ROADS DEPARTMENT OF MINISTRY OF REGIONAL DEVELOPMENT AND INFRASTRUCTURE OF GEORGIA

Preparation of Detailed Design for the Upgrading of Tbilisi-Sagarejo and Sagarejo – Bakurtsikhe Road Sections

Bridge Design Explanatory Note

CONSTRUCTIONAL LOT 0

ACTIVITY 2

31/05/2021

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REVISION

1	31.05.2021	Second Issue	GMI	BME	SMN
0	29.05.2020	First Issue	GMI	BME	SMN
Rev.	Date	Issue, Modification	Prepared	Checked	Approved

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1 INTODUCTION

ILF Consulting Engineers Georgia LLC (The Concessionaire) has been assigned by the the Roads Department of the Ministry of Regional Development and Infrastructure of Georgia - RDMRDI to carry out the the Detailed Design of the project “Upgrading of Tbilisi – Sagarejo (Section 1) and Sagarejo - Bakurtsikhe (Section 2) Road ((EWHIP-4/CS/QCBS-06)”.

ILF Consulting Engineers has also to perform consulting services for preparation of Detail Engineering Design of Earthworks for the main alignment, interchanges and secondary roads that is a part of Consulting Services for the Detailed Design for the Upgrading of Tbilisi – Sagarejo (Section 1) and Sagarejo - Bakurtsikhe (Section 2) Road. The Consultant will assist the Client in the following assignments: Consulting services for preparation of Detailed Design for the Upgrading of Tbilisi-Sagarejo and Sagarejo-Bakurtsikhe Road – Detail Engineering Design of bridges for main alignment, interchanges and secondary roads and railway. Activities for the Section 1 and Section 2 are split in 6 consecutive Lots. Here the designes for lot 0 will be only presented. The Chainage for the six consecutive constructional lots will be:

- **00+310 – 04+040 (Lochini Interchange to Vaziani Interchange.)**
- 04+040 – 27+840 (Vaziani Interchange to Ninotsminda Interchange.
- 27+840 – 35+500 (Ninotsminda Interchange to Tokhliauri Interchange).
- 35+500 – 53+000 (Tokhliauri Interchange to Badiauri Interchange).
- 53+000 – 75+000 (Badiauri Interchange to Chalaubani Interchange).
- 75+100 – 84+000 (Chalaubani Interchange to Bakurtsikhe).

