CONTROLLED VARIETY: THE CASE OF FDE'S PREFABRICATED SCHOOLS IN THE STATE OF SÃO PAULO IN THE 2000s

Variedad controlada: el caso de las escuelas prefabricadas de fde en el estado de são paulo en la década del 2000

Variedade controlada: o caso das escolas pré-fabricadas da fde no estado de são paulo nos anos 2000

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ABSTRACT

During the first decade of the 21st century, São Paulo's State Government, in Brazil, promoted the construction of a series of schools designed by different local architectural firms, using a system of pre-fabricated pieces that allowed adapting the projects to the sites and demands of each region, keeping the budget under control. This initiative allowed building dozens of buildings, relieving the school deficit of the most impoverished regions of the state and promoting the construction of public buildings with great social impact by a whole generation of architects. This paper presents the Prefabricated Schools Program guidelines, promoted by the Foundation for the Development of Education (FDE, in Portuguese) illustrating it with seven projects that showcase the architectural richness achieved by the firms.

Keywords: Schools, prefabricated systems, educational buildings, public works, modular systems

RESUMEN

Durante la década de 2000, el Gobierno del Estado de São Paulo, Brasil, impulsó la construcción de una serie de escuelas diseñadas por varias oficinas en el estado utilizando un sistema de piezas prefabricadas que permitía ajustes de los proyectos a los terrenos y a las demandas de cada región sin perderse el control de los costos de construcción. Esta iniciativa permitió la construcción de decenas de edificios, llevando a la disminución del déficit educacional en las regiones más pobres del estado y a la promoción de la construcción de obras públicas de gran impacto por una generación de arquitectos. Este trabajo presenta los lineamientos del Programa de Escuelas Prefabricadas de la Fundación para el Desarrollo de la Educación (FDE), ilustrándolo con siete proyectos que demuestran la riqueza compositiva alcanzada por las oficinas.

Palabras Clave: Escuelas, sistemas prefabricados, edificios educacionales, obras públicas, sistemas modulares

RESUMO

Durante os anos 2000, o Governo do Estado de São Paulo promoveu a construção de uma série de escolas projetadas por variados escritórios do estado utilizando um sistema de peças pré-fabricadas que permitia adequações dos projetos aos terrenos e demandas de cada região sem perder o controle dos custos de construção. Essa iniciativa permitiu a construção de dezenas de edifícios, aliviando o déficit educacional das regiões mais pobres do estado e promoveu a construção de obras públicas de grande impacto por uma geração de arquitetos. Este trabalho apresenta as diretrizes do Programa de Escolas Pré-Fabricadas da Fundação para o Desenvolvimento da Educação (FDE), ilustrando com sete projetos que demonstram a riqueza compositiva atingida pelos escritórios.

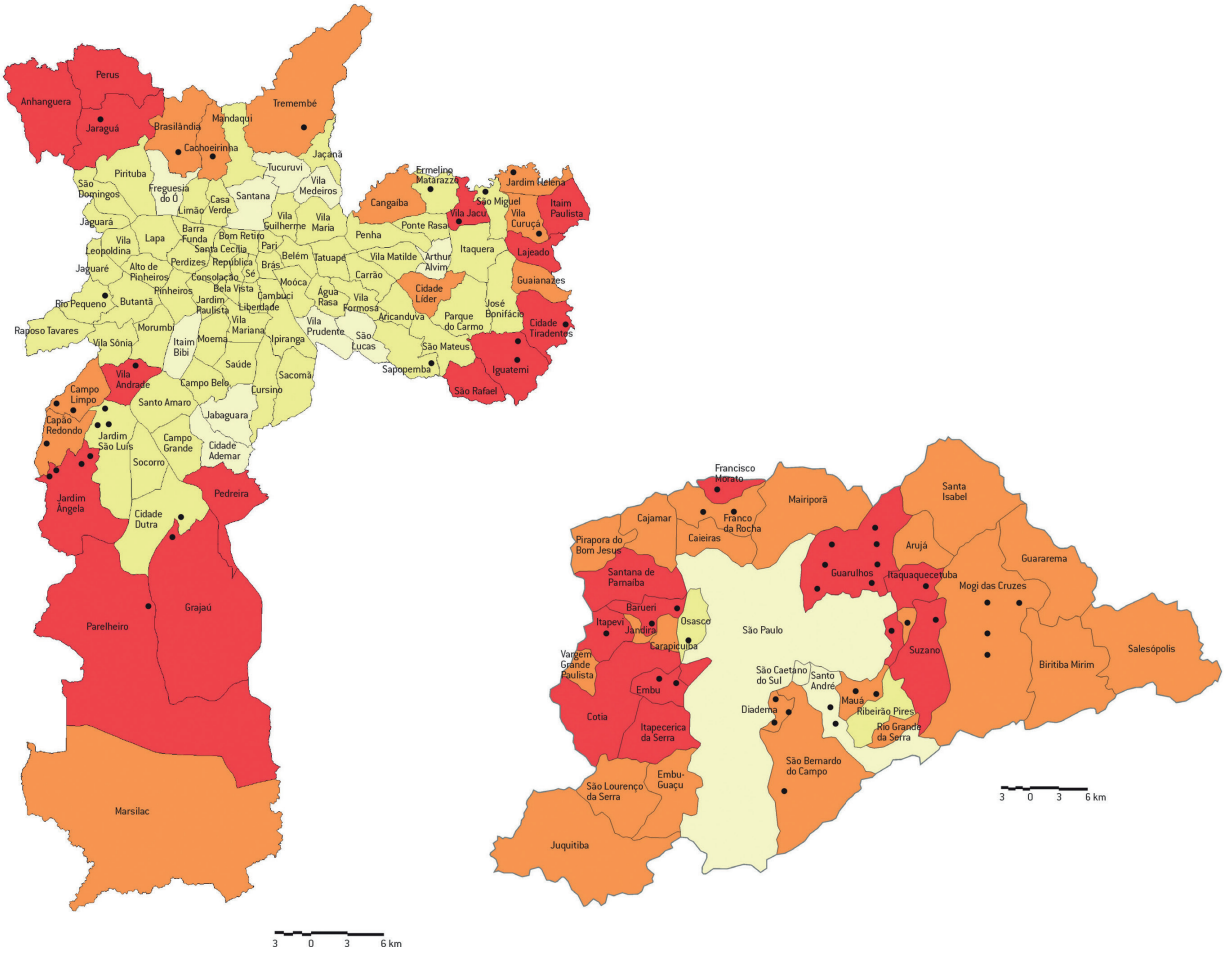
Palavras-Chave: Escolas, sistemas pré-fabricados, edifícios educacionais, obras públicas, sistemas modulares

