LOT NO 2 – SRPSKI ITEBEJ

TECHNICAL SPECIFICATION

VOLUME 3.1. ARCHITECTURAL WORKS ON TECHNICAL BUILDING

TECHNICAL DESCRIPTION

Upon the developer's request the Main design for reparation of facilities has been developed within the hydro-complexes Srpski Itebej, cadastral lots no 10827/1, 10825, 10827/2, 10828/1, 10828/2 and 10826 c.m. Srpski Itebej.

The developer has obtained the Decision on the approval of the execution of works No 143-351-585/2017, ROP-PSUGZ-32314-ISAWHA-1/2017 of 22 November 2017 and Preliminary designs related to repairing, developed by the company Hidroprojekt Zrenjanin doo in February 2016.

TECHNICAL BUILDING

The facility comprises only a ground floor. Under a part of the ground floor there is a basement. Its shape is rectangular and the dimensions are 14.47m x 11.22m. The structure of the basement is vaulted. Above the ground floor there is a ceiling construction made of roof trusses, planks, cane and plaster. It is a gable roof with the double hangers system with ties above the joist hangers above the roof trusses. The roof cover consists of interlocking roof tiles.

Functions

The spot elevation of the ground floor is distanced 125cm from the surrounding terrain so that the ground floor is accessible through the external staircase. The clear height of the rooms is around 370cm. There is a side entrance of the facility to the west and a front entrance to the south.

The facility consists of several offices, a sanitary block and other facilities along with a kitchenette.

Roof repairing covers the disassembly of the roof cover which consists of interlocking roof tiles and roof laths along all elements of the roof edge and gutters. All the damaged and rotten parts of the roof construction are disassembled. This refers to the principal rafters as well as to tie beams which were shortened before and which should be replaced. The chimneys are to be demolished and reconstructed on the same brick position.

All damaged and disassembled parts of the roof construction are to be made of the coniferous timber of II quality class. Undamaged rafters which are disassembled due to the tie beams replacement technology are reused. New visible wooden elements are profiled according to the existing profiling. Overall roof structure and wooden deck frame are to be coated with an insect and fungus protection agent according to the manufacturer's instructions 2-3 times. The rafters are levelled and covered by 2.5 cm thick plunks, over which steam-permeable and water-permeable foil is placed and fastened with 5x5 cm sticks in the direction of rafters. Depending on the choice of interlocking roof tiles the lathes are nailed down of 5x3cm upon the instruction. There are unbalanced snow loadings integrated in the roof construction. Tin roof edges and gutters are constructed of steel galvanized sheet metal.

Complete construction of the floor is planned, with the creation of space for the construction of a new, thick structure with hydro and thermal insulation. An internal excavation of the outer walls of the conference hall up to a level of the field in the width of min 60 cm and the creation of a workbench for walls cutting is a part of this operational item. Cutting these walls from capillary moisture should be done at a level of about 20 cm from the ground so that there remain 14 rows of facade brick on the building socle. Below the water insulation the dilapidated wall of min 50cm height is to be demolished and replaced by reinforced concrete, which will in this case enter min 30cm below the ground. Reinforced concrete is to be drawn in from the outer side of the wall 5cm for

adaptation of the socle. XPS plates with the thickness of 4cm, with final processing of mass called kulirplast will be applied on the plinth by glueing.

The entire cutting operation is to be performed in sections at max. 1.00m in order to avoid collapsing of the wall. The continuity of reinforced concrete is to be achieved by leaving the appropriate anchor plate nuts. Water insulation of water repellent glass wool strips of 4mm thickness, with adequate coatings. Welded overlaps are of 10 cm at least. This also refers to welded overlap and joint with vertical insulation of the wall so that the width of the water repellent strip increases 10 cm into the inner space in relation to the thickness of the upper part of the wall. The grout area above the water insulation on the facade side must be injected with cement emulsion under pressure, due to the establishment of static stability and taking care of the aesthetics of facade brick. All the dilapidate bricks must be replaced with adequate and similar. There are no aesthetic requirements in the inside area and more attention is to be paid to the wall's firmness at wall underpinning.

Vertical water insulation of the plinth wall is to be done by glueing repellent glass wool strips of 4mm thickness onto the firm and flat surface of the inside area of the wall. Before applying the water insulation onto the wall, the wall must be cleaned and levelled by partial concrete removal, by building an extension or by plastering, depending on the humps on the wall. Protect the vertical water insulation with the shiner brick leaning on the new reinforced concrete.

Horizontal water insulation of the inner walls is done cutting at the level of 20cm below the level of the constructed floor. This is also performed in sections. Below the water insulation a concrete padstone should be constructed about 10 cm above the reinforced concrete for making available a flat surface for water insulation. The width of the water repellent strip is to be increased 10 cm due to the overlap with the water insulation of the floor.

The floor structure is made of a layer of gravel, reinforced concrete slabs and water insulation over a plate which is at -20cm level. The continuity of water insulation with the 10 cm overlap and welding with vertical water insulation of the plinth wall and inner walls.

Cutting or any water insulation of these walls above the basement will not be performed at this situation stage except for water insulation of the floors and inner walls at -20 cm level.

Thermal insulation is to be installed in the floor from EPS plates 10cm thick, of 30kg / m3 min density, PVC foil is to be set and cement screeds 6cm thick, Shults steel reinforcement frames with overlaps or synthetic fibres. In the contact between the screed and the wall, a section from EPS plates 1cm thick (floating floor) is to be installed.

The final floor is made of ceramic and granite tiles in glue. The plinth of 10cm height is performed on the wall.

Water insulation of the basement will be performed on the well cleaned and prepared walls on the inner side of walls with mass that penetrates into walls from the manufacturers Bauplus, Texal or similar ones upon the manufacturer's instructions.

Crumbly mortar on interior and exterior walls cracks, and grouts are to be cleaned to the depth of 2cm. Mortar should be stripped off and at mere chase cutting for electrical wiring and the installation of water supply and sewerage. By plastering the straight transition between the old and new mortar is to be achieved. There is a partial drifting of these surfaces.

The treatment of interior walls and partially of the ceiling is done in semi-dispersible colours of light shades.

In the sanitary blocks there are beautiful ceramic tiles high up to 210 cm and in the kitchenette, behind the kitchen elements there are tiles up to 150 cm high.

The ceiling of plaster performed by casting plaster of cane is to be disassembled on the whole facility. All the layers between the ceiling joist are demolished. The new ceiling of two layers of 12.5mm thick plasterboard plates is performed on the substructure of CD / UD profile. Thermal insulation made of mineral wool, 20cm thick with steam protection from below and water vapor permeable waterproof foil is placed between the ceiling joists.

In the conference room, the ceiling of 60x60cm in height made of mineral panels of “armstrong” type or similar one is to be lowered. Lighting fixtures are installed in the ceiling. The necessary electrical installations are performed in the cavity of the ceiling. In the other rooms, a new suspended ceiling composed of 12.5mm thick plasterboard on the metal sub-structure of the CD / UD profile is lowered. The necessary electrical installations are performed in the cavity of the ceiling. The ceiling profiles are secured to the ceiling at the places of the existing ceiling joists. Lighting bodies in these rooms are superstructural.

