A BUILDING TECHNIQUE USED FOR STONWORK FACING IN ITALY IN THE BUILDINGS OF THE THIRTIES: THE CASE OF FACADE THIS STONE FACING OF THE TOWN HALL IN CORRIDONIA

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1. ABSTRACT

This paper presents the results of a survey carried out on a building of the Thirties in Italy: the Town Hall of Corridonia (a small town in Central Italy). The survey was carried out with a view to pinpoint the methods used for the special facade facing, given the present state of deterioration in the connections between slabs and masonry support which now require remedial action to secure slabs.

The results which have thus been obtained consist in the identification of a type of building technology used in that special work in relation to the technologies, which were generally used in that historical period and in finding useful elements for the remedial work to be carried out on slabs.

This report illustrates the results of research carried out on the building under study in order to highlight the special building methods applied in the façade thin stone facing. The research has been carried out by Prof. Placido Munafò.

2. INTRODUCTION

Towards the mid Thirties, the change of language in architecture, advocated in Italy by authors, such as Ridolfi, Libera, Samonà, led many minor authors working at a local level to take the rationalist approach into account. This shift occurred not only in terms of image attempting to reassert those architectural forms already put forward by major authors of the time, but also at a constructional level, with the introduction of techniques

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which proved to be fit to support the modern look that buildings were supposed to feature.

In particular, only the echoes of the major authors’ works arrived in provinces, like Macerata. There a “modernisation” process was implemented by minor authors. It mainly consisted in the use of “façade” building techniques aimed at “modernising” works which were absolutely traditional from a constructional point of view.

An emblematic case was the introduction of façade thin stone facing, which was applied to buildings in order to give them a “modern” look in line with the rationalist approach. Yet, if from a formal point of view this process was to be defined as a minor one, as it was a mere revisiting of architectural forms which were “new” for the time, the same cannot be said for the building approach itself. In this modernisation process new techniques, which were not yet well tested in that time, were used. Hence, although poor from an architectural point of view if compared to major authors’ works, these ones became interesting from a constructional point of view, because it allowed to test and upgrade new special building systems.

Nevertheless, this approach has over time entailed a significant deterioration in many buildings, due to the experimental feature of building techniques and to the alterations which were built in the buildings’ structure itself. In particular, a substantial deterioration has occurred after only a few decades in a building located in the province of Macerata: the Town Hall of Corridonia, which is the case study of this survey. This is mainly due to the lack of protection against rain water infiltration in addition to a slab continuous support system, which is not the ideal solution. Some slabs have come off, the connections have broken down, thus leading to major safety problems, hence with very frequent façade maintenance needs. This problem also concerns many other Italian buildings dating back to the same period as the work under study.

So far rehabilitation works have been carried out occasionally in those spots which required it, but without ever trying to investigate the original facing building methods, nor the effects and expected duration of the remedial actions which are carried out. The study which is illustrated in this paper is intended to overcome this approach, to highlight the building methods applied in this type of facing and consequently the ways in which the necessary façade rehabilitation must now take place.

3. STATE OF THE ART

The researchers who have carried out studies on the buildings provided with façade thin stone facing dating back to the Thirties in Italy are Poretti, Nelva and Astrua. The former [Poretti, 1988, 1990, 1995], in particular, has focused his attention on the relationship between the formal approach and the building structure of some Italian buildings of the Thirties. This author has tried to highlight the innovating character of the architectural and constructional language of the Thirties in Italy through a formal and constructional study of some of the most significant major authors’ works (Libera, Samonà, Ridolfi).

More specifically, in one of his books, this researcher has illustrated the study of three buildings provided with façade thin stone facing built in Rome in the Thirties. The latter [Nelva, 1993, 1994] with [Astrua, 1993, 1994] has instead concentrated on the specific deterioration problems affecting these buildings. In particular, he has focused
on the alterations of some wall facing carried out with these techniques (façade thin stone facing) in Northern Italy (in Turin). His research has pointed out the building methodologies in use, the type of instrumental analysis as well as the most frequent types of deterioration affecting these faces. In spite of the significant results obtained by these two authors’ work, it has been necessary for us to inquire some still uncovered areas. Yet, no sufficient data have been found at a national level concerning the implementation of those techniques at that time. This has led us to set up an information system (based on the analysis of manuals and magazines) related to the implementation of those techniques at that time. At a local level there was a total lack of data concerning the architectural and building framework of that period, so that we were obliged to extend our study also to other types of architecture dating back to those years, which were also characterised - although to a more limited extent - by the same kind of façade faces as the building taken under examination.

