accordance with temperature condition and characteristics of its loading.

The division of technical control and technical supervision of construction shall carry out the supervision/ control of reinforcement quality.

The manufacturer or supplier of the reinforcing bar shall provide a certificate. The certificate shall contain all the tested values of steel bar and the supplying quantity.

Reinforcing steel shall be free from flaws or defects. Reinforcing steel shall be free from rust, grease, pitting, mud, loose-scale, mortar or any foreign material that may impair the quality.

b. Tolerance

Permissible tolerances in diameter of reinforcing bars shall be as follows:

<u>Nominal Diameter</u>	<u>Permissible Tolerance</u>
Up to 25 mm	2.5%
More than 25 mm	2%

c. Source

In the Tender the Contractor shall state his proposed source and grades of reinforcement. Prior to procurement, he shall furnish certificate of compliance from the manufacturer to the effect that the proposed materials comply with this specification.

The Contractor shall not change his source of supply of reinforcement without the written approval of the Engineer-Monitor.

d. Sampling

The Contractor shall submit to the Engineer samples for approval at least 3 weeks prior to the use of any reinforcement.

e. Tests

With a view to check compliance the Engineer may test from time to time samples of reinforcement during execution of the work.

f. Storage

Reinforcement shall be stored in an orderly manner inside the water proof shelter on a clean, dry and hard surface or support. The supporting surface shall be above the ground and the material shall be protected from deterioration or injury due to exposure.

VII.3.2.4 Water

Water for mixing and curing concrete and masonry work shall be clear, free from oil, acid, alkali, organic materials or other deleterious materials or objectionable quantities of suspended materials & shall be neither brackish nor salty. Sewerage and industrial water shall not be used for concrete mix and curing. Water with salt content is used if chemical content meet the following requirements:

- Content of soluble salt not more than 5000mg/ Ltr.
- Content of ions Cl not more than 1200 mg/ Ltr.
- Content of ions SO₄ not more than 2700 mg/ Ltr.
- Weighted particles not more than 200mg/ Ltr.
- Hydrogen indicator (pH) not less than 4 and not more than 12.5.

Thirty days before commencement of the work the Contractor shall test the water and shall state to the Engineer-Monitor the source and percentages of sulphates, chlorides & organic substances and shall submit test certificate to the Engineer-Monitor for his approval. Once approved the Contractor shall not change the source without prior written approval from the Engineer-Monitor.

VII.3.2.5 Sand for Filling

Sand for filling shall be non-saline and consist of hard, dense and durable materials, and shall be free from clay-lumps, light weight material, or other deleterious substances. They shall to comply fully with the requirements as laid down for fine aggregates (Clause VII.3.2.2).

VII.3.2.6 Admixtures

No materials other than the essential ingredients, i.e. cement, aggregates and water, shall ordinarily be used in the manufacture of concrete or mortar. However the Engineer-Monitor may permit the use of approved admixtures for imparting special characteristics to the concrete, on satisfactory evidence that its use does not in any way adversely affect the properties of concrete particularly its strength, volume changes, durability and that the admixture has no deleterious effect on the reinforcement.

VII.3.2.7 Other Materials

Materials not specified herein have been specified in the individual items and section hereinafter.

VII.3.2.8 Imported Materials

At the time of submission of Tender, the Contractor shall furnish a list of materials/ finished products manufactured, produced or fabricated outside the country which he proposes to use in the work.

The materials imported shall conform to the relevant specifications of the Contract.

In cases where materials/ finished products are not covered by the specifications in the Contract, the details of specifications proposed to be followed and the testing procedure as well as laboratories/ establishment where tests are to be carried out shall be provided by the Contractor for approval by the Engineer-Monitor.

The Contractor shall furnish to the Engineer-Monitor a certificate of compliance of the tests carried out. In addition, certified test reports clearly identifiable to the lot of materials shall be furnished at the Contractor's cost.

VII.3.2.9 Testing

The Contractor shall set up a field laboratory with necessary equipment for testing of all materials/ finished products used in the construction as per requirements of the relevant specifications. The testing of all materials shall be carried out by the Contractor who shall make all the necessary arrangements and bear the entire cost. Tests which cannot be carried out in the field laboratory shall be done, at the Contractor's cost, at recognized laboratory/ testing establishment approved by the Engineer.

VII.3.2.10 Sampling of Materials

Samples provided to the Engineer-Monitor or his Representative for their retention are to be in labeled boxes suitable for storage. Materials not corresponding in character and quality with approved samples will be rejected by the Engineer-Monitor and shall be removed from site as directed by the Engineer-Monitor at the Contractor's cost.

Samples required for approval and testing as well as certificates of test results must be supplied well in advance of the need for approval, to allow for testing and approval. Delay to works arising from late submission of samples will not be acceptable as a reason for delay in the completion of the works.

VII.3.2.11 Measuring of Materials

The Contractor shall submit for the Engineer-Monitor's approval his proposed method of measuring the materials.

For the purposes of work, the fine and coarse aggregates & cement shall be measured by volume. Water shall be measured by volume from a calibrated vessel. Allowance being made for the water content of the aggregates.

The measuring scales shall be clearly marked and located so that they can be accurately read. All measuring equipment and its accuracy shall be checked regularly. For the purposes of effecting interim payment the materials shall be measured as follows:

- Aggregates by volume in cubic metre in stock pile
- All other materials as per method approved by the Engineer-Monitor.

VII.3.2.12 Payment

Direct payment will not be made for any materials. The costs of the material shall be included in the prices for the various items appearing in the Bill of Quantities. Such prices shall also include all expenses of the Contractor in handling, processing, transporting, storing, testing and all wastage.

VII.4 CONCRETE WORKS

VII.4.1 DESCRIPTION

The work to be performed under provisions of this section includes the supply of all materials, mixing, transporting, placing, finishing and curing of concrete as shown on the Drawings or as directed by the Engineer-Monitor.

The concrete shall be composed of cement, water fine and coarse aggregate well mixed and brought to the proper consistency. Type and source of ingredients used in concrete shall conform to the approved samples and shall not be varied. The requirement for concrete, its constituent materials, preparation and procedures shall conform to the standard specifications unless otherwise specified herein or directed by the Engineer-Monitor.

Concrete and RCC works shall be according to GOST 2663-85 or equivalent international standard.

Type of concrete that shall be used in construction shall be determined from type of works. The types of concrete shall satisfy the following proper ties:

1. Compressive strength
2. Freezing resistance
3. Resistance to percolation

Concrete types according to compressive strength are B 5, B 7.5, B 10, B 12.5, B 15, B 20, B 25, B 30, B 35, B 40. The term B 5 refers to B for type of concrete and 5 for the magnitude of compressive stress 5 MPa (Mega pascal)

Concrete type according to freezing resistance are F 50, F 75, F 100, F 150, F 200, F 300, F 400, F 500, F 600, F 800, F 1000. The term F 50 refers to F for freezing resistance and 50 for number of cycles of freezing and melting.

Concrete types according to resistance to percolation are W 2, W 4, W 6, W 8, W 10, W 12, W 16, W 18, W 20. The term W 2 refers to W for resistance to percolation and 2 for magnitude of water pressure (Kg/cm²) on concrete without causing percolation.

All concrete shall meet the requirement of all the properties as described above.

For example the concrete type specified as B 5-F 50-W 2 shall have compressive stress 5 Mpa, shall not loose more than 5% strength after 50 cycle of freezing and melting and there shall be no percolation through the concrete under water pressure of 2 Kg/cm².

The size and the grading of coarse aggregate for concrete works are specified in the section 9.3.2.2.

The exact proportions in which the various ingredients are to be used for different parts of the work shall be approved by the Engineer-Monitor. Tests shall be made of samples of the aggregates and the resulting concrete to determine conformance with the specifications.

The characteristic strength is defined as the strength of material below which shall not fall more than 5 per cent of the test results shall fall. In order to get a relatively quicker idea of the quality of concrete, compressive strength tests at 7 days may be carried out in addition to 28 days compressive strength tests. In all cases, the 28 days compressive strength shall alone be the criterion for acceptance or rejection of the concrete, if, however, from tests carried out in a particular job over a reasonably long period, it has been established to the satisfaction of the Engineer-Monitor that a suitable ratio between 28 days compressive strength and compressive strength at 7 days exist, the Engineer-Monitor may relax the frequency of 28 days compressive strength testing provided the expected strength values at the specified early age are consistently met.

VII.4.2 DESIGN OF CONCRETE MIX

1. Design Mix

Concrete for the specified type shall be designed on the basis of preliminary tests. The Contractor shall make trial mixes using samples of aggregates and cement representative of those to be used in the works. If possible, the concreting plant and the methods of transporting and depositing the concrete to be employed in the work shall be used to simulate working conditions with the trial mixes.

Preliminary tests and strength requirements of concrete shall conform to requirements. All the preliminary tests, approvals, etc. shall be completed 15 days in advance by the Contractor before any concreting is commenced. Failure on the part of the Contractor to do so and the consequent delay in the completion of the work will not entitle him for any compensation whatsoever, either financially, or by way of extension of time.

Preparation of concrete mixture/solution

Mixing of concrete shall be done using mixture machines

The following criteria shall be considered for selection concrete ingredients:

1. Cement type depending on concrete type,
2. Water and cement ratio (W/C),
3. Type of cement and quantity of water for 1m³ of concrete,
4. Type of sand, ratio of fine aggregate and coarse aggregate, and gradation of coarse aggregates,
5. Determination of concrete composition,
6. Laboratory test for the selected contents,
7. Test on concrete strength

Based upon the successful tests on concrete and its ingredients, the Contractor shall submit mix proposals to the Engineer for approval.

Water Cement Ratio and Workability

Water cement ratio in all elements shall be as low as practicable in conformity with requirements of workability. The upper limit shall be 0.45. except for concrete placed under water.

In the case of reinforced concrete work, workability shall be such that the concrete surrounds and properly grips, all reinforcement. The degree of consistency, which shall depend upon the nature of work and methods of vibration of concrete shall be determined by regular slump tests. Slumps indicated below shall be adopted for different types of works:

Type of Work	Slumps (mm)
Foundation, Footings, Pile Caps, Columns, Beams, Lintels, walls, Suspended Structural Slabs	30 mm to 45 mm
Thin members	30 mm to 60 mm
Piles, Cast in situ	120 mm to 180 mm

Responsibility for Mix Design

Selection of mix design and ensuring that all concrete placed in the works conforms to requirements of the specifications is the responsibilities of the Contractor, irrespective of the fact that the Engineer-Monitor may have accorded approval.

Blinding Concrete

The blinding concrete/lean concrete may be mixed in proportion by volume. Ordinary Portland cement and well graded aggregate of maximum nominal size not exceeding 25 mm shall be used unless otherwise approved.

Mixing Concrete

For proportioning of the ingredients as per the approved design mix, only weight batching shall be permitted. For all work concrete shall be mixed in a mechanical driving mixer which, along with other accessories, shall be kept in first class working condition and so maintained throughout the construction. Mixing shall continue till materials are uniformly distributed and an uniform color of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar. In no case shall the mixing be done for less than 2 minutes after all ingredients have been added.

Mixers which have not been used for more than 30 minutes at the time shall be thoroughly cleaned before moving in a new batch. Unless otherwise agreed to by the Engineer-Monitor, the first batch of concrete from the mixer shall contain only two thirds of the normal quantity of coarse aggregate- Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

VII.4.3 TRANSPORTATION, PLACING AND COMPACTION OF CONCRETE

The method of transporting and placing of concrete shall be subject to approval by the Engineer-Monitor. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent materials takes place.

Concrete from concrete plants to the place of destination shall be delivered by big trucks (Avtosamosvals) or in specialized trucks having rotating drums for concrete mixing. Transportation of concrete mixture without special admixtures in aggregates together is allowed only to the distance not more than 15 km.

The following conditions shall be followed while transporting:

- Not to allow segregation of concrete mixture
- Not to allow changing the workability of concrete mixture
- To take all possible measures for quickest delivery of concrete mixture at the site.

No concrete shall be placed in any part of the structure until the approval of the Engineer-Monitor has been obtained. If concreting is not started within 24 hours of the approval being given, it shall be obtained again from the Engineer-Monitor. Concreting shall then proceed continuously over the area between construction joints.

Placing of concrete mixture shall comprise preparation of blocks for concrete laying, delivery of concrete mixture.

Before placing concrete in block the following measures shall be taken:

- Clearing up construction rubbish
- Clearing of block from dust
- Blowing off block surface by compressed air for removal of dust and mud
- Clearing of steel bar/ stirrups from rust

If there is any oil on the surface of previously laid concrete, portion of the concrete mixed with oil shall be cut before placing another layer of concrete. If there are concrete placed where segregation occurred or air holes are formed, these parts shall be removed.

Concrete part that shall be removed by special pneumatic equipment, reinforcement shall be cleared by special brushes with electric or pneumatic devices before laying concrete mixes.

When concrete shall be laid at vertical section by layer, the surface at different layer shall be prepared by clearing cement pellicle that decreases the soundness/ strength of concrete. The surface layer of 3-4 mm thickness shall be removed from horizontal and slope surfaces. Removal of cement pellicle shall not be undertaken by pick axes, crow-bars and other hammering tools as hairline cracks appear in the concrete thus decreasing the firmness and waterproof of concrete.

During pouring, concrete shall be compacted by vibrators. The thickness of placing each layer depends on the type of vibrators. Depending on the type of construction, vibrators can be used at surface, side or inside the formwork.

Concrete when deposited shall have a temperature of not less than 4.5°C and not more than 38°C. It shall be compacted in its final position within 30 minutes of its discharge from the mixer unless carried in properly designed agitators, operating continuously, when the time shall be within 2 hours of the addition of cement to the mix and within 30 minutes of its discharge from the agitator.

Except where otherwise agreed to by the Engineer-Monitor, concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 m when internal vibrators are used and not exceeding 0.30 m in all other cases.

Unless otherwise approved to by the Engineer-Monitor, concrete shall not be dropped into place from a height exceeding 2 m. When trucking or chutes are used they shall be kept clean and used in such a way as to avoid segregation.

When concrete is conveyed by chute, the plant shall be of such size and design as to ensure continuous flow. The slope of the chute shall be so adjusted that the concrete flows without the use of an excessive quantity of water and without any segregation of its ingredients. The delivery end of the chute shall be as close as possible to the point of deposit. The chute shall be thoroughly flushed with water before and after each working period and the water used for this purpose shall be discharged outside the formwork.

All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise permitted by the Engineer-Monitor for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.

Internal vibrators shall be capable of producing not less than 10,000 cycles per minute, and external vibrators not less than 3,000 cycles per minute. Vibration shall not be applied through reinforcement, and where vibrators of the immersion type are used, contact with reinforcement shall be avoided.

Re-tempering concrete by adding water or by other means shall not be permitted.

VII.4.4 CURING OF CONCRETE

Immediately after compaction, concrete shall be protected against harmful effects of weather, including rain, running water, shocks, vibration, traffic, rapid temperature changes and drying out process. It shall be covered with wet sacking or other similar absorbent material approved by the Engineer-Monitor soon after the initial set.

Curing shall be started 10-12 hours after placing of concrete, and in hot weather after 2-3 hours; if the temperature is +15°C and more the curing shall be done every 3 hours for first three days and on the following days curing shall be done at least 3 times at day time and one time at night. Curing is not required when temperature is lower than +5°C. Curing shall be continued at least for 28 days.

VII.4.5 WORKING IN EXTREME WEATHER

When depositing concrete in very hot weather, precautions shall be taken so that the temperature of wet concrete does not exceed 38° C while placing. This shall be achieved by stacking aggregate under the shade and keeping the coarse aggregates moist, using cold water, reducing the time between mixing and placing to the minimum, cooling work by sprinkling water, starting curing before concrete dries out and restricting concreting period as far as possible, to mornings and evenings.

VII.4.6 FINISHING

Immediately on removal of forms, the concrete work shall be examined by the Engineer-Monitor before any defects are made good.

The work that has sagged or contains honeycombing to an extent detrimental to structural safety or architectural concept shall be rejected.

Surface defect of a minor nature may be accepted; on acceptance of such work by the Engineer-Monitor, the same shall be rectified.

Surface defects which require repair when forms are removed usually consists of bulges due to movement of forms, ridges at form joints, honey-combed areas, damage resulting from the stripping of forms and bore hole. Bulges and ridges are to be removed by careful chipping or tooling and the surface shall be rubbed with a grinding stone. Honey combed and other defective areas must be chipped out, the edges being cut as straight as possible and perpendicular to the surface, or preferably slightly undercut to provide a key at the edge of the patch. Bolt holes shall be closed by cement mortar to ensure thorough filling.

Shallow patches are first treated with a coat of thin grout composed of one part of cement and one part of sand and then filled with mortar similar to that used in the concrete. The mortar shall be placed in layers not more than 10 mm thick and each layer is given a scratch finish to secure bond with the succeeding layer. The last layer shall be finished to match the surrounding concrete by floating, rubbing, or tooling on formed surfaces by pressing the form material against the patch while the mortar is still plastic.

Large and deep patches shall require filling up with concrete held in place by forms. Such patches are to be reinforced and carefully dowelled to the hardened concrete.

The same amount of care of curing of the patches shall be taken as with the whole structure. Curing must be started, as soon as possible, after the patch is finished to prevent early drying. Damp sacking may be used. A membrane curing compound may be permitted.

VII.4.7 ADMIXTURES

Admixtures shall mean materials added to the concrete materials during mixing for the purpose of altering the properties of the concrete mix.

The Contractor shall obtain the Engineer-Monitor's written permission before using admixtures. The methods of use and the quantities of admixture used shall be subject to the Engineer-Monitor's approval, whose approval or otherwise shall in no way limit the Contractor's obligations under the contract to produce concrete with the specified strength and workability.

VII.4.8 JOINTS IN CONCRETE

Joints

Concrete surfaces upon or against which concrete is to be placed and to which new concrete is to be placed, that have become so rigid that the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. All exposed faces of construction joint shall be made absolutely straight, level or plumb and normal to the finished surface.

For a vertical construction joint, a stopping board shall be fixed previously at the pre-determined position and shall be properly stayed for sufficient lateral rigidity to prevent its displacement or bulging when concrete is compacted against it. Concreting shall be continued right up to the board. The board shall not be removed before the expiry of the specified period for removal of vertical forms.

When work has to be resumed on a surface which has hardened it shall be thoroughly hacked, swept clean, wetted and covered with a layer of neat cement grout. The neat cement grout shall be followed by a 13 mm thick layer of mortar mixed in the same proportion as in concrete and concreting resumed immediately thereafter. The first batch of concrete shall be rammed against the old work to avoid formation of any stone pockets, particular attention being paid to corners and close spots.

Design Joints

Design joints shall be formed in the positions and manner shown on the Drawings and shall be shuttered square to the work to provide a smooth surface to the concrete. The joints shall be made by forming the concrete on one side of the joint and allowing it to set before concrete is placed on the other side of the joint. The face of the joint first formed shall be smooth, dense and free from any irregularities. The plane of the joint shall extend completely through the structure unless shown otherwise on the Drawings.

Caulking grooves shall be provided as shown on the Drawings or in accordance with the joint sealant manufacturer's recommendations. At all joints where a caulking joint is formed, immediately prior to caulking, the groove shall be wire brushed and loose material removed and blown out by compressed air. After the groove has dried it shall be primed and caulked with approved sealant compound applied strictly in accordance with the manufacturer's instructions and to the approval of the Engineer-Monitor

Construction Joints

Contraction joints are defined as joints placed in slabs or structures to provide for volumetric shrinkage of a monolithic unit or movement between monolithic units. The joints shall be constructed so that there will be no bond between the concrete surfaces forming the joints. The surface of the first place at a contraction joint shall be bitumen coated before the concrete on the other side of the joint is placed.

Deformation Joints

Deformation joints are intended to accommodate relative movement between adjoining parts of a structure. Compressive filler shall be placed in the joint to provide freedom for the two adjacent concrete masses to expand. Care shall be taken to ensure that the material fills the joint completely and that no concrete or hard material is left in the joint after the second face of the joint has been cast.

Procurement of materials required for joints shall be done separately. Joints shall be constructed by specialist those have appropriate skill on each type of joint. Technical Control Service shall conduct quality control on implementation of deformation joints.

Joint Sealant

Joint sealant shall be approved bituminous compound as shown on the drawings. The grooves for the sealant shall be primed and a bond breaker shall be placed before application of the sealant. Such joint sealant, bond breakers, and the requisite priming materials shall be obtained from manufacturers approved by the Engineer. Application of joint sealant shall not be commenced without the Contractor having first obtained the approval of the engineer. Sealant shall be stored in accordance with the manufacturer's recommendation and under no circumstances shall the material older than the recommended shelf life be used in the works.

