# VOLUME 3

# TECHNICAL SPECIFICATIONS

**GENERAL REQUIREMENTS**

The Technical Specification is an integral part of the Tender Documentation /TD/ together with the provisions of the Contract, the detailed design drawings, building permissions and the other contract documents. The Specification specifies and further develops the requirements for the implementation of the construction works under the Contract.

Implementation of construction and assembly work must be consistent with all relevant execution of specific types of works legal and regulatory framework, technical rules and regulations and applicable standards following sequence and technology of the performance of different types of works in different parts of the site.

## Drawings, As-built Documentation and Operation and Maintenance Manuals

The contract Drawings are those listed in Volume 5, and those as shall be supplied under the Contract.

The As-built drawings and Operation and Maintenance Manuals shall be prepared in Macedonian languages.

The Contractor shall submit to the Supervisor, all the prepared documentation as well as all other guarantees and operation manuals for the installed equipment in three copies and in electronic format.

## Access to Site

The Contractor shall provide means of access to and on the site, for all personnel, materials and equipment.

For purposes of carrying out the Works, the Contractor shall limit his installations and operations to the defined working areas, as shown on the Drawings.

The Contractor if is necessary, shall submit for approval of the Supervisor and the relevant Authorities/Departments of the Republic of North Macedonia, details of his planned installations and operations at the sites defined on the Drawings as Contractor's working areas.

The Contracting Authority will provide free of charge a working area for the Contractor. The Contractor shall be responsible for the provision of suitable construction materials and for the construction of all-temporary offices, stores and workshops.

The Contractor shall provide a temporary fence to demarcate the working area and to provide a boundary during the construction period.

## Construction Generally

The following general requirements shall apply at each site:

1. The Contractor shall provide and maintain all temporary roads, foot-paths and structures, necessary for the purpose of the Contract. On completion of the works, the Contractor shall remove such structures and restore the ground to the satisfaction of the Supervisor.
2. The Contractor shall provide adequate lighting where work is being carried out and shall provide and install any additional lighting, which the Supervisor may require.
3. The Contractor shall be responsible for the location of suitable sources of materials for the execution of the works, except where otherwise specified, whether such sources are on the site or not and for obtaining all necessary permissions.
4. Materials available on the site shall be used for the execution of the works.
5. Structures, which are to remain intact, shall be properly located, adequately supported, protected and maintained. Services shall be similarly treated, unless a diversion is deemed necessary, in which case it shall be carried out in a manner that prevents inconvenience to the owner and ensures the continuity and safety of the services concerned.
6. The Contractor shall not pollute roads, lands and other places on the site.
7. The Contractor shall provide and maintain adequate communications around the site.
8. The Contractor shall provide, maintain and remove on completion of the works, fencing of the site and adequate security measures on access roads, but without prejudice to his obligations such as maintenance of free access for the Contracting Authority, the Beneficiary, the Supervisor and any other persons entitled to such access.
9. As may be required by the Authority concerned, the Contractor shall be responsible for locating and protecting existing pipes, cables and other items of existing services and for the avoidance of damage to existing pavements and buildings, whilst they continue to be in use. In the event of the Contractor damaging water, fuel, electricity or telephone services, whether these have been marked out or not, the Contractor shall immediately inform the Authority concerned, and advise the Supervisor.

The Contractor must keep a log at the construction site. This log must contain all changes and deviations from the detailed design. The construction log shall be signed and stamped by the Contractor and the Supervisor.

## Construction Program

In accordance with the Conditions of Contract, the Contractor shall submit to the Supervisor detailed programmes for the execution of the works, showing the order in which the various sections of the work are to be constructed, and in so shall take account of the restrictions andlimitations described in this Specification.

Detail planning of working programme shall be agreed with the representative of the Contracting Authority.

Once accepted by the Supervisor, the programmes shall be strictly followed, unless any alterations are found necessary during the construction and confirmed by the Supervisor.

The Contractor shall state and allow a reasonable margin of time for the contingencies.

## Submissions to the Supervisor

Wherever these Specifications require, the Contractor shall submit to the Supervisor proposals, details, calculations, information, materials, test reports, certificates, etc. The Supervisor will consider each submission and shall reply to the Contractor in accordance with the relevant provision of the Contract Conditions.

No operation shall be carried out without complete notice having been given to the Supervisor by the Contractor, sufficiently in advance of the time of the operation to enable the Supervisor to make such arrangements as he may deem necessary for its inspection and checking.

The approval of the Supervisor of any submission shall not relieve the Contractor from his responsibilities under the Contract.

## Setting Out

The Supervisor will indicate to the Contractor sufficient primary reference points close to or on the sites, for the use by the Contractor in setting out the works. The Contractor shall set out the whole of the works relative to these points.

The Contractor shall protect the above reference points and level bench marks, and in the event of damage shall survey and re-establish the points.

The Contractor shall set out the works in accordance with the Drawings supplied by the Supervisor, or as instructed by the Supervisor.

The Contractor shall verify all dimensions and levels shown on the Drawings and referred to in the documents forming of or issued under the Contract, on the site, and he will be held responsible for promptly pointing out errors in such dimensions and levels.

