

**Covid-19's lessons for standard building design: Proinfância daycare centers**

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**ABSTRACT**

*The Covid-19 pandemic brought changes in the behavior of society, with the suspension of several activities, among them the access of children to schools. This study has as main objective the analysis of the daycare spaces of the Proinfância program regarding the attendance of environmental comfort, dimensioning and salubrity, considering the set of issues brought by the pandemic. To achieve this purpose, analyses were made of the type C Proinfância building, project used in the construction of the school unit chosen as case study: the Unidade Municipal de Educação Infantil Profª Júlia Maria de Almeida Oliveira, in the city of Lagarto, Sergipe. The secondary objectives are: to analyze the specificities of the implementation of this standard building in Lagarto and to analyze the post-occupancy condition during and after the Covid-19 pandemic. The methodological approach of the study is quali-qualitative type, applied on documents provided by the Proinfância website and complemented by case study, with detailing of techniques and procedures to achieve the proposed objectives. The study explores the POE methodology (Post-Occupancy Evaluation) for the object of study, selecting the universe of tools to be applied. These are: walkthrough analysis, study of recommendations and technical analysis by the researcher.*

**Keywords:** school building, Covid-19, healthy school

**1 INTRODUCTION**

This study responds to the design demands brought during the Covid-19 pandemic about the children's school buildings, in order to contribute to the understanding of the physical space, comfort and safety of the environments, considered active elements of the educational process, during special conditions of use brought by the pandemic. The pandemic situation brought reflections on aspects that, historically, permeate both theory and practice in the field of architecture, especially in aspects related to comfort and flexibility of the inhabited environment, salubrity, ventilation, hygiene, dimensioning and circulation of spaces. The pandemic brought complex situations regarding the physical and psychological comfort and health of the people who use these spaces. The study intends to systematize the methodology to identify the requirements of school architecture design for post-pandemic early childhood education.

Architecture professionals have the challenge of incorporating new concerns and transforming the built environment into healthier buildings and cities. As with other buildings and urban infrastructures, the daycare space needed to be improved to welcome children back to their activities. However, this improvement should not be restricted to complying with municipal decrees that had, as a guideline, the care of personal hygiene, interpersonal distances, sink installations, etc. Very few changes in the physical structure of spaces took place, because many schools had no resources, time or knowledge to implement permanent changes.

This research aims to evaluate the Type "C" standard project for Early Childhood Education School of the National Program for Restructuring and Acquisition of Equipment for the Public School Network of Early Childhood Education (PROINFANCIA) as to the fulfillment of post-pandemic architectural needs, to be achieved through a case study in the daycare center called Profª Júlia Maria de Almeida Oliveira, located in the city of Lagarto, Sergipe.

Addressing a project that is characterized by repetition with serial implementation throughout the country makes the study of spaces and their performance even more comprehensive and relevant. The achieved reflections may contribute to the improvement of the standard building design, fulfilling to needs and new demands brought by the pandemic.

Schools were the last spaces to be released for partial or full use in the post-pandemic resumption of activities. Due to the high contingent of children living in spaces that were sized for a pre-Covid-19 reality, schools needed to adapt within the possibilities of the pre-existing

spaces through the adoption of hygiene and cleaning protocols. However, the field of architecture reflects the needs and demands of the present in order to interfere on spaces that will last for the future. The architect has a transformative role in society and needs to put into practice technical and humanistic visions about the changes brought by Covid-19. According to MEGAHE and GHONEIM (2020), the pandemic of Covid-19 has caused serious consequences that may represent an opportunity to review individual and collective choices and priorities. Most architectures today show evidence of how humans have responded to infectious diseases by redesigning physical spaces (2020). Sanitarian considerations have sparked real revolutions in architecture and urbanism. Paradigmatic examples date back to the 19th century, with the execution in large scale of sewage systems in European metropolises, or to the 1920s and 30s in Europe, in which entire neighborhoods were designed so that all residences would face the sun. School buildings designed during the 20th century under the principles of Modern Architecture had the dimensions of rooms and circulation areas programmed by architects, as well as cross-ventilation in long permanence spaces. The Covid-19 pandemic in the 21st century brought these features back in the spotlight. The responsibility of updating architecture involves both the public authorities, by defining new guidelines and conducting public policies for large-scale architectural projects; architects, in charge of building design; and managements that are responsible for taking care of daily routine of buildings and users. Likewise, both the physical space and the school management and employees play an active role in disseminating information to the users of the school space, including the children who will learn to live under new paradigms.