Compressible Filler

The contractor shall supply and fix joint filler in all deformation joints as shown on the drawings. Unless otherwise specified, the joint filler shall be of resin and poroisol for joint type 1 and joint type 4 shall be fixed with nut and bolts using zinc sheet, resin and bitumen. The filler shall be obtained from a manufacturer approved by the Engineer-Monitor and shall be stored and fixed in accordance with the manufacturer's instructions. The joint filler of thickness specified shall be cut to shape and fix to fill the whole space between the concrete faces of the joint sealer.

Bitumen Coated Joint

Where the drawings show bituminous paint between concrete faces, the Contractor shall clean and dry the face to which the paint is to be applied and shall then paint the bitumen. The bitumen shall be as shown on the drawings or approved by the Engineer-Monitor. Details of all joints are joint sealer and joint filler are shown on the Drawings.

VII.4.9 TESTS

1) Preliminary Tests for Concrete

The preliminary tests referred to in specification shall consist of three sets of separate tests, and in each set, tests shall be conducted on six specimens. Not more than one set of six specimens shall be made on any particular day. Of the six specimens in each set, three shall be tested at seven days and the remaining three at 28 days. The preliminary tests at 7 days are intended only to indicate the strength likely to be attained at 28 days.

2) Work Strength Tests for Concrete

Work strength tests shall be made and each test shall be conducted on ten specimens, five of which shall be tested at seven days and the remaining five at 28 days. The samples of concrete shall be taken on each day of concreting and cubes shall be made at the rate of one for every 5 cubic metre of concrete or a part thereof. However, if concreting done in a day is less than 15 cubic metre, the minimum number of cubes shall be 6. Similar work tests shall be carried out whenever the quality and grading of materials is changed irrespective of the quantity of concrete poured. The number of specimens may be increased as directed by the Engineer-Monitor, when tests results reveals a poor quality of concrete and in other special cases.

All work shall be carried out under the supervision of qualified and a competent personnel who will supervise proportioning, placing and compacting of concrete at all stages. All necessary labour, material, equipment, etc., for sampling, preparing test cubes, etc., shall be provided by the Contractor, without any charge to the Employer. Testing of the materials and concrete may be arranged by the Engineer-Monitor in an approved laboratory at the cost of the Contractor.

The factor of safety of the concrete shall be applied to the compressive strength of tested sample size 200x200x200 mm.

The compressive strength for concrete shall be determined according to GOST 10180-78 in cube shape samples.

Sample sizes for concrete testing are as follows:

Size of samples Mm	Maximum size of coarse aggregates mm
100x100x100	20
150x150x150	40

Samples shall be manufactured in steel form and shall be vibrated until appearing cement solution into surface.

Samples shall be kept in forms covered with wet material for 1 day under 16-20°C. Then these shall be taken out from the forms and shall be kept under 20±2°C in humidity not less than 90% for 28 days.

Samples shall be inspected, measured and weighted before testing.

The compressive strength (Kg/cm²) of concrete is determined by failure load applied to the sample divided by sample's sectional area. The results obtained by the 100, 150, and 300 mm³ shall be multiplied by the coefficients as stated below for achieving the standard result as obtained by 200 mm³ sample.

Size of samples Mm	Maximum size of coarse aggregates mm
100x100x100	0.85
150x150x150	0.90
200x200x200	1.0
300x300x300	1.10

For concrete type according to freeze resistance (F), depending on the number of cycles of freezing and melting shall not decrease the strength by more than 5%. The method of freezing and melting shall be according to GOST 10060-87 or equivalent international standard.

For concrete type according to water percolation (W), applying water pressure according to GOST 12730.5-84 or equivalent international standard, there shall be no percolation through the concrete.

The concrete attains maximum strength, resistance to freezing and resistance to percolation after 180 days. However, for hydraulic structures the test results for strength, resistance to freezing and resistance to percolation shall be considered after 28 days.

Standard of Acceptance

The average strength of the group of specimens cast for each day shall not be less than the specified works cube strength. 20 percent of the specimens cast for each day may have values less than the specified strength, provided the lowest value is not less than 85 percent of the specified strength. Any concrete which is below standard results, becomes severely damaged due to cracking, shows excessive honeycombing and exposure of reinforcement or exhibits any fault which, seriously impairs its function, may be declared defective concrete. Such concrete shall be cut out, removed from the site and replaced by fresh concrete of the specified quality at the Contractor's expenses. Alternatively, the Contractor shall carry out whatever other remedy the Engineer-Monitor may reasonably require having regard to all the circumstances, at the expense of the Contractor.

VII.4.9 CONCRETE SIGN-OUT FORMS

The Contractor shall provide concrete placement sign-out forms for each concrete placement and Engineer shall check and approve the concrete formwork and reinforcement conformance with the specifications, line and grade, reinforcing steel, embedded items, cleanliness, cement, aggregate, water, batching equipment and vibrators before starting each concrete placement. One copy of the concrete placement sign-out form shall be retained by the Contractor and one copy shall be submitted to the Engineer-Monitor with request for inspection.

VII.4.10 MEASUREMENT AND PAYMENT

Payment for concrete work shall be based on the lines and levels shown on the Construction Drawings. The concrete shall be measured in m³. Payment shall be made at the specified rate against the respective type of concrete shown in the Bill of Quantities.

The unit rate specified in the Bill of Quantities against the respective type of concrete shall include the cost of all materials, labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing as per direction of the Engineer-Monitor, curing and all other incidental expenses for producing concrete of specified strength to complete the structure or its components as shown on the drawings and according to specifications, but excluding the cost of reinforcement.

VII.5 STEEL REINFORCEMENT FOR STRUCTURES

VII.5.1 GENERAL

This work shall consist of furnishing and placing reinforcing steel of the shape and dimension shown on the drawings and as specified herein. Reinforcing steel shall be in conformity with the specification. Clause VII.3.3.

The steel reinforcement shall be prepared and fixed in accordance with the drawings furnished by the Engineer-Monitor.

The Contractor shall provide the Engineer-Monitor with bar bending schedules detailing the reinforcement required for the permanent works. Such schedules are to be approved by the Engineer-Monitor prior to the commencement of the work. Approval shall not relieve the Contractor from his responsibilities under the Contract for providing the materials called for on the drawings. All further working drawings and list of reinforcement necessary to carry out the works shall be provided by the Contractor at his own cost.

Reinforcing steel may be either plain or deformed. All reinforcement bar shall be mild steel made from billet. Standard dimension and weight of the reinforcing bars shall be as follows:

Standard Dimension and Weight

Bar Diameter (mm)	Cross Sectional Area (mm ²)	Perimeter (mm)	Unit Weight (Kg)
6	28.27	18.85	0.22
10	78.54	31.42	0.62
13	113.10	37.70	0.89
16	201.06	50.27	1.58
19	283.53	59.69	2.23
22	380.13	69.12	2.98
25	490.87	78.54	3.85
28	615.75	87.96	4.83
32	804.25	100.53	6.31

VII.5.2 BENDING OF REINFORCEMENT

Reinforcing steel shall conform accurately to the dimensions given in the Bar Bending Schedules.

Bars shall be bent cold to the specified shape and dimensions using a proper bar bender, operated by hand or power to attain proper radius of bends.

Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used on work; they shall not be heated to facilitate bending.

VII.5.3 PLACING OF REINFORCEMENT

The Contractor shall prepare the reinforcements as per schedules and shall clean the reinforcement of rust, loose mill scale, mud, dust, grease and any objectionable foreign substances. After being placed the reinforcements shall be inspected by the Engineer-Monitor and any reinforcement not conforming to these requirements may be rejected and shall be replaced by the Contractor at his own cost.

All reinforcing bars shall be accurately placed in exact position shown on the drawings, and shall be securely held in position during placing of concrete by annealed binding wire not less than 1.2 mm in diameter (stripped) and by using blocks or metal chairs, spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between supports nor displaced during concreting. All devices used for positioning shall be of non-erodible material. Wooden and metal supports will not extend to the surface of concrete, except where shown in the drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, pre-cast mortar blocks or other approved devices.

Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed.

To protect reinforcement from corrosion, concrete cover shall be provided as indicated in the drawings.

In case of Columns and walls, vertical bars shall be kept in position with timber templates having slots accurately cut in for bar position. Such templates shall be removed after the concreting has progressed up to a level just below them.

VII.5.4 JOINING AND SPLICING OF REINFORCEMENT

- i. As far as possible, reinforcing bars shall be furnished in full lengths as indicated in drawings. Joints or splices at positions other than those shown in drawings shall be subject to the approval of the Engineer. The number of joints and splices shall be minimum and shall be avoided at points of maximum stresses. Joints and splices shall be staggered in adjacent bars.
- ii. Welding of bars shall not generally be permitted. But when permitted or specified in drawings, reinforcing bars shall be butt welded so as to transmit their full stress. Welded joints shall be located at points where steel will not be subjected to more than 75 percent of the maximum permissible stresses and welds shall be staggered so that at one section not more than 20 percent of the rods are welded. Only electric arc welding, using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It must be ensured that no voids are left in the welding and when welding is done in 2 or 3 stages, previous surface shall be cleaned properly. Ends of bars shall be cleaned off all loose scale, rust, grease, paint and other foreign matter before welding. Only competent welders shall be employed.
- iii. Electrodes of approved quality shall be used. Welded pieces of reinforcements shall be tested. Specimens shall be taken from the actual site and the number and frequency of tests shall be done as directed by the Engineer-Monitor.
- iv. Whenever indicated in drawings or directed by the Engineer-Monitor, bars shall be joined by couplings which shall have a cross-section sufficient to transmit the full strength of bars. Before their use, the Contractor shall inform the Engineer-Monitor at least 15 days in advance with samples of proposed couplings for approval. The ends of bars that are joined by coupling shall be upset for a sufficient length so that the effective cross-section at the base of threads is not less than the normal cross-section of the bar.

VII.5.5 MEASUREMENT AND PAYMENT

- i. For all items of reinforced concrete work measurement and payment for reinforcement shall be made separately unless specifically stated otherwise.
Measurement shall be made on the basis of the weight for different bar diameters actually placed in concrete as shown in drawings or as directed. The weight of bars shall be calculated based on the weight per metre as shown in Clause 9.5.1. No allowances shall be made for rolling margin.
- ii. Hooks at ends shall be measured. All joints or splices as shown in the drawings or as directed by the Engineer-Monitor shall be measured for payment but additional joints or splices shall not be measured for payment.
- iii. Wastage, spacers, chairs, annealed steel wire for binding off-cuts or extra length of reinforcing steel provided but not shown in the drawing shall not be measured for payments.

The amount of completed and accepted material conforming to the requirements of Contract and measured as provided above in tonnes shall be paid for as per rate shown in the priced Bill of Quantities. The rate shall include the cost of furnishing and attaching wire ties and metal, concrete or other supports, of scheduling, furnishing, cutting, storing, bending, cleaning, securing and maintaining position of all reinforcing bars in complete.

VII.6 FORMWORKS

VII.6.1 GENERAL

Formwork shall include all temporary or permanent forms required for forming the concrete, together with all temporary construction required for their support.

The Contractor shall be entirely responsible for the adequacy and safety for false work notwithstanding any approval or review by the Engineer-Monitor of his drawing and design.

Forms for concrete shall be constructed of metal or timber suitably lined and be of substantial and rigid construction true to shape and dimensions shown in the drawings.

Forms shall be mortar-tight and shall be made sufficiently rigid using ties and bracings to prevent any displacement or sagging between supports. They shall be strong enough to withstand all pressure, ramming and vibration, without deflection from the prescribed lines during and after placing of concrete. Screw jacks or hard-wood wedges where required shall be provided to make up any settlement in the formwork either before or during the placing of concrete.

Suitable camber shall be provided in horizontal members of structure, specially in long spans to counteract the effects of any deflection. The formwork shall be so fixed as to provide for such camber.

Forms shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface or concrete or disturbing other sections.

VII.6.2 FORMED SURFACES AND FINISH

The formwork shall be lined with a material approved by the Engineer-Monitor so as to provide a smooth finish of uniform texture and appearance. This material shall leave no stain on the concrete and shall be so joined and fixed to its backing as not to impart any blemishes. It shall be of same type and obtained from only one source throughout for the construction of any structure. The Contractor shall make good any imperfection in the resulting finish as required by the Engineer-Monitor.

VII.6.3 QUALITY OF SHUTTERING

The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.

Ply-board shuttering material used shall be well seasoned free from projecting nails, splits or other defects that may mark the surface of concrete. It shall not be so dry as to absorb water from concrete and swell /bulge, nor so green or wet as to shrink after erection.

Where timber is used the timber shall be accurately sawn and planed on the sides and surface coming in contact with concrete.

Wooden formwork with metal sheet lining or steel plates stiffened by steel angles is also permitted. Where metal forms are used all bolts and nuts shall be countersunk and well ground to provide a smooth plain surface.

The chamfers, leveled edges and moldings shall be made in the formwork itself, opening for fixtures and other fittings connected with services shall be provided in the shuttering as shown on the Drawing or as directed by the Engineer-Monitor.

VII.6.4 FORMWORK DESIGN

The Contractor will be required to submit a complete design of the formwork he intends to use in each stage of his work. The design includes the method of supporting the formwork and shall indicate size & length of form ties if used. The Engineer will review and approve such designs prior to the erection of any formwork. The designs as approved shall be the basis upon which the Contractor will proceed with his formwork.

VII.6.5 PREPARATION OF FORMWORK BEFORE CONCRETING

The inside surfaces of forms shall, except in the case of permanent formwork or where otherwise agreed to by the Engineer, be coated with an approved material to prevent adhesion of concrete to the formwork. Release agents shall be applied strictly in accordance with the manufacturer's instructions and shall not be allowed to come into contact with any reinforcement or pre-stressing tendons and anchorages. Different release agents shall not be used in formwork for concrete which will be visible in the finished work. Immediately before concreting, all forms shall be thoroughly cleaned.

The Contractor shall give the Engineer-Monitor due notice before placing any concrete in the forms to permit him to inspect and accept the

false work and forms as to their strength alignment and general fitness, but such inspection shall not relieve the Contractor of his responsibility for safety of men, machinery, materials and for results obtained.

Wherever the concreting of narrow members is required to be carried out within shutters of considerable depth, temporary openings in the sides of the shutters shall, if so directed by the Engineer-Monitor, be provided to facilitate the pouring and consolidation of the concrete.

VII.6.6 REMOVAL OF FORMWORK

The formwork shall be removed so as not to cause any damage to concrete. Supports shall be removed in such a manner as to permit the concrete to absorb stresses due to its own weight uniformly and gradually.

In no circumstances should forms be struck until the concrete reaches a strength of at least twice the stress to which the concrete may be subjected at the time of striking where ordinary Portland cement is used. Where possible the formwork should be left longer as it would assist curing. Forms should be eased carefully in order to prevent load being suddenly transferred to concrete. The removal of shuttering shall not be done prior to the approval of the Engineer-Monitor.

The following guidelines shall be followed to determine the time of removal of formwork:

(i)	Columns, Walls, and vertical faces of structural members	48 hrs	
(ii)	Slabs and beams		21 days

VII.6.7 DISCOLORATION

Formation of blotches and stains due to detachment of formwork panel from the concrete when adjacent portion in the same lift is still adhering, shall not be allowed to occur, and for this purpose, all shutters shall be struck off at the same time. Use of old and new plywood in the same board or different quality boards or mixing shutter panels of different numbers of uses is totally prohibited to avoid discoloration.

VII.6.8 CLEAN UP

After forms are stripped, all materials to be reused shall be thoroughly cleaned. All nails shall be pulled from the plywood board and no nails shall be bent over by hammering against the face of the materials if reuse of forms is planned. Holes bored through sheeting for form ties shall be plugged by driving in common corks or foamed plastics. Patching plaster may also be used to fill small holes. After cleaning and before refixing each formwork either of plywood or metal mould shall be approved by the Engineer-Monitor.

VII.6.9 NUMBER OF USES

Plywood boards shall be used so as to maintain quality of the exposed surface. However, if in the opinion of the Engineer-Monitor, any particular board has become unsatisfactory for use at any stage, the board will be rejected.

VII.6.10 FORMWORK (OR EXPOSED CONCRETE WORK)

All exposed concrete surfaces are to be form finish and shall be cast in an approved formwork and shall be free of honey combing, fins, projections and air holes. All external angles to form finished concrete surfaces shall be chamfered, as directed.

No work on form finished exposed concrete shall be carried out until the Contractor has produced acceptable samples of shuttering and concrete to the approval of the Engineer-Monitor.

Utmost care shall then be constantly exercised by the Contractor in the:

- 1) Design, workmanship and fixing of formwork;
- 2) Control of concrete ingredients, mixing and placing; and
- 3) Adequate technical supervision of all processes involved.

In all types of formwork to form finished exposed concrete, only non-staining mould oil supplied by an approved manufacturer shall be used.

The repetitive usage of the same formwork to cast form finished exposed concrete shall be approved by the Engineer-Monitor and in no case shall formwork not guaranteed to produce the required form finish be used.

The exposed concrete shall have uniform finish. The finish of the concrete when shuttering and formwork is removed, shall be without any blemish and shall be such as will not require touch up. Slight touch up for a small spot or two, if necessary, shall be carried out expertly so as to be harmonious with the entire surface.

VII.6.11 MEASUREMENTS AND PAYMENTS

The measurement of formwork shall be taken in square meters of the area of concrete surface, which is in contact with formwork as measured on the drawings.

The cost of formwork includes the cost of all materials, labour, tools and plant as required for construction and removal of forms as described above. Also, for framing required for properly supporting the members until the concrete is sufficiently cured, set and hardened. This cost of formwork is included with the unit cost of concrete or RCC.

VII.7 PRE-CAST RCC FLOOR SLABS

VII.7.1 GENERAL

The work to be performed under this article includes furnishing all labour, materials and equipment, producing pre-cast R.C.C. slabs storing, transporting and placing in accordance with the details shown on the Drawings or as per specification.

VII.7.2 EQUIPMENT, MATERIAL AND PRODUCING OF PRE-CAST ELEMENTS

All the equipment and materials necessary for this work shall be supplied by the Contractor. Unless otherwise specified herein provisions of Clause respectively for concrete, formwork and steel reinforcement shall be applied to this work.

Pre-cast structure shall present smooth, even surface, free from any surface blemishes and true to the dimensions shown on the drawings.

VII.7.3 MARKING OF PRE-CAST ELEMENTS

After a element has been cast, the date of casting, reference number, length shall be clearly inscribed on the top surface of the element.

VII.7.4 HANDLING AND STORAGE OF PRE-CAST STRUCTURES

The method and sequence of lifting, handling, transporting and storing pre-cast RCC elements shall be such that the elements are not damaged. Unless otherwise specified the lifting and handling points of each size of element shall be proposed by the Contractor with supporting calculations for approval of the Engineer-Monitor which verifies that the structure will not be damaged during lifting, handling, transporting and storage.

During transport and storage, elements shall be stored on adequate supports located under the lifting points of the elements. The storage of elements shall be carried out in such a manner that older elements can be withdrawn for using without disturbing newer elements. All elements within a stack shall be in groups of the same length.

VII.7.5 ARRANGING OF FLOOR SLABS

Panels and others shall not be placed until the concrete has achieved the specified 28 days strength.

Before any placing work is commenced, the Contractor shall submit to the Engineer-Monitor full details of the elements, placing equipment and the method he intends to use in carrying out the work. Elements shall be placed with a specified crane.

The placing equipment shall be of a type which assures the energy needed to place on required position without damaging the elements.

The Contractor shall inform the Engineer without delay if an unexpected change in placing characteristic is noted.

The Contractor shall give adequate notice and provide all facilities to enable the Engineer-Monitor to check placing mechanism. A set shall be taken only in presence of the Engineer-Monitor unless otherwise approved.

VII.7.6 DEFECTIVE PRE-CAST STRUCTURES

The procedure incident to the placing of elements shall not subject to excessive and undue abuse producing crushing and spalling of the concrete or deformation of the steel.

Any pre-cast structure damaged due to the reason of internal defects, or by improper placing of its proper location, shall be corrected at the Contractor's expense.

VII.7.7 MEASUREMENT AND PAYMENT

The payment for pre-cast structures shall be as mentioned in Bill of Quantities. The unit rate quoted in the Bill of Quantities shall include all costs, expenses and compensation for all equipment, labour, materials, transportation producing of structure, reinforcement, and cost of form.