The existing reference benchmarks indicated by the Supervisor shall form the basis of measurement for all Construction works, unless otherwise requested in writing by the Contractor, or unless otherwise stated in the Contract Documents.

## Approval of sources, materials and plants

Materials incorporated must originate in a Member State of the European Union or a country covered by the Interreg - IPA CBC Programme 2021 – 2027. However, the goods to be purchased may originate from any country. Material that originates from sources, which are not approved by the Contracting Authority and the Supervisor, cannot be used for Works.

Approval of a source does not mean that all material in the source is approved. The Contractor has to ascertain by continuous control check measurements that only material which complies with the requirements specified in the various clauses of these specifications will be used for the Works.

## Weather Conditions

Without limiting his liabilities, the Contractor shall make suitable arrangements to protect the works and the temporary works, against the effects of the weather.

## Disposal of Materials

The Contractor shall not dispose of materials of any kind obtained from the site without the permission of the Supervisor. Debris shall be removed only to dumping areas approved by local authorities.

The Contractor must provide full compliance with the Rulebook on processing communal and other kinds of solid waste.

## Testing by the Contractor

The Contractor shall provide throughout the whole period of execution of the works, as requested by the Supervisor, all necessary tests for the control of the materials and workmanship, in accordance with this Specification. If necessary, the Contractor shall have such tests carried out by an independent organization, acceptable to the Supervisor.

## Safety on Site

Safety on site shall be a prime consideration of the Contractor who is to appoint a Safety Supervisor throughout the contract. This person is to provide the Supervisor with weekly reports on safety of all operations including regular inspection reports on all site equipment and the storage of hazardous materials.

The Contractor is to ensure that all persons working on the site are to have adequate personal protective clothing. He is also to provide the Supervision staff with helmets when visiting the site.

## Quality Assurance

The Contractor, his suppliers and other sub-contractors, shall comply with the Quality Standards set out in the Conditions of Contract, in all respects. Copies of the quality plan, records and other documentation, shall be submitted to the Supervisor, in respect to imported materials and before such materials arrive on the site.

## Liaison with CA

The Contractor shall keep in close contact with Contracting Authority Officials.

## Applicable standards

As a minimum the Macedonian standards and codes shall always be satisfied. Other internationally acknowledged standards and codes may be used only if:

* They are more or at least equally stringent compared to the respective Macedonian standards and codes or
* European technical approvals (with or without guidance).

The materials which are used must correspond to the requirements of the standardized documents asset in Macedonian standards and codes.

If the Contractor should wish to supply material or execute work to an alternative national standard or international specification, he shall give full details of his proposal in writing to the Supervisor.

## 1.17 Signs

The Contractor shall provide and maintain in good condition at least *one* project identification sign securely supported in a prominent location near to the access to the site. The signs shall be prepared strictly in accordance with the EU guidelines for Visibility.

* 1. **CONTROL OF WORKS**

The Contracting Authority will provide a consultant who will supervise construction with investment functions, according to Macedonian legislation and other legal acts in construction works. The Contracting Authority and / or Supervisor may at any time inspect the work, control technology performance and issue instructions to remove the defects, according to the specified technology and method of implementation. If found serious defects, errors and low quality performance, the Contracting Authority shall notify the Contractor that breached the contract and should stop to work. The Contractor shall always provide access to the construction site of the authorized representatives of the Contracting Authority and the Supervisor.

**2.1 Contractor's equipment**

The Contractor shall furnish equipment which will be efficient and appropriate to secure a satisfactory quality of work and a rate of progress which will insure the completion of the Works within the time stipulated in the Tender. If at any time such equipment appears to be inefficient, inappropriate or insufficient for securing the quality of work required or for the rate of progress, the Supervisor may be entitled to order the Contractor to increase the efficiency, change the character or hire additional equipment, and the Contractor shall conform to such order.

**2.2 Protection of existing structures and utilities**

The Contractor shall assume full responsibility for the protection of all buildings, structures and roads existing in the area of the construction site, public or private, whether or not they are shown on the drawings.

The Contractor has to pay special attention to avoid any damages on any protected areas.

Any damage resulting from the Contractor's operations shall be repaired at his expense.

**2.3 Safety and security on site**

Safety and security arrangement should be performed in accordance with Macedonian Construction Law

**2.4 Handling and storage of materials and plants**

All materials and plants to be incorporated in the work shall be handled and stored in a manner, which prevents injury of any kind whatsoever. Any materials or plants which, in the opinion of the Supervisor, have become too damaged to be fit for the use intended or specified shall be promptly removed from the site, and the Contractor shall receive no compensation for the damaged material or its removal.

**2.5 Clean-up work**

The Contractor shall clear way and remove from the site any wreckage, rubbish and temporary works, which are no longer required.

**2.6 Responsibility of the Contractor**

Approvals from the Supervisor do not relieve the Contractor from his obligations or responsibilities under the Contract.

**3. ADMINISTRATIVE SPEIFICATIONS.**

**3.1 Progress meetings**

The Contractor shall agree with the Supervisor and the Contracting Authority for dates for regular progress meetings. These meetings shall normally be held monthly, no later than 10 working days after the completion of each month.