The windows are double, wooden, alike the existing ones, with all the leaves opening inside and the windows are installed for half of a brick towards the inside from the outer surface of the facade. Glazing of the outer window leaves performed by double thermal insulation with glass of Ug≤1.30W / m2K, and internal single glass of 4mm thickness. Alike the existing ones on the inside there are foldable solid wood shutters constructed and assembled. Installation should be carried out with stainless steel joints and sealed with polyurethane foam.

The interior doors are solid wooden, profiled. The detailed reparation and bringing into a functional state is necessary to perform. The old paint is to be stripped of by shingles and burning with hot air. Surface treatment is to be performed by drilling and sanding to the smooth fine surface. Nonfunctional fittings are to be replaced by adequate or similar ones, which in particular refers to the door handles. Broken glass is to be replaced with adequate one, also possibly rotten parts of wood are to be replaced too.

Electrical Installations

Elimination of all the shortcomings in the existing internal electrical and strong power supply is planned, so that the new electrical installation is to be practically performed in Notes 4 and 5.

Plumbing and drainage

The complete replacement of the existing installation is planned along with monitoring of the architectural solution of the layout of sanitary facilities. For installations routing the old route is to be used at the greatest extent.

Procurement and installation of water pipes made of crosslinked polyethylene with all required fittings within the piping network. The sewage installation is made of polypropylene sewage pipes.

All new sanitary equipment is specified in the Bill of Quantities.

Heating

The structure is not heated because it is not used in the winter period, so pursuant to Article 7, paragraph 1, point 8 of the Rulebook on the conditions, content and method of issuing Certificate of energy properties (Official Gazette of RS No. 69/2012) for this structure it is not necessary to obtain an energy passport and, therefore, the developing of the Energy Efficiency Study, according to the Energy Efficiency of Buildings (Official Gazette of RS No. 61/2011).

For an occasional use of the facility in the transitional period late autumn and early spring, the electric panel radiators are installed on the parapets.

Ventilation

All rooms have windows and, therefore, natural ventilation apart from sanitary blocks. Ventilation of these rooms is artificial, designed so that PVC pipes Ø110mm and with built-in fans perform the function of ventilation.

Facility equipment

The structure is fully equipped with furniture provided by the domestic furniture manufacturer, specified in Bill of Quantities of equipment and furniture.

VOLUME 3.2 TECHNICAL DESCRIPTION OF CONSTRUCTION WORKS ON THE SHIP LOCK

3.2.1. CURRENT STATE

The hydrotechnical complex of the canal lock in Srpski Itebej was constructed between 1910 and 1912, consisting of the canal lock chamber and the structures of the technical building, workshop, residential building and auxiliary facilities.
At the end of the 1960s, navigation through the canal was suspended which reduced the maintenance activities on the canal and the associated hydrotechnical structures, resulting in the current poor state of the structures.

Srpski Itebej canal lock and floodgate is located on the Navigable Begej canal, near the village of Srpski Itebej, at the chainage km 28+970, near the border between Serbia and Romania.

The canal lock chamber is 10 m wide and 90 m long in total (including gates and lock pounds), with 5.8 m high walls. The crown of the wall is at the elevation of 81.20 m.a.s.l., while the bottom of the chamber is at the elevation of 75.40 m.a.s.l. The walls are made of watertight yellow clinker brick which is in rather poor condition. Visible parts of the chamber walls have suffered brick damage and also surface brick degradation. In addition, the wall lining made of solid brick in the upper segment of the right wall has been displaced from the designed position in several places.

The most severe damage to the canal lock walls has been found in the upstream segment, between the pier and the floodgate. The damage is of such an extent that the entire wall with its lower part under water even at a minimum water level needs to be repaired.

Concrete pathways on the canal lock walls have fractures in several places, especially in the wall area within the upstream segment, between the pier and the floodgate. The manhole located in the area has cracked in its upper segment, while the support frame for the manhole cover is broken.

The steel pedestrian bridge across the Navigable Begej canal is located upstream from the floodgate, in its immediate vicinity. The bridge has a box section; it is 1 m wide, spanning 25 m. There is no project documentation for this bridge. The bridge bearing and supports are made of steel sections. The left support is on the right wall of the canal lock chamber, while the right one is on the abutment on the right bank of the canal. Due to the extensive damage to the canal lock wall, between the pier and the floodgate, the left support of the bridge has suffered subsidence.

The pier is made of steel frames, constructed of steel sections. Frame posts are driven into the channel of the canal. Three steel U-sections are installed over the frames to support the pathway made of wooden pallets. The pathway is dilapidated, and it is very dangerous to walk along it. Longitudinal sections - pathway supports are corroded and bent. Steel frames have suffered considerable damage due to corrosion.

The linings of the canal slopes are constructed of stone.

Wooden fender beams in the canal lock and on the pier have rotted away significantly.

PHOTOGRAPHS OF THE CURRENT STATE

Damaged right wall of the canal lock chamber

Damaged left wall of the canal lock chamber

Damaged wall from the pier to the floodgate

Damaged wall from the pier to the floodgate at a lower water level

Damaged wall from the pier to the floodgate at a lower water level - close-up

Damaged bank wall at the right bridge support


Damaged pathway on the right wall of the canal lock

Damaged pathway on the right wall of the canal lock, in the area of the damaged wall from the pier to the floodgate

Subsidence of the left support of the pedestrian bridge on the canal lock wall - upstream view

Subsidence of the left support of the pedestrian bridge on the canal lock wall - downstream view

Damaged pier

Damaged pier - close-up

Damaged bank revetment

3.2.2. SCOPE OF WORKS

Repair of the canal lock includes the following groups of works:

1. PREPARATORY WORKS
2. DISASSEMBLY AND DEMOLITION WORKS
3. EARTHWORKS INCLUDING CONSTRUCTION OF ACCESS ROADS AND HANDLING PLATFORMS
4. CONCRETE WORKS
5. MASONRY WORKS
6. REINFORCING STEEL WORKS
7. INSULATION WORKS
8. CARPENTRY
9. METALWORK
10. OTHER WORKS

11. PREPARATION OF THE DESIGN OF THE CONSTRUCTED FACILITY

The following are the functional parts of the canal lock where repair works are planned to be carried out:

- CANAL LOCK CHAMBER
- THE WALL ON THE UPSTREAM SECTION OF THE BEGEJ, BETWEEN THE PIER AND THE FLOODGATE
- PATHWAYS ON THE CANAL LOCK WALLS
- PIER (upstream access dock for conducting ships into the canal lock chamber)
- SUPPORTS OF THE PEDESTRIAN BRIDGE ACROSS THE BEGEJ
- BANK REVETMENTS
- FLOODGATE SILL MODEL
- FENCE AND GATES OF THE COMPLEX

3.2.3. DESCRIPTION OF WORKS

1. PREPARATORY WORKS

In order to carry out canal lock chamber repair works, it is necessary to undertake onshore works including:

- Installation of stop logs in front of the upstream and behind the downstream canal lock gates
- Water pumping from the canal lock chamber
- Cleaning the chamber bottom of deposits and sludge

In order to execute the pier and bank revetment repair works, a lower water level of the Begej is recommended (min. elevation 77.80 m.a.s.l.). At this water level and in the case, there is no water in the canal lock chamber, the structure may not be safe against sliding. Since there is no project documentation, it is necessary to monitor the facility and the groundwater level. Accordingly, the design includes installation of 2 piezometers along the bank (left) wall of the canal lock to monitor the groundwater level, and it also includes construction of drainage wells along the bank wall of the canal lock chamber. It is planned to construct 4 wells, with a 225 mm diameter and 20 m long. The wells should be spaced 25 m apart and positioned 5 m from the bank wall of the chamber. It is assumed that water will be pumped over a period of 90 days, i.e. the period assumed to be required to execute the repair works on the chamber.
NOTE: Stability calculations for the canal lock chamber have not been performed since the structure was built between 1910 and 1912 and it is not provided with the project documentation.
In order to perform the repair works on the Begej floodgate, the design also includes cleaning of the river bed in the area of the floodgate (in the length of 100 m and width of 30 m of the Begej, assuming that the sludge layer is 0.50 m).
It is planned to use scaffolding to carry out the works to repair the walls of the canal lock chamber.
For the purpose of repairing the wall from the upstream side of the Begej, in the section between the pier and the floodgate, the design includes building of a cofferdam made of two rows of sand-filled Jumbo bags. It is planned to place PVC film between the bags. After the cofferdam is built, the water is planned to be pumped using a mud pump to ensure dry repair works on the wall, in its full height.
The works to repair the pier, depending on the water level of the Begej, are to be carried out either from a vessel or from scaffolding.

2. DISASSEMBLY AND DEMOLITION WORKS

The design for repair works includes disassembly of the following elements:

- Wooden fender beams in the canal lock chamber and on the pillars of the pier
- Wooden pallets on the pathway of the pier
- Steel elements of the pier (frames and longitudinal sections of the pathway)
- Damaged steel supports of manhole covers
- The fence and gates of the entire complex

Demolition works include the following:

- Demolition of damaged and displaced sections of the chamber walls made of watertight solid brick
- Demolition of damaged sections of the walls between the pier and the floodgate
- Demolition of the concrete pathway on the canal lock walls
- Demolition of upper brick layers on the walls of the right abutment of the bridge across the Begej
- Demolition of a section of the reinforced concrete manhole on the right upstream pound of the canal lock
- Demolition of the brick fence wall of the complex (the wall is made of brick laid as shiners between concrete posts)

3. EARTHWORKS INCLUDING CONSTRUCTION OF AN ACCESS ROAD AND HANDLING PLATFORMS

Planned earthworks include manual excavation of soil during repair of access pavements. An access road is planned to be constructed, 134 m long and 3 m wide. The access road is to connect the existing route on the left bank of the complex of the hydrotechnical node of Srpski Itebej with the left bank of the canal lock, including construction of two handling platforms measuring 20x12 m each. Next to each of the handling platforms, the plan is to additionally construct a smaller platform, measuring 11.40x6.40 m, to store stop logs.
The access road structure consists of the following: 30 cm of sand, 20 cm of crushed stone aggregate 0-63 mm and 10 cm of crushed stone aggregate 0-31.5 mm; total thickness 60 cm.
The handling platform structure consists of the following: 40 cm of sand, 25 cm of crushed stone aggregate 0-63 mm and 10 cm of crushed stone aggregate 0-31.5 mm; total thickness 75 cm.
The site where access roads and handling platforms are to be constructed is occupied by green space, thus the design includes three cutting and stump removal. While performing site layout survey in the field, ensure that the routes of access roads and handling platform locations are positioned so as to require minimum tree cutting.

4. CONCRETE WORKS

The design for repair works includes the following concrete works:

- Concreting of pathways on the canal lock walls
- Concreting of access pavements
- Concreting of the reinforced concrete manhole on the right upstream pound of the canal lock
- Concreting the reinforced concrete footing of the bridge support on the canal lock wall
- Concreting of the floodgate sill model on the right bank (in front of the workshop, next to the spare floodgate frames)

5. MASONRY WORKS

Before masonry works to repair the chamber, the wall between the pier and the floodgate and also the wall of the right abutment, it is necessary to pressure wash the surfaces, using an HD device.
After the cleaning, the following works are to be carried out:

- Building of removed segments of chamber walls using watertight solid brick
- Building of the removed wall between the pier and the floodgate using solid brick, watertight solid brick and dressed stone
- Building of upper brick layers on the walls of the right abutment of the bridge across the Begej
- Jointing of the canal lock chamber walls, the wall between the pier and the floodgate and the walls of the right abutment
- Repair of the enrockment under the pier
- Plastering of the fence walls made of brick (the fence in front of the facilities within the complex of the hydrotechnical node)
- Construction and installation of the fence and gates made of galvanized steel pipes and plasticized mesh, 2 m and 1 m high (in the section of the brick fence wall), around the entire complex

6. REINFORCING STEEL WORKS

The design includes reinforcing upon repairing of the manhole on the upstream pound of the canal lock. The manhole is to be reinforced using reinforcing mesh which at the corners should be connected with reinforcing steel Ø10, B500B.

7. INSULATION WORKS

The design includes application of a transparent hydrophobic coating to the walls of the canal lock chamber, the wall between the pier and the floodgate and also the walls of the right abutment of the bridge across the Begej. The coating can be applied by spraying, in two layers.

8. CARPENTRY

The design includes installation of new wooden fenders on the walls of the canal lock chamber and the pillars of the pier. The fenders should be made of dry pine timber measuring 30x30/400 cm in the canal lock chamber and 20x20/350 cm on the pillars of the pier.

9. METALWORK

Metalwork includes:

- Manufacturing and installation of steel frames (pillars) of the pier
- Manufacturing and installation of pathway supports on the pier, made of steel sections U100
- Manufacturing and installation of pathway treads on the pier, made of hot-dip galvanized grid treads (platforms)
- Repair of the steel fence on the wall of the canal lock and the pier
- Repair of manhole covers, cover supports and other metal elements
- Repair of step irons (fixed ladders) in the canal lock chambers
- Lifting of the structure of the bridge across the Begej using a hydraulic press (estimated bridge weight is 9350 kg), using temporary supports
- Manufacturing and installation of new supports for the bridge across the Begej
- Painting of the box structure of the bridge across the Begej, bridge fence and pathway, including base preparation, priming and application of two layers of a paint for metal surfaces

- Threshold lining at the canal lock chamber gate
- Lock gate upper bearing recess
- Recess with gate side support
- Lining of the vertical edge at gate recess
- Stop log threshold
- Lining of the stop log recess

10. OTHER WORKS

Other works include the previously mentioned installation of 2 piezometers for monitoring the groundwater level, and also repair of the stone cladding of the bank revetment.

11. PREPARATION OF THE DESIGN OF THE CONSTRUCTED FACILITY

Having completed the works, the Contractor is to prepare the Design of the Constructed Facility in case that, during the performance of works, there were changes compared to the design solution provided in the Performing Design.