No payment shall be made for unauthorised, defective, unsound or unsatisfactorily prepared and placed RCC structures or for any costs incurred by the contractor for such structures.

VII.8 MASONRY WORKS

VII.8.1 SCOPE OF WORK

The work to be performed under the provision of this article includes furnishing and installation of all brick masonry works as shown and noted on the drawings (blockwork should be performed by brick M75 with solution M100, blockwork category – II / 120кПа ≤ R_p < 180кПа) and as specified herein.

VII.8.2 SAMPLES

Contractor shall furnish at least 3 full-size samples of brick proposed for use to the Engineer-Monitor for approval.

VII.8.3 MATERIAL

- i. Brick shall conform with GOST or equivalent international code.
- ii. First class bricks (M-75, 250x120x65mm) shall be made from required quality of brick firing clay, free from saline deposits, and shall be thoroughly oven-baked without being vitrified, of uniform colour, regular uniform in size, and texture with sharp square edges and parallel faces and shall comply with requirements as per specifications.

Bricks shall be homogeneous in texture and shall emit a clear metallic ringing sound when struck one against the other. They shall be free from flaws, cracks, chips, stones, modules of lime and other blemishes. A first class brick shall not absorb more than 1/6th of its weight of water after being soaked for 24 hours.

- iii. Bricks not meeting the above requirements shall not be used under any circumstances.
- iv. If machine made pressed bricks are proposed for use, they shall be of the size shown on the drawings and specified herein and they shall be a standard commercial product of approved manufacturer. Contractor shall submit sample and technical literature to the Engineer for approval. Bricks require approval before they may be used in the work.

VII.8.4 MORTAR

- i. Cement mortar shall consist of a mixture by weight or volume of cement to by weight or volume of fine aggregate. Mixed in proportion as specified in schedule of work or as shown in drawing. The method of mixing mortar, either by weight or volume, requires approval of the Engineer-Monitor.
- ii. The cement and sand shall be mixed dry in the specified proportions until the colour of the mixture is uniform. Approved water shall then be added sparingly, only the minimum necessary being used to produce a workable mixture of normal consistency, The water/cement ratio shall not exceed 0.50 by weight unless directed otherwise by the Engineer-Monitor.
- iii. All mortar shall be machine mixed or hand mixed on approval by the Engineer-Monitor.
- iv. Mortar shall be mixed in such quantities as can be used in the work within 30 minutes after mixing with water. Mortar, which has matured initial set shall not be used nor shall it be mixed with fresh mortar, and such mortar shall be discarded.

VII.8.5 INSTALLATION AND WORKMANSHIP

- i. Brick masonry work shall be built to dimensions indicated on the drawings. Plumb, curved or battered, as required, shall be supervised by skilled masons and workmen properly. Brick shall be thoroughly washed and soaked in water for at least 4 hours before use.
- ii. All vertical or horizontal joint shall be totally filled with mortar. Horizontal joint shall be parallel, level & straight and vertical joints in alternate courses shall be directly over one order. Joint thickness shall not be less than 0,6 cm & not more than 1.0 cm. The height of four bricks with four bed shall not exceed 30 cm.
- iii. Joint of exposed brickwork shall be raked & concave pointed or as shown in drawings or specified elsewhere. The surface of the exposed brick work shall always be kept clean & free from mortar stains. A wooden template shall be used for uniformity of the joint thickness.
- iv. Where new work joins previous work, the latter shall be well cleaned and thoroughly watered. All bricks for face work shall be specially selected considering size, shape and edges. Brick for 25cm walls, shall be laid in stretcher bond, or as shown in drawing or directed by Engineer-Monitor with frogs (manufacture's trademark) mark upward, Brick for 12 cm walls shall be laid in common bond.
- v. The cavity shall be kept clean of mortar spills or any other materials.
- vi. Height of brick work for a day's work shall be installed as the masonry work progresses. Locations shall be as indicated on the drawings.
- vii. All embedded metal items shall be installed as the masonry work progresses. Locations shall be as indicated on the drawings,
- viii. All brick works shall be thoroughly cured for at best 7 days or as directed by the Engineer-Monitor.

VII.8.6 CORBELLING, COPING, CORNICES, STRING, COURSE, ETC.

- i. All corbelling, brick copings, cornices, string courses, window sills, drip courses and brick footings or foundations shall consist to first class brick work laid in cement mortar as specified above.
- ii. All work be performed in accordance with the drawings and specification.

VII.8.7 METHOD OF MEASUREMENT

Measurement shall be made in cubic metre.

VII.8.8 BRICK FLAT SOLING**VII.8.8.1 Scope of Work**

The work covered by this item shall consist of supplying and laying bricks on top of the earth or sand bed to form a sub-base.

VII.8.8.2 Description of Works

Bricks shall comply with GOST. The blinding sand will have F.M =1.20 and shall be clean, free from organic matters. Brick shall be laid flat in surface to surface contact with adjoining bricks and their joints shall be filled with sand. The sand shall be brushed in until the joints are filled. Flushing of sand with water will not be done until permitted.

VII.8.8.3 Methods of Measurement

Brick soling shall be measured by the square feet in place. The amount of completed and accepted work, measured as described above, will be paid for at the contract unit price per square metre, which is inclusive of all material, transportation, placing, labour, equipment, tools and others necessary to complete the work.

VII.9 METAL WORKS

VII.9.1 SCOPE OF WORK

The work to be performed under this article shall include the supply of all materials, tools, equipment & labour; transporting, storing, fabricating, assembling, manufacturing, installing and painting of all miscellaneous metal works such as steel door, metal staging, gate, beams, fencing, etc made of steel sections, sheets, plates, rod etc according to the drawings, and GOST 8509-86, 8240-89 and 103-76.

The parts or accessories which shall be manufactured in the factory and remain unpainted, shall be protected from corrosion & damages during the period of transportation and installation.

VII.9.2 MATERIALS AND SHOP DRAWINGS

All the materials supplied by the Contractor for permanent works shall conform to the GOST or equivalent and be approved by the Engineer-Monitor.

The Contractor shall submit shop drawings for the Engineer-Monitor's approval. Drawings shall include all shop and erection details including cuts, copes, connections, holes, bolts & welds in structural steel. Along with the shop drawings, the Contractor shall furnish for information two copies of a detailed erection procedure including sequence of erection and temporary staying and bracing.

VII.9.3 FABRICATION, ERECTION AND INSTALLATION

Shearing, flame cutting and chipping shall be done carefully and accurately as per drawings and specifications. Holes shall be cut, drilled or punched at right angles to the surface of the metal and shall not be made or enlarged by burning. Welding shall conform to approved standard.

Splices and field connections shall be made as indicated. Field welding will be permitted only where indicated or approved on the shop drawings. Erecting equipment shall be suitable and safe for the workmen. Error in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer-Monitor and approval of the method of correction shall be obtained. Corrections shall be made at no additional cost.

The Contractor shall give the Engineer-Monitor at least 48 hours notice of the time when he expects to start erection of steel work. The Contractor shall check all hoisting, fittings & anchorage facilities, sealing etc. for gates and steel works to ensure that they are at the correct level, truly flat and ready to receive the work. It shall be the Contractor's responsibility to see that gates and steel works are accurately and correctly fixed. Hoisting devices, fitting facilities, anchor bolts and anchors shall be properly located and placed into connecting works conforming to specification and Drawings.

Electrode type E-42A shall be used for arc welding of joints. The quality of joints shall be tested by physical observation and physical tests. The tensile stress of welding joint shall not be less than the tensile stress of main metal.

Metal shall be insulated at plants. Components surfaces, which shall be in contact with concrete shall be cleaned for cinder, rust, and dust.

Hot vulcanization is used for sealing plastic joints.

Plastic sealing at the gates (detail of gates) shall be painted by the content: chalk-water-glue. This mixture is used for protection from sunlight rays.

The position of accessories shall remain fixed during pouring of concrete. The deviation of accessories from its position shall not exceed $\pm 4\text{mm}$.

Assembling of gates, beams and other metallic items placed or carried by cranes shall be of appropriate capacity.

VII.9.4 MEASUREMENT AND PAYMENT

Payment as per schedule for gates, metallic staging, hoists and other metal works furnished by the Contractor will be made of the actual tonnes supplied, furnished and installed in permanent work only in accordance with the Drawings and Specifications and as directed by the Engineer-Monitor. The weight of other metal works will be calculated weight or manufacturer's weight. Net weight only shall be paid for and the weight of all tare, packing and blocking will not be included. No deduction shall be made for bolt and rivet holes in structural steel and the weight of bolts and rivets shall not be added. Off cuts and waste materials shall not be measured.

The unit rate shall cover the cost of supplying raw materials, manufacturing, hauling, transportation, handling, erection & installation including fabrication and furnishing all labour, tools and other necessary fittings and shall include for all metallic items for providing and installing.

Structure of the roof

The roof covering structure of the training building performed by metal pitched truss $\Phi 1-\Phi 6$ manufactured with corner 50x5mm, which are will be installed on channel-shaped girder and curb plate #12. The frames, diagonal rod and joining with channel-shaped #12 (Album-2, sheets КЖ-31 - КЖ-39).

The bottom of the pitched truss bedded on curb plate will be welded to the metal lists. The curb plate will be fastened to the banding girth by reinforce dowel Φ -14mm, class A-III with distance 500mm.

All the frames will be bedded on embedded parts, which were installed in reinforced concrete frames/ledges.

All the roof metal structures will be prepared in the construction site, fastening of the elements will be done by electric-arc welding. The length of the welding seam should be not less than 100mm and thickness of the electric-arc welding should be done depending on thickness of elements.

The structure of the Gym roof covering performed by metal pitched truss $\Phi 1$; girders ПП-1, ПП-2; joining Св-1, Св-2 and spacers P-1 (Album-2, sheets КЖ-48 - КЖ-51).

The trusses prepared by double-type corners (50x5, 45x5 and 70x5)mm connected with platen t-8x60mm. The trusses will be bedded on embedded parts of banding girth (ledge) with bolts M20. The girders ПП-1, ПП-2 will be bedded on fastening elements M1,2,3 inserted to banding girth (ledge) and will be welded. The welding of the joining elements will be performed by electrodes Э-42, leg of fillet 6mm. Welding of the anchors to embedded parts will be performed in openings. After completion of installation works all the metal elements should be covered by oil paint.

Metal tile t-0,8mm will be laid on square profile girders 50x40mm, t-1,2mm and with distance 250mm. The sheets will be fastened to the profiles with self-tapping screw.

VII.9.5 METALLIC PIPES

VII.9.5.1 Scope of work

The work to be performed under this article shall include the supply of all materials, tools, equipment & labour; transporting, storing, fabricating, assembling, manufacturing, installing & painting; protection of complete work until accepted by the Engineer, and all works of general nature incidental to the items which are required for proper execution and completion.

Metal pipes shall be manufactured at plants. The transportation of materials shall be by trucks.

The parts or accessories which shall be manufactured in the plants and remain unpainted, shall be protected from corrosion & damages during the period of transportation and installation.

Metal works for steel pipeline, water supply, sewerage, electrical, heating and other structures shall be constructed and assembled according to GOST 10704- 77 * and 3262-75 * or equivalent international standard.

Each unit of metal work shall be with weight & sizes those are appropriate for erecting and placing by the equipment and also according to the capacity of transportation.

Transportation of assembled details to the construction site shall be synchronously carried out depending on intensity of works. The required number of assembled details and fixtures shall be supplied to the construction site.

Metal pipes which shall be used in siphons are of 15 to 300 mm dia.

VII.9.5.2 Preparatory Works

Before starting construction works, the engineering survey shall be carried out on alignments and prepare base for structure. The elevations along the alignment shall be marked establishing benchmarks.

Access road shall be at the structural site for conducting of construction works.

Trenches shall be excavated for laying pipelines according to designed longitudinal profile and designed dimension.

VII.9.5.3 Storage

Metal & rolled elements shall have a certificate from the manufacturer describing the type/ class of steel, engineering properties and supply standards.

Steel works shall be kept in closed premises. While keeping large size pipes in the open area, these have to be kept in inclined position so that water does not store in the pipes.

Welding materials (electrodes, flux) shall be kept separately according to types and lots, in a warm and dry place. Flux shall be kept in a closed container. Electrodes & fluxes shall be dried and warmed in compliance with the technical specification set by the manufacturer if stored for longer period than specified in the technical specification of the manufacturer.

VII.9.5.4 Fabrication and Installation

Marking and Cutting

Marking of details for initial assembly shall be undertaken using tape measure/ roulette of class II standard (precision measurement) according to GOST 7502-89 & metal measuring rulers according to GOST 427-75* or equivalent international standard. Allowance shall be considered for mechanical processing and shrinkage in the course of welding during marking.

Detail edges of carbonaceous steel shall be cleaned out and the roughness shall not exceed 1 mm after manual oxygen cutting. Preparation of edge for welding purpose shall be according to GOST 5264-80* or equivalent international standard.

Deviation of pipeline during cutting for assembling shall not exceed the following:

Pipeline 4-9 m	:	4 mm
Pipeline 9-15 m	:	4.5 mm.

Assembly

During assembling of pipes, the edge of the pipe shall be cleaned from wire-edges, dust, oil, rust, scale, and moisture.

The edge of the pipe shall not be changed during assembly. The pipe joint shall be welded in presence of technical supervisor. The technical supervisor shall certify the welding of joint.

During assembling of bigger accessories, initial welding shall be done for fixing properly at locations where permanent welding shall be carried out.

The edge form and clearance sizes shall be as stated in GOST 5264-80* or equivalent international standard.

The tensile stress of welding joint shall not be less than the tensile stress of main metal.

Before assembling, the pipe shall be straighten or to cut off in the deformed ends, cleaned up to pure metal not less of 10mm width the edges & adjoining its inner & outer surfaces. It is necessary to clean up pipe's butt end while joints are welded.

While assembling pipes with the same thickness, the gap between the edges is allowed up to 20 % of thickness of the pipe but not more than 3mm.

At the work intervals of more than 24 hours, the ends of pipe's welding parts shall be covered to keep in clean condition.

Welding works without roof cover are not allowed if wind is above 10 m/s, also for precipitation.

Every welding joint shall have the trade mark seal of the working group.

Welding joint details of pipeline (pipe bends, T-joints, crossings, etc.) in field are not allowed.

For strengthening, the joint shall be smooth and deviation of surface smoothness shall not exceed 1-3 mm.

Quality control of welding joints shall be conducted visually and on results of mechanical tests.

During physical supervision of pipeline joints, carried out by method of arc welding, the following joints will be considered good:

Lack of spot holes at the welding area.

Other substances formed during welding are mixed with welded material which cannot be removed shall not exceed 10% of pipe thickness. The total length of the other substances at a joint shall not be more than 1/6th of the joint perimeter.

The size of spot hole shall not exceed 20% of thickness but not greater than 2.7 mm. The distance between spot holes shall be not less than 3 times the thickness of pipe.

Pipes of diameter 1000 mm or more shall be welded from both inside and outside. No gaps shall be allowed in such pipes.

VII.9.5.5 Measurement and Payment

Measurement for payment of metal pipe shall be in linear meter. Length of pipe shall be considered as supplied, furnished and installed in permanent work only in accordance with the Drawings and Specifications and as directed by the Engineer-Monitor.

Measurement and payment for assembly of pipeline shall be in tons. The weight of metal works will be calculated weight or manufacturer's weight. Net weight only shall be paid for and the weight of all tare, packing and blocking will not be included. No deduction shall be made for bolt and rivet holes in structural steel and the weight of bolts and rivets shall not be added. Off cuts and waste materials shall not be measured.

The unit rate shall cover for the cost of supplying raw materials, manufacturing, hauling, transportation, handling, erection and installation including fabrication and furnishing all labour, tools and other necessary fittings.

VII.9.6 METAL PROTECTION

VII.9.6.1 Work Description

The works to be performed under the provisions of this article consist of furnishing, surface preparation, painting, touch-up painting and protection after painting of all exposed metal surface as shown on the Drawings or as directed by the Engineer-Monitor. Metal paint protection work shall be conducted at the manufacturing plant. Only the parts of joints which will remain unpainted, shall be painted after assembling of joints.

VII.9.6.2 Cleaning

Cleaning of pipeline surfaces from rust, soil, soot and other dust are conducted for protection purposes.

Painting of pipe surfaces is not allowed in adverse weather conditions like wind, rain, snow fall, precipitation, etc.

Surfaces that have been previously painted shall be cleaned of all dirt, grease, loose paint or other foreign material, before applying the next coat.

If any of the previously paint becomes loose, loses bond with the preceding coat, the surface shall be removed and repainted at Contractor's expense as directed by the Engineer-Monitor.

Application

The Contractor shall notify the Engineer-Monitor in writing one week in advance of beginning cleaning and painting operations. Paint shall be applied only on thoroughly dry surfaces and during favourable weather. If the paint becomes damaged by the elements, it shall be replaced by the Contractor at his expense as directed by the Engineer-Monitor.

Methods of applying the paint shall be submitted to the Engineer-Monitor for approval and all work shall be done accordingly.

VII.9.6.3 Materials

The types of bitumen mastics to be used for metal protection should meet the requirements of SNIP III-20-74 and SN 301-65, Construction Standards and Rules, former USSR or equivalent international standard.

Painting and wrapping by roll materials at the pipe shall be done simultaneously preferably with machine/ device. During wrapping of roll materials the lap length shall be minimum 3 cm. For two layer wrapping the lapping of initial layer shall be at the middle of the placed top layer.

Joint of gates, T-joints, pipe-bends, crossings, etc in sub-surface part and in exposed part minimum 15 cm surface shall be painted by bitumen mastic or polymer. Aluminum or other varnish paint shall be done at the exposed pipe portion.

Paint and varnish shall be laid on sub-surface part of the pipeline under the temperature of +5°C. Paint shall be laid in 2 layers and 2 times.

VII.9.6.4 Painting

During the assembly of metal works, the Contractor shall observe the following with regards to painting:

1. Contact surfaces that will be completely sealed by welded construction shall not be painted.
2. Surfaces that will be in continuous contact with concrete after completion of erection, shall not be painted.
3. Contact surfaces of sub-assembly and other members which are put together at site and will be in permanent contact with each other or concealed after erection (other than those mentioned above) shall each be cleaned and painted before assembly and then assembled while the paint is still wet.
4. Contact surfaces of joints made with friction grip bolts shall be left unpainted.

VII.9.6.5 Measurement and Payment

All costs of furnishing and applying primers, under coat, finish coats, labour, materials, tools equipment, surface preparation & touch-up and for doing all work specified or as directed by the Engineer-Monitor shall be measured and paid for per m² (square meter) of surface area of material actually painted.

VII.9.7 PLASTIC PIPES

VII.9.7.1 General

The works to be performed under this article shall include the supply of all materials, tools, equipment & labour; transporting, storing, fabricating, assembling, manufacturing, installing and protection of complete work until accepted by the Engineer-Monitor, and all works of general nature incidental to the item which are required for proper execution and completion.

VII.9.7.2 Requirements

Plastic pipelines works on sewerage and other structures shall be constructed and assembled according to drawings and specifications, and GOST- 1839-80* or equivalent international standard.

VII.9.7.3 Measurement and Payment

Measurement for payment of plastic pipe shall be in linear meter. Length of pipe shall be considered as supplied, furnished and installed in permanent work only in accordance with the Drawings and Specifications and as directed by the Engineer-Monitor.

Measurement and payment for assembly of pipeline shall be in tons. The weight of works will be calculated weight or manufacturer's weight. Net weight only shall be paid for and the weight of all tare, packing and blocking will not be included.

The unit rate shall cover for the cost of supplying raw materials, manufacturing, hauling, transportation, handling, erection and installation including fabrication and furnishing all labour, tools and other necessary fittings.

VII.9.8 PVC PIPE

VII.9.8.1 General

The work to be performed under this article shall include the supply of all materials, tools, equipment & labour; transporting, storing, fabricating, assembling, manufacturing, installing and protection of complete work until accepted by the Engineer-Monitor, and all works of general nature incidental to the item which are required for proper execution and completion.

VII.9.8.2 Requirements

PVC pipelines works on under ground water pipe lines and other structures shall be constructed and assembled according to drawings and specifications, and according to GOST 18599-83* or equivalent international standard. The PVC pipelines shall be tested by hydraulic test according to the SNIP requirements.

VII.9.8.3 Measurement and Payment

Measurement for payment of PVC pipes shall be in linear meter.