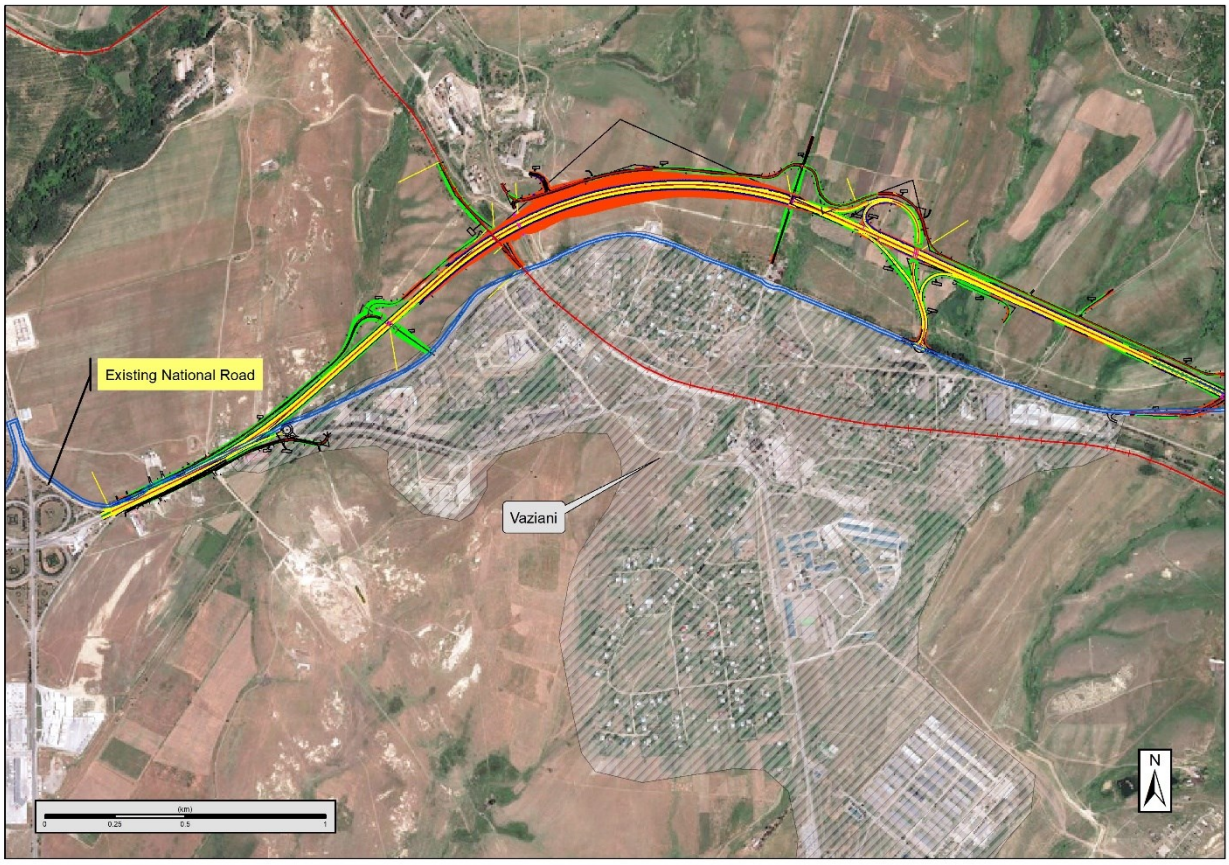

Figure 1. Overview Map of the Constructional Lot 0 from Lotchini I/C to Vaziani I/C, Including the IC.

2 BRI-01 CP 1+514,56 BRIDGE-OVERPASS, WITH SCHEME 2×30,0M

The R/C design motorway bridge for pass above the local design highway. The bridge has two span with scheme 2×30.0 m. the design length of the bridge is L=69.551m. The width of the deck is *b*=7.5m. Sidewalks width is T = 1.0 m, the total width of the span is B = 10.6 m. The bridge is designed on the right section in the plan, and in the façade on R=2560m radius convex vertical curve. Angle of inclination is $\alpha=13^0$ 40'.

The bridge has 2 abutments and 1 pier.

The superstructure represents precast concrete monolithic structure: The pre-stressed R/C section - T - shape beams, with ribs widening lower like a pear and with 0.20÷0.24 m. thickness unstressed monolithic R/C slab of the deck. Number of beams in the superstructure is - 6 pieces. The distance between the axis of the beam transversal the superstructure is 1.9 m.

The total length of pre stressed R/C monolithic beams of the superstructure is *l*=30.0 m. the design span is l_0=29.4m. The height of beam is h = 1.4 m. Beam Concrete strength – 45/55, beam longitudinal working reinforcement – high strength steel K7 ropes, longitudinal bars and supports distributed on perimeter – are unstressed A500 class of different (∅10÷22.0mm) diameter.

To provide the required 2.5% transverse inclination on the deck the beams are located at different heights in the cross section of the superstructure.

The concrete class on strength of unstressed R/C slab is C30/37, the slab is reinforced with of different diameters of A500 class reinforcement.

The barriers of the superstructure- Reinforced concrete of variable width monolithic construction with height 0,75m. With width in foundation 0, 4 m. the concrete strength class of the barriers – C30/37.

Waterproofing of superstructure - Membrane 5.0 mm-thick.

Asphalt Concrete-2 layer (0.03 + 0.04m) with a total thickness of 0.07m.

The railings of the superstructure – 1.1 m high, of strident individual construction, composed with welding joints linked with steel profiled pipes.

The water removing system of superstructure: the steel cap placed at the edge of the R/C slab of the deck with 150.0 mm diameter plastic pipes attached to it.

Expansion joint – is typical construction with rubber compensator.

The supporting parts of the beam: Seismic insulator, Reinforced rubber 0.8 Mpa with dynamic shear modulus, attachment of the supporting part to the superstructure and to the crossbar of the pier and abutment is provided with steel sheet slabs and anchor bolts.

The R/C abutments of the bridge from a constructive point of view is the same and consists of a monolithic crossbar, back walls, wings and a pile foundation. The dimension of crossbar of the abutment is 10.901 m. transversal to the bridge, and dimension of cross sections are2.55×1.5m. On the both crossbars it is provided Installation of R/C cradle (6 pieces on each abutment) and anti-seismic pumps of different height. (3-3 pieces on each abutment). The concrete class of crossbar is - C30/37. Its reinforcement is provided with longitudinal working bars and stirrups of different diameters of A500 class reinforcement.