INTRODUCTION

The Foundation for the Development of Education (FDE) is an institution of the State Government of São Paulo, Brazil, whose purpose is to develop the state's public education. The body was created in 1987 amid the need both for increasing the number of available vacancies in the state educational network, and for discussions on changes in the pedagogical system. FDE, alongside proposing, constructing, and maintaining the educational buildings of the state of São Paulo, is also responsible for managing the programs to use its schools in outside school times, such as weekends, as well as actions aimed at improving school performance and different projects in the pedagogical area.

Between 1990 and 2000, according to the Seade Foundation, even though the total population of the São Paulo capital grew, the number of children and adolescents decreased, reflecting the fall in the region's fertility rate. However, this phenomenon is not homogeneous for all the city's neighborhoods: "while central neighborhoods saw a reduction in child population, some peripheral ones had growth of about 10,000 children" (Ferreira, A. de F. & Mello, M. G., 2006, p.20) in the same period, a phenomenon that could also be seen both in the cities of the Metropolitan Region and in state [Figure 1].

Figure 1
Distribution map of São Paulo educational facilities
Fonte: A. de F. Source: A. de F. Ferreira & Mello, 2006, p. 21



For Ferreira and Mello, it is precisely the cities that grow the most in the state that suffer the most with high rates of violence, making school buildings a target for constant looting and vandalism, demonstrating, according to the authors, the lack of identity these populations have with public properties. In these communities, FDE's strategy was to build architectural objects that reinforce the sense of belonging of the population, seeking to build the buildings on lands central to the community.

However, this strategy comes up against the lack of available building plots in ideal locations, the result of FDE's policy to not expropriate private areas for the creation of new schools. The solution found by the foundation, in these cases, has been the use of areas available on the grounds of schools built in the 1970s and 1980s with poorly optimized projects, usually blocks of land with a poor use of the construction potential. In some cases, it was decided to replace some of the paved area with more intensely occupied buildings, thus covering the demand for vacancies.

The growing demand for the construction of new schools on non-standard land required FDE to create a system that ensures that projects can be built as quickly as necessary, within the required deadlines, without having to give up the spatial quality and symbolic attributes that make the population recognize these new buildings as important parts of their community, thus reducing looting.

For this, they opted to combine prefabricated structures with project and construction management, improving project efficiency both in terms of deadlines and construction quality. Ferreira and Mello point out that this strategy ensured "different architectural solutions for the characteristics of each site" (Ferreira, A. de F. & Mello, M. G., 2006), even using a limited catalog of pre-dimensioned structural parts and technical specifications.

Edson Mahfuz (2009) points out at least two advantages that the adoption of systematic procedures in projects has compared to symptomatic procedures. According to him, first of all, there is a reduction in the amount of solutions needed for formal and constructive problems and, secondly, as a consequence, there is a reduction in arbitrariness in project decisions: "from a first global decision, computerized criteria are defined that guide both the definition of the larger and smaller parts of a project.' (Op. cit. p. 1)

FDE school projects are carried out by third-party architectural firms, chosen in the bidding process based on technique and price. According to Marcela Deliberador, the edicts of the FDE establish that 30% of the score is attached to the service price, while the other 70% is attributed to technique, quantified through "a list of attributes that, according to the institution's coordinators, guarantee the selection of the best available party" (Deliberador, 2010).

The school construction program with precast concrete structures, started in 2003, and allowed a generation of architectural firms to make their interpretation of the needs program and the set of rules established for the compositions, among them, the use of standardized elements for the structural and enclosure system. The reduction of constructive vocabulary and similarity between programs makes the FDE experience a very valuable tool for comparing the production of a large number of São Paulo offices.

> The FDE experience was positive and the teams of architects demonstrated how it is possible to design and build if, beyond measurements and political interference, it was possible to channel efforts for the pleasure of always doing the best. (Gimenez, 2005)

FDE SYSTEM

FDE began the design process for schools built with precast elements with pilot projects carried out in 2003 by the offices Una Arquitetos, Andrade Morettin Arquitetos, MMBB, and André Vainer, who designed four schools in Campinas with the aim of exploring the architectural potentialities of a limited system of industrialized constructive components. From the basic projects delivered by the teams, a tender was held for the construction of the four schools, whose executive projects were to be produced by the companies hired for the work. This experience was behind the standards and standardized procedures for building projects, and established a catalog of building materials allowed in the new schools.

The system of standards and recommendations for FDE projects is summarized in the document *Project: architecture standards*, made available by the Foundation in the category "Project Submission standards". This document, last updated in November 2011, presents the standard procedure for the submission of projects for new schools, upkeep and restoration of FDE heritage.

One of the most striking features of FDE's series of precast schools is the adoption of a limited construction system with components optimized for the needs program. In the text, "the school as a public work", which opens the project presentation manual, the reasons for this are explained: "design decisions should dispense with short-term maintenance", placing upon designers the demand for decision-making that minimizes the need for repairs and replacements of elements throughout the school's life cycle:

> The constructive elements, including the components and FDE services, should be repeated as much as possible in the sense of rationalizing the construction, avoiding exceptions and adaptations, but at the same time producing a unique

> building in its formal, functional and spatial richness. (Foundation for the Development of Education, 2011, p. 1)

In these documents, FDE demonstrates its concern to provide new schools with characteristics that positively insert them into the urban fabric, acting as symbols of the community, which must appropriate the spaces. One of the project strategies that, according to FDE, would enable this appropriation, is the possibility of access to the school's auxiliary equipment, especially the sports facilities. This concern is demonstrated in the guideline that calls for the creation of "independent access for the local community […] outside classroom hours" (Foundation for the Development of Education, 2011, p.2).