VII.10 INSTALLATION OF DOORS AND WINDOWS

VII.10.1 SCOPE OF WORKS

The works to be performed under provisions of this article include manufacturing and supplying of wooden door blocks, metal plastic windows frames, vitrages and others as finished items as shown on the drawings or as instructed by the Engineer-Monitor.

VII.10.2 GENERAL REQUIREMENTS

- i. Metal plastic works shall be according to Drawings
- ii. Shop drawings and must be approved by the Engineer-Monitor prior to starting manufacturing of samples,
- iii. The Contractor shall submit samples of materials, fixtures or fittings as required along with particulars, certificates or Catalogues for Engineer-Monitor's approval.

VII.10.3 INSTALLATION

Windows and vitrages: should correspond to SNIP and design documentation requirements. The window frames with metal plastic material of profile WINHOUSE-80 (Plastic FIRATWINKHAUS, t-80mm with 6 white cells) shall be used in the objects. The windowsills also will be metal plastic with width 300mm. The type and sizes of the windows frames are specified in drawings.

Doors:

Two types of the doors shall be applied:

- Internal doors in office rooms, hospital rooms, boxes, treatment rooms : the doors shall be two-leafed, the material is fine dispersed fraction wood covered by lignin and paraffine (МДФ);
- Entrance doors, also doors in stair landing shall be two-leafed blocks vitrages, the material is metal plastic.

МДФ is fine dispersed fraction wood. This slabs produced by dried wood filament with further hot pressing. The blocks should correspond to the design requirements described in the drawings. They should be rectangular and correspond to the form. Assembling should be made by seam connection on glue using dowels and bolts, which are thoroughly fixed. No nails should be used in joinings. The blocks (including embedded parts to the walls, floors or beams) should be saved from insect and moisture by one ply of priming and two-ply oil painting before the installation.

The metal anchors for the fastening of blocks should be embedded to laying during the stone masonry of block outward passby. The frames should be connected with the anchors. The МДФ slab surface is smooth, therefore the slab easily will be painted, covered by lacquer. The door leaf thickness should be 40mm. The doors and platbands should be painted by ground colour, two-ply oil painting and then covered by lacquer. The doors should be installed with 3 hinges (one in top part, one in bottom and one in middle part). The hinges should be fastened by screws, not nails. The doors hinges should be strong. The doors opening system direction should correspond to the placement described in the drawings.

The metal plastic entrance blocks and vitrages should be produced according to the dimensions described in the drawings. Installation of the door blocks and vitrages, starting-up and adjustment and delivering should be provided by the manufacturer companies.

The metal plastic entrance blocks and vitrages should be produced according to the specifications described in the drawings.

The plastic door, window frames and others will be installed by the manufacturer only.

#	Description of materials	Type, mark	Unit	Quantity (pcs.)				
				Underg round	1 st floor	2 nd floor	3 rd floor	Total
	Windows							
1	Windows block, 1890x1580	OK-1	Pcs.		18	20	20	58
2	Windows block, 1890x1510	OK-2	Pcs.		2	2	2	6
3	Windows block, 900x1510	OK-3	Pcs.		2	2	2	6
4	Windows block, 2450x1510	OK-4	Pcs.		2	2	2	6
5	Windows block, 600x1580	OK-5	Pcs.	18	2	2	2	24
6	Windows block, 600x1510	OK-6	Pcs.	2				2
7	Windows block, 900x3600	OK-7	Pcs.					3
8	Windows block, 1890x1800	OK-8	Pcs.					1

	Doors							
9	Door block, 2600x1500	ДО-1	Pcs.		2	1	1	4
10	Door block, 2600x900	ДО-2	Pcs.		2			2
11	Door block, 2600x1200	ДО-3	Pcs.	2	2			4
12	Door block, 2100x900	ДГ-4	Pcs.		2	2	2	6
13	Door block, 2100x900	ДО-5	Pcs.	2	4	6	6	18
14	Door block, 2100x900	ДГ-6	Pcs.	9	2	2	2	15
15	Door block, 2600x1400	ДО-7	Pcs.	4	5	5	5	19
16	Door block, 2600x1500	ДО-8	Pcs.	2	2	2	2	8
17	Door block, 2100x700	ДГ-9	Pcs.	6	10	10	10	36

VII.10.4 MEASUREMENT AND PAYMENT

Metal plastic door, window frames and others shall be measured as mentioned in Bill of Quantities. The total cost shall include all costs for materials, labour, manufacturing, transportation, fitting, installation, etc.

The pre-pressurized, portable one-component foam system, applied in a bead form, expands and cures slowly to a semi-rigid, closed cell foam upon reaction with moisture, such as ambient humidity. Optimal application temperature is between 18°C and 38°C and may be used between 4°C~46°C. Cured foam is resistant to heat and cold, -40°C to +110°C. Cured foam is also chemically inert and non-reactive in approved applications.

Preparation for use

- Substrate should be clean, firm, free of loose particles and free of dust, grease and mold release agents. Protect surfaces not to be foamed.
- Shake cans before using.
- For best results in cavities larger than 3 inches in diameter, dampen substrate to supplement atmospheric humidity in affecting consistent cure throughout applied foam.

Application/Use

After following instructions for set-up, cans are ready to use. The foam sealant flow can be metered by means of tilting the one piece straw adapter with the valve pointing downwards. By activating the adapter lever carefully, the extrusion rate can be regulated. Foam application can be interrupted when needed, as outlined in the instructions.

VII.11 PLASTERING, PAINTING, FLOORING AND DECORATION WORKS

VII.11.1 PLASTERING

i. Scope of Work

The works to be performed under this article include cement plaster on brick or concrete surfaces for protection and appearance according to SNIP or as directed by the Engineer-Monitor.

ii. Description of Work

- a. Plastering shall be performed in a neat, true and workmanlike manner. Corners shall not be rounded or beveled, unless instructed by the Engineer-Monitor. All intersections, edges and corners shall have sharp edges, unless otherwise instructed, and shall be at right angles. Lines shall be straight and true.
- b. Unless specified otherwise, cement plaster shall be used in the following proportion. On brick walls one part of Portland cement to six parts of sand and on concrete surfaces one part of Portland cement to four parts of sand by weight or by volume. Before proceeding to work, both method requires approval of Engineer-Monitor.
- c. Before starting plaster work, brick joints shall be raked out to a depth of 0.6 cm and concrete surfaces shall be roughened. Both brick and concrete surfaces shall be cleaned to remove loose materials and shall be thoroughly dampened with water.
- d. Thickness of cement plaster for brick surfaces will be min 1.25 cm and that for R.C.C surface will be min 0.6 cm. The F.M of sand will be 1.50 unless otherwise specified. Mortar shall be mixed in such quantities as can be used in work within 30 minutes after mixing with water. Water cement ratio for mortar's mix shall not be more than 0.45.
- e. All plaster shall be kept moist throughout the progress of the work and for at least 10 days thereafter. If cracks or blemishes appear due to negligence other reasons, the defects shall be rectified by the Contractor at his own expense.

iii. Pointing

- a. Unless otherwise specified, the proportion of cement mortar shall be one part of Portland cement to three parts of sand of fineness modulus 1.5 & lime in powder form passing through 100 mesh in proportion 2% by weight.
- b. All joints to be pointed shall be scrubbed, roughened, cleaned and dampened with water. Mortar of specified proportion shall be applied at the joints and finished in ruled or concave pointing or as indicated or instructed by the Engineer.
- c. The surface and edge of exposed bricks in brick work shall be kept clear of mortar stains.
- d. The pointed surface shall be kept moist during the progress of the work for at least ten days thereafter.

VII.11.2 PAINTING

i. Materials

Scope of work

The item covers application of approved paints over surfaces (masonry, wood and steel).

General requirements

- a. Before purchasing materials, the Contractor shall submit to the Engineer-Monitor manufacture's catalogue, date or specification sheets, a list showing the brand and type of paints proposed for the Work. No material shall be used without approval of the Engineer-Monitor.
- b. All painting materials shall be of the best quality and be delivered to the site in unopened original containers bearing manufacturer's labels.

ii. Storage of Materials

- a. Materials and tools shall be stored in a single place at the site as designated by the Engineer.
- b. Storage area shall be maintained in a neat and clean condition with surroundings protected from damage.
- c. Inflammable materials shall be stored in sealed containers, waste shall be removed from the premises at the end of each day, every precaution shall be taken to prevent fire.
- d. Storage area shall be accessible to the Engineer-Monitor at all times.

iii. Colours and Samples

- a. Colour scheme shall be as shown in the Finish Schedule or instructed by the Engineer-Monitor.
- b. For all natural or painted wood finishes, samples shall be prepared as directed on pieces of the same kind of wood at least 15 cm until the finish is approved.
- c. For painted finish on masonry or concrete surfaces, samples shall be prepared as directed on the surface to be painted until the finish is approved.

iv. Protection

- a. Drop cloths or other approved protection materials shall be furnished as laid in all areas where painting and finishing is being done so as to adequately protect floor and other places of work from all damages during the execution of the painting work.

v. Surface Preparation

- a. Plastered concrete and masonry surface.
All surfaces to be painted shall be thoroughly cleaned of all grit, grease, dirt, loose materials, mortar drippings, etc. It is intended improved plastering with alabaster covering and further emulsion painting of the internal walls and improved plastering, surfacing with waterproof putty and painting masonry paint of the façade.
- b. Wood
 - 1. To be sanded smooth and made free of marks before applying the first coat.
 - 2. Grease and oil films to be removed with a solvent, using a fine steel wood pad or a coarse cloth.
 - 3. All damage to shop coat caused by erection, repairing and cleaning shall be spot primed with the same materials used for the shop coat.
- c. Galvanized Metal

Galvanized metal shall be clean and dry; grease and oil films shall be removed with a solvent, using a fine steel wood pad or a coarse cloth. Instructions of manufacturer for primer are to be followed.

vi. Application

- a. No work shall be done under conditions which are unsuitable for the production of good results. All spaces shall clean before painting or finishing is started.
- b. The workmanship shall be the best. All paint shall be applied with brushes under adequate illumination, evenly spread, smoothly flowed on without runs or sags. Paint shall be placed into all corners and crevices.
- c. Materials shall be applied strictly in accordance with the manufacturer's directions and in particular, no prepared paint shall be thinned in any way except as directed by manufacturer. All paint shall be thoroughly mixed before being used.
- d. No exterior painting shall be done during raining or snow falling or damp weather until the surface is thoroughly dry. No interior painting will be done on damp surfaces.
- e. After being fitted by the Carpenter, all edges of doors shall be finished same as the faces.
- f. Suction spots in plaster, masonry or concrete showing after application of first coat, shall be repainted before application of next coat.
- g. All exposed piping (except P.V.C) if specified, shall be painted to match with the adjoining wall surface where such wall surface is either glazed tile or painted.
- h. Painting around finish hardware of other removable items already in place will not be allowed.
- i. Any damage to adjacent work caused by paint or painting operations shall be rectified by the Contractor at his own expense.

vii. Completion

- a. At completion of painting work, the Contractor shall remove any paint spots and stains from floors, walls and glasses caused by work caused during work.
- b. The Engineer-Monitor will conduct a final inspection of all work. The Contractor shall repaint or retouch as directed by the Engineer any surface which do not comply with the requirements of these specifications or which have been damaged during construction work. All surfaces finished under this article shall be left in perfect condition, free of defects and blemishes.
- c. All rubbish and accumulated painting materials shall be removed from the premises.

VII.11.3 DAMP PROOF COURSE

The work to be performed under this article shall consist of installation of damp proof course on top of foundation wall or any where as shown in drawing. Installation of damp proof course will be carried out in accordance with the following GOST and SNIP or equivalent international codes.

- a. Basement work as per GOST 277751-88;
- b. Under laying work as per SNIP 2.03.13-88 ;
- c. Bottom of floor cover as per SNIP 2.03.13-88 (chapter 7);
- d. Damp proofing work as per SNIP 2.03.13-88 "floor" and GOST 4.203-79 "Roll of damp proof materials", GOST 7415-85 "Damp proof", GOST 10296-79 "Damp";
- e. Layer under floor as per SNIP 2.03.13-88 "floor" GOST 4.21-80 "concrete", GOST 4.214-80 "cement"; and
- f. Flooring as per Appendix 1 of SNIP 2.3.13-88 "floor".

VII.11.4 ARTIFICIAL PATENT CONCRETE FLOORING

Scope of work

This item consists of construction of finished layer of cement concrete work over concrete floors or any where in panels for levelling & monir finishing of the top surface of the floor.

Requirements

- i. Materials shall be as specified in drawings or GOST and SNIP or equivalent to international code with the following requirements:
 - a. Cement : Portland cement conforming to ASTM Specification C 150, Type -1
 - b. Sand : Clean, twice washed sand with minimum fineness modulus (FM) not less than 1.50
 - c. Coarse Aggregate: Clean Stone/Aggregate specified in the Schedule of Item of Works.
- ii. Before proceeding with the work, a sample panel of artificial patent stone flooring shall be prepared as specified for approval of the Engineer-Monitor.
- iii. Sub-floors over which the artificial stone flooring will be laid, shall be thoroughly picked and washed clean and free of dirt and other foreign matter.
- iv. Following the preparatory work, the slabs shall be thoroughly wetted with clean water by ponding at least overnight prior to the application of the floorings. All excess water shall be removed ahead of the application of the bonding slurry so that the concrete surface is uniformly damp but not glistening wet
- v. A creamy bonding slurry of neat cement shall be supplied and well scrubbed into the surface with stiff bristle brushes, only as much bonding slurry shall be mixed and applied as will be covered by the succeeding coat before the slurry dries out.
- vi. The method of measuring materials shall be such that the specified proportion of the materials can be controlled and accurately maintained.
- vii. The top shall be mist cured for at least 7 days. The flooring shall not be subjected to moderate use before 14 days and to severe use before 28 days.

Installation

Patent stone floor finish shall be made at places and location as shown in drawing or in finish Schedule.

VII.11.5 FLOORING

- i. Flooring shall be made in compliance with approved materials such as: seranit tiles and parquet floor.
- ii. Samples of materials shall be approved by Engineer-Monitor before execution of works.
- iii. Arranging of floors shall be performed as Series 2.24-1 pr.4 "Public building floor details"
- iv. Construction of floors on covering should be performed on concrete panels of covering with plane and non-plane surface. Non-plane surface of the covering panels should be polished by cement-sand mortar or concrete covering with t-20mm.
- v. The airspace under floors should connection with the premises internal air, vent duct and chimney hole. The premises with more than 25m² area should be divided for self-contained with size /4-5/x/5-6/m by the plank partitions.
- vi. The materials to be applied for construction of floors should correspond to the SNIP, GOST and MRTU requirements.

- vii. The works for construction of floors should be performed according to the SNIP section III-b.14-72.

VII.11.6 DECORATION WORKS

External and Internal decoration works shall be performed as specified in the drawings and Bills of quantities or directed by the Engineer-Monitor.

VII.11.7 MESUREMENT AND PAYMENT

The measurement and payment shall be made on the basis of actual area covered or as specified in Bills of Quantities.

Wooden Flooring:

- a. Supporting Joists. The vertical supports, beams and joists shall be of the class of wood specified in the description of item and shall be fixed in position dead level. The sections, arrangement and spacing shall be as specified in detailed drawings. The width of joists shall be 100 mm. All the members shall be treated with wood preservative.
- b. Boards. Selected boards of uniform (150x25x200mm) of class of wood specified in the description of item shall be used.

VII.11.8 BILL OF PREMISES FINISHING, SPECIFICATION OF FLOORS

#	Title	Floors			Walls and Partitions	Ceiling
		Area, m2	# of detail, series 2.244- 1 вып.4	Covering		
	Basement floor					
1	Staircase	15,44	detail 250	Ceranit	Improved plastering, alabaster covering, water emulsion paint	Rubbing (blind smoothing), gypsum covering, water emulsion paint
2	Corridor	57,37				
7	Utility room	15,34				
8	Inventory room	11,54				
12	Hall	25,64				
13	Utility room	31,36				
16	Warehouse	15,37				
17	Warehouse	15,34				
20	Boiler room	20,63				
21	Staircase	14,98				
3	Morgue	14,56				
4	Bathroom unit	9,38				
5	Shower cabin	4,33				
6	Laundry	32,14				
11	Warehouse	22,04				
15	Kitchen	32,14				
18	Bathroom unit	9,38				
19	Shower cabin	4,27				
9	Staff room	22,33	detail 41	Parquet	Improved plastering, gypsum covering, water emulsion paint	
10	Control box	10,66				
14	Service room	32,2				
	First floor					
1	Tambour	7,01			Improved plastering, gypsum covering, water emulsion paint	
2	Vestibule	32,74				
5	Utility room	71,95				
7	Staircase	15,44				
8	Landing	5,10				
11	Corridor	6,82				
15	Treatment room	12,92				
20	Dining-hall	32,32				
22	Corridor	6,82				

#	Title	Floors			Walls and Partitions	Ceiling	
		Area, m2	# of detail, series 2.244- 1 вып.4	Covering			
28	Staircase	15,44	detail 132	Ceranit		Rubbing (blind smoothing), gypsum covering, water emulsion paint	
29	Landing	5,10					
10	Bathroom unit	2,16					
12	Bathroom unit	1,33					
13	Bathroom unit	1,33					
14	Shower cabin	4,33					
16	Bathroom unit	2,16					
23	Bathroom unit	1,33					
24	Bathroom unit	1,33					
25	Shower cabin	4,33					
27	Bathroom unit	2,16					
3	Medicine staff on duty	10,30			detail 41		Parquet
4	Staff lounge	15,46					
6	Hospital room for 6 beds	32,32					
9	Box for 2 beds	12,19					
17	Hospital room for 6 beds	32,32					
18	Hospital room for 6 beds	31,58					
19	Staff room	15,46					
21	Hospital room for 6 beds	30,06					
26	Box for 2 beds	12,19					
	Second floor						
1	Terrace	16,66	detail 132	Ceranit		Rubbing (blind smoothing), gypsum covering, water emulsion paint	
2	Hall	30,91					
5	Corridor	71,95					
7	Staircase	15,12					
11	Corridor	6,82					
15	Treatment room	12,92					
22	Corridor	6,82					
28	Staircase	15,14					
10	Bathroom unit	2,16					
12	Bathroom unit	1,33					
13	Bathroom unit	1,33					
14	Shower cabin	4,33					
16	Bathroom unit	2,16					
23	Bathroom unit	1,33					
24	Bathroom unit	1,33					
25	Shower cabin	4,33					
27	Bathroom unit	2,16					
3	Medicine staff on duty	15,46	detail 41	Parquet			
4	Staff lounge	15,46					
6	Hospital room for 6 beds	32,32					
8	Hospital room for 3 beds	14,72					
9	Box for 2 beds	12,19					
17	Hospital room for 6 beds	32,32					
18	Hospital room for 6 beds	31,58					
19	Staff room	15,46					
20	Hospital room for 6 beds	32,32					
21	Hospital room for 6 beds	32,32					

#	Title	Floors			Walls and Partitions	Ceiling
		Area, m2	# of detail, series 2.244- 1 вып.4	Covering		
26	Box for 2 beds	12,19				
29	Hospital room for 3 beds	14,72				
	Third floor					
1	Terrace	16,68	detail 132	Ceranit	Improved plastering, gypsum covering, water emulsion paint	Rubbing (blind smoothing), gypsum covering, water emulsion paint
2	Hall	30,91				
5	Corridor	71,95				
7	Staircase	15,12				
11	Corridor	6,82				
15	Treatment room	12,92				
22	Corridor	6,82				
28	Staircase	15,44				
10	Bathroom unit	2,16			Improved plastering, glazed tile	
12	Bathroom unit	1,33				
13	Bathroom unit	1,33				
14	Shower cabin	4,33				
16	Bathroom unit	2,16				
23	Bathroom unit	1,33				
24	Bathroom unit	1,33				
25	Shower cabin	4,33				
27	Bathroom unit	2,16				
3	Physician room	10,30	detail 41	Parquet	Improved plastering, gypsum covering, water emulsion paint	
4	Staff room	15,46				
6	Hospital room for 6 beds	32,32				
8	Hospital room for 3 beds	14,72				
9	Box for 2 beds	12,19				
17	Hospital room for 6 beds	32,32				
18	Hospital room for 6 beds	31,58				
19	Staff room	15,46				
20	Hospital room for 6 beds	32,32				
21	Hospital room for 6 beds	30,06				
26	Box for 2 beds	12,19				
29	Hospital room for 3 beds	14,72				

Floors specifications

#	Title and technical parameters	Type, mark, document reference	Unit	Q-ty
1	2	3	4	5
	Floors			
	Series 2.244-1. В-4, detail-41 , h=310mm			
1	Reinforced concrete slab of ceiling		t-mm	220
2	Sound-proof band laying (wooden fiberboard insulating plate)	GOST 4598-86	t-mm	25
3	Cement-sand grout covering M150	M150	t-mm	40
4	Interlayer by quick-hardening mastic on waterproof binding		t-mm	5
5	Single-piece parquet	GOST 862. 1-76	t-mm	25
	Series 2.244-1. В-4, detail-132 , h=310mm			
1	Reinforced concrete slab of ceiling			220

2	Sound-proof band laying (wooden fiberboard insulating plate)	GOST 4598-86	t-mm	25
3	Cement-sand grout covering M150	M150	t-mm	40
4	Interlayer and filling of junctures by cement-sand grout M150	M150	t-mm	15
5	Ceramic tile «Ceranit»		t-mm	10-13
	Series 2.244-1. Б-4, detail-250 , h=160mm		t-mm	
1	Soil of the bottom with compressed macadam or gravel, size-40-60mm		t-mm	40-60
2	Concrete preparation	M100	t-mm	80
3	Cement-sand grout covering M150	M150	t-mm	20
4	Damp-proof course (wooden fiberboard insulating plate)	GOST 4598-86	t-mm	20
5	Cement-sand grout covering	M150	t-mm	20
6	Interlayer and filling of junctures by cement-sand grout	M150	t-mm	15
7	Ceramic tile «Ceranit»		t-mm	10-13
	Series 2.244-1. Б-4, detail-217 , h=310mm		t-mm	
1	Soil of the bottom with compressed macadam or gravel, size-40-60mm		t-mm	40-60
2	Concrete covering M150	M150	t-mm	50
3	Bitumen or tar damp-course			
4	Concrete preparation M100	M100	t-mm	80
5	Brick stake 250x75x250mm on cement-sand grout covering M25		t-mm	75
6	Wooden laying 150x25x200mm on two-ply roofing felt	M150	t-mm	25
7	Ligger 100x50mm (distance of liggers-1000mm)			50
8	Panel parquet	GOST 862.4-77	t-mm	30

VII.12 PLUMBING AND PIPE LAYING

VII.12.1 SCOPE

This item covers all operation in connection with plumbing and pipe laying as indicated on the drawings. All works shall conform to GOST or equivalent to international code.

