Annex 2

Lower Stations of Cable Way

The study was conducted based on the appeal of the JSC "Technological Development Foundation" (b/r # 10011999816). For defining technical condition of the lower station building of the cable road in Tbilisi (next to the building of the Scientific Academy of Georgia) the quality of the mentioned construction concrete and reinforcement.

The study was conducted in accordance to the normative document: according to requirements of sst EN 12504-2: 2009 (testing of the concrete in the constructions, part 2, non-mixing test). The study of the Tbilisi cable way lower station was conducted by means of the measuring device of the construction elements' concrete quality, digital "Silver Schmidt", which is calibrated by ltd "Metrology" ltd, calibration certificates # 1465, while strength value calculation formula for the mentioned sclerometer by ultrasound method, by specifying indirect attitude between the indication of the applied device for studying compression resistance of the concrete sample and indestructible method. In particular, the sample concrete strength values were checked by the method of ultrasonography together with the silver Schmidt. Later on the strength values of the sample concrete will be checked by the same device, before and after destruction. Consequently, by the data of the measuring device calculating formula of the concrete strength to the surface during acting by 90^0 angle:

$R=Kh$

Where h is Silver Schmidt recoil height, while K=0.75 is the coefficient, which is defined based on the relevant tests. By means of the accepted formula, the concrete firmness values were calculated in the research elements. The studies were conducted by the construction elements form the section $100cm^2$ to $600\ cm^2$. At least 20 samples were made on each study segment, while the distance between the samples was 30mm, the distance from the edges of

the constructions was 50mm, while each studied width was more than 100mm. Received results are given in the table # 1.

The results of the concrete quality check of the constructive elements of the lower station of the cable way. Table 1.

Construction Mart	Sclero meter indication	Concrete firmness	Concrete Mark M	Concrete Class B	Protective layer cm	Note
Lower floor columns						
Column c-1	46	34.5	350	25	6	Dissection in the upper part
Column c-2	30	22.5	200	15	7	Dissection
Column c-3	40	30.0	300	22.5	7	Dissection, reinforcement is corrosive
Column c-4	28	21.0	200	15	7	Dissection, reinforcement is corrosive
Column c-5	24	18.0	200	15	7	Dissection
Column c-6	50	37.5	350	27.5	7	Dissection
Monolithic wall	50	37.5	350	27.5	5	Dissection
	43	32.3	350	25	5	Dissection
	43	32.3	350	25	5	Dissection
	46	34.5	350	25	5	Dissection
	52	38.9	400	30		Dissection
Upper floor Columns						
Column c-7	43	32.3	350	25	6	Dissection
Column c-8	60	45.5	450	35	6	Dissection
Column c-9	54	40.5	400	30	6	Dissection
Column c-10	46	34.5	350	25	6	Surface of the concrete is in a good condition
Arch jumper	26	19.5	200	15	6	Dissection
	32	24.0	250	20	6	
Precast roofing Tiles	44	33.0	350	25		Concrete is in a good condition
	41	31,0	300	22.5		
	42	31.5	350	25		
Ramp						
At the first support on	50	37.5	350	27.5	6-8	Dissection

the side of the main entrance 50						
Foundation						
Pointed foundation – on the 4.50 point	21	15.8	150	12.5		Concrete surface is in a good condition
Pointed foundation – on the 1.50 point	34	25.5	250	20		

As it is demonstrated from the table the quality of the concrete in the constructions of the building is not similar and it varies from 18 mpa to 45 mpa in entire building. Including from 18-37.5 mpa on the first floor, while on the upper floor it is from 24.0 to 40.7 mpa.

The quality of the concrete of the building foundation was checked on the 4.50 m depth and upstairs in every 50cm. In the bottom there was the concrete mark M150, in upper part it was M250-M300.

Checking of the ramp on the entrance side of the building took place in the first support area, as a result it was defined that the firmness frame is armed with 4 ⌀18AI with acting Armoring and ⌀ 8AI armed racks, intervals 20-30 cm (Photo 1). In the ramp, in the transversal direction there are 32AIII iron bar and metal profile which is about KP50by the size ("(„Рельсы крановые" ГОСТ 4121-62*).Mentioned elements of the ramp reinforcement are included in the monolith column.

Study of the monolith columns are implemented on the second floor in all the columns. While on the second upper floor only on the four column (see scheme 1 and scheme 2). Defining of the firmness of the concrete and reinforcement was conducted on two levels: between 0,000/+6.000 marks and +6,000/+11,850 marks, as a result it was defined that reinforcement in the upper columns defers from the reinforcement in the column in the

lower part (see scheme 3-6). Noteworthy that for maintenance of the existing facing the columns are studied mainly from internal side of the construction (photo 2-5), except column 6 (photo 6-7), where the facing was removed only in one place and the reinforcement was uncovered (see scheme 3). As for upper floor, the reinforcement on all the columns studied were uncovered from internal side at one level (see scheme 7).

