RENOVATION OF THE FACADE OF A MONUMENT BUILDING ON ANDRÁSSY AVENUE IN BUDAPEST

Janos Major[1]
Mark Major[2]

UDK: 69.059.25:699.82
DOI: 10.14415/konferencijaGFS2021.05

Summary: *The paper shows the general characteristics of restoration of national monument building on Andrassy Avenue. The article presents the renovation works of the buildings façade. The task is to develop materials, procedures and methods to be used during the restoration, and to determine it in case of using individual technology. Quote from restorer report: Hübner House was built in 1882-1884... the protruding terraces on the facades is rough limestone. The puppets are bodies of rotation. They are already badly damaged, weathered and cracked in their material. In several places, only the gypsum bark surrounding the puppet is present. The condition of the elbows is variable, in any case severely damaged and eroded. There are also larger deficiencies in several places. At their plinths, dirt accumulated on the stone slabs of the terraces clogged the carved spouts, so the moisture accumulated there accelerated the deterioration processes. Repairs with cement or lime materials can be seen in several places, but none of them could replace the original work, they are of substandard quality. In order to optimize the choice of building materials, the market supply was researched with the aim of building a time-resistant solution. We found a Hungarian gypsum patent, which is a moisture-resistant gypsum mixture, the tests of which are presented in detail.*

Keywords*: Andrassy Avenue palace, national monument restoration, moisture resisting gypsum mixture.*

A.Hell: Das dreistockhohe Zins-Palais des Herrn Ferdinand Hübner auf der Radialstrasse, Rondeauplatz Nr.108, in Budapest. "Bauzeitung für Ungarn" XIII. No.36. (1884.XI.16.) pp.229., 230. [2]

[1] Janos Major MSc, PhD, Dr. Habil., University of Debrecen, Faculty of Engineering, Debrecen, Hungary, drmajorjanos@gmail.com
[2] Mark Major, BSc, MSc, Budapest Spa , Budapest, Hungary, majormarko@gmail.com

1. INTRODUCTION

The Hübner House was built in 1885, according to the plans of the architect Gyula Bukovics, on behalf of Ferdinánd Hübner, at 108 Sugár út at the time, with age-appropriate construction technology in the French Renaissance style. The building followed the comprehensive architectural concept of today's Kodály Circle, forming a spectacular unit with the other three buildings. The building, which is also of great importance for the cityscape, is considered a monument. Surrounded by three streets, the ground floor + three-storey residential building has an arched design towards the roundabout, its main façade is decorated in a symmetrical arrangement with four towers (the towers were built in a slightly different, concave form compared to the original plans found in the plan). During the Second World War, the part of the building facing Szinyei Merse Street was hit by a bomb. During the restoration, only the missing roof structure was rebuilt, not the two demolished towers and the attic cornice. [1]
Due to the rather poor condition of the condominium, it has long been looking for an investor to renovate its deteriorating building structures in exchange for a built-in attic. The investor intends to renovate the house and build a new elevator to expand the building. You also want to create apartments on the new levels and an underground garage that can be reached by car under the courtyard. There will be 17 apartments in the attic, and 17 cars in the parking lot under the yard. [2]
The renovation of the facade section on Andrássy Avenue started in 2017 and is still ongoing. Characteristics of the property environment: UNESCO World Heritage Site..

2. THE FAÇADE CONDITION

The restorer report says: ...the puppets are already badly damaged, weathered and cracked in their material. In several places, only the gypsum bark surrounding the puppet is present. The condition of the elbows is variable, in any case severely damaged and eroded. There are also larger deficiencies in several places. At their plinths, dirt accumulated on the stone slabs of the terraces clogged the carved spouts.

Figure 1. The Andrássy Avenue facade

Figure 2. The puppets are badly damaged

There are also larger deficiencies in several places. At their plinths, dirt accumulated on the stone slabs of the terraces clogged the carved spouts, so the moisture accumulated there accelerated the deterioration processes. Repairs with cement or lime materials can be seen in several places, but none of them could replace the original work, they are of substandard quality (Figure 2. – Figure 5.).