The rationalization of educational constructions in São Paulo began, according to Avany Ferreira (2006), in the 1970s with the creation of Conesp which, under the direction of João Honorio, created the devices that were adopted in the precast schools program of the early 21st century. Even if rationalization was adopted in the past for the reproduction of a single project, the lessons of that time served to pave the way that would be explored by the FDE in the future through what became known as the "FDE's ABC":

> This was created in 1976, by Conesp, seeking to rationalize the process. We think that having certain components helps in streamlining the project, as there is no need to detail each of them. It also contributes when it comes to budgeting the project, since the value of the components, both materials and labor, is already known. Rationalization makes it quicker to draw up the budget and, consequently, the work, since there is a large repetition of, for example, frames, doors, etc. (A. D. F. Ferreira, 2006)

Already in the 2000s, changes in the teaching program of São Paulo state schools, which brought the need for covered courts in all schools – in conjunction with the continued use of spaces and appropriation of public property by the community – caused a significant increase in the built volume. For Ferreira, it is precisely the combination of increased demand and the scarcity of large and flat land that led to the almost complete abandonment of the standard project in favor of hiring situation specific projects. However, even if they are unique projects, the deadlines between project and delivery of the work should remain as tight as before. The deadline for the delivery of the school must be a maximum of one year, while the project has, by contract, approximately 50 days from its hiring to begin the work (A. D. F. Ferreira, 2006).

SELECTED PROJECTS

A experiência das escolas pré-fabricadas da FDE iniciou com quatro escolas-piloto construídas em Campinas em 2003 com projetos dos escritórios MMBB, UNA Arquitetos, Vainer e Paoliello e Andrade e Morrettin Arquitetos. Esses projetos foram utilizados como laboratórios para o teste das soluções estruturais, criação dos detalhes padronizados, definição de modulações otimizadas e dimensionamento dos espaços e elementos construtivos que serviriam como referência para as futuras aplicações.

Para o presente trabalho, foram analisadas escolas projetadas por profissionais que fazem parte ou sejam diretamente ligados aos membros da geração de arquitetos paulistas em atuação desde o início dos anos 1990 que ficou conhecida como Geração Sevilha devido ao concurso realizado naquele ano para escolher o representante brasileiro na Exposição realizada na cidade andaluza.

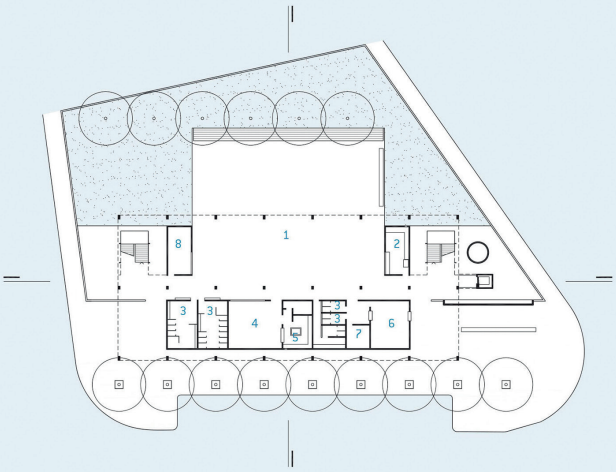
TELEMACO MELGES SCHOOL - UNA ARQUITETOS

The Telemaco Melges school, entrusted to UNA Arquitetos, is located on a trapezoidal-shaped plot located at the top of an irregular block. Its volume consists of seven single spaced square section modules, forming a parallelepiped [Figure 2]. The two modules at the ends are hollow, with only the outer gable remaining, which delimits the volume of the building. The two peripheral modules reveal open stairs that open to the upper floors, where there are two floors of classrooms and, on top of these, the multipurpose court. The ground floor is occupied by services, administrative functions and the canteen, as well as opening to the playground, a square that encompasses part of the pilotis under the classroom block and a portion of the land.

For the architects, the limited dimensions of the site defined the adopted "compact and vertical" preliminary design, a descriptive memorial of the authors. The positioning of the court on the building's roof frees the ground floor for social interaction and the gardens, achieving the inside and outside link requested by the FDE. The freeing up of the ground floor also allowed the architects to create the access control system for the multipurpose court on the roof that is accessed by the stairs positioned next to the side gables, allowing closing the classroom corridors at times when the roof is open to the public.

The floor plan of the two classroom floors consists of a central corridor connecting the two external staircases and rooms on both sides, whose facades received sun protection with translucent

Figure 2
Telemaco Melges School – Una Arquitetos
Source: Kon, 2018C and A. de F. Ferreira & Mello, 2006, p. 21



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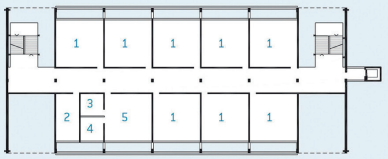

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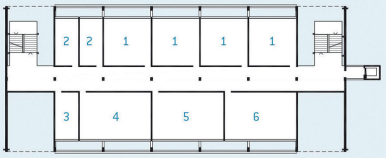

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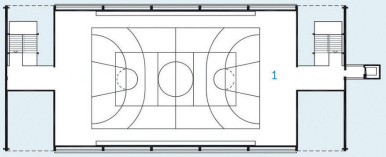

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1. quadra poliesportiva

plastic shutters, interrupted by two horizontal bands next to the classrooms' roof slabs. According to the architects' report (NOBRE, 2003), in addition to the sun-breaking role, they make the building perceived as a luminous volume at night. The monumentality of the building is reinforced by the continuation of the shield to the roof, also enveloping the sides of the sports court.

The school's supporting structure consists of eight bands of three pillars, two external – located between the plastic shield and the classrooms' body – and a central one, located in the center of the corridor that connects the two staircases. On the roof, this pillar is suppressed, leaving just the two external ones, which support the metal structure that protects the triple height space of the multipurpose court.

CHB CAMPINAS F1-MMBB

The CHB Campinas F1 School, of MMBB, is divided into three strips: in the center the multipurpose court occupies a triple height atrium, which communicates visually with the corridors of the three floors of the two strips of classrooms, deployed parallel to the central space. Vertical movement is directly connected to the external corridors, with stairs located at opposite ends of each row of classrooms.