**3.2 Quality assurance**

The Contractor shall institute a quality assurance system to demonstrate compliance with the requirements of this contract. The system shall be in accordance with the details stated in the Contract. The Supervisor shall be entitled to audit any aspects of the system.

**4. IMPLEMENTATION OF THE WORKS**

**4.1 Materials**

The Contractor shall use only materials that conform to the technical requirements set forth in the clauses of this Technical Specification.

All Materials and Plant supplied to perform the Permanent Works under the contract shall be new products. Second-hand Materials and Plant will not be accepted.

The Tender drawings constitute the drawings issued for construction/ installation/ execution.

**4.2 Testing**

Reliable shall be only the type and amount of tests performed in conformity with the prescription of this Technical specification, except when this right is granted to the Contracting Authority.

The Contracting Authority may require additional tests when the results obtained are uncertain.

Beside the tests specified in this Specification, the Contracting Authority may require additional tests to establish possible hidden omissions and effects. Costs for these tests shall be entirely at the Contractor’s expense if such defects are confirmed.

**4.3 Inspection and measurement of works**

The Contracting Authority may at any time inspect the quality and measure the amount of works performed. If this cannot be done with the Contractor’s assistance, a deadline shall be fixed for hiring external specialists. In this case, the expenses shall be paid by the Contractor.

**5. PREPARATORY WORKS**

Before starting the works the Contractor has to perform some preparatory works at the site.

**5.1 Boards and signs**

The Contractor shall mount and maintain in good condition a board with the name of the project and the co-financing institutions written in a way /text and font size/ conforming to the requirements of the Contract and in compliance with EU visibility guidelines.

**5.2 Setting out the site**

The Contractor shall in co-operation with the Contracting Authority set out the total site to be used for construction.

**5.3 Temporary facilities**

The Contractor shall effects all expenditure for establishing, operation and removal of temporary facilities if such are needed for the good performance of the Contract. All needs for establishing such facility shall be duly justified.

**5.4 General supply facilities**

***Sanitary Arrangements***

The Contractor shall provide for and maintain temporary sanitary facilities on the site for the use of all persons connected with the Works. The Contractor shall keep the facilities in a clean and sanitary condition, and shall post notices and take such precautions as may be necessary to keep the site clean.

***Water supply***

The Contractor shall provide for and maintain an adequate supply of potable water for his use. The water supply shall be used for construction purposes and for consumption in the temporary facilities.

***Power supply***

All electrical power required by the Contractor shall be provided by him at his own expense. The Contractor prior to taking-over of the Works shall remove all temporary installations if it is not agreed upon that the Contracting Authority takes over the installations.

**6. ADDITIONAL SPECIFICATIONS**

All provisions and clauses from the Macedonian Construction Law and other codes that are valid obligate the Contractor.

SPECIFIC REQUIREMENTS

**LOT 1 - Conservation, restoration and reconstruction of property No22**

The rehabilitation of the existing building envisages the repair of all damaged structural and non-structural damage, and the strengthening envisages an increase in the load-bearing capacity and deformability of the building to a certain level of seismic protection, in accordance with the relevant conservation requirements and positive technical regulations.

Considering the structural damage and the impaired local stability of the existing building, the rehabilitation and strengthening solution envisages the following:

1. Injection of possible cracks - in the stone walls along their entire length.
2. Systematic injection - of the wall mass in the zone of the horizontal cerclage.
3. Rehabilitation and repair of damaged stone walls.
4. Dismantling of the damaged wooden roof structure together with the roofing and construction of a new roof structure with a tiled roof.
5. Dismantling of the damaged wooden interfloor structure above the ground floor together with the floor covering and construction of a new one.
6. Construction of vertical elements to strengthen the existing constructive system.
7. Insertion of horizontal reinforced concrete rings in the stone walls at the level of the interfloor structures above the basement and ground floor.
8. Construction of a new wooden inter floor structure above the ground floor.
9. Consolidation of the masonry elements of so called “bondruk” on the floor.
10. Construction of new wooden stairs.

Based on the performed analyses, the envisaged method of rehabilitation and strengthening of

the existing building, which is located in seismic zone VIII level according to the “MCS” scale, meets the basic requirements of stability and seismic protection.

**DESCRIPTION OF THE SOLUTION FOR REHABILITATION AND STRENGTHENING**

*Point–1 Crack injection*

The injection of cracks is carried out by applying a cement-based injection mass. The technological procedure for repairing cracks is as follows: First, the crack is located along its entire length, a patch is made a 2cm slot in which injection tubes secured with polymer cement mortar are placed. To avoid the possibility of leakage of the injection mass through the joints of the stone masonry, it is necessary to pre-treat all joints of the stone masonry. The treatment is carried out in such a way that the mortar is removed from the joints mechanically to a depth of 2cm, the substrate is thoroughly cleaned and dedusted with compressed air and then the joints are sealed with modified cement mortar.