Figure 3. The façade surface

Figure 4. The window decorations

3. THE RENOVATION METHODS

As the building is a monument, the renovation of the existing building structures can only be done with a monumental approach, according to the level of the building at the time of construction. Renovation of metal, artificial stone and stone elements, stucco, doors and windows, as well as the restoration of former decorative paintings can only be done by a specialist restorer [2].
The surfaces must be cleaned with stone sculptural restoration work, the defects must be corrected, and the deficiencies must be replaced in the pattern of the existing originals.
Gypsum with suitable properties is not available on the building material market, so the moisture-resistant property can be achieved by adding additives.
Technogips Pro BlueBoard Type GM-FH1-IR is composed of hydrophobic gypsum core with special additives and bi envelope of white glass matt, which provides superior strength and impact resistance.
Standard Classification: In compliance with EN 15283-1:2008 Type: GM-FH1-IR

- Improved Fire Resistance – class F
- Decreased water absorption – class H1
- Improved impact resistance – class I
- Improved strength – class R

Moisture resistant gypsum plasterboards Type H2 is made of cardboard liner and gypsum core with water-repellent (hydrophobic) additives for protection against moisture.
They are used for walls and ceilings in areas with high levels of humidity (bathrooms, kitchens, laundry rooms, lavatories, etc.).
Standard Classification: In compliance with EN 520:2004+A1:2009, Type H2
Advantages and properties:

- Possess all the advantages and properties of the standard plasterboard,
- Create a strong, stable and durable base ready for ceramic coatings in areas with high humidity,
- Lightweight and comfortable to cut and mount,
- Provide high levels of soundproofing of walls,
- Sustains a healthy, moisture-controlled environment.

Table 1. Technical characteristics of Technogips [4]

Technical characteristics	
Flexural breaking load – 9.5 mm ✓ longitudinal ✓ transversal Flexural breaking load – 12.5 mm ✓ longitudinal ✓ transversal	 > 400 N > 160 N > 550 N > 210 N
Reaction to fire	A2-s1,d0
Thermal conductivity, λ	0.25 W/(m.K)
Water vapor resistance factor, μ	10
Total water absorption	5 - 10%

Figure 5. Column head damage

Figure 6. The old-new building after reconstruction (model) [1]

4. HUNGARIAN GYPSUM PATENT

The main advantage of the gypsum mixture according to the present invention is that it is permanently resistant to moisture-saturated environments while absorbing up to 2% by weight of water at 40 ° C and 100% relative humidity.
The gypsum product was tested with three standard tests:

- water absorption (Table 2.),
- cooking test (Table 3.), and
- water penetration under water pressure (Table 4., Figure 7.- 8.).

Table 2. Gypsum experiment – water absorption test

40x40x80 mm prisms WATER ABSORPTION at 6 minutes:					10 minutes increase:		90 minutes increase:		24 hours increase:	
sign	starting weight	10 minutes	90 minutes	24 hours	grams	%	grams	%	grams	%
0	173 g	184 g	205 g	214 g	11	6.5	32	18	41	24
9.	192 g	192 g	193 g	196 g	0	0	1	0.5	4	2
10.	216 g	216 g	217 g	219 g	0	0	1	0.46	3	1.4
11.	204 g	204 g	205 g	207 g	0	0	1	0.49	3	1.47
13.	197 g	198 g	199 g	203 g	1	0.5	2	1	6	3
19.	208 g	208 g	209 g	213 g	0	0	1	0.5	5	2.4
20.	208 g	208 g	209 g	213 g	0	0	1	0.5	5	2.4
21.	204 g	205 g	207 g	212 g	1	0.5	3	1.47	8	3.9
22.	209 g	210 g	211 g	217 g	1	0.5	3	1.43	8	3.8
27.	195 g	195 g	196 g	203 g	0	0	1	0.5	8	4.1
28.	204 g	206 g	207 g	213 g	2	0.98	3	1.5	9	4.4
29.	202 g	204 g	205 g	211 g	2	0.99	3	1.5	9	4.4
30.	204 g	206 g	207 g	214 g	2	0.98	3	1.5	10	4.9
31.	198 g	198 g	199 g	201 g	0	0	1	0.5	3	1.51
31-s	194 g	194 g	195 g	198 g	0	0	1	0.51	4	2.06
32.	205 g	205 g	205 g	206 g	0	0	0	0	1	0.48
33.	201 g	201 g	201 g	202 g	0	0	0	0	1	0.49
34.	198 g	198 g	198 g	200 g	0	0	0	0	2	1.01
35.	204 g	204 g	205 g	207 g	0	0	1	0.49	3	1.47
36.	203 g	203 g	203 g	205 g	0	0	0	0	2	0.98

