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Section 6 – Employer's Requirements

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Annotation

Description of works to be executed is provided in Bill of Quantities which is integral part of tender documents. Please, refer to the attached **Detail** and **General Specifications**.

The construction site is located in Eastern Georgia, in Akhaltsikhe Municipality, Village Agara (c.c. 62.05.58.505).

The area selected for the project is free of buildings. The facade of the building will be decided in a modern style and cheerful colors. The new two-story building will be located at the extreme north point of the project land plot, and the rest of the yard will be used to arrange entertainment grounds, attractions and a recreation area.

The project envisages thermal insulation of the building, low emission glass package will be used, which will further reduce energy consumption and save budget.

The new kindergarten will feature bedrooms and playrooms, dressing rooms, a buffet, a pantry, a hall, a storage room for products, a doctor, an administration, a dishwasher, a kitchen, an elevator, an evacuation ladder and a boiler room.

The project envisages the improvement of the yard of the kindergarten, the arrangement of entertainment attractions, playgrounds, swings, yard chairs, skating rinks, garbage bins and drinking water fountains (so-called mushrooms).

The project also includes the arrangement of engineering networks of the building: water supply and sewerage, electricity, weak system, heating-cooling-ventilation, etc.

The contractor is obliged to carry out an engineering geological and hydro-geological survey of the land plot, an expert opinion must be issued on the engineering-geological survey in compliance with the current legislation. Following an engineering geological survey, the contractor must recalculate the existing typical design project and, if necessary, make appropriate changes to the design project and the relevant parts of the estimate. The constructive part should be presented in the same way; the conclusion of the examination should be. Similarly, the contractor must submit an expert opinion on the proposed project in accordance with Resolution 41. The contractor must ensure the topo-shooting of the construction area, the preparation of vertical plans, the adjustment of the typical landscaping project to the actual land plot, and, if necessary, the relevant changes made. The contractor must also submit a project for the external engineering parts. The expert organization / person must meet all the requirements required by law. The deadline for submitting a typical project (adjusting to a real plot of land) and submitting the required examinations is 3 months.

The costs for examination and amendments in project documentation will not be compensated; thus the contractor is requested to consider the related costs into the price.

Upon completion of examination and performance of any amendments in the project, the contractor is obliged to present full version of the project in 5 samples together with electronic version.

Duration of the project each kindergarten: 15 months, including examination and project corrections – 3 months, construction period-12 months.

Fulfillment of the requirements defined under IEE document is compulsory for the Contractor. Those have to be performed once the Contractor receive the specific notification from the Client.

The Contractor is required to conduct a full review of the design drawings and Bill Of Quantities to identify any potential deficiencies or shortcomings, and to rectify these, and provide a fully translated set for use by the Supervising Consultant. This is to be done at the Contractor's own expense.

Any and all specifically named models of equipment, materials, or suppliers mentioned in design drawings and Bills of Quantity are examples only, the Contractor is to determine the type of equipment or material, and supplier, to meet the requirements of the Specifications of the design.

Prior to the commencement of the construction works, the Construction Contractor is obliged to prepare Site-specific environmental plan (SSEMP) under which the Site Specific Health and Safety Management Plan (SSHSM) is attached. The SSEMP will be submitted to the Employer and Supervision Company for approval at least 10 days before taking possession of any work site. No access to site will be allowed until the SSEMP is approved by the project management Unit (PMU). The SSHSM shall be submitted and agreed with the Project Manager and the Employer.

General Specifications

1. GENERAL

Technical part describes main technical works and materials needed for realization of the works within the frames of the Project by the observance of engineering norms and rules currently in force on the territory of the state. The present specification is general in nature and does not claim to describe all of the works and facilities to be provided under this Contract. Detail descriptions/specifications of works, required materials and equipment as well as quantities are provided in BOQs and drawings. Names of manufacturers or product brands indicated in the documents are for general information only referring to acceptable quality of goods and are not mandatory requirements.

2. BUILDING WORKS

2.1 Preliminary works

Construction of fencing should satisfy the demands of state standard 23407-78. Height of the protecting fence (with caps/visors and without it) should be 2 m, with protecting caps – 2 m, without it – 1,6 m; height of the tower for signaling fencing should be 6 m. caps over the fence should be mounted by 20 ° inclination towards the footpath. Area in horizontal projection – 1.25-1.3 m. Thickness of boards of caps-maximum 40 mm.

The width of footpath pavement should be determined according to population traffic intensity within the frames of 0,7-1,2 m distance. On the side of transport traffic the pavement should be equipped with protective fence, which should consist of posts and handle. Height of the handle (hand-rail) should be 1.1.m. Handles should be fixed in the inner side of the post.

Elements of wooden fence, which are in contact with the ground, should be covered with anti static liquid.

Fence boards, caps, pavements, posts, banisters, joining nods should be made of deciduous /larch and coniferous (soft) wood material of minimum third grade.

At the approval of fencing jobs its right and vertical states should be inspected. Posts should not sway and ready elements should sit in the contour firmly.

2.1.1 Dismantling works

From the front facade protecting packaging grid should satisfy the demands of state standards. The garbage pipes must be installed on two sides with posts.

Dismantling of roof layers and covering, brick partitions, brick walls, natural stone floors, facades and stairwells must be packed after and stored in warehouse.

Withdrawed construction garbage must be loaded on excavator and should be transported on a special location point given from local municipality administration.

3. EARTHWORKS

3.1. Excavation of ground

3.1.1. Forms of work

The present paragraph of the specifications deals with removal of plants, wood logs, stone blocks existing within the limits of the object, including quarries, their shifting, work in the constant or temporary ground-fill as well as smoothing out and profiling according to those contours and marks which are needed for construction, for assembling of equipment or organization of the area of the object, as shown on drawings, are referred to in the present document or might be referred to by the project manager. Jobs of ground removal cover; arrangement of cavities, canals et al, their keeping, transportation and disposal of the removed ground.

Designing, delivery to the site, fixing, keeping and dismantling of any needed fixtures, rabbit walls, limitation/fencing and strengthening by boards;

Control over surface or ground water leaking from any source or due to any reason in the places of ground removal/excavation and their extirpation by the use of any method, including changing direction of water flow, accumulation or pumping.

Disposal of the excavated ground should be performed at the instructions of the project manager and according to the relevant paragraphs of the present specifications.

3.1.2. General demands

- a) Minimum three working days prior to starting excavations, the contractor should notify the project manager about starting of jobs. The contractor, before the ground excavation works are started, should submit to the project manager the plan of works for its approval. The working plan should state the method of ground removal, safety measures, list of equipment and other details.
- b) The contractor should make all measures and should use the most appropriate method of ground removal, in order to avoid weakening or decomposition of rocks - within the frames of the contours and limits which should be given on drawings or be referred to by the project manager.
- c) Ground removal should be performed by the provision of those labels and contours, which should be given on drawings or be referred to by the project manager. Temporary canals made by the contractor should be stable and agreed upon in advance with the project manager.
- d) Ground should be excavated by the methods which would enable one to implement building works duly,
- e) Excavations within the limits of underground waters and below it, need corresponding system of water removal, which should be approved by the project manager.
- f) When the fixed levels and limits of ground excavations are reached the project manager will inspect the soil of the open cavity. If the project manager considers that any part of that ground is inadmissible by its type/form, he may give to the contractor the right to continue ground excavation. If as a result of inspection carried out by the project manager or due to the fact that in the process of excavations they reach the weak, splitting or organic ground not fit for the goals of works, additional excavations might be performed beyond the levels given on drawings.
- g) If the ground of a canal bottom or sides which was considered acceptable by the project manager gradually becomes non-fit due to weather or flooding, or it became soft and loose in the process of works, the contractor should remove this damaged, softened or loosened material and should continue ground excavation to the non-damaged surface and then should fill it by due material till the needed level, by the observance of instructions of the project manager.
- h) Removed ground, which is unfit for ground-fill, should be transported to the territory of a dump. The contractor should smooth out and bring in order the territory of a dump within the corresponding frames of contours and levels.
- i) The Contractor should dislocate buildings/premises according to the marks given on drawings and should use frames, axes of lay out and coordinates referred to by the client/project manager. The contractor will be responsible for adequate dislocation of all premixes. Any extra work, which might become necessary due to his carelessness in the process of mark fixing, should be implemented at his costs and should be done immediately at the demand of project manager.
- j) Contractor shall be accountable for carrying out necessary measures of safety. To avoid the accidents the contractor should observe strictly the safety rules from the beginning of works to the moment of handing over.
- k) The contractor should make all possible measures and should use the most appropriate methods of ground excavation, in order to avoid rock loosening or ruining beyond the limits of levels given on drawings or referred to by the project manager. If because of any reason excavations are carried out beyond the lines and levels given on drawings or referred to by the project manager – the contractor, at his own costs should make any steps to restore necessary lines and levels by the use of the approved material (such as ground backing or concrete) and by the method referred to by the project manager.
- l) Unit price should contain wood fixtures needed for ground excavations, all material and labor needed for their assembling/erection, keeping and dismantling, as well as the resources needed for decrease of landslide threat etc. If during ground excavation the landslide occurs due to the used incorrect or improper methods, due to insufficient water-remo`val or supports, losses should be compensated by the

contractor, at his/its own costs. Transportation/removal of the material obtained after such incident and any necessary ground backing should be implemented by the contractor, at its costs.

3.1.3. Interpretation

Below, for the purposes of the present specifications we are listing materials to be used and/or processed in the process of ground excavations:

Cliffy rock -

of the strength and structure, mineral mass firmly fixed on the site, which can not be treated by manual pick.

Non-rocky grounds -

all material, which do not correspond to the above given definition of rocks.

Non-rocky grounds can contain the following components:

1. Clay - plastic ground which passes through No 200 USA standard sieve,
2. Silt - non-plastic or very weakly plastic ground, which passes through No 200 USA standard sieve.
1. Sand – mineral particles, which passe through No 4 and do not pass through No 200 USA standard sieve.
2. Gravel –rounded or partly rounded part of rock maximum 7,5 cm size, which does not pass through No 4 USA Standard sieve;
3. Boulder –cobble - rounded or semi-rounded piece of rock with mean sizes: 7.5-30 cm.
4. Boulder– maximum 0.7 m³ volume and maximum 30 cm size rounded or semi-rounded rock fragments.
5. Withered rock –mineral material, which is rather firmly fixed in its place and has such strength and structure that can be removed without application of explosive substances.
6. Non-solidified and loose mass of soil or ground , which is obtained by physical and chemical decomposition of rocks;
7. Mixture of slime-soil and water in liquid or weakly hard state.

Classification of Soils by Complexity of Processing (Used in Bill of Quantities)

#	Description of Soils	Average Density kg/m ³	Group of Earthwork		
			By Excavator	By Bulldozer	By Hand
1	Pebble-gravel-sand soils with particles' size:				
	a) up to 80mm	1750	I	II	II
	b) more than 80mm	1950	II	III	III
	c) more than 80 mm, boulder content up to 10%	1950	III	III	III
	d) more than 80 mm, boulder content up to 30%	2000	IV	IV	IV
2	Clay Soils				
	a) plastic soil without dirt	1800	II	II	II
	b) plastic soil with pebble and gravel inclusion up to 10%	1750	II	II	II
	c) plastic soil with pebble and gravel inclusion more than 10%	1900	III	II	III
	d) semisolid clay	1950	III	III	III
	e) solid clay	1950-2150	IV	III	IV
3	Earth (top soil)				
	a) without roots of bushes and trees	1200	I	I	I
	b) with roots of bushes and trees	1200	I	II	II

	c) with pebble and gravel inclusion	1400	I	II	II
4	Sand				
	a) without dirt	1600	I	II	I
	b) with pebble and gravel inclusion up to 10%	1600	I	II	I
	c) plastic soil with pebble and gravel inclusion more than 10%	1700	I	II	II
5	Loam				
	a) plastic soil without dirt	1700	I	I	I
	b) plastic soil with pebble and gravel inclusion up to 10%	1700	I	I	I
	c) plastic soil with pebble and gravel inclusion more than 10%, semisolid and solid with pebble and gravel inclusion up to 10%	1750	II	II	II
	d) semisolid and solid with pebble and gravel inclusion more than 10%	1950	III	II	III
6	Sandy loam				
	a) plastic soil without dirt	1650	I	II	I
	b) plastic and solid with pebble and gravel inclusion up to 10%	1650	I	II	I
	c) plastic and solid with pebble and gravel inclusion more than 10%,	1850	I	II	II

3.1.4. Profiling

For the completed work, the level of the surface cutting at the removal of ground should be the ordinal level, which is attained as a result of working by knife-grader, scraper or hand spade, less the cases when project manager gives the right to use other method.

For arranging concrete cover or ground-fill on the ground obtained after ground jobs. The loose and exhausted material should be removed from the excavated place in order to dislocate the object on the strong and clear base, or, where necessary, to lean against non damaged rocks. Methods of cleaning of the excavated material, in case of need, should contain treatment by compressed air spray. The project manager, prior to receiving ground works, should inspect and record geological structure of the foundation. Unit prices should cover all costs connected with profiling.

3.1.5. Methods of ground excavation/removal

The contractor should execute extraction of ground by open method and should make profiling according to the profiles, contours and levels given on drawings and/or referred to by the project manager.

Ground excavation should be implemented by the approved methods, which should enable to obtain material meeting the demands fixed for the materials of the places of the object, where the removed ground should be used according to the plant. The contractor, when necessary, should carry out trial excavation of ground, which should prove that the methods used for ground removal enable to receive needed material. Irrespective of the approval of the project manager, the responsibility for efficiency of a method of ground removal shall be imposed on the contractor. In the process of works the project manager should notify the contractor as to how fit is the ground to be removed or the excavated and treated material for building dykes/dams and ground embankments, which depends

on characteristics of material and the results of methods of extraction of ground used by the contractor, including its treatment, in case of need.

Whenever the activity of the contractor enables, the project manager should do his best to notify the contractor on the spot of loading if the extracted ground is fit for dams and ground embankments, which should be based on the results of inspection carried out by the project manager prior to transportation of material.

3.1.6. Disposal of the removed material

Conditions for extraction of ground should cover disposal of the extracted material by the use of any method listed below:

- ground backing at the finished (concrete) constructions, including temporary embankments and new loading-unloading;
- Loading, transportation of the extracted ground, and dislocation on the spot of temporary embankment, including forming, storing and draining.

3.1.7. Measuring and payment

If there are no other instructions, ground extraction should be measured by the use of the method convenient for the given situation, by vertical or horizontal sections or a method of averaging of sections.

Measuring of and payment for ground jobs organized for temporary roads and other temporary objects for the contractor will not be made.

Unit prices of ground extraction should cover all costs of ground extraction and disposal of extracted material including the expenses made for cleaning of the base for the arrangement of embankment, excavations, removal of vegetable cover of the ground, pulling down, trial drilling-explosion works and other jobs connected with drilling-explosion jobs, ground extraction, profiling, loading, spreading and dislocation, as well as jobs connected with embankments, dumps for extracted ground, ground cover and those connected with the present article.

4. Concrete and Reinforcement Works

4.1 Types of works

The present section covers preparation of concrete, its transportation, pouring, treatment, care and hardening, preparation of detailed drawings for reinforcement, their delivery, bending, fixing, as well as casings/centerings, seams, fillings for joints, treatment of joins and all forms of works connected with the concrete made on the spot and concrete to be assembled.

4.2 Standards

The present specification gives standards in abbreviated form. Below see a list of some standards and works for which they are used:

American Concrete Institute (ACI)

ACI 211.1	Standard practice for selecting proportions for normal, heavyweight, and mass concrete
ACI 305R	Hot weather concreting
ACI 315	ACI detailing manual

ACI 318 Building code requirements for reinforced concrete

American Society for Testing and Materials (ASTM)

ASTM A36 Specification for structural steel

ASTM A53 Specification for pipes, steel, black and hot-dipped, zinc-coated, welded and seamless pipes

ASTM A184M Specification for fabricated deformed steel bar mats for concrete reinforcement

ASTM A185 Specification for steel, welded wire fabric, plain, for concrete reinforcement

ASTM C31 Practices for making and curing concrete test specimens in the field

ASTM C33 Specification for concrete aggregates

ASTM C39 Test method for compressive strength of cylindrical concrete specimens

ASTM C88 Test method for soundness of aggregates by use of sodium sulphate or magnesium sulphate

ASTM C94 Specification for ready-mixed concrete

ASTM C117 Test method for materials finer than 75 µm (No. 200) sieve in mineral admixtures by washing

ASTM C127 Test method for specific gravity and absorption of coarse aggregate

ASTM C131 Test method for resistance to degradation of small-size coarse aggregate by abrasion and impact in the Los Angeles machine

ASTM C136 Method for sieve analyses of fine and coarse aggregates

ASTM C142 Test method for clay lumps & friable particles in aggregates

ASTM C143 Test method for slump of Portland cement concrete

ASTM 150 Standard Specification for Portland Cement

ASTM C151 Test method for autoclave expansion of Portland cement

ASTM C186 Test method for heat of hydration of hydraulic cement

ASTM C231	Test method for air content of freshly mixed concrete by the pressure method
ASTM C260	Specification for air-entraining admixtures for concrete
ASTM C309	Specification for liquid membrane-forming compounds for curing concrete
ASTM C311	Method for sampling and testing fly ash or natural pozzolans for use as a mineral admixture in Portland cement concrete
ASTM C494	Specification for chemical admixtures for concrete
ASTM D1190	Specification for concrete joint sealer, hot-poured elastic type
ASTM D1751	Formed expansion joint fillers for concrete paving and structural construction (Non-extruding and resilient bituminous types)
ASTM D1850	Specification for concrete joint sealer, cold-application type
ASTM D2419	Test method for sand equivalent value of soils and fine aggregate

British Standards (BS)

BS 340	Specification for precast concrete kerbs, channels, edgings and quadrants
BS 368	Precast concrete flags
BS 1200	Building sands from natural sources
BS 3148	Methods of tests for water for making concrete
BS 4871	Approval testing of welders working to approved welding procedures
BS 5135	Metal-arc welding of carbon and carbon manganese steels
BS 5400	Design & Specification of Steel-Concrete-Composite Bridges

U.S. Army Corps of Project Managers (US COE)

CRD C572	Specifications for polyvinyl chloride waterstops
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FSU State Standarts

GOST 26633-86	Concrete for Hydraulic Structures
GOST 7473-76	Ready-mixed Concrete. Technical Requirements
GOST 10178-85	Portland Cement and Blast Furnace Portland Cement
GOST 22266-76	Sulphate Resisting Cements

GOST 11052-74	Expanding Cement
TY 21-20-18 - 80	Self-stressing Cement
GOST 22237-85	Packing, Labelling, Transport and Storage of Cement
GOST 22236-85	Cements. Rules of Acceptance
GOST 310.1-76	Cements. Testing Methods
310.4-76	
GOST 5382-73	Cements. Methods of Chemical Analysis
GOST 10268-80	Aggregates for Heavy Concrete. Technical Requirements
GOST 10260-74*	Crushed Gravel for Construction Work
GOST 8267-82	Crushed Aggregate of Natural Rock for Construction Work
GOST 8268-82	Gravel for Construction Work
GOST 17539-72*	Concrete Aggregates for Reinforced Concrete and Concrete Pipes. Technical Requirements
GOST 8269-82	Crushed Aggregate of Natural Rock, Crushed-Gravel Aggregate and Gravel for Construction Work. Testing Methods
GOST 8736-85	Sand for Construction Work. Technical Requirements
GOST 8735-85	Sand for Construction Work. Testing Methods
GOST 23732-79	Water for Concretes and Mortars. Specifications
GOST 10922-75	Reinforcing Products and Welded Inserts for Concrete Structures. Technical Regulations and Testing Methods
GOST 14098-85	Welded Armature Joints of Reinforced Concrete Products and Structures. Contact and „Bath“ Welding. Basic Types and Constructive Elements
GOST 23858-79	Welded Joints Butt and T-formed of Reinforcement Steel Bars. Ultrasonic Methods of Quality Inspections. Acceptability Requirements
GOST 5781-82*	Reinforcing Steel Bars
GOST 8478-81	Reinforcing Fabrics
GOST 6727-80*	Reinforcing Wire

4.3 Materials to be submitted by the contractor

4.3.1. General demands

Demands for the material connected with concrete works to be submitted by the contractor are given in the corresponding paragraphs of the present specifications. The demands are formulated below.