4. SURVEY PHASES AND METHODOLOGY

Our research has taken place in two different phases:
• archival and historical research phase intended to collect constructional data about the building itself, as well as building yard documents, original specifications, minutes of calls for tenders, collection of correspondence between the podestà and the designers and about the architectural works carried out in the area during that period;
• an on site experimental research phase, intended to identify the constructional methods and the state of conservation of wall facing by means of non destructive and semi-destructive tests.

The archival and historical research phase has been carried out with reference to two types of sources: archival sources (municipal archives of Corridonia and State Archives of Macerata) and literary sources (manuals and magazines of the time). The first type of sources has allowed us to retrieve the documents issued before and during the execution of the building under study, thus obtaining information about the techniques and materials used. The second type of sources has enabled us to understand the national reference framework for the works in question, thus retrieving information about the execution techniques of these special types of facings. Furthermore these results have been compared with other research works carried out by other authors on similar buildings dating back to the same period although located in different areas.

The experimental research phase has been carried out by means of non destructive and semi-destructive tests. Among the non destructive tests, magnetometry and percussion sound response have been applied. Among the semi-destructive tests, coring has been carried out on some slabs in view of an endoscopic examination. These investigations have allowed us to understand the wall facing execution techniques and to evaluate the conservation state of the whole facing, which was useful to identify the kind of suitable remedial actions which were necessary to secure the façade slabs.
5. THE TOWN HALL OF CORRIDONIA

The Town Hall of Corridonia was built in the Thirties upon the call for tenders which was issued for the execution of a “monument to Filippo Corridoni and of the Town Hall”. 10 projects participated in the call for tenders dated December 1st 1934, amongst which also a project by one of the best known architects, such as Mario Ridolfi, but none of them was considered to be suitable. The contract was instead directly awarded by the Podestà, Carlo Firmani, to two designers, Architect Marrani and Engineer Francalancia, that he knew personally, although they were absolutely unknown in the Italian architectural field. Fig. 1

The work which was carried out by these two designers was especially intended to provide a modern image of the whole unit, in compliance with other works by major authors which had been built in Rome during that period. The building is characterised by an absolutely traditional masonry structure masked by constructional elements which are bound to convey the image of modernity. In particular the bearing structure is out of brickwork, although reinforced concrete is also used, although with a very low confidence level. Yet, a thin stone facing was used for the façade. This was a rather innovating solution for the time and the geographical area. This was intended to provide an image of modernity and monumentality to a building which was built with constructional techniques which were far from being innovating. Hence, all the decorations which characterised the early Twentieth Century architecture were removed.

The stone facing is made out of travertine slabs. They are arranged in different ways according to their position on the front of the building. They cover the whole façade, including the balcony parapet and the town hall. Slabs define a rational surface, although some decorative elements are occasionally used (the column ends) which characterise many architectural works of the fascist regime time in Italy. These are style inconsistencies which highlight the low architectural level of the designers, especially in comparison with other works of the same period designed by other major architects.

But it is exactly this type of solution, namely the use of thin stone slabs for the facing of a traditional stonework structure, which conveys the idea of novelty. The deterioration which now seriously affects the building after only a few decades, which therefore requires a substantial remedial action to secure slabs, is probably due to the designers’ lack of knowledge about the suitable technical solutions required to support this type of facing.