NOTES: The use of most of the repair materials is limited by the base and ambient temperature requirements, specified by the Manufacturer, ranging from +5ºC to +30ºC. Accordingly, the Designer recommends that the repair works be carried out in the period when the expected temperature corresponds with the specified one so as to avoid performing works of lower quality.

- The works to repair the canal lock gates, mechanical equipment and floodgate are included in the mechanical engineering section of the Performing Design (Book 6).
- The works to repair the facilities within the hydrotechnical node of Klek (technical building, workshop, residential facility and shed) are included in the architectural engineering section of the Performing Design (Book 1).

VOLUME 3.3 TECHNICAL DESCRIPTION OF ELECTRICAL WORKS ON REHABLITATION OF HC SRPSKI ITEBEJ

3.3.1. GENERAL PROVISIONS

Pursuant to the ToR, and based on the bases and data from the construction and mechanical designs, the following parts of the complex are developed under this design of electrical installations for the **Rehabilitation of Srpski Itebej hydroengineering complex:**

Ancillary facilities:

- Technical building;
- Lighting of hydraulic power system;
- Marking of waterways;
- STS power facility.

The following electrical installations are described:

- Cable connection boxes (CCB), measuring point cabinets (MPC), main distribution cabinets (MDC) and distribution cabinets (DC) of sub- distribution for the supply of consumers;
- Interior installations of general electrical lightning;
- Exterior installations of electrical lightning and light signals of hydraulic power system;
- Installations of "panic" lighting on main communications and exits;
- Installation of mono-phase and tree-phase Schuko sockets;
- Installation of earthing, potential equilization and lightning protection of buildings.

The technical solutions envisaged by this design are in compliance with the valid SRPS, IEC and ISO standards, other applicable technical regulations for this area and good engineering practice.

3.3.2. DESCRIPTION OF CURRENT CONDITION OF POWER INSTALLATIONS OF HYDRO-ENGINEERING COMPLEX

3.3.2.1. Technical building

The building was built at the beginning of the twentieth century. It remained unchanged until present, except that electrification of the building was carried out in the mid-1970s. The power supply for the consumers in the building is provided from the MDC located inside the building. MDC is supplied from the cable connection box CCB-2, which is located on the facade of the building. CCB-2 is supplied from the pole-mounted substation STS20/10/0.4 kV/kV/kV, 50 kVA in whose low voltage distribution cabinet there is a measuring group for measurement of electricity consumption. The electrical installation of the building was maintained only in the part of the building that was used as an office, and only within the scope of regular maintenance. It is necessary to replace the complete cable distribution and adjust the installation to the actual needs of the users in the building. Electrical installation equipment is partly broken, worn out, and its complete replacement is necessary. Existing lights in the building are of poor lighting characteristics, defective, unsafe and need to be completely replaced. There is a classical lightning installation on the building, in the form of a Faraday Cage, with four down lead conductors and measuring points, which is out of function.

3.3.2.2. Lighting of hydraulic power system

Exterior lighting is carried out on the right side of the river Begej bank, along the existing road between the facilities on the hydraulic power system and the ship lock, with six lighting poles equipped with lamps with sodium high pressure lightbulbs. On the left side of the river Begej there is no lighting installed on the hydraulic power system.

3.3.2.3. Marking of waterways

Marking of waterways has not been installed.

3.3. NEWLY DESIGNED INSTALLATIONS

3.3.1.TECHNICAL BUILDING

Building power supply

The basic power supply of the building will be provided from the public electric distribution network of medium voltage (20/10kV/kV), from the pole-mounted substation 20/10/0.4 kV/kV/kV, with the power of 50kVA.

The measurement of the power consumption is provided by existing, three-phase active electronic meter located in the NN box of STS.

Distribution cabinets

The main distribution cabinet MDC (power supply from CCB-2) is located in the building and it supplies all consumers in the building. The outdoor lighting cabinet DC-SR (power supply from CCB-2) is located in the staircase area and it supplies power to the lighting of the hydraulic power system - the left and right banks of the Begej river and the marking of waterways of the ship lock.

The cabinet housings are made of polyester, in IP54 protection.

Electrical installations of interior lighting

The present design of the administrative building reconstruction of the hydroengineering complex in Srpski Itebej foresees the dismantling and replacement of existing worn-out lamps and installation switches with new ones.

The lighting of individual rooms is envisaged by means of adequate installation of lighting points with above-fitted fluorescent lamps. In the ancillary rooms, lamps with bulbs with wire filaments and fluo compact are envisaged.

Lighting installation is performed by cables of type N2XH 2,3,4 ×1.5mm², in the wall and ceiling, under mortar.

Activation of the lighting is by means of a single-pole installation switch of “in wall” type.

For panic lighting of escape routes and exits, the lamps with their own source of power supply (Ni-Cd batteries), automatic charging and automatic switch-on in the event of a power outage shall be foreseen. These lamps are above fitted with a 1×8W bulb, autonomy 3h, similar to the type BPN P 108, IP40, Buck.The installation of panic lighting provides passage of communications to the exit from the building, in case of a need for evacuation and voltage failure, and they should be provided with stickers with direction markings to the nearest exit and exit signs.

Electrical installations of sockets and plugs

The present design of the administrative building reconstruction of the hydroengineering complex in Srpski Itebej foresees the dismantling and replacement of existing worn-out lamps installation sockets with new ones. The sockets have been selected and fitted according to the conditions of the site where they are being mounted.

Electrical distribution for the purpose of installation of mono-phase sockets is foreseen by means of cables of type N2XH 3×2.5mm², placed in the wall, under the mortar.

Electrical distribution for the purpose of installation of three-phase five-pole sockets is foreseen by means of cables of type N2XH 5×2.5mm², placed in the wall, under the mortar.

The sockets are installed at a height of 0.5m from the floor level.

Lightning protection of facilities

The existing lightning installation of the administrative building will be disassembled during the reconstruction of the roof covering, roof structure and facade, and the design foresees its complete replacement.

The new lightning installation has been implemented in accordance with PTN 11/96 and valid SRPS standards for this type of works. In order to protect the buildings from lightning, a protection levels has been selected in advance according to SRPS IEC 1024-1-1, and for the

adopted level of protection, a lightning protection installation consisting of an earthing system, a system of down lead conductors and a reception system has been designed.

Earthing system:

A standard lightning installation has been designed for the building with the following characteristics: for accepting the lightning electricity discharge, a ground ring made of galvanized steel strip Fe-Zn 25×4mm steel strip, which is laid in a trench, at a distance of 1.5 m from the building and at a depth of 0.8 m is foreseen. This type of earth electrode is of type "B" according to IEC SRPS 1024-1, point 2.3.3.2 .. The manufacturing of ground wires from the earth electrode to the test joint and metallic components is envisaged by the Fe-Zn 25x4mm band, and the joints of the earth tape and ground wire are fitted by standard cross-run clamps in the ground, which are filled with bitumen.