One of the arched bridging of the lower floor was studied as well, with armed frame 4Ø28AIII with operational reinforcement and Ø8AI racks, with interval 30 cm (See scheme 8; photo 8-9).

Monolith wall with width 40 cm is armed with Ø10AI interval 10 cm.

Covering between floors is made by collected concrete tiles with the size 60X12X6cm and supported by the lower and upper orte-like shelves (See scheme 9). The metal beam size is 450x200mm. The thickness of the shelves is 14mm. The metal beam surface is corrosive (photo 10-11).

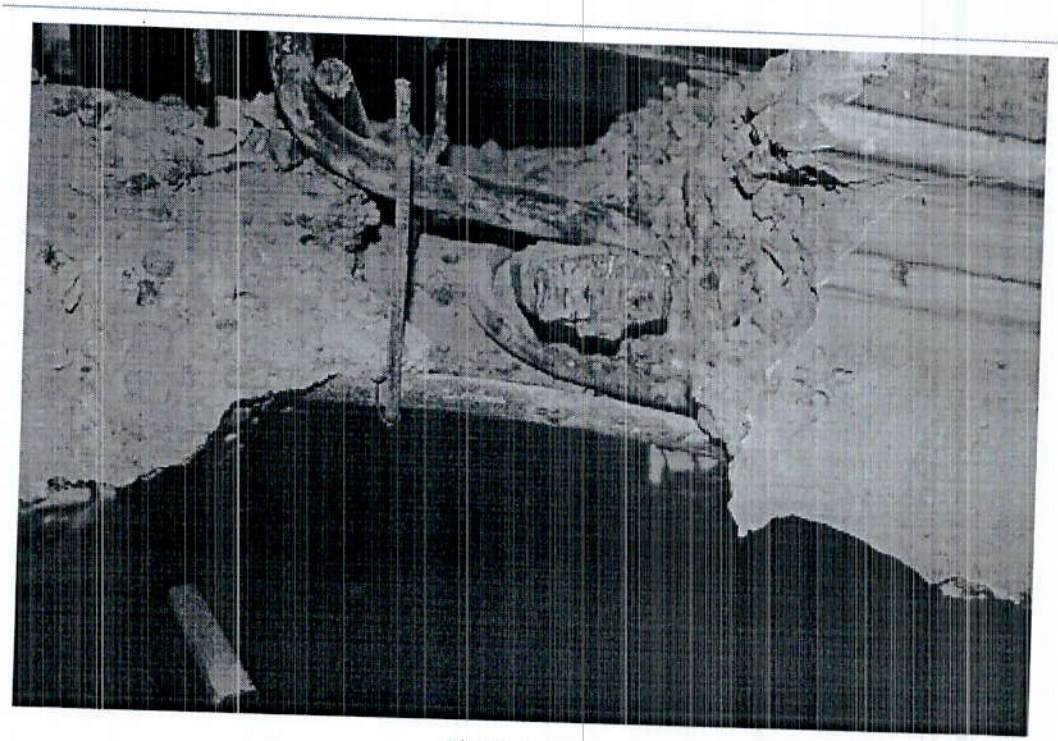


Photo 1.

1.

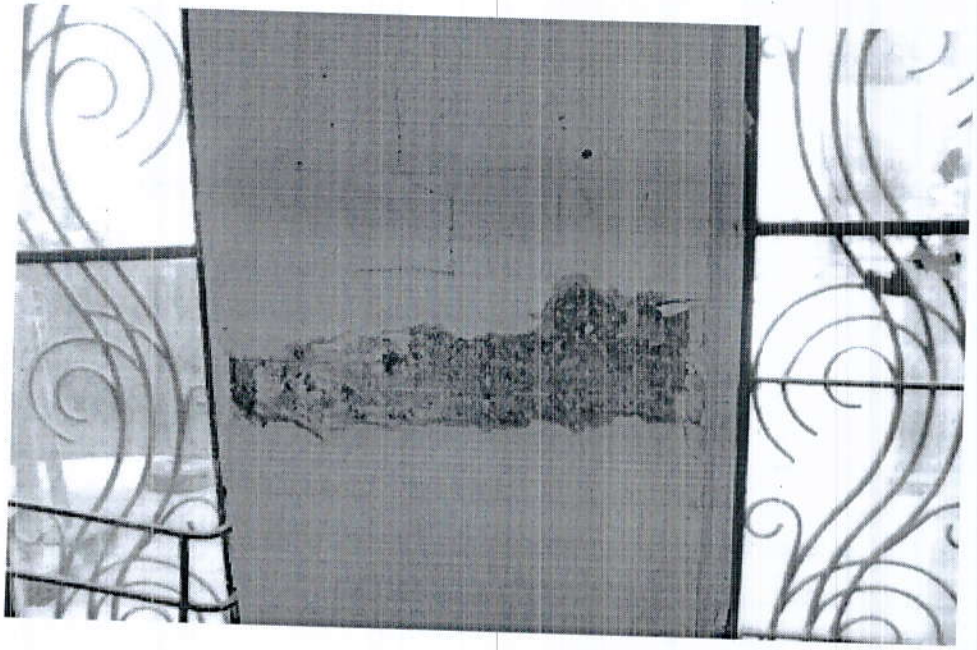


Photo 2.