VII.12.2 GENERAL REQUIREMENTS

Drawings

The drawings indicate the general arrangement of all plumbing and pipe fitting details. However where actual field conditions necessitate a rearrangement, the Contractor shall prepare and submit detailed shop drawings of the proposed rearrangement for approval of the Engineer-Monitor because of the small scale of the drawings it may not be possible to indicate all offsets, fittings and accessories which may be required.

Specifications

Materials, Fittings, Fixtures, Equipment required for the works and which are not covered by the detailed specification shall be as recommended by the manufacturer or consistent with good practice and approved by the Engineer-Monitor.

Gradients

Drain pipes shall be laid to the gradients as shown in the drawings or mentioned in the SNIP.

Cutting and Repairing

The work shall be carefully laid out in advance and any cutting of construction shall be done only with the written permission of the Engineer-Monitor. Cutting shall be carefully done and any damage to the buildings, piping, wiring or equipment as a result of cutting for installation shall be repaired by skilled worker of the trade involved, at no additional expense to the Employer.

Protection of fixtures, materials and equipment

Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury. At the completion of the work, fixtures, materials and equipment shall be thoroughly cleaned and delivered in a condition satisfactory to the Engineer-Monitor and Employer.

Hydrostatic pressure

All piping and pipe fittings including specials such as elbows, tees, valves etc. shall be able to withstand a hydrostatic pressure of 3 metre of water, unless otherwise stated.

Location of pipes

On the ground floor, water and soil pipes will generally follow under the concrete floor in the approximate location as indicated on drawings. Pipe sleeves will be provided for the crossing beams. Pipe locations shall not interfere with the reinforcing steel of the beams or floor slabs or with the shear concrete in or near the beams or walls. Prior to placing the pipe, a detailed shop drawing including its location shall be approved by the Engineer.

VII.12.3 APPROVAL AND LIST OF MATERIALS, FIXTURES AND EQUIPMENT

The Contractor shall submit to the Engineer for approval a complete list of materials, fixtures, fittings and equipment which are to be supplied by him together with the names and addresses of the manufacturers and their catalogue numbers and trade names. The manufacturer's should be from the List of Approved Makes attached with this document. The Contractor shall also furnish other detailed information, where so directed under various items. No consideration will be given to partial lists submitted from time to time.

VII.12.4 MATERIALS AND EQUIPMENT

All pipes, fixtures, fittings, setting compounds and jointing materials shall conform to the specifications shown against their names on the drawings unless otherwise specified or instructed by the Engineer.

VII.12.5 WATER PIPE, FITTING AND CONNECTIONS

Piping and fitting

- i. Water pipes shall be galvanized iron suitable for threaded jointing and complying with GOST or SNIP.
- ii. All Water Pipe fittings shall be similar in every respect to the pipe.
- iv. All connecting tubes shall be PVC pipes of approved size and shape.

- v. The water-supply nets should be performed by steel water-gas pipe d-20-15mm. The water shall be provided for the school administrative and laboratorial needs.

Installation

- i. A gate valve and drain valve on the service line shall be installed inside the building. The piping shall be extended to all fixtures, outlet and equipment from the gate calved. The cold water system shall be installed with a fall toward the shut-off valve. Supply line taken from pressure or gravity tanks shall be calved (approved type) at or near its source and an interior stop and waste valve or cock shall be provide for each outlet or group of outlets. Stops and waste cock shall be accessible and of such size and so installed as to permit complete drainage of the entire water supply system they serve.
- ii. A capped tee shall be installed below the shut-off valve on each water service riser in each building.
- iii. Mains, Branches and Runouts - Piping shall be installed as indicated on the drawings. Pipe shall be cut accurately to measurements established at the building by the Contractor and shall be worked into place without springing or forcing. Care shall be taken not to weaken the structural portions of the building. Piping above ground shall run parallel with the lines of the building unless otherwise shown or noted on the drawings. Branch pipe from service lines may be taken top of main, bottom of main, or side of main using such crossover fittings as may be required by structural or installation conditions.
- iv. Service pipes, valves and fittings shall be kept at sufficient distance from other work and other services to permit not less than 0.6 cm between finished covering of the different services. No water piping shall be buried in floors unless specifically indicated on drawings. Changes on pipes sizes shall be made with reducing fittings. The use of bushings will not be permitted.
- v. All water pipes shall be so graded or pitched that the entire system or parts thereof can be drained and the formation of traps or sags shall be avoided where possible. But where they occur, each sag, trap or inert shall have provision of complete drainage.
- vi. Pipe drains indicated on the drawings shall consist of globe valves with renewable disks and hose nipples. Trapped water line shall be equipped with a drain cock, a union, a plugged tee, or a nipple and cap at the lowest point in the trapped section.
- vii. Expansion and contraction of piping allowance shall be made throughout for expansion and contraction of piping. Horizontal runs of piping over 16 metre in length or specified in the SNIP shall be anchored to the wall or to the supporting construction about midway on the run to force expansion, evenly divided towards the ends.
- ix. Air Chambers for water hammer control shall be provided on cold supplies at each and control valve and flush valve and where not definitely shown on the drawings shall consist of 25 cm length of pipe of the same diameter as the branch supply, fitted with a cap.

Joints

Threaded Pipe (steel pipes of water-supply and heating) - After cutting and before threading, pipe shall be reamed and shall have burrs removed. Screw joints shall be made with hempyarn soaked in China lacquer or with an approved graphite compound applied to male threads only. Threads shall be fully cut and not more than three threads on the pipe shall remain exposed. Caulking of threaded joints to stop prevent leaks will not be permitted. Unions shall be provided where required for disconnection.

Sterilization

The entire piping system shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine, calcium hypochlorite or chlorinated lime and shall be introduced into the system in a manner approved by the Engineer. The sterilizing solution shall be allowed to remain in the system for a period of 8 hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not grater than 0.2 parts per million, or unless otherwise directed.

VII.12.6 SEWAGE AND RAIN WATER PIPING, FITTING AND CONNECTIONS

Piping and Fittings

- i. Sewage piping, shall be heave duty cast iron conforming to GOST. All fittings shall be similar in every respect to the pipe. The pipe shall be coated with 2 coats of epoxy paint.
- ii. Rain water down pipes shall be PVC pipes of GOST or approved equal. Fittings shall also be of PVC.
- iii. Roof drains shall generally be of non-pressure Cast iron/PVC pipe as specified or the size designated. Pipe used outside the building shall be reinforced concrete pipe without any special coal tar epoxy lining.

Installation

- i. Handling: Pipe and accessories shall be handled in such a manner as to insure delivery to the point of installation in sound, undamaged condition. Particular care shall be taken not to injure the pipe coat. No other pipe or material of any kind shall be placed inside a pipe or fittings after the coating has been applied.
- ii. Cutting of Pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise authorised by the Engineer cutting shall be done by means of an approved type of mechanical cutter. Wheel cutters shall be used when practicable.

Placing and Laying

Before installation, the pipe shall be inspected for defects and tapped with a light hammer to detect cracks. Defective, damaged or unsound pipe will be rejected.

Bedding and Encasing pipe drains

The trench bottom shall be rammed and compacted and carefully shaped as mentioned in SNIP or equivalent to international code.

Joints

All joints - threaded, mechanical, bolted, bell & spigot, lead-filled, hot-poured bituminous compound, and cement sand mortar shall conform to GOST and SNIP or otherwise approved by the Engineer.

VII.12.7 CLEANOUTS, TEST TEES, TRAPS, SLEEVES, VALVES, ETC

Cleanouts, Traps, Test tees, Sleeves, Gate Valves, Unions, Hose Bibs, Reducers shall conform to GOST and SNIP or otherwise approved by Engineer.

VII.12.8 TOILET FIXTURES

Fixtures include lavatories, wash basins, urinals, squat urinals, squat toilets, western type toilets, etc. These shall be made of white vitreous China of the highest quality available as per GOST or equivalent to international standard or approved equal. All these toilet fixtures shall be approved by the Engineer-Monitor.

VII.12.9 INSPECTION AND TESTS

Immediately after the drains are laid, jointed and flushed clean but before covering, all drain pipes shall be inspected, tested for alignment and infiltration to be passed by the engineer. The testing may be done section by section in accordance with GOST and SNIP or equivalent to international code.

VII.12.10 MEASUREMENT AND PAYMENT

Measurement for payment of pipe shall be in linear meter. Length of pipe shall be considered as supplied, furnished and installed in permanent work only in accordance with the Drawings and Specifications and as directed by the Engineer-Monitor.

Measurement and payment for assembly of pipeline shall be in tons. The weight of works will be calculated weight or manufacturer's weight. Net weight only shall be paid for and the weight of all tare, packing and blocking will not be included.

The unit rate shall cover for the cost of supplying of materials, manufacturing, hauling, transportation, handling, erection and installation including fabrication and furnishing all labour, tools and other necessary fittings.

VII.13. WATER SUPPLY AND SEWERAGE

VII.13.1 GENERAL DATA

Water-supply

- internal

The existing internal areal net of the hospital will be water-supply source. The single water-supply system will be applied in the building to provide water for the household water use and fire-proof needs. For the purpose of recording of the water consumption the water measuring system will be installed in underground. The risers are located in bathrooms and corridors. The mains will be laid under the underground ceiling. Cable grooming to the sanitation devices will be mounted openly on height 0,3m from the floor.

The internal firefighting to be applied from the fire cocks, which are installed in the underground and storey on height 1,35m from the floor. For the watering of walkways and landscape gardening of the object territory the watering cock is stipulated.

Hot-water supply is local. Water will be heated by electrical heaters (Termeks) produced by ARISTON. The risers of the cold water-supply will be galvanized steel pipes GOST 3262-75. Cable grooming to the sanitation devices (polyethylene tube and fittings) «HAKAN» by standard TC EN ISO 15874-TS 11451-DIN 8077-DIN8078.

Note:

1. Installation of the plastic pipe nets should be completed according to the requirements CH 478-80.
2. In places of passage through construction structures the plastic pipes will be laid in cases.
3. The pipelines of the cold water-supply passed in the building underground will be isolated by mineral wool downy rope with glass braid. The isolation will be fastened with the filaments covered by glasscloth and different soakings. The thickness of isolation will be 40mm.
4. Pressurization of the input B1 and output K1 should be performed according to series 2.100-1 вып.6.
5. The steel pipelines should be painted by oil painting 2 times.

For keeping drinking water the water tower (V-15m³, H-14m) is designed in the hospital territory. The water to be provided from the pump station by the pumps: one operational and one reserve.

- external

The existing internal areal net of the hospital will be water-supply source. The draw-off point of the water supply system will be existing water supply line, which is leading to the water tower. The designed water supply system will provide water for the hospital building, chlorination and fire reservoirs. Watering of the territory will be provided by the watering cock of the hospital building.

Water consumption recording will be provided by the water measuring system, which will be installed in technical premises of the hospital building.

The external firefighting will be supported from the reservoirs W=50m³x2pcs. by the monoblock pump Honda SEN-50X. The monoblock pump will be kept in warehouse. The reservoirs will be filled by the fire hose from the fire hydrant. Material of the designed pipes is steel water and gas pipes GOST 3262-75.

Sewerage

- internal

The wastewater will flow to external internal areal sewerage nets. The electrified valve will be installed in the control delve (KK-1) on the way out of nets from sanitation instruments below the mark 0,00. The valve will be controlled from the control room. Sewerage way outs laid in reinforced concrete trays with the control delves in the end of trays. Laying of the lead pipeline in underground is stipulated in channel with slope to the control delve.

Internal sewerage net and trimmers are polyethylene tubes ТКР-ПНД 50-1-50-1200 и ГОСТ 22689-89. The sanitation instruments are equipped by bottled siphons. Way out laid in reinforced concrete tray. The control delve is stipulated in the end of tray.

- internal areal

Way out K-1 from the southern side of the building to be provided to the sewerage pump station. With support of sewerage pump station the flows will be dispensed to the delve K-1. Other flows from the building will be diverted by self-flowing to the designed raking W=60m³. The raking is divided into two sections. The distribution sluice valves are stipulated in front of raking. Emptying of the raking to be provided through 6 days in location agreed with C3C.

The material of the pipes is asbestos GOST 539-80. All the way outs are laid in the reinforced concrete trays. The control delve is stipulated in the end of tray.

Note:

1. The space between pipes and openings of delves walls should be plastered by elastic materials.
2. Delves on the nets to be designed with soil compaction on 1m and construction of the waterproof bottom and delve walls lower pipeline.
3. Internal surface of the walls and delves bottom to be coated with hot bitumen two times on paint base with bituminous grout.
4. The pipes openings after installation should be carefully plastered with installation external waterproof lock by loamy soil mixed with bitumen materials.
5. Earth works should be done according to the SNIP 3.02.01-87.
6. Installation and testing of the pipelines should be provided strongly according to the SNIP 3.05.04-85.

Water-supply and sewerage main estimated indicators

System title	Required pressure of input, m	Estimated consumption				Installed capacity of the electric engine kWt / Note
		m ³ / twenty-four hours	m ³ /hour	litre/ second	In case of fire, litre/ second	
B1	-	4,0	0,828	0,417	-	-
T3	-	7,5	1,024	0,49	-	-
Input B1	18,0	11,5	1,897	1,164	2,5/10,0	-
K1	-	11,5	1,897	1,164/2,76	-	-
X						- / 0,02 kg/hour

VII.13.2 SPECIFICATIONS OF THE EQUIPMENT AND MATERIALS

Specification of the equipment and materials B1, T3 and K1

#	Description of equipment and materials	Type, mark, document reference	Unit	Code of the manufacturer	Code of equipment and materials	Q-ty	Weight of equipment per unit, kg
1	Steel galvanized water and gas pipelines ø26,8x2,8	GOST 3262-75	running meter			30	1,66
2	Steel galvanized water and gas pipelines ø33,5x3,2	GOST 3262-75	running meter			20	2,9
3	Steel galvanized water and gas pipelines ø60x3,5	GOST 3262-75	running meter			62	3,84
4	PPRC pipe PPR-C type-3 ø20, standard TC EN ISO 15874-TS 11451-DIN 8077-DIN8078	Hakan plastic	running meter		MB5500020020	382	
5	Crank 90° PPR-C type-3 ø20, standard TC EN ISO 15874-TS 11451-DIN 8077-DIN8078	Hakan plastic	Pcs.		MB5511000020	108	
6	Three-way pipe PPR-C with external thread ø20, standard TC EN ISO 15874-TS 11451-DIN 8077-DIN8078	Hakan plastic	Pcs.		MB5534020020	50	
7	Three-way pipe PPR-C ø20, standard TC EN ISO 15874-TS 11451-DIN 8077-DIN8078	Hakan plastic	Pcs.		MB5541000020	46	
8	Crank with external thread ø20	Hakan plastic	Pcs.		MB5532020020	74	
9	Nipple external thread ø20	Hakan plastic	Pcs.		MB5526020020	56	

#	Description of equipment and materials	Type, mark, document reference	Unit	Code of the manufacturer	Code of equipment and materials	Q-ty	Weight of equipment per unit, kg
10	Pair crow	Hakan plastic	Pcs.		MB5543000020	120	
11	Laking coupled valve ø20	15Б 16κ	Pcs.			2	0,47
12	Laking coupled valve, ø25	15Б 16κ	Pcs.			5	0,78
13	Laking coupled valve, ø15	15Б 16κ	Pcs.			52	0,38
14	Clack valve: muff, lift, brass ø15	166Б 16κ	Pcs.			17	0,23
15	Three-way pipe: steel, welded, equally pass, ø57x5	GOST 17376-83	Pcs.			4	0,9
16	Steel welded off-take, ø57x5	GOST 17375-83	Pcs.			4	0,8
17	Fire-cock with valve, ø50	1Б 1p	Pcs.			8	
18	Manual fire-hose barrel ПСБ, ø16	GOST 9923-80	Pcs.			8	
19	Coupling head ГЦ, ø50/ГМ ø50	GOST 2217-76	Pcs.			16/8	
20	Linen fire hose, ø50 L=20m					8	
21	Plastic pipes ТКР 110-3000-ПНД	GOST 22689.2-89	running meter			93,0	1,117
22	Plastic pipes ТКР 50-3000-ПНД	GOST 22689.2-89	running meter			85,0	0,423
23	T-socket T45° 110Kx110Kx110C-ПНД	GOST 22689.2-89	Pcs.			36	0,430
24	T-socket T45° 50Kx50Kx50C-ПНД	GOST 22689.2-89	Pcs.			30	
25	T-socket T110Kx50Kx110C-ПНД	GOST 22689.2-89	Pcs.			22	0,48
26	Tapered pipe ПП 110Cx50K-ПНД	GOST 22689.2-89	Pcs.			9	0,130
27	Off-take 135° ø100	GOST 22689.2-89	Pcs.			48	
28	Off-take 135° ø50	GOST 22689.2-89	Pcs.			28	
29	Off-take 90° ø50	GOST 22689.2-89	Pcs.			28	
30	Revision ø100	GOST 22689.15-77	Pcs.			4	
31	Revision ø50	GOST 22689.15-77	Pcs.			8	
32	Water counter BCKM 20	GOST 6019-83	Pcs.			1	
33	Filter ø20		Pcs.			1	
34	Three-way cock 14M1 ø15	GOST 21345-78	Pcs.			1	0,26
35	Manometer МП-3У Py=10 kgs/cm ²	GOST 2405-88	Pcs.			1	0,65
36	Laking coupled valve ø50	1548p	Pcs.			3	5,6
37	Steel welded concentric diminishing piece ø50x20	GOST 17378-83	Pcs.				0,2
38	Watering cock ø25					1	
39	Lavatory bowl with leg pedal drain		Set	LLC "Santechmed"		25	
40	Washstand type "Tulpan" with pedal water run-up		Set	LLC "Santechmed"		44	
41	Washstand in triangle form "Tulpan" with pedal water run-up		Set	LLC "Santechmed"		25	
42	Shower enameled iron bottom plate	GOST 10161-	Set			8	

