

ANNEX I to Corrigendum No.1

1. TECHNICAL CONDITIONS FOR PERFORMING OF WORKS

1.1. Preparatory works

For performing of works the Contractor has to conduct all preparatory works and all other necessary activities according to the construction project and time schedule approved by the Supervisor.

Before the start of earth works, the terrain covered by the belt of regulation works has to be cleared. Clearing of the terrain is consisted of the removal of all obstacles in the terrain from all surfaces which will be occupied by permanent or temporary structures, access roads and auxiliary buildings and similar. Boundaries of clearing have to be within necessary minimum and approved by the supervision organ.

How the works on clearing of surfaces will be done the Contractor himself will decide, and all regulations on safety at work have to be respected, and any damage of other property prevented and every obstructing of the property avoided.

The clearing of the terrain should include the removal of shrubs, trees, demolition of fences and other similar obstacles consisted of materials or waste that would obstruct the performing of works. All material resulting from this work the Contractor has to remove outside the working area, e.g. to dispose it at the location predicted for that.

Clearing of the terrain is consisted of removal of all obstacles on terrain from all surfaces which will be occupied by permanent or temporary structures/objects, access roads, auxiliary buildings and similar. Clearing boundaries have to be within necessary minimum and approved by the supervision organ.

How the works on clearing of surfaces will be done the Contractor himself will decide, and all regulations on safety at work have to be respected, and any damage of other property prevented and every obstructing of the property avoided.

Before start of earth works it is necessary to conduct the renewal of the trace on the terrain and to put all other necessary marks.

Geodetic picketing/marketing, controls and measurements necessary for realization have to be done precisely and completely according to the drawings.

1.2. Earth works

1.2.1. Removal of surface layer

Removal of surface layer includes surface excavation of humus, or loose material to the depth of maximum 20 cm, except at surfaces where the excavation is usually done deeper than 20 cm.

By surface layer is understood the upper layer of soil the thickness of approx. 20 cm which may be interwoven by roots and it may contain organic materials, or loose material. All material will be removed including that what would leave after cleaning. Every excavation deeper than 20 cm will be classified as the open excavation.

Excavated soil is transported to the dump for reuse in regulation of slopes and environment.

Due to the quality of humus material and its purpose, it cannot happen that during digging occurs mixing of that material with other non-humus excavation.

1.2.2. Excavation and digging away

Digging away is conducted according to the measures predicted by the project with regular cutting of slopes and bottom of the bed or surfaces for foundations of the structures. During digging the Contractor has to pay attention that in the vicinity of excavation is not conducted intensive traffic which could cause the coving in of the soil, and if it is necessary to have that traffic during the performing of works, the Contractor has to prevent the coving in of the excavation by appropriate supporting measures.

Excavated soil is transported to the dump, or sorted per category for reuse in the riverbed itself, for making of embankment and regulation of slopes.

Surplus of the soil is transported to the place predicted for that purpose.

Loading and carting off of the excavated soil into embankment or to the dump, and regulation of the dump is calculated by unit price of excavation.

Excavation in the ground which is subject to coving in or burying beneath due to precipitation, and due to impact of groundwater or running water, or due to any other reasons, has to be conducted on shorter sections since to the Contractor will not be recognized works on restoration measures and repeated excavation and carting off of the earth that has coved in.

Excavation in non-cohesive soil is performed by adequate machinery with loading and carting off to the location of building-in or to the dump. During the excavation the Contractor has to pay attention not to cause the penetration of water from outside into the excavation and into excavated material, and especially into the material which in soaked condition becomes plastic.

Excavation should not be performed up to the invert level but slightly shallower, so that after the end of excavation and planning manually performed or by machinery for that purpose subgrade remains in healthy and non-routed soil. During planning also the lateral sides should remain clear.

In weak soil, and especially in the soil which is easily deformed, the excavation of the very bottom or the last layer with thickness of 20 cm has to be done immediately before the beginning of the other construction works at this section/part.

Excavation in the lime-stone or in marl (V category) will be conducted by excavation using pneumatic hammers/drills or by blasting. During the excavation by blasting it is necessary that these works are performed by expert skilled for this type of work. Calculation of charging, placing of explosive and blasting cannot be done without the approval of the Supervisor which has to be registered (written) in the construction log-book.

Contractor has to undertake all necessary measures of protection during the performing of these works in order not to damage the neighboring structures, and to protect workers who conduct the works and people passing-by and the neighboring inhabitants.

During the excavations the Contractor has to provide drainage and pumping of water, in a way to ensure correct and uninterrupted conducting of works, and to prevent the softening of the land, and to insure health and lives of workers who work on the excavation. The Contractor has to, at all places of excavation for the structure where the water cannot be drained in natural way, install pumping plants for draining of percolation and partially flood water.

The Contractor has to provide the pumping of water at working places as well as all necessary devices by which he will be able to cope with smaller penetrations of water and to enable the proper drainage from the place of excavation.

All damages caused by discharging of water at the place in the bed where the works are conducted will be borne by the Contractor and he has to remove all caused damages and to bring the performed works in previous condition at his own expense. Before the start of works the Contractor will, obligatory and in presence of Supervisor, survey the transversal profiles based on which will be done a final calculation of excavation.

1.2.3. Compacting of sub-soil

Compacting of sub-soil is made by soaking, or by routing up of the soil for drying in necessary thickness, and compacting of natural sub-soil at parts below the embankment as well as the excavation of hack and cutting to the elevation of the bedding by implementation of suitable mechanical means depending on the mechanical characteristics of the soil and volume of works.

After the removal of humus, and before the construction of embankment has to be checked the quality of sub-soil in order to identify the real quality of the soil in relation with the by the project predicted quality of sub-soil. Quality of sub-soil has to be identified according to the valid standards. If it is not otherwise designated by the project, the following compactness of the soil is required as follows:

- For embankments up to 2 m of height 100% of maximal laboratory compactness
- For embankments over 2 m of height 95% of maximal laboratory compactness
- Volume weight of 16.4 KN/m³ for non-cohesive soils.

Trial samples are taken at every 1500 m² of the sub-soil surface. Compactness of sub-soil can be designated by test slab/plot in which case is required a minimal value of the compressibility module $M_{\min} = 26-40$ MPa, and according to the instructions by the field laboratory, and based on volume weight, granulometric composition, shape and share of small-grain fractions in the material which will be built-in.

Compacting of sub-soil has to be done immediately before the construction of the embankment. If that is not the case, the surface has to be made in such way to enable the drainage of atmospheric water.

1.2.4. Making of embankment

This work includes shooting of soil, spreading, coarse and fine planning, soaking and compacting of the material into the embankment, and according to the dimensions given in the project.

Since it is necessary occasionally to conduct in the same time several of these operations, than the embankment has to be made in fronts. According to the number of operations in the cycle should be four of such fronts.

In one front will be conducted the unloading of the material from the means of transport, on the other the material is spread to achieve even thickness of the layer, on third eventual drying or soaking (to achieve optimal moisture).

On fourth front is done compacting of the material up to the necessary compactness.

Due to the size of the structure some operations at the embankment can be done in two fronts, on first unloading and loading of the material, and on second soaking, or drying and compacting. It is necessary to pay attention to climatic conditions so that after watering remains sufficient time for achieving of optimal moisture immediately during the construction process and after the end of works.

During construction and during the delivery of the structure are controlled:

- a. position of performed works by situation and per height,
- b. geometrical proportions of embankment and flatness of surfaces,
- c. characteristics of material used for making of the embankment,
- d. quality of the building-in of material into the embankment

Designed position of the embankment has to be ensured by proper geodetic working-out before the start of works.

Position of the boundaries of embankment is designated by the simplest changes on the site in relation to the axis, before as well as after the construction.

Height of the embankment is checked by leveling in relation to the permanent points. During construction and control of the embankment with height determined as permanent, the settling of the embankment has to be taken into account, and at compressible basis the settling of the basis.

To ensure the designed inclination of slopes it is necessary to place the adequate stencils by which is checked the adequate inclination of slopes.

Width and inclination are measured after the removal from the slope of eventually non-compacted layer which is not additionally paid since this work is calculated into the price of finished compacted embankment. Wider and higher constructed embankments by mistake of the Contractor will not be calculated and the Contractor has to conduct adjustments to designed dimensions with accuracy of ± 4 cm.

Each individual layer has to be spread in longitudinal direction horizontally, or to the inclination of the designed embankment. In transversal direction each layer must have a two-sided or one-side inclination of 2-5 % for draining of atmospheric water, where at building-in of the cohesive materials the spread layer has to be compacted immediately.

Height of individual layer has to be in accordance with effects of compacting per depth of used compacting device, type of material and segregation of occurrence.

After the removal of humus it is obligatory to check the quality of sub-soil, volume weight, humidity, plasticity, and shear angle, module of compressibility and

filtration characteristics. Systematic control is necessary during the process of compacting of the embankment. Necessary compactness of the embankment is designated by spatial weight of the built-in earth in dry condition and there is necessary to follow the instructions of following standards and taking the samples.

If the material for the embankment contains higher percentage of humidity than the optimal, it is necessary to wait for drying of the spread layer and then start with the compacting.

If the material for embankment is dry, e.g. with moisture lower than optimal, the Supervisor will order through the construction log-book the soaking to the optimal humidity.

Quantity of built-in material is designated per m³ of really executed quantities within designed dimensions without the humus layer.

Price for making of the embankment includes all works on making of steplike hacks, spreading, soaking or drying of material, planning of slopes and compacting. The Contractor does not have a right to any additional works for making of the embankment.

Unit prices for making of the embankment should contain the following:

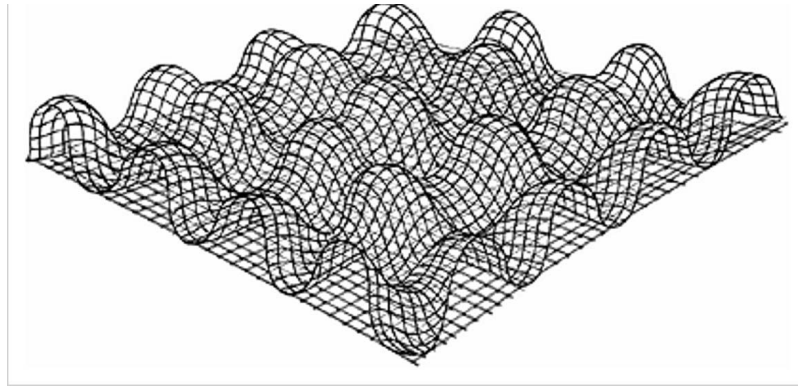
- all works on making of the embankment
- all necessary planning of the slopes.