4.3.2. Certificates and data of factory tests

The contractor should submit certificate of conformity issued by manufacturer or supplier for every lot of materials of fittings to be used in the main works. These are:

- cement
- trass materials;
- accessories;
- admixes; plasticizer additives
- seam compactor, including water proof packers
- fitting
- details, joining fittings

The contractor should also submit the data of analysis of samples tested by the manufacturer and those of laboratory testing. Factory analysis and trial data should conform to materials, which were submitted for the main works. Frequency of sample taking and examination by manufacturer should conform to the corresponding standards.

4.3.3. Results of tests carried out by the contractor

The contractor should submit:

- Daily accounts/reports on testing of granulometric composition of the prepared fillers and monthly summing up reports;
- Certificates of monthly inspection of weighing and distribution units of concrete mixing and batch meter aggregates.

4.3.4. Samples

The contractor should submit samples of all materials together with technical information of manufacturer, to be used in the process of realization of major works at the demand of project manager. Duly marked standard samples should be kept at the building site in corresponding containers.

4.3.5. Building aggregates

Prior to ordering or assembling of aggregate(s), washing and sieving-grading unit(s) and refrigeration equipment(s), cement batch meter and mixing device(s), loading and transporting means, the contractor should submit the corresponding situation plans, drawings of coordination, work graphics and list of equipment to the project manager. Documents submitted for consideration for each device should be accompanied by the written offer of the contractor about quality control of production to be performed on the spot. Conformity of the offers of the contractor about equipment and quality control should be inspected by the project manager and he should make relevant comments. In case of necessity the contractor should make changes in his offers, which should be satisfactory for the project manager. The project manager has to consider the offers within one month.

4.3.6. Details of building

The contractor should submit his detailed offers to the project manager for approval. The offers should deal with the following issues:

- dislocation of concrete plates;
- water proof packers;
- preparation of seams between existing and new concrete, description of binding/joining materials, special composition of concrete for repair;
- succession of concrete pouring, special procedures of concrete pouring in hot weather and at night;
- assembling concrete works;
- casings/centering;
- detailed data on fitting rods, rod forms, including length of insertion, anchor and interlay junctions.

The contractor will have no right to start works until he obtains agreement of the project manager.

4.3.7. Registration of concrete works

The contractor, in the form agreed upon by the project manager, should submit his report on concrete poured on the preceding day.

This report should cover the following (and other data too) in connection with concrete composition:

- number of batches of prepared mixtures;
- quantity of prepared mixture, average norm and total volume of the poured concrete;
- volume of vainly spent or defective mixture

- total weight of the used cement, concrete fillers, water, trass materials and admixes.

In connection with each pouring of concrete on the object:

- place of pouring;
- poured concrete mixture;
- net volume of poured concrete and amount of every used mixture.

Simultaneously, the contractor should perform accurate and timely recording of the data, which will state date of concreting of each part of the object, time, weather and temperature conditions. The project manager should always have the possibility to check up the documents.

4.3.8. Welding of fitting

The contractor should obtain preliminary agreement of the project manager for any welding operation of fitting. This agreement should contain:

- welding procedures;
- welders; with adequate qualification to work on building site;
- check up of weld seams.

4.4 Materials and equipment

4.4.1 Cement

Cement used on the object should be the Portland cement, conforming to ST 150 and other equivalent adopted standards. The project manager may demand removal of any concrete, if it is prepared by cement not responding to the demands of the present specifications.

Cement – ST 10178-85 (standard of the former Soviet Union)

Cement	strength limit in 18 days, MPa	
	at compression	at bending
Portland cement 400	39.2	5.4.
Portland cement 500	49.0	5.9

4.4.2. Concrete Fillers

4.4.2.1 General

Concrete fillers should be treated and should contain natural particles or mixture of natural and artificial particles. Concrete fillers should be prepared from the corresponding materials received from sources/quarries and should be approved by the project manager. Approval of any source from which the contractor produces fillers for cement, does not imply approval or receipt of all materials obtained from that source.

The contractor may receive material from any source approved by the project manager. With this in view he should submit the results of study and testing of material obtained from that source and should submit those results to the project manager for consideration. Alternate sources offered by the contractor should be approved according to the same procedure.

The contractor has to provide all forms of labor, equipment and implement care-supervision over laboratory of control of fillers produced for works. In one working shift the contractor should test minimum once a sample of untreated filler produced in that period. Gradation of fine fillers should be determined by minimum frequency: one test per hour of production. But the project manager may decide that the test results (in case of due consistence of fillers gradation) are good enough to enable them to carry out testing with less frequency. The contractor will also be responsible to take sample and test it for adequate gradation at various stages of work, at transportation, during accumulation and in the process of smoothing out if the contract manager has sufficient grounds to demand so. The contractor will be obliged to submit to the project manager daily reports on production volume and results of gradation test.

In the process of production the contractor should correct any small or greater deviation in grading composition of fillers without delay. Rejected material wastes should be removed to the agreed upon territory.

4.4.3 Quality and grading composition of fillers

Fine fillers

Fine fillers of concrete should conform to ST C33 or the quality demands of the equivalent standard of the former Soviet Union and should consist of natural and/or crushed/powdered sand. Fine fillers should be washed.

Alongside with the above stated, fine fillers of concrete should satisfy the following physical requirements:

- dimension module 02.50-3.0
- Sodium sulfate resistance 5 cycles (ST C 88 Maximum 10% losses
- Sand equivalent (ST 2419) minimum 80%

Alongside with satisfaction of the demands of granulometric composition, fine fillers should be inspected for the following: minimum nine of ten successively tested samples should not differ by more than 0.20 from 10 samples of average dimension module .to be tested.

4.4.4. Taking and testing of filler samples

Concrete fillers

In the process of preparation of concrete the project manager will check up concrete samples delivered to concrete mixer in order to establish their conformity to the demands of the present specification. The contractor should provide submitting of samples and means of their testing. Testing of concrete fillers by the project manager will not release the contractor from his/its responsibilities to control production of fine and large-size (coarse) fillers, its storing and loading-unloading by the observance of the present specifications.

Storing of fillers

The contractor should provide facilities for storing of fillers in order

- to keep separately fine and large-size fillers of every nominal fraction always
- to avoid pollution of fillers with ground or other foreign matters, always;
- To provide removal of water from each heap of filler;

The contractor should provide placing, storing and removal of graded large fillers from the storing place so as to avoid segregation of material. Operation of mechanisms on the heaps of the stored material is not permitted.

Fine fillers brought to the batch meter or mixing device bunker should have homogeneous, stable moisture composition, which should not exceed 7%. Excess humidity should be removed mechanically and by stacking, according to drainage method. The contractor should protect heaps of fine fillers from weather. If there is a chance of pollution of fillers by materials brought by wind, it is necessary to provide wind-protection fencing.

4.4.5 Water

Water, needed for washing of fillers, for mixing of concrete and hardening should conform to recommendations of the appendix to ST 3148. Concentration of chlorides and sulfides should conform to the limits of mineralization of concrete mixes recommended by ST 3148. With this in view, water of channel, duly filtered is considered fit. The contractor should take all measures to protect water from direct sunrays and from pollution by materials brought by wind. The project manager will issue order about repeated control of water, when he considers it appropriate.

4.4.6 Admixes

Admixes are materials added to concrete in the process of mixing and it pursues changing of properties of concrete mixture. Admixes should not contain calcium chloride.

Unless otherwise instructed by the project manager, the contractor should provide and use liquefier hardening moderating additives in all types of concrete. Liquefier retarder admix should conform to ST C494 type. Volume of admixture added to each mix should be defined by the project manager, but generally, admix should conform to manufacturer's instructions. If hardening additive, used earlier for similar purposes failed to show satisfactory results, it will not be considered for approval. Certificate of manufacturer on technical characteristics and certificate about conformity to ST C494 should be submitted for approval, when demanded. After its approval the manufacturer's certificate of conformity should be submitted to building site together with every delivered lot. The project manager, in case of necessity, should take samples of mixture of liquefier hardener moderating/retarder additive and test for determination of conformity to ST C494 standard. If the test shows that the supplied additive is not satisfactory, it should be removed from the building site immediately.

Admixes which were kept for more than 6 months, should not be used without repeated test, if a new test doesn't show that they are satisfactory. Costs of all new tests should be covered by the contractor. Unsatisfactory material should be removed from building site without delay.

4.4.7 Seam filling and waterproof packers/compactors

Seam filling material covers waterproof compactors, fillers, paints, compositions for seam filling, sealing materials, binding materials and others, which are necessary for concrete seams. Seam filling material should be offered by the contractor and should be approved by the project manager. Materials should be loaded and unloaded, used or stored according to the manufacturer's instructions.

4.4.8 Casing/centering

Casing should be made of wood material, from metal sheets or other approved material, proceeding from construction peculiarities and according to the texture of concrete surface to be obtained, by the provision of demands stipulated by paragraph 3.5.24. For open surfaces the contractor should use materials approved for surfaces of corresponding class of treatment.

Tightening element should be beam-circular-spiral (helical) element or any other similar to the approved, patented one. Welding rods of details to be enclosed should end inside the formed concrete surface, minimum at 50 mm depth. Wire connections are excluded.

Tightening elements used in water pooling constructions should possess diaphragm along the whole length of section, of at least 50 mm diameter and 4 mm thickness, which should be welded perpendicularly in the middle of tightening element, to avoid leakage of water along it.

4.4.9. Steel Reinforcement

Rods of steel reinforcement should be the hot rolled fitting rods of periodical profile conforming to 615 standard, 40 and 60 class or state standard equivalent to the standards of the former Soviet Union. Fitting carcass should conform to demands of ST 184 or ST 185 standards or the demands referred to on drawings.

At the demand of the project manager, contractor should take samples of fittings delivered to the building site and should provide sample testing by certified testing authority. Certificate issued by such authority should be submitted to the project manager.

Fluidity limits, according to the test data of factory of fittings should not exceed the fixed fluidity limit by 120 A. Ratio of strength at stretching to fluidity limit should not be less than 1.25.

Reinforcement bars ST 5781-82* (norms of the former Soviet Union)

Reinforcement class	Yield strength, MPa	Strength limit, MPa	Elasticity module, MPa
A-I	235	373	210000
A-II	294	490	210000
A-III (d=10-40 mm)	392	590	200000

Reinforcement net St 8487-81 (d=6-10 mm –III ST 5781-82*; d=3-5 mm Reinforcement wire, P-I ST 6727-80).

4.4.10. Equipment

4.4.10.1. General

Quantity and quality of machinery-equipment should meet the demands of specifications as well as those of building program.

4.4.10.2. Auto-concrete mixers

Auto-concrete mixers might be used for transportation of ready concrete, according to the demands of specifications, at the terms that the approved measures will be taken to avoid addition of water to the concrete placed in auto-concrete mixer. transportation period should not exceed 2 hours.

4.4.10.3. Vibrators for concrete hardening

Concrete hardening vibrators in the constructions/buildings should be powerful, depth type vibrators. Vibrators should operate at the following frequency and amplitude: For vibrators with head diameter exceeding 75 mm – minimum 6000 impulses/min and 1 mm amplitude; for smaller head vibrators – 7000 impulses/min and 0.5 mm amplitude. Vibrators should provide due hardening quality for all types of concrete. Periodically the project manager has to examine vibrator frequency and amplitude to check up their conformity to manufacturer's specifications. If vibrator does not work duly/satisfactorily in all working conditions, it should be improved or replaced immediately. Without instructions of the project manager or other due instructions surface or fixed vibratory equipment should not be used.

4.5 Workmanship

4.5.1. Concrete batching

Proportions of materials to be used at each concrete pouring should be coordinated with the project manager.

Unless otherwise instructed, concrete mixture should contain binding materials, water, fine and larger fillers. Using of additives and admixes might be permitted only if approved by the project manager. Binding materials can contain only cement and cement and trass materials. Application of epoxide concrete/solution should be agreed upon with the project manager.

The contractor should provide for efficient measures (such as preliminary cooling of fillers, cooling of water, addition of ice pieces within the frames of total water for mixing and other methods) for keeping the fixed or lower temperature of concrete at its pouring.

4.5.2. Assembling and covering of Reinforcement

Reinforcement should be reliably and accurately mounted in the places shown on drawings by means of tracer blocks or fixators. Rod crossings should be fixed by soft wire and their ends should be fixed in concrete. The contractor should provide for keeping of fittings at their places. Specific care should be shown during concrete pouring.

Upper limit of fitting in the plates should be kept in its position by application of those supporters/tracers, size and volume of which are designed for the provision of adequate support of working charge.

4.5.3 Welding of Reinforcement

Welding of intercrossing rods during mounting of fitting is not permitted without consent of the project manager.

But, irrespective of it, if it is necessary to join fitting rods by welding, the demands of WS 14 and ST 796 standards should be observed.

To observe the welding procedure it is necessary to determine rod type, its chemical composition on the base of information submitted by manufacture or on the base of sample testing.

Adequate electrodes should be used for welding of seams. Small electric-arc welding of intercrossing rods is not permitted, that is the so called coupling seam should be made. Such form of welding can significantly

weaken a rod at welding point. This operation is permitted only when material to be welded is under competent control, as it is done during production of wire net of welded fitting.

Unless otherwise permitted by the project manager, joining of fitting rods (especially intercrossing rods) should be performed by mechanical method of joining and by lap joining.

4.5.4 Casing/centering design and dislocation scheme

Casing should be designed so as to provide for accurate/due location of buildings and constructions to be concreted, with forms, sizes and levels within the frames of permissible errors.

Casing should be designed for all vertical and horizontal loading, which can be endured by the construction itself. Casing drawings should be approved by the project manager.

Consideration/adoption of drawings of casings does not release the contractor from responsibility stipulating adequate building and keeping of casings. Casings should operate duly in any case.

Till concreting the project manager should inspect and register the results. Inspection documents should be signed by project manager and agent of contractor. Inspection documents should cover the following information and criteria:

- Conformity of dimensions of installed casings to dimensions given on drawings;
- Due joining of tracers, seizing and fixing elements by lap joining;
- Fixing elements should be fixed vertically and with corresponding support;
- Casing belt and fixing objects of needed size and load bearing capacity should be used;
- Casing should be compact enough to avoid missing of building solution.
- Packing, sleeves, anchors, waterproof packers, pipes and other parts to be placed should be installed and fixed.
- Casing should be cleaned and covered completely.

4.5.5. Concrete transportation

Concrete should be moved from concrete mixer to the spot of its pouring at the object as quickly as possible by the means/facilities which will enable to avoid segregation or drying and will ensure needed consistency in the moment of its pouring.

At the agreement of the project manager the bucket, band conveyors, chutes/gutters and other like equipment might be used for shifting of concrete.

All equipment and methods for delivery of concrete should be designed and capable to transport any type of concrete used on the object.

For identification of various mixtures of concrete and for defining their designation it is necessary to observe instructions. Each batch should be accompanied by a copy of a printed record of distribution unit according to point 3-4.12.3.

4.5.6. Pouring of concrete

Concreting should guarantee obtaining of strong, resistant, compact concrete without uneven surface or any other defect. Minimum 30 days prior to pouring concrete in the main building, the contractor should submit to the project manager for approval his/its building procedures, including description of methods of concrete pouring. Approval of building procedures and methods of concrete pouring does not release the contractor from his responsibility for their conformity and he/it will be personally responsible for adequate/satisfactory building of the object.

At every pouring, the contractor should submit to the project manager a written notice, drawing and results of necessary inspection to be done before concrete pouring, signed by relevant supervisory officers of the contractor. It should certify that preparation of the base, building seam, cleaning of surface, casing, assembling of fitting and parts to be inserted were made according to drawings or given instructions. Prior to issuing a permit on concrete pouring every point of inspection list should be signed by the project manager to show that the given point was inspected and were fit for starting concreting operations. No concreting will be permitted if according to the opinion of the project manager, real conditions can hinder due pouring of concrete, its hardening, polishing and hardening.

Where concrete relies on soil or such material, which tends to loosen and slide, the contractor should take measures not to enable such material to fall on the surface of just poured concrete.

4.6 Testing

Testing should be performed according to the provisions given in the previous section.

4.7 Measuring and payment

4.7.1. Concrete – General demands

Provisions given below deal with all clauses on concrete works, less those referred to in specific clauses for measuring and payment.

Volume of concrete poured on the object should be measured according to the contours and levels given on drawings, or according to other instructions of the project manager. When concrete is poured on the foundation, contours of the foundation and levels given on drawings or referred to by the project manager should be measured.

Measuring

Measuring of concrete should be performed according to demands of the relevant paragraphs.

Rubber packing should be measured by units (pcs), as one integral whole. Packers/compactors should be measured in linear meters.

Payment

Payment for concreting should be realized per cubic meters measured according to the above referred rule, on the base of unit rate of corresponding clause.

Payment for rubber packing should be realized in units (pcs), For compactors – payment should be realized according to linear meters.

4.7.2. Steel fitting

Measuring

Fitting rods should be measured as net weight of steel fitting placed in constructions/buildings in metric tons. Net weight of steel fitting rods should be calculated as the length of fitting rods given on drawings or length of rods dislocated according to invoices on rods multiplied by nominal weight corresponding to length unit. Fitting of lap joints and joints, which are arranged by the contractor for facilitation of operations, will not be measured.

Wire, fixators, supports, fixing elements and other elements for fixing the fittings will not be measured.

Payment

Payment should be realized according to metric tons measured by the above stated rule, on the base of unit rates of relevant clauses.

Unit evaluations of fitting should contain all costs of fitting including detailed drawings of fittings, preparation of invoices, delivery of fittings, bending, fixing and losses and all other possible jobs connected with the present clause.

4.8. Repair or replacement of defective concrete

Concrete, cracked, ruined, weak, broken, loose, conchoidal, corroded or with other defects should be repaired according to the following principles:

- Surface to be repaired should be prepared well and primed/grounded;
- For obtaining better results adequate material (especially sand) should be used;

- Mixture should be duly batches, it should not contain excess cement and should contain water, minimum quantity for mixing;
- Repaired place should be dealt duly and hardened;
- Workers, who carry out repair jobs should have adequate qualification and they should honestly fulfill their work.