Besides sanitary requirements related to ventilation and attention to flows, crowding and distances, the pandemic brought a reflection on the need for flexibility of spaces that quickly adapted to new uses and conditions. During the pandemic, spaces were transformed: soccer stadiums became field hospitals, hospital wards became ICUs, hotels were converted into hospitals, housing became classrooms or work spaces. As school buildings gradually opened up, the encouragement of outdoor activities became a necessity, and the use of open areas began to be valued. According to the Brazilian Society of Pediatrics, Alana Institute, "families, schools, and governmental structures of education, health, social assistance, environment, and urbanism can contribute to bring experiences closer to nature, promoting a healthier development of all children in cities."

The reason for choosing the daycare building is due to the long day of the child's stay and the intense contact of the children among themselves and between caregivers, as well as the sharing of equipment, toys, furniture, and spaces for meals, hygiene, and rest. The difficulty in individualizing the use of this equipment overloads the need for sanitation, implying new cleaning procedures.

The choice of the Unidade Municipal de Educação Infantil Profª Júlia Maria de Almeida Oliveira, in Lagarto, was due to the number of students who attend the daycare full time and to its full operation, because some daycare centers during the pandemic stopped their activities for not having an adequate structure to receive the students. The mentioned daycare center did not have a staggered schedule of classes and hours. The location is also easily accessible for the proposed study, since it is located in a neighborhood near the center of the city of Lagarto, where the flow of transportation is constant, unlike other daycare centers that are far from the center and have transportation difficulties.

Figure 1 – Location.



Source: Authors (2022)

To establish criteria for analyzing the daycare building, authors who are a reference for the theme were sought. The bibliographic verification sought to collect information and data regarding several subjects: children's rights, projects on children's school architecture, evaluations of school environments, and standardized projects for early childhood education. Kowaltowski (2011) believes that design principles can be studied in relation to the constant needs of architecture through time. According to the author, the six needs of the physical environment are: comfort, to meet the sensory needs of warmth, light, sound and smell; territoriality and privacy; safety; spatial orientation and constancy; aesthetic visual stimulation and beauty; variety of sensory stimuli.

## **2 OBJECTIVE**

The general objective of the study is to evaluate the Type "C" standard project (Early Childhood Education School) of the National Program for Restructuring and Acquisition of Equipment for the Public School Network of Early Childhood Education (PROINF N CIA) as to the fulfillment of architectural needs in the post-pandemic through a case study in the city of Lagarto in Sergipe.

1.To perform a post-occupancy evaluation of the Profª Júlia Maria de Almeida Oliveira daycare center;

2.To survey and systematize the methodology for identifying school architecture design requirements for post-pandemic early childhood education.

## **3 METHODOLOGY**

To be able to answer the questions raised throughout the study, as well as to carry out and systematize the proposal, the methodological approach that will guide it is based on the qualitative method and through the case study.

From the perspective of qualitative approaches, it is not the attribution of a name that establishes the methodological rigor of the research, but the explicitness of the steps followed in conducting the research, that is, the clear and detailed description of the path taken to reach the objectives, with the justification of each option made (ANDRE, 2013).