Conduct trial testing of the embankment for obtaining of certificate for above mentioned conditions. Calculation is made per m³ of built-in and compacted embankment without the humus layer for planting of grass.

1.2.5. Use of geotextile and geonets

Geotextile is mechanically strengthened from non-woven polipropilee fibers. It has the implementation as the layer for separation below bearable shooted materials on soft base, as the layer for filtration in drainage systems and, as the protection of sealing elements and it prevents washing-out of foundation soil/ground. These are synthetic materials from white primary fibres, with surface weight of 130 – 1200 g/m².

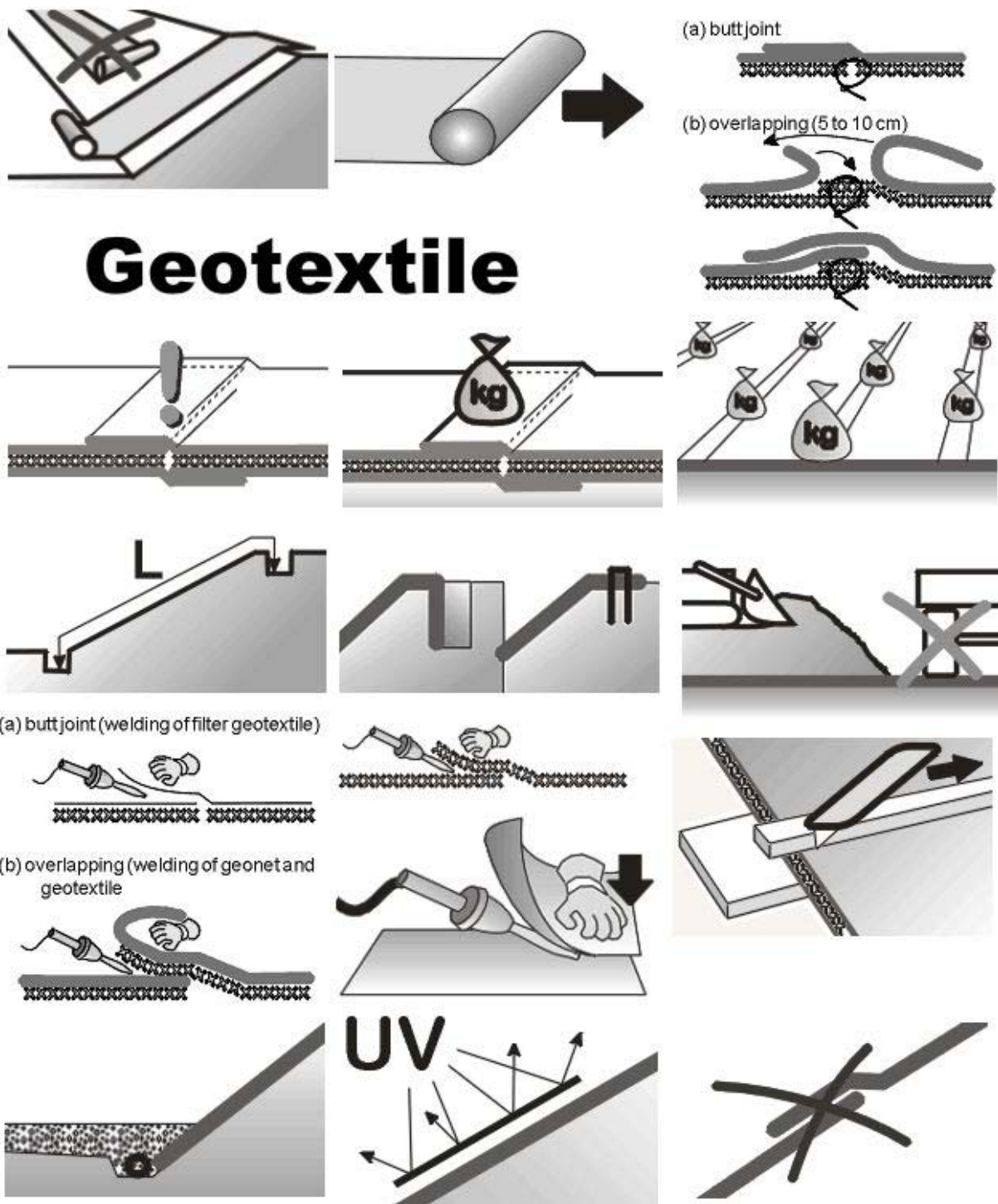
Geonet serves for surface protection from erosion at slopes which are geo-technically sabilized. It mechanically stabilizes the surface layer of soil improving the even growth of vegetation, helping spreading of roots in horional direction. A honey-combed 3-D structure of high stretching/pulling resistance is extremely suitable for coating in combination with humus it stabilizes the surfaces of slopes and it helps easier creation of grass surface. Geonet is by adequate pins stabilized into the soil. Pins/wedges are 15cm long. Humus layer is placed up to 2 cm above the geo-net, grass is planted and adequate compacting is performed, and all that according to the instructions by the producer.



Picture 1 3-D geonet

Geotextile has to be placed-down on precisely planned surface of the sub-layer. Shooting of the next layer of material has to be done evenly and completely according to instructions by the producer. At vertical separation the „unfolding“ of geotextile is made according to advancing of the shooting of material at two neighboring layers which geotextile separates. On the slope geotextile has to be placed-down „down the slope“ and not „along“ the slope. Joining is made at the place of placing-down into riverbed in order to avoid all unnecessary transport costs. Overlapping of two neighboring „sheets“ of geotextile has to be 5-10 cm. Joints are velded and, if necessary at installation of „geo-composite“ (combination of geotextile and geonet), joined by synthetic thread. Joints are temporarily secured by weights (bags filled with sand and similar). Some of basic schemes of placing-down are given in the following picture.

Calculation and payment: per m² of the installed/built-in surface.



Picture 2 Scheme of placing-down of geotextile

1.2.6. Making and installation of gabions and Reno mattresses

GABIONS are constructions made of wire-stone baskets, and gabions are made by rectangular elements consisted of hexagonal netting. Gabions are filled with stones and mutually connected by braces. Constructions of wire-stone buckets fulfill all ecological requirements demanded during the construction. Most often it is used for the following purposes: Construction of gravitation supporting walls with flat or step

like back side with ribs or behind the wall anchored in the ground; fortification at places of strong vortexes; places of unloading of shooting materials; fortification of steep slopes; regulation of riverbeds; stabilization of soil, etc.

Nets are made of heavily zinc-plated net with diameter of 2.4, 2.7 and 3.0 mm for temporary or permanent structures. Materials that are produced based on the double-woven wire net with three levels of anti-rust protection of wire – double zinc-plated, Galfan zinc-plated (with added aluminium) and Galfan zinc-plated in combination with coating made of polyethylene.

Gabions and Reno mattresses are in use already over 100 years in order to prevent the erosion.

Its basic characteristics are: flexibility, duration, firmness, water permeability, economy. It fit well into environment. Thank to its qualities both are implemented for protection of slopes of embankments, for construction of supporting walls, in hydro-technical installations, etc.

Gabions are rectangular cells of different dimensions. They are filled with river or quarry stones of adequate dimensions and form elastic, permeable monolith system. There are also the cylindrical gabions which are used for protection of sea coast, construction of quays and wells.

Gabions are the most suitable from the economic aspect regarding:

- Support walls with height of up to 5 m;
- Limited space for excavations;
- Dry climate and existence of rocky materials;
- Partial underwater building of the construction;
- Steep/vertical slopes;
- Previous mounting of vegetation "pockets" in the upper part of the gabion enables the growth of green plants/grass on the construction.

Table 1 – Standard sizes of gabions

GABIONS														
Mesh type				10 × 12				8 × 10				6 × 8		
Sizes				Weight (kg)										
Length (m)	Width (m)	Height (m)	Diaphragms (n)	Zinc coated				Zinc coated				Zinc and PVC coated wire mm Ø 1, 2,7 Ø 3, 3,7	Zinc coated	
				Wire Ø 2,7 mm		Wire Ø 3,0 mm		Wire Ø 2,7 mm		Wire Ø 3,0 mm			Wire Ø 2,7 mm	
				With diaphragms	Without diaphragms	With diaphragms	Without diaphragms	With diaphragms	Without diaphragms	With diaphragms	Without diaphragms		With diaphragms	Without diaphragms
2	1	0,50	1	10,800	9,600	13,100	12,000	12,400	11,500	15,600	14,600	14,500	14,800	13,300
3	1	0,50	2	15,300	13,500	18,700	16,500	17,500	16,200	21,900	20,200	20,200	21,400	18,700
4	1	0,50	3	19,300	17,100	23,600	20,700	23,200	20,500	28,000	26,000	25,900	—	—
1,5	1	1	—	—	11,400	—	14,000	—	12,800	—	16,500	14,900 without diaphragms	—	15,500
2	1	1	1	15,300	13,400	18,600	16,700	17,500	15,500	21,700	19,500	20,000	21,000	18,600
3	1	1	2	21,600	18,000	26,400	22,700	24,200	21,300	30,400	26,800	28,000	30,400	26,000
4	1	1	3	27,200	23,400	34,000	28,400	31,500	27,200	39,000	33,600	36,000	—	—

Advantages

Ecologically acceptable constructions built from natural materials;

After the covering by vegetation it practically melts into landscape and keeps the natural appearance of the environment;

Elasticity – without disturbance it will bear eventual deformation of the basis;

Water permeability – it does not make obstacles to natural passing of the water;

Durability – it is raised in height by filling of cracks by depositing of soil and overgrowing of vegetation;

Economical – cheaper if compared with similar constructions made of other materials, diverse in shapes, simple and quick installation;

Elimination of the wet process in construction, e.g. constructions can be built during whole year

RENO MATTRESS is a long and thin construction thick up to 30 cm. It is consisted of non-interrupted slab that forms the bases, walls of buckets and diaphragm. For covering of the mattress are placed special panels "covers", but also can be used a double-woven wire net in rolls. It is used for paving/coating of rivers and canals, and it is also the part of the construction of gabions.