The height of the back wall of the abutment is variable: Its height is the largest on the deck axis and equal to 2.069 m. and at the edges is 1.936 m. The thickness of the walls is 0.95 m at the surface of the crossbar and 0.526 m. in the upper part. On the back walls at the side of the access embankment it is provided arrangement of 0, 3 m, width steps for the purpose of reliance R/C transmitted slab. The concrete class of the back walls is C30/37. For reinforcement, are provided A500 class reinforcement bars of different diameters.

The wings of the abutments have a trapezoidal shape in the facade. The wing thickness is variable and is within the range of 0.6 ÷ 0.850 m. the concrete class of the wing is C30/37 for reinforcement, are provided A500 class reinforcement bars of different diameters.

At the wings of the abutments and at the edge of the back walls is provided arrangement of variable cross section R/C balustrades. The concrete class of the balustrades is C30/37 and for the reinforcement is provided A500 class reinforcement with small diameter bars.

The reliance of both abutments of the design bridge is provided on 1, 2 m. and 24.0 m. length 4 piece of R/C drilling pile. The concrete class of the pile is C30/37, and for the reinforcement is provided A500 class reinforcement with small diameter bars.

The reinforced concrete pier of the bridge consists of a crossbar, ascending pipe, pile cap and a drilling pile foundation.

R/C crossbar of the pier has a trapezoidal shape transversal to the bridge, the crossbar dimension transversal to the bridge is 11.9 m, and the height is 1.2 m at the intersection of the ascending pipe. At the end of the cantilever is 0.4 m, the width of the crossbar is constant and is 2.6 m due to the indirect section at the façade of the bridge. On the crossbar it is provided Installation of R/C cradle (6 pieces on each pier) and anti-seismic pumps (4 pieces). The Reinforcement of crossbars and its constituent structures are provided with A500 class steel bars of different diameters.

The reliance of the crossbar of the bridge pier is provided on 2 oval cross-section reinforced concrete ascending pipe. The height of the ascending pipe is 5.0 m. the size of the oval transversal to the bridge is 2.0 m. and longitudinal to the bridge is 1, 0 m. for the

reinforcement of the ascending pipe is provided with A500 class steel bars of different diameters.

The reliance of the ascending pipes of the piers is provided on the R/C beam of pile cap. The dimension of the beam of pile cap transversal to the bridge is 9.2 m. cross section dimensions are 1.7×1.5m.the reinforcement of the beam of the pile cap is provided with A500 class steel bars of different diameters.

The reliance of the beam of the pile cap of the pier is provided on 1,2 m. and 27.0 m. length 4 piece of R/C drilling pile. For the pile reinforcement is provided A500 class steel bars of different diameters.

The concrete strength class of all pier structures is C30/37.

The protection of access embankment cones of the bridge is provided by the Reno mattress.

The monolithic staircase with steel structure railing is provided to arrange at the access embankment of the design bridge. The concrete class of the staircases is C30/37.

3 BRI-02 KM. 1+998,48 RAILWAY BRIDGE WITH SCHEME 12,2+2×23,6+12,2 M.

The purpose of the R/C railway bridge is crossing over the existing Kakheti Railway line. The design bridge has 4 (four) span, with scheme 12,2+2×23,6+12,2m. The design length is L = 78.879 m, the width of the superstructure is - 4,18m. The sidewalks width is 0,53m, the total width of the superstructure is B=5,24m. The bridge is designed on the right section in the plan, and in the façade on 1.6 % inclination.

The bridge has 2 abutments and 3 piers.

The superstructure represents precast concrete monolithic structure: For the roofing of the initial and last span are provided 12.2 m. length unstressed R/C monolithic railway superstructure slabs (Two pieces in cross section), and for the roofing of middle span is provided with 23.6 m. length pre stressed R/C railway superstructure T - shape beams with pear shape widening of the lower ribs. The distance between the axes of the slabs and the beams is 1.8 meters' transversal to the superstructure.

The total length of the design 12.2-meter-long unstressed R/C monolithic typical slabs (typical No. 557/11) is 12.2 meters, The total length of the construction slabs is 12.2 meters, the design span is l0=11.7m, Slab height is h = 0.55 m, Slab concrete class is C45/55. Different diameter of A500 reinforcement bars are used for reinforcement.

