



CASES OF UNTYPICAL APPLICATION OF GYPSUM IN CULTURAL HERITAGE OF LATVIA

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SUMMARY

Inorganic binders (lime, dolomitic lime and gypsum) as building materials appear in Latvia since XII - XIII century and is related to the efforts of German crusaders to conquer the territory [1]. It has been indicated in literature [2], that initially gypsum was burned at high temperatures (800-1200° C) thus obtaining so called "paved floor" gypsum, mainly used for the pavements of floors in churches and monasteries. Starting with the XIII-XIV c, crushed brick dust was added to the gypsum.

Given report summarizes the information about some historical objects of Latvian cultural heritage, where gypsum binder or even the gypsum as a building stone, intentionally or not, have been used in a not traditional, unusual or just interesting way.

It is well known, that if the gypsum mixture is not supplemented with special additives, the surface of object covered or treated, its application is more suitable for the indoor conditions. When in contact with moisture, gypsum dissolves easily, thus both the gypsum-containing object itself as well the adjacent other materials are exposed to corrosion processes caused by soluble salts. Quite often, the solutions from the view point of restoration are challenging, as it is neither possible to isolate the source of soluble salts or influence the moist Latvian climate. Obtained findings show that while gypsum was not the dominant binder in medieval Latvian architecture, it played a more varied and nuanced role than previously thought. Sometimes used inappropriately from a material science perspective, these choices reflect both practical constraints and craftsmanship over time.



1., 2. Gypsum stone blocks in the Northern wall pilaster of Riga Cathedral, XIII c.



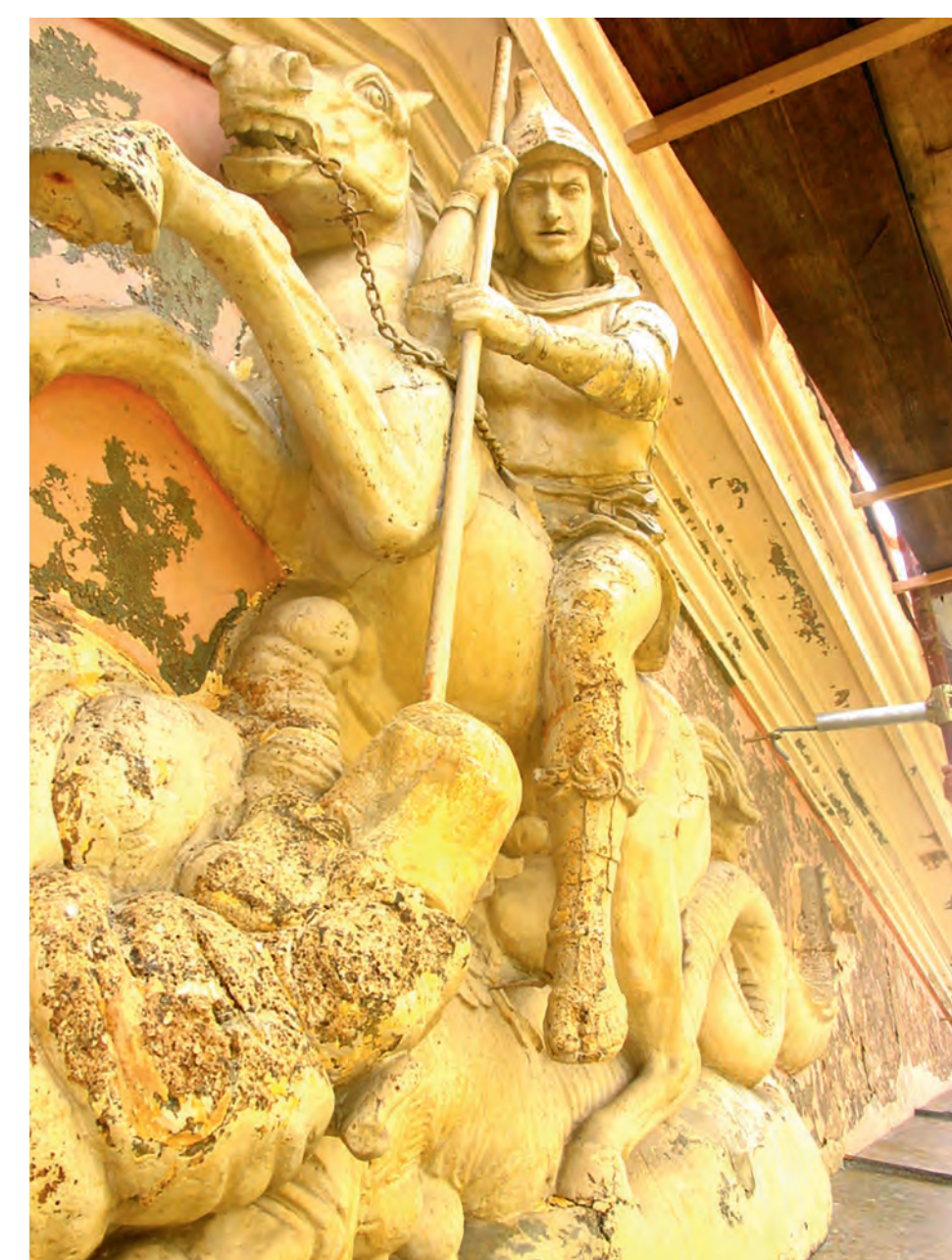
3. Gypsum sculptures of St. Mary and W. von Plettenberg in the Cross-road gallery of Riga Cathedral.