Techniques and procedures to achieve the proposed objectives will be studied in depth. The study will explore the POE methodology (Post-Occupation Evaluation) for the object of study, selecting the universe of tools to be applied. These are: walkthrough analysis, study of recommendations, and technical analysis by the researcher. The walkthrough analysis method has been widely used in the performance evaluation of the built environment and in architectural programming. It allows the descriptive identification of the negative and positive aspects of the analyzed environments (RHEINGANTZ, P. A.; AZEVEDO, G. A.; BRASILEIRO, A.; ALCANTARA, D.; QUEIROZ, M.). The interviews will be structured and directed to the managers of the city's Department of Education in order to collect information about the guidelines given in daycare centers during the pandemic and post-pandemic period of COVID-19. This contact will be relevant because the guidelines adopted by the direction of the schools came from the municipal management

#### **4 HEALTHIER SCHOOL**

Architecture is responsible for ensuring the quality of healthier school spaces and meeting the needs generated by the pandemic moment, as well as rethinking the future of school environments. At this moment, we have the opportunity to discuss the direction we want to give to the school infrastructure, since the Covid-19 pandemic has highlighted problems that already existed, such as closed classrooms and outdoor playgrounds that were poorly used. The possibility of rethinking these environments will contribute to improving the quality of life in these spaces and preventing other diseases.

According to the Technical Manual of the IAB-SP (2020, p.05), a healthy school is one that promotes the well-being of those who use the space, which meets the requirements of environmental comfort, providing well-ventilated spaces, illuminated and with acoustic quality. The environments need to provide movement and interaction of users, with space for study and collective work.

Also according to the Handbook, the fear of being infected by the coronavirus has impacted the way we use school space, requiring a change of habit and the way these environments are occupied, and representing an opportunity for them to be changed and reorganized.

There is research that shows that the quality of learning is directly linked to the quality of the infrastructure and the school building. The school space is important not only for the well-being of students, but also of employees and other education workers. School environments demand different solutions for thermal comfort, ventilation, lighting, and acoustics. These characteristics demand flexibility of solutions and design responses, due to their location, in urban or rural areas.

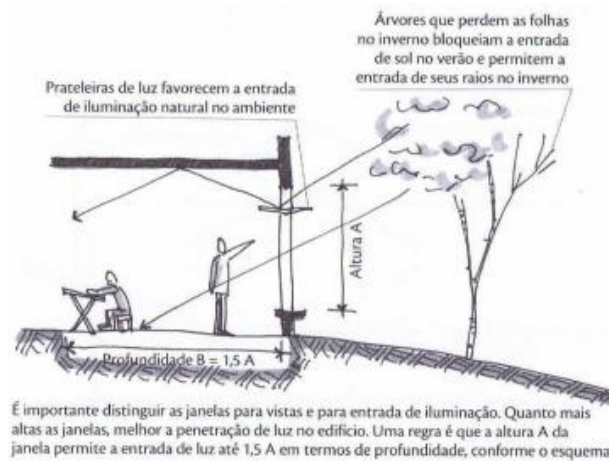
In addition to meeting the needs of comfort and performance, the pandemic moment raises in the school community the discussion about the daily space, in order to promote its sustainable and healthy use during and after the pandemic, demanding collective participation in decisions and actions that enable the confrontation of the public health crisis. It is necessary that the school management, the curriculum and the environment, as well as the users, are in constant dialogue so that everyone participates in the decisions and in the organization of the spaces. It is necessary to point out that each school, each community has its cultural and environmental specificities that strongly interfere in the decisions to be made. Each case is a

particular case (p.8). In the perspective of the pandemic, the importance of dialogue is intensified, because by participating in the discussion and implementation of new rules for use and care, everyone will be co-responsible in the process of collaboration and mutual help, reorganization of times and spaces. Educational actions, discussed collectively, are the basis of a healthy school. (p.08)

School is the place where the child lives for a long period of the day. It is the place where they grow up and build social relationships, being a space for collective living. It presents a program of needs that provides collective living in closed or open spaces, which were planned for a time before the Covid-19 pandemic. Thus, it is necessary to rethink these environments urgently to adapt and transform them to the new reality brought by the pandemic. Architecture will need to adapt existing spaces and develop spaces under new parameters, proposing post-pandemic solutions for the place called "school". These solutions, as will be seen, rely on references from the past that help us think about the future about the design and the user. Kowaltowski (2011, p.112) emphasizes the importance of environmental comfort in relation to productivity in work or learning depends, first of all, on the design of the building and its adjustments to the user's activities.