#	Description of equipment and materials	Type, mark, document reference	Unit	Code of the manufacturer	Code of equipment and materials	Q-ty	Weight of equipment per unit, kg
		73					
43	Enameled steel wash	GOST 24843-81с.изм	Set			2	
44	Trap with skewed way out ø50	T50	Set			10	
45	Mixer for the shower cubicle with fixed shower tube	GOST 8224-79	Set			8	
46	Bottled siphon for washstand ø50	GOST 23412-79	Set			69	
47	Siphon for shower bottom plate ø50	GOST 23412-79	Set			8	
48	Bottled siphon for wash ø50	GOST 23412-79	Set			2	
49	Electrical water heater (Termeks) W=80л.	ARISTON	Set			8	
50	Electrical water heater (Termeks), W=40л.	ARISTON	Set			4	
51	Electrical water heater (Termeks), W=30л.	ARISTON	Set			6	
52	Flanged electrified valve ø100, electrical wire 0,18 kWt		Pcs.			1	
1	Control delve (KK) ø1000 Hp=1,8m		Pcs.			1	
2	Observation delve ø1000 Hp=1,5m		Pcs.			3	
3	Hatchway type «Л»	GOST 3634-92	Pcs.			4	80,0

Specification of the equipment and materials HBK.CO

#	Description of equipment and materials	Type, mark, document reference	Unit	Code of the manufacturer	Code of equipment and materials	Q-ty	Weight of equipment per unit, kg
1	Steel galvanized water and gas pipelines ø60x3,5	GOST 3262-75	running meter			102,0	4,38
2	Steel galvanized water and gas pipelines ø89x3,5	GOST 3262-75	running meter			87,5	7,38
2'	Parallel valve with transfer spindle ø50, PY=no less than 6kgs/cm ²	30ч66р	Pcs.			2	15,9
3	Parallel valve with transfer spindle ø80, PY=no less than 6kgs/cm ²	30ч66р	Pcs.			1	25,9
4	Underground fire hydrant, BS 750 type 2 with laminated current	AVK International	Set		19-089-01001	1	18,0
5	Three-way pipe: flanged, iron molding in sandy form ТФ 80/80	GOST 5525-88	Pcs.			1	20,0
6	Fire hose none-rubber, length-120,0m ø66mm with sprinkling ø19mm		Set			1	
7	Hatchway type «Л»	GOST 3634-99	Pcs.			16	60
8	Steel off-take steeply curved 90° ø50	GOST 17375-83	Pcs.			3	0,8
9	Steel off-take 45° ø80	Produced on place	Pcs.			2	
10	Steel sleeve valve 150x300mm	Produced on place	Pcs.			2	

#	Description of equipment and materials	Type, mark, document reference	Unit	Code of the manufacturer	Code of equipment and materials	Q-ty	Weight of equipment per unit, kg
11	Drain-pipe ø100	Sheet 7	Pcs.			3	
12	Directing sign of the fire hydrant	Sheet 8	Pcs.			1	
13	Asbestos pipes, pressure ø150	GOST 539-80	Pcs.			75,0	
14	Asbestos muffs with heat insulations ø150	GOST 539-80	Pcs.			18	
15	Normal dampproofing of steel pipes ø60,80 (bitumen)		m ²			43,0	
16	Petrolic monoblock pump	HONDA SEN-50X	Pcs.			1	23
17	Fire hose ø65, L=80,0m with trunk		Pcs.			1	
18	Flange ø80mm	GOST 12820-80	Pcs.			2	
19	Flange ø50mm	GOST 12820-80	Pcs.			4	
20	Back-pressure valve ø80mm	19ч21р	Pcs.			1,0	4,9

Specification of material consumption for sewerage pump station (KHC)

#	Marking	Title	Q-ty / pcs.	Weight of equipment per unit, kg	Comments
Delves K-3					
1	КЛ-15-9 (3.900-3 вып-7)	Wall becket	3	1000	
2	КЛ-15-6 (3.900-3 вып-7)	Wall becket	2	660	
3	КЛД-15 (3.900-3 вып-7)	Bottom slab	1	940	
4	КЛП1-15-1 (3.900-3 вып-7)	Covering slab	1	680	
5	GOST 3634-99	Hatch	1	80	
Lattice P-1					
6	Л 32 GOST 8509-86	Angle L=500mm	4	0,73	
7	Л 32 GOST 8509-86	Angle L=400mm	2	0,58	
8	– 40 GOST 103-76	Stripe L=400mm	3	0,58	
9	– 40 GOST 103-76	Stripe L=250mm	4	0,58	
10	– B-6 GOST 5781-82	Circle L=250mm	18	0,055	
11	– B-6 GOST 5781-82	Circle L=500mm	38	0,11	
12	– B-6 GOST 5781-82	Circle L=300mm	18	0,066	
		Concrete M50, m ³	0,23		
		Steel embedded fittings, kg	82,8		
	C-3	Catwalk C-3	1		
	GOST 539-80	Asbestos pipe ø200, L=1500mm	1		

Note:

1. All the metal structures should be painted by oil painting two times.
2. Welding should be done by electrodes Э-42.
3. The height of the weld joint should not exceed thickness of the welded elements.
4. The pumps works should be automatized.
5. Lattice P-1 should be cleaned manually when it filled.
6. Lattice P-1 should be fastened to delve embedded fittings.
7. Installation of the pump equipment should be according to the installation guidelines.

VII.14 HEATING AND VENTILATION

VII.14.1 GENERAL DATA

The heating and ventilation design of the hospital was developed based on assignment for designing and in compliance with existing norms and rules.

VII.14.2 HEATING

The heating and ventilation design of the building of tuberculous prison hospital for 100 beds of the entity я/c 3/13 of Ministry of Justice of the Republic of Tajikistan performed according to the assignment for designing and requirements of SNIP II-69-78. Estimated temperature for $t_{\text{н}} = -14^{\circ}\text{C}$.

The heating provided by electrical boiler, type "Nevski" with capacity 100kWt. The heat-carrying is hot water with parameters $t_{\text{r}}=90^{\circ}\text{C}$ and $t_{\text{o}}=70^{\circ}\text{C}$. The heaters will be cast-iron radiators M_c-90. The heat consumption for heating $Q=84950$ kilocalorie /h. The heating system is single-pipe flowing with overhead distribution.

Supply main pipes will be installed in roof space and fastened by steel cantilevers. Return supply main pipes will be installed on the floor of the basement floor with appropriate slope. The air will be removed from the system through air collectors in the roof by outlet pipe $\varnothing 25$. After installation of the heating system it should be washed conducted hydraulic test.

The pipelines passed through the roof and basement floor to be heat isolated: anticorrosive isolation – oil-bitumen ГФ-021; main layer 40mm, twist of glass complex threads $\varnothing \leq 50$ and roll glass-staple fiber $\varnothing > 50$; covering layer of glass-fibre plastic PCT.

The pipelines passed through the places in intersection of the internal walls and partitions coverings should be laid in collet with noncombustible compaction, which is ensure rated limit of partitions fire resistance.

All the pipes in the roof and under-floor duct will be isolated by:

- (i) anticorrosive isolation – oil-bitumen ГФ-021, GOST 25129-82;
- (ii) heat insulation, $\delta=30\text{mm}$, GOST 1779-89 for $d \leq 50\text{mm}$, for $d > 50\text{mm}$ – roll glass-staple fiber, $\delta=40\text{mm}$ GOST 18499-76; and
- (iii) covering layer of glass-fibre plastic PCT, ТУБ-11-145-80.

VII.14.3 VENTILATION

The hospital ventilation system is designed according to the SNIP II-69-78 (designing of heating supply, heating, ventilation, air-conditioning and hot water-supply in the buildings of medioprofilactic institution), balanced system of ventilation with natural mechanical movement. The natural ventilation will be from the dining-hall, showers, laundry, bathroom units and hospital rooms.

The kitchen ventilation will be with mechanical movement in support of exhaust fan. Air inflow to the building will be provided by applying of mechanical air-supply plant through corridors of each floor.

The ventilation equipment accepted by Systemair with supply grill type "Вентс". The ventilation blocks of the natural ventilation should be taken out for 1,5m higher from the roof level. Umbrellas will be installed over the ventilation blocks series 5.904-51 for the purpose of rainfall protection.

VII.14.4 SPECIFICATION OF EQUIPMENT AND HEATING AND VENTILATION (OB)

#	Description of equipment and materials	Type, mark, document reference	Code of equipment and materials	Code of the manufacturer	Unit	Q-ty	Weight of equipment per unit, kg
	Heating						
1	Electrical boiler 100 kWt	ЭПЗ-100И2			Set	2	50,0
2	Circulating pump TPE 32-190/2-S N=0,75 kWt, n=2920 rev. /min., V=380-480, H=15m.	GRUNDFOS			Set	2	47,6
3	Safety valve ø50	17ч 186р			Pcs.	2	14
4	Mud collector 16-40	T34.01			Pcs.	1	59,2
5	anti-scale magnetic device ПМУ-1				Pcs.	1	11,7
6	Damper ø50	30ч 66р			Pcs.	10	
7	Valve ø25	15ч 9п2			Pcs.	8	
8	Back valve ø50	19ч 216р			Pcs.	2	
9	Expansion tank	T.35.02			Pcs.	1	172
10	Three-way cock for manometer	14 M1-16			Pcs.	6	
11	Manometer МТП 160-16	GOST 2405-80			Pcs.	6	
12	Thermometer П5-1-240-163	GOST 2823-76			Pcs.	2	
13	Sectional iron radiator M-90	GOST 8690-75			Section	459	6,15
14					экм	119,34	
15					м²	91,8	
16					kWt	67,43	
17	Stopcock 2 nd tuning, brass	КДРП	37 1222 2010		Pcs.	90	0,29
18	Muff valve ø20	15ч 8п	37 2212 1039		Pcs.	18	0,94
19	Muff valve ø15	15ч 8п	37 2211 1009		Pcs.	10	0,75
20	Steel gas pipeline ø15	GOST 3262-75	006		running meter	213	1,160
21	Steel gas pipeline ø20	GOST 3262-75	006		running meter	120	1,500
22	Steel gas pipeline ø25	GOST 3262-75	006		running meter	35	2,120
23	Steel gas pipeline ø32	GOST 3262-75	006		running meter	40	2,690
24	Steel gas pipeline ø40	GOST 3262-75	006		running meter	48	3,330
25	Steel gas pipeline ø50	GOST 3262-75	006		running meter	20	4,220
26	Capsule for the walls, partitions, coverings intersection ø32	GOST 3262-75	L=0.35mm		Pcs.	56	
27	Hydraulic test of the heating system						
28	Oil painting of the radiators and pipes, 2 times				м²	126,78	
29	Muff pass valve		37 1211 1002		Pcs.	4	0,38
30	Anticorrosive layer: oil bitumen, 2 layer on soil ГФ-021						
31	Same, ø15	GOST 25129-82			м²	24	
32	Same, ø20	GOST 25129-82			м²	16	
33	Same, ø25	GOST 25129-82			м²	6	
34	Same, ø32	GOST 25129-82			м²	8	

#	Description of equipment and materials	Type, mark, document reference	Code of equipment and materials	Code of the manufacturer	Unit	Q-ty	Weight of equipment per unit, kg
35	Same, ø40	GOST 25129-82			M ²	10	
36	Same, ø50	GOST 25129-82			M ²	6	
37	Heating isolation, main layer, heating isolation twist of glass complex threads						
38	Same, ø15				M ³	3	
39	Same, ø20				M ³	2	
40	Same, ø25				M ³	1	
41	Same, ø32				M ³	1	
42	Same, ø40				M ³	1	
43	Same, ø50				M ³	1	
44	Heating isolation, main layer, heat-insulated blanket из glass staple fiber						
45	Same, ø15				M ²	82	
46	Same, ø20				M ²	48	
47	Same, ø25				M ²	15	
48	Same, ø32				M ²	18	
49	Same, ø40				M ²	23	
50	Same, ø50				M ²	10	
	Ventilation						
51	Ventilating grill 200x200	MB101c		«BEHTC»	Pcs.	71	
52	Umbrella 3П.00.000.00	5.904-51			Pcs.	10	4,5
53	Umbrella 3П.00.000.01	5.904-51			Pcs.	9	8,7
54	Input, stainless steel δ=0,6						
55	Dimension 100x200	GOST 14918-80			M ²	2,7	
56	Dimension 200x200	GOST 14918-80			M ²	10,8	
57	Dimension 200x250	GOST 14918-80			M ²	16,2	
58	Dimension 200x300	GOST 14918-80			M ²	4,5	
59	Dimension 250x250	GOST 14918-80			M ²	4,5	
60	Dimension 250x400	GOST 14918-80			M ²	46,8	
61	П1. Supply fan N=3 kWt	TA-450EL	7257	Systemair	Set	1	46
62	Air intake	ITA 200	8421	Systemair	Pcs.	1	
63	Water air cooler	CWK 200	30023	Systemair	Pcs.	1	
64	Sound damper	LDC 200	5194	Systemair	Pcs.	1	
65	Filter EU3	BFTA 450/3	5357	Systemair	Pcs.	1	
66	Filter EU5	BFTA 450/5	204830	Systemair	Pcs.	1	
67	Filter EU7	BFTA 450/7	5358	Systemair	Pcs.	1	
68	Input, stainless steel δ=0,6						
69	Dimension 100x200	GOST 14918-80			M ²	11,5	
70	Dimension 150x200	GOST 14918-80			M ²	4,2	
71	Dimension 200x200	GOST 14918-80			M ²	4,0	
72	П2. Supply fan N=33,3 kWt	TA-2000EL	2184	Systemair	Set	1	99

#	Description of equipment and materials	Type, mark, document reference	Code of equipment and materials	Code of the manufacturer	Unit	Q-ty	Weight of equipment per unit, kg
73	Air intake	ITA 50-25	8495	Systemair	Pcs.	1	
74	Water air cooler	PGK 50-25	30028	Systemair	Pcs.	1	
75	Sound damper	LDR 50-25	5070	Systemair	Pcs.	1	
76	Filter EU3	BFTA 2000/3	7395	Systemair	Pcs.	1	
77	Filter EU5	BFTA 2000/5	203887	Systemair	Pcs.	1	
78	Filter EU7	BFTA 2000/7	7617	Systemair	Pcs.	1	
79	Input, stainless steel $\delta=0,6$						
80	Dimension 100x150	GOST 14918-80			M ²	3,5	
81	Dimension 200x200	GOST 14918-80			M ²	2,4	
82	Dimension 250x300	GOST 14918-80			M ²	15,4	
83	Dimension 250x400	GOST 14918-80			M ²	11,18	
84	П3. П4. Supply fan N=33,3 kWt	TA-3000EL	2188	Systemair	Set	2	125
85	Air intake	ITA 60-30	8496	Systemair	Pcs.	2	
86	Water air cooler	PGK 60-30	30030	Systemair	Pcs.	2	
87	Sound damper	LDR 60-30	5072	Systemair	Pcs.	2	
88	Filter EU3	BFTA 3000/3	7396	Systemair	Pcs.	2	
89	Filter EU5	BFTA 3000/5	203888	Systemair	Pcs.	2	
90	Filter EU7	BFTA 3000/7	7619	Systemair	Pcs.	2	
91	Input, stainless steel $\delta=0,6$						
92	Dimension 150x200	GOST 14918-80			M ²	8,4	
93	Dimension 200x250	GOST 14918-80			M ²	9,0	
94	Dimension 200x300	GOST 14918-80			M ²	11,0	
95	Dimension 200x400	GOST 14918-80			M ²	15,0	
96	Dimension 250x400	GOST 14918-80			M ²	26,0	
97	Ventilating grill 200x200	ОНГ		«BEHTC»	Pcs.	26	
B1.1	Kitchen exhaust fan:	DVV 450D6			Pcs.	1	65
	Frequency B/50H 400 Staging 3 Power consumption BT 2200 Current A 5,0 Max air consumption m ³ /s (m ³ /h) 1,53 (5500) Rotation frequency min. 2660 Max. Temperature of air relocatable °C 120 The level of sound pressure in distance 4/10m ДБ(A) 54/46						
	Input, stainless steel $\delta=0,6$						
2	Dimension 400x500 $\delta=0,6$ mm	GOST 14918-80			M ²	36	
3	Dimension 300x500 $\delta=0,6$ mm	GOST 14918-80			M ²	4	
4	Dimension 250x500 $\delta=0,6$ mm	GOST 14918-80			M ²	3	
5	Dimension 200x250 $\delta=0,6$ mm	GOST 14918-80			M ²	4	

#	Description of equipment and materials	Type, mark, document reference	Code of equipment and materials	Code of the manufacturer	Unit	Q-ty	Weight of equipment per unit, kg
6	Umbrella type DDS 101 1000x800	DDS 101			Pcs.	6	22
7	Fastening of air ducts and lattices	GOST 5.904-1			kg	6	
8	Galvanized roofing steel for the umbrella 1000x1000mm	GOST 19904-91			m ²	24	

VII.15 POWER SUPPLY

VII.15.1 POWER SUPPLY

Internal electrical lighting

The power supply part of the design developed based on normative materials:

1. ПУЭ-2000
2. Daylight and lamplight MCP2,04-05-95
3. СП-31-110-2003 Designing and installation of electrical equipments of houses and public building

Input and electrical energy distribution to be provided from БРУ-3-10 and БРУ-3-25, which are installed in electrical control unit basement floor. Accounting of electricity will be made by the counter of active energy, which is fixed in input.

The lighting net should be performed by wire ППВ 3x1,5 and 3x2,5mm², the plug socket net – by wire ППВ 3x4mm² in ceiling panels and links under plaster. The backbone networks in corridor should be performed by plastic pipes.

The power supply mains will be installed in plastic pipes under floors. All the metal structure of electrical installations under tension should be grounded according to the Rules of Installation of the Electrical Equipment.

There are two types of lighting will be installed in the building:

1. Working lighting
2. Emergency lighting

The working lighting will be provided for all premises of the building. The emergency lighting will be provided for evacuation in staircases and corridors. The lamps chosen based on purpose of the premises and environmental specifics. The height of the sockets and cut-off switches installed from the floor is 1,5m.

The main indicators

#	Title	Unit	Indicator
1	Illuminated area	m	720
2	Voltage of lighting leads	B	220
3	Rated capacity	kWt	44,62
4	Calculated power	kWt	40,15
5	Demand coefficient	Cos φ	0,9

Internal power equipment

The design performed based on architectural construction part. The box type ПР8503 applied as a distributor box.

Supply and distribution net performed by wire АПВ-0,66 in pipes under concrete. The power equipment performed according to GOST21-613-88 and BCH59-88 based on norms of designing of apartment public buildings.

The main indicators

#	Title	Unit	Indicator
1	Rated capacity	kWt	170,38
2	Rated current	A	258,15
3	Power coefficient	Cos φ	0,8

External

Electrical nets 10 and 0,4 kWt for the working design are performed according to:

- a) assignment for designing
- b) general layout.

1. The designed nets 10kWt from the existing transformer substation to designed transformer substation should be performed by cable mark ABBB-10 cut-3x95 mm² in 0,7m depth from the earth surface on loose soil.
2. The project accepted packaged transformer city type K42-630-M5 with capacity 250 kWt.
3. The designed nets 0,4 kWt should be performed by cable mark AAlIlBy-1 cut-4x150 mm² in 0,7m depth from the earth surface.
4. In plantation zones the cables should be laid with distance not less than 2m from the cable to stem of trees, in case of frutex the distance maybe reduced to 0,75m. In intersection with sewerage, water-supply system the cable should be laid in asbestos pipe.
5. The lighting of the object's territory should be performed by lighting fixtures type PKY33-250-003 with plane glass and PTY06-125-004. Control of external lighting will be done from transformer substation. Power supply to lighting fixtures performed by cable type ABBГ cut-3x6mm² in earth. The searchlights should be installed in watchtower. Power supply to the searchlights should be performed with the same cable.
6. All the electrical works should be performed according to the ПУЭ, ПТБ и ПТЭ.
7. All the metal parts of the electrical equipment, which are in working conditions and without voltage, but could be under voltage, should be grounded. For grounding PE conductor cable should be applied.