On the first two floors, only the row of classrooms to the South is occupied, while the opposite side is released in the form of a pilotis that opens to the uncovered courtyard to the north of the site. The space of the pilotis, delimited on one side by the multipurpose court and, on the other, by the garden, although it has a double height, maintains the scale of the site by the repetition of the external wall of the second floor, a strip outside the pillars that divides the volume into two defined zones. The use of walkways positioned on the perimeter of the court makes this central space the focal point of the project, while solving the access control of the pedagogical sector in alternative shifts, when only the meeting area is open to the public [Figure 3].

> Spatiality - especially regarding the creation of the two floors around the central void – is the highlight of the project, since the authors opted for elements of traditional composition, of masonry. (Serapion, 2004b)

The supporting structure of the CHB Campinas F1 makes the composition even clearer by separating the classroom rows; each of them is supported by a set of six precast concrete porticoes, with pillars at both ends and cross beams. Each of these sets supports one end of the metal lattice that covers the multipurpose court. The classrooms are set back from the external facade, leaving the external pillars visible, whose vertical lines are cut only by the wall painted in navy blue that marks the separation of the ground floor from the other floors.

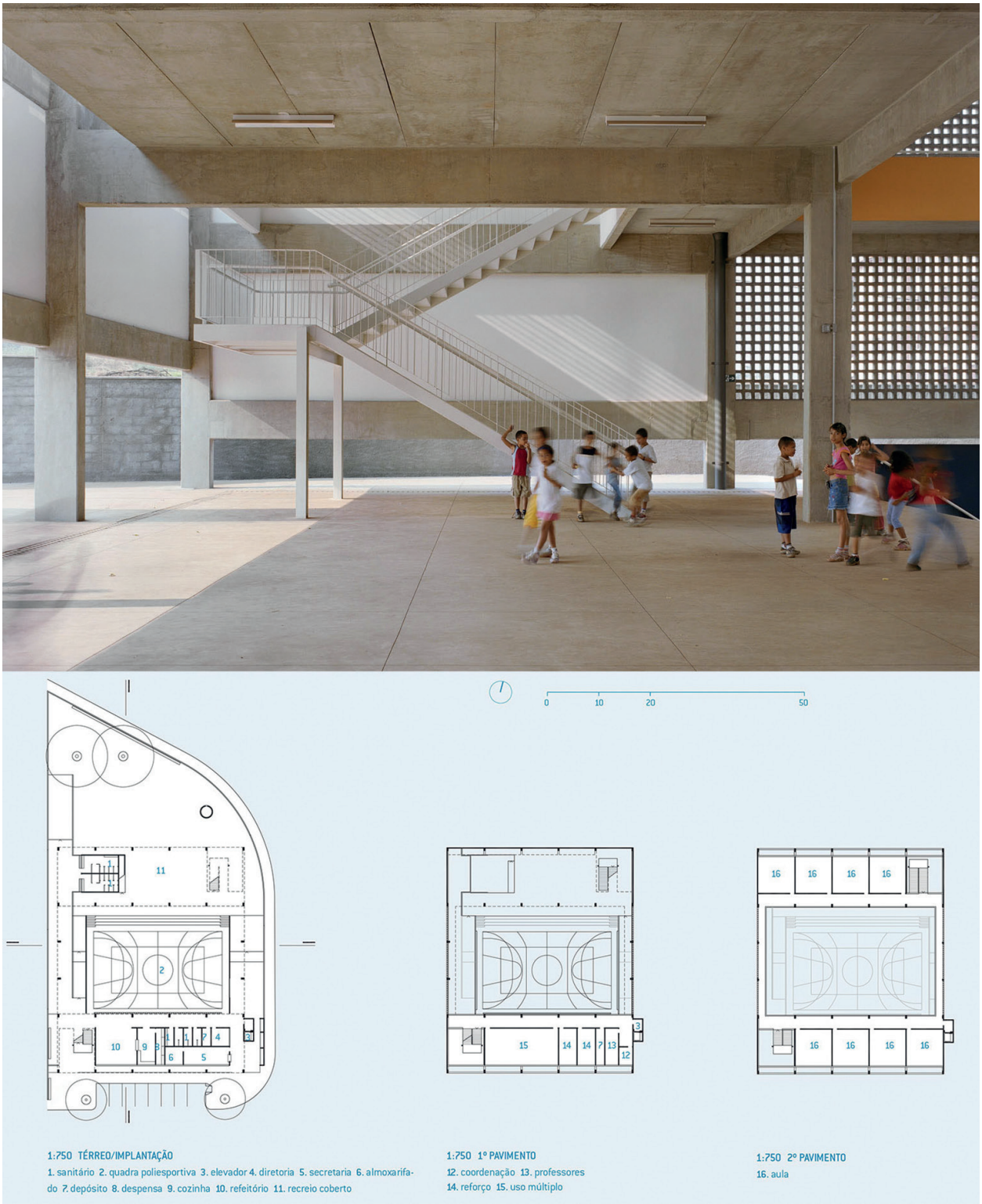


Figure 3
Transition between indoor and outdoor areas, and floor plans.
Source: Kon, 2018A and A. de F. Ferreira & Mello, 2006, p. 68.