4.8.1. Material

- Cement: regular or swiftly hardening – Portland cement;
- Sand: mixture, 1 share of good sand, passed through 4.75 mm sieve per 1 share of sand for plastering works;
- Gravel: is needed only for filling deep holes, gravel of even form, 6.7 mm nominal size should be used;
- Large-particle gravel or broken stone might be used in extremely thick seams, when the thickness of the spot of a seam exceeds 4-times the nominal size of a filler.

4.8.2. Mix

One share of cement with additives/admixes is mixed with two shares of sand with additives and 1.6 share of 6.7 mm crushed stone and water which is necessary just for sufficient moisturizing of a mix. Mix should not be wet.

4.8.3. Preparation of surface for repair

Removal of defective material. Weak, soft and conchoidal material should be removed to reveal strong, hard surface. If possible limits of the surface to be repaired should be marked by sawing off. Final cutting should be made by light blows of pointed crusher, in order to avoid damage of the remaining concrete.

Cleaning of surface. When material is porous or when it has visual suction, it might be wet minimum 24 hr prior to its priming. Drying of surface before priming is allowed. As an alternative, surface can be dried by means of propane burner so as to heat concrete only to temperature felt at touching. Very hard material of low absorption capacity and concrete of less than 36 hrs should not be wetted prior to priming. Soon after priming low absorption increases binding with priming surface.

A. It patented types of priming and binding materials are used, they should be approved by the project manager. At the application of such materials specific care should be taken because they may require care which differs from the above stated.

Priming. Priming should be performed immediately prior to starting repair works. This as paint mixture of cement should be used. It should be spread on the surface by a rather hard brush. Spreading should be performed by circular movements, to enable the liquid to enter the cavities. Then brush should be cleaned so as only thin layer remained on it. The cavities should not hold pools of liquid. Liquid should be spread far from edges in order to avoid thin, dark contour around the foundation.

Cement priming may contain patented admixes or patented binding material might be used. Such materials should be used according to recommendations of manufacturer or as the project manager approves.

Methods of repair. Liquid used for repairing should be spread when the priming layer is still wet. Liquid should be spread in maximum 30 mm thickness layers. For its ramming the mechanical ramming machine can be used. Ramming of the last layer should be performed by plane wooden board and hammer. Texture of the surface similar to the texture of the surrounding concrete should be attained, for example by means of wooden polisher or sponge. If after termination of hardening the repaired surface is clearly wet, it means that the mixture is excessively wet and the repaired place should be removed. New repair should be performed by relatively dry mixture.

Repaired place should be covered to avoid its excess drying.

Special cases:

Connecting layer for repair of soffits. Instead of cement-water priming solution the sprayed cover should be used by spreading wet mixture, which should consist of one share cement and 2 shares of large particle sand, which should be placed by trowel to form 5 mm height layer. It should be stayed to harden for two-three days. When the pile is hard and closely bound, the repair- or plaster layer should be spread.

Casing. If it is necessary to pour concrete of significant thickness repair, cavity to be filled might be closed partially by casing and the solution for repair might be rammed under the casing or above it. Casing might be extended together with the process of repair, till relatively small part is left, which should be filled in by direct filling. In this case casing will need very powerful and firmly fixed support.

Completion. If needed, the repaired spots might be polished by carborundum stone and water, or it can be filed in minimum 6 (seven) days after its hardening.

5 STRUCTURAL STEEL AND METAL WORKS

5.1 Steel Works - General

Structural steel works shall conform to the requirements hereinafter specified, unless otherwise called for in these specifications or on the drawings. Finished members shall be free from twists, bends and open joints. Compression joints depending upon bearing contact shall have surfaces truly faced so as to have full contact when aligned and welded or riveted or bolted.

5.1.1 Suggested List of Materials

To the purpose of obtaining the same good level of quality, a suggested list of suitable materials for the structural steel and metal works as ladders, handrails, etc., are given below.

Material	Standard and Grade
High stress carrying structural steel	DIN 17100 St 37-2, St 37-3, St 52-3
Low stress-carrying structural steel	DIN 17100 St 37-2
Rolled steel for rivet	DIN 17110 St 34, St 44
Carbon steel pipes for ordinary piping	DIN 2440 St 33
Carbon steel pipes for pressure service	DIN 1626 (2) St 37
Carbon steel for machine structural use	DIN 17200 CK 35, CK 45
Bronze for bushing and bearings	ASTM B22 Alloy E
Steel for turned bolts, threaded anchor bolts	DIN 19704, 4D, 5D
Stainless steel bolts and nuts	DIN 267, Grade 4.6 and 4.8
Stainless steel for sealing surface	DIN 17440 Gr. 1.4305.

TYPES OF FINISHED STEEL (FSU Standards)

Type	GOST or TY
Equal angle	8509-86
Unequal angle	8510-86
Channel beam	8240-89
Flange beam	8239-89
Steel sheet	19903-74 5681-57
Steel strip	103-76
Rounds	2590-71
Squares	2591-71
Crane girder M24, M30	19425-74* TY14-2-427-80
Steel pipes	8732-78 3262-75 10704-76

WASHERS, BOLTS AND NUTS Technical requirements – GOST 18123 – 79

Type	GOST
Washer	11371-78, 6402 –70, 10906-78
Bolt	7798-70

Nut	5915-70
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GENERAL DATA ON STEEL USED IN STEEL WORKS (FSU Standards)

GOST	Rolling mm	sickness,	Yield strength, MPa	Ultimate strength of break, MPa
TY14-1-3023-80	4-10 11-20		225 235	360 370
GOST 380-88	41-100 >100		205 185	365 365
GOST 19281-73*	4-15		390	530
19282-73*	33-40		390	510
GOST 10706-76*	4-15		235	365

5.2 Preparation

5.2.1 Straightening Material

Before being laid off or worked, rolled and flat material shall be straight and shall be cleaned of all rust and dirt. If straightening is necessary, this shall be done by methods that will not injure the metal. Sharp kinks and bands will be cause for rejection of the material.

5.2.2 Shearing and Cutting

Shearing and cutting by torch shall be performed carefully, and all portions of the work which will be exposed to view after completion shall be finished neatly. Sheared or cut edges of plates more than 16 mm thick which carry computed stresses shall be planed to a depth of 6 mm. Re-entrant cuts shall be filleted before cutting. All work shall be performed so as to secure proper matching of adjoining unfinished surfaces. Where there is a large discrepancy between adjoining surfaces, same shall be chipped and ground smooth, or machined, to ensure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown on the drawings, and shall be chipped or ground so as to be free from projections and rough spots.

5.2.3 Surface Finish

All surfaces which are subsequently to be painted shall be smooth and free from crevices, bumps, or sharp discontinuities. All corners of all surfaces to be painted shall be ground to a 3 mm radius.

The surface finish of all parts and components shall be in conformity with the respective strength, fit and service requirements. Surfaces to be machine-finished shall be indicated on the shop drawings by corresponding symbols.

5.3 Welding, Riveting and Bolting

5.3.1 General

No production welding of joints shall be commenced, until:

- The welding procedures proposed have been approved by the Employer / Project Manager.
- Welders/operators have been approved by the Employer / Project Manager.

5.3.2 Preparation for Welding

Members and sections to be joined by welding shall be cut accurately to size, with their edges sheared, flame-cut or machined to suit the required type of welding and to allow full penetration.

The surfaces of members or sections to be welded shall be free from rust, grease and other foreign matters for a distance of at least 50 mm back from the edge of weld.

5.3.3 Welding Procedure

All welding shall be performed by the electric-arc method, by a process at least equal to that required by the latest edition of the "Standard Qualification Procedure" of the American Welding Society, or the corresponding DIN standards.

5.3.4 Qualification of Welders

The Contractor shall be responsible for the quality of the work performed by his welding organization. All welders and welding operators assigned to the work shall have passed a performance qualification test for welding operators at least equal to that specified in the 1a test edition of the "Standards Qualification Procedure" of the American Welding Society (or DIN 8560 and 8563). All expenses in connection with making the qualification tests for welding operators shall be borne by the Contractor.

Operators' welding certificates shall be furnished to the Employer / Project Manager if requested by him.

5.3.5 Welding Equipment

All welding equipment, such as welding machines, transformers, cables, electrodes, etc., for welding at the Site shall be of reputable make and suitable for the purpose intended for.

Welding consumables (e.g.: wire, electrodes, flux, shielding gas) shall be of similar composition to those used in the procedure and welder approval tests. By agreement equivalent welding consumables may be accepted. Materials shall be stored under satisfactory conditions so that no deterioration occurs.

The Contractor shall provide evidence that the deposited weld metal is suitable in all respects for the intended duty and has a yield strength (or proof stress) not less than the minimum specified for the plate material at 10°C. The reduction of area shall not be less than 35% for carbon steels. Low hydrogen basic coated electrodes shall be used in all welding. The impact properties of the parent plate shall be considered in the choice of consumables during weld procedure approval trials.

Consumable material (electrodes, etc.) shall be included in the price. Other materials and tools shall remain the property of the Contractor.

Note: FSU standards for welding materials (arc-welding electrode, electrode wire, flux-cored electrode, welding compound, carbonic acid gas, argon) – GOSTs 9467-75, 2246-70*, 9087-81, 8050-85, 10157-79*; for welding procedures – GOSTs 8713-79, 5264-80, 11534-75, 11533-75, 16037-70, 23518-79, 14771-76*, 15164-78.

5.4 Bolts, Studs, Nuts and Screws

They shall have standard threads and be of high quality steel. All bolts, studs, nuts and screws (including their washers) shall be well protected against corrosion according to the site of their installation. Nuts and bolt heads shall be hexagonal in shape and truly faced. Nuts, bolts and screws which might become loose during operation shall be locked in fastened position by means approved by the Employer / Project Manager. Tack welding will not be permitted.

High strength friction grip bolts, nuts and washers shall comply with the approved standards. The correct tension in the bolt shall be determined using an approved raised pattern hardened washer system, whereby a reduced gap is created between the washer and the head of the bolt after tensioning. The load indicating devices shall be used strictly in accordance with the manufacturer's instructions. High strength friction grip bolts shall be tightened in accordance with the manufacturer's recommendations and the tension shall be re-checked not less than 3 hours after first tightening and then the bolts shall be re-tightened to the initial load, all to the satisfaction of the Employer / Project Manager.

6 PAINTING (Including Corrosion Protection)

6.1 Scope of Supply

The supply shall include the surface treatment, priming, corrosion protection and painting of the metal equipment furnished. Such work shall comprise the workshop-and at site-coating up to and including the finish painting. Unless otherwise specified the coating and painting shall be carried out in accordance with the latest edition of DIN 55928 (Protective Coatings for Steel Structures, Directions) ASTM Standards A 153, A 386, A 123 and A 120 or other equivalent approved standard.

All priming and painting material shall satisfactorily fulfil the requirements imposed by the Site conditions, as well as the stresses to which the respective equipment is subjected during its operation. At the request of the Project Manager, painting samples for the different coats and colours shall be provided.

All finished surfaces shall present a neat, pleasing appearance.

Each coat of primer and painting shall be compatible with the previous and subsequent coats. All pigmented primers and paints, which will be used for priming and painting at the Site, shall be delivered in sealed containers as originally packed by the manufacturer.

The Contractor shall supply full details regarding the extent of which sand-blasting, priming and painting will be carried out in his workshops (or his subcontractors', as the case may be), at the Site and after erection. A properly equipped paint-shop shall be set up at the Site using a specialist organization, experienced and skilled in the preparation and application of protective coatings at the conditions prevailing at the Site.

Materials shall be thoroughly mixed at the time of application.

It is essential that before any primer and coat of paint is applied, the surfaces are properly prepared. Such preparation shall include any cleaning, smoothing, drying and similar operation that may be required to ensure that the primer and/or paint is applied on suitable surfaces. Clean cloths and clean fluids shall be used to avoid leaving film or greasy residue on the surfaces being cleaned.

Each coat shall be free from runs, drops, pinholes, waves, laps, sags and unnecessary brush mark, and shall be allowed to dry or to harden before the following coat is applied.

Machinery-paint may be thinned, if necessary, to permit satisfactory application, but the amount of thinner shall be kept to the minimum.

For removing rust and mill scale from structural steel, plate, sheet, piping and other steel surfaces, as well as from other parts suitable for blast-cleaning, sand-blasting shall be carried out down to clean bare metal, according to SA-3 of SIS 05.59.00 ("Sveriges Standardiserings Kommission") or equivalent approved standards. The average surface roughness after sand-blasting shall amount to approximately 50 microns.

Parts which cannot be blast-cleaned shall be cleaned free from rust and scale by power-tool cleaning to the highest possible degree, according to the above standards or equivalent approved standards.

Blast-cleaned surfaces shall receive a quick-drying shopcoating immediately after blast-cleaning. Hand- or power tool-cleaned parts shall be treated likewise immediately after cleaning.

6.2 Solvents

Separate supplies of solvents shall be kept on Site for these purposes shall be tinted in different colour to those which are used for thinning paint. The solvent used for the preparation of the wash coat shall be supplied by the manufacturer of the coating material and shall be compatible with the coating material.

6.3 Paint Containers

All paint shall be delivered in containers sealed by the manufacturer. The name of manufacturer, colour, type of paint, batch number, and information regarding special storage requirements shall be clearly shown on each container.

6.4 Storage of Paint and Other Materials

Paint shall be stored on Site, under cover, in conditions as recommended by the manufacturer. Paint shall be stored in such a manner that each batch can be issued for use in the order of delivery. Other materials shall be stored in a manner which is to the approval by the Project Manager.

A separate store shall be provided for cleaning solvents used for brushes or other cleaning purposes. They shall not be stored where paint or paint thinners are stored or where paint is prepared for application.

Bulk supplies of coating materials shall be stored above ground in a secure properly constructed store to the approval by the Project Manager and in accordance with the regulations concerning storage of highly inflammable materials. No coating materials shall be stored below ground.

6.5 Checks

The work of anti-corrosion protection will be checked by the Project Manager. The check-work will include:

- Check of the cleanliness of the cleaned surfaces
- Check of the thickness and adhesion of zinc and paint coatings
- Check of quality of the materials applied.

The thickness of the zinc and paint coatings shall be checked at about 10 points per square meter. For the acceptance, the guaranteed thickness of the coating shall be decisive and not the number of coats applied.

The adhesion shall be checked by means of the Araldite adhering method.

The coating of small parts shall be checked at random with respect to thickness by the magnetic-static (Elcometer, Diameter, etc.) method, and with respect to absence of pores by means of the Elco-pinhole detector (ASTM E376).

6.6 Execution of the Work

In principle the painting work shall be executed in the Contractor's shops except for the finishing coats. The priming coats and the first finishing coat, respectively, shall always be applied by means of a painting brush in order to obtain better adhesion.

Paintwork damaged during shipment, storage and/or erection shall be properly restored by the Contractor after thorough removal of the damaged coating. The repair coating and painting shall be carried out as per the above specifications and reach the minimum dry film thickness stipulated.

When executing the paint work the air humidity shall not exceed 60% at the working place, and all necessary fans, air heaters, ventilation ducts, dust absorbers, etc., shall be provided by the Contractor.

The Contractor shall furnish a suitable quantity of each priming and finishing paint for touch-up work at the Site, after the end of the guarantee period.

6.7 Guarantees

All above specified coatings, paintings, protections, etc., shall last and be guaranteed for a period of at least twenty-four (24) calendar months from the Provisional Acceptance of the respective equipment.

7. CONSTRUCTION OF WALLS

• **By Concrete and Ceramic Blocks**

Integral and cavity blocks are made of various light concrete (slag concrete, ceramsite concrete, pumice concrete etc). Cavity narrow blocks with piercing or semipiercing cavities are most widespread ones. Cavities can be rectangular or oval shaped. In terms of economy, blocks with semipiercing cavities are better as during construction there is no need in total filling of cavities (e.g with slag).

Semipiercing narrow blocks are laid under cavities so as to create a chain system by each line. If wall thickness is of one block width, what is most widespread practice in Georgia, then in each subsequent line blocks are laid with diverse directions.

During laying, horizontal and cross joints have to be well filled so as to prevent light penetration. Horizontal joint thickness must not exceed 12 mm and cross joint thickness must not be over 10 mm.

Narrow blocks are laid by a group of three or four workers. The group of three workers laying blocks consists of one highly qualified bricklayer and two assisting bricklayers with lower qualification. The scheme of laying is as follows: first assistant bricklayer places blocks near the line which will be installed so as that blocks laid transversely will be semireversed and blocks with longitudinal direction will be standing (with the distance of 0.25 of block in between standing blocks); the distance between semireversed blocks will be 0.5 of block. Another worker will dissolve grout for horizontal joints and pour grout on semireversed and standing blocks with trowel for creating cross joint. After that the highly qualified bricklayer will rotate blocks with 90° and finally lay blocks where they belong by pressing. The grout leaked on the facade side has to be removed by means of trowel. Accuracy of each line is checked by the level tube in both horizontal and vertical directions. The similar principle is used for laying ceramic tiles and bricks.

In accordance with the seismic requirements laid block lines are reinforced at wall corners and column joints in every 40-60 cm. The details have to be shown for a separate design.

Plastering of Walls

Removing Damaged Plaster

To repair plaster all loose wall material must be removed. Scrape all degraded material from the area using a putty knife. This includes bubbling or peeling paint, plaster putty coat and any brown or scratch coat involved. Remove all loose material back to the lath substrate and scrape back to solid material in the surrounding surface.

Scrape Peeling Paint

Test the paint coat immediately surrounding the area to see if it is loose. If the paint film comes off easily when a putty knife is slipped under it, it should also be removed back to sound paint.

Remove the Dust

Remove dust from the chipping and scraping process and coat the whole damaged area with shellac-based primer-sealer or an alkyd wall primer. With water damage, a sealer like this is essential to block residual moisture that would otherwise inhibit bonding of the patching compound. This could result in bubbling of the new joint compound.

Sealing the Plaster

Coat all affected surfaces including the surrounding wall paint. To help hide stains and make finish coating easier, use a primer–sealer with a white pigment added. Let the sealer dry completely before beginning repairs. Shellac primer will dry in about an hour while alkyd primer will take about 12 hours to dry completely.

Repairing the Plaster

To smooth out shallow plaster damage it will take several thin coats of setting joint compound to fill and cover all the damage. Start by mixing a small amount of setting compound and spread it over the whole area using a joint knife to "butter" the surface, leaving about ¼ inch of mud behind.

Immediately go back and skim off the excess mud to leave a thin coat that just begins to cover the damage. Hold the joint knife at a 30° angle and press down firmly as you pull the blade in parallel strokes, from one side of the area to the other, without stopping. Ignore any ridges left by the edge of the knife blade, when the mud has set you can scrape them off before applying a second coat.

Scrape and Sand

Let the mud set until it hardens. Scrape off any protruding ridges from the first coat using an upward stroke with the joint knife. Lightly sand the area with coarse to medium sandpaper to remove any other bumps, etc. in the surface. A completely smooth surface is not necessary here, just remove any protrusions that would cause bumps in the next coat of mud.

