



The natural light in the Italian rationalist architecture of Ex G.I.L. of Mario Ridolfi in Macerata. The virtual reconstruction and the daylight analysis of the original building



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ABSTRACT

This study presents the analysis and the evaluation of indoor daylighting levels of Ex G.I.L. building (1935) in Macerata (Italy), designed by Architect Mario Ridolfi (1904–1984), according to the original composition and internal distribution, which have been deeply modified during time. The Ex G.I.L. building is a very representative example of Italian rationalist architecture. The virtual reconstruction of the original aspect of the building has been possible thanks to the study of sources and of original documents.

The simulations, produced to evaluate and to represent the levels of indoor natural light, have involved a very reliable 3D virtual reconstruction of the original building about size, building components dimensions and internal distributions, allowing at the same time to provide reliable and new representations of the original building. The daylighting simulations are run, using advanced solar-lighting design tools, which use international technical lighting calculations, according to ISO/CIE standards. Finally, the data and simulations obtained are compared and evaluated with current regulatory standards.

The use of current energy simulation tools on the study of this architecture of the past, shows a very high availability of natural light and optimum light distribution of indoor environments designed by Ridolfi, highlighting a specifically design attention dedicated to this purpose, where the excellent formal solution, according to the rationalist style, includes the achievement of optimum natural lighting and visual comfort.

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1. Introduction

In Italy, starting from 1926, year of the establishment of O.N.B. Institute (Opera Nazionale del Balilla), until the end of the fascist regime, it was started a very intensive programme of building projects for the construction of new buildings, used for the gymnastic education and sport activities for young people. According to the overall strategy of the regime, a large number of these new buildings were built, settled throughout the national territory. These buildings, named as “Case del Balilla” had to provide spaces, in which young people could play sport and could learn gymnastics [1], but at the same time, these buildings provided a way to spread a new modern Italian architecture language, based on the rational style. These buildings, managed by the O.N.B Institute and next by the G.I.L. Institute (Gioventù Italiana del Littorio), are recognized as best examples of Italian modern architecture, designed by the best Italian architects of that period [2], such as Enrico Del Debbio,

Luigi Moretti, Adalberto Libera, Mario Ridolfi, etc. These buildings were characterized by many innovations about functions, technology, systems, equipments and materials. The building design and the construction of these buildings involved advanced constructive systems, new techniques, better building performances and a new aesthetics. Today, all the Balilla Houses, represent a very important architectural heritage, which is valued and regarded [3,4].

The Balilla House of Macerata, designed by the architect Mario Ridolfi (1904–1984) and commonly named also as Ex G.I.L. Building, is certainly one of the most representative and best building in Regione Marche and one of the best architecture of Ridolfi. The Ex G.I.L. Building of Macerata is an excellent example, corresponding to the criteria and the features required by this type of buildings. In this sense, a design guide for the design of these building, written by E. Del Debbio in 1928, provided information and standard about required functions, size of rooms, exterior design and also about best orientations of rooms, dimensions of windows, natural ventilation and daylight requirements [5]. In the Ridolfi's building is possible to recognize all these main features. The building design, made by Ridolfi, for the Casa del Balilla of Macerata provided not only material innovations and constructive innovations,

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such as metal window frames or concrete frame construction, but also new design criteria: some specific aspects such as the internal distributions, the internal paths of occupants, the availability of natural light became objectives in the building design process [6,7].

The aspect of the building, with its wide vertical windows of the staircase and with its horizontal windows, has developed the desire to study and to highlight the daylighting conditions of this building. On the other side, the current status of the building, which is deeply modified by many changes and refurbishments, has led the will to re-discover the original aspect and to evaluate the original daylight performance.

This study about the daylighting analysis of an architecture of the past, could be considered an experimental approach to define a method to apply in other case studies. In this sense, there are many architectures of the past, which no longer exist or are transformed and which could be studied again, thanks to recent building design tools.

2. The virtual reconstruction of original building

The Ex G.I.L. building is located in a semi-central area, near the inner city centre, along the current Don Bosco avenue. Today, the building is in low maintenance conditions, with apparent signs of diffuse deterioration and damage, and it partly represent the original building.

In 1933, only after several events with different building design solutions made by municipal technicians, the O.N.B Institute commissioned the architect Mario Ridolfi, for the design of this building. The building construction started in 1934 and it ended in few time in 1935, with the building inauguration, dated 10 November of the same year [8]. The Ex G.I.L. building was opened and it worked until the end of the second world war. Even after the war, in later years, the building has preserved its prevailing functional services, such as gym centre for young. Nowadays, the building, which is open, is used for similar activities, albeit with important changes: the gym room is used by school groups and there are headquarters of sport associations.

The analysis of original documents [9] and the study of previous researches and publications [10–12] have allowed to know and to understand the several modifications that occurred. During the years, starting from 50s, the building has been modified, with many maintenance operations and transformation processes, which have altered both the exterior appearance and the indoor spaces. The building operations, made between the 60s and 80s, had the greatest effect on architectural composition of the building. These operations had provided a new internal distribution, changes in windows, the elimination of the portico, the extension of the eastern volume, the modification of the atrium space with a underground trench and a skylight well, new fire escape stairs in the north front, etc. In addition to these modifications, it must be noted another important intervention, made in 80s, near the Ex G.I.L. building. Along Don Bosco avenue, a swimming pool centre was built, with a canopy and a volume adjacent to the building, deleting the volumetric independence of the original building. Ultimately, the current appearance of Ex G.I.L. building (Figs. 1 and 2), deprived of some important architectural solutions, is quite different to the original one, decreasing the quality and the possibility of a complete restoration.

To discover the original aspect of the building has been necessary, in addition to the detection of the current status, the study of the original building project of Ridolfi, which is conserved in the Ridolfi Archive at San Luca Academia in Rome [13], the study of other original documents [14], such as photos, letters and the study of previous publications and researches on this topic, which have allowed to understand what could be the appearance of the



Fig. 1. Current status. West front.

building when it was built and to make an overall digital reconstruction. By all the available documents, is possible to say that the building, started in 1934 and finished in 1935, was not entirely similar to the design of Ridolfi. The original building project boards show some solutions, prevailing about internal distributions, which are not made in the realized building, but in general there are not relevant differences. The differences between the building design and the realized one are: a stairway and a room at the underground floor; two toilets in place of a stairway and a different internal distribution of outpatient rooms and dressing rooms at the ground floor; three horizontal windows in the west front of the eastern volume; two toilets in place of a stairway and a different internal distribution of office rooms at first floor. It is possible to consider these differences as result of functional and logistic changes, realized during the construction process. To define the reliable composition and appearance of the original building, all the other parts of the building, which are the same in the design and in the realized building, have been also verified. The comparison between the dimensions of building volumes and building components of the current status with the dimensions submitted in the original project boards of Ridolfi, allow to assume, with a high level of confidence, that shapes, dimensions of volumes, windows, walls etc. correspond to the realized original building. In this sense, the detected dimensions about thickness of walls, dimensions of windows, height of ceilings, etc. are correct and reliable with the original ones. Any other differences, are minimal, and they can be considered not relevant for the purpose of this study, in terms of virtual reconstruction and of daylighting results.

According to the above considerations and assessments, technical drawings, such as plans, elevations and sections, have been made, representing the original status in 1935, and, in addition, a tridimensional model of the entire building has been done. By the virtual 3D model, renders are produced, giving reliable representations of the original appearance of the building (Figs. 3–6), which



Fig. 2. Current status. View of the courtyard.

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