ROBERTO MARINHO SCHOOL - ANDRADE MORETTIN ARCHITECTS

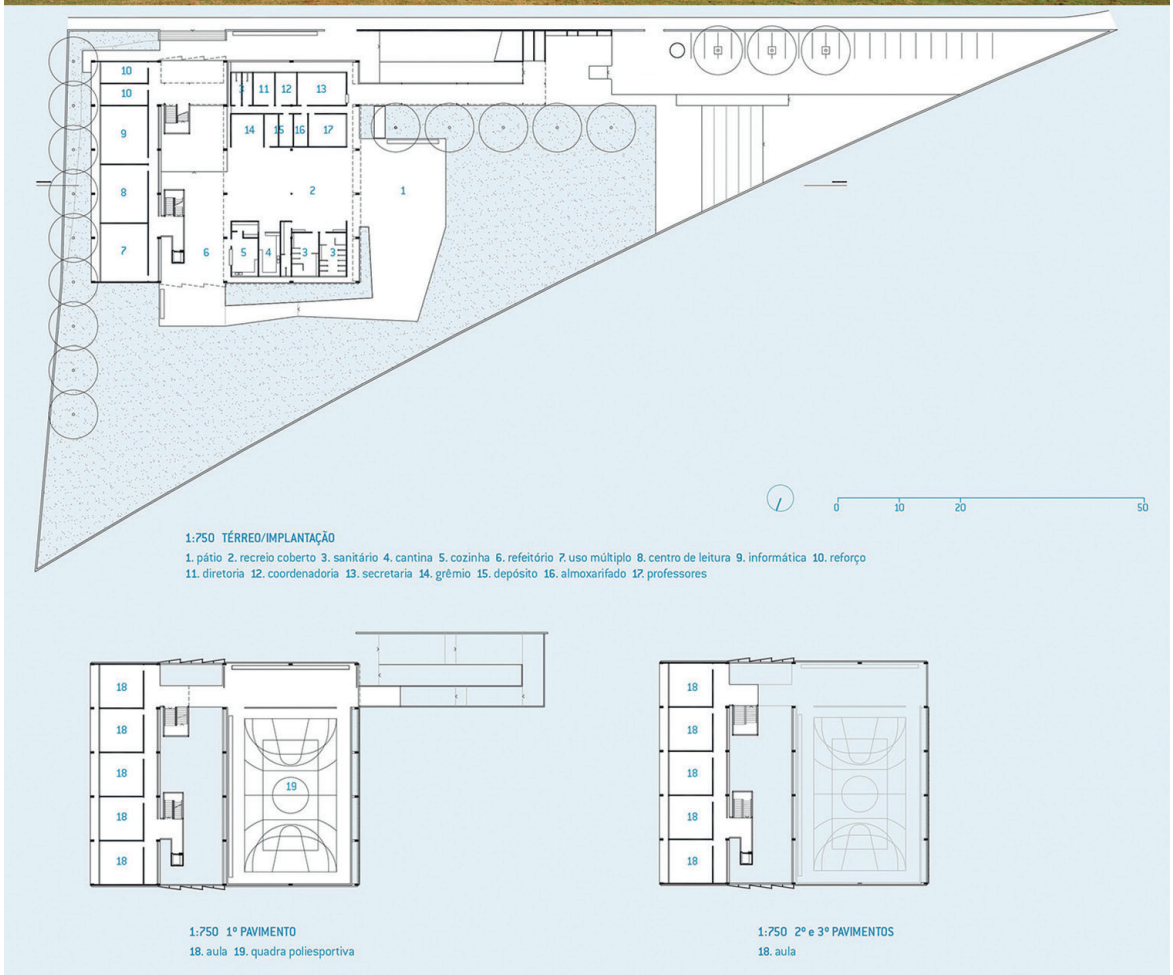
The pilot project carried out by Andrade Morettin Architects – the Roberto Marinho School – comprises the association of two structurally identical volumes occupied in different ways. Each of them is formed by a set of five modules, with two free spans and four high floors, on which a metal roof is supported. Their differentiation is in the use that these spaces receive: on one side, classrooms and a generous atrium; on the other, the sports court, located on the second floor, under which the collective roles are placed, open to the courtyard.

The classrooms are on the four floors in a simple band bounded externally by the grid of pillars and beams visible on the east facade and, internally, by the corridor that opens to the atrium, where the two staircases are. On the ground floor, the volume of the multipurpose court receives a transversal opening connecting the atrium to the external playground, along which it opens to the support functions such as toilets, canteen and administration. Access to the school is made along a walkway to the second floor, next to the multipurpose court, extending over the atrium to the classrooms' corridor.

Fernando Serapião (2004a) uses the analogy between buildings and cities, attributed to Vilanova Artigas, to describe the volumetric articulation of the Andrade Morettin school where a steel box houses the walkway, large and small buildings, while maintaining a frank relationship with the outside, as in the "internal walkway illuminated by translucent tiles" [Figure 4] that cuts the volume longitudinally, connecting one side of the site to the other.

Externally, the school is perceived as a monolithic volume, the result of the use of PVC shutters on all facades except for the east facing one, where the classrooms are. On this face it is possible to perceive the modulation of the structural grid. The west facade is interrupted next to one of the corners, where the access walkway to the second floor slopes the volume. For Fernando Serapião, the envelope using industrialized elements is one of the most interesting aspects of the project by encapsulating the internal volumetric complexity with alternating closure translucency, opacity and exceptional points, such as the main access, marked by vertical sheds, or "gills [that] allow the building-city to breathe" (Serapião, 2004a), in the words of the critic.

Figure 4
Internal walkway and floor plan
Source: Kon, 2018B and A. de F. Ferreira & Mello, 2006 p. 72.



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18. aula

CONJUNTO HABITACIONAL CAMPINAS E1 SCHOOL - ANDRÉ VAINER AND GUILHERME PAOLIELLO

The School of the Campinas E1 housing complex, developed by André Vainer and Guilherme Paoliello is located on a rectangular site with rounded edges whose topography configures only a slight slope from one side to the other. The composition adopted by the firm takes advantage of the plot format, by deploying an elongated block in the center of the plot, with uniform spacing of the edges.

The unevenness is taken advantage of by the architects to form the stands that serve the sports court, located on the ground floor. For the architects, the rental of sports equipment on this floor considered the practical aspects of the community using the space and ended up guiding the development of the preliminary design, divided into two blocks, one of which is entirely occupied by this use.

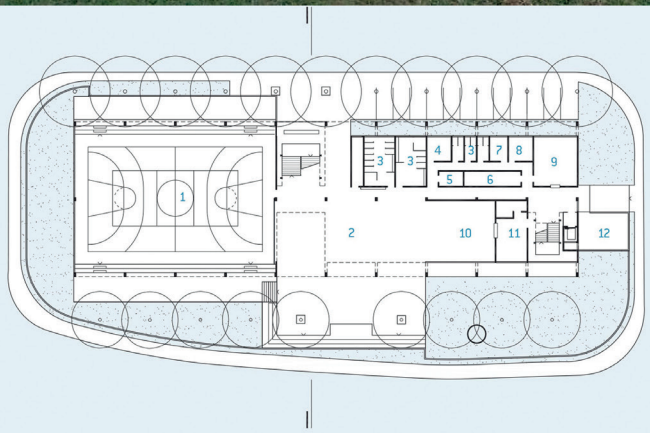
Its floor plan is divided into two blocks separated by the staircase: on one side, the classrooms are distributed on both sides of a central corridor on the two floors above the ground floor, where the administrative and support functions are located; on the other side of the vertical circulation is the multipurpose court, occupying the three floors of the volume. The treatment of the facades reveals the change of use at both ends of the building: in the multipurpose court, the closure of the two upper floors is made with metal screens applied on tubular frames outside the precast concrete structure; in the classrooms, the facade is set back in relation to the pillars, revealing, in depth, the blue painted masonry and tilting frames [Figure 5].

