Works Tender
for
Reconstruction of part of the local road Crkvicko Polje - Nikovici

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VOLUME 3

TECHNICAL SPECIFICATIONS

Section 1 - Civil Works

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TEHNICAL REPORT

1. GENERAL DATA ABOUT PROJECT

1.1. Introduction

Investor: Municipality of Pluzine

Processor: „SIMM INŽENJERING" – Podgorica

Project: Main Design of the Reconstruction of the local road Crkvicko Polje – Nikovici

Phase: Traffic

1.2. Project Subject and Description of the Existing State

The Project subject is the reconstruction of the local road Crkvicko Polje – Nikovici in the Municipality of Pluzine.

The existing transport route is Macadam road of average width of about 3m. There are numerous horizontal curves. Curves are without transition curves, with non-equal relations of neighbor radiuses. The flank widths are small and there are no flumes.

Except for unfavourable elements of horizontal curves, the lack are also vertical curves because there are numerous changes of level, and there are also batters bigger than allowed.

Drainage is solved by free runoff in surround terrain. There are no flumes
or channels as well as culverts. Water is often flown over pavement, because overflow is not regulated. There are built culverts, mainly of smaller radiuses, but there are few built flumes by witch water from pavement would by channels be drained off to the culvert.

2. BASIS FOR PROJECTING

2.1. Base For General Project

The Project is done on the purposely recorded geodetic bases. For purpose of creating of Preliminary Design was made geodetic base but it was not used for the Main Project, because it is recorded only narrow band and there is relatively small number of recorded points. Because of that, for the Main Project there is specially recorded geodetic base and it did enterprise Geos d.o.o. from Podgorica.

2.2. Design Brief, urbanistic-technical conditions and conditions of the relevant institutions, enterprises and organizations

Designer received Urbanistic-Technical conditions, no. 04-1773 of 27.09.2010. Conditions are issued by the Secreteriat of Local Government of the Municipality of Pluzine.
Of eventually relevant institutions, enterprises and organization are not received any conditions.

2.3. Legal Regulative

During the creation of the project documentation, except for the Code of basic conditions which public roads out of settlements and their elements have to fulfil from the aspect of traffic security (June of 1981) are used and the JUS standards U.C4.301-310, which refer to the tecnical elements of the connection roads and access roads, in other words roads with rare traffic.

Except for the mentioned documentation, it is taken into account about all the standing standards and other regulative from this area.

2.4. Project Documentation

For subject section of the local raod is done Preliminary Design, which the Investor delivered to the Designer.
Processor of the Preliminary Design is the enterprise KOV-Atelje d.o.o. from Niksic and the consultant was the enterprise Via Project d.o.o. from Podgorica.

Preliminary Design was not available for use during the creation of Main Design because it was not solved drainage and finished road level of the projected road is practically the same as the finished road level of the existing road, whose elements are not satisfactory.

2.5. The existing road network

Alignment of the projected transport route passes throughout the space which is remarkably weakly covered by the transport grid. There is a couple of Macadam roads which are connected to the subject transport route.

2.6. Precis from Study on the Geotechnical surveys of terrain

Study made by Geotehnika Montenegro d.o.o. Enterprises from Nikšić. In the Study, among other things mentioned:" For the newly formed scarps are recommend final batter of scarp not steeper than 3:1. If it larger (over 5 meters) than batter need to be 2:1."

At the end of the Study write: Terrain is generally favorable for planned reconstruction of the road. Excavation can be completely done by machine. Slope on the route are small size and are generally stable, although there are plenty of places where the pad layers with respect to time is not favorable. If they formed a slope greater heights on this account should be taken. Load-bearing capacity is good.

3. BASIC CHARACTERISTICS OF DESIGN SOLUTION

3.1. Layout drawing

In relation to Preliminary Design there was a displacement of the coordinates of the apex and the reason is to get a better technical elements.

Projected length of road is 8213,867m. Projected total of 117 curves of which 107 circular curves with transition curve and the rest are pure circular curves.
Transition curve are small, but in consultation with Revisor came to the conclusion that is better to anticipate of transition curves, even if they are small in length. In some part of route was to predicted was not possible without of significant increase in construction cost , so they used pure circular curves.
Used smallest radius of circular curve is R=15m.

3.2.Cross section

Pavement width, in accordance with the conditions of 4.00 m. The pavement expanded curves according to JUS U.C4. 303rd According to the standard required in the expansion of the curve depends on the deviation angle and reduced vehicle length (distance between front and rear axles and front extension of the vehicle). Adopted Adopted a reduced length of D = 6.5 m which is related to large agricultural machinery and commercial vehicles.

Now at the beginning of the route, there is a traffic sign, which limits the maximum axle load of seven tons and applies to vehicles that cross the Macadam road to asphalt.

Flank width is 0,5 m according to the Preliminary Design.

3.3. Leveling road and drainage

Extension batters have almost the entire length of the conditioned elevations of the existing terrain. A large number of fractures and alignment in order to reduce construction costs, because the funds allocated for this purpose are not large.
Maximum elevation is 1450.00 meters above sea level climbing a minimum 1181.49 meters above sea level.
Maximum longitudinal slope is 12 %.

Pavement is the gravitational drainage. It is designed with the channel side of the hills and waters that are collected are released into the surrounding terrain or the terrain is not possible to link to the failures that are built into the hull.

A total of 13 projected culverts. All culverts are tubular diameter Ø800.

3.4. Pavement construction

In accordance with the preliminary design was adopted following pavement construction:

BNS22	6 cm
Road base	25 cm
total:	31 cm

3.7. Extended Bill of Quantities

Design for traffic areas made Bill of Quantities by plane geometry.

Of the total planned excavation, it has been in consultation with the geologist, that 35% belongs to the III and IV and 65% V and VI category.

DESCRIPTION OF WORKS WITH TEHNICAL CONDITIONS

REMOVAL OF TREES AND SHRUBS

Scope

This work includes removal of shrubs up to 10 cm thickness, cutting of trees of all thicknesses with chopping of branches, felling of trunk to the prescribed length, excavating pulling out and removing of tree-stups of the newly and old felled trees as well as all other works which are necessary in accordance with these Technical Conditions. The areas that are to be cleaned or excavated must be shown in the drawings, or they are to be determined by the Supervising organ prior to commencement of works.

Cleaning or excavating of areas contains the following: cleaning of the area of trees, shrubs, waste and all surpluss of plants and it must include excavation of tree-stumps, roots and removal of all adverse material which was left after, removal of shrubs, trees and tree-stumps.