In terms of comfort, natural lighting plays a fundamental role: "natural light impacts the physiological and psychological well-being of children and adults confined for many hours in indoor or enclosed spaces" (Ibidem, p.187). Also according to the author, external enclosures can be mobile and reduce the confinement of users.

Figure 2 - Natural lighting in the school environment. The presence of trees, the type of opening, and the depth of the space interfere with the entrance of light. In the cutaway scheme, the window flap reflects light to the ceiling of the room.

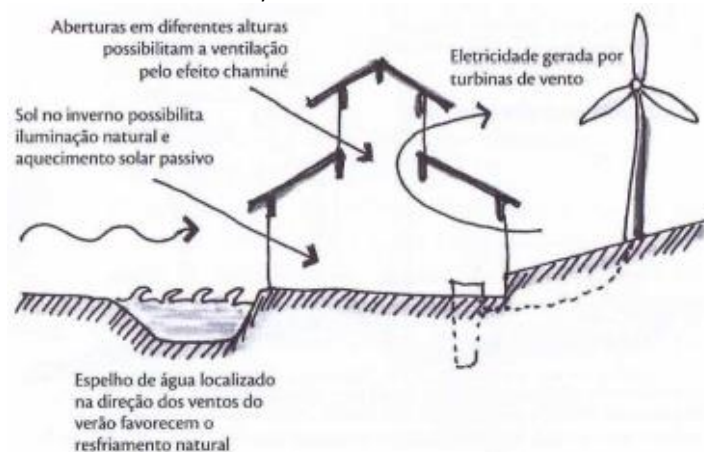


Source: Kowaltowski, 2011, p.187, based on Nair and Fielding(2005).

Still in relation to environmental comfort, natural ventilation provides air exchange to create a healthy environment, improving air quality and eliminating microorganisms that cause health problems. The author advocates natural cross-ventilation in all collective living environments, such as classrooms, laboratories, multipurpose rooms, and libraries. She shows, through cut-away graphic diagrams, the role of skylights to promote cross-ventilation (fig. 3). It also advocates the possibility for users to have the freedom and ease to control openings according to their needs.



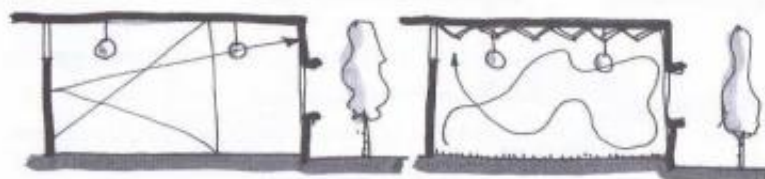
Figure 3 - Natural ventilation of the school building, considering the chimney effect. The water mirror guarantees humidity for the interior of the room.



Source: Kowaltowski, 2011, p.188, based on Nair and Fielding(2005).

Environmental comfort also presupposes a concern with acoustics. According to the author, the surfaces of environments such as classrooms should reduce sound reverberation and absorb noise. She points out that concern with acoustics is little considered in Brazil and contradicts the needs of thermal comfort, since cross-ventilation often makes use of openings into corridors and noisy areas (figure 6).

Figure 4 - The acoustic comfort of the school environment depends on the application of materials and shapes that avoid the reverberation of sound, solutions little applied in Brazil.