Brush off the dust and wipe the area with a clean, damp rag or sponge to remove the sanding dust before coating the area again with mud.

Apply a Second Coat

Apply a second coat of mud buttering the surface as before. Skim off the excess stroking perpendicular to the first coat. If the first mud coat was applied horizontally, apply this one with vertical strokes. Apply each subsequent mud coat reversing direction like this to help level any ripples and other irregularities for a smoother finished surface.

Sand and Paint

Let the last skim coat set and dry for about an hour before sanding with 120 sandpaper. Prime the new patch and surrounding paint with primer–sealer and let it dry completely before touching up the paint. Check the skim coating page for more about smoothing walls with joint compound.

8. ROOFING

Definition of terms used in the text:

Roof – an upper bounding structure of the building, at the same time having bearing and waterproofing functions and in buildings without mansard it has a function of heat insulation.

Roofage – an upper element of the roof protecting building from precipitation.

Grillage – horizontal base under the waterproofer coat can be made of a special galvanized metal or wooden profile. The board thickness can not be less than 30 mm, and beams – not less than 50 mm.

Counter grillage – longitudinal base under grillage is necessary for creating gap for ventilation and condensate outflow between the grillage and wind break.

Wind break – barring heating skim for avoiding humidity penetration from outside. Wind break bank can or can not be vapor sealing;

Vapor sealing – barring heating skim for penetration of warm humid air inside the building and avoiding condensate formation in the warmth-keeping jacket ;

Cornice reach– lower side of the roof where eaves and snow shield can be attached.

Cornice air escape – a hole in lamier for penetration of air; ensures airtightness of under roof space together with apex air escape. Cornice air escape area has to portion 2-5% of the total roof area.

Apex air escape – a gap in the wind break band of the roof apex for airing under roof space. Apex air escape area must portion 2-5% of the total roof area.

• **General Recommendations Before Work Commencement**

Before work commencement it is necessary to make sure that there are no noticeable bendings on roof plane. The minimum inclination of the roof has to be at least 14° (1:4). The roof with less than 14° inclination cannot be made of piece material as joints may leak.

For water resistance in winter it is very important to keep roof operation temperature regime. If roof heating is not enough icicles and aufeis are formed. They barrier natural flow of water during warming period and result

in water outflow as water begins to leak through the roof sheet joints. In some cases there may be a need to heat the roof with electric method in order to avoid results of design and heating installation errors. Before commencement of roofing all ventilation, chimney and other installations have to be made through the roof. Besides it is not advisable to perform facade works along with roofing as spatters of paint or grout may damage exterior view of the roof and in case of removing spatters protective layer of the metal tiles may be damaged.

- **Installation of Grillage and Counter Grillage**

Before commencement of grillage mounting all the activities related to cornice reach installation need to be performed as cornice reach line is basic for grillage installation.

If ceiling raft step –angle does not enable installation of wind break and counter grillage on ceiling rafts then there is a need to lay black grillage on ceiling rafts functioning as wind breaks and counter grillage basis.

Counter grillage is installed along the ceiling rafts with step-angle of not more than 700 mm. Besides, roof edge outlets and eavestroughs are separately treated so as to avoid emerging of cantilevers anywhere during grillage.

The grillage is hammered with galvanized nails (length 100 mm and step-angle 60 mm) or with knurled nails (length 90mm). After hammering nail ends need to be bent from the bottom.

During grillage a first board is hammered precisely along the cornice reach so that not to stick out. The thickness of the first board must be over 12 mm compared to the thickness of other grillages. For this purpose relevant size pads can be used to be hammered to the face of the board. This is necessary for compensation of difference between the reference points of modules of first and subsequent metal tile.

The second board of grillage will be hammered in parallel to the first one in accordance with the length of metal tile module. Besides, the distance is measured from cornice reach to the middle of grillage board.

The recommended dimensions of metal tile reaches are as follows:

Metal tile reach size outside the cornice and around the eavestroughs – minimum 40 mm.

Metal tile reach size in case of presence of hanging eavestroughs and up to 40° inclination - 70 mm;

Metal tile reach size in case of presence of hanging eavestroughs and over 40° inclination - 100 mm;

e.g for tile with a step-angle of 300 mm (in case of 30° inclination hanging eavestroughs) a step-angle between the first and second boards of grillage is 280 mm.

In order to check accuracy of distance between the first and second boards it is necessary to put two pieces of boards on the ground with parallelly determined distance in between, then to put metal tile on them and define if the tile reach is enough for normal flow of water. Too high reach of the tile will result in overtopping of water over frontal board.

All subsequent boards of grillage have to be installed with the relevant distance of tile module (usually 350 mm). All measurements are made by a tape measure. Usage of gage plugs between boards is forbidden.

It is recommended to install two auxiliary boards under the apex from both sides with the distance of 50 mm in between. It will simplify apex installation and enable us to create “air lock” for aeration of under roof space without penetration of snow under the apex.

- **Cornice Reach Characteristics**

A function of the cornice reach of the roof is to remove waste water from the walls. During installation of the water catchment the cornice functions as a bearing structure for eavestroughs. Besides, the air is penetrated from the cornice reach for airing under roof space. All these characteristics are attributed to cornice reach structure.

When eavestroughs are hung on the roof sometimes there is a problem with attachment of a hook. There are two options of its attachment – using additional attaching elements being fixed on boards or ceiling raft and attachment of the hook immediately on the frontal board. First method is comparatively unique but expensive. The second method is cheaper but it can be applied only if cornice frontal board thickness is at least 30 mm.

- **Installation of Drainage System**

An eavestrough of the drainage system is installed with inclination of over 0.5-0.7 m. The hook is mounted with a step-angle of 0.6-0.8 m for metal eavestroughs and 0.6 m for plastic eavestroughs.

Before mounting of eavestroughs it is necessary to determine shute locations. It is the lowest point of the eavestrough. Before determining locations for installation of drainage pipes an attention needs to be paid to avoiding framing of windows and doors by them as well as penetration of water under the building.

During installation of drainage pipes it is necessary to remember that the upper hook of the pipe should be located on the joint of upper bend and the pipe. The lower hook must be placed on the joint of the pipe and an anvil. The distance between locks must not exceed 1,900 mm. The distance from the anvil to the surface of lining must be at least 150 mm. The distance between the lower end of the pipe and the ground surface must be at least 300 mm.

General rule of assembling drainage pipes: each element of the drainage system being above is installed in the element being below.

- **Roofing in Winter**

In order to perform high quality roofing works in winter it is necessary to control their performance at all stages. When the temperature is below zero a roof can be covered with tiles, metal tiles and sheet metal. For this purpose cleanness of roofing materials and foundations from snow and icing needs to be accurately checked.

- **Acceptance of Roofing Works**

The finished roof may deviate from the unit material not more than 5% of the design.

During acceptance of the finished roof its surface is carefully inspected especially at shutes, valley gutters and stuck out parts at joints. Impermeability of the roof is checked by pouring water deliberately to imitate rain.

Coatings at shutes, valley gutters and stuck out parts of the building and constructions must be in full compliance with the design.

- **Rolled-strip Roofing**

Main works. Soft rolled-strip roofs are widely used in industrial, civil and agricultural construction. This type of roofs has a range of advantages such as: they are comparatively light, impermeable having low permeability to heat, they can be used when the batter is maximum or zero, they are especially comfortable when rapid installation of the roof is needed.

Rolled-strip roofs are flat i.e. with not more than 2.5% batter and inclined with up to 15% batter. A significant disadvantage of the soft rolled-strip roof is low and small mechanic durability.

Roofing works of industrial buildings comprise vapor sealing, heat insulation, installation of lower basis, dampproofing carpet and a protective layer. On dwelling, civil and other buildings having mansards rolled-strip roof is laid on boarding or thin tiles.

Vapor sealing with its external side and construction is determined by the design. Vapor sealing can be made by one or two layers of mastic and adhesive rolled-strip material (pitch paper, ruberoid and parchment) stuck to the mastic. Vapor sealing is laid on flat, cleaned surface of a bearing structure. Uneven surface is levelled by cement grout. Vapor sealing layer is lifted over 10-15 meters at the contact points of the roofage with vertical walls. As regards to heat insulation layer it is recommended to make it with inorganic heater tiles (foam concrete, foam silicate and glass foam etc).

Heater tiles are laid on the mastic tightly linked to vapor sealing layer. As an exception effective friable materials (pumice and haydite) can be used. Usage of heater tiles enables us to increase roofing stability and compared to other thermal insulation materials reduce labour input for arrangement of thermal insulation layer.

The foundation under dampproofing carpet is made of materials envisaged by the design. Sand-cement tightened covering, poured sand asphalt, precast concrete or asphalt-concrete slabs or wooden boarding can be used as foundation. Before laying sand-cement tightened cover a thermal insulation layer is dusted (and is dried if necessary); besides water intake pits, inner water drains are placed on the cement grout which are attached to the foundation with screws and yokes. Cement foundation needs to be made of sand-cement grout (1/3) of not less than 50 brand with the thickness of 1-3 cm (according to the design).

Before sticking a rolled-strip carpet the foundation is coated with cold coating mixture by means of pneumatic unit. Coating protects foundation from rapid drying. Asphalt concrete foundations can be installed on roofs with at least 20% inclination. Temperature sedimentary joints are made in every 4 m toward both directions with the width of 0.5-1.0 cm and thickness of 1.5-2.5 cm (according to the design).

Sand asphalt foundation is made of poured sand asphalt mix what is levelled by a micro bulldozer or rake over the entire area and is packed with manual packer.

Installation of sand-cement tightened cover in winter is recommended by precast concrete or asphalt concrete slabs to be laid at lower levelling layer made of hydrophobic cinder or screened skim with the thickness of 2 cm. Joints between the slabs are filled with hot mastic.

Before sticking the rolled-strip carpet the foundation is cleaned from waste and dust.

In order to avoid waving of rolled-strip carpet during sticking it is cleaned from redundant mineral material and remained open at least for 20 hours.

Rolled-strip dampproofing carpet unfolding starts at cornice reach from down to top up to apex.

Rolled-strip material with all kind of covers is stuck on hot and cold mastic and materials without cover is stuck only with hot mastic.

When roof inclination is 15% the rolls are unfolded paralelly and when inclination is more than 15% they are unfolded perpendicularly toward roof apex. The rolled-strip materials are stuck with cold and hot mastic with mechanical means.

For strengthening dampproofing carpet at contact points with parapet walls and other stuck out structural elements an additional dampproofing layer needs to be laid. Before roofing there is a need of installation of inclined borders at contact points as well as perform vertical and surface plastering works and their coating.

Dampproofing carpet is installed at parapet and wall contact points with ruberoid RM 350 and the upper layer - with roberoid coarse grained layer pk 420. The upper side of the dampproofing carpet needs to be lifted 20-30 cm over the roof and protected from water leakage and solar radiation by zinked tin sheet apron.

When flat roof is made of foliated roofing the layers are overlapped with 10 cm (in width) for roofs with less than 5% inclination; as for roofs with more than 5% inclination the overlapping of lower layer can be 7 cm and the upper one of 10 cm. 4 layer roofage sticking is started from the cornice. When the roof inclination is 15% sticking is made with manual packer first with 25 cm width ruberoid and then 50, 75 and 100 cm width ruberoid. The subsequent layers are of the entire ruberoid width.

Installation of the roof with rolled glass fabric is done similarly as with using other rolled-strip materials. The glass fabric is stuck on hot bitumen or rubber bitumen mastic.

Nowadays the rolled-strip roofage is laid on bitumen material by melting compacted layer with flame of a special aggregate. The space under the roofage layer is heated with flame and tightly stuck to the upper layer of the roof. Tight sticking of the layers ensures tightening of melted materials to each other and to the foundation.

9. FLOORING

Installation of each element of the floor (dampproofing, levelcrete, interlayer and revetment) has to be done after completion of civil-installation works and only after thorough inspection and preparation of certificates for the performed hidden works.

Installation of parquet, plank floors and levelcretes can be done only after completion of works related to damping (plastering, painting) of the floor. Linoleum can be floored only after completion of all civil, installation and finishing works.

The floor can be laid only if the air temperature on the floor level is not less than 50°.

Floor can not be laid on the frozen soil.

Floors consist of structural elements having various functions:

Revetment – the upper element of the floor being in actual use;

Interlayer - linking layer between revetment and floor foundation or roofing.

Levelcrete – a layer having hard or compact surface on porous elements of ceiling. Levelcrete is made for leveling of uneven surface of ceiling or the floor or making the needed inclination of the revetment.

The following elements can be added to the floor structure:

Heat insulation – protective layer of the floor helping to prevent warmth.

sound deadening layer.

Flooring in dwelling houses and social structures is made of ordinary timber, parquet, linoleum or various artificial or natural stones or other artificial or natural materials.

Constructive requirements for each type of flooring are provided for by draft drawings and they have to comply with the modern international standards and technical conditions.

- **Ceramic Floor**

Ceramic tiles are sometimes used for flooring. Shapes and sizes have to comply with international standards. In order to check tile surface quality 50 tiles are taken as samples from each batch of tiles. Out of tiles considered to be usable by exterior view 20 tiles are taken as samples in order to detect their dimensions, bending and skew-angularity. 5 tiles are taken to detect thermal stability, water absorption, bend strength, coating firmness.

When 4% of the selected sample tiles do not meet standard technical conditions a retesting is conducted on doubled number of samples.

After rechecking if there is no compliance the batch will not be accepted.

Nominal thickness of figure tiles must be 6-8 mm. Deviations in length and width of tiles from one batch can be maximum 1.5 mm in length and 1 mm in thickness.

The tile must have robust corners and face edges.

Water absorption must not exceed 16%.

The reverse side of the tile must be grooved. Groove height – not less than 0.3 mm.

For tiling firm and hard foundation is needed. Such foundation is usually considered to be a levelcrete of cement-sand grout (M100 brand) on floor revetment.

The floor laying has to be started after preparatory layer is ready in accordance with design marks and after installation of sanitary-ware and technical layout, access boards, up-rises, wash stands etc.

It is important to prepare a certificate on performed sealing works that is why it is necessary to check waterproofing quality in bathrooms.

It is also necessary to check horizontal lying of the floor by 2 m control rod.

During tiling marks are made at the corners of the building. In order to have a proper quality a rope is stretched between marks.

During laying ceramic tiles in winter a temperature in a building must not be less than 8°.

The surface ceramic tiles laid must be smooth (if otherwise specified by the design); gaps must not exceed 4 mm when checked by control rod.

A special attention needs to be paid to joining with interlayer, what is checked by knocking on a tile. Besides tiles must not be cracked or have broken corners or edges or other defects. Joints between tiles must be linear and filled with cement grout. Deviation from the linearity must not be more than 100 mm in every 10 meters.

- **Parquet Floors**

After delivery of parquet floor to the construction site its quality has to be controlled as well as storage recommendations have to be strictly followed. Block parquet floors sorted out by types (sizes, timber varieties) and packed up in batches have to be stored arranged in piles over 1.5 m height in a dry, warm and ventilated building on one and the same air temperature where humidity does not exceed 60%. It is forbidden to store parquet in buildings with wet plastered walls.

Inspection test; 3% of parquet is taken from each parquet batch delivered. Each sample parquet block taken will be measured, inspected and undergo physical-mechanical testing.

Block parquet is laid on cement, concrete and asphalt concrete screed coat, on the interlayer of fiber tiles with the thickness of 10-15 mm and on black plank floor (as it is provided for by the draft drawings).

Parquet can be laid directly on reinforced concrete panels. Before starting parquet flooring the surface has to be cleaned from dust, debris etc.

Before parquet flooring it is necessary to check parquet flooring type and quality of materials to be used. It should be considered that timber variety and dimensions of parquet to be laid in one room have to be similar.

During and after work performance the humidity in rooms where parquet is floored has to be within the range of 50-60%. Moistening of floors is forbidden.

- **Cement Floors**

After washing and cleaning of cement floor foundation, timber bars (with the section of 70X30X3500 mm) are placed along the wall length. First line of the rods (screed guide) is installed over the distance of 0.5-0.6 m from the wall, the subsequent one over 2-2.5 m parallelly to the first one.

After installation of rods (partially or on the entire area of the floor) foundation is coated with cement grout; gaps between rods are filled with the ready grout. The filling is made to the next nearest line.

The filled lines are levelled with a linear rod. They are compacted with a vibrating board or a vibrator with an electric surface. After levelling they are covered with a thin cement layer.

Cement floor thickness (grout brand of 100) must not be less than 25 mm.

According to the cement brand the proportion of cement and sand in the grout (according to volume) is as follows: brand 600 – 1:4,5; brand 500 1:4, brand 400 – 1:3.

- **Outdoor Ceramic Floor**

Ceramic tiles (slabs) are sometimes used for outdoor flooring. Shapes and sizes have to comply with international standards. Tile should have a rating from the Porcelain Enamel Institute of "PEI Class 4" or "PEI Class 5." Ceramic tiles thus rated are rugged enough to survive the freeze and thaw cycle and have less of a chance of cracking than do lower rated tiles. Tile should have a rough surface. Wet ceramic tile is very slippery. A tile with textured surface is less slippery, and therefore safer. Ceramic slabs are to be placed on prepared fine graded B 15 concrete base or cement mortar M100, all in accordance with project specifications. **Thickness of the concrete slab on which will be installed ceramic tile should be minimum 10 cm.** Thoroughly clean the concrete slab on which you will install your ceramic tile. Remove any small specks of sand, dirt, paint, grease or anything else that may interfere with the under layer membrane bonding completely with the concrete surface. Install the under layer membrane. This membrane is necessary to keep ceramic tile from cracking. The membrane shifts during freeze and thaw cycles and helps keep the ceramic tile from moving or cracking. It is not necessary to wait for the membrane adhesive to dry completely before beginning to lay the tile. Use the multi-flex thin set mortar that you used to put down the under layer membrane. This type of mortar will give a little when it freezes, saving the tiles from shifting and cracking. Lay down a layer of thin set mortar, putting down only as much as you can tile in about 45 minutes, or a film will form on the mortar which interferes with the mortar and tile bond. Install the tile. When working with outside ceramic tile, lay the tiles closer together than you would for indoor installation. This will reduce the overall area of mortar, which thereby reduces the risk of water being absorbed into the tile, which reduces the risk of cracking when it freezes. Let the mortar dry, usually about 24 hours. Once the mortar is dry, apply the grout. Use a grout specifically designed for outdoor installation. The grout is first line of defence against moisture seeping into the tiles, which will make them crack when it expands upon freezing. Use a grout float trowel to push the mortar between the tiles. Wipe off the excess grout with sponge. Allow the grout to cure for up to 48 hours before allowing foot traffic on the tiles.

10. WATER PROOFING

10.1 Scope and Objectives of Waterproofing

The main objective of waterproofing is to protect the works, buildings and structures from water and moisture. Due to their porosity the main construction materials, like stone and concrete, absorb moisture and under pressure they may pass it through the structure body. Besides, the water absorbed into the wall stones of the building at the ground level or below may go up quite high, unless it is blocked by the firm watertight material – hydraulic insulation material.