Such treatment of the surface of the wall mass is carried out in a zone to the left and right of the crack itself, and the size of this zone depends on the thickness of the wall itself. For walls up to 50cm thick, this zone is at least 50cm to the left and right of the crack, and for walls thicker than 50cm the width of the zone is 80cm to the left and right of the crack itself. After the preparation of the wall surface and the installation of the injection tubes, the injection mixture is injected under a pressure of 2-3 bar starting from the bottom up, which allows for complete expulsion of trapped air and filling of the cavities in the masonry with injection mixture.

*Point–2 Systematic injection*

Systematic injection of the wall mass in the zone of the horizontal cerclages is performed in the same manner and methodology as described above for the injection of cracks, with the difference that during systemic injection, a larger area of ​​the wall mass is injected. The area of ​​the systemic injection is a function of the thickness of the wall itself, i.e. for walls up to 50cm thick, an area of ​​80cm wide is injected, while for walls with greater thickness, the injection width is 2d (two wall thicknesses), in our case the width is 130cm below the crown level.

*Point–3 Rehabilitation and repair of damaged stone walls*

First, the damaged mortar in the joints of the stone masonry is cleaned, the loose stones are removed, they are cleaned well and the wall is built and sealed again. Finally, the masonry is grouted with a full joint with hydraulic mortar.

*Point–4 Dismantling of damaged wooden roof structure and construction of a new one.*

Due to damage and wear and tear of the wooden roof structure, its replacement is planned. Before the injection is performed, the existing roof structure is dismantled together with the roofing. After the horizontal and vertical elements for strengthening the existing structure of the floor are constructed, a new roof structure made of wooden beams is constructed. Horizontal ceiling wooden beams POZ-301 with dimensions 10/12cm are installed at an axial distance of 50cm, over the entire surface of the floor. On the part of the main support - chair, at the place for the horizontal beam, two wooden beams POZ-302 with dimensions 2\*12/16cm (24/16) are installed, connected to each other in one whole. Above this beam, two wooden posts are placed to the left and right of the ridge with dimensions 12/12cm, above which POZ-352 rafters are placed in the longitudinal direction with dimensions 12/16cm, and the posts are supported with wooden clamps 2\*5/20cm. POZ-351 wooden rafters with dimensions

10/12cm are placed on the rafters, placed at an axial distance of 50cm, and a plank formwork is placed on them, on which waterproofing is placed and 2.5/5cm wooden battens are hammered. Tiles are placed on the base thus placed with fixing the lower part. The wooden beams of the roof structure as well as the plank formwork are protected with protective coatings.

*Point–5 Dismantling of damaged wooden interfloor structure above ground floor and construction of a new one*

Due to damage and deterioration of the wooden interfloor structure above the ground floor, its replacement is planned. After the injection is carried out, the existing interfloor structure is dismantled together with the floor and ceiling covering. After the horizontal and vertical elements for strengthening the existing structure on the ground floor are constructed, a new interfloor structure made of wooden beams is constructed. Horizontal wooden beams POZ-201 and POZ-202 are installed over the entire surface of the floor with dimensions of 12/14cm and 12/16cm at an axial distance of 50cm, which are supported by the newly installed reinforced concrete frame. A floor covering made of planks is installed above these beams, and a ceiling construction made of battens, reeds and plaster is installed on the underside in the rooms, except in the porch where there is a visible beam system on the underside

*Point–6 Construction of vertical elements to strengthen the existing structural system*

In order to increase the rigidity and deformability of the stone masonry as well as to ensure synchronous operation of the load-bearing walls, it is planned to install vertical reinforced concrete jackets ABZ-1, ABZ-2 and ABZ-3 and one reinforced concrete sheet AB-PL1 in the section where a new wall is to be constructed on the western side. In height, reinforced concrete jackets are constructed from the foundation elevation -3.00m to the elevation above the ground floor +3.50m, and the reinforced concrete sheet is also constructed on the first floor to the elevation +5.90m. First, the position of the intended strengthening elements is marked, the plaster is removed from the walls where the jackets are planned, the joints between the stones are thoroughly cleaned and individual stones are removed in a checkerboard pattern along the height of the wall to create a connection between the jacket and the existing stone wall. Then, manual excavation is carried out for the new foundations according to the formwork plan. The new foundations of the jackets are lowered below the existing walls by 20 cm and 10 cm, to an assumed foundation elevation of -3.00 m, since there is no information about the foundation elevation of the existing building. The intended reinforcement for the foundation is placed in the jackets and the canvas, as well as vertical reinforcement in them, and the foundations are concreting to a height of 50 cm with MB-30. After placing the vertical reinforcement in the jackets, reinforcement for the “plugs” is placed in the previously made openings in the stone wall. The vertical elements are formed and the jackets are concreting and the reinforced concrete canvas is reinforced to the height of the interfloor structures 25 cm below the existing wooden ceilings.

