VOLUME 3

TECHNICAL SPECIFICATIONS

I. CONSTRUCTION WORKS

1. Technical description

Some 30% of the overall population of the town area Rožaj lives in the zone „Bandžovo brdo". The streets Rifata Burdževića and Karavanski put both pass through this town zone. Pedestrian sidewalks have been completed from the centre of the town up to the Rifata Burdževića Street.

Because of the specific configuration of the terrain, the rather inconvenient location of some of the residential objects and insufficient existence of town streets and sidewalks for pedestrians, the residents have significant difficulties to reach their homes. The traffic here is extremely busy and since there are no sidewalks, pedestrians are forced to walk on the traffic lane, resulting in many traffic incidents involving such pedestrians. At the same time, this street is used by a great number of pupils (there are two high schools and one elementary school) on their way to and from school. The street Rifata Burdževića is at the same time used by the visitors of the sports- recreation center with a football stadium and a sports hall. All the above only emphasizes the necessity of constructing sidewalks along the street Rifata Burdževića in the town zone „Bandžovo brdo".

The construction of sidewalks would solve the problem of pedestrian communication and movements between the town center and the residential zone Bandžovo brdo. At the same time such sidewalks would enable smooth traffic for vehicles, at the same time offering the needed safety to all participants in traffic, in particular pedestrians.

The first section of the sidewalk starts from the Ganića crossing on the left side of street R. Burževića all the way to the crossing with the street Carine that passes by the sports- recreation center.

The second section starts also from the Ganića crossing on the rights side of street R. Burdževića and runs all the way to the entrance into the schoolyard of two high schools.

The third section starts on the left side of the planned sidewalk along street Rifata Burdževića and runs all the way to the sports-recreation center.

The sidewalk on the left side of the street starts at elevation 0+000 – 1+519.28 meters, i.e. finishes at the crossing with the street Carine that runs by the sports and recreation center.

The sidewalk on the right side of the street starts at elevation 0+000 – 0+275.57 meters, i.e. up to the entrance into the school yard of the Grammar and high school and on the other side of the school yard the sidewalk continues into the second entrance of the school yard and the street Rifata Burdžovića. The length of this sidewalk is 81 meters.

The third sidewalk section connects to the sidewalk on the left side of the street, starting at 0+632.00 and running all the way to the street Carine that passes by the stadium and the sports hall, whereas the overall length of this sidewalk is 400 meters.

1.1 Width of sidewalks

The sidewalk along the left side of the street, starting from point 0+000 – 0+044.10 has a width of 1.20 m.,
From point 0+044.10 – 0+109.25 m., the width is 1.10 m.
From point 0+109.25 – 1+519.28 m, the width is 1.60 m.
The sidewalk along the right from point 0+000 – 0+017.28 m has a width of 0.90 m
From point 0+017.28 – 0+275.57 m the width is 1.20 m, while the section of the sidewalk on the right side of the street has a width of 1.60 m.
The sidewalk that continues to the sidewalks along the left side of street Rifata Burdževića-left section (stairwell) starts from point 0+632.00 with a width of 1.60 m.
The width of the sidewalks along both the left and right side of street Rifata Burdževića is at the beginning of the sidewalks conditioned by existing available space.

2. Conditions and construction

The lower levels of the sidewalk will be constructed in such a way, that first the existing terrain is leveled in accordance with the designed elevation points, and then the laid and leveled bedding is being compacted. After this the tampon layer is leveled and compacted at a thickness of 10-15 cm in compacted status. The reinforcement of the sidewalks on the left and right side of the street will be done with reinforced concrete parapet walls and concrete curbstones type MB-40, of a cross diameter of 18 x 24 cm.

The processing of the upper layer of these sidewalks will be done in asphalt BNS 0 – 16 mm, thickness = 6 cm. On the existing concrete sidewalks an asphalt layer will be applied with ABS 0 – 8 mm, thickness = 3 cm.

The section of the sidewalk on the left side of street Rifata Burdževića (stairwell) that connects this street with the street Carine – sport- recreation center, will be completely done with reinforced concrete of type MB-30. This consists of:

- a free laying reinforced concrete slab, thickness = 15 cm,
- reinforced concrete parapet walls of a thickness = 20 cm and average height = 45 cm.
- steps with a ration of width and height of each step 30 x 17 cm.
- on the crown of the parapet walls a metal fence/railing will be mounted.