The main indicators

#	Title	Unit	Indicator
1	Voltage of supply net	B	380/220
2	Calculated capacity	kWt	294,4
2	Calculated current	A	446
4	Power coefficient	Cos φ	0,8
5	Security coefficient		II

I CONDUITS, WIRING, SWITCHES AND ACCESSORIES

1. STEEL CONDUITS:
The steel conduits shall be manufactured from mild steel with 16 Gauge wall thicknesses for all sizes up to 32mm diameter and 14 Gauge for sizes above 32mm diameter. They shall be welded, electric thread type having perfectly circular tubing and light fitting joints. They should have no internal welding burrs or any other form of sharp edges internally. The conduit shall be protected by one coat of black enamelled paint applied inside and outside in its manufactured form. No steel conduit less than 19mm in diameter shall be used. Bends shall be of 16 gauge wall thickness and as far as possible the conduit system shall be so laid out that it will avoid the use of tees, elbows and sharp bends.
2. JUNCTION BOXES:
M.S. draw boxes/ junction boxes of ample dimensions and fabricated from 16 gauge MS sheet steel, properly chemically cleaned and painted shall be provided at convenient points on walls/ ceiling to facilitate pulling of long runs of cables/ wires. They shall have the required number and size of knockouts machine punched at the time of fabrication. All knockouts that are subsequently not required are to be closed off with suitably sized stoppers. The boxes will be completely concealed and covered with MS covers, as required, flush with the plaster. The locations of these boxes should be intimated to the Architect/ Consultant before installation and every effort must be made to minimize the number.
3. SWITCH BOXES:
Galvanized M.S. boxes of prescribed sizes shall be provided to house the switches, sockets, regulators, other switch modules. Every effort must be made to ensure the line and level of the switch boxes where more than one is required. Proper spacing must be maintained between boxes so that the switch plates can be accommodated with uniformity. All boxes shall have ample space at the back and on the sides for accommodating wires and check nut entries. The boxes shall be completely recessed with edges flush with final finished wall surface.
4. ERECTION:

Conduits shall be laid in accordance with approved drawings so as to be both technically suitable and aesthetically pleasing.

Where conduits are required to run on the surface, they shall be duly saddled and fastened to the wall/ ceiling in a neat and proper manner with not more than 1200mm spacing between saddles. When the conduit is laid above the slab the same shall be covered with cement concrete mixture 1:3:6 using 1/4" thick stone aggregate and coarse sand.

If required to run in the wall or in the floor filling, the same must be carried out so as to conceal the entire run of conduits and outlet boxes and must be held in position by iron hooks or cleats. Wherever necessary, chaises should be cut by the contractor to sufficient depth to allow full thickness of plaster over conduits. Width of the chaise should be made to accommodate the required number of conduits. The chaises shall be filled with cement and mortar (1:3) and properly cured by watering. If a chaise is cut in an already finished surface the contractor shall fill the chaise and finish it to match existing finish within the tendered rates.

When the conduit is to be embedded in a concrete member it shall be adequately tied to the reinforcement to prevent displacement during casting. Conduits in chaises or laid above the slab, shall be held by hooks spaced at a maximum of 1500mm centre to centre with at least one hook/ saddle near the point of junction with another conduit or junction box.

Suitable expansion joint fittings shall be provided at all the points where the conduit crosses any structural expansion joint in the building.

The entire conduiting system should be minimum IP 41 for internal conduiting. Proper threading of metal conduits and proper screw grip in case of PVC conduits should be ensure to prevent any opening for vermin or moisture. While cutting threads in metal conduits care should be taken to cut only up to required insertion length. Should any threaded portion be left exposed it should be immediately coated with enamel paint to prevent rusting.

Proper tools should be used for bending and thread-cutting. While bending care should be taken to ensure that cross section of the conduit is not reduced in any way and that no sharp bends or sharp edges are created. After cutting of pipe to suitable length, round file should be used to ensure there are no sharp edges at the pipe end.

Wherever the steel conduit enters a DB/ panel/ junction/ switch box, it should have properly sized checknut to hold the conduit in place.

The use of flexible pipe should be restricted to connections to lighting fixtures in false ceilings only. They should have proper glands and check nuts in place to ensure the continuity of the conduit run.

The conduit shall have ample sectional area to facilitate the drawing of cable. The contractor should refer to the table given below for the drawing of wires:

Nominal cross sectional Area of conductor	Conduit size (PVC/M.S.) in mm				
Sq.mm	19/20	25/25	32/32	38/40	50
1.5	4	8	12	-	-
2.5	3	6	10	-	-
4.0	2	5	8	-	-
6.0	-	4	7	-	-
10.0	-	3	5	6	-
16.0	-	2	3	5	7
25.0	-	-	2	3	6
35.0	-	-	-	2	5

Note: The above shows the maximum capacities of conduits for a simultaneous drawing in of cables. The table applies to 1100V grade FR PVC insulated copper conductor cables.

The entire conduit systems including outlets and boxes shall be thoroughly cleaned after completion of erection and before drawing of cables.

5. SWITCHES, SOCKETS AND ACCESSORIES:

All switches, sockets, regulators and other outlet modules shall be of modular construction. The current ratings for the switches and sockets shall be as specified with screwed wire terminals properly shrouded and suitably rated for the current carrying capacities indicated. Mounting heights for the switches and accessories should be strictly followed from the drawings and verified from the Architect/ Engineer-at-site before installation. All heights are to be measured from finish floor level. Only correct accessories and tools as specified by the manufacturer are to be used

Screws shall be cadmium or zinc electroplated or passivated.

6. CABLES:

All cables shall be 1100V grade and shall have been manufactured in accordance with the latest I.S. specification. Only copper conductor cables in multi-stranded ply with FR PVC insulation and of size as mentioned in the Schedule of Quantities are to be used.

7. POINT WIRING:

Wiring for light, fan and 6A convenience outlet. The size of wire shall not be less than 1.5sq.mm or as specified against each item. The 6A socket outlet points shall be complete with circuit wiring, 3/5 pin 6A socket and cover plate on a galvanized M.S. box with the controlling switch as required and the third pin shall be earthed as specified with copper earth wire.

Wiring for 16A convenience outlet. The size of wire shall not be less than 4sq.mm or as specified against each item. Each circuit shall have one or maximum two outlets as mentioned in the Bill of Quantities and each point shall be earthed with at least 2.5sq.mm copper earth wire or as specified against each item. The point shall be considered complete with circuit wiring, 3/6 pin 6/16A socket, switch and cover plate mounted on a galvanized MS box with the third pin earthed as specified.

Colour coding is to be strictly followed at levels of distribution. Red, Yellow and Blue colours are to be used to carry phase currents only and black is to be used for Neutral only. Green or Yellow-Green is to be used for earth conductor only.

Segregation of phases is to be maintained at all levels downstream from the last Distribution Board. At no switchbox, junction box or outlet box are wires of different phases to be carried or terminated, i.e. potential between any two wires in switchbox, junction box or outlet box is not to exceed 220V.

Separate and independent conduits will be used for each of the following systems:

- a) Lighting system;
- b) Power system;
- c) Computer/ Data system;
- d) Fire Alarm System

II MAINS AND SUBMAINS:

Mains and sub-mains shall consist of wires, cables and conduits, bends, junction boxes, rubber bushes, check-nuts etc. and installation and termination as specified before. The sizes and capacities of conduits and wires shall be as stated in the Bill of Quantities and will commence from the main switches to the various Distribution Boards. Wires shall be drawn in concealed or surface conduits as required without being damaged. For this purpose draw boxes shall be located at convenient but not in conspicuous places. Every main and submain will run in an independent conduit. Necessary provisions of wire lengths entering and emerging from the conduit must be made for connections. Colour code for phases and neutral are to be followed i.e. only RED, YELLOW, BLUE colours for phase wires, BLACK colour for neutral wires and GREEN colour for earth wires are to be used. Per metre rate for submains shall include all conduiting, wiring and associated accessories, connections, labour etc. as specified above.

III CABLE WORK:

1. STORAGE AND HANDLING:

Cable drums shall be stored on a well drained, hard surface, preferably concrete, so that the drums do not sink into the ground causing rot and damage to the cable drum.

During storage, periodical rolling of drums once in 3 months through 90° shall be done specially in the case of paper insulated cables. Rolling shall be done in the direction of the arrow marked on the drum. It should be ensured that both ends of the cables are properly sealed to prevent ingress/ absorption of moisture by the insulation. Protection from rain and sun is preferable. Sufficient ventilation between cable drums should be ensured during storage. The drums shall always be rested on flanges and not on flat sides. While removing cables the drums shall be properly mounted on jacks or on a cable wheel or any other suitable means making sure the spindle, jack, etc. is strong enough to take the weight of the drum.

The cables shall not be sharply bent within a small radius. The minimum safe bending radius for all types of steel armoured, PVC sheathed cables shall be taken as 12 times the overall diameter of the cable. Wherever practicable, larger radius should be adopted. At joints and terminations, the bending radius of individual cores of multicore cables shall not be less than 15times its overall diameter. Cables with kinks and straightened kinks or with similar apparent defects like defective armouring etc. shall not be installed.

2. INSTALLATION:

The cable installation including necessary joints shall be carried out in accordance with the specifications given. For details not covered in the specification, ПУЭ-2000, НП31-110-2003 and НПБ104-95 shall be followed. Before the cable laying is undertaken, the route of the cable shall be decided by the Engineer-in-charge. While shortest practical route should be preferred, cable runs shall generally follow fixed developments such as roads, foot-paths, etc. Cables of different voltages and also power and control cables should be kept in different trenches with adequate separation.

3. LAYING IN PIPES/ CLOSED DUCTS:

At locations such as road crossings, entry to buildings, for poles in paved area, etc. cables shall be laid in pipes or closed ducts. Stoneware pipes shall be used for such purposes. Pipes shall be continuous and clear of debris or concrete before a cable is drawn. Sharp edges at ends shall be smoothened to prevent any injury to cable insulation or sheathing.

Pipes for cable entries to the building shall slope downwards from the building and shall be suitably sealed to prevent entry of water inside the building. Further the mouth of the pipes at the building end shall be suitably sealed to avoid entry of water. Cable grips/ draw wires and winches etc. may be employed for drawing cables through pipes/closed ducts etc.

4. LAYING ON SURFACE:

The cables may be laid through in trough or brackets at regular intervals or directly cleated to wall/ ceiling. When laid over bracket supports the cables shall be clamped to prevent undue sag. Cable clamps shall be made from materials such as mild steel, aluminium etc. In case of single core cables the clamps shall be of non-magnetic materials. A suitable non-corrosive packaging shall be used for clamping unarmoured cables to prevent damage to the cable sheath.

Wherever more than one cable is laid/ run side by side, marker tags as approved inscribed with cable identification details shall be permanently attached to all the cables in the manholes/ pull pits/ joint pits/ entry points in buildings/ open ducts etc. These shall also be attached to various cables laid direct in ground at suitable intervals as decided by the Engineer-in-charge before the trenches are filled up.

Jointing work shall be carried out only by licensed/ experienced cable jointer. Sufficient ventilation shall be provided during jointing operation in order to disperse fumes given out by fluxing. Jointing materials and accessories like conductor ferrules, solder flux and protective tapes, filling compound, jointing boxes etc. of right quality and correct sizes conforming to relevant Indian standards, wherever they exist shall be used.

The design of the joint box and the composition of the filling compound shall be such as to provide an effective sealing against entry of moisture in addition to affording proper electrical characteristic to joints. Where special type of splicing connector kits or epoxy resin spliced joints are specified, materials approved for such application shall be used and instruction of the manufacturer/ supplier of such materials shall be strictly followed.

Insulation resistance of cables to be jointed shall be measured with 500V meggar up to 1.1kV grade and with 2500/ 5000V meggar for cables of higher voltage. Unless the insulation resistance values are satisfactory, jointing shall not be done. Whenever Aluminium conductor is exposed to outside atmosphere a highly tenacious oxide film is formed which makes soldering of

aluminium conductor difficult. This oxide film should be removed using appropriate type of flux. The clamps for the armoured shall be clean and tight.

IV DISTRIBUTION BOARDS

The light boards YOЦБ for receiving and distribution electrical energy and overload and short-circuit current protection should be installed in niche on stair landing. The light boards will be installed according to the type design ТП407-129 "Installation of light boards YOЦБ"/

V EARTHING

The case of each electric apparatus (electrical appliance) shall be earthed by third earthing wire (zero wire). Distribution switchboard and light board also shall be earthed by separate zero wire on earthing strip to the lead-in distributor.

From earthing strip to the lead-in distributor by steel corner or by steel strip will be earthed on outer contour of earthing, which is performed on depth 0,5m (from the ground level) by steel strip, 4x40mm.

Dowels with bar steel Φ -16mm, length-2,5 m will be clinched to ground with distance 3,5m from space to space. Joining between dowels and steel strip will be performed by welding.

Earthing shall conform to the following specifications. For other details not covered in this specification, ПУЭ-2000 shall be referred to.

1. TYPES OF EARTH ELECTRODES:

- a) Pipe earth electrode.
- b) Plate earth electrode.

a) PIPE EARTH ELECTRODE:

G.I pipe shall be of medium class, 40mm dia and 4.5 m in length. Galvanising of the pipe shall conform to relevant GOSTs. G.I pipe electrodes shall be cut tapered at the bottom and provided with holes of 12mm dia drilled not less than 7.5 cm from each other up to 2m of length from the bottom. The electrode shall be buried in the ground vertically with its top not less than 20 cm below ground level.

b) PLATE EARTH ELECTRODE.

For plate electrode minimum dimensions of the electrodes shall be as under:

- i) GI plate electrode- 60 cm x 60 cm x 6 mm thick.
- ii) Copper plate electrode- 60 cm x 60 cm x 3mm thick.

The electrode shall be buried in the ground with its faces vertical and the top not less than 3 m below ground level.

2. METHOD OF INSTALLING WATERING ARRANGEMENT:

In the case of plate electrode, a watering pipe of 20 mm dia of medium class G.I pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided on the top of this pipe for watering the earth. In case of pipe electrode a 40mm x 20mm reducer shall be used for fixing the funnel. The watering funnel attachment shall be housed in a masonry enclosure of not less than 30cm x30cmx30 cm. A cast iron/M.S frame with cover and locking arrangement shall be suitably embedded in the masonry enclosure.

3. LOCATION OF EARTH ELECTRODE:

Normally an earth electrode shall not be situated less than 1.5m from any building. Care shall be taken that the excavations for earth electrode shall not effect the column footings or foundations of the building. In such cases the electrodes shall be situated farther away from the building.

The location of the earth electrode shall be where the soil has reasonable chance of remaining moist, as far as possible. Entrances, pavements and roadways, are definitely to be avoided for locating the earth electrode.

4. METHOD OF CONNECTING EARTHING LEAD TO EARTH ELECTRODE:

In the case of plate earth electrode the earthing lead shall be securely bolted to the plate with two bolts, nuts, checknuts and washers. In the case of pipe earth electrode, it shall be connected by means of a through bolt, nuts, washers and cable socket.

All materials used for connecting the earth lead with electrode shall be G.I in case of G.I pipe or G.I plate earth electrode and of tinned brass in case of copper plate electrode.

The earthing lead shall be securely connected at the other end to the main board Loop earthing shall be provided for all mountings of mainboard and other metal clad switches and distribution fuse boards with not less than 14 SWG copper or 12 SWG G.I or 4 sq.mm. Aluminium wire.

The earthing lead from electrode onwards shall be suitably protected from mechanical damage by a 15 mm dia G.I pipe in case of wire and by 40mm dia medium G.I pipe in case of strip. Portions of this protection pipe within ground shall be buried at least 30 cm deep (to be increased to 50 cm in case of road crossing and pavement). The portion within the building shall be recessed in walls and floors to adequate depth.

VI VOICE AND DATA WIRING SYSTEM:

1. CONDUITING:

All conduiting in concealed/ surface installation including the conduit run above the false ceiling space shall be carried out with heavy gauge black enameled MS Conduit. The specification for materials & installation shall be same as described in electrical section. All relevant clauses are applicable for telephone system as well. Where the conduits for telephone system and electrical power are running parallel to each other, a minimum distance of 150mm shall be maintained between the two. Wherever telephone conduits cross power conduits, they shall be at right angles to each other.

Size of Cable	Conduit Size
Up to 5 cables	25mm
Above 5 up to 8 cables	32mm
Above 8 up to 13 cables	40mm

The size of conduit shall depend upon number of wires to be drawn. However minimum size of conduits shall be 25mm.

VII.15.2 SPECIFICATION OF THE ELECTRICAL LIGHTING EQUIPMENT OF HOSPITAL

#	Title and technical parameters	Type, mark, document reference	Unit	Q-ty
	Internal nets (lighting)			
1	Distribution box with lead-in switch BA51-33 and 9 distribution box BA51-33	ЩУ851-401531 УХЛ3	Pcs.	3
2	Lightening board with lead-in cutoff switch BA23-33 63A and 6 distribution box BA23-13	ЩУ851-381431 УХЛ3	Pcs.	3
3	Lighting fixture with one incandescent lamp	НПО18-60	Pcs.	30
4	Lighting fixture with two luminescent lamps (protected)	ЛСП -2x40	Pcs.	14
5	Lighting fixture with two luminescent lamps (ceiling)	ЛПО-2x40	Pcs.	18
6	Emergency lighting fixture for providing of evacuation and reserve lighting	ЛБО 29-9-831	Pcs.	41
7	Lighting fixture for incandescent lamp (protected)	LSO-1351-01	Pcs.	5
8	Lighting fixture with two luminescent lamps (ceiling)	ЛПО-1x40	Pcs.	116
9	Lighting fixture for incandescent lamp (protected)	НСПО2-100-003	Pcs.	10
10	Automatic cutout	АП50-2MT	Pcs.	15
11	Lighting fixture with two luminescent lamps (ceiling)	ARS/S2x40	Pcs.	12

12	Single-button switch underplaster installed	BC1Y-125-6	Pcs.	191
13	Double-button switch underplaster installed	BC5Y-227-6	Pcs.	15
14	One-place socket underplaster installed for 10A	PC10-122-6	Pcs.	171
15	Lighting box	У-196УХЛ4	Pcs.	210
16	Assembling box for sockets and switches Л90	Л90	Pcs.	371
17	Wire with copper threads cut-1,5мм2	ПВ1	м	8880
18	Wire with copper threads cut-2,5мм2	ПВ1	м	4770
19	Luminescent lamp	ЛБ-40	Pcs.	261
20	Starter	80С-220	Pcs.	261
21	Incandescent lamp	БК-220-230-60-1	Pcs.	30
22	Incandescent lamp	БК-220-230-100-1	Pcs.	8
23	Wire with copper threads cut-1,5мм2	ПВ1	м	450
Internal nets (power equipment)				
1	Distribution box with lead-in switch and 6 distribution box BA57-31	ПР8503-3131-1УХЛ3	Pcs.	5
2	Wire with aluminum threads cut-2,5мм2	АПВ-0,38	м	289
3	Wire with aluminum threads cut-6мм2	АПВ-0,38	м	95
4	Wire with aluminum threads cut-25мм2	АПВ-0,38	м	80
5	Power cable with aluminum threads cut-4x25мм2	АВВГнг	м	20
6	Plastic pipe ø25	GOST 1839-80	м	12
7	Plastic pipe ø32	GOST 1839-80	м	25
8	Plastic pipe ø40	GOST 1839-80	м	14
9	Steel pipe ø25	GOST 10704-63	м	15
10	Magnetic starter 1 st dimension 6A	ПМЛ 122002	Pcs.	1
11	Wire with copper threads cut-3x1,5мм	кг	м	22
Supply net				
12	Lead-in device with counters and 2 cutouts	ВРУ-3-11	Pcs.	1
13	Distribution box for 10 groups 100A	ВРУ-3-25	Pcs.	2
14	Wire with aluminum threads cut-2,5мм2	АПВ-0,38	м	30
15	Wire with aluminum threads cut-4мм2	АПВ-0,38	м	230
16	Wire with aluminum threads cut-6мм2	АПВ-0,38	м	55
17	Wire with aluminum threads cut-10мм2	АПВ-0,38	м	21
18	Wire with aluminum threads cut-16мм2	АПВ-0,38	м	75
19	Wire with aluminum threads cut-25мм2	АПВ-0,38	м	130
20	Wire with aluminum threads cut-35мм2	АПВ-0,38	м	145
21	Plastic pipe ø25	GOST 1839-80	м	44
22	Plastic pipe ø32	GOST 1839-80	м	30
23	Plastic pipe ø40	GOST 1839-80	м	35
24	Cable with copper threads cut-4x6мм2	ВВГнг	м	64
25	Reversible magnetic starter	ПМЛ352002	Pcs.	4
26	Automatic cutout	АП50-2МТ	Pcs.	1
27	Cable with copper threads cut-5x4мм	ВВГнг	м	21

VII.15.3 SPECIFICATIONS OF THE EQUIPMENT FOR THE EXTERNAL ELECTRICAL NETS AND BOILER ROOM

#	Title and technical parameters	Type, mark, document reference	Unit	Q-ty
Electrical nets 10kWt				
1	Prepacked transformer substation city type	ТП-2x250/10/04	Set	1
2	Cable with aluminum threads isolated by armored polyvinylchloride cut-3x95 мм2	АВВБ-10кВ	м	310
3	Cable thimbles		Pcs.	2
4	Brick		Pcs.	1500
5	Sand		м3	5
6	Asbestos pipe ø150		м	8

	Electrical nets 0,4 kWt			
7	Cable with aluminum threads cut-3x6 мм	АВВГнг-1	м	295
8	Cable with aluminum threads cut-5x10мм	АВВГнг-1	м	85
9	Armored cable with aluminum threads cut-5x70 мм	АВБбШв-1	м	300
10	Isolated cable with copper threads cut-1x35 мм	ПВ1	м	30
11	Internal installed end sleeve	КВЭл-1-3x70	Pcs.	8
12	Power cable with copper threads cut-3x1,5мм	ВВГнг-0,66	м	120
13	Lighting fixture for mercury lamp	РКУ24-125-001	Pcs.	12
14	Mercury lamp 125 Wt	ДРЛ-125	Pcs.	12
15	Pluggable cantilever	КС-1	Pcs.	12
16	Board	OIV	Pcs.	12
17	Reinforced concrete support of external lighting	M12	Pcs./м3	12/4,56
18	Power cable with aluminum threads cut-5x6мм	АВВГнг-1	м	126
19	Steel pipe ø32мм		м	39
20	Asbestos pipe ø150мм		м	6
21	Starter	80С-220	Pcs.	261
22	Incandescent lamp	БК220-230-60-1	Pcs.	30
23	Incandescent lamp	БК220-230-100-1	Pcs.	8
24	Wire with copper threads cut-1,5мм	ПВ1	м	450

VII.16 FIRE ALARM

VII.16.1 FIRE ALARM

The fire alarm design was developed based on assignment for designing of architectural construction section and according to the requirements SNIP 2.04.09-84 and ПУЭ-87. The distribution net of fire alarm should be performed by wire КПСВЭВ-1x2x0,75 mm². The wire should be installed in pipes between the floors. All the connections and turnout of the wires should be performed by welding or soldering. Sound and light warning should be fixed in foyer and corridors of the 1st, 2nd and 3rd floors.