The total length of the design R/C stressed cast-in-situ typical (Typical PR # 3501-91 Inv # 556) construction T- shape beams is 23.6 m, the design span is 22,9 m. the height of the beam is h=1.85m, beam concrete class is C45/55. Linear and polygonal stressed and A500 class bars of different diameters are used for reinforcement.

Arrangement of membrane waterproofing and concrete protective layers according to the typical design are provided on superstructure slabs and beams.

On the superstructure is provided the arrangement of the railway superstructure on the ballast prism.

The beams of both superstructure of the railway bridge are calculated on the railway C14 vertical live load.

The sidewalks of superstructure and abutments are of typical construction. It consists of a steel structure sidewalk console, a reinforced concrete sidewalk slab mounted on it, and a steel strident railing. The attachment of the sidewalk console to the superstructure flange and to the abutment flange is provided with steel bolts.

The water removing system of the superstructure: On the outer edge of the superstructure beam slabs, adjacent to the flange are placed steel caps with 150 mm diameter pipes attached to it

The expansion joints are of a typical construction. With the shape of ballast through of sheet steel

The supporting parts of superstructure beams and slabs are of typical construction. For slab superstructure is provided using of tangential supporting steel parts (Four to four pieces per slabs) and the use of segmental steel construction supporting parts on 23.6-meter beams. (Two pieces on one beam. One movable and one immovable)

The abutments of the design bridge from a constructive point of view is the same and consists of a cast-in-situ R/C body, pile cap slab and drilling piles.

The dimension of the abutments/piers: longitudinal to the bridge is 4.487m, transversal to the bridge is 4.0 m. It is provided arrangement of under slab and special mating equipment on it. The concrete class of the abutment/pier body is C30/37. Its reinforcement is provided with A500 class steel bars of different diameters.

The cast-in-situ R/C pile cap slab of the abutment has a square shape in the plan with 6.00 m. sides. Slab thickness is 1.5 m. Slab concrete class is C30/37. Its reinforcement is provided with A500 class steel bars of different diameters.

The foundation of the abutment is 1.5 m. diameter and 10.0 m. length cast-in –situ R/C 4 pieces high-power drilling pile. The concrete class of the piles are C30/37. Its reinforcement is provided with A500 class steel bars of different diameters.

The piers of design railway bridge N 2 and N 4 are identical in constructive point of view and they each consist of cast-in-situ R/C crossbars and drilling pile.

The dimension of R/C crossbars in the plan is: longitudinal to the bridge is 2,5 m. transversal to the bridge is 4.7 m. crossbar thickness is 0.9 meters. It is provided installation of cradles (for supporting 23.6 meters long beams) and 1.642 m. height pumps (for supporting 12.2 m. length slabs) on it. The size of the pumps in the plan is: longitudinal to the bridge is 0.975 m., transversal to the bridge is 3,3 m. On single side of the under slab of the both piers are provided arrangement of 2.0 m. length and 1.2×0.7 m. cross section R/C crossbar for supporting Contact Network tower.

The foundation of the piers/abutments are 2-2 pieces 1.5 meters in diameter and 35.0 meters long R/C high-power drilling piles.

The construction of piers of N 2 and N 4 is provided with concrete of C30/37 class. And for reinforcement is provided A500 class steel bars of different diameters.

The bridge pier # 3 constructively differs from pier # 2 and # 4 and consists of a cast-in-situ R/C under slab, body, and a small deepening foundation.

The under slab has a rectangular shape with rounded corners in the plan. Its dimensions are: longitudinal to the bridge is 2.5 m. transversal to the bridge is 4,7 m. Thickness

is 0.9 meters. It is provided arrangement of cradles on under slabs. On the single side of the slab it is provided Contact network tower support of 2.0 m. length and arrangement of 1.2×0.7 m. cross sectional R/C crossbar.

The cross section of the N3 pier body is round. The cross section of the body has a diameter of 2.0 meters and a height of 5.1 meters.

The arrangement of the small deepening foundation is provided with two-step slab. The slab has a rectangular shape in the plan. The dimensions of the first step of the slab are: longitudinal to the bridge is 5.3 m. transversal to the bridge is 7.3 m. Thickness is 1.5 meters; The second step measures: longitudinal to the bridge is 3,8 m. transversal to the bridge 5,8 m. Thickness is 1.0 meters.

The construction of N 3 pier is provided with C30/37 Class concrete and for reinforcement is provided A500 class steel bars of different diameters.