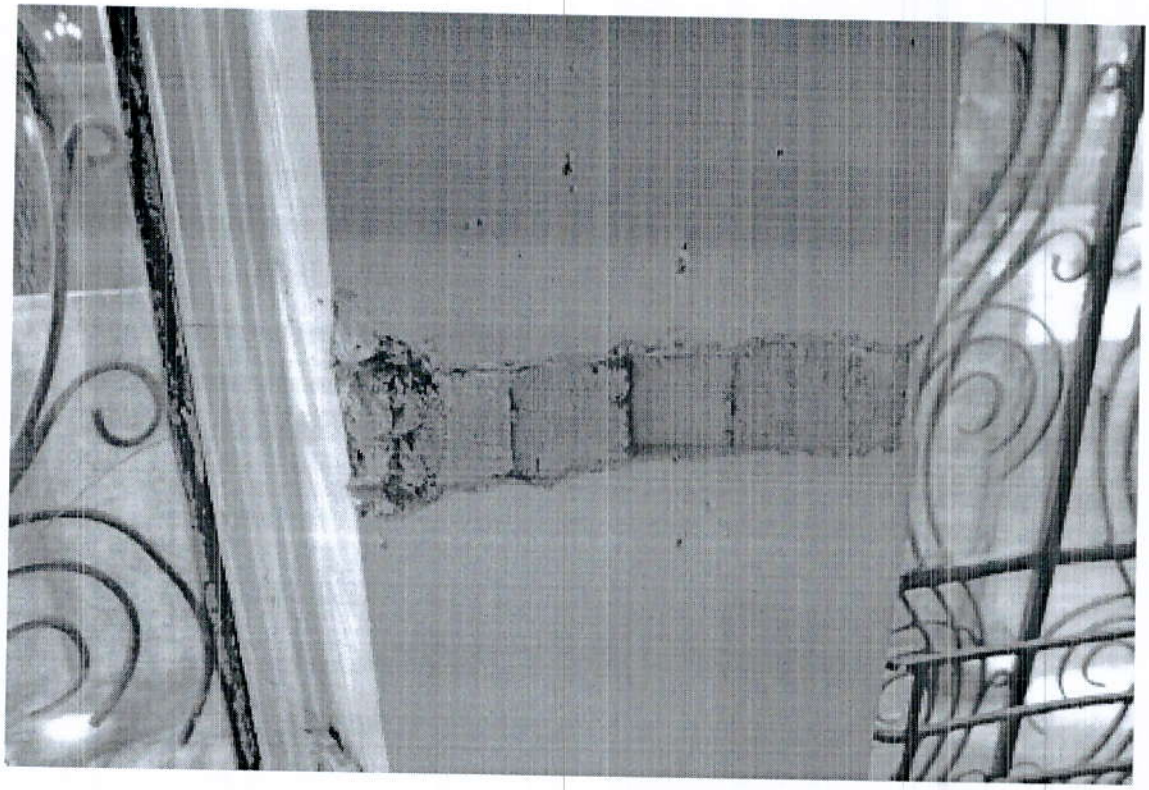


Photo 3.