Due to proven good hydraulic characteristics, for more than one century gabions and Reno mattresses are used for making of canals in natural and artificial watercourses. Important is its implementation in correcting of rivers, for transversal and longitudinal strengthening, as well as in coastal civil engineering.

Basic characteristics of these paneling:

Reduction of water losses due to filtration;

Improvement of the stability of slopes;

Protection from erosion;

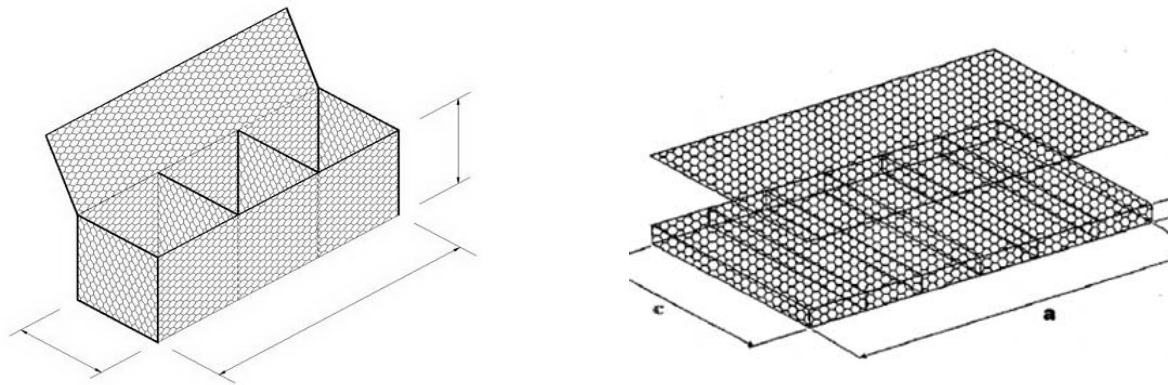
Guaranty for necessary values of the ruggedness of slopes.

Table 2 – Standard sizes of Reno mattresses

RENO® MATTRESSES											
Mesh type			6 × 8				5 × 7				
Sizes			Weight				Sizes			Weight	
Length (m)	Width (m)	Height (m)	Zinc coated		Zinc and PVC coated		Length (m)	Width (m)	Height (m)	Zinc coated	
			Wire Ø 2,2 mm		Wire Ø (mm) 1, 2,2 e. 3,2					Wire Ø 2,0 mm	
			(kg)	(kg/m²)	(kg)	(kg/m²)				(kg)	(kg/m²)
3	2	0,17	19,300	3,220	24,700	4,100	3	2	0,15	20,000	3,330
4	2	0,17	25,000	3,130	31,500	3,940	4	2	0,15	26,000	3,250
5	2	0,17	30,600	3,060	37,600	3,760	5	2	0,15	32,000	3,200
6	2	0,17	36,400	3,040	44,500	3,710	6	2	0,15	38,000	3,160
3	2	0,23	21,000	3,500	26,200	4,360	3	2	0,20	21,400	3,560
4	2	0,23	27,200	3,400	33,800	4,220	4	2	0,20	27,800	3,470
5	2	0,23	33,600	3,360	41,000	4,100	5	2	0,20	34,200	3,420
6	2	0,23	39,500	3,290	48,700	4,060	6	2	0,20	40,800	3,400
3	2	0,30	22,800	3,800	28,600	4,760	3	2	0,25	22,700	3,780
4	2	0,30	29,400	3,680	36,600	4,570	4	2	0,25	29,500	3,690
5	2	0,30	36,300	3,630	44,700	4,470	5	2	0,25	36,400	3,640
6	2	0,30	43,000	3,580	53,000	4,420	6	2	0,25	43,400	3,610

Constructions based on gabion and Reno mattresses are efficient solution from the technical point of view during designing and maintenance of gully holes, canals as well as for hydraulic sills, spillways, overflows, etc.

Gabions and Reno mattresses are open and mantled on hard surface. Sides and diaphragms are raised into upright position in order to form the basket. Upper parts are secured with thick edge wire. Edges are mutually joined with rings or wire, starting from the top towards the bottom. Rings are put at every 20 cm of length, by manual or pneumatic joining device.



Picture 3 – Appearance of gabion and Reno mattress

They are placed in line on the flat surface and mutually connected before filling. The principle is that at least one gabion is in front of the gabions that are to be filled. They are filled with appropriate stones 50 – 75 mm above the top level of the net, to enable the settling due to its own weight. When considered as necessary from aesthetic and other reasons, gabions and Reno mattresses can be filled with tension. They are tensioned by implementation of load distributed on whole end panel, joined to first cell, which is anchored to the position.

Gabions with exposed face are filled in thirds of the height, where at every third is made a transversal rigid by wire. After filling, the cover is closed and joined with front, rear and lateral sides, and by diaphragm, rings or by wire.

1.3. Making of pavement/coating

1.3.1. Concrete and reinforced concrete works

By these Technical Conditions are given standards for materials and works for all concrete and reinforced concrete works. All concrete and reinforced concrete works for construction of the system have to be done according to the Rulebook on technical regulations for civil engineering products which are built-in in concrete constructions (Official Gazette FBiH 86/08 and according to the standards BAS EN 206-1:2002 Concrete – Part 1: Specifications, characteristics and criteria of harmonization, BAS EN 206-1/Amd 1:2006 and BAS EN 206-1/A2:2007. Except that, all concrete and reinforced concrete works have to be done according to the

"Rulebook for technical measures and conditions for concrete and reinforced concrete".

Concrete and reinforced concrete works will be performed according to this and the other projects of the system. If the Contractor proposes some change in construction of the structures, the proposal with appropriate justification has to be submitted to the Supervisor for the approval.

The Contractor has to, after the completed excavation for the structure and before the start of covering with concrete of the structure, call the supervisor to check the completed excavation. The Contractor also has to, before the start of concrete works on constructive reinforced concrete parts, call the Supervisor to check the installed rebar, paneling and scaffolds. Only when the Supervisor issues the approval by registration in the construction log-book is allowed to start with concrete works on this part of the structure.

Contractor has to timely inform the Supervisor that the installed rebar is prepared for inspection and delivery. For inspection of the paneling and scaffolds the Contractor has to timely inform the Supervisor before the start of installation of rebar. If Supervisor does not start with inspection of rebar, paneling and scaffolds in adequate period of time or does not inform the Contractor that is not possible to conduct the inspection, the Contractor has the right to conduct concrete works on the said structure or the part of it even without the inspection by the Supervisor and that circumstance has to be registered in the construction log-book.

The whole process of concrete works and preparation has to be registered in the construction log-book so that is possible to precisely identify whole working process and time circumstances in all phases of construction.

For every position and type of construction in the project is marked the type and class of concrete which has to be achieved, and the Contractor will prove that by excerpt and testing of previous trial bodies made of the material of which the concrete will be prepared and concrete works conducted on particular constructions. Testing is done by an adequate institution registered for testing of construction materials and engaged upon the consent by the Supervisor or by field laboratory of the Contractor whose work should be under constant control of the authorized laboratory.

Methods of proving and testing are conducted according to relevant Standards and Norms, as well as the conditions from previous paragraphs. Costs of these tests are borne by the Contractor and they are calculated into unit prices of concrete works.

Materials for which is identified that the samples did not satisfy at any of the tests will be immediately removed from the construction site.

Contractor has to include in the unit prices for concrete and reinforced concrete works on adequate constructions of particular structures also the costs of obligatory trial loading where that is explicitly required in the project.

In case that there is a need for conducting of trial loading of particular constructions, costs for that will be borne by the Contractor, regardless the results of these tests.

All works have to be conducted according to the adequate drawings, details and statically calculations, expertly and with adequate skilled workers and under the supervision.

1.3.2. Materials for making of the concrete

Materials for making of the concrete are natural or crushed aggregate or the mixture of it, then the cohesion material, water and different additives to the concrete.

1.3.2.1. Aggregate for concrete

Technical characteristics and other requirements, and the confirmation of harmonization of the aggregate are designated or executed, depending of the type of aggregate, according to the norms: BAS EN 12620:2004 Aggregates for concrete (EN 12620:2002) and BAS EN 13055-1:2006 Light aggregates – Part 1.: Light aggregates for concrete, mortar and injection plaster (EN 13055-1:2002), norms to which it direct and provisions of the Rulebook on technical regulations for construction products that are built-in in concrete constructions, and according to the provisions of the Rulebook on certification.

Aggregate for concrete and fillers with density of grain higher than 2000 kg/m³ and light aggregate for concrete and light fillers with density of grain not higher than 2000 kg/m³ or shooting density not higher than 1200 kg/m³ obtained by processing of natural, industrially produced or recycled materials and mixture of these aggregates in plants for production of aggregates.

Technical characteristics of the aggregate for concrete have to fulfill, depending on the origin of the aggregate, general and special requirements important for final use in concrete and it have to be specified according to several norms BAS EN 12620.

Granulometric composition of the fraction of aggregate d/D (fraction of aggregate designated by the use of the pair of sieves from the basic line), is tested according to the norm BAS EN 933-1 and it has to satisfy classes according to BAS EN 12620.

Granulometric composition of the filler is tested according to the norm BAS EN 933-10 and it has to meet the conditions according to the norm BAS EN 12620. Content of small particles is tested according to the norm BAS EN 933-1 and it has to satisfy classes according to the norm BAS EN 12620.

If the content of small particles is higher than 3%, its quality is assessed by designation of the equivalent of sand (SE) according to BAS EN 933-8 and by testing by methyl blueness (MB) according to BAS EN 933-9.

Shape of the large aggregate (SI) is designated according to the norm BAS EN 12620 by shape index class tested according to the norm BAS EN 933-4 up to highest: SI40 for concretes up to including the hardness class on pressure C12/15 according to the norm BAS EN 206-1 and SI20 for other concretes.

Resistance to crushing of large aggregate (LA) tested according to the norm BAS EN 1097-2 has to satisfy classes according to the norm BAS EN 12620 selected depending on the final use of the concrete of up to the highest LA35 for concrete of general purpose and LA30 for concrete with exposure classes of XF1 to XF4 according to BAS EN 206-1.

Density of the grain and absorption of water is tested according to the norm BAS EN 1097-6 and BAS EN 1097-6/AC:2004, and shooting density is tested according to the norm BAS EN 1097-3 and it has to satisfy the project requirements or the requirements by ordering party and buyer.

Aggregate for concrete cannot contain ingredients which have impact to the speed of cohesion and hardening of the concrete (organic substances, sugar, light particles, etc.), and the presence of it is tested according to the norm BAS EN 1744-1.