Execution

Removal of shrubs, trees and tree-stumps is to be carried out on all indicated or determined places, as well as on certain places which are determined by the Supervising organ for individual and tree-stumps.

On areas excavated for the road there are to be removed all tree-stumps and roots to the depth of 50 cm below the finally levelled area.

On surfaces below the future embankments the holes created by excavation of tree-stumps and roots are to be filled with earth material and well rammed.

The cut trees and tree-stumps are to be deposited at corresponding places along the route so that they are not in the way of execution of works and the quantity is to be given over to the Supervising organ, or any other person authorized by the Investor.

Measuring

Cutting of shrubs and trees, excavation, drawing out and removal of tree stumps of the newly and old cut trees together with all the listed works is done per meter lengths of the final length of the incorporated basic route.

Payment

The determined quantities are paid per unit price for km of route from the contractual Bill of Quantities and this price represents full compensation for all actions of works, which are listed or which are necessary for completion of works.

CUTTING THE EXISTING PAVEMENT IN CONNECTION WITH DESIGNED ROAD

Description

The position involves cutting into the existing asphalt layer with a chainsaw in the removal of 30 cm from the edge of existing pavement. The position also includes the implementation of traffic safety measures during construction works. Performance in the drawings referenced in the project, cutting into the existing asphalt layer is done by line 0.3 m away from the edge of existing pavement. Cutting into the asphalt layer is done vertically with a chainsaw.

Measurement and payment
Measurement and payment for work performed to measure the mind, and shall be paid at the contract unit price.

BULK EXCAVATIONS AND TRANSPORTS

Scope

The work includes all bulk excavation of all types of earth material envisaged in the technical documentation, together with haulage and/ or moving of excavated material into fills, stockpiles or spoil areas for various reuses depending on the method these materials will be used in the Works. These works shall include all excavations in fills, cuttings and other open cuts. All excavation shall be carried out according to the cross sections, levels, and designed angles, taking into account the requested properties for subsequent use of excavated material conforming to the Technical Specification here.

Regulations

JUS U. E1. 010 Earth works for road construction

Execution

In principle, excavation shall be done with the use of construction plant and other facilities, so that any manual work is limited to the necessary minimum level. Hard rock shall be drilled and blasted by deep and ordinary blasting and repeated blasting of boulders if this will be required for the intended use of excavated material. Mechanical moving and/ or loading, haulage to the site of reuse and/ or to spoil areas, dumping included shall be taken into account. The excavated material shall meet the requirements relating to intended reuse in accordance with design documentation and this Technical specification.

All excavation shall be true to cross sections, levels and angles specified in the project documentation or requested by the Supervising organ. Precautionary measures shall be undertaken for full work safety and protection of any existing works/ structures and communication lines. In this stage of work, efficient drainage of the area shall be made possible.

Side slope angles shall be in accordance with the design documentation and the Supervising organ's requests. This also includes safety of loose zones, unless such works are already envisaged in other sections, like for instance: protection of side slopes fully adapted to earth material condition, geological findings and other occurrences within excavations. All the above shall be undertaken by the Executor in the course of works and the Executor shall not be entitled to any changes in unit prices/ rates on account of that.

Care should be taken to prevent any undermining, disturbance of balance or damage to side slopes. Any such case shall be remedied by the Executor at a later date as instructed by the Supervising organ, on the understanding that the Executor shall not be entitled to any compensation or approval of payments on account of extra or contingent work.

Incidents during excavation that may cause disturbance in traffic, to people and environment should be minimized if possible, in which case the Executor shall procure the necessary traffic and safety signs with an approval of the authority concerned. The Executor shall be obliged to remove any such disturbances immediately, at his own cost.

Haulage of local materials and testing

Before and during the works test samples shall be taken at places of change of earth material in excavation and its suitability for reuse shall be checked. Certificates on the suitability of material
from cutting or for reuse shall be obtained from an authorized institution. If it is indented to reuse the excavated material then it shall be placed in embankments and surplus quantities, if any shall be deposited at a special place suggested and/ or accepted by the Supervising organ.

Measurements

The unit of measurement shall be the cubic meters of completed excavation in original soil according to the cross sections formed after top soiling and after final excavation according to the project documentation or any changes that were approved by the Supervising organ. Surplus excavated quantities on top of the designed ones shall not be payable if resulting from the Executor's error. The following criterion is adopted to determine quantities of various kinds of earth material in excavation:

During construction, cross sections shall be used to determine quantities of the particular kinds of earth materials within the percentage of the total cross sectional area which shall serve as basis for determining the total quantities by categories. Classification into categories shall be compulsory for mixed material in open cuts, notwithstanding the Executor's request.

Every excavation shall be classified by a commission constituted of the Investor's Resident Representative, Supervising organ (if there is a Resident Chief Supervising organ that person shall be a member of the Commission) and the Executor's authorized representative. The Commission shall make the minutes of work and on the basis of the approved percentages, through the minutes, the Investor's representative shall classify the excavation into categories and make due entry thereof in the construction book (GN 200 to apply).

Lenses, nests and cavities in particular types of earth material not exceeding one square meter shall not be deducted from the total square meters and total cubic meters, while larger surface areas shall be deducted from the total earth material surface areas of corresponding types.

Payment

The cubic metres of excavation in natural ground will be paid for at the unit price/ rate indicated in the agreed Cost Estimate/ Schedule of rates, separately by kinds of earth materials. This price/ rate shall constitute full compensation for the excavation with loading, haulage and unloading at the chosen place.

The mean transport distance (MTD) quoted (Executor's Cost Estimate) is only tentative and will serve to make an interim statement of works. The actual mean transport distance shall be determined when all excavation works are finished, a settlement of accounts is made for the transport of masses or the estimated prices/ rates are adjusted.

Berm provision will not be paid separately nor this work will be separately measured as it will be
payable at the price/ rate of bulk excavation and/ or fill when berm is constructed by filling and compacting material as per design.

TOPSOIL STRIPPING

Description, Scope and Contents of Works

The work includes the stripping of topsoil obtained from bulk excavation on the road alignment and in borrow pits, and under embankments up to 40 cm thick, including transport or mechanical pushing to a roadside stockpile, within the road's right of way.

All work shall be completed in line with the design, these Technical Specifications. If topsoil and soil suitable for being used as subsoil-foundation soil cannot be visually differentiated, the depth of the topsoil layer shall be determined in the laboratory by testing the organic matter content (JUS U.B1.024, soil with organic content exceeding 6%).