Source: Kowaltowski, 2011, p.198, based on Nair and Fielding(2005).

As for the smell, this issue impacts on the use of collective spaces, requiring air renewal and absence of humidity to ensure salubrity. Moreover, specific environments such as eating areas and toilets are places of concern with this aspect, in addition to sanitary facilities that are substandard or inadequately maintained, including septic tanks and drains.

The IAB-SP Technical Manual (2020, p.12) also shows that school environments demand different solutions for thermal comfort, ventilation, lighting and acoustics. There is a need for flexibility in solutions and design responses, whether in urban or rural environments.

The covid-19 pandemic has made us look at school buildings in a way that we seek adaptations that can contribute to the non-spread of the virus and ensure healthy environments. It is important to note that these points are not enough to be successful, it is necessary to follow the protocols of hygiene, monitoring and response to the identification of potential infection, in addition to a complete review of the logistics of care, flows, shifts and number of people per environment (2020, p.18).

## 5 CASE STUDY OF DAYCARE CENTER

The Municipal Early Childhood Education Unit Prof<sup>a</sup> Júlia Maria de Almeida Oliveira is located at Rua Carmelita Maria de Jesus, 227, Mesquita subdivision, São José neighborhood, in the city of Lagarto/SE. The unit was built in 2015 to meet a local demand.

Figure 5 - Classroom.



Source: authors (2021)

Figure 6 - External Area.



Source: authors (2021)

The Municipal Child Education Unit Prof. Júlia Maria de Almeida Oliveira operates full time with 91 students in daycare and 95 students in preschool. There are 21 professionals working there, including teachers, coordination, and other employees in other areas such as kitchen, cleaning, and security.

Due to its location, the daycare center under study fulfills a social role by receiving workers' children. The specificities of this group of users make the daycare service a fundamental need, and it is noted that the parents' concern with the quality of the spaces that the children receive is not a priority. Users develop a less demanding look for these qualities, which is related to the lack of understanding of how architecture can provide comfort, well-being, and contribute to the development of children.

On visits, idle spaces are noted that could be better used as shown in figure 5. The outdoor spaces, recommended for pandemic use, are not properly treated, with lack of equipment or support for the permanence of users and development of outdoor activities.



Figure 7 - External Area.


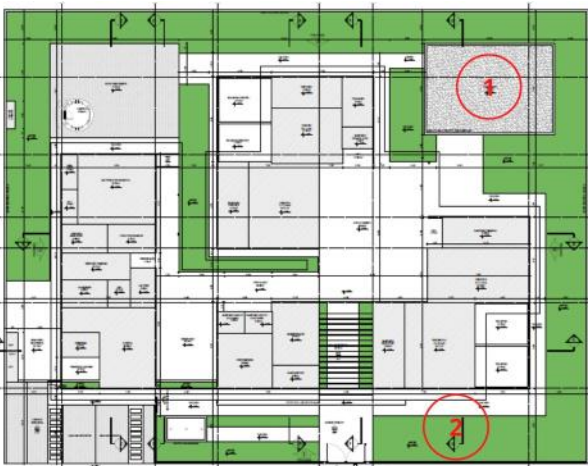



Source: authors (2021)

The visit shows the need to investigate the adaptations of a standard Type C building dedicated to early childhood education for children aged 0 to 6 years old to safely meet the recommendations for coping with Covid-19.