4., 5. Gypsum castings of Cesis medieval castle



6. Portal in Riga, Kramu str.3, gypsum mortar between the stone blocks during construction, 1737.



7., 8., 9. St. George hospital in Riga with gypsum figure of St. George fighting the dragon, 1845.

Portal in Riga, Kramu str.3

The entrance of building in Riga, Kramu str. 3 is decorated with a polychrome portal (image 6), dated with 1737. In the phase of practical conservation (2003-2005), the object was dismantled and removed to restoration workshop, thus the mortars between the parts of portal became accessible. Investigations indicated, that during the construction of object the gypsum mortar was used between the stone parts [6].

St. George's hospital

On the facade of the St. George's hospital (1845) in Riga, there is a sculptural group of St. Georg fighting with dragon (image 7, 8, 9). Initially it was thought that the object is carved from freshwater limestone, however DTA/TG analysis indicated that the painted gypsum was used for the creation of object.

CONCLUSIONS

Given research enhances the understanding of local building traditions and contributes to conservation practice by highlighting the need to assess the behavior of non-standard historical materials *in situ*, especially under the challenging climatic conditions of the Baltic region.

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METHODOLOGY

The methodology of studies mainly included: visual assessment, analysis of chemical composition, X-ray diffraction (XRD), differential thermal analysis (DTA/TG), review of archival records, including conservation reports, restoration documentation, and historical references.

DISCUSSION

Untypical cases where the application of gypsum has been confirmed by research data could be divided into the following groups:

- occasional use (e.g. gypsum blocks in the stone cladding of Riga Cathedral, XIII c);
- originally applied in interior which over time has become an outdoor space (e.g. ruins of Cesis medieval castle);
- applied for specific purposes (e.g. joints of portal at Kramu str.3., Riga);
- intended exposure in outdoor environment, but protecting the object from direct influence of precipitation (St. Mary and von W. Plettenberg, Riga Cathedral);
- intended exposure in outdoor environment (St. Georgs hospital in Riga).

Riga Cathedral

Gypsum stone blocks in the Northern wall of Riga Cathedral is one of the eldest examples of occasional application of gypsum stone. 3 blocks were built in the pilaster of Cathedral at around XIII century (image 1,2). Different types of soluble salts were detected by XRD on the surface of pilaster, coming from diverse sources, but the presence of CaSO₄x2H₂O is related to historically applied gypsum stones [3].

In the crossroad gallery of Riga Cathedral, protected from direct influence of precipitation, there are 2 polychrome gypsum figures – St. Mary and Walter von Plettenberg (image 3). The same sculptures but carved in natural stone in XVI century are in Riga castle as well.

Medieval castle of Cesis

In the medieval castle of Cesis, gypsum has been applied for different purposes in the end of XV and XVI century – for decorative castings, mortars and plasters [4]. As with the time the castle turned to ruins, interior become the outdoor space and thus some gypsum elements are exposed to environmental conditions, (image 4,5). As concluded in previous research the gypsum binder for castings, historically was obtained in temperature range of 800-1000° C [5].