Execution of Works

The stripping of topsoil, up to 40 cm thick, shall be performed wherever necessary to prepare the subsoil – foundation soil.

Topsoil shall be stripped down to the subsoil –bearing soil, as specified in the design and these Technical Specifications. All excavated material shall be stockpiled along the road alignment,

out of the roadbed surfaces, in order to ensure that any later use of the material and access to it remain unobstructed. The haulage, i.e. pushing of material to stockpiles shall be performed carefully in order to preserve the quality of stripped topsoil for the later landscaping of slopes and green surfaces, as to avoid the mixing of that material with other non-topsoil material. Topsoil shall be stockpiled in such a way as not to jeopardize the stability of slopes and to enable the runoff of water.

Measurement

This work shall not be measured for payment, but any achieved thickness of topsoil shall be indicated on cross sections and submitted for the approval of the Engineer.

Payment

The stripping and stockpiling of topsoil, protection of stockpiles during the execution of construction and other works, including the clearing of the entire site after the removal of stockpiles are included in the offered unit price for bulk excavation and filling, and shall not be paid extra.

If the measurements performed in the course of works show that the actual topsoil stripping is less than the designed amount, the excess topsoil and omitted excavation, or less topsoil and excess excavation, shall then be determined and calculated and submitted for the approval of the Engineer

GRADUALLY CUTTING INTO THE STEEP TERRAIN

Description

The work involves cutting into terraced fields on steep slopes, embankments for better seating.

Method of performing

The terrain slopes greater than 20 ° levees must be placed on the stairs cuts 1-1.5 m wide cut into the ground on which the dam is built. Side steps to export cuts in the slope of 2:1. For slope greater than 30 ° stepped narrowed rests work without clearance, while the slope at 20-30° put spaces of 1.0m.

Measurement and payment

Payment is made per m3 of excavated material from the unit price agreed estimate.

EMBANKMENT CONSTRUCTION

Scope

Embankment construction includes placing, spreading, rough and fine leveling, wetting and compacting of material to the dimensions provided in the project documentation that governs the works in addition to the Technical Specification and JUS U. E1. 010 – Earthworks in road construction.

Material

All inorganic materials of prescribed quality shall be used for an embankment construction. No organic waste, roots, turf and/ or other materials that may due to biochemical action change their mechanical- physical properties in the course of time shall be placed in an embankment. Filling materials can be obtained in cuttings along the alignment.

Regulations governing quality control of materials:

- JUS U. B1. 010 – Sampling
- JUS U. B1. 012 – Determination of moisture content
- JUS U. B1. 014 – Determination of specific gravity
- JUS U. B1. 016 – Determination of bulk density
- JUS U. B1. 018 – Determination of particle size distribution
- JUS U. B1. 020 – Determination of consistency limits
- JUS U. B1. 024 – Combustible and organic matter content
- JUS U. B1. 038 – Determination of optimum water content

Determination of organic matter and combustible material content and a soil bulk density test shall only be carried out under specific circumstances (dubious materials).

Classification of materials

The unique classification terminology of USCS and ASSHO and Casagrande plasticity diagram shall apply to classification of materials for an embankment construction.

Preliminary testing of materials for fill

To check the suitability of earth materials for fill, all materials from the cuttings and borrow pits with cohesive soils and cohesive materials in mixed soils shall be tested. The following tests are required:

(1) Bulk density, optimum and actual moisture shall be tested by Proctor compaction test. Minimum bulk density of subsoil shall be 15 kN/ m3 for embankments not higher than 3.00 m, 15.5 kN/ m3 for those higher than 3.00m, and 16.5 kN/ m3 for subsoil, while sand may be used only when its suitability for subsoil construction is confirmed and bulk density is below 16.5 kN/ m3.
(2) Gradation and uniformity tests
(3) The following Atterberg limits of consistency shall be tested: limit of liquidity, limit of plasticity, index of plasticity and Casagrande frost criterion.

(4) Group index (Ig) shall be determined on the basis of the above tests.
(5) California Bearing Ratio (CBR) shall be laboratory tested according to JUS U. B1. 042 Standard.

Two preliminary tests shall be treated in the Soil Mechanics Report.

Quality assessment of materials prior to placing

- Moisture content shall be of the rate that can give the designed quality to compacted material (close to optimum).
- Minimum bulk density obtained in laboratory with E- 60Mpm/ m3 shall be 15.0 kN/ m3 for embankments up to 3 m high and 15.5 kN/ m3 for embankments over 3 m.
- Optimum moisture content below 25%;
- Limit of liquidity below 65%;
- Index of plasticity below 30%;
- Uniformity "U" not less than 9;
- Organic matter content less than 10;
- If a fill is made of cohesion less soil, grain size shall not surpass 30 cm, with not more than 10% of the biggest particles up to 40 cm;
- The materials of approved stability within the roadbed shall be used for embankment construction.

To check suitability of earth materials for fill, the materials from each cutting and borrow pit and from the places where soils change shall be tested. Tests shall be performed on minimum two samples for each type of material involved. The above tests shall be carried out also when the design includes the soil mechanics test results.

Haulage and filling

Haulage and dumping of earth material on the prepared foundation soil or onto an already completed layer of fill can only begin after the Supervising organ has approved the underlying courses. Each layer must be spread to a horizontal line in the longitudinal direction or to max. angle equalling the designed longitudinal gradient. Transversely, each layer shall have single-sided fall from 2 to 5%. This fall is required for water runoff for which reason any surface of the course made up of cohesive soils shall be spread and immediately compacted (on a daily basis). Each layer shall be filled in accordance with the designed cross section. Passes of transport vehicles shall be as uniformly distributed over the whole width of the formation as possible.

The height (thickness) of an individual layer shall conform to compaction effect depth wise of the compaction appliance, type of spread material and possible segregation phenomena.

Should there by any requests and possibility for the construction of embankment in 30 cm thick layers, then the Supervising organ may approve of the request provided the Executor meets the following requirements: on a trial section 30– 50 m long with the use of mechanical equipment for compaction the following parameters shall be established: thickness, types of mechanical

appliances, number of passes, properties of materials and moisture content, compactness of layer in five points of which at least two points shall be within the bottom half of the layer. The thickness approval procedure by means of a trial section shall be carried out by a joint commission of the Supervising organ's representative and Executor's representative. Based on the results obtained, the Supervising organ shall enter the necessary findings and issue the order through the construction book. Extra costs incurred on the trial section shall be borne by the Executor, though the finished layer may be, if being part of the alignment and if being of satisfactory density, admitted as completed embankment. For each type of material to be deposited, the tests shall be carried out on the trial section and the mechanical equipment shall be approved following the procedure from the preceding paragraph.