### 5.1 WALKTHROUGH ANALYSIS FORM

Chart 1- Completed Walkthrough Observation form - Playground and Garden

WALKTHROUGH ANALYSIS FORM	
Environments: Playground and Garden	
Area: 65,00m <sup>2</sup> / 638,76 m <sup>2</sup>	
Occupants: Children 0 to 6 years old	
Observations: The playground area has no toys, as guided by the Proinfância descriptive memorial. The children do not use the open space, only the closed rooms. The garden area is not landscaped. We verified the presence of undergrowth that is not appropriate for children's use.	
Photos:	
 <p>Playground</p>	 <p>Project Implementation</p>
 <p>Garden area</p>	


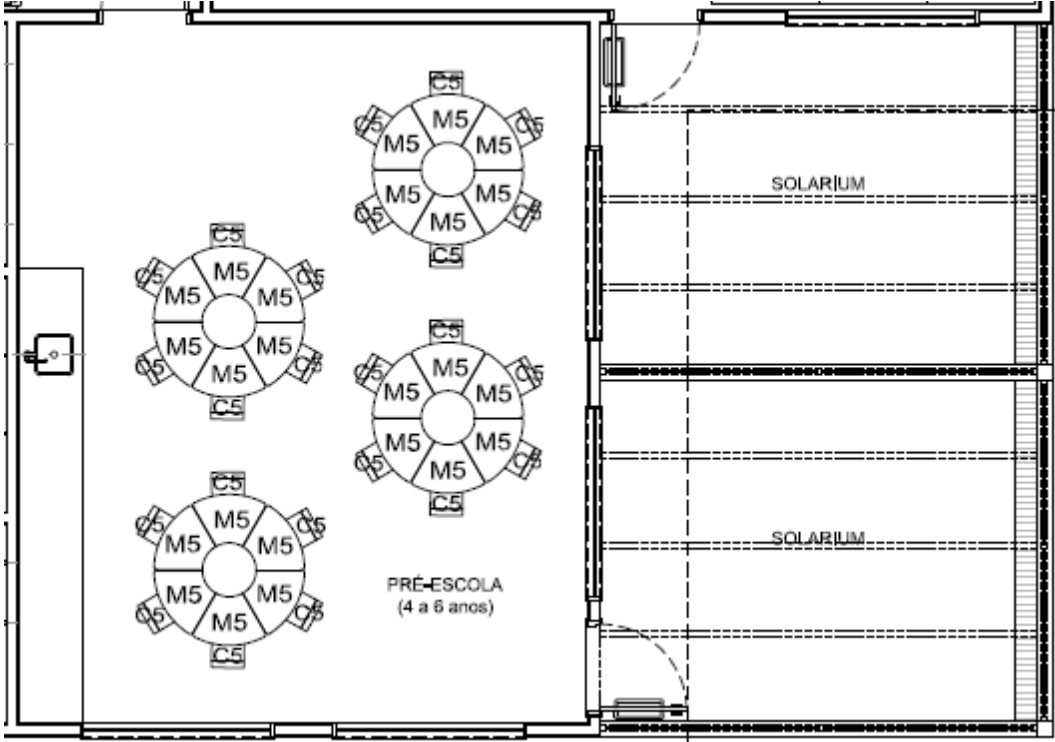
Source: Authors (2022)

Table 2 - Completed Walkthrough Observation Form - Daycare I, Nursery Home

<b>WALKTHROUGH ANALYSIS FORM</b>	
Environment: Daycare I, resting, diaper room	
Occupants: Children from 3 months to 4 years	
Observations: the space of daycare I, despite having openings with windows and solarium on the side, makes use of air conditioning, which is not recommended in the guidelines of health agencies due to contamination from respiratory diseases. The cribs occupy the space in daycare I where, in the project's layout, there is a rest area. There is divergence between what is indicated in the project and what is used in practice.	
Photos:	
	<p>TA1 - EVA tatami plates;          BÇ1 - Cradle in mdf with white bars.          CO1 - Mattresses for crib.</p>
<p>Day Care Center I</p>  <p>Project layout</p>	

Source: Authors (2022)