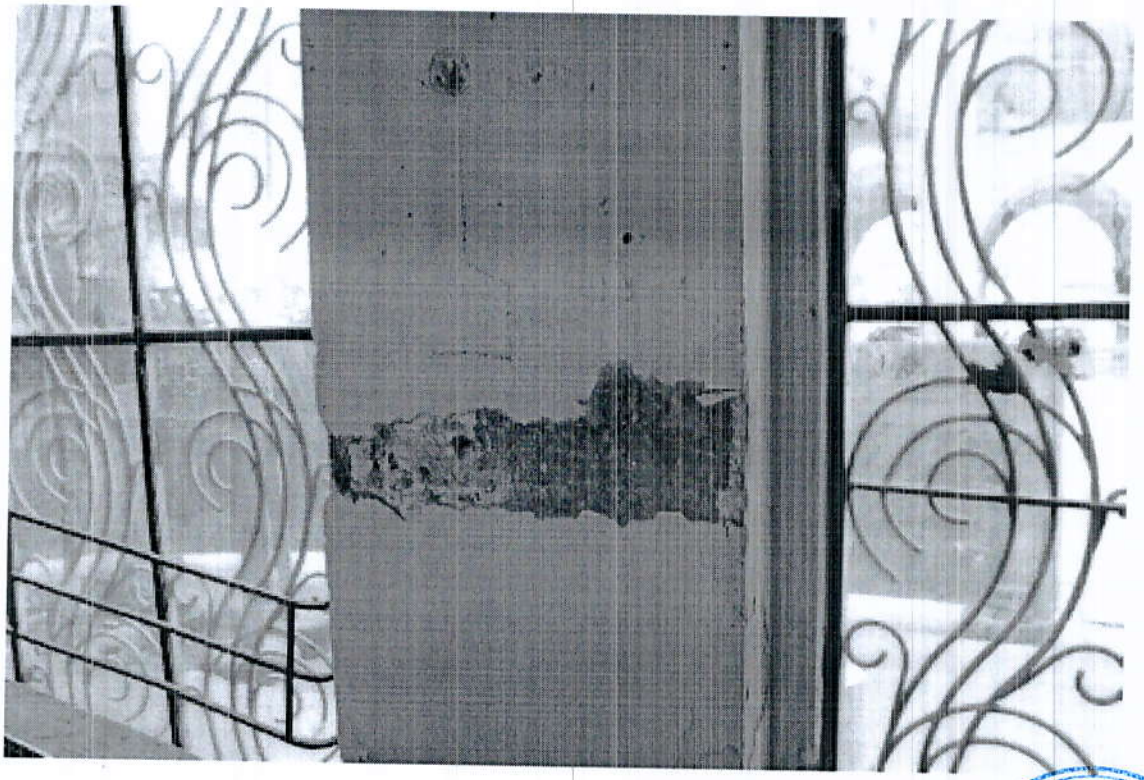


Photo 4.

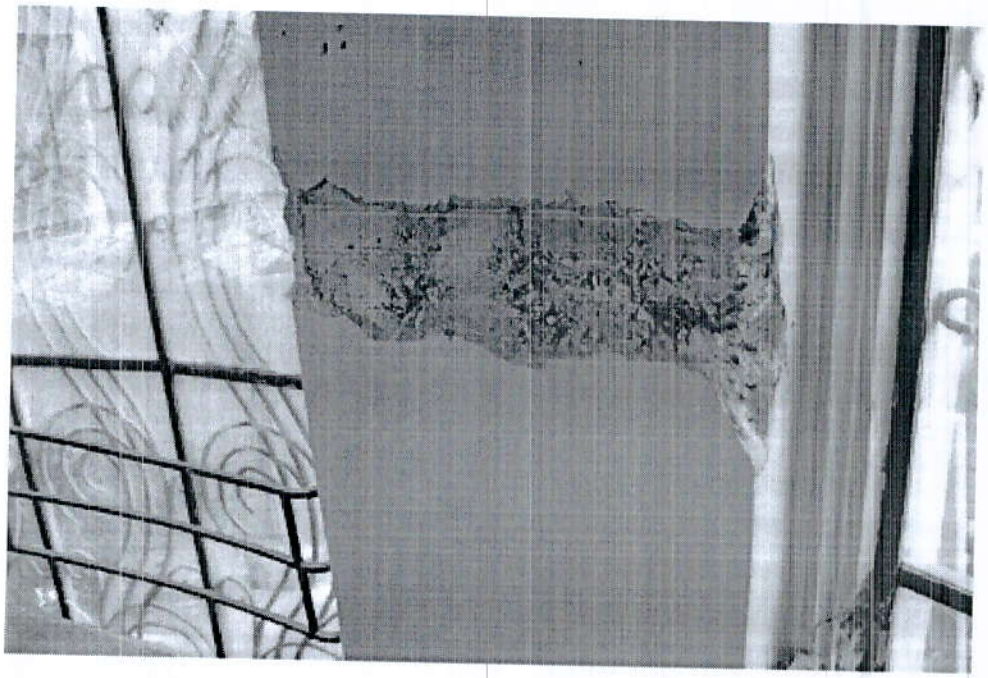


Photo 5.

Photo 6.