Compaction

Each layer within the embankment shall be compacted in its full width with appropriate mechanical appliances, and compaction shall, in principle, proceed from the edge towards the middle of the embankment. Any locations inaccessible to construction plant or those where the use of heavy compacting machinery would not be appropriate for other reasons (filling behind the structure, retaining walls, etc) shall be compacted using other suitable appliances or methods which as approved by the Supervising organ.

Prior to compaction, each layer in the embankment shall be either wetted or dried to the optimum moisture content conforming to the preliminary tests and suitable for compaction of a particular kind of material to required density. Besides, each layer shall be mechanically turned to fines if compaction and quality control are not immediately followed by a next layer but spreading takes place after a long period of time in different weather conditions. Then the quality of compaction shall be controlled again and embankment construction can only commence after the tests have proved the quality of density again.

If predominantly cohesive soils will be used for fill and weather conditions are such as to prevent compaction, then other methods may be chosen such as stabilization, conditioning or replacement of material upon a request or approval of the Supervising organ, provided that the incurred costs will be borne by the Executor. If during daylight, there is an imminent danger of rainfall the Supervising organ shall, if needed, stop any further spreading without compensation of costs. The top surface of the layer made of cohesive soil shall be graded and rolled with lightweight flat roller (3- 5 tons) to get a one- sided cross fall of 2 to 5%, smooth surface without depressions in which precipitation could accumulate. Such a flat, smooth surface shall be scarified prior to deposition of a new layer for better bond between layers. This will be also true with other longer stoppages of embankment construction, end of construction season and the like.

Filling shall be done so that the layers longitudinally are as horizontal as possible and sudden height transitions among the layers of different heights are avoided but the layers are sloped to allow proper compaction.

Filling shall stop at any moment when satisfactory results cannot be obtained, especially due to rain or other inclement weather. On these grounds, the Executor shall not be entitled to any

compensation. The embankment material shall not be spread over frozen surfaces, nor on top of snow and ice.

In the terrain of inclinations more than 20% embankments has to be placed on the stepped heel joints. Lateral surfaces of stepped heel joints have to be executed in inclination 2:1. If steps are not provided by the design, any need for them shall be identified by the Supervising organ and the Executor shall execute them. The Executor shall afterwards determine the manner and scope of other current technology tests.

Quality control of construction

Regulations governing control procedure

- JUS U. B1. 010 – Sampling
- JUS U. B1. 012 – Determination of soil moisture content
- JUS U. B1. 016 – Determination of soil bulk density
- JUS U. Bl. 046 – Determination of modulus of compressibility by means of a round plate.

Criterion for quality assessment of cohesive and mixed soils with up to 20% of stone material: required minimum % density to standard Proctor's method, E= 60 Mpm/m3

a) Embankment layers, 2.00 m above the foot of the embankment to the level of 2.00 m below the pavement surface - 95%.
b) Embankment layers, up to 2.00 m high and higher embankment layers from the formation level up to 2.00m below the pavement surface - 100 %.

Criterion for quality assessment of cohesion less mixed soils with over 20% stone material

Minimum required value of the modulus of compressibility for cohesion less and mixed materials of various particle size distribution shall be established according to the following criteria with a 30 cm diam. plate.

- For mixed materials with 20- 35% stone material MC= 25- 30MPa,
- For mixed materials with 30- 50% stone material MC= 30- 35MPa,
- For mixed materials with over 50% of stone material at optimum or close to optimum moisture content MC = 40 MPa.

For coarse grained crushed stone materials (grain diameter over 200 mm) and mixed materials, density control can be, if required, also carried out by volumetric methods or by a modulus of compressibility (to JUS U. B1. 046 standard).

Scope of current control tests

Density of embankment layers shall be tested on every 50- 100m with two tests carried out in close vicinity but giving one result. This applies to embankments shorter than 50 m. Moisture

content of the material shall be tested on a daily basis. The construction of the next course (of embankment) shall not be undertaken unless the quality of the previous layer is proven first.

In case the Supervising organ in control tests, finds out high deviations of results from the prescribed ones, he will be entitled to make changes in the scope of tests. In agreement with the Supervising organ, the quality of completed layers can be determined by other approved methods, too and the criteria of quality of construction and method and scope of tests shall be indicated.

Acceptance of placed material

Each layer within an embankment shall be accepted by the Supervising organ as provided following the prescribed criteria. Any deficiencies from the quality requirements shall be repaired and/ or removed by the Executor.

Measurement

The unit of measurement for payment shall be the cubic meters of the actual quantities, but including the shoulder core.

Payment

The quantities shall be payable at the agreed prices per one cubic meter of the material placed in the embankment.

The contracted prices shall cover all works as spreading, wetting/ drying, compacting, bench and step cutting, levelling of embankment slopes and shoulders to 5 cm accuracy to the designed embankment slopes, then all material and work, haulage and transfer, and the Executor shall not be entitled to any additional compensation for the above.
Material of poor bearing capacity (poor quality) in the subsoil shall be replaced with other material of better soil mechanics properties. Excavation of material shall be payable per item of excavation in III rd and IV th cat. ground, and/ or V th and VI th category, if stone or gravel are used for replacement.

Construction of embankment, when soils of III rd and IV th categories are used for subsoil replacement shall be payable at price/ rate of embankment construction with III rd and IV th cat. soils increased by 20% and if the replacement is done with soils of V th and VI th categories or gravel, embankment construction shall be payable at the price/ rate for filling with V th and VI th cat. soils, increased by 20%.

For the replacement of poor bearing capacity materials in the sub grade, in cut and fills and in cuttings, the provisions on the replacement of poor bearing capacity materials in subsoil shall fully apply. Excavation in subsoil intended for replacement of improper material shall be payable according to the agreed unit price/ rate for bulk excavations on the road alignment of the corresponding category.

The quantities of completed embankment shall be measured according to cross sections.

PREPARATION OF SUBSOIL

Scope

Subsoil is the original soil on which the foundation (construction) of an embankment is made. The work includes compaction, possibly scarifying to drying or wet the natural soil in the thickness provided by the design.