For Nanci Corbioli, the main characteristic of Vainer and Paoliello's design is the plastic articulation between the supporting structure "projected out of the building and aligned with the enclosure of the court" and the volume occupied by the classrooms, "set back from the external contour" (Corbioli, 2004). The facade is assembled in such a way as to create a game between full and empty, alternating hollow spans, with the frames of the classrooms set back, and filled, where the space between the beams is closed with masonry.

UNIÃO DA VILA NOVA III E IV SCHOOL-BAROSSI & NAKAMURA ARCHITECTS AND HEREÑU + FERRONI ARCHITECTS

The building designed by the offices Barrossi & Nakamura and Hereñu+Ferroni houses two schools, one elementary and one high school. The initial demand for the construction of two schools went against the available land: a small plot with an "L" shape, leading the architects to choose to house both schools in a single building with the separation of sports and recreation spaces.

Access to the two schools is made by a staircase that leads to a square, positioned on the larger portion of the land. From this space, students can head to the gates of their respective school, limited on both sides by the offices. In the elementary school, the access floor coincides with the covered playground, which leads to the playground open to the back; in the High School, the ground floor



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1. professores 2. uso múltiplo 3. aula 4. reforço

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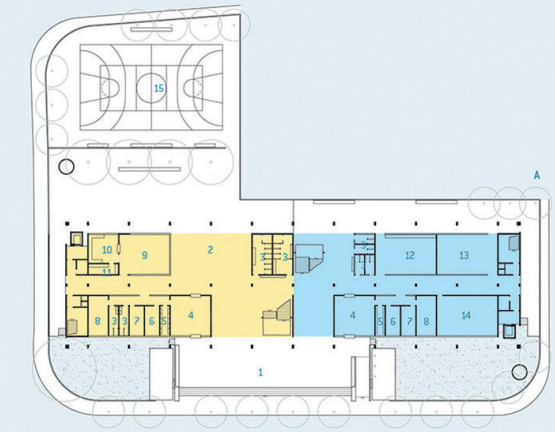
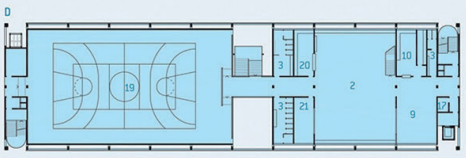
3. aula

Figure 5
Conjunto Habitacional Campinas E1 School -André Vainer and Guilherme Paoliello. Source: A. de F. Ferreira & Mello, 2006, p. 57.





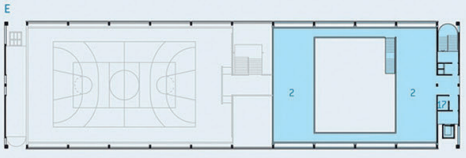


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Figure 6
Exterior view of the school.
Source: Kon, 2018d and A. de F. Ferreira & Mello, 2006 p. 173.

is occupied by multipurpose rooms, leaving the recreational space on the roof. The classroom floors are the same in both schools, occupying five modules of 7.20 meters each and separated by the central stairs, positioned in the central openings leaving an open atrium between the classrooms.

The two lateral gables receive complementary circulation cores, with enclosed elevators and stairs, each occupying half a structural module, which is evident in the longitudinal elevations. In the ten modules occupied by classrooms, the sealing of the internal spaces is set back from the plane of the facade, whose modules between pillars and beams are filled by "10 x 10 cm ceramic hollow elements", protecting the East and West teaching areas from overheating and highlighting the relationship between classroom volume and vertical circulations.

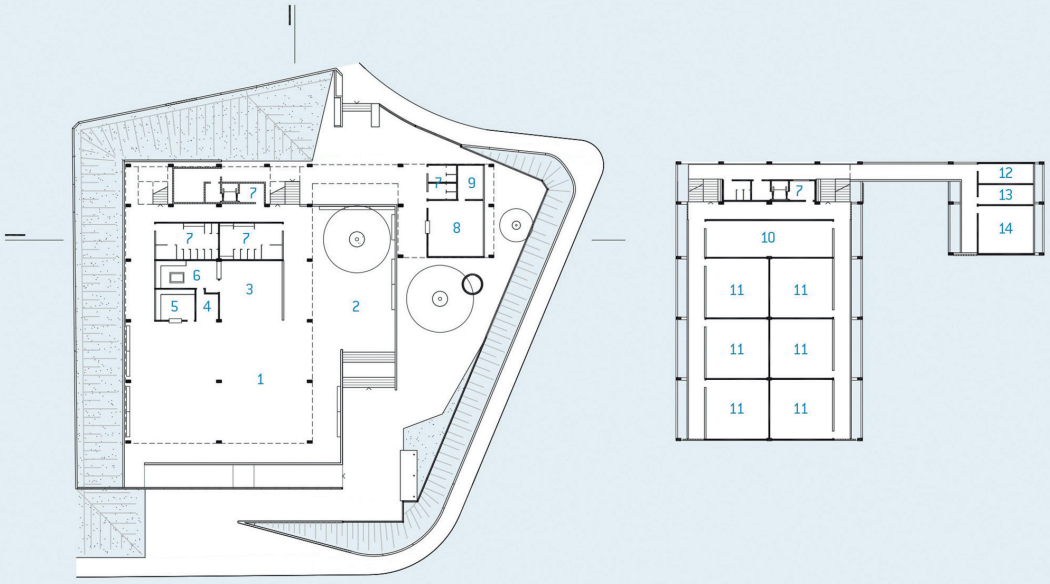
The photos of the built school demonstrate the contrast of scale and construction technique with the surroundings [Figure 6]. For Avany Ferreira and Mirela Mello, the verticalization caused by the grouping of two schools in a building meant "the construction took on a prominent role in the landscape, becoming an important reference in the neighborhood" (Ferreira, A. de F. & Mello, M. G., 2006, p.160), thus bringing the community closer to the institution.