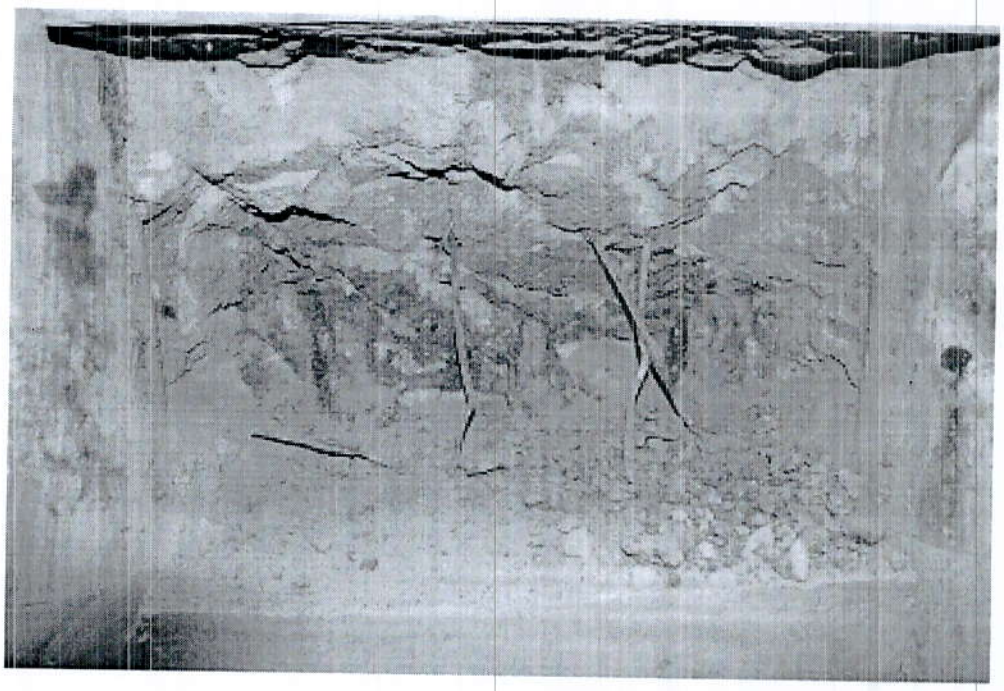


Photo 7.

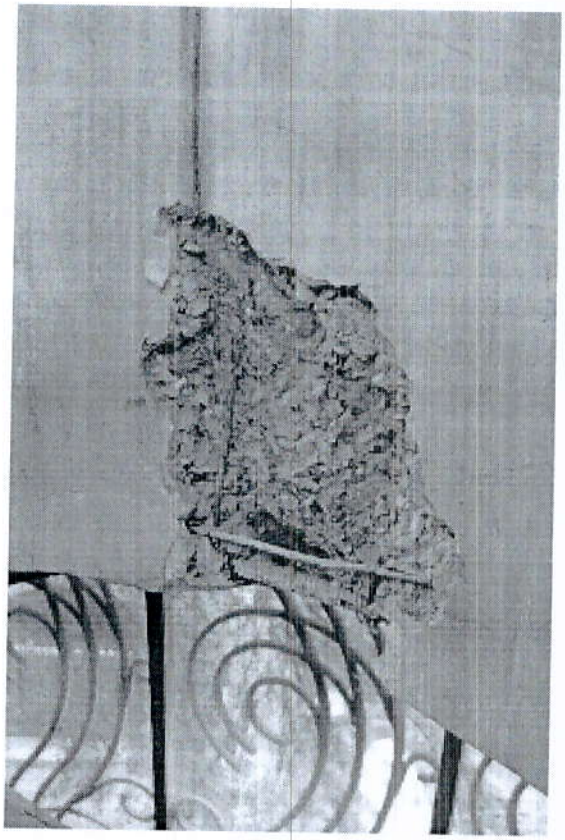


Photo 8.