The building design should specify the type of waterproofing, materials and sequence of operations. The close monitoring of the waterproofing quality and its conformity with the design is essential as even the minor deviations may impair the performance of the building. The correction of such defects is complicated and often impossible.

Prior to the commencement of waterproofing the ground water level in the buildings should be kept at least 50 cm below the lowest level of waterproofing. The said ground water level should be continuously maintained from the commencement of the waterproofing works to their completion using pumping and drainage for dewatering. Pumping-out of the ground water requires strict control of the water levels keeping records in a register, which is enclosed with the acceptance certificates. Pumping-out water is not allowed if washes off the soil. For the ground water drainage the site of the building should planned so as to avoid water intrusion into the pit or trench. In order to drain the foundation pit special pits and ditches have to be cut maintaining the required slope of the drainage area.

During the preparations for waterproofing timely installation of inserts in the pipelines (all kinds of conduits) should be ensured in the openings envisaged by the design and their levels and placement should be checked, the conformity of movement joints with the design and the accuracy of their construction should also be examined.

The movement joints of the building should be filled with elastic mastic (rubber-bitumen mixture, low-melting bitumen filler) and then covered with the material specified in the design. Vertical movement joints should be filled with mastic gradually (by 50 cm high sections) as the waterproofing goes on.

10.2 Quality Requirements of Waterproofing Materials

Waterproofing is carried out using hot and cold bitumastic, roll bitumen and other materials.

During the waterproofing a special focus should be placed on the quality of the used materials. All the materials should have manufacturer's certificate. If they do not, average samples of such materials should be sent to the construction laboratory to analyze their quality using the methods of current state standards.

In selecting the bitumen for surface waterproof it should be taken into account that its softening temperature must be 20-25°C higher than the maximum temperature of the waterproofed surface or the environment but no less than 40°C. Cement of any brand or well-milled mineral powder (e.g. ground limestone, dust ash) with the particle of less than 0.15mm, can be used as an additive.

Cold bitumastic is also widely used for waterproofing. Milled lime with no less than 67% of active calcium oxide and magnesia, plastic clay, Tripoli powder, etc. can be used as emulsifying agents. Cold mastic has to be homogenous and should not contain any fillers unsaturated with bitumen and residue, which can not be removed by mixing of the mastic.

Surface waterproof is applied to basement foundations and walls in case of high ground water level and comprises several layers of roll materials: sarking, ruberoid, sanded coal-tar saturated roofing felt, tarred felt and other materials on a root-proof basis. The quality of each roll material delivered to the site should be controlled. Roofing felt, ruberoid, bitumen felt and sarking should be wrapped in proper packing paper and adequately marked. Each of the said materials should be rolled up in a single 20m roll.

Storage of roll materials requires special attention. Roofing felt, ruberoid, bitumen felt and sarking should be stored in enclosed unheated space or under sheds. Storage of the said materials in open storage yards or near the flammable materials is prohibited. Rolls of ruberoid, roofing felt and bitumen felt should be categorized by brands and placed vertically in no more than five rows in height. When the temperature is higher than 35°C waterproofing materials may stick together. Therefore, in summer they should be protected from sunlight. When the temperature is below 0°C, the roofing felt and ruberoid start cracking and so, before unrolling them it is recommended to previously warm their rolls in a heated storehouse.

Prior to the use of roll materials, their quality should be checked to meet the following requirements:

- they should not contain light layers unsaturated with bitumen;
- they should not stick together in the roll;
- they should easily unroll without cracking;
- their strength, flexibility, cardboard weight, weight increment of saturation should be no less than those specified in the relevant state GOCT standards.

10.3 Execution of Waterproofing

Paint Waterproofing

Waterproofing should be executed in strict compliance with the design.

During the execution of waterproofing the quality of used materials, waterproofing technique and completed works at various stages should be checked. Records of the check results, defects and ways of their correction should be kept in a register and certificates should be made for buried works.

Paint waterproofing is executed by painting the surface with hot bitumen, hot bitumastic, bitumen cutback and other materials on the basis of synthetic resin and plastic. The finished emulsion should be homogenous without clots and bitumen fiber. The deviations in the volume weight, water content and viscosity of the emulsion should not exceed 5%. The emulsion should be stored in tightly closed tank. If the emulsion is stored for more than a month, it should be mixed once or twice a month. Prior to their use the emulsion paste, hot bitumastic and other materials should be checked by a laboratory assistant through visual inspection and laboratory tests.

The strength and reliability of the paint waterproof can be ensured only if it permeates deeply enough into the porous base (concrete or stone). Therefore, prior to the application of paint waterproof the surface of reinforced concrete and stone structures should be thoroughly cleaned and from dirt and dust, popouts should be filled up and wet spots should be dried.

The paint waterproof is applied in two or better three successive 0.5-2mm thick layers (exclusive of coat base coat). Each subsequent layers is applied only after solidification of the previous layers and inspection of their quality. The thickness of paint waterproof should meet the design requirements.

The paint waterproof thickness in vertical and close to vertical surfaces depends on the structure type, material and air temperature. The waterproof thickness may be increased in horizontal and slightly inclined surfaces if there is a risk of waterproof integrity damage during the execution of works. At the bends, intersections and over the movement joints the paint waterproof should be reinforced with meshes, glass fabric, etc.

For the mechanical application of paint waterproof gear pumps or compressed air machines are used and for the manual application – fiber, grass and hair brushes (the use of oakum and burlap brushes is not permitted). In order to fully use the material flowing down, the waterproof is applied from top downward in 1-2 m wide strips with 20-25% overlap of adjoining strips.

In the paint waterproof quality control particular care should be taken to avoid any popouts, cracks, swelling and exfoliations. The faulty areas should be cleaned from the waterproof and after drying covered with several layers of the same material.

Cold Asphalt Mastic Waterproofing

This type of waterproofing is used for those parts of the building which are not exposed to weather impact and direct sunlight. The requirements for such mastics in terms of flowability, water impermeability, water resistance, heat resistance, mechanical effect resistance should be determined by the construction laboratory through selection method.

Prior to the application of cold mastic the surface should be cleaned as in case of the hot bitumen waterproofing and the parts of the building (basement walls, foundation) located above the ground water level should be wetted by watering through a hose or nozzle mortar pump.

On vertical surfaces cold asphalt mastic is typically in two or three 5-7mm thick layers (from top downward in 2.5 m high strips) and on horizontal surfaces – 7-10mm thick layers. The overlaps of the strips and stages should be no less than 20 cm wide.

Each subsequent layers is applied after incomplete drying of the previous layer, which should not stick to hands but have sufficient to stick to new mastic layer. It takes 1-2 hours when the weather is dry and hot and 24 hours when the temperature is 5-10°C and the humidity is high.

In cold asphalt mastic waterproofing long intervals are not permitted as the layer may meanwhile get dirty. A new layer should not be placed on a fully dried previous layer as the adhesion between them will considerably decrease. In such cases it is recommended to clean the surface from the dried layer and then cover it with a new layer of the design thickness.

The waterproof quality is checked after its drying through inspection of the mastic layer integrity and identification of visible defects (cracks, mechanical damages and sags). Exfoliations are identified through light tapping of the waterproofing layer with a wooden hammer. The mastic layer thickness is measured with a thickness gage (one prick on every waterproofed surface or in every 25-30m²).

Surface Waterproofing

Surface waterproofing is typically used for the underground parts of the buildings. Roll waterproofing materials (like ruberoid, roofing felt, sarking, etc) are pasted to the surface. Prior to the pasting the quality of the roll materials should be carefully examined and samples selected for the laboratory tests.

All the necessary arrangements should be made to prepare the roll materials in a special site prior to pasting: they should be unrolled and their surfaces cleaned from grit. Talc grit, sprayed with green oil or kerosene is, is sunk into the covering layer of ruberoid. After preliminary treatment of the roll surfaces with a dissolvent (which should evaporate before pasting the rolls) coarse-grained grit is removed by wooden staples or scrubbers. Rumbled spots are straightened with smoothing irons or hot smoothers. Incidental defects should be sealed.

The prepared waterproofing material is rolled with the treated surface outward in so that the surfaces do not contact, tied up and kept in a vertical position.

The commencement of the waterproofing is only permitted after the project Manager in collaboration with the construction laboratory assistant has checked the quality of the waterproofed surfaces.

The waterproofed surfaces should be even and cleaned from dust and dirt. The surface evenness is checked by the application of 2m long control rod. If the gap between the rod and the surface is more than 10mm, the spot has to be straightened: less than 10mm long hollows can be straightened by pasting roll materials on hot mastic and larger hollows can be filled with cement grout.

The adequate surface drying is checked by trial pasting of 2-3 roll material pieces on 1m² surfaces and tearing them off after the mastic cooling. If the material is torn, the surface is considered sufficiently dry.

Right and acute angles between the adjacent surfaces should be chamfered or rounded with about 10 cm radius.

In order to avoid capillary moisture in residential buildings without basements the simplest waterproofing is used: two layers of sarking, ruberoid and other roll materials on mastic between the foundation and socle and 100-150mm below the floor in the socle part of the wall.

In residential buildings where the basement floor is below the ground water level waterproofing of the foundation and basement floor should be carried out.

The number of surface waterproofing layers is specified in the design and depends on the hydrostatic pressure of ground waters, structure type, waterproofing material quality, air temperature, drainage methods, etc. Typically, the surface waterproofing is carried out with 2-5 layers of roll or sheet materials and mastic. The hot mastics used are the same as in paint waterproofing. The thickness of hot mastic layer should not exceed 1.5-2mm. For pasting roll materials on horizontal surface the use of cold roof mastics is permitted provided that their layer thickness does not exceed 1mm.

It is recommended to carry out surface waterproofing in the dry weather and the temperature of no less than 5°C. Roll materials should be pasted with at least 100mm overlap in longitudinal joints and at least 150-200mm in cross joints. The overlap joints should be additionally spackled with the mastic squeezed during the pasting. Mutually perpendicular pasting of roll materials is unacceptable. Joints should not be located immediately above one another. During the pasting the roll materials should be tightly pressed to the surface or to the previous layers by a wooden spatula. In waterproofing the horizontal surfaces a 80-100kg roller with soft covering should be used or an electric roller if the temperature is low. For waterproofing the vertical surface the previously cut roll materials (1.5-2m long strips) are pasted from top downward and carefully smoothed. The mastic is first applied to the waterproofed surface and then to the roll material.

Waterproofing of conjugations between adjacent surfaces and the places where waterproofing abuts on the compensators and embedded elements require special attention. In such places additional (reinforced) waterproofing layers are applied. The width of the additional layers should be no less than 15cm. The appropriate roll materials, as well as metal sheets and meshes for the reinforcement of waterproofing are swaged and bent on the spot to put them in the required shape. When the surface waterproofing is extended from the horizontal surface to the vertical face of the walls, the ends of the horizontal roll waterproofing should be pasted to the temporary 1.2-1.5 m high protection walls, which are built along building perimeter before construction of the bearing walls. When the bearing walls are built, the upper parts of the protection walls should be demolished and the waterproofing should be extended to the bearing walls. The waterproofing should be executed in layers with lap joints and the size of the laps should be no less than 15cm.

The quality of the last layer pasting and its surface treatment needs special care. The last layer of the surface waterproofing of bitumen roll materials is covered with 2-2.5 m thick continuous layer of hot bitumastic and then sprinkled with dry hot sand to be pressed in.

All the folds, air bubbles, pinholes and other defects detected in the waterproofing layers after rolling should be removed. For this purpose a cruciform cut is made in faulty spot, the cut parts are turned back and the waterproofing layer and apply a patch. A patched spot is covered with a strip of roll material in such a manner as to overlap the cut by 20cm in all the directions.

Cement-sand Waterproofing

This type of waterproofing is recommended for the wall and ceiling surfaces exposed to higher humidity (such as sanitary arrangements, bathrooms, kitchens, laundries, etc) as well as for protection of the foundations, reservoirs and blind areas of the basements..

If there is no water pressure cement-sand waterproofing can be applied both outside and inside of the building. If In case of water pressure the waterproofing should be applied to the side exposed to pressure.

For the sanitary arrangements cement-sand waterproofing with water-repellent and sealing additives (e.g. sodium aluminate, chloride iron, etc). It is recommended to prepare the compo with the said additives in small batches and near the site.

300-400 brand Portland cements and ordinary sand of average particle size are used for the compo preparation. The compo of 1:3 proportions (by volume) should be tempered by 3% sodium aluminate or chloride iron, solution). The flowability of the cement-sand compo should be about 2-4 cm. The waterproof cover should be applied to the clean and wetted concrete base in a 3cm thick layer with 10-12 cm high application to the walls.

In waterproofing of the sanitary arrangements the contractor should ensure regular watering of the cement cover for the first three 24 hours. All the precautions should be taken to prevent cement cover damage when

flooring tiles are laid. Waterproofing quality control in sanitary arrangements is carried out by flooding with 2-3 cm high layer of water and observations to detect a leakage.

10.4 Protection of Waterproofing

The durability and high quality of the waterproofing can be ensured only if the necessary protection is timely executed. Protection measures should be taken immediately after the quality check of the paint or surface waterproofing. For this purpose 2-3 cm thick cement (1:3 – 1:4 proportions) or asphalt coats are applied to the horizontal surface. The waterproofing of the vertical surfaces is previously sanded and then plastered with cement mortar up to 2m height. Above the 2m level plaster is applied to the metal mesh installed in the upper part of the structure and dubbed on the mat by spreading bitumen or mastic in particular places.

Brick, concrete and reinforced concrete slabs are used to fix and maintain the waterproofing along the building outlines. The gap between the waterproofing and protection wall should be filled with masonry mortar of 50 brand and 12-13 cm slump flowability. Then the protection wall is covered with 10-12 cm thick layers of soil carefully compacting each layer.

Reinforced concrete jacket is used to fix and maintain the internal waterproofing. The waterproofing of horizontal surfaces is protected by covering it with 5-15 mm size fraction gravel layer used as drainage. The layer thickness should be no less than 50mm. Gravelling the waterproofing mat without protection coats is not permitted.

10.5 Waterproofing in Winter

If waterproofing is executed in winter all the material storehouses and plants should be located as close to the works as possible. Cement-sand waterproofing can be executed when the ambient air temperature is no less than 5°C. In such conditions paint waterproofing should be suspended as its quality would be low.

Prior to the waterproofing in winter the surfaces should be warmed to the above-zero temperature. Application of coats and mastics and pasting of roll materials to wet, frozen snowy surfaces is prohibited.

In winter roll materials should be kept in warm buildings until they warm up to the above-zero temperature and treated with heavy dissolvent. Control of waterproofing mixtures during their preparation and application is necessary. In winter the protection walls should be covered with thawed ground.

10.6 Acceptance of Waterproofing Works

The durability of waterproofing substantially depends on the quality of the works execution. All stages of waterproofing are buried works and therefore each completed stage of waterproofing works should be accepted and certified separately. The certificate should specify the quality of works and confirm the absence of defects.

For interim acceptance first the structure surfaces prepared for waterproofing and then each layer of the waterproofing prior to the next application should be checked. The quality of movement joint compensators should be checked with the utmost care and their acceptance should be certified by a special certificate.

Acceptance of the completed works envisages careful inspection of the waterproofing (particularly at the joints and pipeline routes) and quality control of the used materials based on the laboratory test results. If necessary, instrumental checks of the cut out waterproofing samples can be carried out.

Final acceptance envisages the following checks: conformity of the structure with the design, continuity of waterproofing layers, adhesion between the waterproofing and the base surface and between waterproofing layers, absence of bubbles and exfoliations, impermeability of joints, absence of mechanical damages.

11. INSTALLATION OF WINDOWS AND DOORS

In stone (block and brick) buildings windows and doors are installed during the wall construction in compliance with the levels and slopes. They are installed using the installation foam. All of the doors and windows should be at the same distance from the outer surface of the wall. The joining points of door frames and window cases with the external wall masonry are treated with insulating paste and protected with water-proof layers (roofing felt, bitumen felt). Gaps between the door and window frames and the external wall masonry should be carefully caulked with thermo-insulating materials and the gaps between the frames and internal walls - with sound-insulating materials.

Door frames and window cases are fixed in the walls with barbed nails, which are hammered in wooden plugs treated with antiseptic. Side vertical bars of the frames are fastened with two barbed nails at no less 1.5 m height.

When the window and door frames are placed in the walls and partitions and platbands are installed in the doorways and window openings, the frames should protrude outside the limits of the wall plane at the same length of the plaster thickness so that the platbands are closely fitted to the exterior face of the frames and plaster.

A cill is made of cement mortar or galvanized steel on the previously prepared sand-cement surface. It should protrude from the vertical wall surface by 40mm with the larmier.

Installation of Window-sills

Window-sill are installed in the openings of the stone (block, brick) walls prior to the commencement of plastering works. More than 12 cm wide window boards should be made of 54 mm thick and no more than 10cm wide sections in width. The sections are interconnected with connector and glue. The length of the window-sill is determined by the width of the plastered opening. The window-sills are installed with a slight slope 0.01) inward. The downside of the sill is covered with antiseptic varnish. The window-sill is placed on the tar paper bedding. All the parts embedded in the masonry should be insulated with roofing felt. The ends of the boards are imbedded in the masonry and caulked with alabaster solution. In a building all the window-sills should be located at the same level.

12. PLUMBING

Plumbing Installation

The following works should be executed prior to the commencement of plumbing installation:

Construction of the structural units (floors, walls, partitions) where sanitary appliances should be installed;

Construction of trenches for sewage outlets from the building to the first sewage well with channel pipes;

Laying inlet pipes for connecting the building with the external sanitary system;

Preparation of openings, trenches, niches and pockets in the structural units of the building for pipelines and air ducts;

Installation of door frames and window cases;

Plastering of the wall and niche surfaces where sanitary and heating appliances are to be installed;

Installation of fixings in the structural units to fasten pipelines, air ducts and appliances;

marking the floor line +500mm on all the external and internal walls of the building;

No damage of the earlier completed surfaces is allowed during the plumbing installation;

pipe components and parts should be delivered in containers with accompanying forms and plates marking the packed units and parts;

components of heating, heat supplying, internal cold and hot water supply systems, valves, taps, dampers, air collectors, elevators, etc, should be checked for impermeability at the site of their manufacturing in compliance with state GOCT standards 25136-82 and 24054-80.

Steel pipes, their elements and components should be connected by welding, threaded junctions, coupling nuts and flanges. Typically, galvanized steel pipes, components and elements are connected by galvanized or malleable cast iron threaded fasteners, with coupling nuts and flanges.

Pipeline turns are made in the following manner:

- in the heating and heat supplying systems – by bending pipes or by seamless welded pipe-bends made of carbon steel. In compliance with the state GOCT standard 17357-83 the bend radius of the pipes should be no less than the external diameter, i.e. for the pipes with the internal diameter of up to 40mm – no less than 2.5 and for the pipes with the internal diameter of 40-50mm – no less than 3.5.
- in cold and hot water supplying systems by installing an elbow with the state GOCT standard 8946-75, pipe-bends or turning the pipes (if the diameter is more than 100mm only pipe bends and turning can be used). radius of the bend should be no less than 1.5 of the internal pipe diameter.
- when welded pipes are bent the joint should be outside at 45° angle to the plane of bending.