Table 3. Cooking test - The prisms (40x40x160 mm) were placed over a liquid boiling 100-110 degrees Celsius in a covered vessel

sign	weight grams	60 minutes water absorption			90 minutes water absorption			120 minutes water absorption		
		weight g	water g	water %	weight g	water g	water %	weight g	water g	water %
basis	340	363	23	6,76	378	38	1,17	378	38	11,17
basis	369	380	11	2,98	386	17	4,6	386	17	4,6
9	387	394	7	1,8	396	9	2,32	396	9	2,32
10	401	404	3	0,74	407	6	1,49	407	6	1,49
11	373	383	10	2,68	387	14	3,75	389	16	4,28
13	389	396	7	1,79	400	11	2,82	401	12	3,08
19	393	396	3	0,76	397	4	1,01	398	5	1,27
20	397	403	6	1,51	403	6	1,51	404	7	1,76
21	393	403	10	2,54	403	10	2,54	405	12	3,05
22	396	405	9	2,27	406	10	2,52	408	12	3,03
27	373	380	7	1,87	381	8	2,14	381	8	2,14
28	388	394	6	1,54	394	6	1,54	394	6	1,54
29	384	387	3	0,78	388	4	1,04	392	8	2,08
30	384	388	4	1,04	389	5	1,3	389	5	1,3
31	399	399	0	0	400	1	0,25	401	2	0,5
31-s	397	397	0	0	398	1	0,25	398	1	0,25

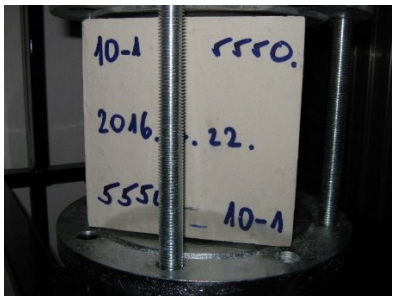

Figure 7. Water penetration depth into gypsum cube

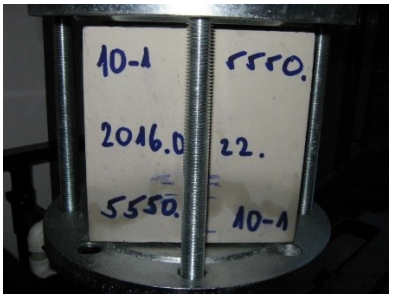

Figure 8. The water penetration depth (52 mm) into gypsum cube after 72 hours water pressure

Table 4. Water penetration under pressure [3]

GYPSUM EXPERIMENT [3] WITH A 150X150X150 MM CUBE

cube			increase after 72 hours at constant 0.5 bar water pressure	
manufactured weight	starting weight	ending weight	grams	%
5550 g	5395 g	5526 g	131	2.4

REFERENCES

[1] Márk Home Kft.: Budapest, 2017
[2] KVARC Studió Tervező Kft : Budapest, 2019
[3] DUNStop GIPS KFT, dunstopgipskft@gmail.com, 2016
[4] http://www.technogipspro.com/en/pages/documents.html, 2021

РЕНОВИРАЊЕ ФАСАДЕ HÜBNER ЗГРАДЕ У БУДИМПЕШТИ

Резиме: *У раду је приказана реновација Хубнер палате у Будимпешти. Украсни елементи фасаде су грађени од гипса, и обнова треба да буде извођена од истог материјала. Материјали који су доступни на тржишту нису довољно водоотпорни. Карактеристика коју произвођачи наглашавају у техничким таблицама је апсорпција воде 5-10 % масе пробног тела. Мађарски патент показује мање од 2 м% апсорпцију воде, исти тест изнад водене паре после два сата показује исте резултате. Тест пенетрације воде под притиском од 0.5 бара - са гипс коцком 150µ150µ150 мм – достиже 52 мм, а количина воде је 2.4 м..*

Кључне речи: *хидрофобни гипс, апсорпција воде, светска баштина UNESCO-а.*