*Point–7 Insertion of horizontal rings*

In order to increase the tensile and shear load-bearing capacity of the masonry as well as to ensure synchronous operation of the load-bearing walls, it is planned to insert horizontal reinforced concrete rings above the basement - elevation +1.07m and above the ground floor elevation +3.50m on the part of the stone walls. The insertion of horizontal reinforced concrete rings into the walls of the facility, at the level of the interfloor structure above the basement, is carried out after dismantling part of the floor structure directly next to the walls. First, the existing beams of the interfloor structure above the basement are supported, the wall is carefully removed from under the wooden beams at an elevation of +1.07m with a ring height of ~25cm, i.e. a channel of ~20/25cm is made at the longitudinal stone wall with a thickness of 65 cm, ~10/25 cm for walls with a thickness of 30 cm, and for a stone wall with a thickness of 50 cm, a channel with dimensions of ~30/25 cm is made along the entire length. The channels are thoroughly cleaned and the intended longitudinal reinforcement is placed according to the reinforcement details.

After placing the reinforcement in the rings, concreting is carried out with MB-30 concrete.

After concreting the ring above the basement at an elevation of +1.70 m, a ring above the ground floor at an elevation of +3.50 m is carried out so that the stone walls are removed at a height of (25+16=41) cm below the floor level on the first floor along the entire thickness of the walls of 30 cm and 40 cm on the wall with a thickness of 65 cm and along the entire length of the walls. In the part where the walls of the floor continue, careful splicing is performed so as not to disrupt the stability of the wall itself. The masonry surfaces are thoroughly cleaned and the intended longitudinal reinforcement is placed in the rings. After the intended reinforcement is placed in the rings, anchor bars are placed in a “U” shape at a distance of 50 cm to accept the wooden beams from the interfloor structure above the ground floor, and then the rings are formed and concreting is carried out with MB-30.

*Point–8 Construction of a new wooden interfloor structure above the ground floor*

After the installation of the new reinforced concrete rings of reinforced concrete above the ground floor, a new interfloor structure is constructed from wooden beams POZ-201 and POZ-202 with dimensions of 12/14 cm and 10/14 cm, placed at an axial distance of 50 cm. These beams lie on the frame and are supported by pre-concreted reinforcing bars Ø6mm. A wooden plank floor is placed above these beams, and thermal and sound insulation is placed inside. The intended ceiling construction given in the architectural project is placed on the lower side.

*Point–9 Consolidation of the masonry elements from “bondruk”*

The external walls of the first floor are constructed as a “bondruk” system from unbaked brick (plitar) and a wooden substructure and they are quite damaged and as such cannot exist, which is why their repair and consolidation are necessary. To improve the strength-deformable characteristics of the “bondruk” wall panels on the first floor, it is planned that they will be coated with a special mesh for that purpose and plastered with extended plaster on both sides. In addition, it is planned to place on final wooden beams above the walls of bondruk, at the level of the ceiling structure at elevation +5.90, which will play the role of tensioners and ensure the necessary integrity of the walls of the first floor.

*Point–10 Construction of new wooden stairs*

After previous dismantling of the existing wooden stairs, new authentic ones are constructed from oak wood in accordance with the architectural dimensions.

CHRONOLOGY OF WORK PERFORMANCE

1. ​​Removal of the roof covering together with the wooden roof structure.
2. Rehabilitation and repair of damaged stone walls.
3. Injection of possible cracks in the stone walls.
4. Systematic injection of wall mass in zones of horizontal seams.
5. Marking and positioning of jackets and canvas in the basement.
6. Removing mortar, and where there is brick and stone from the basement walls in places intended for jackets.
7. Removing individual stones along the height of the wall to create a jacket connection.
8. Cleaning the joints between the stones from the basement walls.
9. Excavating foundations for vertical AB jackets.
10. Excavating foundations for vertical AB canvas.
11. Placing reinforcement for foundations for AB jackets.
12. Placing reinforcement for foundations for AB canvas.
13. Concreting foundations for AB jackets.
14. Concreting foundations for AB canvas.
15. Placing reinforcement for AB jackets in the basement.
16. Placing reinforcement for AB canvas in the basement.
17. Formwork for AB jackets and canvas in the basement.
18. Concreting reinforced concrete jackets and canvas in the basement.
19. Dismantling jackets and canvas in the basement.
20. Dismantling part of the floor structure in the basement in places intended for jackets.
21. Supporting an existing wooden interfloor structure in the basement.
22. Slotting - dismantling the walls in the basement in places where reinforced concrete horizontal rings are intended.
23. Cleaning the dismantled material from the channel formed in the basement walls.
24. Placing reinforcement for horizontal AB rings in the basement.
25. Formwork of horizontal AB rings in the basement.
26. Concreting reinforced concrete horizontal columns in the basement.
27. Dismantling horizontal columns in the basement.
28. Removing plaster from the walls on the ground floor in places intended for jackets.
29. Removing individual stones along the height of the wall to create a connection with a jacket.
30. Cleaning the joints between the stones on the walls on the ground floor.
31. Placing reinforcement for AB jackets on the ground floor.
32. Placing reinforcement for AB canvas on the ground floor.
33. Formwork for AB jackets and canvas on the ground floor.
34. Concreting reinforced concrete jackets and canvas on the ground floor.
35. Dismantling jackets and canvas on the ground floor.
36. Dismantling the interfloor structure above the ground floor in places intended for horizontal columns.
37. Demolition of the walls above the ground floor in the places where reinforced concrete horizontal rings are foreseen.
38. Cleaning of the demolished material from the walls on the ground floor.
39. Installation of reinforcement for horizontal AB rings on the ground floor.
40. Formwork of horizontal AB rings on the ground floor.
41. Concreting of reinforced concrete horizontal rings on the ground floor.
42. Dismantling of horizontal rings on the ground floor.
43. Construction of a new wooden interfloor structure on the first floor.
44. Consolidation of the masonry elements made of bondruk.
45. Installation of wooden beams above the first floor.
46. Construction of a new wooden roof structure.
47. Covering the building with a roof made of tiles.
48. Clearing the building of rubble and various materials.