Threaded joints of the pipes are sealed when the heat-carrier temperature is up to 378K (105°C) with a strip of fluoroplastic packing material or flax treated with red lead mixed with paint oil.

For condensation lines when the heat-carrier temperature is more than 378K joints are sealed with a strip of fluoroplastic packing material treated with black lead mixed with paint oil. Sealing material should be applied in even layers along the thread lead and should not protrude inside or outside of the pipe.

When the heat-carrier's temperature is no more than 423K (150°C) flange coupling gaskets can be made with 203mm thick paronite or 4mm thick fluoroplastic. If the heat-carrier's temperature is no more than 403 K (130°C) – with heat-resistant rubber layers.

Flanges are welded to the pipe. Their surfaces should be smooth and without fins. Bolt heads should be located on one side (in vertical sections on top). Bolt ends should not protrude out of the screw nut limits for more than 0.5 of the bolt diameter. Gaskets in flange couplings should not overlay the boltholes.

Cast iron sewer pipes can be sealed with treated hemp ropes In compliance with the state ГOCT standard 483-75 or treated oakum strip In compliance with the state ГOCT standard 16183-77 with subsequent sulphuring (ГOCT standard 127-76) and addition of enriched porcelain clay (ГOCT standard 19608) or gypsum-alumina expansible cement.

Air ducts and ventilation system elements are manufactured based on the working documents.

In installation and welding works:

- 11 detachable joints of the pipelines are made at the fittings, which are easily accessible for servicing;
- 12 vertical deviations of the riser pipes should not exceed 2mm per 1 m of the length;
- 13 the distance between plastered or coated surfaces to the axis of the uninsulated pipelines should be 35-55mm if the internal diameter is up to 32mm inclusive, in case of 40-50mm internal diameter the distance should be 50-60mm and if the internal diameter is more than 50mm the distance should be determined according to the design;
- 14 Embedment of the fasteners with wooden plugs and welding of the pipelines to the fasteners is forbidden;
- 15 the distance between fasteners of horizontal cast iron sewer pipes should be no more than 2m and for vertical pipes – one fastener per floor.
- 16 fasteners should be installed under the pipe sockets;
- 17 leads to the heating appliances, which are longer than 1500mm should have fasteners;
- 18 sanitary appliances are plummeted and leveled.

The heights of the plumbing and water intake fixtures are given Table 1 below.

Table No1

	From the floor line to the upper border of the plumbing fixture (mm)	From the upper border of the plumbing fixture to the intake fixture axis
wash-stands	80 - 20	
the same with the common mixer for the bath and wash-stand	850 - 20	
sinks and wash-basins	850 - 20	
Highly placed lavatory flushing tanks (to the bottom of the tank)	1800 - 20	
Intake faucets and mixers for sinks	-	250 - 20
the same for wash-basins	-	200 - 20
Lavatory faucets and mixers of wash-stands	-	200 - 20
Mixers for bathes	-	800 - 20
Common mixers for bathes and wash-stands	-	1100 - 20
Shower mixers	-	1200 - 20
Shower nets (to the bottom of the net)	-	2100 - 2250

When the internal plumbing and drains are installed the pipe sockets and fittings should be set in the direction opposite to the water flow. Lavatory pan outlet is connected directly to the waste pipe socket or the waste pipe with a cast iron, polyethylene branch pipe or a rubber coupling. Lavatory pans are screwed or glued to the floor. If the lavatory pans are screwed a rubber gasket should be placed under pan base.

13. INSTALLATION OF ELECTRICAL DEVICES

Preparation Works

The Contractor hands over the structural part of the building for the installation works under the handing-over certificate. Residential buildings are handed over by sections and public buildings – by floors (or by buildings). In the buildings handed over for the installation works floor panels, wall panels and partitions should have channels (conduits) for wiring, niches, pockets with embedded fittings for the installation of sockets, switches, bells, bell-pushes. No more than 15% deviations from the design are allowed for the flow areas of channels and embedded pipes. In the junctions of the adjacent structures niches and pockets can be displaced by no more than 40mm.

The foundations, walls, partitions, floors and coverings should include design holes (of more than 30mm diameter), grooves, niches and pockets. Holes of less than 30mm diameter for the installation of dowels, pins and tips for supporting structures, which are not envisaged in the construction method conditions, should be made by the wiring company on-site. The Contractor is responsible for closing up the holes, grooves, niches and sockets.

Support structures are installed by welding to the embedded items or fastening elements (dowels, pins and tips). The method of fastening is specified in the design.

In residential buildings naked cables and wiring through fire-proof walls (partitions) and floors are laid in tube sections (if the walls and floors are flammable – only in steel tube sections). After the cable installation (wiring) both ends of the tube section are sealed with easily removable incombustible material, which should ensure fire resistance in conformity with the fire resistance of the structural unit.

Open and Buried Wiring

Wiring is permitted only when the temperature is $+15^{\circ}\text{C}$.

In case of open horizontal wiring wires are laid in parallel with the wall and ceiling intersection lines at the distance of no less than 100mm and no more than 20mm from the ceiling or cornice.

Vertical wiring should be made transversely to the ceiling plane. Near doors and windows wires are laid at 100mm distance from the frame edge.

In thin-walled partitions and or under the plaster the distance between horizontally laid wires and the floor slab should not exceed 150mm. In more than 80mm thick partitions wires are laid at the shortest distance.

Connection and derivation of installation wires are made by welding, embedding or fasteners in tee-cable boxes. At the wire entry tee-cable boxes should have insulating material sleeves.

In buried wiring flat wires should be tightly fitted to the base. In horizontal and vertical sections the distance between fixing points of wire bunches to be plastered should be no more than 50 cm. For single wires – 90cm and for wires to be covered with gypsum boards – 120 cm.

When the wiring is installed along the plinth feeble-current and power cables should be separated.

Wiring channels should have smooth surfaces. The length of the channels between niches or boxes should be no more than 8m and thickness of protection layer over the channel (pipe) should be no less than 10mm.

Installation of Lighting Fittings, Switches and Receptacles

Fastening of the lighting fittings to the supports should be demountable to ensure lamp replacement. Hooks and pins used for suspending lamps should be insulated from the lamps.

Lamps and single receptacles (in the kitchen, hall) are connected with group networks by means of terminal plates.

When lighting fittings, switches and receptacles are connected a reserve of sufficiently long wires should be kept to re-connect them if they break. Switches and receptacles of the open wiring are fastened in the sockets. Receptacles above the plinth should be installed right against the plinths.

Installation of Switchgears

Switchgears are located in the electrical control unit of the building in compliance with the electrical drawings. Panels are leveled and plummeted and fastened to the embedded parts with bolts and welding.

Circuit of the lightning protection system should be connected with a zero bus-line of the switchgear. Supply cables are fastened to the switchgears with clamps.

Supply, main and group lines should be marked in compliance with the electrical drawings. Connection of the wires and cables with the installed electrical equipment should be carried out in accordance with the equipment design.

Grounding of the switchgear should be carried out by connecting metal covering of the cable with the zero wire of the switchgear.

14. BUILDING OF PIPELINES AND RELATED WORKS

Pipelining, generally

Minimal depth of pipeline border cover should conform to ground freezing depth of territory of project zone, unless otherwise defined in the contract.

On each spot of charging or discharging rising of pipes or casings should be performed by the approved hoisting equipment. Loading by means of down moving boards or other forms of inclined fixed ramps is not allowed without written agreement of the engineer on the offered method.

Hoisting of pipes should be performed only by means of the approved cable according to manufacturer's instructions.

Channel for pipes should be built on the whole territory of spreading of granular material for channel and on the whole territory of pipeline channel. After putting pipes compactly in case of necessity, additional material should be displaced and should be evenly placed on each side of pipes. This should be realized after channel tracers are removed where possible. The depth of granular material (sand) below pipe shall be not less than 100 mm and above pipe – not less than 200 mm.

The sidewalls of all trenches greater than one meter in depth should be reinforced with suitable wooden planks and cross-trench struts to avoid caving-in of the sidewalls.

- Joining of pipes, generally

Surface and components of pipe joining should be kept clean and foreign matters should not contact with them. It is necessary to exclude access of any liquid or any foreign matter to connection arc after connection is achieved.

Engineer can issue order to continue pipelining and ground backing without inspection of joining spots, but it doesn't release the contractor from responsibilities connected with excavation of soil, in case of necessity, and with inspection of connection spots in the process of inspection of pipeline.

Flange joints

Ribs should be duly placed in line till tightening of bolts.

Connecting matters/substances should not be used in making joining spots in ribs. Less the cases of facilitation of making vertical connecting joints, lining might be protected temporarily by means of spreading minimal quantity of pure rubber liquid on one rib. Both angles should be treated by graphite paste and screw-nuts should be tightened evenly and in diametrically opposite couples.

Joining plastic pipes are dried and cleaned of foreign particles from

Torsional force and succession used during tightening of bolts should conform to manufacturer's instructions. Wrenches for torsional force should be used.

- Pipe cutting off

Pipe cutting off should be performed by the method ensuring clean quadratic profiles without cracking or breaking of walls, causing results minimal injury of any protecting paint layer. In case of need cut off ends of pipes will be formed into cones and canals fit for connection spot (joint) types and any protecting paint layer will be made well, and the ends – sealed.

- Ready concrete wells

Cells for ready concrete and pit sections should be constructed by steps, chain, stairs or rightly lined plates.

Points of junctions should be organized so as the demanded material for points of junction filled in the cavity of point of junction. Any excess material inside a cell or a shaft should be smoothed out and points of junction should be marked along the whole set.

When the wells need concrete jacket, concrete should be of C-29 type and height of each concrete pouring should not exceed 2 m. In each building, point of junction may deviate from junction of cell or shaft sections by 150 mm.

- Water-resistance of wells and cells

In the principle, wells and cells should be waterproof, without water flow, which can create problems for constant works.

- Organization of well covers and cells

Organization of well frames should be performed at the demanded level by the use of B-class engineering brick or on the carcass arc of ready/finished concrete, as defined in the contract. Carcass should be organized at the level, will be poured (placed) on the carcass base and on the sides, in the I class lime solution.

- Markers and indicatory posts

Markers and indicatory posts should be erected to refer to the location of the following equipment:

- Valves
- Fence or board crossing
- Water discharging cock
- Air valves
- Washing;

Pipe marker tape shall be installed 300 mm above utility pipe to protect pipe from disturbance by future digging/excavation;

- Permitted deviations on pipelines

Line and level of any type pipeline should not deviate from the norm stipulated by the contract by more than 20 mm.

- Organization of valves and branching

The contractor will be responsible for keeping valves and additional devices/tools in clean and dry state. Posts, engine, tools and indicators should be removed, should be marked adequately for identification and be kept in waterproof premises. The above stated should be repaired after installation of valves. Electric equipment should be protected from moisture and the seals protected from moisture should be left intact till they are not ready for assembling.

Mounting of all valves should be made in valve cells, unless otherwise formulated in the contract, gun metal profile and spots of valves should be kept clean. No valve should be closed without cleaning of profiles by clean fabric and without manual cleaning of the valve below cavity passage (exit).

All valves should be placed so as the operation axes are vertical, unless otherwise formulated in the contract.

Before a valve starts functioning, devices/tools, bearings and axes should be greased and oiled by the approved lubricants. Oil baths should be cleaned and filled in to the corresponding level and the holes of every lubricating material should be filled in by lubricants. Contact with any harmful substance with working profiles is inadmissible and oil depot should be kept clean.

Gaskets should be inspected when water pipes are charged and leaking places are in order or repeatedly packed by quadratic folded greased string/rope packing, when necessary. Gasket should not be placed near to hinder rotation of axis.

Installation of special type valves and measuring of equipment should be implemented by strict observance of manufacturer's instructions.

- Connection to existing pipelines

The contractor should perform connection to existing pipelines only when it is agreed upon in advance with the engineer. Prior to connection operation, minimum 7 days in advance, the contractor should notify the

engineer about it, and the contractor will have no right to start connection operations without written consent of the engineer.

The contractor should plan engineering works to bring to minimum the obstacles for the works. It might force the contractor to work not only within the frames of regular working hours.

The contractor has no right to remove any hoof, brake or fitting from the existing pipeline, to make obstacles to it in any form or to enter any existing structure without the right granted to him in writing by a contractor.

When the contractor is asked to perform connection to the existing pipeline, the contractor should inspect connection prior to starting the operations, in case of need, inspect spots by removal of whole ground, in order to use material supplied within the frames of the contract for execution of connection works.

While planning the joining to the existing pipeline, the contractor should take into consideration the fact that isolated valves and washed equipment generally are not fit for operations and he should plan the works correspondingly.

- Piping and accounts on services

The contractor should prepare reports on all pipes, services and used fitting according to succession of their placing, together with information on their length and depth to enable workers to move pipes to the end of other pipes; he should also describe the surface and location.

The contractor will be obliged to prepare reports/accounts on all services on pipe canal. Records should contain service type, description of its dimension, depth and location from the very beginning of the pipeline to its end. Accounts should also contain the angle at which the definite service crosses the canal.

The contractor should submit registered accounts, weekly to the engineer.

Acts of hidden Works should be developed after conducting construction works which will be approved by executor and contractor

- Process of pipeline building

Ground backing in each canal around each pipe should be realized within 8 hours of connection unless otherwise decided by the engineer. Canal should be filled in fully and should be cleaned when every part of each pipe is inspected, checked and approved.

Wastes of building, excess soil and other material should be removed and repair of all fences, canals, pipelines, indicator posts and similar facilities should be terminated as soon as ground backing is finished.

Pressure Testing of Pipelines

Hydraulic or pneumatic pressure testing of pipelines shall be carried out according to Georgian construction regulations (07.01-09, clause 16).

All joints shall be leaved exposed until pressure testing is successfully completed for all drinking water pipelines.

- Hygiene and cleanness

Pipes, special devices and fitting stipulated for potable water provision should be scrupulously clean from the moment of their delivery or accumulation to the end of termination of pipeline. The contractor should do his best to avoid pollution of pipes from any source. Prior to putting potable water pipes or specific mechanisms, relevant brush, impregnated with chlorine should be passed through it. Other type fitting should be washed by chlorine mixture just before their mounting. Chlorine mixture should be used by pulverizer, standard device of any complete set within the frames of the area of the client. Putting of drinking water pipes is banned without the above stated conformity.

In the process of piping and mounting any harmful substance or liquid, which can enter pipes should be washed out immediately and the pipeline - should be swabbed.

After piping, open end of each pipe should be closed by waterproof lid/cover, which should not be removed until the next pipe is placed and is not prepared for assembling. Open end of each pipe should be closed similarly along the whole length of a pipeline and should be kept so till closed by adjoining length.

No protecting lid, disc or other form installation at the end of a pipe should be removed till the process of mounting is in progress. Pipes and equipment, including facing and fencing should be tested on loss and common surfaces and components should be cleaned immediately before piping.

- Disinfecting, inspection and operation of water pipes

After bacteriological and chemical inspection and disinfecting of completed parts of water pipe and communication pipes the contractor should not replace/change valves or do anything contributing to appearance of problems hindering to functioning of pipeline.

Bacteriological inspection of completed parts of drinking water conduits should be performed by the client, unless otherwise formulated in the contract.

In the process of chlorination the contractor should observe the following procedure:

- a) The contractor should provide points on the pipelines, where samples will be taken for checking up water chlorination level in pipeline, or for taking bacteriologic samples, where drainage taps could be washed; he should mark location of air taps too.
- b) Prior to chlorination operation drinking water conduit should be swabbed and tested for pressure, as is defined elsewhere; and be left full of water;
- c) In the process of chlorination relevant measures should be taken to avoid entering of chlorine containing water to the existing distribution system. The only connection between the existing system and new pipeline should be realized in the form of temporary connection. Thus, e.g. fire-hose between two water conduit taps, including double non-reversible and control valves, which should be separated when, standing idle.
- d) Chlorination by chlorine gas or sodium hypochloride liquid approved by the engineer should be performed at water flow from the existing distribution system to permanent section of a pipeline, when chlorination substance is entered constantly up to corresponding norm in order to keep maximum 25 mg free chlorine remainder per liter (mg/l). The above stated minimal remainder should stay along the whole length of pipeline. Lead passage in the pipe from chlorine containing water is not allowed.
- e) Pipe should be left in such concentration for minimum 24 hrs.
- f) All valves and taps on every pipe should be operated several times to provide contact of chlorine containing water with all parts;
- g) After 24 hrs contact chlorination liquid should flow outside together with water-pipe water, including the ends of each branching of each fitting and each pipe. Chlorine remainder should be checked up frequently. Water flow should be stopped when chlorine remainder will not exceed the rate/volume of the remainder of incoming water.
- h) After chlorine containing water is expelled a new water pipe should be filled in by water-pipe water for the following 24 hrs, till sample taking.
- i) The client should take samples from incoming water of water-pipe, from the end of pipe and from all its branching. In case of long pipes rather great number of samples should be taken for checking up of total quality. Chlorine remainder should be measured in the moment of sample taking. Pipeline will not be considered satisfactorily disinfected, till all samples will not meet the demands of quality standards of drinking water of the client.
- j) The contractor has minimum 3 working days from the day of sample taking to get results and the results shall be considered satisfactory if no coliforms that is E.coliform substances are exposed in 100 ml.
- k) In case of unsatisfactory samples, complete or partial using of broom and disinfecting procedure should be repeated at the discretion of engineer.
- l) After successful bacteriological test final connection should be realized and pipeline will go into exploitation within 72 hrs.

The contractor should provide for all types of works, necessary assembling, pumps (drying, filling and operation), temporary pipes, holes and connections for transfer of water from the nearest adequate water-pipe, chlorination shop and chlorination equipment, from material and from all other apparatuses, which should necessarily conform to the present paragraph..

- Water necessary for testing and disinfecting

Water for testing of pipes and buildings and for disinfecting might be taken from the available reserves if the contract defines so. The contractor, jointly with the organization dealing with water-pipe, should take measures in connection with the above stated water-pipe system and in case of need, should take alternate measures.

Pipes which are used for obtaining water from communal system should be approved by duly authorized organization dealing with water-pipe and should be handed over to them for inspection and approval, if demanded.

System of control valve should be joined between communal pipe and the pipe or premise, which should be filled in to avoid back-siphoning.

- Localization of water for cleaning, testing or disinfecting

Special equipment should be guaranteed for localization of water for disinfecting, swabbing or testing.

Vacation of sewer pipes should not be executed without consent of duly authorized organization dealing with sewer pipes.

Water after cleaning of structures or pipes, water used for testing or disinfecting should be safe, prior to its pouring outside/into environment,

After water testing, pipes and mechanism should be vacated to the possible extent.

Discharge of chlorine containing water to water channel, to roadside water-canals or to surface water drainage channels - should be performed by taking due care for environment.

When there are no corresponding constructions for delivery of chlorine containing water, dechlorination should be performed prior to localization.

15. On Preparation for Launching Restoration Works & the Materials Required Thereby

General

Engineering aspects of the project contain description of the materials required to perform the work under this refurbishment project. However, the specifications of materials are of general nature so they may fail to embrace all the works and operations to be performed under the project.