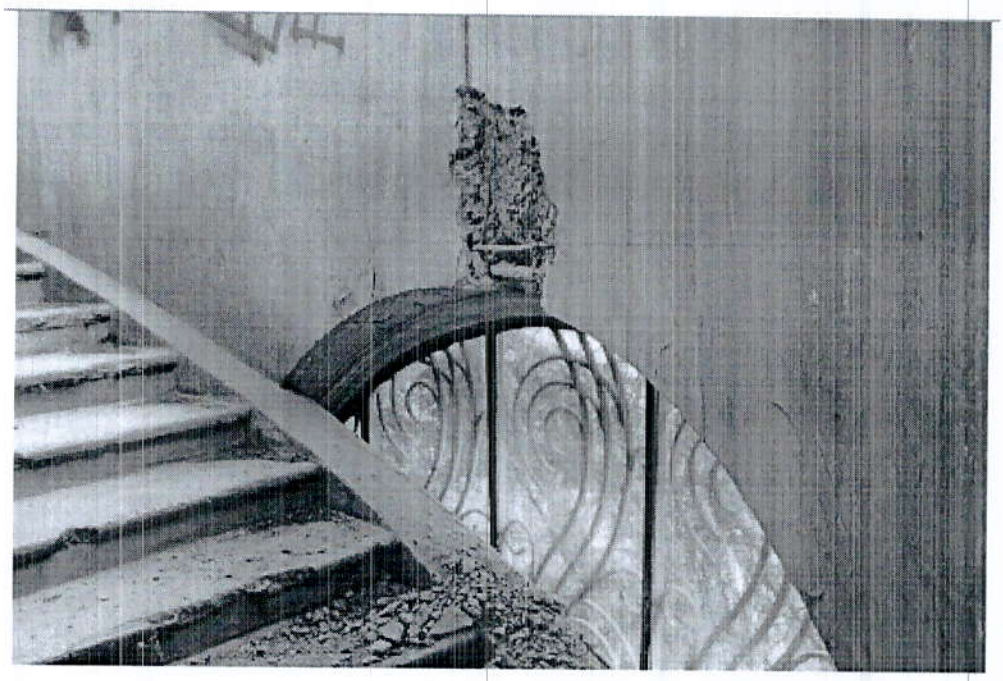


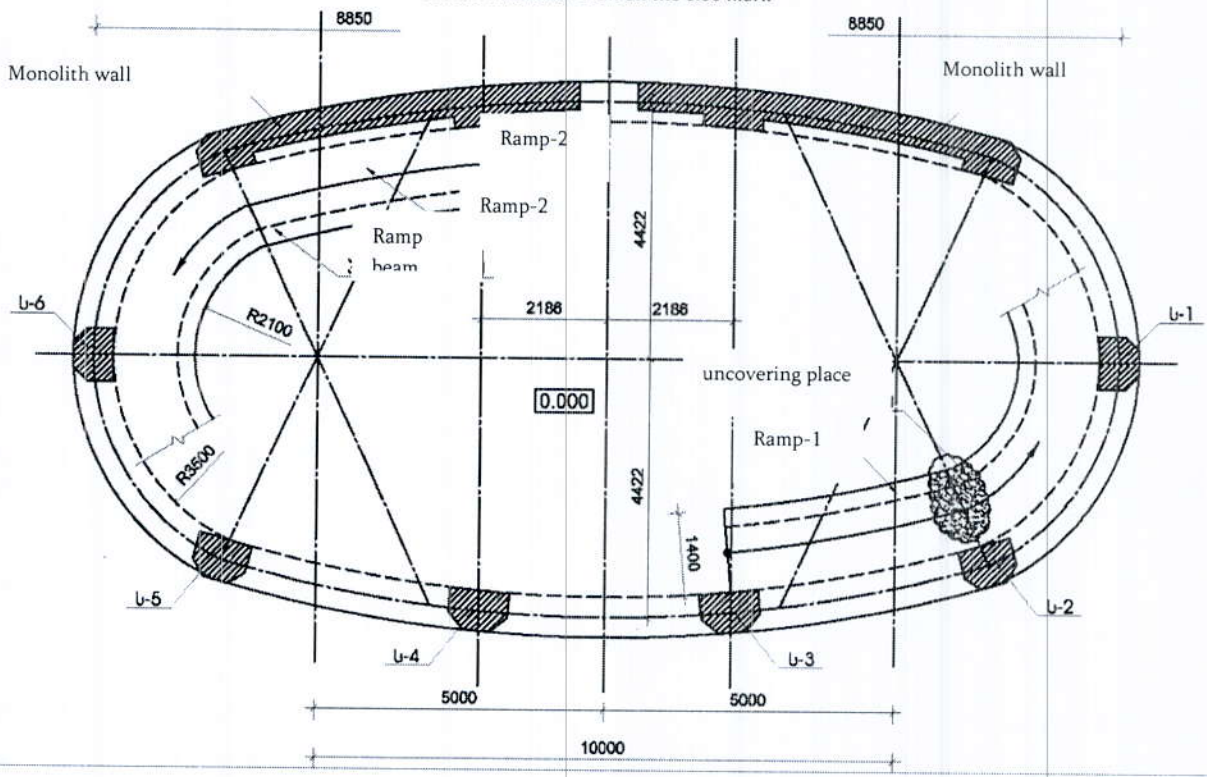
Photo 9.

Photo 10.