The system of down lead conductors:

Four down lead conductors have been provided for the routing of the lightning discharge. The down lead conductors are fitted with galvanized Fe-Zn 20×3mm band, on adequate supports, across the facade of the building. At the very end of a vertical lightning conductor, down lead, and at a height of 1.75m from the ground level, a measuring joint is fitted according to standards and norms, overlapping, and this point is to be secured by a cross-run plate of type P SRPS N.B4.936. At the bottom, towards the earth electrode, an earth leakage is used, a steel galvanized strip Fe-Zn 25x4mm, length 4.5m. A ground wire strip (P 25×4 SRPS N.B4.901 Č) to the level of the measuring joint on the facade of the building shall be mechanically protected by a galvanized section A 40×40× 51500 SRPS N.B4.913 P.

Reception system:

For the reception system lightning protection installations, the natural components of the steel galvanized sheet with more than 0.5mm thickness are partially used, and partially galvanized Fe-Zn 20x3mm strip for the ills and slopes of the roof on the adequate supports at a distance of 1m between each other. The joints of the reception system strip are fitted with standard cross-run clamps. The width of the reception system installation mesh sieve is in accordance with the general requirements of SRPS IEC 1024-1.

Protection against electric shock

Power supply system in terms of earthing (JUS N. B2.730) is TN-C-S. The functions of neutral and protective conductors is only integrated in the part of the system to the main power supply points, and further down it is separated throughout the installation. All built-in equipment shall comply with the standard SRPS N.B2.741 in regards to the protection against direct contact and with other standards that apply to that type of equipment.

Protection against electric shock is provided by automatic power outage in case of failure, by means of the prescribed protection devices of the differential current ZUDS according to SRPS N.B2.741. The zinc-coated strip Fe-Zn 25x4mm is supplied to the main GPU earthing terminal, in a standard box, with the SIP bus mounted at the CCB-2.

The main potential equalization is provided by connecting all metal components of non-electrical installations at the entrance to the building, by P-Y 1×16 mm² conductor and adequate bonding material.

After the completion of the works, the contractor shall perform measurement of grounding resistance, loop resistance and check the continuity of the protective conductor on all protected circuits and shall perform the equipotential check.

3.3.2. LIGHTING OF HYDRAULIC POWER SYSTEM

Lights

The lights intended to replace the existing ones and for the lighting of the hydraulic power system are light for urban surroundings with aluminium alloy housing under pressure, protector and polycarbonate cover, mirror electropolished and anode protected aluminium high-purity

and control gear, of the type K-LUX/1640/100 MINEL SCHREDER, with high pressure sodium lamp 100W, 230V, 50Hz, under protection IP66 and IK09.

Light poles

Replacement and installation of conic light poles, 4m high, Ø60mm on pole tope with the base of min. 400×400×10mm, with Ø90mm opening, protected by warm internal and external zinc plating and additional anti-corrosion protection up to 40cm above the foundation base is foreseen. The pole shall be equipped with:

- carrier and connection panel RPO-4;
- fuse FRA 16/6A or automatic switch B 6A, 1 piece;
- power supply cable for lamp PP00-Y 3×1.5mm², 4m;
- zinc bolt for earthing and inside the pole and on the pole;
- cover with a red arrow (lighting symbol);
- protection of connection area from rain and
- ordinal number of the pole.

Power supply cables

The installation of the lighting on the hydraulic power system will be supplied by power provided from the public electric distribution network of medium voltage (20/10 kV/kV), from the pole-mounted substation 20/10/0.4kV/kV/kV, with the power of 50kVA.

According to the design, the lighting is powered from the DC-SR, located in the administrative building, and will be manually activated by a switch from the switchboard and automatically via a time-programmer. Power cables are the type PP00-Y 5x16mm^2, according to the principle of the input/output, and for the left and right banks of the river Begej.

The cables for outdoor lighting are laid in a cable trench measuring 0.4 x 0.8 m. At crossing points with other installations, it is envisaged to lay protective PVC pipes in advance. The pipes are of nominal diameter Ø50mm.

For the purpose of powering the lighting poles on the left side of the Begej, the power cable goes from the right to the left side of the Begej, the drilling will be carried out under the river bed and adequate protective tubes will be placed.

Protection against direct contact voltage is carried out in such a way that all live parts are in the pole, on an insulated panel or in a lamp that is positioned at such a height that it can not be reached by unauthorized persons.

On the pole there is an aperture for the connection to the connection board, which is closed by a sealed cover. The cover is fixed with a cap screw.

Protection against indirect contact voltage is foreseen by the same system as for the entire complex.

Additional lightning protection is foreseen. The Fe/Zn 25x4mm strip shall be laid in the same trench, parallel to the cables of the exterior lighting.

3.3.3. MARKING OF WATERWAYS

Traffic lights

Traffic lights signalization is foreseen in accordance with applicable regulations on inland waterways navigation. It consists of optical signals formed by red and green lights. It is implemented with input and output traffic lights, one per each unit. The traffic lights consist of a single two-part driver lantern. A two-part lantern consists of one red and one green light.

Traffic lights pole

Traffic lights are fitted on the pole, 3.2m high, Ø60mm on pole top with the base of min. 400×400×10mm, with Ø90mm opening, protected by warm internal and external zinc plating and additional anti-corrosion protection up to 40cm above the foundation base.

Power supply cables

The basic power supply will be provided from the public electric distribution network of medium voltage (20/10kV/kV), from the pole-mounted substation 20/10/0.4kV/kV/kV, with the power of 50kVA. The distribution cabinet of the traffic lights (DC-Semafor) is powered from DC-SR, located in the administrative building, with a cable of type PP00-Y 3x4mm^2. The housing of the distribution cabinet is made of steel sheet metal protected with anti-corrosion paint. The housing has a door, lock and a key. Envisaged in the cabinet is the construction for carrying equipment made of perforated profiles. Placed above the equipment is a protective plate.

According to the design, the traffic lights at the upstream and downstream entrance into the ship lock shall be manually operated, with a switch, from the distribution cabinet DC-Semafor.

The cables for the power supply of traffic lights are laid in a cable trench measuring 0.4x0.8 m. At crossing points with other installations, it is envisaged to lay protective PVC pipes in advance. The pipes are of nominal diameter Ø50mm.

For the purpose of power supply of the lighting signalization, a power cable goes from the right to the left side of the river Begej, i.e. the cable, along with the power cable of the hydraulic power system lighting on the left side of the Begej is laid under the riverbed, through a protective tube.

Protection against direct contact voltage is carried out in such a way that all live parts are in the pole, on an insulated panel or in a traffic light that is positioned at such a height that it can not be reached by unauthorized persons. On the pole there is an aperture for the connection to the connection board, which is closed by a sealed cover. The cover is fixed with a cap screw.

Protection against indirect contact voltage is foreseen by the same system as for the entire complex.

Additional lightning protection is foreseen. The Fe/Zn 25x4mm strip shall be laid in the same trench, parallel to the cables of the traffic lights.

3.3.4. POLE-MOUNTED SUBSTATION STS 20/10/0.4kV/kV/kv, 50kVA

The hydroengineering complex will be supplied by power from the public electric distribution network of medium voltage (20/10 kV/kV), from the pole-mounted substation 20/10/0.4kV/kV/kV, with the power of 50kVA.