With the commencement of works on the building, related to reconstruction, rehabilitation and structural strengthening in accordance with this proposed solution, it is necessary to establish cooperation with experts in the field of conservation and application of materials for the construction of individual positions.

**Materials for rehabilitation and structural strengthening of the building**.

When implementing this solution, the following materials are used:

* Repair of cracks: Injection is performed with a cement-based mixture under a pressure of 2-3 bars, depending on the conditions of the field. Special attention should be paid to the regulation of the pressure in order to avoid leakage of the injection mass through the processing {face formed in the cracks and leaks of the masonry.
* Cement or extended mortar is provided for pre-casting of stone elements.
* Constructive consolidation of Jews from bondruk is foreseen extended mortar and special network for that purpose.
* Standard reinforcing profiles of RA-400/500-2, MAG 500-560 and concrete brand MB-30 are provided for the reinforced concrete elements for the construction.
* For the construction of the mezzanine and roof construction, sawn timber with appropriate cross-sections and lengths is foreseen.

*Installations of energy distribution, mains voltage and lighting,*

*Electrical installations for telephone, internet and cable TV*

0.4 kV network:

The facility is not powered by electricity, but the installations and new built-in equipment require electricity.

The facility has more of a museum-exhibition purpose, therefore several electrical (s.c. Schuko) connection points are provided in each room, as well as providing hot water in the sanitary facilities and the sink on the porch. For these reasons, water heaters are provided in the bathroom and a connection for a low-mounted water heater under the sink on the porch. The remaining electrical (s.c. Schuko) connection points are with a standard arrangement in the rooms. They are installed at a standard height of 0.45 to 0.50m from the finished floor, unless otherwise specifically emphasized in the graphic attachments (Volume 5 - basic design).

The lighting in the building is standard with ceiling lights in the low rooms, the basement and the veranda, while the rooms are equipped with modern LED lights with a traditional "authentic" look of hanging copper plates. Due to the additional possibility of placing exhibition elements, the switches are modular, built into boxes for 4 elements with the possibility of upgrading for an additional two switches in each room. The building is of a public nature and has panic lights installed, one on each level. The switchboard and the measuring cabinet are planned to be in a single sheet metal cabinet, inside the porch, behind the entrance gate, installed on top of a new concrete wall. Flexible hoses should be laid in the wall during concreting so that the cables can be pulled in smoothly to the corners of the building from where verticals are led to the floor. The possibilities for connecting multiple consumers have been taken into account by leaving a large spare space for additional cable pulling and installation of fuses and switches.

The measurement of the consumed electricity is provided by a digital meter 10-60A, cl.2 placed in the measuring cabinet. In the upper part of the measuring cabinet in two rows it is planned to place the main fuses, the fid switch and all other fuses. to the measuring cabinet where the cable is quickly connected to the meter terminals, and a galvanic connection is made to the strip with the metal housing (with steel machine screws M8). The cables are laid in the wall in already dug slots. Digging the slots and laying the cables is carried out under the supervision of the responsible conservation advisor.

The installation for electrical (shuko) sockets is made with NYY-J 3x2.5mm2 cables, and for lighting with NYY-J 3x1.5mm2 cables. The TN-C protection system is used to protect against indirect contact voltage. In the switchboard, the neutral and protective conductors are bridged on one busbar, and then led to the consumers separately. The protective conductor has the same cross-section as the neutral and is necessarily marked in yellow-green.

Telephone and computer network, cable TV installation:

The facility does not foresee the construction of a telephone installation, nor a computer network. Only the construction of an internet connection is foreseen where all other devices would be wirelessly accelerated with a router.

For these reasons, boxes have been placed in the large room on the ground floor in which a fiber optic cable and a coaxial cable from a local TV operator are brought from the outside. They would be used to connect to a router. A electrical (Schuko) socket is provided nearby for all these elements.

A fire alarm system and a burglar alarm control panel are not part of this project. The primary objective is to preserve the authenticity of the building.

**LOT 2 - Reconstruction of accommodation facility in Spa Kezhovica and Creating an open-air museum at spring of mineral water**

**Accommodation facility in Spa Kezhovica**

**Site Analysis**

The location of the planned facility is in the Shtip suburb Novo Selo at the exit from the city of Shtip. The object in question is bordered on the west side by a building from the contents of the Kezhovica spa, on the east side by the river, Bregalnica, while on the south side is the access to the accommodation facility in the Kezhovica spa.