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Detail description and specification of the materials required for the work are given in the bills of quantities and detail drawings.

15.1 Lime mortar. Preparation will include activation of the waterproofing properties of lime by the use of special additives, and testing the mortar enriched now, with a production engineer and the design author involved in the procedure. The lime mortar to be used both as a protective lime layers and as stucco or plaster will be specially modified i.e. enriched with mineral and polymer additives. Hence, such mortar should be prepared by experts, under strict observance of relevant production techniques.

15.2 Setting-up/ putting-in again: The actions meant by setting-up/putting-in of ashlar/facing bond, stairs, wood structures or any other architecture items (such as chapters, cornices, ends or other ornamental pieces) again will include numeration and numbering of the existing items, next their removal or taking down, and then their cleaning/brushing and rehabilitation-restoration (repair of and mending the damaged areas). Once restored and reconditioned, the items will be mounted to and fixed according to their numeration, in the places specified in detail design drawings.

15.3 Restoration of stone wall masonry:

I. Rehabilitation according to the existing pockets means setting up laying new facing bonds into the gaps, or pockets left after the old ashlar.

II. Restoration of stone wall masonry to match the old masonry means adding new space to the existing facilities through following the stone masonry pattern (inc.material, structure, texture etc) specific for the old walls.

III.Rehabilitation of stones damaged as a result of weathering means repairing/mending gaps through their infilling, sealing and thus stabilization to ensure their future structural integrity.

IV. Puttying means infilling gaps or slots, mainly the ones caused by weathering, between courses of masonry with mortar; before puttying is started, the wall shall first be freed from climbing plants and cleaned/brushed to remove dust, and then putted with adequate mortar. Puttying shall be performed with great care so that the wall masonry texture would not got hidden under the putty.

V. Mixed-type masonry (such as of slate, ashlar etc) means erection of a mixed-type masonry wall as specified by the design. Its decor, or decorative make-up to be finally imparted in situ shall be the responsibility of the foreman guided by the architect.

15.4 Restoration of stone columns and other ornamental pieces means rehabilitation of damaged pieces or recreation/re-establishment of the ones non-survived and lost. Priority should be given to preservation and conservation of the ornamental pieces that have survived for the time being.

15.5 Replacement of stone columns and other ornamental pieces means substitution of the existing items, damaged or tilted, with new ones of the same design. New items shall be made of the similar stuff. For their manufacture, patterns derived from the original design shall be applied. Reseating and adapting of ready items shall be performed in situ, pursuant to the design.

15.6 Injection of cracks to be observed in the masonry, with lime mortar means arresting of the cracks and splits by means of their injecting with modified lime mortar enriched with special additives that ensure structural stability of the mortar and control the pressure inside the injected stuff

15.7 Deck roof shall be understood as a flat roof installed by the construction methods traditional for the 19th century. To prevent penetration of stormwater into the building, the deck of the roof that will follow the traditional design and be mounted according to traditionally recognized techniques, will additionally be provided with waterproofing implying installation of the following: 1. 20X25 cm beam. 2. 3 cm-thick layer of slate. 3. Waterproofing course. 4. Light filler (8 cm thatch layer). 5. 20 to 45 cm long layer of rammed loam. 6. Waterproofing course. Slope of the roof deck should be not less than 3 degrees.

15.8 Restoration of windows and doors implies in situ rehabilitation and reconditioning of the existing window and door units, to be performed by a skilled restorer of wood items; for the rehabilitation, the same material and shape patterns will be used. The damaged or pilling paint or varnish coating will be removed and then replaced with new of the same stuff and colour as per the design.

15.9 Replacement of windows and doors with new ones means removal of damaged window and door units what shall be performed with great care to avoid damaging the walls. The new window and door units shall be made of hardwood and follow their original design.

15.10 Axiliary/miscellaneous works –Timber scaffolds to be makeshift, heavy duty, spacious ones specially manufactured for the occasion shall meet the current standards and the requirements specified by the Contractor in their Construction Operations Organization Plan. In particular, the scaffold lifts to number not more than 4, shall not exceed 2 m in height and make at least 1.4 m in width.

Spacing between scaffold poles to represent $d=120$ mm square beams/timber bars, should not exceed 2.5 m. Beams sized 60x100 mm should be employed as supports, 40 mm thick boards should be used for the platform/dais and the access/walking stair, 60x60mm bars should be provided as protective railing, angle braces and cross-pieces. All the above will ensure perfect rigidity and structural safety of the scaffolds. The timber scaffold members should be attached one to another by nails and $d=4$ mm black-drawn wire.

Note:

All works shall be performed by a skilled workman who has got experience of work in similar restoration projects.

16. PLASTERING

Removing Damaged Plaster

To repair plaster all loose wall material must be removed. Scrape all degraded material from the area using a putty knife. This includes bubbling or peeling paint, plaster putty coat and any brown or scratch coat involved. Remove all loose material back to the lath substrate and scrape back to solid material in the surrounding surface.

Scrape Peeling Paint

Test the paint coat immediately surrounding the area to see if it is loose. If the paint film comes off easily when a putty knife is slipped under it, it should also be removed back to sound paint.

Remove the Dust

Remove dust from the chipping and scraping process and coat the whole damaged area with shellac-based primer-sealer or an alkyd wall primer. With water damage, a sealer like this is essential to block residual moisture that would otherwise inhibit bonding of the patching compound. This could result in bubbling of the new joint compound.

Sealing the Plaster

Coat all affected surfaces including the surrounding wall paint. To help hide stains and make finish coating easier, use a primer-sealer with a white pigment added. Let the sealer dry completely before beginning repairs. Shellac primer will dry in about an hour while alkyd primer will take about 12 hours to dry completely.

Repairing the Plaster

To smooth out shallow plaster damage it will take several thin coats of setting joint compound to fill and cover all the damage. Start by mixing a small amount of setting compound and spread it over the whole area using a joint knife to "butter" the surface, leaving about ¼ inch of mud behind.

Immediately go back and skim off the excess mud to leave a thin coat that just begins to cover the damage. Hold the joint knife at a 30° angle and press down firmly as you pull the blade in parallel strokes, from one side of the area to the other, without stopping. Ignore any ridges left by the edge of the knife blade, when the mud has set you can scrape them off before applying a second coat.

Scrape and Sand

Let the mud set until it hardens. Scrape off any protruding ridges from the first coat using an upward stroke with the joint knife. Lightly sand the area with coarse to medium sandpaper to remove any other bumps, etc. in the surface. A completely smooth surface is not necessary here, just remove any protrusions that would cause bumps in the next coat of mud.

Brush off the dust and wipe the area with a clean, damp rag or sponge to remove the sanding dust before coating the area again with mud.

Apply a Second Coat

Apply a second coat of mud buttering the surface as before. Skim off the excess stroking perpendicular to the first coat. If the first mud coat was applied horizontally, apply this one with vertical strokes. Apply each subsequent mud coat reversing direction like this to help level any ripples and other irregularities for a smoother finished surface.

Sand and Paint

Let the last skim coat set and dry for about an hour before sanding with 120 sandpaper. Prime the new patch and surrounding paint with primer-sealer and let it dry completely before touching up the paint. Check the skim coating page for more about smoothing walls with joint compound.

17. NATURAL STONE FINISHES ON THE FACADE

Finishing of buildings' facades shall be executed in compliance with drawings and BoQ which is an integral part of BD.

The Contractor shall supply in good time to the Project Manager/Engineer for his approval, samples of materials that he proposes to use for the façade finishing. Sources of materials and production methods shall be to the approval of the Project Manager/Engineer.

Façade finishing works should be carried out in the following order.

- a) Cleaning of the surfaces- should be performed by compressed air.
- b) Rebar net installation on the surface – should be implemented with smooth rebar (rebar diameter minimum 6mm). Rebar should be weaved making squares (200x200mm) and bound by fire rated wire (wire diameter minimum 2mm). The net should be attached to the rebar stems (rebar diameter 10mm) in both directions, arranged as a chess type, which are installed in the wall, with 60cm spacing. Rebar stems should penetrate the wall by minimum 5cm, through predrilled holes. Nets should be attached to the stems by puncture welding.
- c) Attaching natural stone – should be done by schist type natural stone. Stones should be attached on the rebar net by using forks (wire diameter should be minimum 3mm) and attached with mortar (M75 cement). Reinforcement should be performed in layers. After reinforcement, gaps should be carefully cleaned from mortar debris.
- d) Cleaning of the finishes – should be performed when mortar is dry. Cleaning should be done in wet manner, using brushes.

Detail Specifications

1. Building Site

1.1. Location and Pathways

The construction site is located in Eastern Georgia, In Akhaltsikhe Municipality, Village Agara (c.c. 62.05.58.505).

1.2 Visit to Building Site

Having taken into account diverse nature of executed work, it is essential to have studied the site by any contractors.

Each of the contractors should have information about types and scopes of work that pricing of offered units should include all expenditures related to construction.

2. Works within Frameworks of Contract

2.1 General Description

The area selected for the project is free of buildings.. The facade of the building will be decided in a modern style and cheerful colors. The new two-story building will be located at the extreme north point of the project land plot, and the rest of the yard will be used to arrange entertainment grounds, attractions and a recreation area.

The project envisages thermal insulation of the building, low emission glass package will be used, which will further reduce energy consumption and save budget.

The new kindergarten will feature bedrooms and playrooms, dressing rooms, a buffet, a pantry, a hall, a storage room for products, a doctor, an administration, a dishwasher, a kitchen, an elevator, an evacuation ladder and a boiler room.

The project envisages the improvement of the yard of the kindergarten, the arrangement of entertainment attractions, playgrounds, swings, yard chairs, skating rinks, garbage bins and drinking water fountains (so-called mushrooms).

The project also includes the arrangement of engineering networks of the building: water supply and sewerage, electricity, weak system, heating-cooling-ventilation, etc.

2.2 Design/expert Work

The contractor is obliged to carry out an engineering geological and hydro-geological survey of the land plot, an expert opinion must be issued on the engineering-geological survey in compliance with the current legislation. Following an engineering geological survey, the contractor must recalculate the existing typical design project and, if necessary, make appropriate changes to the design project and the relevant parts of the estimate. The constructive part should be presented in the same way; the conclusion of the examination should be. Similarly, the contractor must submit an expert opinion on the proposed project in accordance with Resolution 41. The contractor must ensure the topo-shooting of the construction area, the preparation of

vertical plans, the adjustment of the typical landscaping project to the actual land plot, and, if necessary, the relevant changes made. The contractor must also submit a project for the external engineering parts.

The expert organization / person must meet all the requirements required by law. The deadline for submitting a typical project (adjusting to a real plot of land) and submitting the required examinations is 3 months.

Environmental measures

Contractor should pay attention to vehicles and mechanisms at work, in order to minimize the risk of contamination of the environment, and such case takes place immediately to ensure the localization of the contaminated area, unusable soil removal and disposal of the regional office of Environmental Protection by the ad Ilse, safety and environmental protection requirements in full.

3. Specific Nature of the Design to Be Prepared under the Project

3.1 Description of the Design Peculiarities

The description of the key works to be performed under the Contract is of general nature so it does not schedule all the contractual works or describe and itemize all the machinery, equipment and facilities.

Construction work

Land works include the removal and demolition of all types of land, clearing of sediments, access and operation roads, flooding during construction, and other road repairs within the existing trench.

Concrete works include scarce (lean) and monolithic concrete and reinforced concrete works.

Reinforcement work includes all work with steel smooth and periodic profile rods and grids for reinforced concrete reinforcement. (Wells) in roofing tiles.

Rehabilitation works for water supply networks include the installation of various fittings for various pipes, hoses, wells, water meters and plastic and steel pipes.

3.2 Temporary Works

General

The Contractor shall procure, furnish, provide and arrange for all the necessary electric power, water and services; be responsible for the construction and maintenance of the necessary access roads, construction camps, offices and warehouses; and perform all other work necessary for completion of the Works described herein in strict conformance with these Specifications.

Construction Schedule

A bidder has to submit its proposal with an attached construction schedule clearly demonstrating the timing and sequence of work performance.

3.3 Organization of realization of general constructional and assembly works

Building and assembly works shall be carried out according to the operative state norms and regulations.

4 DRAWINGS

Employer will provide construction drawings to the contractor.

4.1. As-Build Drawings

During the implementation of works, the contractor shall record the project decisions reflected on the drawings and all changes and amendments to the plans and shall prepare the as-build drawings. The contractor shall submit to the project manager three copies of preliminary drafts of as-build drawings and maintenance rules. Following the approval the contractor shall provide the contracting party with one original for multiplication and two printed copies of the above drawings.

5 APPROVAL OF MATERIALS AND EQUIPMENT

5.1 Quality of Materials

All materials, fixtures, fittings and supplies furnished under the Contract shall be new and unused, of standard first-grade quality and of the best workmanship and design. No inferior or low-grade materials, supplies or articles will be approved or accepted, and all work of assembly and construction shall be done in a first-class and workmanlike manner. In asking for prices for materials intended for delivery to the Site and incorporation in the Works under any portion of these Specifications, the Contractor shall provide the manufacturer or supplier with complete information as may be necessary to secure compliance to this Clause and, in every case, he shall quote this Clause in full to each such manufacturer or supplier.

5.2 Submission of Samples and Data

As soon as practicable after award of Contract, the Contractor shall submit for the approval by the Project Manager drawings, catalogues, diagrams, other descriptive data, etc., for all mechanical, electrical, architectural and such other materials and equipment designated by the Project Manager, which the Contractor proposes for use under this Contract. For certain materials and equipment, data may be required to be submitted in accordance with a detail form furnished by the Project Manager. Samples of materials shall be submitted to the Project Manager for approval when so directed by him. Items submitted shall be properly labeled to indicate source of supply, manufacturer, contract item number and other data required by these Specifications. All information, samples, etc., shall be submitted in sufficient time, but not later than 60 days prior to purchase, to permit proper consideration and action thereon without delaying the approved construction schedule. Items sent for approval shall be shipped prepaid by the Contractor and the Project Manager shall be given advance notice in writing of all items shipped.

5.3 Testing

5.3.1 Manufacturer's Certificate of Compliance

In the case of standard labeled stock products of standard manufacture, which have a record of satisfactory performance in similar work over a period of not less than two years, the Project Manager may accept a notarized statement from the manufacturer certifying that the product conforms to the applicable specifications.

Entries should also include the name and manufacturer in the country.

5.3.2 Mill Certificates

Regarding materials for which such practice is usual, the Project Manager may accept the manufacturer's certified mill and laboratory certificate.

5.3.3 Test Laboratory Certificates

The Project Manager may accept a certificate from a commercial test laboratory, satisfactory to him, certifying that the product has been tested within a period acceptable to the Project Manager and that it conforms to the requirements of these Specifications.

5.4 Cost

The cost of any additional laboratory, field and shop tests required through the re-submission of samples because of failure of compliance with Specifications shall be borne by the Contractor.

5.5 Inspection

All material and equipment furnished and all work performed under this Contract will be subject to inspection by the Project Manager at all times and in all states of completion both off-Site and on-Site. The Contractor shall furnish promptly without additional charge, all facilities, labor and materials reasonably needed for performing such inspection and testing as may be required by the Project Manager. Inspection at the source, e.g. borrow area, manufacturer's plant, etc., will be made of selected materials and equipment in addition to inspection at the Site. The Contractor shall inform the Project Manager when materials and equipment are available for inspection. Acceptance of materials and equipment or the waiving of inspection thereof shall in no way relieve the Contractor of his responsibility for furnishing materials and equipment meeting the requirements of the Contract Documents.

5.6 Documentation

Execution of work shall include a system to ensure that the documentation necessary to attest the completion of any phase of the work; use of correct materials; completion of required inspections and tests; and acceptability of results are generated, reviewed, maintained and submitted to the Project Manager at the required time. The system shall ensure that such documentation is reviewed by the Contractor on readability in the contractual language, completeness, validity of data, traceability of document to activity or equipment and acceptability of results.

The documentation to be prepared and maintained shall include:

1. Test reports for raw material (cement, steel, aggregates, etc.).
2. Test reports on the main items of the Works (dewatering, excavation, concrete, embankments, etc.).
3. Survey and layout procedures.
4. Inspection and test procedures.
5. Inspection and test reports.
6. Vendor surveillance reports.
7. Final inspection reports.
8. Corresponding certificates.
9. Hidden Construction Works

6 CONSTRUCTION SCHEDULE

6.1 Submittal Date

The Construction Programme to be submitted by the Contractor shall be supplemented by a detailed schedule, covering all construction activities. The Construction Programme is to be furnished to the Project Manager within 10 days of the date of the Project Manager's written notice to commence.

6.2 Requirements

The detailed submittal shall consist of schedules and narrative descriptions of the proposed construction programme.

Each summary or detailed schedule shall consist of a bar chart and a time-scaled network. The scheduled start and finish times for all activities on the bar chart shall agree with those on the network.

Where necessary, dummy activities or constraints shall be introduced into the network in order to show

activities starting on the proposed dates. Separate detailed schedules shall be submitted for each major item.

6.3 Monthly Reports

Each month the Contractor shall submit three copies of a report consisting of:

- Copies of the bar charts for the current phase with both actual progress and scheduled progress shown.
- A narrative report discussing any significant deviations from the schedule and, if necessary, explaining the steps proposed to be taken to maintain the approved schedule.

7 SAFETY AND HEALTH

7.1 GENERAL

In executing the work under this Contract, the Contractor shall provide working conditions for each operation that shall be as safe and not injurious to health as the nature of that operation permits. All the work shall be performed in accordance with applicable local and national laws, codes, requirements and regulations including safety, health, welfare of persons and others. The Contractor shall in general be fully conversant and comply with the relevant sections of all construction regulations enforceable by the law.

7.2 ACCIDENT AND FIRE PREVENTION

The Contractor shall enforce all necessary rules and regulations for the safe execution of the work in order to avoid preventable accidents and to minimize injuries to his employees and those of other concerned entities. Working areas shall be adequately marked with warning signs and posters.

The Contractor shall, during the entire period of his operations on Site, provide emergency facilities with adequate medical and surgical equipment for first aid treatment and approved qualified personnel to administer such treatment to all injured persons. Employees on the construction site should be ensured and should have medical insurance policy.

8 CONSTRUCTION UTILITIES

8.1 GENERAL

The Contractor shall provide such water, electricity, telephone, power, lighting, compressed air and other utilities as required for construction and other uses in connection with work under this Contract. Before final acceptance, all temporary utilities shall be removed or suitably abandoned unless otherwise specified or directed.

9 TRAFFIC - ROADS, BRIDGES

9.1 MAINTENANCE OF EXISTING ACCESS ROUTES, ROADS AND OTHER FACILITIES

The Contractor shall take over and maintain in suitable condition, as required by the Project Manager, existing public access routes, roads and other facilities encountered within the project area unless these public access routes and roads are diverted or alternative arrangements are to be made by the Contractor to the satisfaction of the Project Manager.

The Contractor shall furnish and maintain traffic signs, traffic barricades, lights, flagmen and other installations as necessary for safe and efficient directing and handling of traffic and shall be responsible to ensure, that all roads and temporary facilities provided are adequate to safely divert public traffic.