6. THE STONE FACING BUILDING STRUCTURE

The survey which has been carried out on the stonework facing of the Town Hall of Corridonia, based both on the constructional analysis and on experimental examinations, has allowed us to identify the constructional technology which was used,
thus supplying us with the necessary data to assess the suitable rehabilitation work to secure slabs. Fig. 2

Different technologies were applied in the thin facing according to the façade portions. Two main “standard” solutions, namely applied to large portions of the building surface, were implemented:

- facing with thin slabs arranged according to staggered joints
- continuous facing with thin slabs arranged according to unstaggered joints.

Five special solutions were adopted for specific problems:

- facing of the portico entrance portal;
- facing of the balcony window;
- facing of the embrasure;
- facing of the façade pilaster and of the edge;
- facing of the curved portions of the façade.

6.1 Facing with thin slabs arranged with staggered and unstaggered joints

These solutions concern most of the façade surface. In both solutions 4 cm thick travertine slabs were used. Height and width vary slightly. In the first case 1.5 by 1.1 m slabs were used and 1.4 by 1 m slabs were used in the second case. Slab surface is smooth and features no mutually connected joints. The only type of processing on slabs is the holes made to anchor clamps to the wall at the back. The 1.5 - 2 cm distance between the slabs and the wall is filled with mortar of cement. Clamps are made out of flat iron pieces hooked at the ends for insertion into the slab holes. Every slab is connected to the wall only by means of two clamps, located in the upper part.

In case of staggered joints, every slab takes advantage of the support provided by the two slabs underneath. In the case of the unstaggered joints, every slab is supported by the following one. Fig. 3

This special system therefore allows slabs to support one another from the bottom to the top (i.e. the direction they were positioned in the execution procedure) thus burdening the lower slabs with a substantial load and exerting an extremely high shearing stress on clamps, due to the lack of an effective setting of the mortar of cement (which was thus stultified because of its deterioration).

6.2 Facings in special areas

The technology which was generally used was slightly changed in some portions of the building to meet specific needs. The areas concerned are the portico entrance portal, the balcony window, the embrasure, the façade pilaster strip facing, the edge facing and the façade curved portions (Fig.4,5,6).

Three types of thin slabs were used in the portico area: 1.0 by 1 by 0.04 m slabs; 0.61 by 1 by 0.04 m slabs; 1.24 by 1 by 0.04 m slabs were used. The previously illustrated execution criteria were adopted for all the three types of slabs: i.e. two holes on the slab upper side for their connection to the clamps. Additionally, grooves were made on the lower part of these slabs to allow them to be supported by the lower clamps. Thin shaped chamfered travertine (1.7 by 1 by 0.07) blocks were used here to meet special perspective needs.

In this case a substantial difference can be found against the standard facing due to the change in the support stonework. Given the presence of a reinforced concrete lintel
no connection is provided to the clamp stonework support (The travertine unit should have been hung), but instead two side connection units are used.

7. DETERIORATION PROBLEMS

To conclude, the travertine slab facing, which has been described above, features the following deterioration signs:

Loss of adherence of the slab to the mortar connecting it to the wall at the back. Fig.7 This deterioration is clearly visible because the support lower edge of the slab tends to come out from its housing, whereas it is still held in place in the upper part thanks to the fixation metal clamps. Yet, it should be pointed out that the corrosion of the metal clamps - i.e. one of the first deterioration signs which emerged due to rain water infiltration - could lead to the full detachment of the slab from the wall;

Fissuring of slabs due to their deflection. Fissures can be seen in the horizontal facing slabs (i.e. at the balcony intrados), which are only fixated at their ends. Fig.8

Chipping of slabs can be seen in a side pilaster slip of the case under study, which is probably due to seismic events or to accidental shocks;

Localised breakage of slabs near the fixation points due to thermal effects because unsuitable or no thermal expansion joints are used.

8. BIBLIOGRAPHY


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Fig. 1. An image of the Corridonia’s Town hall in the thirties.

Fig. 2. Facade of the Town hall and indication of the analized places.
Fig. 3 Technical solution used in the facade.

Fig. 4 Technical solution used in the portico entrance portal
Fig. 5 Technical solution used in the balcony window

Fig. 6 Technical solution used in the embrasure
Fig. 7 Loss of adherence.

Fig. 8 Localised breakage of slab.