Mineral-petrography composition of the aggregate is tested according to the norm BAS EN 932-3 and it has to satisfy project requirements or the requirements of the ordering party.

Resistance to freezing of large aggregate (F or MS) is tested according to the norm BAS EN 1367-1 and it has to satisfy classes according to BAS EN 12620 selected depending on the final use of the concrete.

For concretes exposed to surface abrasion, resistance to abrasion (AAV) is tested according to norm BAS EN 1097-8 and it must satisfy selected classes according to norm BAS EN 12620 depending on exposure to abrasion, and it cannot be higher than AAV20.

When aggregate used in the concrete which is exposed to moisture contains potentially alkali-reactive ingredients with possibility of reaction with alkalis (Na₂O and K₂O with origin from cement or other source), there should be conducted further testing and undertake reliably designated measures of prevention of alkali-silicate reaction.

Content of shells (SC) in large aggregate for concrete is tested according to norm BAS EN 933-7 and it has to satisfy class SC10 according to norm BAS EN 12620.

For concretes with special requirements and in special conditions, shrinking of aggregate for concrete due to drying is tested according to norm BAS EN 1367-3 also there are BAS EN 1367-3/AC:2005 and BAS EN 1367-5:2005 and it cannot be higher than 0.075%.

Aggregate for concrete produced from slag cooled by air cannot contain decomposed di-calcium silicate and decomposed iron, and the presence of it is tested according to norm BAS EN 1744-1.

Technical characteristics of light aggregate for concrete have to, depending on the origin of aggregate, satisfy general and special requirements important for final purpose in the concrete and it has to be specified according to norm BAS EN 13055-1:2006, norms to which that norm directs and provisions of this Annex.

Granulometric curve of the aggregate always has to be between two control curves proposed by Contractor according to the valid regulations and based on results of previous tests. Results have to be stamped by authorized and registered laboratory or institute of adequate rank. Lower control curve (ideally) should enable the making of concrete of high density, and upper control curve (ideally) making of concrete of good workability.

Aggregate with granulometric curve between these two control curves should ensure the prescribed quality of concrete taking into account that the other conditions

are also fulfilled (cement of adequate quality, prescribed way of making and building-in of concrete, etc.).

Frequency of particular tests has to be in accordance with tables from Rulebook, and other characteristics of aggregate for concrete (like alkali-silicate reactive features, content of hazardous substances which radiate, release heavy metals, etc.) are tested upon request or in case of doubt.

Samples for testing are taken by the producer of aggregate for concrete and authorized legal person in a way designated by the Rulebook.

Testing of characteristics, depending on type of aggregate for concrete and light aggregate for concrete, is conducted according to norms in line BAS EN 932, BAS EN 933, BAS EN 1097, BAS EN 1367, BAS EN 1744, norms to which these norms direct and provisions of this Annex.

Taking and preparation of samples for testing of characteristics, depending on the type of aggregate for concrete and light aggregate for concrete, is done according to norm of the line BAS EN 932, BAS EN 933, BAS EN 1097, BAS EN 1367 and BAS EN 1744, norms which direct to these norms and provisions of the Rulebook.

Control of the aggregate is done in central concrete plant (concrete factory), in the concrete plant for prefabricated concrete elements and in the concrete plant at the construction site according to the norm BAS EN 206-1.

Producer and distributor of aggregate and the producer of concrete have to undertake appropriate measures in order to maintain the characteristics of aggregate during handling, transport, reloading and storage according to the norm BAS EN 12620, or norm BAS EN 13055-1.

Aggregate for concrete can be natural or crushed, but it cannot contain harmful ingredients in quantities which may endanger the quality of concrete.

Origin, composition and structure of aggregate are identified by mineral-petrography analyses which will be conducted during previous testing. Previous testing Contractor has to conduct before the start of concrete works, and to deliver to the Supervisor for the approval all details on the origin of his proposed aggregate, including the following:

- location and production facilities of the supplier,
- petrology and possible variables (variability),
- proposed aggregates, produced sizes and results of analyses of at least three sieves,
- confirmation of supplier that the product from the source of production is consistently in accordance with the requirements of adequate specifications,
- particularities on standard physical and chemical characteristics of the aggregate from that source,
- samples of all sizes of aggregate

Periodical taking of samples and testing of aggregate during the works should be done according to requirements JUS B.B0.001 "Taking of samples of natural aggregate and stone", and in that purpose the Contractor has to deliver free of

charge appropriate quantities of different sizes of aggregate to selected Technical laboratory. Supervisor has to be, without delay, informed on any changes in particularities of aggregate which may occur during the construction works.

Hardness of the stone from which is produced crushed aggregate cannot be lower than 80 N/mm^2 , while the content of fine particles (smaller than 0.09 millimeters) in the aggregate should not at small aggregate (sand) be higher than 5 %, and at large aggregate not higher than 1 %.

Small aggregate has to be clean, hard, firm, stable, healthy, durable, from natural sand, it cannot contain more than 1 % of clay, slate, mica, detached grains, coal, alkali, slag, shells or other harmful ingredients which may lower the strength or durability of concrete or attack steel rebar. Small aggregate should pass through the sieve with opening of 5 mm, and with even gradation from large to small grains, and by that up to 100 % passing through the sieve with 5 mm opening, a maximum of 13 % through the sieve with 0.3 mm openings. Wherever the analysis of granulometric composition discovers the deficit of small fractions, or unevenness of gradation, will be used the combination of small aggregate and asphalt sand in proportion which will provide the final result.

Large gravel has to be hard, firm, small-grained and stable and washed, which contains max. 0.5 % of the weight of flat elongated broken or layered grains. As flat or elongated grains are considered those grains with one dimension which is for more than 2.5 times larger than the average dimension.

Granulometric curve of the aggregate always has to be between two control curves proposed by Contractor according to the valid regulations and based on results of previous tests. Results have to be stamped by authorized and registered laboratory or institute of adequate rank. Lower control curve (ideally) should enable the making of concrete of high density, and upper control curve (ideally) making of concrete of good workability.

Aggregate with granulometric curve between these two control curves should ensure the prescribed quality of concrete taking into account that the other conditions are also fulfilled (cement of adequate quality, prescribed way of making and building-in of concrete, etc.).

Dosage of the aggregate is done by weight per fractions (four fractions 0/2, 2/4, 4/8, 8/32 mm) with accuracy of $\pm 3 \%$. Each fraction has to be separated in separate silo or compartments without possibility of mutual uncontrolled mixing.

Testing of aggregate for concrete is consisted of:

1. Analysis of sieving which is done according to the method for testing of granulation of aggregate for making of concrete (JUS B.B8.029 "Designation of granulometric composition of the stone aggregate by method of dry sieving").

Testing of the contents of organic admixtures is done according to the method for testing of sand polluted by organic substances (JUS B.B8.039 JUS B.B8.040). Sand on testing must not produce the color darker than designated by standard.

Steadiness which will be tested according to the method for testing of steadiness of natural aggregate by use of sodium sulfate (JUS B.B8.040) according to the method for testing of steadiness of natural aggregate at

frost (JUS B.B8.001), and according to the method for testing of resistance of natural stone on wear by grinding (JUS B.B8.015).

Quantity of harmful admixtures is designated per method for designation of light particles in the aggregate per adequate standard.

1.3.2.2. *Cement*

For all concrete and reinforced concrete works will be used Portland cement which in everything has to be according to the standard JUS B6.1011/1975 and to have a Bosnian-Herzegovinian mark of standard or to be stamped according to the standards of other EU Member Country which gives the same guaranties of safety and adequacy in which case the certificate has to be issued by State authorities for standards of Bosnia and Herzegovina.

Selected type of cement will not be changed during performing of works, and if some other type of cement is used, the Contractor has to ask for approval from Supervisor and to prove the quality of it.

Decision on the type of cement and eventual additives is made by Supervisor or the Designer after the conducted previous tests.

Previous tests of cement will be conducted by the Contractor in the laboratory, and with the consent of the Supervisor.

Ongoing testing of cement will be done during the construction per special program. These tests have to designate the basic characteristics of the cement like:

- start and end of bonding;
- permanency of the volume;
- hardness on bending and pressure;
- fineness of grinding;

Transport and storage of cement have to be done according to the valid regulations and usances. Cement in transit should be protected from atmospherics, and in the factory stored in buildings which are not wet, on dry floor raised above the ground level and delivered in bags/sacks. If different classes of cement are used, a separate storage has to be used for every class of cement.

Hydrated; partially bonded or cement damaged at storage or manipulation cannot be used and it has to be removed from the construction site.

Dosage of cement has to be done by weight, except if it is delivered in bags/sacks of standard weigh, with accuracy of ± 2 %.

1.3.2.3. *Water for making of the concrete*

Water for making of the concrete has to be clean and to meet the provisions of the "Rulebook on technical measures and conditions for concrete and reinforced concrete ". Water for making of the concrete has to without oils, acids, alkali, salts, harmful quantities of organic substances, and other harmful admixtures and ingredients.

The Contractor has to conduct field and laboratory testing of water quality at his own expense. Taking of samples and testing of water is conducted according to JUS U. M1.058 "Technical conditions and methods testing of water for making of concrete".

Water has to be clean, it cannot be turbid and it has to be without retained substances and with stamped approval by the chemist with good reputation that it is suitable for the said purpose. In the time of use the water cannot contain ice or snow.

Dosage of water is done by weight, and accuracy of water dosage should be ± 3 %.

1.3.2.4. *Additives to concrete*

Additives to concrete serve for improvement of comonibility, water tightness or the resistance of concrete against chemical or mechanical impacts and similar.

If the additives to concrete are not standardized, it must have official certificates and permits for use. Additional means can be used only according to the regulations and official conditions for implementation and instructions by the producer, with the consent of Supervisor.

Additives should satisfy conditions of the "Rulebook on technical measures and conditions for concrete and reinforced concrete" Chapter II, materials 4 Additives to concrete, articles 28 to 30.

1.3.3. **Concrete**

Upon approved use of basic materials for making of concrete by the Supervisor, the Contractor has to determine mixtures according to these conditions and to submit it for approval by the Supervisor at least one month before the start of concrete works.

For needs of the construction of the structure here will be used the concrete class which is stipulated on drawings or in the bill of quantities of works. Concrete class will be changed only in case of written instruction by the Supervisor.

