

PRE-SCHOOL UNITS AND THEIR FUNCTIONING IN VIEW OF LITERATURE STUDIES AND THE AUTHORS' OWN RESEARCH

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Abstract

The conceptual design of a four-ward kindergarten was prepared on the grounds of the functional and spatial program created in the course of research and analyses. The starting point for ensuring proper and efficient performance of a pre-school unit, and, subsequently, determining the design guidelines, were the analyses of some Polish and foreign kindergartens described in professional publications, to find out the needs of young children and the functional and spatial requirements that such units must fulfil. The studies were supplemented with the authors' quality analyses of existing buildings which serve the functions of kindergartens.

Streszczenie

Projekt koncepcyjny przedszkola czterooddziałowego powstał na bazie programu funkcjonalno-powierzchniowego stworzonego w wyniku przeprowadzonych badań i analiz. Punktem wyjścia dla określenia należytego, sprawnego sposobu funkcjonowania placówki przedszkolnej, a w konsekwencji określenia wytycznych projektowych, stały się badania i analizy literaturowe obiektów z kraju i zagranicy, prowadzące do poznania potrzeb dzieci w wieku przedszkolnym i wymogów funkcjonalno-przestrzennym stawianych tymże obiektom. Drugą grupę rozważań stanowiły badania własne (badania jakościowe) przeprowadzone na istniejących, funkcjonujących budynkach zawierających bliźniacze funkcje.

Keywords: Quality analyses; Spatial and functional programing; Building Quality Researches.

A kindergarten building is the first important public place in a child's life, an architectural landmark, a carrier of information on social culture, a token of time and place. Due to social requirements and modern technical and technological measures, newly constructed kindergarten buildings offer a great variety of functional and spatial solutions.

The kindergarten building, being an important landmark in its surroundings, requires a legible spatial layout, in which its connections with the neighbouring space are clearly marked. As far as the internal solutions are concerned, such building is always a compromise between the need of creating a safe, secluded, optimal environment for the child's play and development and its external opening to green areas.

Furthermore, a kindergarten is a special place of child comprehensive development and education [1]. Accordingly, it should provide a well-organized environment, meeting the physiological and psychologi-

cal needs of children and making it easier for them to participate in diverse upbringing situations.

1. CHILDREN AS THE MAIN USERS OF KINDERGARTEN BUILDINGS AND THEIR NEEDS

Children are the most important users of kindergarten facilities, hence it is their needs that should be the main consideration in determining the functional and spatial program to be used in the design process. The design assume building, its efficiency of space and "friendliness" towards children.

The children's needs shall be defined as follows:

Organization:

- The need of safety – it compels the site fencing, the access to the building controlled, the interiors should have rooms for children in the vicinity of the

rooms for teachers. One of the most essential functions is the nurse's room.

- The need of play – calls for specially furnished rooms of adequate floor area, properly equipped and providing access to sanitary facilities, external green area and internal play area used in rainy days.
- The need of acquiring knowledge and information – requires facilities supporting basic classrooms, such as: a gymnasium room, a dining room, a video room, a library, an art workshop, a computer workshop.
- The need of acceptance and integration with a group, a sense of closeness, belonging and support.

The physical environment:

- The quality of the microclimate: temperature, humidity, air exchange, peace, good lighting and aesthetic values [2].

2. KINDERGARTEN FUNCTIONS

The starting point for determining the functions of pre-school units, and, consequently, for creating their

new design, was the analysis of 10 Polish and foreign kindergartens leading to the determination of specific needs of pre-school children and the spatial and functional requirements that kindergartens should meet, as well as the authors' own analyses of 5 currently functioning units.

2.1. THE EXAMPLES FROM PERIOD 1970-1980

The first analysis entailed four buildings from the 1970s-1980s located in Poland.

The main objective of the investigation was to detect changes in the functional and spatial program of pre-school facilities that occurred in the passage of time. The example of the analysed building of four-ward nursery school in Sokółka [3].

2.2. THE EXAMPLES FROM PERIOD 1980-2005

The second analysis included 10 foreign buildings from period 1990-2005.

The example of the analysed building of nursery school. [3]

Table 1.