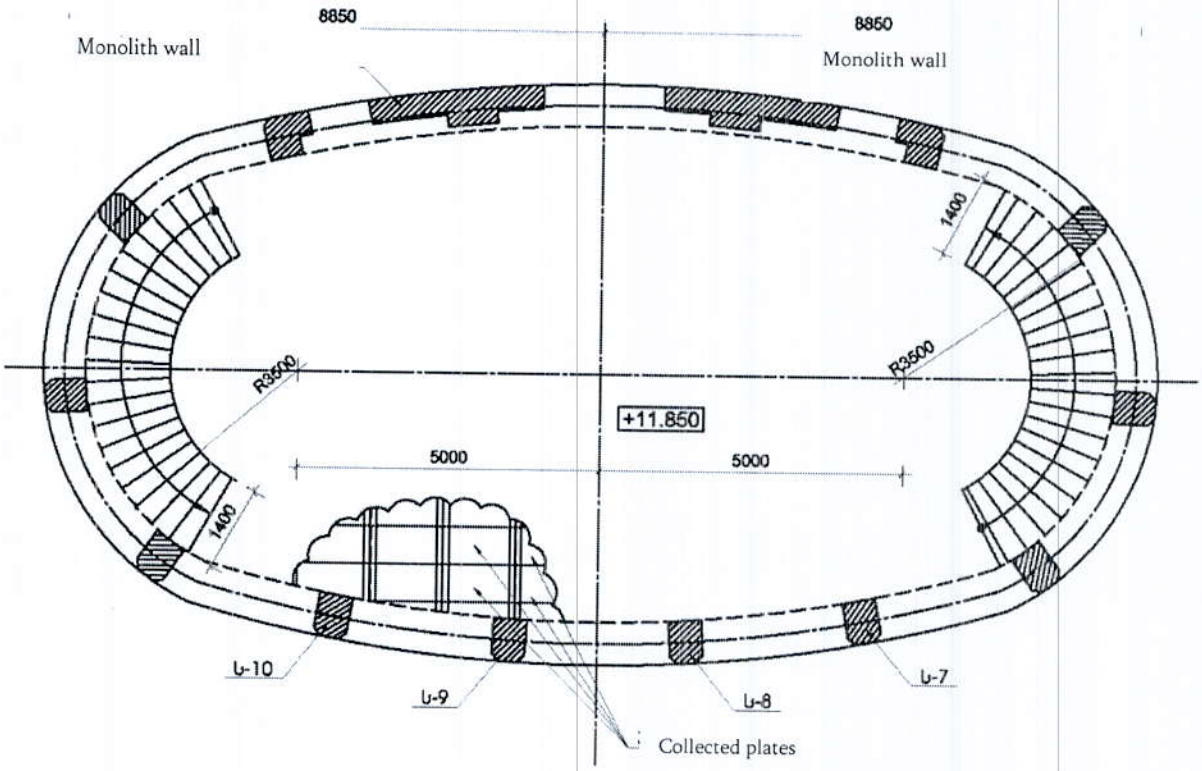
Photo 11.

Photo 12.