For determination of the quantity of cement on the mixture relevant are hardness, density, water tightness and workability of concrete.

Contractor has to prove, for every type of concrete by trial samples and by testing that the proposed mixture will be adequate for regulations for these conditions.

Previous testing has to identify the mixing relations of all main types of concrete, way of preparation and required hardness to pressure after 28 days.

Proportions of mixing and composition formulas tested by previous testing are not regarded as non-changeable, therefore during construction it will be improved and adjusted to real conditions. Previous tests should include also the comparative testing of cubes after 7, 14 and 28 days in order to get the average relations that will, later on, enable that ongoing control is performed more accurate and intervention faster.

On concrete works on one whole construction should be used strictly only one type and class of cement.

To make a watertight (hydro-technical) concrete, the following is recommended:

- Granulometric composition of aggregate designated in such way that the curve of sieving is between the lines A and B which are given by our regulations for maximal aggregate grain of 32 mm and closer to line B, e.g. ritcher in small grains of aggregate.

- Water-cement factor has to be limited to w/c 0.55.
- Quantity of cement should not be smaller than 350 kg/m^3 of concrete.
- Contents of fine grains of aggregate 0/0.2 mm together with the quantity of cement has a decisive impact to good internal cohesion of fresh concrete mass and prevention of detaching of large grains, water and small particles from concrete mass. In that order it is necessary that the content of fine grains in fresh concrete mass (cement + aggregate 0/0.2 mm) in 1 m^3 of concrete is about 400 kg.
- To reduce effort on compacting of fresh concrete mass, it is recommended that the consistency of concrete is plastic and closer to soft than the hard consistency. It means that on making of the concrete will be used larger quantity of water to make the concrete of plastic consistency, where the water-cement factor must not be changed, e.g. it must stay within limits 0.55.

During construction will be conducted ongoing tests which will be limited to the control of:

- consistency of concrete;
- hardness to pressure;
- volume weight;
- comonibility of concrete.

Testing of concrete cubes to pressure, protraction and water tightness is conducted at every 200 m^3 of built-in concrete. Water tightness is tested on concrete cubes of size $20 \times 20 \times 20 \text{ cm}$ or $30 \times 30 \times 30 \text{ cm}$ (depending on the size of grain of aggregate) old 28 and 90 days.

Cubes are put under water pressure in duration of four days exposed to the following pressures:

- 1 bar 24 hours;
- 2 bars 24 hours;
- 3 bars 24 hours;
- 4 bars 24 hours.

For this time water must not pass through the cube.

Allowed tolerance of aggregate for each fraction is $\pm 2 \%$. At dosage of water it is obligatory to pay attention to previous moisture of aggregate.

Maximal grain size of the aggregate for particular types of concrete is designated by the project, standards and regulations and it cannot exceed that size. Contractor submits to Supervisor request for approval of composition of each concrete. Consent of the Supervisor does not in any case reduce the responsibility of the Contractor.

Consent can be withdrawn in any moment if it is identified that the required quality and class of concrete was not achieved.

Additives to concrete (plasticizers, aerators, etc.) can be added to concrete with previous consent of Supervisor. If the adding of it to concrete is necessary, it will be calculated separately as the material.

1.3.3.1. *Testing of concrete*

Taking of samples, preparation of testing samples and testing of characteristics of fresh concrete is conducted according to norms in line BAS EN 12350, and testing of characteristics of hardened concrete according to norms in line BAS EN 12390.

Taking of samples, preparation of testing samples and testing of resistance of concrete to freezing is conducted according to recognized technical Rulebooks (JUS U.M1.016), and testing of resistance of concrete to freezing and defrosting salt according to norm BAS CEN/TS 12390-9.

When the concrete plant is at the construction site, at taking of samples and confirmation of harmonization of concrete, in the documentation at the construction site is obligatory stipulated the mark of individual element of concrete construction into which is built-in the concrete from which the sample was taken.

1.3.3.2. *Designing*

Concrete which has technical characteristics and which fulfils other requirements from the Rulebook is used for concrete constructions designed according to recognized technical regulations from Article 11 of the Rulebook.

Concrete class according to Rulebook on technical normative for concrete and reinforced concrete is adequate for concrete hardness class at pressure according to Rulebook.

Table 3 – Concrete class according to PBAB and adequate hardness class at pressure of concrete according to the norm BAS EN 206-1

Concrete class (PBAB)	15	20	30	40	50	60
Hardness classes at pressure	C12/15	C16/20	C25/30	C30/37	C40/50	C50/60

1.3.3.3. *Quality control*

Control of quality of concrete and its integral parts is done at the location of production, at the location of building-in and already built-in concrete in the construction.

Control of all integral parts of concrete, and especially cement, is done at delivery to construction site if required by the Supervisory organ, or immediately before the start of making of concrete.

Cement stored for longer period of time in bags/sacks or in strewn condition (more than 3, or more than 6 months) has obligatory to be tested before use.

Accuracy of mixing of integral parts of concrete in the plant for preparation of concrete has to be checked in the first phase of preparation of fresh concrete for the structure for which the concrete is used.

At place where the Contractor is planning the mixture, he will, before the start of concrete works, order trial mixtures to be made in approved laboratory in order to achieve medium hardness for every concrete class and to satisfy the conditions of minimal quantity of cement, workability and maximal size of aggregate. Trial mixtures have to contain identical components of materials which are proposed for use in works during the duration of contract. Adequate trial mixtures will be made and tested in the period which is sufficient to avoid delay of start of concrete works. Supervisor can accept, as an alternative, the proof on previous production of concrete by the Contractor, including the results of testing, where are incorporated identical components of the material.

Taking of samples and testing of concrete from trial mixtures will be done according to the Rulebook for concrete and reinforced concrete, in independent approved laboratory. From each of three production cycles will be made three cubes for testing after seven days, and three for testing after 28 days. There will be designated workability of the concrete in any trial cycle. Dosage of trial mixtures will be approved if, satisfying other provisions of Technical Conditions, the average hardness of nine cubes which were tested after 28 days (recommended is only 7 days) exceed the relevant value in Table 4.

Table 4 Average hardness of cube from trial mixture

Concrete class	Hardness of trial mixture (N/mm ²)	
	7 days	28 days
15	-	26,5
25	24,3	36,5
30	27,7	41,5
35	31,0	46,5

Under certain circumstances, Supervisor can accept results of testing after 7 days. If these resistances to pressure are presented, Supervisor can give such instructions which will enable the Contractor to start with concrete works after the end of 7 days or 28 days already according to production of previous cubes.

Contractor should not start with concrete works until the above mentioned requirements are fulfilled at satisfaction of the Supervisor. Contractor will ensure and deliver, free of charge, forms for sample in approved laboratory. Costs will be calculated from the sum which is included in the Bill of quantities of works.

Where the ready made concrete is proposed, mixed outside the construction site, concrete can be used only in agreement with Supervisor and it should be

according to all requirements of these Technical Conditions and valid standards. Contractor has to deliver for approval to Supervisor the name of the company which is producing the ready made concrete and details for propose procurement, before deliver of any of concrete types to the construction site. Contractor also has to ensure that he Company which is producing the ready made concrete will ensure smooth and permanent delivery of concrete to keep the continuity of building-in of concrete between the cracks. Supplier will deliver such results of previous testing which will enable the Supervisor to be satisfied regarding the adequacy of the quality of control in the plant for production of concrete. All records on delivery, including the original receipts of supplier on reception of goods, will be kept by the Contractor. Content of cement in every delivery/shipment will be presented in the receipt. Contractor will get the certificate from the supplier of ready made concrete regarding testing of cubes from trial mixtures which was conducted in approved independent laboratory using identical material which was proposed for use. Taking of samples and testing should be done by the Contractor, at the place of unloading of concrete according to provisions of the specification.

Samples of fresh concrete are taken according to the standard. Testing of consistency of fresh concrete is done regularly. Content of air in fresh concrete and density of mixture are tested with taking of concrete for trial cubes on which will obligatory be tested the hardness and water tightness where that is prescribed by the project or by these Technical Conditions. Taking of samples and testing of concrete to hardness and workability should be conducted according to the Rulebook for concrete and reinforced concrete. Such testing, since it is not usually done in the field, will be conducted in the laboratory approved by the Supervisory organ. Contractor will ensure all conditions for adequate storage and transport of samples for testing. There should be made three cubes at every 20 m³ of concrete built-in per day or according to the instructions of Supervisor. Samples of concrete for trial concrete cubes will be taken at the place of layering of concrete when it is built-in in the position. Trial concrete cubes will be clearly marked according to the approved way of marking.

Supervisor may require taking out of samples from structure covered with concrete for the purpose of control of achieved quality. Contractor has to take out the samples from the place marked by the Supervisor and to send it to testing. Costs of testing will be borne by the Contractor.

Supervisor may require/ask from the Contractor to change the mixture formula for making of concrete in order to achieve the quality predicted by the project, and costs of these changes will be borne by the Contractor.

1.3.3.4. Making of concrete

For conducting of works according to the said project solution is obligatory mechanical making of concrete in the concrete production plant, or concrete factory. Concrete plant or concrete factory has to decide dosage by weight, automated or semi-automated dosage of the fractions of aggregate, cement and water, and to ensure the homogeneity of the mixture. It also has to enable the changes of proportions at dosage by quick leveling. Concrete plant must have sufficient capacity which enables performing of concrete works according to planned dynamics.

Accuracy of dosage has to within the limits of ± 2 % for cement, ± 3 % for water and ± 3 % for aggregate.

Contractor has to get the consent by the Supervisor for the duration of mixing of the mixture.

Concrete plant should have the notice board where must be presented the composition of the concrete which was made.

1.3.3.5. Transport of concrete

Transport of concrete can be done only in a way and by means that are predicted by the project of organization of conducting of works prepared by the Contractor and adopted by the Supervisor before the start of concrete works.

Concrete will be transported from the concrete plant to the place where it will be built-in for the shortest possible time. Transport of concrete has to be solved in such way to disable the beginning of bonding before building-in.

During transport the concrete must not be unprotected and exposed to unnecessary impact of sun or frost which endangers the quality of produced concrete.

Transport of concrete will be done by concrete-mixer trucks, which operate without interruption or in mixer-lorries Concrete has to be compacted and it should be at its final position in the period of two hours upon putting of cement into aggregates, except if the Supervisory engineer did not approve the longer period. Time of such putting (of cement) will be recorded on delivery form together with the weight of ingredients of each mixture.