PALANQUE SCHOOL- PIRATININGA ARQUITETOS ASSOCIADOS

Piratininga Arquitetos created its own typology for the implementation of the Palanque school, joining two vertical and independent volumes by an open walkway. The larger block houses the pedagogical functions, with covered playground and canteen on the ground floor, classrooms on the two floors above and sports court on the roof. The smaller block houses mostly administrative functions and special classrooms, such as computer labs [Figure 7].

The union between the pedagogical and administrative blocks is made by a walkway positioned next to the west facade of the two blocks, which are aligned on this side. Next to the walkway, a strip is designed that contains the vertical circulations and toilets, separating the circulation of the classroom areas, which allows access to the court, on the roof, without needing to go into the teaching sector. On the classroom floors, circulation is peripheral and terraced, with the classrooms positioned in the center of the floor plan with their openings facing the corridor.

The two blocks, although structurally independent, use the same compositional system: grid of pillars and beams in apparent concrete form the external volumetry that is sometimes filled with white masonry wall sections, sometimes with hollow ceramic elements. In the corridors, the parapets are made of blue painted masonry, which extends to the walkway, with a supporting structure comprising apparent metal beams with ceramic colored paint.

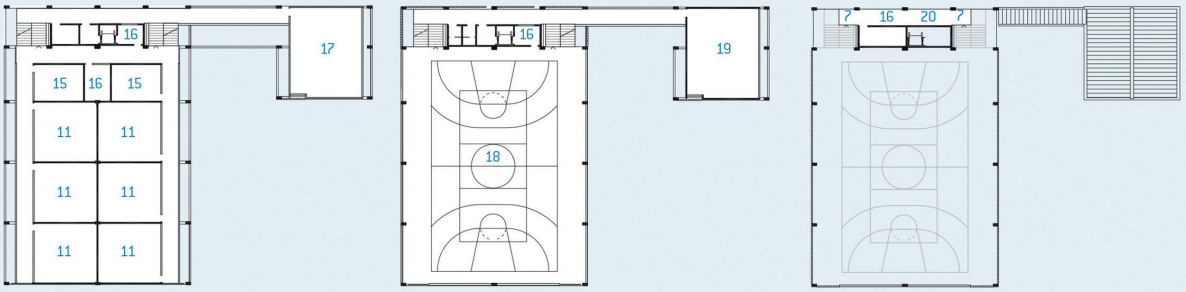


1:750 TÉRREO/IMPLANTAÇÃO

1. recreio coberto 2. pátio 3. refeitório 4. despensa 5. cantina 6. cozinha 7. sanitário 8. secretaria 9. almoxarifado

1:750 1º PAVIMENTO

10. informática 11. aula 12. coordenação 13. diretoria 14. professores



1:750 2º PAVIMENTO

11. aula 15. reforço 16. depósito 17. biblioteca

1:750 3º PAVIMENTO

16. depósito 18. quadra poliesportiva 19. uso múltiplo

1:750 4º PAVIMENTO

7. sanitário 16. depósito 20. grêmio

Figure 7
School in Pimentas VII neighborhood- Projeto Paulista de Arquitetura. Source: Projeto Paulista, 2004 and A. de F. Ferreira & Mello, 2006, p. 234.

SCHOOL IN PIMENTAS VII NEIGHBORHOOD-PROJETO PAULISTA DE ARQUITETURA

The school in Pimentas VII neighborhood, in Guarulhos, is organized around a central atrium which opens to a horizontal circulation ring where stairs and elevators are embedded. The circulation is surrounded by classrooms on three sides of the ring, opening to the multipurpose court on the fourth. In the center, the atrium extends under the pilotis, forming the playground and giving access to the court.

The structure is visible on the facade, with pillars and beams marked between the enclosure elements. There are, in this project, four way openings are handled between the structural mesh on the external facade: the complete hollow, present in a large part of the ground floor, giving access to the pilotis; the classroom modules, with half-height masonry and frames up to the roof slab; the 100% enclosed opaque masonry panels, on the Northeast facade, enclosing the classrooms, and, finally, the panels closed with latticework, present in the multipurpose court and in the classrooms to the north of the school. On the atrium facade, the pillars remain external, while the beams are recessed [Figure 8]. In this space, the railings of the vertical and horizontal circulation elements are painted red, highlighting the separation between the fence and the supporting structure.

In the Projeto Paulista de Arquitetura school it is possible to perceive a great care in handling constructive elements, demonstrating a refinement in the articulation of structural elements, enclosures, frames and installations. The adopted preliminary study, with a central playground to which the horizontal circulation rings open, collaborates with the spatiality of the work, bringing visual relations with the site and internally to the school, without this making the construction more expensive. The enclosure elements comply with a series of rules, such as the positioning of frames in the space remaining between the beams of different heights, an alignment also shown in reverse between the latticework and roofing beams.