**Organization of the space**

The object in question is an accommodation facility for the needs of the bathroom and it consists of accommodation rooms with toilets, as well as a kitchen with a dining room. This project envisages a complete reconstruction of the building, which has a total area of 207m2. The building is on the ground floor with several entrances on the west side. The reconstruction itself consists in keeping the massive walls, which are made of baked solid brick, installing reinforced concrete beams 30/30 cm in segments and an inter-floor slab with d=10 cm, a new floor pad as well as installing a new roof structure. The existing condition of the building in the ground part consists of a kitchen and a dining room with a total area of 29.75m2, and in addition there are three entrances from which the accommodation rooms and the toilet are served. From the first entrance with a corridor of 14.36m2, you can reach the accommodation rooms, namely room-1 with 8.05m2, room-2 with an area of 7.90m2, room-3 with an area of 10.75m2, room-4 with an area of 10.41m2, room-5 with an area of 15.38m2, room-6 with an area of 9.38m2 and a toilet with an area of 1.15m2. From the second entrance with a corridor with an area of 10.77m2 leads to room-7 with an area of 12.42m2, room-8 with an area of 12.03m2, room-9 with an area of 12.28m2, room-10 with an area of 11.89m2 and toilets with an area of 1.56m2 and 1.70m2. From the third entrance, a hallway with an area of 10.06m2 leads to room-11 with an area of 8.37m2, room-12 with an area of 8.33m2, room-13 with an area of 8.33m2, as well as a toilet with an area of 1.27m2. All these contents keep the existing surfaces even with the reconstruction.

**Construction of the facility**

The facility is a massive construction made of baked full brick masonry with a mezzanine construction of wooden beams. The project envisages a new subfloor, installation of reinforced concrete beams 30/30 cm in segments and the reinforced concrete slab between the floors, which is placed at a height of 3.00 m and has a length of 12 cm. The covering is a wooden structure with a base system made of beams and columns, and the covering is provided with ceramic tiles.

**Processing of the surfaces**

The outer walls are already part of the massive solid brick construction. Window openings on two sides are built into the walls. The floor is planned to be made with ceramic tiles placed on a cement screed in the corridors and toilets, the kitchen and the dining room. In the accommodation rooms, the floor will be made of laminate.

**Covering works**

The roof construction is wooden. The covering is provided with ceramides placed on the plank formwork, the wooden beams as well as thermal insulation with d=12 cm.

**Sheet metal work**

Storm water drainage is planned through horizontal and vertical gutters made of galvanized sheet with d=0.6mm. The joints between the sheets should be made by folding and siliconizing. The joints of two ribbed sheets in the longitudinal direction should be performed with a minimum overlap of 30 cm and treated with a self-adhesive bitumenized membrane to ensure water tightness.

**Locksmith**

In the building, only the doors are changed during the reconstruction. Masonry measurements are provided for all locksmith works in the project. The closure of the building should be made with PVC - profiles glazed with thermopan glass.

**PLUMBING**

The building's water supply to all sanitary devices is based on the architectural construction foundations. The facility is supplied with water from the street water pipe. The connection is from 3/4", and the horizontal distribution of the water pipes is led in each sanitary junction at 30 cm from the floor, and for each outlet it is raised vertically.

The entire installation for cold and hot water inside the building is planned to be made of polypropylene pipes and shaped parts, fittings according to the dimensions of the project, while outside the building with corundated pipes. Network sizing is based on the units of resistance from each consumer. For the calculation of the main water pipe, the total consumption of water in the entire facility is taken as a basis, and according to the load units of all sanitary facilities in the facility, according to their simultaneous use and the total number. The unit of the load means the load of the water supply network according to the specialty of the tap points and the way of their use. Some places pull part of the E.O. some a whole unit, and some several units. The determination of the number of E.O. is according to the order of the verticals, starting from the highest points of consumption, gathering all the way down to the point of connection with the street water supply. Based on the total number of E.O. and from the individual sections of the route, the necessary amounts such as the water consumption in lit/sec, the size of the internal diameter of the pipes in inches and the pressure losses in meters were obtained.

**Sewage**

The sewerage phase is decided on the basis of the architectural construction foundations and the disposition of the sanitary equipment in the sanitary facilities, taking care to accept all waste water and, after gravitational fall, to connect it to the revision manholes. The sewerage plan for the object in question is given in the attachments. There are 4 sinks, 4 toilets and one sink. The separations from the sinks and the sink have a diameter of Ø50 mm in vertical and Ø50 in horizontal and from the toilets Ø 100. The amount of wastewater leakage for the facility is obtained as a sum of the products of the individual spouts. At the same time, it is not taken into account that the total element acts in one interval, because unrealistic results would be obtained, here only a certain percentage is taken into account, which is likely to be spilled.

**Creating an open-air museum at spring of mineral water**

*PREPARATORY WORK*

First, the marking and securing of the terrain is started.

The rocky part where there are overgrown plants and material that is falling is also cleared.

The upper path is also cleared of landslides and vegetation.