Collection and drainage of surface waters from the sidewalks on the left and right side of the street is solved with cross inclinations of the sidewalk of 1%, which will lead such surface water into existing street drains, from where this water is taken into the town's sewage network. The sidewalk connecting the sidewalk on the left side of street Rifata Burdževića with street Carine – Sports hall, the collection and drainage of surface water is done via plastic drainage pipe that will be laid along the sidewalk, with a diameter of D = 160 mm. This pipe will be laid along the middle of the sidewalk, under the reinforced concrete slab. At the joint between the sidewalk platform and the stairs, a metal grate will be installed on top of a concrete drainage canal. This canal falls in elevation from the sides towards the middle section. In this middle section a vertical plastic pipe will be installed of a diameter of 110 mm, connected with a T-element of a diameter 110/160 as link to the drainage pipe of 160 mm diameter, all in accordance with the project design. This drainage – sewage pipe follows the longitudinal profile of the stairs. At the beginning of the sidewalk a reinforced concrete manhole/shaft will be constructed collecting the drained water, from here the water is taken to the existing shaft of the town sewage system via plastic sewage pipe of a diameter of 200 mm.

On the sidewalk along the left side of the street is an existing concrete canal, starting from point 1+179.13–1+519.28 m. This canal will be used for collection and drainage of surface, i.e. precipitation water. Based on design plans, it is planned to mount a reinforced concrete pipe of a diameter of D=600mm into this existing canal and fill the remaining free space with a tampon or lean concrete. This entire canal to be done completely in accordance with the project design detail. This project design also plans the reconstruction of the existing sidewalk along the school center, in a length of 81 meters. This will be done with concrete. On basic layers of tampon material, the sidewalk's concrete slab and stairs will be reinforced with steel mats Q – 335, while the reinforcement of the sidewalks side areas will be done with reinforced concrete parapet walls of a thickness of 20 cm.

2.1 The used concrete and concrete curbstones must comply with the following characteristics:

2.1.1 Water tightness

The water-tightness class of the concrete is (v-8), whereas the number (8) stands for pressure resistance in bars, as defined by the construction project design. There may be no emergence of drops on the surface on any of five of the six tested samples of the concrete, while the first lower type has been complied by all six bodies.

2.2.1 Frost resistance
The concrete to be used will be exposed to frequent freezing/de-freezing and moisture saturated portions. Accordingly the aggregate for this concrete must be frost resistant and the concrete must be water tight. The analysis of the concrete regarding frost resistance defines the resistance class against frost of M-150, where the number signifies the maximum number of cycles of interchanging freezing/de-freezing tests. The strength of the concrete under frost pressure must be 75% of the demanded strength of concrete based on project design.
2.2.2 Frost and salt resistance
The resistance of the concrete against frost and snow melting /ice preventing salt is defined by level of damage caused to tested surface after 25 cycles of freezing/de-freezing. The concrete will be considered resistant against frost and salt, if after 25 test cycles a loss in mass of 0.2 mg/mm is found.

2.2.3 The contractor is obligated to present all certificates and attestations regarding the quality of the used concrete
The attestation/certificate is evidence of meeting the defined conditions. The contractor must also use a vibrating machine (pervibrator) when pouring the concrete, maintain and nourish the new concrete and use adequate formworks of check plate woods. The concrete to be prepared exclusively in the concrete plant – industrial concrete mixing. The contractor must also present certificates and attestations for all aggregate, cement and water used, including submission of recipes for the demanded concrete types.

II. ELECTRIC WORKS

3. Technical description

The length of the public illumination stretch: 2240m
Type and number of lights: 107 pcs
Candelabras: Standard, hot galvanized h= 5m, 107pcs
Cable: PP 00 4x16mm2 2650m
Projected load: 8320W

4. Construction terms

The connection of the object onto the LV (low voltage) network to be done in accordance with the terms and conditions established by the authorized power supply company "Elektrodistribucija", from the transformer station MBTS „B.Brdo-1" and „B.Brdo-2" with cable PP 00A 4x25mm2 up to the public illumination network distribution cabinets that will be mounted as free standing cabinets at the beginning of the illuminated stretch and from the cabinets, based on incoming – outgoing principle, with power cables type PP 00, cross section 4x16mm2 laid in a trench in the ground.

The illumination is designed for full and partial overnight operation.

The control of the illumination is done with standard type equipment mounted into the distribution cabinet of the public illumination network. A detailed description on setting up this installation is contained in the preliminary measurements and Bill of quantities of works.

Electric power consumption is done directly through power meters in the distribution cabinet of the public illumination.

On the illumination field permanent indicators of the distribution system must be mounted, regarding earthing, automatic power – off protection, including a symbol for "Danger – electric current". All elements of the illumination field must also be marked with permanent marks regarding number and designation of the power circuit. The illumination field must be dimensioned sufficiently large for the installation of equipment in accordance with the single pole scheme and conditions of the installation

location , as well as in compliance with the requirements established and set forth by the authorized power supplied "Elektrodistribucija".

All designed and planned electric low voltage cables for the supply of the illumination grid are type PP 00, laid in a trench after being pulled through protective pipes made of Okiten, diameter 50mm.

If any other non-electric installations are found near to the planned electric installations path, sufficient distance must be arranged between these. Above the cables in the trench, a galvanized strip to be laid of 25x4mm and this strip must be connected to the metal masses of the light posts and other equipment.