Judging by its condition, no investments have been made in the energy facility for a long period of time. Revision of the transformer station should be carried out for the purpose of the regular operation of the pole-mounted substation and regular and continuous supply of electric power. Based on the revision a complete report will be prepared with expert findings and with the measures required for rehabilitation of equipment.

Works on the revision of the energy facility would include the following:

1. Inspection obligation

Rulebook on technical norms for operation and maintenance of electric power facilities and lines (Official Gazette of SRY 41/93).

2. Manner of inspection

1) Rulebook on technical norms for electric power facilities with nominal voltage over 1000V (Official Gazette of SFRY 4/74);
2) Rulebook on technical norms for fire protection of electric power facilities and devices (Official Gazette of SFRY 74/90) and
3) Rulebook on technical norms for electric power facilities with nominal voltage over 1000V (Official Gazette of SFRY 61/95) and
4) Rulebook on technical norms for protection of low voltage networks and accompanying transformer stations (Official Gazette of SFRY no. 13/78 and Official Gazette of SRY 37/95)

VOLUME 3.4
TECHNICAL SPECIFICATIONS - MECHANICAL WORKS
(SRPSKI ITEBEJ CANAL LOCK AND FLOODGATE)

3.4.1.CANAL LOCK

The design of the canal lock Srpski Itebej includes the manufacturing of parts, replacement/repairing of the following equipment parts:

- double-leaf doors with a driving mechanism,
- overhaul stop logs,
- ancillary equipment

Within this project's framework, several visits to the canal lock were conducted in order to determine the condition and dimensions of the hydromechanical equipment.

3.4.1.1.Short description of the canal lock

Srpski Itebej canal lock consists of the following parts: upper and lower double-door gates. It is a single-chamber lock. The opening and closing of the gates (doors) of the canal lock is operated manually by using manual mechanisms placed in the manholes adjacent to the walls of the lock. Lifting and lowering of the flashboards allowing the water to drain through the door are also carried out using manual mechanisms whose rack, with an operating handle, is mounted on the pedestrian walkway (platform) of the double doors. Both doors contain flashboards, while the possibility of water drainage for both doors is provided through tunnel channels on both sides of the lock.

Upper and lower gates

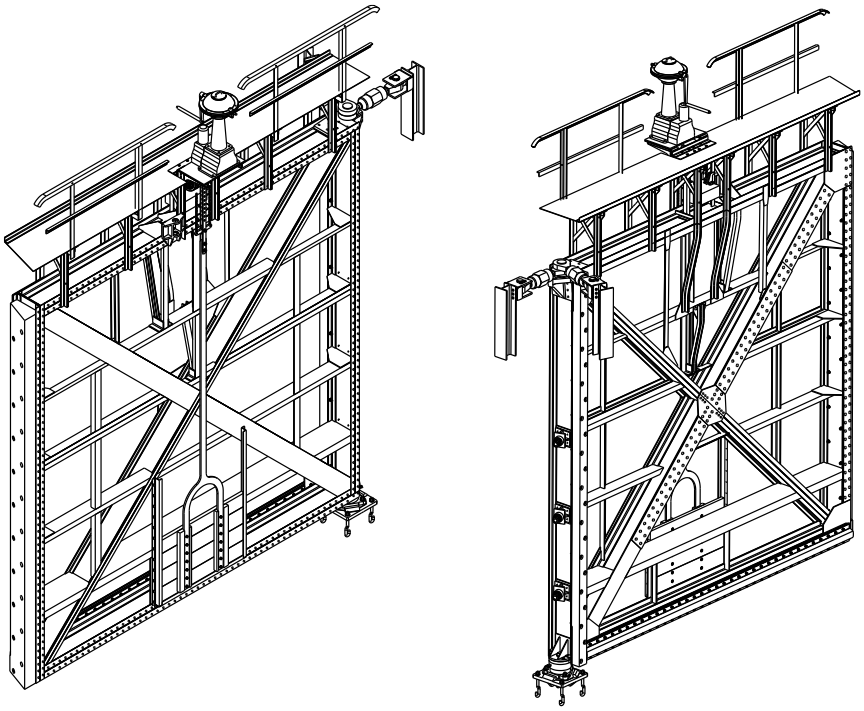
Both gates are constructed as double-door, with the seal levels in the closed position locking the angle of 70º in relation to the axis of the chamber, i.e. 140º between them. Since the gates were built in the period 1910 - 1912, the joining of structural elements of the gates (steel sheets, profiles, ...) was performed with rivets. Door leaf dimensions (LxHxW): 5950 x 5140 x 400 mm. The sealing on vertical joints with the concrete wall of the lock (chamber), with the concrete bottom of the chamber, as well as in the middle, i.e. on the joints of both leaves, is performed with impregnated oak beams. The lower and upper ends of both leaves next to the wall of the lock are lying on the bearings. The upper gate has been upgraded with a footpath made of ribbed steel sheets with a steel pipe fence, while the old footpath of wood boards is kept at the lower gate. In the lower parts of both door leaves, there are flashboards installed, one on each leaf, the opening of which allows the chamber to be filled with water, as well as the discharge of water from the chamber. The opening and closing of the gate is performed manually by means of a mechanism with gears that is used to operate a lever which is at one end connected to the gate. Each leaf has its own mechanism.

Water is let in through the upper and lower doors by means of dam diversion channels (tunnels) on both sides of the canal lock. Sealing parts for the flashboards on the tunnels are made of oak, while the opening and closing is designed to be manually activated. The activation is realized by means of two sprockets and chains tied to the counterbalance on one side, while on the other, an oak flashboard ("klinketa" in Serbian) is tied to them. The sides of the flashboards are outfitted with two wheels each for board handling. The position of the flashboards (open/closed) is registered on the column located in the immediate vicinity of the letting-in mechanism.

Based on the inspection of the doors by multiple visits to the site, detailed visual inspection and measurements on the part of the equipment and the structure that is located above the water level, it can be concluded that the sheets (formwork) and the supporting structure have visibly corroded. The supporting structure has partly corroded and partly deformed. Based on the assessment of the part of the gates under the water it is necessary to manufacture a new gate.

The new door is to have the identical geometric shape as the existing door. The loadbearing structure consists of standard sections lined on one side with steel gate plates. The sections of the loadbearing structure and steel gate plates are to be connected by welding. Where the existing solution has rivets in the visible part of the structure (above water), the connection is to be made by welding with high-quality setting (welding) of strips with rivets as a mask. This is the way to keep the same visual appearance of the doors. The upper door is defined in Drawing No. PUI-1.01.01.00.00.

Vital changes to the existing solution include changes in the upper and lower bearings, the method of door support in the niches, the niches themselves, which have been adapted to the new support and sealing, the threshold structure, horizontal sealing (rubber instead of oak beams) and flashboards where sealing is done using rubber on a stainless steel strip, L-section supports, with oak board infilling. All these changes have either no or negligible effect on the visual appearance of the new doors, compared to the existing doors.