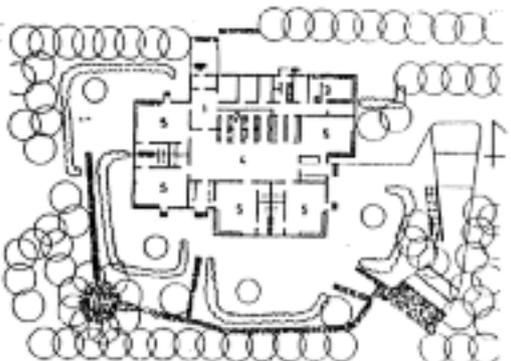
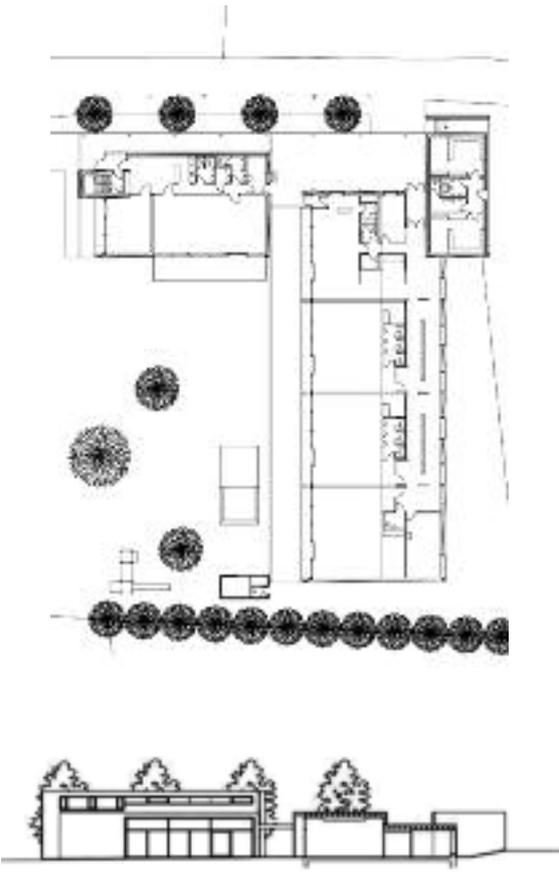
1	Object (name, place, country)	Four-ward nursery school in Sokółka, PL
	Architect	H. Skibniewska, K. Kontkiewicz
	Year of realization / Competition	1975.
		Plan of the ground floor with design of plot: 1 – entrance hall, 2 – cloak-room, 3 – kitchen, 4 – gymnastics halls, 5 – school-rooms.
USERS		
One-storied, four-ward nursery school; users – 120 children and staff		
DESCRIPTION		
Project is characterized by big compactness of plan and advantageous fusion of communication and useful area. External dimensions in horizontal view: 31x41 m, cubage – 5350 m ³ , basic area – 1100 m ² .		
SOURCE MATERIALS		
Figure (draft/sketch) and description: the publication of Technical University		

Table 2.

2	Object (name, place, country)	Bludesch – Gais, 6712 Bludesch, A
	Architect	Bruno Spagolla
	Year of realization / Competition	1998-1999.
		
		
USERS		
<p>The two-ward nursery school is also a meeting place of local population (inhabitants) acting as a Culture Centre.</p>		
DESCRIPTION		
<p>The building consists of 3 parts and it stands out in the neighbourhood (environs) because of material of its front elevation. The elevation is made of wood fashioned in 3 different ways: natural colour, burned surface, surface painted with lime. The building was built for the most part of wooden prefabricated elements and it is equipped with energetic system, which offers a wide spectrum of possibilities of power supply for the nursery school.</p>		
SOURCE MATERIALS		
<p>Figure, photo and description: www.nextroom.at</p>		

2.3. CONCLUSIONS DRAWN FROM LITERATURE REVIEW

There have been marked changes in the creation of pre-school facilities in the last few years.

The first stage of the investigation covered some Polish pre-school units constructed in the 1970s-1980s, characterized by simple solutions, minimal functional program and absence of supporting activities rooms. Collective rooms rendered uniformity of space with a direct access to toilets. Terraces led to playgrounds, often poorly equipped and improperly fenced.

The necessity of financial savings was manifested in disregard for details and poor materials which, predominantly, were prefabricated slab blocks so popular in the 1970s.

Such approach resulted from the political and economic situation prevailing in Poland at that time and is partially justifiable. Generally speaking, the attractiveness of the facilities was poor.

The second stage covered new kindergartens designed by foreign architects in the 1990s. Accordingly tremendous differences were observed, as the units are no longer stiff but well-balanced and attractive, appealing to child imagination in the architectural form of, for example, boats with round windows through which green playground areas can be seen.

New technologies and new materials make it possible to fulfill any architectural vision, which, in consequence, translates into attractive facilities that fit into the context of their surroundings. Their function is easily discernible due to the visual message manifested by the façade: a wide range of colours, the height not exceeding two floors thanks to which there is a sense of privacy and cosiness, the foredesigns are consistent with the scale and the main users of the facilities; the structures are performing successfully, they are free from design errors and operate well.

Summing up, the examination of different kindergarten facilities is essential and very helpful in the design process. Good and bad examples show which solutions shall be pursued and which directions avoided.

3. THE AUTHORS' OWN RESEARCH

Five pre school units located in the town of Zabrze were analysed. The facilities differ in size, number of users, functional and spatial programs. Each building was analysed in terms of its performance, location, site management, image, facility management, maintenance, internal environment, micro-climate, light-

ing, acoustics, common space, private space, supporting space and communication.