Regulations governing the quality control of materials are:

- JUS U. B1. 010 – Sampling
- JUS U. B1. 012 – Determination of moisture content
- JUS U. B1. 014 – Determination of soil specific gravity
- JUS U. B1. 016 – Determination of soil bulk density
- JUS U. B1. 018 – Determination of particle size distribution
- JUS U. B1. 020 – Determination of consistency limits
- JUS U. B1. 024 – Combustible and organic matter content
- JUS U. B1. 038 – Optimum water content

In case the embankment soil – subsoil is such that an embankment cannot be directly constructed on it (saturated, organic matter, etc) such subsoil should be prepared and/ or remedied before embankment construction as instructed by the Supervising organ.

Regulations governing the quality control of construction:

- JUS U. B1. 010 – Sampling
- JUS U. B1. 012 – Determination of moisture content
- JUS U. B1. 016 – Determination of bulk density
- JUS U. B1. 046 – Determination of modulus of compressibility.

Criteria for quality assessment of construction

Prior to filling, cleaned and leveled foundation soil – subsoil shall be compacted as to meet the following requirements:

Minimum % density required (degree of compactness) in standard Proctor compaction test (and other methods):

a) Original soils composed of cohesive soils - embankment not higher than 2.00 m = 100%
b) Original soils composed of cohesive soils - embankment higher than 2.00 m = 95%
c) Original soils composed of cohesion less soils - embankment not higher than 2.00 m = 100%
d) Original soils composed of cohesion less soils - embankment higher than 2.00 m = 95%.

The embankment height is considered to be the height above the prepared subsoil – foundation soil to the level of road substructure (sub grade) at its lowest point.

Measurements

The unit of measurement for payment shall be the square meters of the actually conditioned subsoil.

Payment

The square meters of the conditioned subsoil will be paid for.

PROTECTION OF SIDE SLOPES

Protection of side slopes with wire netting

Description

The work includes protection with wire netting of the rock side slopes which are under certain inclination stable in themselves, but subject to surface erosion.

Materials

Wire nettings

The nettings are made from zinkplated steel wire of 3 mm diameter with rectangular or rectangular openings. The wires are to be doubly zin=-coated, with the thickness of zin coating of 0,07 mm.

Anchors

For fixing of the netting of the side slopes there are to be used the anchors in accordance with the details given in the design, and the anchors are to be made of steel in accordance with JUS C.B3.021, with a doubly zinc-coated anti-corrosion layer of thickness 0,07 to 0,08 mm.

The weights for suspended netting

Concrete weight in accordance with the details from the design are to be used. Concrete for the weights is to be of the quality MB-200, and it must correspond with the requirements contained in Item 5 of these Technical Conditions.

Construction

The places for and the method of protection with wire netting are to b determined by the supervising organ in accordance with requirements in the design and in these Technical Conditions. Prior to placement of the netting the side slope must be arranged in accordance with the requirements of the design and these Technical Conditions. Prior to placement of the netting the side slope must be arranged in accordance with the requirements of the design and these Technical Conditions. Everything which could hinder a normal support of the netting of the site is to be removed. For providing safety against falling rocks, for steeper inclinations (3:1 to 2:1) suspending nettings are to be used which are burdened on the bottom with concrete weights, and at the top of the side slope fastened with anchors and pipes so that the falling rocks slides under control to the bottom of the cutting.

With slighter inclinations nettings are to be provided with anchor fastenings. The spacing between the anchors is to be selected with regard to geomechanical properties of the rock, and the spacing of approximately 1,0 m is to be counted with. With rocks where direct driving of anchors is not possible holes are to be drilled for that purpose. Individual nettings are to be connected with a netting of doubly zinc – plated wire of the same diameter as the wire for the netting.

Quality control

The executor of works is obliged to supply the Supervising organ with a test certificate issued by the producer of the netting. The control of the quality of the material used and of the manufacture is to be done by the Supervising organ in accordance with the requirements of those Technical Conditions.

Measuring

The area to be protected by netting is to be determined on the basis of measuring taken of the area covered with netting in m^2, along side slope of the inclination.

Payment

Protection of side slopes with netting will be calculated in accordance with the contracted unit price for m^2, of placed and fastened netting. This price includes all the works materials and transportation for protection with netting in accordance with the design, so that the Executor of works has no right to demand any additional payments.

EXCAVATION OF DRAINAGE DITCHES

Description

Drain ditch, without lining, for the excavation of soil to detail the project or the provisions of the S upervisory authorities in all categories.

All surface excavation bottom and sides of the trench must be laid flat in the bottom of the falls and slope batter.

Quality

Excavation should be done mechanically, and manual labor minimized and applied only where it can not be done mechanically.

Measuring

Excavation for drainage ditches is measured in cubic meters of soil actually excavated dirt.

Payment

Calculation of the work done shall be per cubic meter ditch built a special price included the excavation, the planning area of the ditch and depositing excavated material.

HAUNCHES

Description

This Chapter includes the construction of haunches as follows:

Haunches covered with sand, gravel, stone and grits in 5 cm thicknesses and with width in accordance with the design.

Material

For filling of the part of haunch above the sub-base vertical alignement there can be used the material which corresponds to the conditions for materials proposed for construction of the embankment final layer and the final part of the haunch is to be filled in stone and grits in 5 cm thicknesses and with width in accordance with the design.
On both sides of the pavement, to the sub-base vertical alignement, the haunch is to be made from the same material and with the same thickness as the base supporting (sub-base) layer.

For covering with sand or stone grits there can be used the sand from sound rock material of size 0/8 mm, whose quality corresponds to the requirements of JUS U.E9.020, and gravel and grits of grain size 0/30 mm.

Execution and quality

All the works are to be carried out in accordance with detailed drawings from the design documentation, if these Conditions do not stipulate otherwise:

Haunches covered with sand, gravel or stone grits: The material used for embankments must be rammed. In principle the provisions for construction of embankments of these Technical Conditions must be observed.

The surface of the placed layer must be made regarding the transversal and longitudinal inclination as stipulated in the design, taking into account the decrease of the vertical alignment for the thickness of the rammed sand layer, gravel or stone grit layer.

Covering of haunches with the, proposed material in 5 cm thickness is to be done exactly in accordance with the designed section with a special camber because of ramming. Ramming is to be done with a 3 tons roller. Horizontal edges of haunches are to be done in accordance with the design.

Deviations from the designed lines are only permitted to the extent that there does not come to visual distractions.