Door Leaf

Lower and upper bearings of gate leaves

Each door leaf has two bearings. The upper radial bearing is mounted on the side concrete wall. The radial bearing is constructed as a cylindrical support.

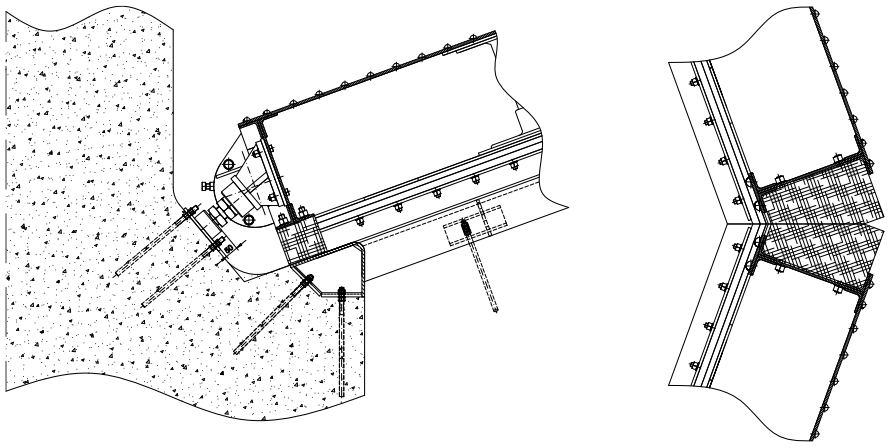
The lower bearing is axial (the hinge is a spherical calotte), which is intended to receive vertical (axial) force, as the dominant load. For the purpose of transferring the hydrostatic forces acting on the structure in the closed position of the door, the construction of the door leaf has been designed so to lean on the lateral concrete walls by means of an oak beam throughout the entire height of the door. In the open position (calm water - aligned pressures) the doors lean solely on bearings.

Based on the inspection of the existing condition of the upper bearings (located above the water level), by repeated visits to the site, detailed visual inspection of the structure, it has been concluded that it is necessary to replace them. On the occasion of door dismantling the actual condition of the lower bearings would be determined. However, in any case, due to their design in terms of being constantly under water and the unification, their replacement is envisaged.

Due to the unification of the bearings on the hydromechanical equipment of the entire hydraulic engineering system, it is necessary to replace the upper and lower bearings on the doors.

The drawings showing the solution for the upper bearing of the lower and upper doors are presented in Drawing No. PUI-1.01.01.02.00.

The application of this solution requires careful adjustment of the upper and lower bearings so as to ensure correct fitting of the support elements, arranged at the height of the side section of the doors in the niche, to receive lateral force when the doors are closed together with correct fitting of the vertical oak beams in the niche and between the doors that are used for sealing. The figure shows characteristic door leaning points.

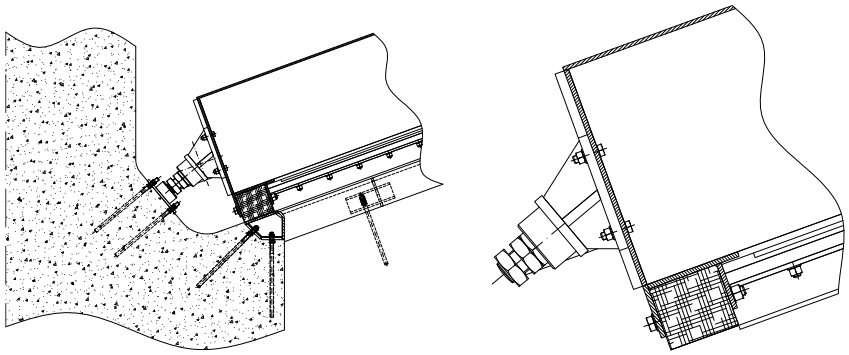


Characteristic door support and sealing points

The existing lower bearings are to be changed by the new solution in Drawing No. PUI-1.01.02.03.00, applied at several locks with double-leaf doors within the competence of PWMC Vode Vojvodine. The use of new bearings with a modern structure does not interfere with the appearance of the double-leaf door, as they are always under water.

Support and sealing elements in the door niche

The existing doors receive horizontal forces (when the doors are closed) via oak beams onto the concrete. The leaning of adjustable lateral supports is applied instead of wood, as shown in Drawing No. PUI-1.01.01.00.00. This solution does not affect the appearance of the gates, given that the supports are hidden in the door niche, both when the door leaves are open and closed. In addition, instead of sealing by having oak beams lean against the concrete, modern lateral sealing solutions involve leaning against stainless steel.



Support and sealing in the door niche

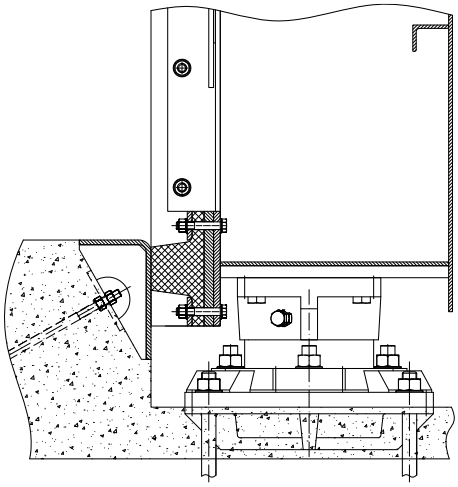
The existing lateral sealing in the door niche via an oak beam leaning against steel lining is to be kept.

Support and sealing between door leaves

When closed, the door leaves are mutually supported via oak beams, Drawing No. PUI-1.01.01.00.00 and PUI-1.01.01.01.00. The existing solution for the mutual support and sealing of door leaves via oak beams is to be kept.

Support and sealing at the door threshold

Given that this part of the door is always under water, sealing is possible by using structural rubber that can make high-quality connection with vertical oak beam seals on both lateral sides. The support and sealing solution for double-leaf doors is presented in Drawing No. PUI-1.01.01.01.00.



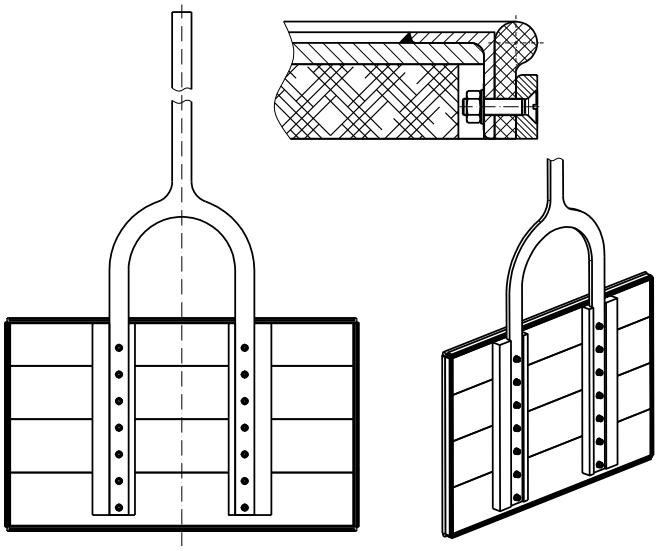
Sealing elements at the door threshold

Mechanisms for opening/closing of gates

The opening and closing of both leaves of all gates is done by means of hand-operated mechanisms. These are operated by means of two pairs of cylindrical gears and one pair of conical gears, and then the opening and closing of the door leaf is carried out by a gear rack. The complete mechanism is located in a niche in the immediate vicinity of the upper bearing. The same type of mechanism is used for both doors.
On the basis of detailed visual inspection and measurements it is concluded that the condition of the elements of the mechanism is satisfactory, so their repair is necessary (Drawing No. PUI-1.01.01.04.00).