Scheme 1. Station Plan on the 0.00 mark

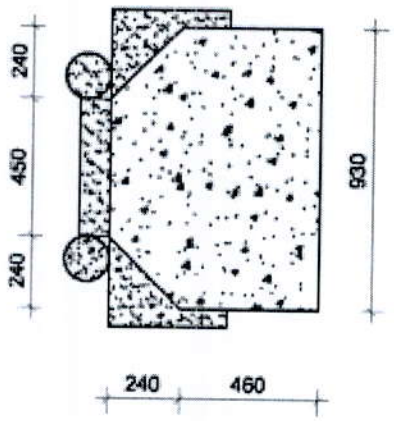


Scheme 2. Station plan+11.850 mark

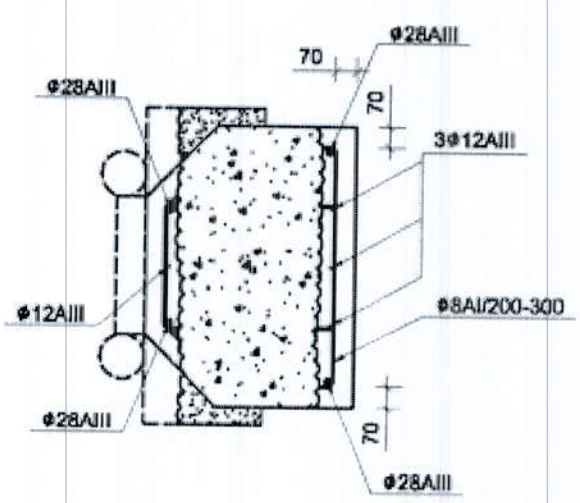


Scheme 3. Column “s-3”; “s-4”, between 0.00….+6.00

Geometric parameters

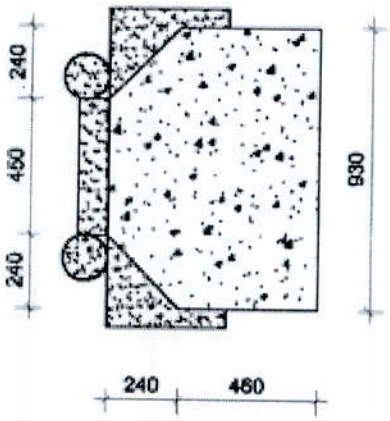


Armoring

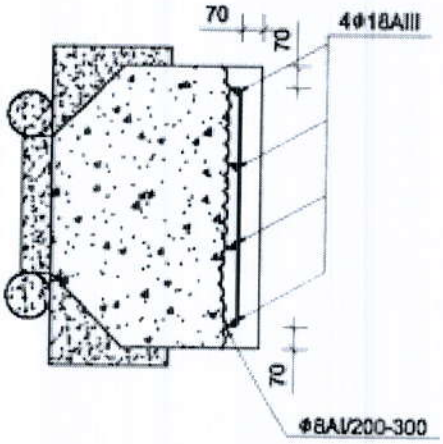


Scheme 4. Column “s-3”; “s-4”, between +6.00 …+11.85 marks

Geometric parameters

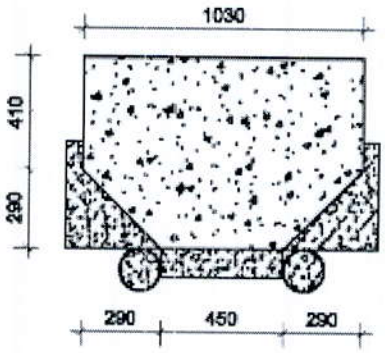


Armoring

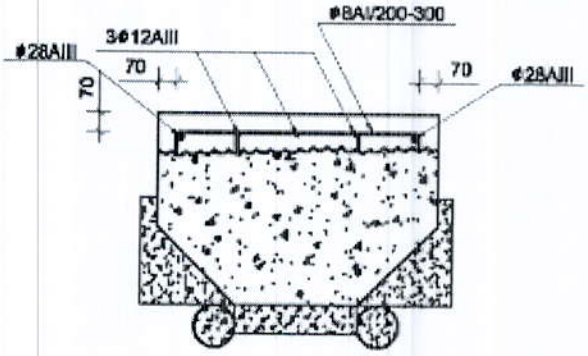


Scheme 5. Column "s-1"; "s-2", "s-5", "s-6" between 0.00….+6.00 marks

Geometric parameters

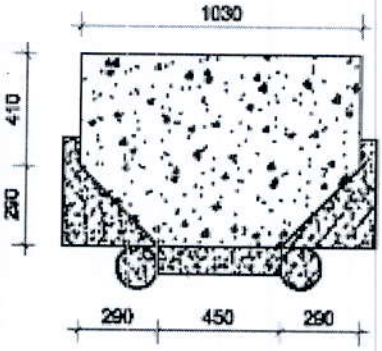


Armoring

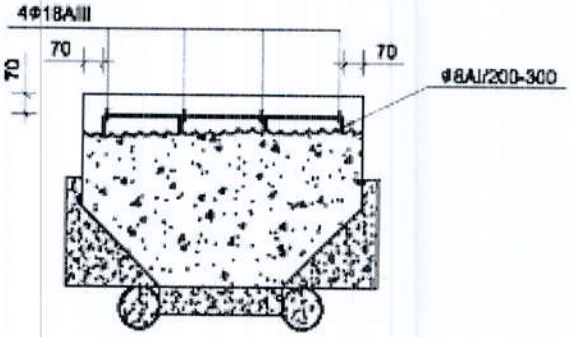


Scheme 6. Column "s-1"; "s-2", s-5", "s-6" between +6.00 ….+11.85 marks

Geometric parameters

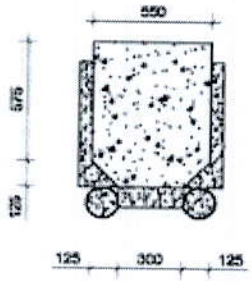


Armoring

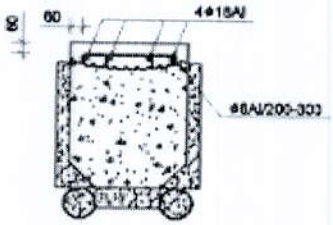


Scheme 7. Column "s-7"; "s-8", "s-9", "s-10", between +11.85….+18.00 marks

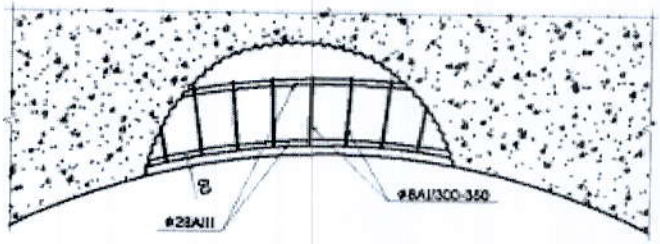
Geometric parameters



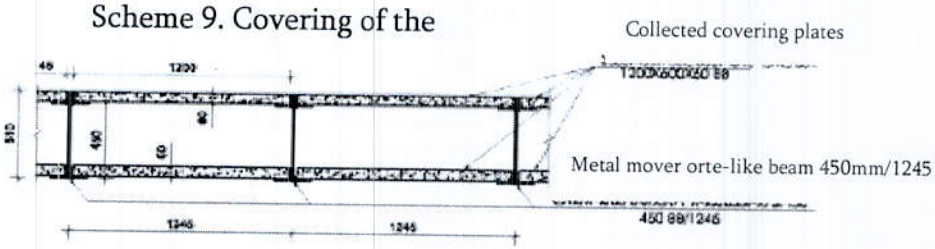
Armoring



Scheme 8. Arched bridging reinforcement



Scheme 9. Covering of the



Metal mover orte-like beam