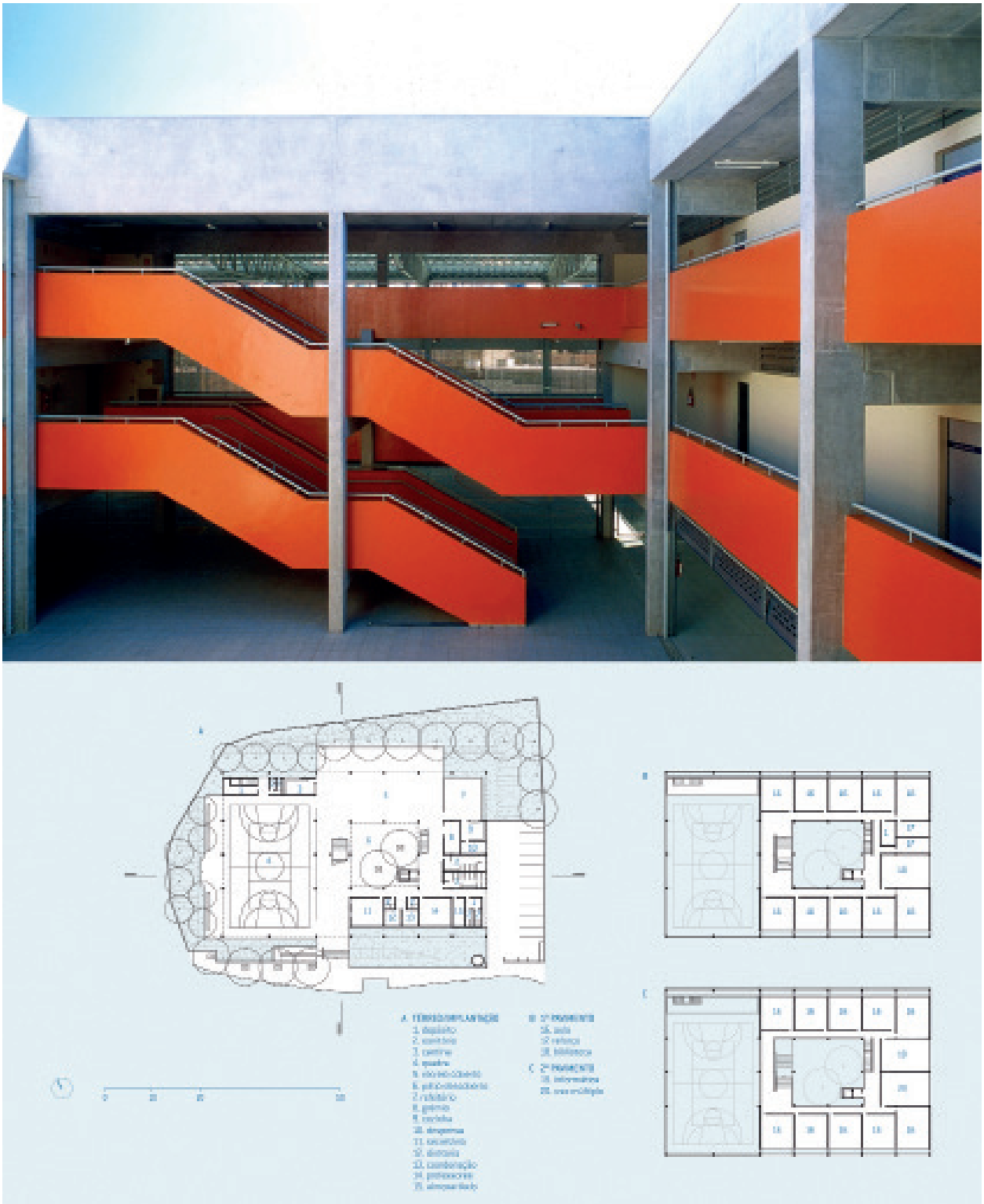


Figure 8
School in Pimentas VII neighborhood- Projeto Paulista de Arquitetura.
Source: Projeto Paulista, 2004 and A. de F. Ferreira & Mello, 2006, p. 234.

CONCLUSIONS

The construction of schools in the size needed to overcome the shortage of classrooms existing in the state of São Paulo at the beginning of the 21st Century, required adopting strategies that facilitate the design, construction and supervision of the units. Since the 1970s, Conesp, which would later be encompassed by the FDE, has been developing techniques that rationalized the process of creating new educational buildings either by outsourcing projects or by adopting standardized building elements.

Before the implementation of the prefabricated schools construction program, the most efficient strategy for the rapid expansion of the education network was the application of standard projects, ranging from projects that had their architectural quality questioned, such as those applied by the FDE itself until the 1990s, to experimental projects such as the Unified Educational Centers (CEU, in Portuguese) of the city of São Paulo, and the Integrated Public Education Centers built in Rio de Janeiro between the 1980s and 1990s with Oscar Niemeyer's project.

As good as the standard projects developed in these programs are, the adoption of unique projects for distinct sites requires terrain that supports their construction. Avany Mello points out that, in the early 2000s, FDE did not have land with the dimensions and topographic attributes compatible with the demands of standard projects, as was the case in CEUs.

It is precisely the combination between rationalization of construction and adaptability to different terrains that brought critical prominence to the schools built by FDE in the 2000s. In 2003, Projeto magazine announced the hiring of the 28 offices that would develop the first schools with precast concrete structures, making a fact that should not be highlighted –hiring of architectural firms to design schools – into encouraging news.

> To create a scale of production, the body determined the standardization of the spans of all units (10.80 x 7.20 meters) and the division of schools into groups of three or four using the same types of prefabricated elements. (Project Magazine, 2003)

The adoption of strict rules both constructively and compositionally, at first, suggests monotony between the built works. However, as Mahfuz (2009) argues, such fear is unfounded, since "the encounter of a system with concrete programmatic and contextual situations always results in singular works". It is from this point of view that the projects for the FDE are most interesting: the variety identified among the different schools demonstrates the possibilities of a restricted lexicon when faced with the demands of the place and the program.

Therefore, the schools produced for the FDE are demonstrative of how a generation of professionals can, as long as suitable oppor-

tunities exist, express their architecture. The set of projects carried out can be seen as evidence of the maturity of Brazilian production at the beginning of the 21st century, applying them in projects with considerable formal investigation restrictions that remain relevant and contemporary two decades later. The architects whose works are shown in this work are part – even if indirectly – of what Fernando Serapião (2019) called the "Seville generation", due to the infamous competition for the choice of the Brazilian Pavilion at Expo-92: professionals from São Paulo whose work began in the last decade of the 20th century under the influence of the movement to revalorize modern Brazilian heritage. The reference to Brazilian modern architecture, which in the early 1990s was labeled extemporaneous, gained strength, passing, as Maria Alice Junqueira Bastos and Ruth Verde Zein (2015, p.291) argue, from a "more or less mimetic appropriation" to a "less literal, more proper and certainly much more creative management of this same repertoire, built on its local tradition, that is, in the architecture of the Paulista brutalist School of 1960-1970". Such references are evident in the vast horizontal planes, the use of structure as a compositional element and large atria present in most FDE schools.

In a certain way, it is possible to say that the budgetary and constructive constraints allow analysis of these objects to be made from the articulation of the elements, making the comparison between them more objective. Thus, the FDE schools form a collection of inestimable quality for scholars of architecture produced in Brazil at the beginning of the 21st century.

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