The protection of the bridge access embankment cones is provided by the Reno mattress.

4 BRI-03 KM. 2+097.449 RAILWAY BRIDGE WITH SCHEME 12,2+2×23,6+12,2 M.

The purpose of the R/C railway bridge is crossing over the existing Kakheti Railway line. The design bridge has 4 (four) span, with scheme 12,2+2×23,6+12,2m. The design length is L = 78.986 m, the width of the superstructure is - 4,18m. The sidewalks width is 0,53m, the total width of the superstructure is B=5,24m. The bridge is designed on the right section in the plan, and in the façade on 1.6 % inclination.

The bridge has 2 abutments and 3 piers.

The superstructure represents precast concrete monolithic structure: For the roofing of the initial and last span are provided 12.2 m. length unstressed R/C monolithic railway superstructure slabs (Two pieces in cross section), and for the roofing of middle span is provided with 23.6 m. length pre stressed R/C railway superstructure T - shape beams with pear shape widening of the lower ribs. The distance between the axes of the slabs and the beams is 1.8 meters' transversal to the superstructure.

The total length of the design 12.2-meter-long unstressed R/C monolithic typical slabs (typical No. 557/11) is 12.2 meters, The total length of the construction slabs is 12.2 meters, the design span is l0=11.7m, Slab height is h = 0.55 m, Slab concrete class is C45/55. Different diameter of A500 reinforcement bars are used for reinforcement.

The total length of the design R/C stressed cast-in-situ typical (Typical PR # 3501-91 Inv # 556) construction T- shape beams is 23.6 m, the design span is 22,9 m. the height of the beam is h=1.85m, beam concrete class is C45/55. Linear and polygonal stressed and A500 class bars of different diameters are used for reinforcement.

Arrangement of membrane waterproofing and concrete protective layers according to the typical design are provided on superstructure slabs and beams.

On the superstructure is provided the arrangement of the railway superstructure on the ballast prism.

The beams of both superstructure of the railway bridge are calculated on the railway C14 vertical live load.

The sidewalks of superstructure and abutments are of typical construction. It consists of a steel structure sidewalk console, a reinforced concrete sidewalk slab mounted on it, and a steel strident railing. The attachment of the sidewalk console to the superstructure flange and to the abutment flange is provided with steel bolts.

The water removing system of the superstructure: On the outer edge of the superstructure beam slabs, adjacent to the flange are placed steel caps with 150 mm diameter pipes attached to it

The expansion joints are of a typical construction. With the shape of ballast through of sheet steel

The supporting parts of superstructure beams and slabs are of typical construction. For slab superstructure is provided using of tangential supporting steel parts (Four to four pieces per slabs) and the use of segmental steel construction supporting parts on 23.6-meter beams. (Two pieces on one beam. One movable and one immovable)

The abutments of the design bridge from a constructive point of view is the same and consists of a cast-in-situ R/C body, pile cap slab and drilling piles.

The dimension of the abutments/piers: longitudinal to the bridge is 4.517m and 4.508m, transversal to the bridge is 4.0 m. It is provided arrangement of under slab and special mating equipment on it. The concrete class of the abutment/pier body is C30/37. Its reinforcement is provided with A500 class steel bars of different diameters.

The cast-in-situ R/C pile cap slab of the abutment has a square shape in the plan with 6.00 m. sides. Slab thickness is 1.5 m. Slab concrete class is C30/37. Its reinforcement is provided with A500 class steel bars of different diameters.

The foundation of the abutment is 1.5 m. diameter and 10.0 m. length cast-in –situ R/C 4 pieces high-power drilling pile. The concrete class of the piles are C30/37. Its reinforcement is provided with A500 class steel bars of different diameters.

The piers of design railway bridge N 2 and N 4 are identical in constructive point of view and they each consist of cast-in-situ R/C crossbars and drilling pile.

The dimension of R/C crossbars in the plan is: longitudinal to the bridge is 2,5 m. transversal to the bridge is 4.7 m. crossbar thickness is 0.9 meters. It is provided installation of cradles (for supporting 23.6 meters long beams) and 1.642 m. height pumps (for supporting 12.2 m. length slabs) on it. The size of the pumps in the plan is: longitudinal to the bridge is 0.975 m., transversal to the bridge is 3,3 m. On single side of the under slab of the both piers are provided arrangement of 2.0 m. length and 1.2×0.7 m. cross section R/C crossbar for supporting Contact Network tower.