The powering of control and indicating equipment should be performed from the alternating current net 220W. The control and indicating equipment should be installed with the height 0,8-1,5m from the floor.

The fire-alarm box should be installed according to the technical documentations requirements for the mentioned box on ceiling not near 0,5m from the lamps, not near 1m from the ventilation system gaps, not more than 4,5m from the walls and not far 9m from each other.

There is automatic cutout of the ventilation system when the fire is happen.

The devise "Signal-20" as a receiving station of the signals should be installed with the height 1,5m from the floor. The number and type of fire-alarm boxes chosen taking into account area and terms of the premises. The smoke detection automatic fire alarm type ИП101-18А2R1 and manual fire alarm type ИПР-3СУ will be applied as a detector of fire alarm.

The manual fire alarm type ИПР-3СУ should be installed in the walls with the height 1,5m from the floor. The fire alarm stubs should be performed by wire КПСВЭВ 1x2x0,75. The wire screen should be grounded. The alarm line should be performed by cable mark ШВВП 1x2x0,75.

Fire warning will be done automatically by the devise "Signal-20" leading light and sound signals by fire alarm type "Mayak-12-КП" (U=12В, I=75mA).

The works for wiring, installation of fire alarm equipment should be performed according to the safety regulations.

VII.16.2 SPECIFICATION OF EQUIPMENT AND MATERIALS

#	Title and technical parameters	Type, mark, document reference	Unit	Q-ty
1	Control and indicating equipment	Signal-20	Pcs.	1
2	Smoke detection fire alarm	ИП101-18А2R1 исп.01	Pcs.	112
3	Manual fire alarm	ИПР-3СУ-8	Pcs.	112
4	Combined fire alarm	Mayak-12КП	Pcs.	9
5	Wire, cut-1x2x0,75mm	КПСВЭВ	м	498
6	Wire, cut-1x2x0,75mm	ШВВП	м	95
7	Corrugated pipe ø16		м	20

VII.17 GLASS AND GLAZING

VII.17.1 GLASS

GENERAL REQUIREMENTS

- i. All glass shall be sheet glass of approved quality unless otherwise specified and shall be of the various sizes and thickness as shown in drawing and GOST III-78 & SNIP III-21-83*.
- ii. All glass shall be free from bubbles, distortion & flaws of every kind and shall be colourless if not mentioned otherwise.
- iii. Each piece of glass shall bear a label indicating the name of manufacturer, thickness and type of glass. Label shall remain on glass until fixing and final cleaning.

SAMPLES

Samples of each type of glass of specified size bearing the name of the manufacturer, thickness & type of glass shall be submitted to the Engineer for approval.

VII.17.2 GLAZING

GENERAL REQUIREMENTS

- i. All glazing works shall be performed in accordance with the typical glazing details shown on drawings, GOST and SNIP.
- ii. Joints and spaces to be sealed shall be thoroughly dried and made free from dust and other foreign materials before glazing.
- iii. All glass shall be set with proper clearance as recommended by the manufacturer at all edges. Glass with nipped or damaged edges shall not be installed.
- iv. Adjacent materials which are solid shall be cleaned immediately before the sealant and compound harden or stain the adjoining surfaces.

GLAZING OF WOOD AND METAL WINDOWS

- i. First a thin layer of sealant made of chalk, double boiled lin-seed oil and resin is to be applied to the frame surface to come in contact with glass.
- ii. Then the glass will be set taking care to center with equal clearance of jambs between glass and frame.
- iii. The glass is then pressed firmly into the place against sealant.
- iv. A bead of sealant is then to be laid into the space between glass and frame. Then sufficient sealant will be applied so that when top is put in place, the sealant will be forced between glass & stop and completely fill the space between frame, glass and stop.
- v. The removal stop is then to be installed.
- vi. The remaining space between the face of glass and stop shall be completely filled with sealant.

VII.17.3 MIRROR

The thickness of mirrors shall be as specified in the drawings and SNIP. They have a silver coating hermetically sealed with uniform coating of electrolytic copper plating and the copper protected by a coat of mineral oxide. Oil base paint mirrors shall be fixed in position in accordance with architectural drawings.

VII.17.4 DEFECTS AND BREAKAGE

- i. The Contractor shall replace the glass, which does not comply with specifications or having defects not permitted by the manufacture's grading rules.
- ii. The Contractor shall replace the glass, which is broken or cracked or chipped by his own men or due to faulty installation.
- iii. The Contractor shall replace all glass broken or cracked or chipped by any other cause, so that all glasses are in perfect condition at the time of acceptance of the building

VII.17.5 CLEANING

No glazing shall be considered complete until & unless paints and other stains have been removed from the surface of the glass. Glass must be cleaned and polished with pads of damp cloth and with clean & dry soft cloths. It will have to be finally finished with appropriate glass cleaning fluid and made absolutely free of foreign materials

VII.17.6 MEASUREMENT AND PAYMENT

Measurement and payment for the work under this article shall be made in square metre measured by the actual openings in the frames (wood & steel) on completion of glazing work as per drawings, specifications and on instruction of the Engineer.

VII.18 PROVISIONAL SUMS

VII.18.1 DAY WORK

This item includes ППР (draft of the works performance), ПОР (draft of the works organization), calendar work schedule and net schedule of works, which are cover day work by labour, material, schedule of the construction works, consistency of the works performance, supply of construction materials etc.

VII.18.2 SPECIAL GRASS COVER

This item covers the supply and plantation of specified grass and trees mentioned in the drawings within the school area where and as directed by the Engineer. If required specification and Bill of Quantities for the work shall be issued to the Contractor for pricing four (4) months prior to Practical Completion.

Upon approval of rates and prices by the Engineer, a work order shall then be issued to the Contractor who shall proceed with the work immediately upon receipt of work order.

VII.18.3 MEASUREMENT AND PAYMENT

The supply and planting of special grass and trees are covered under provisional sum. Payment shall be made on provisional sum (PS).

VII.19 LIFT FOR DISABLED PERSONS

General conditions and requirements to lift shaft

Installation of the lifts will be performed by grain node with building crane. Accordingly arranging of coverings over the lift shaft should be done after installation lift equipment. The coverings of the engine house also will be arranged after supplying of the lift equipment.

The framing of the doors openings of shaft doors will be produced by the manufacturer with Purchaser agreement.

All sides of the shaft should be fenced for whole height and it should have top covering and floor. The internal surface of the shaft wall from the entrance side to the cabin for the whole width of the opening plus 25mm for each side should be without protuberances and cavity. On this surface may be protuberances and cavity not more than 100mm and the same time protuberances and cavity more than 50mm should have skew from above and from below with angle not less than 60° to horizontal.

The skews should be arranged for the whole width of protuberance or cavity and bordered to the shaft wall from the side of entrance to cabin. The sink should be saved from ground water and wastewater. It is not applicable installation of equipment and communication in the lift shaft, which are not related to lift except heating and ventilation system of the shaft and the same time start-controlling devices of the mentioned system should not be inside of shaft.

Deviation of the shaft width and depth from the normal sizes should not be more than 30mm. The difference of the shaft diagonals (according to the plan) should not be more than 25mm. Deviation of the shaft axis from the vertical plane should not be more than 30mm.

The thickness of the embedded fittings should be not less than:

- 8mm for the fastening of guiding;
- 5mm for the fastening other elements.

Deviation of the embedded fittings for the fastening of guiding from their normal condition should not be more than:

- 80mm in vertical direction;
- 10mm in horizontal direction.

Deviation of symmetry of the doors opening axis to the general vertical axis of the doors installation should not be more than 10mm. The shaft walls should be vertical without protuberance and cavity (except embedded fittings).

Deviation of the shaft walls from the vertical plane should not exceed 15mm under height of cabin lifting up to 45m.

Passenger hospital lift, GOST 5746-83

Destination

The passenger hospital lift GOST 5746-83 is for installation in apartment buildings and civic buildings for the purpose to carriage of passengers, including patients (the weight of the wheelchair together with accompanied cargo not exceed nominal capacity of the lift).

Technical parameters of the lift

- lifting capacity, 630 kg
- traverse speed, 1,0 m/s
- lifting height, max, 27,5 m
- cabin size in plan, 1080x2200x2100 mm
- width of door gap, 900 mm
- shaft size, 2250x2950 mm
- depth of pit, 1400 mm
- height of top storey, 3800 mm

Principle of operation

When the call button is push in the landing storey, the cabin will come to the level of exact stopping. The lift doors will be opened automatically. The passenger enters to the cabin and pushes the command button of the necessary storey. The lift doors will be automatically closed and the lift will going with nominal speed. When the lift cabin coming to the sensor of necessary storey, the lift will slow down and stop on the level of exact stopping and open doors. The passenger leaves the lift cabin, doors will be closed and the cabin will stay till the next call from any other storey.

VII.20 ENVIRONMENTAL MANAGEMENT PLAN

Mitigation

Construction

Pollution Prevention Measures:

Pollution of the territory. Specific mitigation measures should be implemented at the construction site for prevention of contamination of the school territory and adjacent areas:

Contractors will ensure the proper handling of lubricants, fuel and solvents. All tanks will be placed in a bund of at least 110% of the tank's maximum capacity. If more than one tank is stored within the bund, the system must be capable of storing 110% of the biggest container's capacity or 25% of their total capacity, whichever is greater. The bund will be impermeable (e.g. concrete-lined), without drainage points or other breaches. Accumulated rainwater in bunds will be pumped out of the bund to either drains or the ground if uncontaminated. In case of fuel spillage the spilled fuel should be recollected and contaminated bund treated by the absorbents: sawdust, sand or straw.

All fuel / hydrocarbon dispensing nozzles are to be of a drip control design and securely locked when not in use.

Vehicles will not be left without supervision during refueling process. All refuelling operations on the working sites will use absorbent pads and/or straw to minimise spills, which will be put in place prior to the commencement of refuelling operations. Soiled ground and absorbents will be removed, stored and treated as hazardous waste. In case of significant spill authorized and responsible person will be informed, works will be stopped till the elimination of pollution risk. Refuelling will always be carried out with the correct equipment (i.e. nozzles of the appropriate size), and only by suitably trained and experienced Refuelling Operators. Fuel supply equipments will be regularly revised to prevent leakage due to inappropriate condition of refueling equipments. Equipment and storages will be isolated and guarded to prevent pollution due to cases of stealing or vandalism. All mobile plant, including but not limited to cranes, compressors, generators, bulldozers, excavators etc. and storage tanks will be maintained and operated such that all leaks and spills of materials will be minimised. Daily plant checks (Vehicle Maintenance Procedure) will be undertaken to ensure no leaks or other problems are apparent. Vehicle maintenance, cleaning, degreasing etc will be undertaken in designated areas of hard-standing, not over made ground.

Waste Handling

All wastes, including excess soil and rock, from the construction site will be disposed of in accordance with local environmental regulations and at sites approved by the environmental authority. The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in:

- Waste handling
- Waste treatment; and
- Waste storage.

Burning of waste on any construction site is forbidden.

Noise, dust and emissions

All vehicles shall be maintained so that their noise and emissions do not cause nuisance to workers or residential area. Activities will be limited to daylight working hours to reduce impacts. All vehicles will be checked and repaired in case of need to eliminate increased level of noise due to damaged parts.

Regular maintenance of diesel engines will be undertaken to ensure that emissions are minimised, for example by cleaning fuel injectors. Routine maintenance will be to a high standard to ensure that vehicles are safe and that emissions and noise are minimised. All plant used on site will be regularly maintained so as to be in good working order at all times to minimise potentially polluting exhaust emissions.

Vehicle refuelling will be undertaken so as to avoid fugitive emissions of volatile organic compounds through the use of fuel nozzles and pumps and enclosed tanks (no open containers will be used to stored fuel).

If deemed necessary in dry conditions or where significant quantities of dust are being or are likely to be produced mitigation measures will be arranged with the Construction Manager. Mitigation measures will include:

- Damping down using water bowsters with spray bars or other technical means;;
- Sheeting of construction materials and storage piles; and
- Reductions in vehicle speed where required. Materials will be transported to site in off peak hours.

- Materials transported to site will be covered/ wetted down to reduce dust. The construction site will be watered as appropriate. Protective equipment will be provided to workers as necessary. All vehicles will be checked and repaired in case of need to eliminate increased emission due to damaged parts

Topsoil Protection

The topsoil will not be handled by Contractor when the following conditions are observed:

- The topsoil is frozen;
- The site is experiencing persistent rainfall;
- The topsoil is saturated; or
- Handling will damage the structure of the topsoil.

Topsoil Storage

The storage of topsoil in stockpiles, no more than 2m high with side slopes at a maximum angle of 45°, will take into consideration the following:

- Dedicated storage locations that prevent the stockpiles being compacted by vehicle movements or contaminated by other materials;
- Segregation from subsoil stockpiles;

Topsoil stockpiles will be monitored and should any adverse conditions be identified corrective actions will include:

- Anaerobic conditions - turning the stockpile or creating ventilation holes through the stockpile;

Subsoil Storage

The storage of subsoil in stockpiles, no more than 3m high with side slopes at a maximum angle of 60°, will take into consideration the following:

- Dedicated storage locations where the stockpiles will not be compacted by vehicle movements or contaminated by other materials; and
- Segregation from topsoil stockpiles.

Reinstatement

The preexisting landscape will be reinstated and landscaping and planting of greenery will be implemented in accordance with appropriate standards.

Construction Materials

- Licensed material supply sites will be used. .

Safety and Access

- Appropriate lighting and signs will be employed for safety reasons. The transportation schemes and construction site will be planned to minimize impacts on traffic and access and ensure acceptable level of safety.

Mitigation - Exploitation Phase

- The sewage system should be designed and maintained in accordance with technical standards;
- Power generator and heating device emissions should be in compliance with the standards and approved limits. The inventory of sources of emission and approval of emission limits should be conducted in accordance with the Tajikistan environmental legislation. Inventory of sources of emission and air dispersion modeling for approval of emission limits should be prepared by competent environmental consulting company;

Monitoring

The monitoring plan for the project is summarized in Appendix1. Monitoring measures include site supervision, verification of permits, monitoring of compliance of the contractor performance and environmental impacts like: noise, dust, air emissions etc.

The Education Modernization Project's Chief Engineer and the Engineer-Monitor, who will conduct construction supervision, are responsible for environmental monitoring.

Implementation Arrangements

Overall responsibility for the coordination and implementation of the Environmental Management Plan will be with the Education Modernization Project. As such they will be responsible for liaising with environmental authorities, the residents of the surrounding blocks and the contractors engaged for construction on environmental issues associated with the implementation of this Plan for Contractors.

The Education Modernization Project will be responsible for ensuring that the following requirements are met: (i) Tajikistan environmental regulations; (ii) environmental permits are obtained; (iii) waste is disposed to a licensed disposal site; (iv) any other requirements identified by the Ministry of Environment and agreed with the Education Modernization Project; and (v) the Environmental Management and Monitoring Plans are implemented.

Costs of Implementation

The costs of environmental activities associated with construction will be included in the contract for construction.

Approval of the Project by the Authorities

The project has been approved by the Ministry of Education of the Republic of Tajikistan.

Safety Requirements

The contractor should ensure the safety of children during construction and sound not to disturb the classes; a fence will be put between the existing school and the site; a net would be put at appropriate level so that the loose materials do not fly into the existing school; the issues of dust pollution should be addressed specially because the classes would be functioning when these activities are executed; a separate gate will be used for flow of materials and labour. The existing school gate will function normally; the contractor will temporarily connected to the municipal engineering nets (central water-supply, electric communications, sewage etc.) separately from the existing school.

Appendix 1. Environmental Monitoring Plan

Phase	What? (parameter is to be monitored)	Where? (is the parameter to be monitored)	How? (is the parameter to be monitored /type of monitoring equipment/?)	When? (is the parameter to be monitored – frequency of measurement or continuously)	Responsible Institution
Material supply	Possession of official approval or valid operating license	Supplier of materials (cement and gravel)	Inspection	Before work begins	Plant operator; oversight UNDP/ Engineer-Monitor
Material transport according to the schedule and routes defined for deliveries	Truck loads covered/ wetted Air pollution due to the dust and fumes related to the Material Transport	Construction site and adjacent access road/	Supervision	Unannounced inspections during work hours	Works contractors; oversight UNDP/ Engineer-Monitor
Top-soil stripping stage. Final reinstatement.	Top-soil storage. Reinstatement. Landscaping	Construction site	Supervision	Periodic (Unannounced inspections during work hours); Following completion of the works.	Works contractors; oversight UNDP/ Engineer-Monitor
Work hours	Noise levels; Equipment;	Construction site	Inspection; noise measuring device	Periodic (average once per week); Following complaints	Works contractors; oversight UNDP/ Engineer-Monitor
Work hours	Vibration	Construction site	Supervision	Unannounced inspections; following complaints	Works contractors; oversight UNDP/ Engineer-Monitor
Work hours	Dust and Air pollution (solid particles, suspended solids, flying heavy metal particles)	At the construction site	Visually	During material delivery and periodically in dry periods during construction	Works contractors; oversight UNDP/ Engineer-Monitor
Reinstatement	Removal of construction wastes Reinstatement Landscaping	At the construction site	Supervision, inspections	Supervision during working hours; unannounced inspections. Replacement of removed vegetation after completion of construction.	Works contractors; inspections by UNDP / Engineer-Monitor
Whole construction period.	Vehicle/ pedestrian access Visibility/ appropriate signs	Construction site	Observation	Once per week in the evening	Works contractors; oversight UNDP/ Engineer-Monitor
Whole construction period.	Material and waste storage, handling, use	Material storage areas;	Observation	During material delivery and periodically during construction (average 1/week), especially during precipitation (rain/ snow/ etc).	Works contractors; oversight UNDP/ Engineer-Monitor
Whole construction period.	Equipment maintenance and fueling	Material storage areas; equipment maintenance facilities	Observation	During material delivery and periodically during construction (average 1/week), especially during precipitation (rain/ snow/ etc).	Works contractors; oversight UNDP/ Engineer-Monitor
Worker safety	Protective equipment. Organization of traffic by-pass	Construction site	Inspection	Unannounced inspections during works	Works contractors; oversight UNDP/ Engineer-Monitor

Phase	What? <i>(parameter is to be monitored)</i>	Where? <i>(is the parameter to be monitored)</i>	How? <i>(is the parameter to be monitored /type of monitoring equipment/?)</i>	When? <i>(is the parameter to be monitored – frequency of measurement or continuously)</i>	Responsible Institution
Whole construction period	Safety of patients: a fence will be put between the existing hospital and the site. The fence will be metal plate	Construction site	Observation	During construction period	Works contractors; oversight UNDP/ Engineer-Monitor