When the concrete mixer-lorry is used, water will be added under supervision or at the construction site or at central dosage device, as it was agreed with Supervisory organ, but in any circumstance water will not be added in transit. Before building-in of any concrete at the construction site, Contractor will ensure that the mixture of concrete which has to be delivered is in accordance with certain characteristics of mixture, without adding of water or any other materials, upon delivery to the construction site.

If during concrete works is identified that there are occurrences of segregation or loss of particular ingredients of concrete caused by solution of organization of transport of concrete, Contractor has to immediately remove the causes of these occurrences at his own expense.

1.3.3.6. Ugradnja betona

Building-in of concrete should satisfy conditions from the "Rulebook on technical measures and conditions for concrete and reinforced concrete".

Building-in of concrete can be done by device which guarantees achievement of required quality of concrete. Concrete works on structures is done according to the project or registration in construction log-book during the construction works, and which may be conditioned by change of soil quality in which the concrete works are performed.

Before the start of building-in of concrete it is necessary to check the rebar, forms (paneling) and scaffolds in detail.

Concrete works must not start before the expert conducts the examination of installed rebar and state by the registration in the construction log-book that the rebar is installed according to the project and to approve the start of concrete works.

During the building-in of concrete special attention should be paid to avoid the segregation of concrete. This especially related to concrete works on walls and lower slab of water chambers. It is not allowed the building-in of concrete by channels or skips with free fall higher than 1 m.

Time for building-in of concrete from the moment of making of it should be the shortest possible so that the concrete can be built-in before the start of bonding and hardening.

If the concrete works are performed on dry and hot weather with temperatures over 29 °C, time of building-in of concrete has to be shorter than 45 minutes and on cold and humid weather at most 1.5 hour.

Concrete before building-in has to be protected from sun, wind, rain and other impacts.

During concrete works on hot weather, the temperature of fresh concrete must not be higher than 30 °C, since at higher temperatures of fresh concrete and environment the evaporation of water from fresh concrete is significantly faster. Contractor will ensure appropriate means during the hot weather in order to protect the stored aggregate from direct sun exposure or the aggregate will be cooled by sprinkling of water, as well as by insulation of tank for mixing of water and pipeline, so that the temperature of concrete when layered does not exceed 30 °C.

During the concrete works on cold weather should be undertaken adequate precaution measures so that the temperature of concrete upon building-in does not drop below 5 °C until the concrete is completely hardened. Method of heating of concrete or the forms/paneling will not be of such kind to cause the drying of concrete. Before the building-in of concrete, all surfaces which are in contact with concrete, including forms, rebar, neighboring concrete and ground, will be without ice, snow and damages caused by frost.

No concrete works will be undertaken during cold weather, until the temperature in shade reaches 1 °C on thermometer neither the concrete works will be continued when the temperature on thermometer is below 4 °C in shade. Special attention will be directed to preventing of dropping of temperature of fresh concrete below 5 °C when it is built-in onto previously placed concrete which is at lower temperature. Adequate thermometer with maximal/minimal temperature will be placed in the construction site at appropriate location for this purpose. Temperature of concrete will be measured at the most favorable place regarding the limits.

Water for making of concrete will not have temperature higher than 60 °C. If there will be used the water with temperature above 50 °C, it first will be mixed with aggregate before adding of cement.

Above the previously mentioned requirements, concrete will be protected from frost by covering with adequate insulation material in the period of at least 72 hours when normal Portland cement is used, or 36 hours when the quick-bonding Portland cement is used. Building-in of concrete can be prohibited at any time if by the opinion of Supervisor the conditions are not appropriate or if adequate precaution measures are not undertaken. Regardless the all prohibitions given by Supervisor, all damages of concrete due to frost will be removed by Contractor at his own expense, and the concrete will be replaced with undamaged material at the satisfaction of Supervisor.

During the use of concrete pumps for building-in of concrete, with the approval of Supervisor, will be used the concrete with specially designed mixture for pumping. In case of interruption of work of the pump for more than 1 hour, and before the continuation of concrete works it is necessary to conduct the washing-out and cleaning of the pump, channels, pipes and all parts for transport of concrete to the place of building-in. For whole time of the use of concrete pump the Contractor has to predict appropriate alternative solution for building-in of concrete in case of failure of the equipment for pumping.

Concrete has to be built-in into forms in continuity until the end of previously designated batch of concrete works, and it has to be built-in at the closest possible to its final position on the forms. Concrete works are done in layers which cannot exceed the height of 50 cm.

Upon putting of the concrete layer into the forms it is necessary, by suitable means for compacting to compact the fresh concrete to the highest extent possible in order to remove the air from it, to increase compactness of concrete and to achieve an adequate final processing of surfaces.

Compacting of concrete obligatory has to be done by mechanical means by pervibrators, according to the recommendations of the producer regarding the efficiency radius and time of vibrating. Pervibrators are put into concrete vertically at even distances to ensure the overlapping of vibrating surfaces. Vibrating will be implemented whole time during the building-in of concrete, until the complete stop of pushing-out of the air and in a way to avoid segregation. Spare equipment in working order form has always to be available at the construction site in case of failures.

Pervibrators cannot be used for transport of concrete within the forms. At use of pervibrators, will be avoided every contact with rebar and all plugs, if possible.

For slabs with thickness of 10 cm and less, instead of pervibrators for compacting of the concrete it is necessary to use vibration beams or some other technique accepted by the Supervisory organ.

Concrete will not be built-in under water until the special instructions are given by the Supervisor in written that the works have to be done in such way. Content of cement in such concrete will be increased for the quantity which is not less than 25% of minimal previously designated quantity for every concrete class. Highest attention has to be paid during placing of concrete to prevent separation of ingredients, and in that purpose will be used approved bucket for concrete or the bell – for pouring of concrete under water. Concrete has to be placed constantly when the works start, and upper surface will be maintained at the same level as long as possible, until the adequate height is reached. When the concrete works are finished, it will be carefully covered, and the Contractor has to prevent penetration of water into concrete until concrete is completely hardened.

1.3.3.7. Working joints and interruptions in concrete placing

To eliminate unfavorable impacts due to deformations from shrinking of concrete, at places where it is predicted by the project are made working joints in water chambers. Since working joints represent potentially weak places in the construction since the firmness of concrete to protraction at the joint of "old" and

"new concrete is still lower than in monolith part of concrete, these working joints and interruptions in concrete placing has to be limited to lowest possible number.

Closing of working joints has to be done in a way to achieve the best possible bond between "old" and "new" concrete. Surfaces of working joints an interruption in placing of concrete have to be clean and rugged, which may be achieved by processing of working dilatations and interruption in placing of concrete my water jet and compressed air several hours after placing of concrete. Such processed surfaces have to be continuously moisturized by water.

Upon expired 20 days from the date of concrete works can start the closing of horizontal working joined parts/joints.

First layer with thickness of about 5 cm has to be placed from concrete made with higher quantity of cement and aggregate with largest grain of 8 mm, with previous moisturizing of contact surface, but in a way that in the moment of placing of this layer the contact surfaces are not too moist since in such way can be created a water film which reduces the adhesion between the "old" and "new" concrete. After such made first layer can be continued the building-in of normal concrete.

Processing of vertical working joints/joined parts is done in the same way, but the closing of these working dilatations is done with small-grain concrete made with higher quantity of cement.

Care for concrete built-in in working joints/joined parts has to be conducted for at least 15 days from the date of concrete works.

Where is predicted by the project, on working joints/joined parts are built-in PVC seals the shape and quality of which is prescribed by the project and accepted by Supervisory organ.

Leaving and closing of working joints/joined parts are included in price of concrete.

1.3.3.8. Care for and protection of concrete

Care for and protection of concrete during preparation, transport and building-in and after building-in into particular parts of concrete constructions has to be according to conditions from "Regulations for hydro-technical concrete".

To prevent sudden evaporation of water from fresh concrete which may lead to disturbance in the process of hydration, uneven tightening, reduced firmness and density, occurrence of own stress and surface cracks, concrete has to be cared for.

Maintenance of concrete in the state of total saturation can be achieved by moisturizing of free surfaces of concrete by sprinklers, where should be avoided sudden cooling of heated concrete surfaces by strong jet of water especially in first days of bonding and hardening.

Time of care for concrete depends on the type of construction, on type of used cement and climatic conditions but it should not be shorter than 7 days from the date of building-in, except for massive constructions.

If the forms were removed before the end of the period of care for concrete, care will continue as for surfaces without forms using adequate accepted materials.

Horizontal surfaces are cared for by poring of water on it, covering with min. 5 cm of constantly saturated sand or by polyethylene foils.

Protection of concrete during bonding and hardening can be done by special means for care which create impermeable film, if the implementation of it is approved by Supervisory engineer. These means cannot be used on surfaces which require additional processing which depends on the bond with concrete.

Other means can be implemented for covering of finished concrete surfaces if it is adequate for the type of construction and if it ensures efficient care in local conditions, and which are obligatory approved by Supervisory engineer.

Care for concrete in usual way is included in the price of concrete and it is not paid separately.

1.3.3.9. Processing and repairs of concrete surfaces

All exposed surfaces of concrete should be firm, smooth and without nests and hollows.

On all surfaces where nests and other mistakes are present, it is necessary to perform cutting to the healthy concrete, and to the depth of at least 25 mm. Edges of surfaces which are to be repaired should be cut vertically to the surface of concrete, and whole surface cleaned from all non-cohesive material. Prepared surface has to be moist and coated with cement milk by brush, and the repair has to be done with adequate non-shrinking mortar.

On places where the quality of concrete is unacceptably bad, the Contractor will replace it without the reimbursement, with new concrete of required quality.

1.3.4. Rebar

For all reinforced concrete constructions by the project is predicted the use of steel of normal concrete steel of round profile, rebar nets and ribbed steel.

Rolled steel bars, cold twisted rebar, heavy pulled steel wire and highly tensioned net rebar will be according to the requirements of JUS C.KG.020, JUS C.KG.120 and JUS U.M1.091.

For every delivery of concrete steel to the construction site Contractor has to submit to Supervisor the certificates on steel quality which will be used for making of rebar in reinforced concrete constructions.

Certificate must contain results of the following tests:

- hardness to protrusion;
- yielding limit;
- elongation until breach;

Concrete steel will not contain oil, fat, dirt and paint, and all rust and metal after heating to a red-hot have to be carefully removed before use. Rebar will be properly stored at cleaned construction site with adequate protection to prevent deterioration.