The levels of the finally finished haunches are allowed to be within 1 cm lower that the designed surface.

Deviation in the thickness of the placed layer in compacted state with regard to the designed thickness is allowed within the limits of +- 1 cm.

Commissioning

Commissioning of works is done by the Supervising organ on the basis of the quality conditions and these findings.

Quantities for calculation are determined in M^2 of executed areas of haunches covered with sand, gravel etc on the basis of actually performed works within the framework of the design. The construction of the haunch cores above the sub-base vertical alignement is to be calculated in cubation of the embankment, and the cores on both sides of the pavement to the sub-base vertical alignement is to be calculated in the sub-base cubation.

Payment

The quantities determined in previous chapter are paid for per unit contracted price fom 1 M^2. The contracted price must include all the works connected with the procurance of material, transportation, incorporation and everything else which is necessary for complete finishing of works, so that the Executor of works has no right to demand any additional payment.

MECHANICALLY STABILIZED SUBBASE SUPPORTING LAYER

Description

The work covered by this section of the Specification consists in procuring, transporting, spreading and compacting. The thickness of placed and compacted layer is 25 cm in compliance with the technical documentation.

Construction

The sub base course shall overlie the sub grade, which must be prepared as required in this Technical Specification. Only after the acceptance of the sub grade and work by the Supervising organ haulage of materials for the sub base source can start. No vehicles with muddy wheels should ride over spread or compacted material. The material brought to the area shall be spread and fine leveled to a loose thickness to obtain the required compacted thickness of the layer. Each layer shall be compacted with appropriate vibrating appliances.

The formation of the compacted layer shall have the designed levels, width and cross fall as specified in the technical documentation.

Quality control

Quality control shall include preliminary and control tests of material and control of placed and compacted layers.

Preliminary tests

The sub base material shall meet the following requirements:

- physical-mechanical and mineralogical-petrographical properties of aggregate,
- grain size distribution of entire material,
- bearing capacity,
- organic matter and lightweight particle content.

With regard to the physical-mechanical and mineralogical petrographic properties, the material must satisfy the following criteria:

* grain shape	unacceptable till 50%
* frail grains	till 7%
* muddy clayey and organic particles	till 5%
* wear after the Los Angeles method frost resistance of aggregate	max 50%
* frost resistance of aggregate	stable

- The mineralogical-petrographical composition will be established by an analysis, which should give the shares of individual kinds of rocks by degree of presence in the whole. The

presence of marls, shale, soft and clayey sandstones, conglomerates, weathered granite and gneiss is not allowed.

The grain size distribution curve shall be within the limits given in the following table:

S1uare mesh sieve size (mm)	% passing
45	100
31.5	85-100
22.4	68-93
16	56-85
8	38-69
4	27-56
2	20-44
1	15-35
0.5	11-30
0.25	8-23
0.09	2-11

The grain size distribution shall also satisfy the following:

- content of grain sizes smaller than 0.02 mm shall not exceed 5%;
- uniformity in the grain size distribution: U=15 – 100;
- Bearing capacity of the materials (California bearing ratio) must be CBR 30% at relative compactness of 95% in relation to the maximum volumetric mass according to the modified Proctor compaction test;
- Content of organic matter and light particles must not be greater than 5%.

Control tests of the course placed

Finding the degree of relative compaction according to the modified Proctor compaction test at least at each 500 m2 shall perform the control.
Compaction ratio Sz(%)>98%.
Gradation shall be checked at each 3000 m^2 and Evenness with a 4 m long straightedge at each cross section. Permissible tolerance is 10 m. The thickness of a finished sub base course at any point may deviate from the design value by max 10 mm, which will be checked by level surveying. The tolerance of the finished course thickness shall not exceed 15 mm. Larger deviations are not allowed. In case deviations shall remain permanent the Supervising organ and the Investor must give their opinions and positions concerning this issue so as to enable adequate measures to be undertaken to maintain the designed quality of works, i.e. to identify the measures to be undertaken in work measurements.

Measurements and payment

The unify of measurement for payment of actually placed and compacted sub base course.

BITUMEN COATED GRAVEL BASE COURSE BNS 22

Scope

The work includes preparation, placing and compacting of a mixture of mineral material and bitumen, in one layer (6 cm).

Basic materials

The following basic materials sand and gravel, rock flour, binder Bit 60 shall be used to build bitumen coated gravel base course.

Quality of basic materials

Sand and gravel

The material shall satisfy the following requirements:

- physical-mechanical and mineralogical-petrographical properties of grains, in accordance with JUS U.E9.021,
- wear resistance after the Los Angeles method max 28%
- share of grains of unfavourable shape max 20%
- clay lump content max 0.25%
- water absorption max 1.2%
- adhesion to bitumen good
- frost resistance stable
- grain size distribution must correspond to the given curve sections.

Square mesh sieve size (mm)	% passing BNS 22
0.09	4-14
0.25	7-37
0.71	12-53
2	21-65
4	30-74
8	44-85
11.2	54-92

16.0	70-100
22.4	97-100
31.5	100

Rock flour

Rock flour must fully satisfy the criteria in JUS B.B3.045.

Bitumen

Bitumen may be Bit 45 or Bit 60. Bitumen shall fully comply with the criteria of JUS U.M3.010 for the envisaged type bitumen.

Emulsion

As a binder between the courses should be used the cat ion semi-stable emulsion in accordance with JUS U.M3.024, or anion emulsion according to JUS U.M3.022.

Mixture

In asphalted mixtures, the share of bitumen is approximately 3.5-4%. Aggregates screening lines should lie within the specified limits.

Physical-mechanical properties of asphalt mix

Asphalt mixture compressed into Marshall's moulds. At 115-160 ^{o}C and mineral mixture of the extracted asphalted mass shall meet the following requirements:

Ord. No	Exploring type	Quality conditions
1	Remaining holes (%)	3-9
2	Stability (kN)	min 6
3	Rigidity (kN/mm)	min 2.2
4	Tolerable deviation of sifting line of separated mineral mixture in relation to the accepted mixture with test machine working	sifter 0.09 mm 0.8% sifter 0.25 mm 2.0% sifter 0.71 mm 3.0% sifter 2 mm 3.0% sifter 4 mm 4.0% siever 8 mm 4.0% siever 11 mm 4.0%
5	Tolerable deviation of connective tissue quality in relation to accepted recipe	It is establishing with preliminary explorations and tolerable limit ±0.5% from established value in preliminary structure of asphalt mixture.