The illumination is done with posts of a height of 5m, which need to be adjusted in height in accordance with the terrain configuration. These posts are equipped with metal, halogen bulbs of 70W, 220V. The lights to be mounted on one side, along the street and in the parts where the sidewalk passes along the outer edge of the street. The situation with the lights and the cable laying route is presented in the attached drawing.

4.1 Protection against electric shock

The electric shock protection, at the joints of the metal masses for devices that usually are not under voltage, to be done with automatic power/voltage cut-off, in accordance with standard JUS N.B2 741.

4.2 Measurements

The accuracy and completeness of the finished works will be tested, while the attestation means that an authorized organization for control and verification of properties, characteristics and quality for electric installations (National Gazette of SFRY No.53/88, article 189-198 of the Regulation on technical norms and standards for low voltage electric installations) has to issue an adequate report certifying the quality of such works.

Under item – Check of the finished works and issuing a certificate means that an authorized organization for control and verification of properties, characteristics and quality for electric installations (National Gazette of SFRY No.53/88, article 189-198 of the Regulation on technical norms and standards for low voltage electric installations) has to issue an adequate report certifying the quality of such works.

4.2.1 Continuousness of the main, protective and additional conductor for potential equalization
4.2.2. Insulation resistance of the electric installations
4.2.3. Protection by separation of electric circuits
4.2.4. Functionality check
4.2.5. Functionality of the protective device of differential current
4.2.6. Resistance of the object earthing
4.2.7. Report/Protocol on functionality, accuracy and regularity of installation and setting of protective devices

5. Applied measures of danger and damaging impact prevention during handling and usage of electric installations

The danger of electric shock is removed by voltage supply cut-off, preventing non-allowed high voltage and at for time intervals that do not represent danger in the sense of physiological impact (IEC - 479-1).

Protection against a short cut is done by application of LV switches with thermal and electromagnetic triggers.

Danger of overload is prevented by proper choice of adequate LV switches.

Danger of fire due to power short cut is prevented by proper selection and dimensioning of devices, cross sections of cables, the method of laying the cables, so that in case of a short cut the system is reliably cut off.

The electric equipment was selected and mounted in accordance with the requirements of demanded properties of equipment, all depending on outside impacts this equipment is exposed to.

The non-allowed drop in voltage is prevented by adequate dimensioning of the cables.

Danger of improper handling is prevented by adequate installation of cables and equipment. The planned measures ensure that the designed installation complies with all requirements of the "Law on labor".

6. Technical conditions of laying the outside cables

These technical conditions are integral part of the project design and as such mandatory for both the investor and the contractor during the construction works.

6.1 Cable laying:

6.1.1. Along the cable route of the sidewalks and the green landscaped strips, the cable to be laid freely in the ground, between two layers of 10 cm of sand and a protective plastic cover. The sand used must be dry and of small fraction. Before the laying of the cables, the trench bottom must be covered with a sand layer of 10 cm, while another such layer of 10m cm thickness is laid on top of the positioned cable.

6.1.2. On the crossings over the paths, the cable is to be laid into plastic pipes that must exceed at their ends 0, 5 – 1, 0 meter of the path width.

6.1.3. Filling of the remaining part of the trench is to be done with previously excavated soil. This soil to be filled into the trench in layers of 15 – 20 cm thickness and properly compacted. Excess soil to be removed from the site and disposed at a land fill designated by the authorized body.

6.1.4. Along the entire route length the cable is to be laid with slight bend, to prevent any tension on the cable during temperature changes.

6.1.5. The bending of cables at all direction changes must be done with a semi-diameter of the curve 15xD. D is the outer cable diameter.

6.1.6. Cables must not be laid at temperatures below 0 C, while cable laying is suggested at temperatures above 5^{o} C.

7. List of applicable regulations

For the draft of the project design the following technical norms and standards were used in accordance with the Law on construction of the Republic of Montenegro (National Gazette of Montenegro, No 55/2000).

1. Yugoslav standards for electro-technics – main group N.B.(1987 and 1988)

2. Yugoslav standards for lighting rods (JUS I EC 1024-1 , JUS I EC 1024-1-1 JUS N.B4. 803).

3. Regulation on technical norms for electric LV installations (National Gazette SFRY No.53/88 and 54/88 and supplements, National Gazette SRY No.28/95).

4. Regulation on technical norms for protection of LV grids and transformer stations (National Gazette SFRY No.13/78).

5. Recommendations for illumination by the Yugoslav Committee for illumination systems ICS Belgrade 1974

6. Technical norms for fire protection

7. Law on safety at work, National Gazette of Montenegro No 35/98

8. Law on construction works of the Republic Montenegro (NG of Montenegro No 55/2000).
-JUS standards – Electric installations in buildings –Safety requirements JUS N.B2.741/1989
-Law on fire protection (NG Montenegro No.47/92
-General conditions for power distribution
-Collection of regulations for electric and technical installations , Book I and II from 1989