Chart 3 - Completed Walkthrough Observation Sheet - Preschool

WALKTHROUGH ANALYSIS FORM	
Environment:	Preschool
Occupants:	Children of 5 and 6 year olds
Observations:	The preschool room has window openings, providing cross ventilation, but there are problems with direct sun incidence, which causes discomfort and necessitates the use of curtains to contain the sun's entrance. The room has a western orientation and opens laterally to the solarium. The furniture used corresponds in part to the original, with a modular table in circular arrangement, but the insufficient quantity was complemented with a rectangular table of appropriate size for older children.
Photos:	 <div data-bbox="1066 757 1433 1124" style="border: 1px solid black; padding: 10px; margin-left: 20px;"> <p>M5 - Table covered with melamine laminate for children 5 and 6 years old.</p> <p>C5 - Chair covered with melamine laminate for children from 5 to 6 years old</p> </div>
	Preschool
	
	Project layout

Source: Authors (2022)

## 6 RESULTS

The study shows that the open spaces and some classrooms of the Municipal Child Education Unit Prof<sup>a</sup> Júlia Maria de Almeida Oliveira do not present themselves according to the specification of the architectural design project. In addition, the changes made by the users do not represent better alternatives internally or externally, not making use of the outdoor spaces, floor equipment such as tatami and the arrangement of tables in a circle for children's activities. In the case of the nursery, natural ventilation, an important recommendation to provide a healthy environment for children and avoid diseases, was neglected due to the use of air conditioning.

The playground and the garden area are little explored and are not part of the day-to-day activities of the daycare center, not meeting what was specified in the project. The study shows the importance of the school receiving technical support to guide the use of open spaces. These spaces represent an opportunity for learning and socializing outside the classroom environment, and for children to run, play, eat, or sunbathe. Outdoor spaces were an important alternative in many places around the world during the pandemic's return to school activities, but it does not seem to be a path that the Municipal Unit followed.

The Manual of the Brazilian Society of Pediatrics (2019) points out that the school system presents disparities and asymmetries with respect to outdoor spaces and contact with greenery. However, schools that have spaces such as open courtyards or even open but shaded spaces can organize flexible layouts by transporting desks for the development of outdoor lessons. As children feel the need to play and socialize, open spaces represent an alternative to socializing without concern for air renewal and quality, an important factor to consider in preventing the transmission of COVID-19.

## 7 CONCLUSION

The application of the Walkthrough analysis in the Municipal Child Education Unit Prof<sup>a</sup> Júlia Maria de Almeida Oliveira represented the first stage of research for the understanding of the daycare spaces and their adequacy to the challenges permanently brought by the Covid-19 pandemic, such as the use of outdoor spaces and the assurance of air renewal in the indoor environments. For these two aspects, which are considered elementary to an approach that incorporates concerns brought by the pandemic, the Walkthrough analysis revealed unconcern to respond to the challenges brought in the pandemic with rapid overcoming of the memory of the pandemic condition at the moment of cooling of the contagions. This shows that the discussion about the benefits of ventilation and outdoor living for everyday life must be established so that these practices are incorporated as habit, achieving a permanent learning of the pandemic condition capable of preventing new outbreaks of this and other diseases, such as the one we currently see in November 2022, with the return of positive diagnoses and hospitalizations for Covid-19.

The study recorded that the free areas and some rooms of the daycare center under study are not being used the way they were designed for, which demonstrates a certain flexibility of the standard project when applied in specific cases. However, it is important to emphasize that such changes were made at the expense of natural ventilation performance and the proper layout of the spaces, which reveals that the design specifications, even when correct,

may suffer interference during their implementation. Far from being fought, this adaptation of spaces must be technically oriented. Such a finding reveals the need for coordinated work, in which architecture designers meets the user's expectations and needs, but the user is also educated to achieve a better use of the building as provided for in the performance standards and, in an optimized way, to take advantage of a group of possibilities presented by the architect when designing internal and external spaces. We also reiterate the fact that it is from the contact between the designer and the user, in post-occupancy analysis, that the building can be transformed to meet eventual needs that arise by use or to remedy problems not foreseen in the design stage, in order to improve the user experience and also improve the standard project.

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