The placed layer of bitumen-coated gravel shall have the following properties:

No	Item Properties	Quality requirements
1.	Residual voids (%)	2 – 10
2.	Compactness of the course (%)	min 97
3.	Evenness under 4m long straightedge 4 m	max 20 mm
4.	Tolerance from designed height	max + 10 mm
5.	Tolerance from designed cross fall	max 20 mm
6.	Evenness under 4 m long straightedge	max + - 0.4 % aps

Tolerances greater than the given ones are not permitted. In case that tolerances remain permanent the Supervising organ and the Investor shall give their opinions and positions concerning this issue so that appropriate measures can be undertaken to maintain the designed quality and to identify measures that should be undertaken in the measurements of works.

Technology of the works

Preparation of the surface

Asphalted layer can be placed on the surface that is dry and not frozen. Immediately before applying it the surface shall be washed thoroughly, brushed with wire brushes and blown off by compressor. When the surface is cleaned the Supervising organ shall survey its reference level and evenness. If any deviation from the prescribed height is more than 20 mm the Executor will have to repair the surface in accordance with the requirements of the technical design i.e.

- at places where the surface is below the designed grade, the repair should consist in increasing the asphalt course;
- at places where the surface is above the designed grade, the surplus material shall be removed appropriately.

Immediately before spreading the asphalt layer, a coat of bitumen binding emulsion in the quantity of 150 g per one square meter shall be applied. The kind of emulsion shall depend on the type of surface.

Preparation and transport of hot-mix asphalt

The temperature of bitumen shall be 150-170 ^{o}C. The temperature of the aggregate shall not exceed that of bitumen, namely it shall not exceed 150 ^{o}C. The temperature of the asphalt mixture in the mixer shall vary within 150-170 ^{o}C (exceptionally 175 ^{o}C). Asphalt mass can be transported only in vehicles whose loading bodies are well cleaned and coated with silicone emulsion. Use of oil and oil derivatives is forbidden. Asphalted mix must be transported under a cover. Vehicle axle load shall not exceed the permitted 10 tons.

Placing of asphalt mixture

The asphalt mixture shall be spread using one mechanical surface finisher, a suitable set of rollers and applying the technology adopted on the trial section. Simultaneous work with two finishers will be permitted only if required in the technical documentation.

The temperature of the asphalt mixture at the point of placing shall not be below 130°C nor higher than 175 ^{o}C. The asphalt layer shall be rolled until the required compactness is reached which is checked on the spot by an isotope probe.

a) Service joints

When the work is resumed after longer stoppage or suspension, the joint should be cut through entire thickness and coated with bitumen emulsion.

Period of work

The base course according to this Technical Specification can be placed solely when the temperature of the air exceeds 5 ^{o}C, without wind or minimum 10 ^{o}C with wind. The asphalt mixture shall not be laced in misty weather or when it rains. The temperature of the surface shall not be below +5 ^{o}C.

Quality control

Preliminary tests of asphalt mixture

Prior to commencement of works, the Executor shall have a preliminary job-mix formula designed in an authorized laboratory in strict accordance with the requirements of this Technical Specification.

No work shall commence until the Executor for approval has submitted the job-mix formula by the Supervising organ. Test certificates for basic materials and the preliminary job-mix formula shall not be older than 6 months. Should there be any changes in the quality of basic materials, the Executor shall be obliged to submit to the Supervising organ a written proposal to modify the asphalt mix i.e. to propose a new preliminary job-mix formula for approval prior to use of such materials.

Proving the asphalt job-mix formula

Trial operation can start when there is at least 40% of the required quantity of chippings available in separate stockpiles. The preliminary asphalt job-mix formula shall be proved in trial operation provided that the asphalt mixture was accepted at the plant and the quality of placing was accepted on the trial section. If the quality of basic materials on the site does not correspond to this Technical Specification, the Executor shall be obliged to provide basic materials of better quality. If the basic materials proportioned according to the preliminary ob-mix formula do not satisfy all the designed physical-mechanical properties of the asphalt mixture and the finished layer, then the proportioning of the basic materials shall be adjusted and trial operation repeated. Only when all the requirements are met in the trial operation, the

Supervising organ will accept the job-mix formula and shall give approval for continuous work.

The operational authorized laboratory shall prove the job-mix formula.

Bitumen tests

The Executor may procure bitumen provided always that he can produce the manufacturer's test certificate for each shipment and make it available to the Supervising organ and/or the laboratory for inspection.

Besides inspecting the manufacturer's test certificate, the operating laboratory will carry out regular but abbreviated tests (PK, penetration and breaking point):

- at the beginning of work,
- for each tank-truck of bitumen that arrived in the asphalt mixing plant, before use.

Use of bitumen from untested tank-truck is forbidden.

Filler testing

The grain size distribution of the filler shall be subjected to laboratory testing:

- at the beginning of works,
- and at each 100 ton of delivered filler.

Tests of the physical-mechanical properties of the asphalted mix and the placed layer

These tests shall be done in the operational laboratory:

- at the beginning of works,
- at each 2000 m^2.

A sample of asphalt mass shall be taken from the hot just spread-over asphalt mixture after the finisher. Control of compactness and voids in the mass shall be checked by taking out "core" samples from the finished surfacing, at the same place where a sample of hot-asphalted mix was taken.

Evenness

The Supervising organ in each cross section will do measurement provided that the space between them is not greater than 30 m. A 4 m long straightedge shall be used for measurement (left, right, middle).

Grain size distribution of aggregate

If more than 5% results have discrepancies in a filler fraction and in bitumen than allowed the asphalt course cannot be accepted as satisfactory.

Measurement and payment

The unit of measure shall be the square meter of actual asphalted layer of determined thickness in strict accordance with this Technical Specification.

CONSTRUCTION OF PREFABRICATED CULVERTS Ø800

Description

The work covers execution of prefabricated culverts with heads. These works cover: extavation, timbering, preparation of formworks, efection and building in, back filling, with purchase of all materials and prefabricated members and also pulling down of existing pavement, excavation to height level of foundation, construction of concrete base for culvert, construction of embankment and construction of BNS 22 to height levels of existing pavement. All works should be executed in compliance with designs and these tehnical conditions.

The Executor can, with approval of the Investor, complete or modify the way of execution of these works.

Execution

In principle, it is allowed to use prefabricated concrete members, as well as their preparation in situ, in compliance with design and offer of the Executor.