The foundation of the piers/abutments are 2-2 pieces 1.5 meters in diameter and 36.0 meters long R/C high-power drilling piles.

The construction of piers of N 2 and N 4 is provided with concrete of C30/37 class. And for reinforcement is provided A500 class steel bars of different diameters.

The bridge pier # 3 constructively differs from pier # 2 and # 4 and consists of a cast-in-situ R/C under slab, body, and a small deepening foundation.

The under slab has a rectangular shape with rounded corners in the plan. Its dimensions are: longitudinal to the bridge is 2.5 m. transversal to the bridge is 4,7 m. Thickness

is 0.9 meters. It is provided arrangement of cradles on under slabs. On the single side of the slab it is provided Contact network tower support of 2.0 m. length and arrangement of 1.2×0.7 m. cross sectional R/C crossbar.

The cross section of the N3 pier body is round. The cross section of the body has a diameter of 2.0 meters and a height of 8.0 meters.

The arrangement of the small deepening foundation is provided with two-step slab. The slab has a rectangular shape in the plan. The dimensions of the first step of the slab are: longitudinal to the bridge is 5.7 m. transversal to the bridge is 7.7 m. Thickness is 1.5 meters; The second step measures: longitudinal to the bridge is 4.2 m. transversal to the bridge 6.2 m. Thickness is 1.0 meters.

The construction of N 3 pier is provided with C30/37 Class concrete and for reinforcement is provided A500 class steel bars of different diameters.

The protection of the bridge access embankment cones is provided by the Reno mattress.

5 BRI-04 CP 3+098.57 BRIDGE-OVERPASS, WITH SCHEME 2×30,0M

The R/C design motorway bridge for pass above the local design highway. The bridge has two span with scheme 2×30.0 m. the design length of the bridge is L=68.553m. The width of the deck is *b*=7.5m. Sidewalks width is T = 1.0 m, the total width of the span is B = 10.6 m. The bridge is designed on the right section in the plan, and in the façade on R=1800m radius convex vertical curve. Angle of inclination is $\alpha=91^0$ 4'.

The bridge has 2 abutments and 1 pier.

The superstructure represents precast concrete monolithic structure: The pre-stressed R/C section - T - shape beams, with ribs widening lower like a pear and with 0.20÷0.24 m. thickness unstressed monolithic R/C slab of the deck. Number of beams in the superstructure is - 6 pieces. The distance between the axis of the beam transversal the superstructure is 1.9 m.

The total length of pre stressed R/C monolithic beams of the superstructure is *l*=30.0 m. the design span is l_0=29.4m. The height of beam is h = 1.4 m. Beam Concrete strength – 45/55, beam longitudinal working reinforcement – high strength steel K7 ropes, longitudinal bars and supports distributed on perimeter – are unstressed A500 class of different (∅10÷22.0mm) diameter.

To provide the required 2.5% transverse inclination on the deck the beams are located at different heights in the cross section of the superstructure.

The concrete class on strength of unstressed R/C slab is C30/37, the slab is reinforced with of different diameters of A500 class reinforcement.

The barriers of the superstructure- Reinforced concrete of variable width monolithic construction with height 0,75m. With width in foundation 0, 4 m. the concrete strength class of the barriers – C30/37.

Waterproofing of superstructure - Membrane 5.0 mm-thick.

Asphalt Concrete-2 layer (0.03 + 0.04m) with a total thickness of 0.07m.

The railings of the superstructure – 1.1 m high, of strident individual construction, composed with welding joints linked with steel profiled pipes.

The water removing system of superstructure: the steel cap placed at the edge of the R/C slab of the deck with 150.0 mm diameter plastic pipes attached to it.

Expansion joint – is typical construction with rubber compensator.

The supporting parts of the beam: Seismic insulator, Reinforced rubber 0.8 Mpa with dynamic shear modulus, attachment of the supporting part to the superstructure and to the crossbar of the pier and abutment is provided with steel sheet slabs and anchor bolts.

The R/C abutments of the bridge from a constructive point of view is the same and consists of a monolithic crossbar, back walls, wings and a pile foundation. The dimension of crossbar of the abutment is 10.602 m. transversal to the bridge, and dimension of cross sections are2.31×1.5m. On the both crossbars it is provided Installation of R/C cradle (6 pieces on each abutment) and anti-seismic pumps of different height. (3-3 pieces on each abutment). The concrete class of crossbar is - C30/37. Its reinforcement is provided with longitudinal working bars and stirrups of different diameters of A500 class reinforcement.