Of the existing materials, all surfaces with concrete (behaton or similar) elements on the location are removed and the material is transported to a landfill designated by the investor.

On the existing stone wall along the border of the plot on the eastern side towards the river, the upper layer of concrete (cap) of the wall is removed, that layer is removed along its entire length, while that wall is planned to be walled up for an additional

60cm in height from the middle to the end towards the north side, while from the beginning to the middle (marked in technical drawings) at the place where the cap is removed, a new cap (finishing layer) of stone slabs is formed. The same finishing is done on the completed part of the same wall.

The existing concrete channel that carries the water from the pool to the nearest manhole is cleaned and a new metal grate is installed on it.

In order to expand the pool, the parapet walls that form this pool of water are demolished, along with the removal of part of the concrete floor slab, respectively, to expand the pool.

*EARTHWORKS*

In order to expand the staircase that serves as access from the south side, manual excavation of the ground is carried out in the area where there are existing concrete elements. The waste material is transported to a landfill designated by the Investor.

On the north side, in the upper part where the existing concrete elements are removed and to the end along the newly planned path, manual excavation of the ground d=20cm is carried out, for the installation of a layer of buffer material and the manufacture of an AB slab reinforced with Q257 on which stone slabs will be installed.

Buffer material is also provided for filling the space at the cascades on the north side for the construction of a new flight of stairs for access from that side.

*CONCRETE AND REINFORCED CONCRETE WORKS*

For better functionality and flow of the program, two flights of stairs are provided, i.e.

Production of A.B. Stairs with MB30 (two flights) access from both sides:

1. one flight has a width of 110cm per flight, a height of the step 17cm and a width of the step 30cm
2. the other access flight has a variable width of the flight, a height of the step 15cm and a variable width of the step, with several adjustments.

The total quantity is calculated, the stairs are reinforced with Q257 reinforcement

The new expanded pool for the spring is being constructed with a new base with a height of 30cm with external dimensions of the pool 205cm x 255cm. Base thickness 30cm and height 30cm. Reinforced with Q257 rebar.

*MASONRY AND GROUND FLOOR WORKS*

According to the newly envisaged situation, almost all surfaces are covered with decorative stone slabs applied to wet concrete. More specifically, all stairwells, risers and stairwell heights, the floor surface of the lower level, the parapet from which the spring pool is formed, the vertical wall above the spring, part of the existing cascades that are retained for seating by the pool, as well as the upper level on the north side where benches are placed (urban equipment). The upper level on the north side is covered with stone slabs up to the end of the stone wall.

The stairs that are newly envisaged for access - descent from the north side are provided with a metal fence made of box profiles on one side, while on the other side the existing stone wall is the protection.

New stone walls are being built with a width of 40cm and a height of 60cm.

One stone wall is built on one side next to the stairs that descend from the south side to the spring, the wall is planned along the cliff all the way to the lowest level, ending next to the spring.

The other stone wall that is planned is along the upper existing path of stone slabs that extends along the cliff. The wall is built along the entire length of the side of the cliff with the plan. It extends to the northernmost point of the access.

On this stretch of the upper level where the stone wall is planned to be built on one side, for protection from the cliff itself and from possible landslides, it is planned to install a protective net with concrete weights in the shear of the slope of the cliff on the upper part along the stone path. Procurement, transportation, preparation and installation of steel, double-twisted, galvanized mesh with a thickness of up to 3 mm, opening dimensions 8x10 cm, interconnection of the meshes with "rings" placed at a distance of 20 cm and attached to the crown of the slope with steel anchors Ø25 mm, placed at a distance of 1.5 - 3.0 m, with a length L = 0.5 - 1.0 m. Mesh tensile strength: 350 - 550 N/mm2 according to EN 10223-3 and mesh tolerance in accordance with EN 10218. Tensioning with concrete weights in the shear of the slope made of concrete grade MB 30 and dimensions 30 x 30 x 10 cm, which are placed at a horizontal distance of 1.5 m. The hook of the concrete weights is a steel rod Ø12 mm. Anti-corrosion protection by galvanizing the mesh according to class A according to EN 10244-2. Along with the mesh, a steel cable is installed to secure the protective mesh at the top of the slope. The cable is secured to the protective mesh with steel anchors with a diameter of Ø25 mm and a length of L = 3.0 m, placed at the ends of the mesh. Urban equipment is installed in certain places (shown in the graphic attachments) - benches with backrests and waste bins.

*Lighting*

The lighting is solved with ambient light, i.e. posts with different heights are provided at the location.

Namely, along the upper stone path, posts are planned to be placed (specification given in the graphic attachments) with a height of 100.45 cm, F180, they are placed on the new stone wall, at a distance of no more than 4 m, along the entire stretch of the wall to the northernmost point of the access. according to the scheme according to the technical drawings.

While along the wall that leads down the stairs from the southern part, posts with a width of 51.45 cm, F180 are placed. Such posts are also placed on every 4th step of the staircase on the north side.

On the upper level on the north side, one post with a height of 5 m is placed for lighting.

At the level of the spring at the lowest point, next to the stone wall where the drainage channel exits, two spotlights are placed aimed at the spring, illuminating it.