Excavations

Excavations should be done in compliance with design and instructions of the Supervisor, and the shape of excavation is to be adjusted to the detail drawing of the design and to the site conditions. Classification of excavated material is done as per the type of ground material.
Excavation includes all additional works: timbering, transportation of excavated material to the embankments or to the waste area, and they are not paid separately.

Laying of concrete (MB-200 or above) pipes for, culverts, and joints of individual parts of pipes on the fresh MB-150 concrete base starts on the downstream side with the outflow head, and this base must be prepared in compliance with design requirements, and it must be accepted by the Supervisor. Installation of broken pipes or damaged members is not allowed. When pipes are laid down, and after their cleaning and wetting with water the concreting of foundations and culvert heads as well as construction of culvert inlet and outlet are to be done.

All culverts should be first back, filled from both sides. When proper compactness of the backfill is obtained by use of relevant tools for ramming, or in some other way (chemical stabilization), mechanical ramming of embankment all over the width of the culvert can be effected in such a way that the structure is not damaged and the required compactness of embankment is obtained. A condition for a good quality embankment along and above the

culvert is that proper compactness of the whole embankment in which a culvert is built in is obtained.

Cleaning

Upon the completion of backfilling if there are some surplus materials or wastes they should be immediately transported to the waste area. Upon the completion of works the Executor shall remove all tools and equipment which he used during execution of works, and leave the site clean.
Works carried out against this Item are not paid for separately, but they are considered as additional obligation of the Executor, and are included in unit prices.

Quality control

In addition to the current control in the plants where prefabricated members are manufactured it is necessary to ensure quality control of final products. Quality of the culvert pipes is controlled on the basis of JUS U.N 1.050. In addition to the requirements of JUS U.N 1.050 the Executor shall provide test certificate for actually obtained MB of the pipe.

When prefabricated members are used, the Executor is obliged to pro- vide, prior to commencement of work, a test certificate for one civil engineering season, for each different member and from'all manufacturers of the same.

Measuring

Prefabricated culverts are measured per actual length in long metres along the bottom of the pipe. This length also includes culvert heads (inlet and outlet), and also pulling down of existing pavement, excavation to height level of foundation, construction of concrete base for culvert, construction of embankment and construction of BNS 22 to height levels of existing pavement.

Payment

All works from section "Measuring", are paid for on the basis of contracted unit prices.

TRAFFIC EQUIPMENT

Protecting reflective fence

The roads with modern road blind, with all characteristics that enable high speed, peaceful and comfortable driving must offer also maximal safety for traffic participants. One of important elements for impruvment of traffic safety is also a protecting rejection steel fence along the roads.

Protecting steel fence is placing in all parts of the road where is a possibility for uncontroled and undesired turning of vehicles from the road which would imperil the safety of drivers and

other participants in traffic, so the task of the fence is to accept, stop and gradualy slow down the vehicle and in that way prevents or alleviates bigger material damages and people injuries.

Protecting fence must be in accordance with Yugoslav standards YUS.U.S4.104. and YUS.U.S4.110.

Anticorrosive protection of all elements of steel protecting fence needs to be done by the process of hot zincing which is suitable for normal atmosphere conditions in coastland.

At the beginning and at the end of protecting rejective fence the final elements are placed, which are performing by inclined falling of the bulwark of length 4 m and by digging-in into the ground more exactly with semi-circular final elements.

With this design it is predicted a single side rejective fence. The location and the longitude of the protecting rejective fence are shown on situation plan in the design and through technical report by stations.

We recomend that the same type of fence determine for all reconstructed links of trunk road.

VERTICAL SIGNALIZATION

Those Technical conditions refer to elements of vertical signaling system for traffic signals on the roads according to the law regulations of rules for traffic safety on roads, rulebook about traffic signals on roads and current standards from this field.

Technical conditions for construction and testing of traffic signals on roads are defined by Yugoslav standard YUS.Z.S2.300 to 308. The standards are related to the traffic signals made of ordinary material (color) or retro reflecting material, as though to the signals with external or internal light.

The elements and their measurements for graphic presentation of traffic signals on roads and road signs are defined by Yugoslav standards YUS.Z.S2.301 to 322.

The basic geometric shapes of traffic signals on roads are: single-legsided triangle, circle, quadrate, rectangle, rectangle with arrow-headed and symetrical octagon.

The deviations from established capacity measurements are allowed to the limit of 2%. Total impression of symbols or inscriptions are not allowed to be changed through allowed deviations. The letters and numbers that are used on traffic signals, road signs and additional boards must total correspond to the standards YUS.U.S4.201 to 204.

Colorimetric and photometric characteristics of materials for traffic signals on roads are established also with Yugoslav standard YUS.Z.S2.330.

Traffic signals and boards could be made from following materials: steel sheet, aluminum sheet or from plastic mass with or without glass fiber , on condition that necessary firmness, steadiness and permanence to different atmospheric conditions are provided.

Traffic signals and additional boards are made for using in all climate conditions with temperature from -40ºC to +50ºC and relative moistness of 95%.

The color of the background of traffic signals and additional boards, and all elements for strengthening is gray without glow.

Placed traffic signals must be secured from turning and removing.

Traffic signals are placing so their flats deviate from the horizontal at the most of 3% to 5% in the field of normal to the road axle.

Traffic signals mustn't have visible elements for fastening and damages on their faces.

The elements for fastening of traffic signals to the pole or supporting poles could make one entity with the sign or they are connecting by screws, rivets or by welding.

Duration of traffic signals must be at least five years from the day of placing, exactly, seven years from the day of production.

The work on placing of signals and road signs includes purchase and delivery of signs, digging and concreting of foundation with placing and painting of appropriate poles and installation of signs.

The signs are to be placed so that their lower edge is on the height of 1,2 m to 1,4 m at the ground surfaces next to roads outside of the settlements, exactly, minimum 2 m when they are placing on the pavement and in minimal distance of 0,30 m between the edge of the road and the nearest edge of the sign (recommendation of 0,50 m) in maximal distance of 2 m.

The payment will be done according to the piece of placed signs and individually agreed price connected to different dimensions and the way of placing of signs according to the Design of traffic signaling system and equipment given in the plan of horizontal and vertical traffic signaling system and road equipment.

Supporting pole of traffic signal is of steel pulled pipe with uniform section and diameter thick Ø=50 to 70 mm painted with dark gray color. The poles of traffic signals are placing in concrete foundations in proportion to the detail. The payment is doing by the piece and agreed unit price.