Cutting, bending and placing of concrete steel Contractor has to perform according to as-built drawings, plans for bending and placing. Making of rebar must in every detail be according to valid regulations for reinforced concrete.

Built-in rebar must be clean from rust, flakes, oil, fat, mud, paint or any other material which may cause reduction of bond between concrete steel and concrete.

Rebar must be bended and folded according to the project, properly fixed and bonded so that during building-in and vibrating of concrete it can keep its position.

All rebar will be bended at temperature of 5 °C to 100 °C. It is not allowed bending or stretching of rebar using heat without the approval of Supervisory organ.

Overlapping of particular bars of rebar has to satisfy valid technical regulations and to be made according to given rebar drawings. All crossings of bars or joining by stirrups must be bonded with burned wire. Free ends of the wire have to be turned opposite of the forms not to penetrate into protective layer of concrete.

To ensure position of particular bars of rebar as well as to achieve necessary distance from the forms can be used combs, chairs etc. but with previous approval of Supervisory organ.

At places where bars are coming out from the concrete will be undertaken precaution measures to prevent bars to be angled or swerved in such way which could damage the bond between steel and concrete.

If Contractor wants and has intention to bend rebar at the construction site, it will be allowed under the conditions that he keeps and maintain small storage with different sizes of steel bars, and to have device/machine for bending at the construction site in order to make any small corrections or additions to rebar which may be used in later phase.

Before start of concrete works Supervisor has to conduct examination and acceptance of rebar as the precondition for start of concrete works. Approval issued by Supervisor will not in any case release the Contractor from responsibility if the rebar is placed different than it is given in the project.

Calculation and payment is done per 1 kg of weight of concrete steel according to rebar drawings of the project.

1.3.5. Forms and scaffolds

Forms for concrete works on structures must satisfy the conditions given in "Rulebook on technical measures and conditions for concrete and reinforced concrete". Forms and scaffolds for concrete works must have in every point the same position, direction and shape which is predicted by the project. At correct building-in of concrete after the removal of forms must be achieved flat and smooth surface, and dimensions of each of produced concrete elements have to precisely fit to those from the project. Also must be ensured minimal required protection layer above the rebar.

Forms will include all temporary or permanent forms necessary for shaping of concrete, together with all temporary constructions necessary for supporting of it. Forms will be designed and built in such way that the concrete can be correctly built-in and fully compacted, and according to JUS U.C9.400 which defines conditions for making of wooden scaffolds and forms.

Forms will be firmly supported, stretched and fixed. It will be adequate regarding leveling of lines and dimensions of processed concrete, it will be sufficiently firm to resist, without excessive twisting, to the pressure of concrete during the building-in and compacting of it, and to stand other loads to which it may be exposed. It will not be subject to twisting under the impact of weather. After hardening, concrete will be at the position and of shape, dimensions and final processing of surfaces as it was given in the project.

Forms can be made of metal, plain wooden forms of adequate quality or made of hard water resistant boards.

Forms must be sufficiently impermeable to prevent leaking of concrete milk during the concrete works. Forms before every use must be smooth, well cleaned and coated with coat harmless for quality and appearance of concrete.

Together with placing of forms must be placed adequate anchors according to the project or drawings by the Contractor. Anchors have to be correctly placed, centered and rigid.

For walls of water chambers is not allowed the use of means for securing (bonding) of forms which pass through whole thickness of the wall. Scaffolds for supporting of forms must be leaned on pad-boards and it cannot lean directly on concrete. It must be secured easy releasing of scaffold on dismantling.

Internal surface of the forms, except for permanent forms or if it is not otherwise required by Supervisory organ, will be coated with releasing agents approved by Supervisory organ. Releasing agents will be strictly implemented according to the instructions by the producer and it will not get into contact with rebar or cables for pre-tensioning and anchoring blocks. Different releasing agents should not be used in the forms on concrete if that will be visible in final works.

Designation of the period after which the forms are removed is the responsibility of Contractor. In general, if it is not otherwise designated by Supervisory organ, minimal period for keeping of forms at the position will be as it is presented in Table 5.

Days when the temperature at the surface of concrete is below 3 °C will not be taken into account for Table 5. For each day in which the temperature of concrete surface in general is between 3 °C and 7 °C will be added half day into calculation of the periods given in Table 5.

Table 5 Time of keeping of forms

Elements of forms	Temperature	
	Above 7 °C	Above 16 °C
Vertical forms for pillars, walls and beams	18 hours	12 hours
Sub-ceiling forms for slabs	6 days	4 days
Supporters for slabs	15 days	10 days
Sub-ceiling forms for beams	15 days	10 days
Supporters for beams	21 days	14 days

To more reliable designate the time of removal of scaffolds and forms of particular construction elements of the structure, or if the Contractor wants to remove the forms before the period mentioned in Table 5 it is necessary in parallel with

concrete works to make certain number of trial bodies which will be left to harden under the same conditions under which the concrete is hardening in the construction of the structure.

Based on testing of these trial bodies after 3 and 7 days and identified hardness it will be possible to decide should the scaffolds and forms be removed. If the hardness of trial bodies which are 7 days old is identified as higher than 60 % of the final hardness of the concrete required by the project, in that case the scaffolds and forms can be removed. If the hardness of trial bodies which are 7 days old is lower than 18 N/mm², in that case the scaffolds and forms can be removed after 14 days from the day of completed concrete works.

Making, placing, removing and maintenance of forms have to be calculated in the unit price of built-in concrete of particular position according to the bill of quantities and invoice of works.

Contractor will be responsible for any damage of concrete and damage caused by that, or which was made during removal or dismantling of forms and sub-ceiling. Any advice, permit or approval by Supervisory engineer, related to dismantling or removal of forms, will not release the Contractor from responsibility.

1.3.6. Tolerances

Marking and dimensioning of finished works, except if not otherwise given in drawings or specified, will be within allowed tolerances which are given in these Technical conditions, and the Contractor will be responsible for costs of all repairs which Supervisor regards as necessary to conduct those repairs which are not done within this designated tolerances.

Except where specially marked, dimensions, elevations, sizes, positions and thickness have to be precisely dimensioned or designated within the following tolerances:

- thickness of concrete around rebar ± 5 mm, except for slabs where tolerances should be ± 3 mm;
- for sizes of beams, pillars and thickness of wall or slab not less than the one which is dimensioned and not larger than 10 mm;
- for marking of positions and dimensions, horizontal or vertical ± 6 mm;

1.3.7. Pumping of water during performing of works

During the conducting of works Contractor has to perform pumping and drainage of water in order to ensure correct and uninterrupted performing of works, to prevent the softening of land and to secure life and health of workers.

Contractor has to, at all places of excavation and construction of the structure where the water cannot be drained in natural way, install the pumping plants for drainage of percolation water.

Contractor has to provide pumping of water at working place, as well as all other necessary means by which will be possible to cope with smaller penetrations of water and to enable proper draining of that water from the place of excavation for the structure. For draining of water from the construction site in the quantity of up to 10 l/s, costs are calculated in the unit price of excavation of adequate category of land and type of excavation. If the quantity of inflow exceeds 10 l/s, all costs of pumping

and drainage of surplus of water will be separately calculated. Quantity of inflow water is identified by Supervisory engineer with the Contractor.

Contractor has to provide and install the pump or battery of pumps of sufficient capacity with suction and pushing pipeline of adequate dimensions, which enables efficient pumping of water to designated depth and lowering of the level to designated depth, according to the conditions for the said structure.

Contractor has to inform Supervisory engineer on the occurrence of inflow of over 10 l/s in due time as well as on the need for pumping of water.

Supervisor will give approval for pumping of water which inflows in the quantity higher than 10 l/s. If frequency, intensity and character of the inflow points to the need of installing bigger capacities of water pumps or the battery of pumps to speed-up the pumping of water from the excavation place, and upon the request by Supervisor, Contractor has to ensure the required capacities.

Pumped water must not pour down on the place where the works are conducted. All damages caused by discharging of water into spaces for future works will be borne by Contractor and he has to remove all caused damages and to bring the performed works into correct condition at his own expense.

1.3.8. Speed of progress in concrete works

Construction concrete works on structures should be harmonized with other works in a way not to disturb dynamics of whole works per particular parts of the structure.

1.3.9. Making of stone pavement in concrete

Stone for pavement must be according to standards rus B.O. 8.001-66, rus B.B.8.010-57, JDS B.B.8.001-57, JDS B.B.8.013-60, JDS B.B.8.012-57, JDS B.B.8.015-63, JDS B.B. 8.018-57, e.g. it must have prescribed hardness to pressure, be stable in water and at frost and be resistant to wear.

Paving of the profile by stone has to be conducted by pushing of the stone into concrete, in all according to enclosed details in the project.

Stone and concrete works have to be done simultaneously so that stone is pushed into concrete. Lines between stones must not be wider than 2 cm. Upon making of the lines it has to be cleaned and poured-on by cement mortar 1:2 if necessary. Mortar has to be compacted by iron bars to the concrete base. Mortar must not be glued to stone surfaces. Cement mortar has to be prepared with larger percentage of puzzolane (PC 450) and sand in cement mortar must not be of dolomite origin but limestone, siliceous and quartz origin.

All hollows in the wall have to be filled with small stone and poured with cement mortar.

Edges and surfaces have to be flat and vertical or in planned inclination.

Individual stones used for building must have the smallest size according to technical regulations.

Coating will be placed over the buffer layer of gravel.

1.4. Mounting works

1.4.1. PVC pipes

1.4.1.1. General

For successful placing of pipes it is necessary to conduct all preparatory works, draining, access roads and everything else related to construction of pipeline.

Contractor has to place pipes according to these conditions and recommendation of supervisory engineer which is consisted of procurement, external transport, storage, development, placing down in the trench, mounting of pipes, pressure trials, disinfection and testing of pipeline.

It is necessary to perform geodetic controls before, during and after completed placing of pipeline and it should be calculated into the bidding price.

1.4.1.2. Characteristics of pipes

PVC sewer pipes are used for overflow water, outlets and in separate and mixed systems of drainage of wastewater which have constant temperature above 60°C. At evacuation of industrial wastewater it is necessary to pay attention to chemical stability of pipes.

1.4.1.3. Transport and handling

Sewer PVC pipes are transported by suitable vehicles, and loaded and unloaded under expert supervision. At transport pipes have to lie evenly along whole length to avoid the bending of it.