The height of the back wall of the abutment is variable: Its height is the largest on the deck axis and equal to 2.064 m. and at the edges is 1.931 m. The thickness of the walls is 0.95 m at the surface of the crossbar and 0.683 m. in the upper part. On the back walls at the side of the access embankment it is provided arrangement of 0, 3 m, width steps for the purpose of reliance R/C transmitted slab. The concrete class of the back walls is C30/37. For reinforcement, are provided A500 class reinforcement bars of different diameters.

The wings of the abutments have a trapezoidal shape in the facade. The wing thickness is variable and is within the range of 0.6 ÷ 0.850 m. the concrete class of the wing is C30/37 for reinforcement, are provided A500 class reinforcement bars of different diameters.

At the wings of the abutments and at the edge of the back walls is provided arrangement of variable cross section R/C balustrades. The concrete class of the balustrades is C30/37 and for the reinforcement is provided A500 class reinforcement with small diameter bars.

The reliance of both abutments of the design bridge is provided on 1.2 m. and 22.0 m. length 4 piece of R/C drilling pile. The concrete class of the pile is C30/37, and for the reinforcement is provided A500 class reinforcement with small diameter bars.

The reinforced concrete pier of the bridge consists of a crossbar, ascending pipe, pile cap and a drilling pile foundation.

R/C crossbar of the pier has a trapezoidal shape transversal to the bridge, the crossbar dimension transversal to the bridge is 11.6 m, and the height is 1.2 m at the intersection of the ascending pipe. At the end of the cantilever is 0.4 m, the width of the crossbar is constant and is 2.4 m due to the indirect section at the façade of the bridge. On the crossbar it is provided Installation of R/C cradle (6 pieces on each pier) and anti-seismic pumps (4 pieces). The Reinforcement of crossbars and its constituent structures are provided with A500 class steel bars of different diameters.

The reliance of the crossbar of the bridge pier is provided on 2 oval cross-section reinforced concrete ascending pipe. The height of the ascending pipe is 5.0 m. the size of the oval transversal to the bridge is 2.0 m. and longitudinal to the bridge is 1, 0 m. for the

reinforcement of the ascending pipe is provided with A500 class steel bars of different diameters.

The reliance of the ascending pipes of the piers is provided on the R/C beam of pile cap. The dimension of the beam of pile cap transversal to the bridge is 9.2 m. cross section dimensions are 1.7×1.5m.the reinforcement of the beam of the pile cap is provided with A500 class steel bars of different diameters.

The reliance of the beam of the pile cap of the pier is provided on 1,2 m. and 33.0 m. length 4 piece of R/C drilling pile. For the pile reinforcement is provided A500 class steel bars of different diameters.

The concrete strength class of all pier structures is C30/37.

The protection of access embankment cones of the bridge is provided by the Reno mattress.

The monolithic staircase with steel structure railing is provided to arrange at the access embankment of the design bridge. The concrete class of the staircases is C30/37.

6 BRI-05 CP 3+578.82 BRIDGE-OVERPASS, WITH SCHEME 2×30,0M

The R/C design motorway bridge for pass above the local design highway. The bridge has two span with scheme 2×30.0 m. the design length of the bridge is L=68.573m. The width of the deck is *b*=9.0m. Sidewalks width is T = 1.0 m, the total width of the span is B = 12.1 m. The bridge is designed on the right section in the plan, and in the façade on R=2800m radius convex vertical curve. Angle of inclination is $\alpha=78^0$ 5'.

The bridge has 2 abutments and 1 pier.

The superstructure represents precast concrete monolithic structure: The pre-stressed R/C section - T - shape beams, with ribs widening lower like a pear and with 0.20÷0.24 m. thickness unstressed monolithic R/C slab of the deck. Number of beams in the superstructure is - 7 pieces. The distance between the axis of the beam transversal the superstructure is 1.8 m.

The total length of pre stressed R/C monolithic beams of the superstructure is *l*=30.0 m. the design span is l_0=29.4m. The height of beam is h = 1.4 m. Beam Concrete strength – 45/55, beam longitudinal working reinforcement – high strength steel K7 ropes, longitudinal bars and supports distributed on perimeter – are unstressed A500 class of different (∅10÷22.0mm) diameter.