9.2 UTILITY LINES

The Contractor shall conduct his operations, make necessary arrangements, take suitable precautions and perform all required work incidental to the protection of and avoidance of interference with power,

telegraph, telephone and natural gas lines and other utilities within the areas of his operations in connection with the Contract. The cost thereof shall be borne by the Contractor and the Contractor shall save harmless and indemnify the Project Manager Project Manager in respect of all claims, demands, proceedings, damages, costs, charges and expenses whatsoever arising out of or in relation to any such interference.

9.3 Construction camp

9.3.1 General

The contractor shall ensure establishment of all offices, workshops, storage facilities, accommodation facilities, medical units, shops, leisure facilities and etc required for the appropriate execution of the contract.

9.3.2 Location of construction camp and workshops

Construction camp, workshops and other temporary buildings shall be located over the areas indicated in the drawings at the land owned or managed by the ordering party. If required, other auxiliary buildings will be built within the property of the contracting party on the sites approved by the project manager. If for any reason (with the consent of the project manager) the contractor requests to utilize such land plots for the construction camp, which are not owned or managed by the contracting party, then the contractor shall reach agreement with the land owner (owners) and shall cover lease costs and other related costs.

9.3.3 Buildings and camps

All accommodation buildings as well as camps, workshops and storing facilities constructed by the contractor shall be designed and constructed in the form of temporary construction, if not otherwise requested by the contracting party.

The accommodation of employees of the contractor shall be constructed based on the requirements of the contractor and in compliance with all standards, laws and regulations of Georgia which are valid for the date of tender proposal submission, as provided in the present document. Materials, designs and construction works for the accommodation and other buildings shall be approved by the project manager in terms of their correspondence with the Georgian standards.

9.4 Looking after and storing the contractor's buildings and equipment

The contractor shall ensure and implement all measures and carry out the proper maintenance of all buildings constructed, in order to create clean, tidy, pleasant, healthy environment and working conditions for the employees. All areas must be clean, leveled, cleaned from the plants and bushes and drained appropriately.

9.4.1 Mobile communication system

Contractor shall be responsible for the provision of mobile communication system for the project.

9.5 Utility buildings

Utility and temporary buildings required for the contractor, such as storing sheds, temporary offices, workshops and laboratories, shall be constructed based on the preliminary consent provided by the project manager. Types of constructions for such buildings shall be preliminarily approved by the

project manager. The temporary buildings, which are not necessary for the contracting party, shall be immediately removed after they fulfill their purpose.

9.6 Signboards

The Contractor shall provide, install and maintain weather resistant signboards at the Site, on location approved by the Engineer and agreed by the Employer. The signs are to be in the English and Georgian language. The signs shall be a movable (folded) type minimum of 2.5X1.5 m size. Design of signboards shall be agreed with employer.

No separate payment will be made for manufacturing, installation and maintenance of signboards.

10. ENVIRONMENTAL PROTECTION

10.1 Working Hours

The normal working hours shall be 07.00 – 19.00. These hours of work do not apply to equipment which is required to operate continuously (e.g. for safety reasons).

At certain sites, different working hours shall apply. These will be as agreed between the Contractor and the Project Manager.

In general, night-time working shall be kept to a minimum. However, for some sites where night-time working is required it shall be agreed with the Project Manager.

Additional or alternative working hours needed for emergency reasons shall be advised to the Project Manager.

10.3 Noise Control

The Contractor shall have a general duty to take all practicable measures to minimize nuisance from noise. This includes:

1. Respecting normal working hours in or close to residential areas.
2. Maintaining equipment in good working order so that extraneous noises from mechanical vibration, creaking and squeaking are reduced to a minimum.
3. Shutting down equipment when it is not directly in use (except where the equipment is required to run continuously).

10.4 Dust and Air Pollution

10.4.1 Dust

The Contractor shall take all necessary measures to avoid creating a dust nuisance during both construction and demolition works.

Measures to prevent dust shall include the following practices:

1. The enclosure of material stockpiles at all times and damping down of dusty materials using water sprays during dry weather.
2. Control of cutting or grinding of materials on site.
3. The complete sheeting of the sides and top of all vehicles carrying spoil and other dusty materials.
4. Watering of unpaved surfaces and roads.
5. Limit vehicle speeds on unpaved surfaces to 35 kph.

10.4.2 Air Pollution

The Contractor shall take precautions to prevent the occurrence of smoke emissions or fumes from site plant or stored fuel oils. Plant shall be well maintained and measures shall be taken to ensure that it is not left running for long periods when not directly in use.

10.5 Disposal of Waste and Contaminated Materials

10.5.1 Waste

As part of the SEMP, the Contractor will develop a management plan which will identify:

- the waste category and quantities of materials generated;
- opportunities for recycling and/or re-use; and
- Disposal routes and licensing requirements.

Spoil arising from the works which is classed as “acceptable fill” will wherever practicable be used in construction works.

Disposal sites will be identified by administration department of the Ministry of Environmental Protection. The additional sites will be identified by the Contractor in consultation with the Project Manager.

10.5.2 Contaminated Land and Materials

Any contaminated material encountered will be dealt with in compliance with relevant regulations and instructions from the Project Manager.

The Project Manager will identify those areas within the Site where contaminated land may be encountered. The Contractor will be required to:

- develop transportation and other management procedures to be followed;
- Ensure that removal and disposal of contaminated materials complies with local environmental regulations.

10.6 Ecology

10.6.1 Protection of Mature Trees

Loss of trees will be avoided wherever possible. Adverse effects on all trees within or in the vicinity of the Site shall be minimized by the adoption of suitable mitigation measures, including, but not limited to the following (where appropriate):

1. selective removal of lower branches in an approved manner, to reduce mechanical damage by construction plant;
2. the use of matting around the root zone to prevent excess soil compaction;
3. the use of piling around the trunk to prevent damage; and
4. Notwithstanding (ii) above, construction activities shall be controlled in the vicinity of all trees so as to minimize excessive compaction of the ground beneath the entire canopy of the tree. No heavy materials or plant shall be stored, and construction traffic movements shall be controlled, within the areas.

10.6.2 Tree Replacement

Any tree that is damaged or cut down without approval or dies as a consequence of the construction shall be treated or be replaced by a suitably sized transplant to the approval of the Project Manager and in accordance with landscaping project

10.7 Site Boundaries/Hoardings

The Contractor shall liaise with the Project Manager to decide upon which (if any) areas of the site should be fenced from public ingress.

10.8 Site Activities

10.8.1 Good Housekeeping

The Contractor shall follow a “good housekeeping” policy at all times. This shall include, but not necessarily be limited to, the following requirements:

- Open fires will be prohibited at all times;
- Rubbish will be removed at frequent intervals and the site kept clean and tidy;
- Hoardings shall be frequently inspected, repaired and re-painted as necessary;
- Adequate toilet facilities shall be provided for all site staff. Toilets shall be kept clean;

- Food waste shall be removed frequently;
- The wheel washing facilities area shall be brushed clean frequently.
- Lorries shall enter and exit the Site in a forward direction.
- All loading and unloading of vehicles shall take place off the public highway wherever this is practicable

10.8.2 Living Accommodation

No living accommodation will be permitted on the Site except with the approval of the Project Manager.

10.8.3 Clearance of Site on Completion

The Contractor shall clear up all working areas both within and outside the Site and accesses as work proceeds and when no longer required for the carrying out of the Rehabilitation works.

All surplus soil and materials, temporary roads, plant, sheds, offices and temporary fencing shall be removed, post holes filled and the surface of the ground restored as near as practicable to its original condition.

10.8.4 Pest Control

The Contractor shall ensure that the risk of infestation by pests or vermin is minimized by adequate arrangements for the disposal of food waste or other material attractive to pests. If infestation occurs he shall take the necessary action to deal with it.

10.9 Safety

10.9.1 Emergency Contacts and Procedures

The Contractor shall prepare and maintain an Emergency Contacts Set of Procedures for each work site which shall be displayed prominently at each site. These Procedures shall be followed in any site emergency.

They shall contain emergency phone numbers and the method of notifying local authorities/services for action by the Contractor and the Project Manager. Copies of the Procedures will be issued to the Project Manager and the Police.

Emergency telephone numbers for the Contractor's key personnel shall also be included for the Project Manager use in an emergency.

10.9.2 Use of Explosives

The use of explosives shall not be permitted except in exceptional circumstances. Prior approval from the Project Manager shall be obtained.

10.10 Protection of Existing Installations

10.10.1 Information

The Contractor will be required to make his own investigations and to take all appropriate actions concerning existing foundations, buildings, structures, walls, roadways, sewers cables and other services, apparatus and installations.

10.10.2 Safeguarding

The Contractor shall properly safeguard all buildings, structures, works, services or installations from harm, disturbance or deterioration during the construction period. The Contractor shall take all necessary measures required for the support and protection of all buildings, structures, pipes, cables, sewers, railways and other apparatus during the concession period.

11 STANDARDS OF COUNTRIES OTHER THAN THOSE SPECIFIED

11.1 GENERAL

Where the Contract Documents specify a standard, which has its origin in a specific country, this does not imply the intention to restrict the requirements solely to that particular standard of that country. Other standards, including standards of other countries, will be accepted provided the requirements thereof, in the opinion of the Project Manager, are equal or superior to the standard specified. The

Contractor may propose a standard other than the one specified to the Project Manager. In this case he shall submit an English version / translation of the standard proposed by him and any other supporting documentation deemed useful to prove, that in all significant aspects the proposed standard is at least equivalent to the standard specified.

Editions of specified standards are generally not provided in the specifications nor indicated in the Drawings. Where dates of issue are not shown, specified or indicated, the standards referred to are the ones in effect 28 days prior to submission of Bid.

12 PHOTOGRAPHS

The Contractor shall furnish to the Project Manager 200 mm x 250 mm color photos of the work in progress throughout the Contract period. The photos shall be taken at the start and completion of each major component of the work and at other times as directed by the Project Manager to show the progress of the project and each feature thereof. Only clear, sharply defined photos will be accepted. Each picture shall bear the date and location together with a brief description of its content and purpose.

The Contractor shall submit to the Project Manager digital photos on CDs at the end of each month.

13 MEASUREMENT

13.1 GENERAL

Except as stated herein or specifically stated elsewhere in the Contract, the items given in the Bill of Quantities are the only ones under which measurement will be made for work performed under the Contract.

13.2 MEASUREMENTS

The Project Manager will measure the actual quantities of work performed or items furnished in accordance with the specified methods of measurement. In all cases where a quantity under one item measured is contiguous to the quantity under another item measured, the division lines marking the beginning and end of the quantity under each item shall be as indicated on the Drawings or as defined in the Specifications. If any question arises as to the location of any such line, it shall be determined by the Project Manager. Unless otherwise specified, measurement will be made only of work, material removed or placed, accepted and required as part of the Permanent Works. Efforts and expenses for Temporary Works, such as for construction plant and other purposes of the Contractor's choosing, will not be measured unless such efforts are required for the Permanent Works.

13.3 MEASUREMENT BY WEIGHT

The weights of materials and equipment, the installing, handling or placing will be determined by the Project Manager from information furnished by the Contractor. The weights shall be determined as defined in the relevant measurement clauses. Unless otherwise specified, the Contractor will not be required to provide scales for actually weighing these materials and equipment; the Project Manager will determine the weight of each part or item involved in the most practicable manner and he may use for that purpose railroad shipping weights, manufacturer's weights, catalogue weights, scale weights if available, or computed theoretical weights at the Project Manager's discretion. Net weights only will be paid for and the weight of all tares, packing and blocking will be deducted. No extra allowance will be made for painting and coating.

13.4 UNITS OF WEIGHTS AND MEASUREMENT

SI units will be used for measurement in this Contract. All the items in the Bill of Quantities and in measurement clauses have therefore been provided accordingly. Conversion factors wherever required for conversion of quantities from one system to another shall be as per the ACI code. Some of the conversion factors are as follows:

One linear foot	=	0.3048 linear meter
One square foot	=	0.0929 square meter
One cubic foot	=	0.02832 cubic meter
One gallon (Imp)	=	4.546 liters

One US gallon	=	3.785 liters
One pound	=	0.4536 kilogram

Prior to the commencement of the construction works, the Construction Contractor is obliged to prepare Site-specific environmental plan (SSEMP) under which the Site Specific Health and Safety Management Plan (SSHSMP) is attached. The SSHSMP shall be submitted and agreed with the Engineer and the Employer.

Drawings and Supplementary Information Regarding Works to Be Procured

Is separately attached as Volume 1 of Section 6: Employer's Requirements.

The Contractor is requested to comply with the local laws and regulations regarding health and safety guidelines as well as to undertake necessary measures against the distribution of COVID-19. The Employer reserves the right to conduct unscheduled site inspections on the Site, request an environmental and safety policy documents of the Contractor, and mandatory documentation related to COVID-19.

Recommendations against the spread of COVID-19 can be found at the link below:

<https://matsne.gov.ge/ka/document/view/4845540?publication=0>

Government's General recommendations against the spread of COVID-19 is also provided in the English language below:

**The Ministry of Internally Displaced Persons
from the Occupied Territories, Labor,
Health and Social Affairs of Georgia**

**Department for Inspection of Labor Conditions
Let's Create Safe Working Environment Together!**

**General Recommendations for Construction Sector
Related to infection (COVID-19) caused by novel Coronavirus (SARS-CoV-2)**

Remark: Pursuant to the Decree #281/5 by Minister of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs of Georgia (MoH) "On Regulation to Expertize Temporal Incapacity for Work and Release Sick Leave Certificate", the Notice equal to the Sick Leave Certificate (medical bulletin) will be issued by MoH. The Notice will be release for those, being under quarantine for coronavirus prevention purposes. The referenced document will be the basis for Employer to pay salaries and working days missed in the course of being under quarantine, self-isolation, will be deemed as legitimate for those employees, and they will be fully paid. Those concerned in above referenced Notification receiving, may address to the MoH via email: info@moh.gov.ge For additional information, please call at: 15 05; 116 001

The working activity of constructors is characterized with permanent changeability of workplaces and working activities under open atmospheric conditions. Therefore, construction represents the average risk sector from virus spreading standpoint, since its specifics includes natural ventilating, however it is significant the following preventive measures to be considered in the course of construction works executing.

Staffers shall not appear at the workplace if:

- They have left the virus spreading countries for the last 14 days;
- For the last 14 days they have been in close contact with those having coronavirus (they have to stay under self-isolation/quarantine as per set regulation);
- They have the symptoms that are characterizing for respiratory infections (coughing, sneezing, temperature, difficult breathing, general weakness, etc.);
- They are under high risk of being infected by COVID-19 and further complications: those aged over 70, as well as people with chronic diseases (cardiovascular diseases, diabetes, bronchial asthma and other diseases of respiratory organs).

Obligations of an Employer

- Notwithstanding whether cases of infecting were identified or not, Employer shall develop the Emergency Action Plan that will assist to reducing of working days, missed due to disease, and in case of disease identification – it will back prevention of its spreading;
- To provide the employees with the information on safe working procedures and preventing virus spreading (please use as guidelines the recommendations by LEPL National Center for Disease Control and Public Health (NCDC), being under state control of the Ministry of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs of Georgia);
- To make available in working environment the Statements on COVID-19 and preventive measures that are determined by LEPL L. Sakvarelidze NCDC;
- To provide remote working as much as possible for those who are able to execute the work on a remote basis (administrative staff);

- To place the disinfection barriers at the hall of the rest room/dining room, indicating at respective mandatory sign;
- To provide at the workplace the possibility for handwashing with soap and other hygienic means. If washing of hands is not possible, there shall be applied the hand sanitizer liquid with at least 70% alcoholic content;
- To place at visible places the hand sanitizing means and rules for their proper applying;
- To be assured that the employees have an access to hygienic means and they are aware of its applying along with keeping associated regulations;
- To provide all employees and Contractor, as well as the staff responsible for cleaning with the information on associated preventive measures in order spreading of coronavirus in working environment to be avoided;
- To train the employees on proper applying of individual protection means and hygienic ones and their further keeping/removing;
- To provide the employees with the required individual means of protection (special clothing, special shoes, helmet, glasses, respirator) due to the specifics of work and provide control over their applying;
- To provide natural ventilation of closed spaces/units from time to time - several times a day;
- To disinfect periodically the frequently used working equipment and workplaces;
- To regulate the ergonomics at the construction site. To provide cleaning of working space in a timely manner and remove construction debris on time.
- To place the closed containers for employees and visitors at the working space for single use napkins or other applied hygienic remains.

Obligations of Employees

Performing of hands hygiene regularly and thoroughly represents the best means for being protected from majority of viruses.

Therefore, it is important the following measures to be taken at workplaces:

- Keep hygienic rules on your workplace;
- Execute the work process in accordance with the Emergency Action Plan, developed by Employer/Work Safety Manager;
- Do not shake hands while greeting each other and avoid contacting (touching, etc.) others;
- Avoid gathering. It is recommended at most 10 people to work on the same work platform and safe distance (of at least 2 m) to be kept;
- In the course of work execution, you have to use thoroughly those means of individual protection that you are supplied by the Employer;
- Clean the workplaces and those tools with the means of disinfection that you use in the course of the work process execution;
- Prior to feeding and afterwards, as well as before entering and exiting the lavatory, you have to wash your hands thoroughly with water and soap. Dry hands well upon washing;
- Use the water sanitizers with alcohol content in case you are not able to wash and dry your hands;
- Keep safe distance (of at least 2 m);
- While coughing or sneezing, cover your mouth with either clean napkin or your elbow. Throw already applied single use napkin into the bin;
- Avoid touching your eyes, nose and a mouth with your hands.

Remark: Pursuant to the Decree #281/5 by Minister of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs of Georgia (MoH) "On Regulation to Expertize Temporal Incapacity for Work and Release Sick Leave Certificate", the Notice equal to the Sick Leave Certificate (medical bulletin) will be issued by MoH. The Notice will be release for those, being under quarantine for coronavirus prevention purposes. The referenced document will be the basis for Employer to pay salaries and working days missed in the course of being under quarantine, self-isolation, will be deemed as legitimate for those employees, and they will be fully paid. Those concerned in above referenced Notification receiving, may address to the MoH via email as follows: info@moh.gov.ge For additional information, please call at: 15 05; 116 001

Personnel Requirements

Using Form PER - 1 and PER - 2 in Section 4 (Bidding Forms), the Bidder must demonstrate that it has personnel who meet the following requirements:

No.	Position	Total Work Experience [years]	Experience In Similar Work [years]
1	Director of works/foreman	5	3
2	Lead Plumber	<u>5</u>	5
3	Lead Electrician	<u>5</u>	5
4	Lead Construction Engineer	<u>5</u>	5

Equipment Requirements

Using Form EQU in Section 4 (Bidding Forms), the Bidder must demonstrate that it has the key equipment listed below:

Auto Tipper with Cargo Crane 7-10 ton	1 unit
Greider 79 kwt	1 unit
Bulldozer – 228 h/p	1 unit
Crane 10 ton	1 unit
Concrete Vibrator	1 unit
Car with the Board	1 unit
Excavator with bucket size – 0.5 m3	1 unit