Flashboards

Dimensions of the flashboards will be the same as those of the existing ones. Instead of originally wooden flashboards, these will be a combination of an L-section frame with the filling made of oak boards, while the sealing is done using rubber onto stainless steel. The steel frame is filled with oak boards fastened by screws to the steel frame sheets on one side, and on the other, to the arms of the vertical bar for flashboard lifting, in the same way as in the case of the original solution. The figure shows details of the new flashboard.

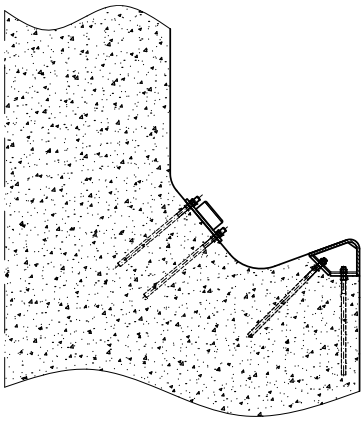


Lifting and lowering mechanism of the lock door flashboards

As in the case of the mechanism for closing and opening the doors, due to the visual appearance, manual operation of the mechanism for lifting and lowering the door flashboards is to be kept. Based on the inspection, it was found that the elements are in a satisfactory condition. The repair is estimated at 65% of the value of a new structure.

Door niches

The existing niches should be adjusted to the new solution for the door support and sealing.
NOTE: The part relating to the concreting and connection elements (stalks, anchor bolts, concrete composition and method of installation) is to be defined by construction experts.

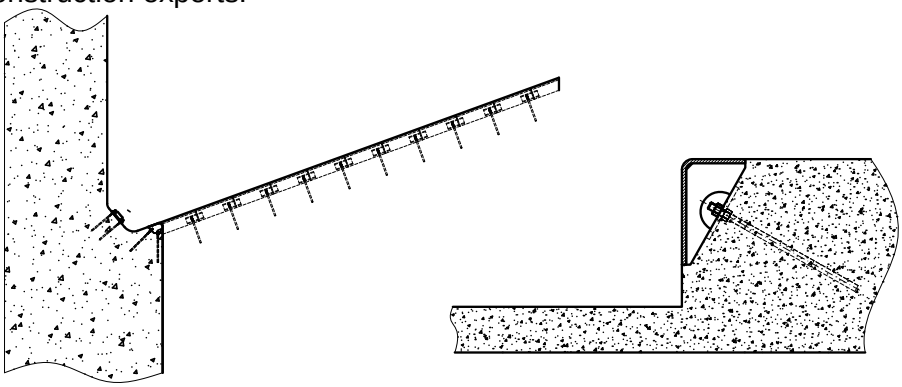


Door niche details

The door threshold

The existing thresholds are flashed with steel sheet and are adjusted, with the new concreting, to the new method of horizontal door sealing.

NOTE: As in the previous case, it should be noted that the part relating to the concreting and connection elements (stalks, anchor bolts, concrete composition and method of installation) is to be defined by construction experts.



Door threshold details

Stop logs

Completely the same as in the technical description of the stop logs for the Klek lock, except the numbers of drawings. The drawings relating to the stop logs of the S.Itebej lock are as follows:

- Drawing No. PUI-1.01.02.01.00;
- Drawing No. PUI-1.01.02.01.01;
- Drawing No. PUI-1.01.02.03.00;
- Drawing No. PUI-1.01.02.04.00;
- Drawing No. PUI-1.05.01.00.00;
- Drawing No. PUI-1.05.02.00.00.

3.4.2. FLOODGATE

The floodgate comprises frames (16 pcs.) over which flashboards are placed and perform sealing. The frames are interconnected by a chain that is used to lower or lift them either manually or by a mechanism (hand winch). Mechanism (hand winch) is fitted on the side of the floodgate (laterally). A modular bridge with rails for the movement of trolleys with a crane for mounting/demounting of the flashboards is placed over the frames.

Frames represent a grid steel structure and are placed at a distance of 1.25 m between each other. They are used as supports for flashboards, which are used to close or regulate the water flow by being inserted or taken out. In the wall of the floodgate towards the canal lock there is a niche in which the frames are laid when the floodgate is fully opened. The floodgate is fully opened before the start of the winter, by manually taking out the flashboards by means of an electric hoist with a trolley and transporting them to the warehouse for storing. The floodgate is once again lifted in the spring. The frames are articulated to the base plate and by rotating around the horizontal shaft at the bottom of the floodgate they roll towards the lock, with the first three frames entering the niche proportionally to their upper part.
Based on the inspection of the existing condition of the frames by repeated visits to the site, detailed visual inspection of the part of the structure that is above water level and by inspection of the frames on the bank, it has been concluded that it is necessary to repair them (anti-corrosion protection).

The space frame is defined in Drawing No. PUI-1.02.03A.00.00 and PUI-1.02.03B.00.00. The other frames are identical. They are defined in Drawing No. PUI-1.02.01.00.00.

By inspection, measuring and determining the existing condition of the trolley and the crane for lifting / lowering of flashboards, as well as of the bridge above the frames and rails for the movement of trolleys, it is also noted that these need only to be repaired (overhauled).

Based on the visual inspection of the mechanism for lifting/lowering of the frames (Drawing No. PUI-1.02.11.00.00.) it has been found that the mechanism is well preserved and in a very good condition. The gears are in good condition. It is necessary to perform the repair (overhaul) of the elements of the mechanism.

There are 17 flashboards in the first row and there are 5 rows.
Upon inspection it was found that a certain number flashboards are in a good condition, so they require repairing (a detailed inspection and the necessary repairs). The other flashboards need to be constructed as per documentation - Drawing No. PUI-1.02.02.00.00.

Flashboards are handled by a cantilever crane that, in addition to manual hoisting, may rotate around the vertical axis and move along the floodgate on rails at the tread level. Flashboards are handled by means of a special traverse that leans against the frames by wheels. Detailed inspections revealed that the crane elements are in a good condition, so the crane needs to be repaired and not replaced with a new one. However, the traverse and especially the wheels, is in such a condition that it is necessary to manufacture a new one, Drawing No. PUI-1.02.05.00.00.

3.4.3. WAREHOUSE BRIDGE CRANE

When the mechanical equipment is concerned, there is a bridge crane in the warehouse. Based on the inspection of its present condition, detailed visual inspection and measurements on parts of its structure, it is noted that the supporting construction of the crane is in a satisfactory condition and that only repair is necessary. It is necessary to replace the trolley of the bridge crane with the lifting gear.