Pipes must not be thrown on and dragged on the ground, but carefully unloaded one by one. Loads caused by hit/impact in principle should be avoided.

Storage of sewer PVC pipes can be done in open space, on previously leveled and flat terrain, although it is recommendable that stored pipes should be protected (covered). Storage is done with and without pads, and distance between pads, if used, should be 1-2 m.

Height of piling of pipes should be designated in a way that the pipes from the lowest row keep its round (circular) cross section.

In spite of that it is recommended that the height of piling does not exceed 2 m.

1.4.1.4. Processing and mounting

Pipes placed in the trench should be straight and without tension.

Change of direction on joints/couplings is not allowed. Pipes are joined by coupling with rubber ring. Before use, or installing of pipes and coupled parts, it is necessary to clean inside surface of the joint, as well as the end of the pipe which will be inserted.

Pipes, according to the need, can be sawn by fine saw and then the ends are angled by file.

1.4.1.5. Excavation of the trench

Placing of sewer pipes and fitting pieces of PVC is allowed without special check by static calculation, in following cases:

Below traffic surfaces intended for transport of cargo up to 30 Mp if the upper layer above the crown of the pipe is at least 1.5 m,

Below surfaces without traffic or the surfaces which are only temporarily exposed to traffic loads by lighter vehicles if the minimal height of the upper layer is 0.8 m,

At placing into channels of minimal width the height of the cover layer must not exceed 6.0 m while at placing under the embankment and in wide channels that layer must not exceed 4.0 m,

Soil for burying down the pipes should have approximately the following characteristics: $\gamma = 2,1 \text{ Mp/r}^3$ and $f_i = 22,5 \text{ st}$.

Placing in the area of groundwater is allowed only under the condition that the washing out of the shooting material is prevented. This can be avoided by placing of pipes into filter layer made of gravel or in concrete.

Excavation of the channels for placing of sewer pipes is defined by the Rulebook on protection at work in civil engineering Art. 1 0-24 (Set of Technical conditions in civil engineering).

Depth of the channel in which the pipeline is placed is in direct connection with elevations and configuration of terrain. In principle it cannot be less than 1.0 m.

Width of the trench in principle depends on the depth of placing and the profile of collector, however the minimal is $b = D + 30$ (cm).

Before placing of sewer pipes to the bottom of excavated channels it is necessary to clean the channels from large materials. If there are not noticed layers of soil of different supporting capacity, concrete pipes can also be placed directly.

In stony and karsts soils bottom of the trench is covered with shooting fine material (sand, smaller gravel, fine earth without stones) in layer 10 cm thick. For bedding never can be used clayey material. In areas exposed to impact of groundwater are recommended exclusively gravel beddings.

1.4.1.6. Covering of the trench (stopping up)

Shooting in the zone of pipeline (from bottom of channel to at least 30 cm above the crown of the pipe) is done by material without stones which in the same time can bend. It can be used material from excavation, but with previous sieving.

Compacting contributes to the stability of position of placed sewer and it should be done carefully. During that it is necessary to protect pipeline from moving. Bending around the pipe is done by manual tools or by hydraulic tools. Material is spread on in layers only to the crown of the pipe, compacting is done only at sides and not above the crown of the pipes. Compacting lasts as long as it is removed good lateral preconstruction of sewer line.

Shooting above the crown of the pipe is done in layers. Further layers above the layer up to 30 cm above the pipe can be done with material from excavation.

1.4.1.7. Testing of the net for water tightness

Upon completed works on mounting, particular section of sewer network are tested on water tightness.

Pipeline is filled with water and kept under pressure of 5.0 m of water column for 1 hour. Satisfactory level of test is that there are no losses, e.g. the reduction of the height of water column.

Coating will be placed over the buffer layer of gravel.

1.5. Final works

Final works are these works mainly related to building of roads and cleaning and painting of mechanical equipment.

1.5.1. Making of road –gravel curtain

This work includes the procurement of road-gravel per fractions, transport, spreading and rolling of road-gravel curtain as basis for supporting layers of road construction, or making of road-gravel road or leveling layer in the bedding.

1.5.1.1. Material

Stone: Stone for production of road-gravel can be used from the quarry amen or from broad excavation from the trace, with previous proving of quality by previous testing. Stone has to meet certain requirements.

Road-gravel: Percentage share of grain of stone aggregate, with size up to 60 mm with sieving through sieves and screens with rectangular openings, has to meet the standards like:

- Grain size 0.5 mm17 - 27 %,
- Small stones 5/12 mm16 - 22 %,
- Small stones 12/25 mm19 -15 %,
- Road-gravel 25/40 mm21 - 16 %,
- Road-gravel 40/60 mm27 - 20 %.

For supporting road-gravel layers with thickness of more than 15 cm must be implemented granulometric composition of grain with biggest size of 80 mm.

Content of fine, clayey and powder/dusty cohesion materials with grains of diameter smaller than 0.06 mm, can be at most 3 %. Allowed are deviations from presented granulometric composition to at most ± 5 %.

1.5.1.2. Making of road-gravel curtain

Over the planned and tested buffer layer or over prepared bedding in stone cuttings and hacks upon written approval of Supervisor can start the making of road-gravel base in required thickness and layers.

If the road-gravel base is made in stone cuttings and hacks as lower base (layer for leveling) or in other paces as upper layer (final) of lower base over which is directly placed a layer of bituminized gravel, road-gravel base has to be made according to the principle of road-gravel bonded with bitumen. Road-gravel spread in required thickness has to be lightly rolled over (ironed), and than the surface is sprayed with 2.5 kg/m² bitumen or adequate quantity of emulsion. Surface has to be covered with uncoated grit of grain size 1-3 cm and rolled over until is reached the satisfactory compactness of the layer and surface to look like mosaic and according designed profiles and invert level. First layer of road-gravel is rolled over without use of bonding material.

Roadway which is made as of road-gravel: before completed rolling over is spread 20-30 kg/m² of small stones of size 8-15 mm and by roller it is pushed between the road-gravel grains, and after that is spread and rolled over a protective layer of sand 0.2/2 mm.

Road-gravel layer as one of several lower road-gravel layers of roadway construction, made immediately above the buffer layer – filter layer per principle of water-bonded road-gravel, must have minimal module of compressibility of $M_s = 10.0$ kN/cm² with use of slab Φ 30 cm on testing of compactness at every 50 m of the road.

Calculation is made per 1 m² of produced road-gravel roadway. In unit price are included all these works which normally occur in making of such structures and which are not separately mentioned in the list of expenses of works.

1.5.2. Base from bituminized gravel for roadways

Works include making of the base from bituminized gravel in the layer of adequate thickness for asphalt roadway or sidewalk, or whatever the case may be.

Calculation is made per 1 m² of placed base from bituminized gravel for asphalt roadway or sidewalk/pavement. In unit price are included all these works which normally occur in making of such structures and which are not separately mentioned in the list of expenses of works.

1.5.3. Asphaltting of the roadway

Upon the making of the base from bituminized gravel it is necessary to coat the roadway with asphalt. Works include making of supporting asphalt layer of adequate thickness for roadway or sidewalk.

Calculation is made per 1 m² of placed asphalt layer or sidewalk (pavement). In unit price are included all these works which normally occur in making of such structures and which are not separately mentioned in the list of expenses of works.

1.5.4. Cleaning and painting

Cleaning chemicals must be suitable for the purpose and must not damage the cleaned objects.

Cleaning of premises is performed until premises are ready for use, according to its purpose. During cleaning of sanitary facilities, windows, etc. one must behave carefully since the surfaces of equipment and interior that are damaged-scratched during cleaning must be repaired or replaced with adequate new one, and all according to the requirement of Supervisory organ. Rubble from the object the Contractor will dispose at the place designated by Supervisory organ.

Cleaned surfaces are paid in m² based on the gross surface of the building from the project. Into unit price is calculated all material for cleaning, work and transport of rubble, up to 5 km from the object, and onto the place designated by Supervisory engineer.

Painting works include painting of constructions, iron surfaces, etc. by oil anti-rust paint, as well as whitewash and painting of premises by frugal paint. Paints which will be used for painting should satisfy valid standards. Painting of metal constructions and premises has to be done in a skilled manner with all necessary preparatory activities and in shade of color according to the description in the project and the list of expenses of works. Equipment for painting has to be of that kind which

is recommended by the producer of paints. Painting is not allowed when there is dust at the place where the painting will be done, during rains and low temperatures; neither can it be done on wet, humid and dusty surfaces. Painting can be done when all necessary preparatory activities are done and when the surfaces which are going to be painted are completely clean and dry. Preparation of surfaces for painting has to be done before painting. On surfaces must not be fat, oil, moisture, dirt and damaged places.

Calculation is made per 1 m² of painted surface of metal constructions with anti-rust oil paint or per 1 m² of whitewashed or painted premises by frugal paint in the shade of color and according to the description of works in the project and list of expenses of works. In the unit price is include the procurements of paints and other necessary material, all preparatory activities and final works. In unit price are also included all these works which normally occur in performing of such works and which are not separately mentioned in the list of expenses of works.

1.6. Acceptance of performed works

Taking over/Acceptance of excavated cutting or hack of regulated bed can be done partially, per particular sections, and always immediately before next phase of works if not otherwise agreed with the Supervisor. Acceptance is done according to designed profiles of excavation for particular section.

Acceptance of embankment can be done per particular built-in layers, or when particular section of the embankment of lower height is completely finished. Previously is necessary to identify are the required quality characteristics of the embankment (compactness) satisfied.

Acceptance of pavement can be done partially, and per sections if quality conditions are met.

At acceptance of particular structures, above the conditions of quality, it is necessary to control are the structures built exactly according to designed height elevations and in good quality.

All partial and final acceptances of particular works and structures at regulated bed have to be registered in construction log-book.

If some of the works are accepted in spite of certain drawbacks, these drawbacks have to be registered in written and deadline for the removal of it has to be designated.

Definite acceptance of regulated bed can be done (no matter the previous partial procedures of acceptance), only after repeated detail examination and acceptance of all parts and elements and the statement on achieving of predicted quality and solutions.

Definite acceptance means that the construction site is cleaned in detail, including all parts of profiles of the bed and structures, and especially that the area in the zone of regulation is brought into previous condition: places of mechanization/machinery passages, etc. have to be covered with grass, eventually demolished fences raised up again, etc.