To provide the required transverse inclination on the deck the beams are located at different heights in the cross section of the superstructure.

The concrete class on strength of unstressed R/C slab is C30/37, the slab is reinforced with of different diameters of A500 class reinforcement.

The barriers of the superstructure- Reinforced concrete of variable width monolithic construction with height 0,75m. With width in foundation 0, 4 m. the concrete strength class of the barriers – C30/37.

Waterproofing of superstructure - Membrane 5.0 mm-thick.

Asphalt Concrete-2 layer (0.03 + 0.04m) with a total thickness of 0.07m.

The railings of the superstructure – 1.1 m high, of strident individual construction, composed with welding joints linked with steel profiled pipes.

The water removing system of superstructure: the steel cap placed at the edge of the R/C slab of the deck with 150.0 mm diameter plastic pipes attached to it.

Expansion joint – is typical construction with rubber compensator.

The supporting parts of the beam: Seismic insulator, Reinforced rubber 0.8 Mpa with dynamic shear modulus, attachment of the supporting part to the superstructure and to the crossbar of the pier and abutment is provided with steel sheet slabs and anchor bolts.

The R/C abutments of the bridge from a constructive point of view is the same and consists of a monolithic crossbar, back walls, wings and a pile foundation. The dimension of crossbar of the abutment is 12.366 m. transversal to the bridge, and dimension of cross sections are 2.55×1.5m. On the both crossbars it is provided Installation of R/C cradle (7 pieces on each abutment) and anti-seismic pumps of different height. (4-4 pieces on each abutment). The concrete class of crossbar is - C30/37. Its reinforcement is provided with longitudinal working bars and stirrups of different diameters of A500 class reinforcement.

The height of the back wall of the abutment is variable: On the back walls at the side of the access embankment it is provided arrangement of 0, 3 m, width steps for the purpose of reliance R/C transmitted slab. The concrete class of the back walls is C30/37. For reinforcement, are provided A500 class reinforcement bars of different diameters.

The wings of the abutments have a trapezoidal shape in the facade. The wing thickness is variable and is within the range of 0.6 ÷ 0.850 m. the concrete class of the wing is C30/37 for reinforcement, are provided A500 class reinforcement bars of different diameters.

At the wings of the abutments and at the edge of the back walls is provided arrangement of variable cross section R/C balustrades. The concrete class of the balustrades is C30/37 and for the reinforcement is provided A500 class reinforcement with small diameter bars.

The reliance of both abutments of the design bridge is provided on 1.2 m. and 26.0 m. length 4 piece of R/C drilling pile. The concrete class of the pile is C30/37, and for the reinforcement is provided A500 class reinforcement with small diameter bars.

The reinforced concrete pier of the bridge consists of a crossbar, ascending pipe, pile cap and a drilling pile foundation.

R/C crossbar of the pier has a trapezoidal shape transversal to the bridge, the crossbar dimension transversal to the bridge is 13.1 m, and the height is 1.2 m at the intersection of the ascending pipe. At the end of the cantilever is 0.4 m, the width of the crossbar is constant and is 2.6 m due to the indirect section at the façade of the bridge. On the crossbar it is provided Installation of R/C cradle (7 pieces on each pier) and anti-seismic pumps (4 pieces). The Reinforcement of crossbars and its constituent structures are provided with A500 class steel bars of different diameters.

The reliance of the crossbar of the bridge pier is provided on 3 oval cross-section reinforced concrete ascending pipe. The height of the ascending pipe is 5.0 m. the size of the oval transversal to the bridge is 1.5 m. and longitudinal to the bridge is 1, 0 m. for the reinforcement of the ascending pipe is provided with A500 class steel bars of different diameters.

The reliance of the ascending pipes of the piers is provided on the R/C beam of pile cap. The dimension of the beam of pile cap transversal to the bridge is 12.2 m. cross section dimensions are 1.7×1.5m.the reinforcement of the beam of the pile cap is provided with A500 class steel bars of different diameters.

The reliance of the beam of the pile cap of the pier is provided on 1,2 m. and 34.0 m. length 4 piece of R/C drilling pile. For the pile reinforcement is provided A500 class steel bars of different diameters.

The concrete strength class of all pier structures is C30/37.

The protection of access embankment cones of the bridge is provided by the Reno mattress.

The monolithic staircase with steel structure railing is provided to arrange at the access embankment of the design bridge. The concrete class of the staircases is C30/37.