The employees of the five units completed detailed questionnaires, on the bases of which information was collected on the accessibility of the facility, site management, work space for the employees and space for the children in their care.

Exemplary facility – Kindergarten No 1 in Zabrze, Reymonta 1. [3]

3.1. CONCLUSIONS FROM THE OBSERVATIONS AND SURVEYS MADE IN KINDERGARTEN NO 1 IN ZABRZE [3]

SITE

- **Location**

The site is located in the very centre of the town of Zabrze.

The aesthetic quality of open place is assessed as good, despite doubtful attractiveness of the surroundings – old, hideous buildings. The site is big and contains a certain part green, however not properly maintained.

- **Neighbourhood**

The vicinity of the town centre guarantees easy access to the building by means of transport, car, or on foot. There are no bicycle routes and pedestrian precincts are in unsatisfactory condition. The neighbourhood tends to be dangerous: there have been incidents of petty crimes and instances of vandalism. Streets and public places are infested with rubbish. In the vicinity all basic services are available: commercial, educational, medical, cultural.

- **Site management**

The layout and functionality of the site development were assessed as average. According to the respondents, the site is not sufficiently protected from intruders. The building is conveniently situated in terms of access.

The functions of the building and the entrance zones are legible. There is no foreground in the entrance zone, accordingly, no entrance provided for the disabled.

The percentage in which the building occupies the whole site, the height of the building in relation to its size, exposure to natural light and percent of green on the site were assessed by the respondents as suitable, yet the quality of the green area and the façade as inadequate, as the facades are in need of repair and the green area requires gardening care. Essential elements of small architecture are missing and there is a clear insufficiency of parking space.

Table 3.

NURSERY SCHOOL IN ZABRZE		REYMONT 52 STREET 41-800 ZABRZE PHONE: +48 32 271 27 34	
GENERAL DESCRIPTION			
PLOT AREA	3777 m ²		
YEAR OF CONSTRUCTION	1956		
BUILDING AREA	350 m ²		
USEFUL AREA	1026 m ²		
HEATED AREA	473.41 m ²		
CUBAGE	3020 m ³		
NUMBER OF FLOORS	2		
HEIGHT OF THE BUILDING FLOOR	2.50 m		
TOTAL NUMBER OF ROOMS	25		
NUMBER OF SCHOOL-ROOMS	4		
NUMBER OF GYMNASTIC HALLS	1	area 60 m ²	
NUMBER OF ADMINISTRATIVE ROOMS	1	area 8.8 m ²	
NUMBER OF SANITARY ROOMS	1	area 37 m ²	
NUMBER OF LAVATORY PANS			
– GIRLS	4		
– BOYS	4		
NUMBER OF NOURISHMENT COMPLEXES	1	area 32 m ²	
NUMBER OF MAGAZINES (STORES)	4	area 29 m ²	
NUMBER OF SERVICE ROOMS	1	area 9 m ²	
NUMBER OF STAIR-CASES	1		



BUILDING – BEHAVIOURAL QUALITY

• Safety

The respondents assess the safety of the main users of the building (children) as sufficient, due to controlled access to the interior. However, the building is not equipped with the alarm and fire warning system. The site has no monitoring system.

• Privacy and comfort

The staff does not complain about thermal discomfort, the building is well heated, but the absence of any acoustic barriers between the rooms is very inconvenient for the users.

Natural ventilation provides sufficient quantity and quality of air. Yet, drafts occur between rooms separated by glass, unsealed doors. Privacy may be maintained at workplaces, which are adequately equipped. The workplaces are perceived as satisfactory in spite of the absence of any support facilities or social rooms.

• Aesthetic quality

The staff are happy about their workplace but less happy about its aesthetic quality: dirty facades and the general condition of the site were criticised. On the other hand, the building inside is clean.

THE BUILDING – FUNCTIONAL QUALITY

• Common space

Common space is arranged appropriately, but the functional layout is not that accurate, as the building was adjusted and not designed for its current function, hence its structural and functional zones are not clearly separated and the functions are mixed which results in certain discomfort. As the floor area is limited, it has been fully utilized.

• Private space

Private space is provided in rooms with suitable floor area but without direct access to toilets. The furnishings were assessed by the staff and the chil-

dren as sufficient. Apart from classrooms, no extra functions are provided. The gymnasium hall is set up in the corridor, it does not have proper dimensions and is not functional.

3.2. GENERAL CONCLUSIONS AND DESIGN GUIDELINES

After the review of 5 selected pre-school facilities, following the same assumptions and assessing identical problems or qualities, conclusions have been drawn as to basic guidelines for a conceptual design of kindergartens. [3]

4. LITERATURE ANALYSES OF PRE-SCHOOL FACILITIES – THEORETICAL, FUNCTIONAL AND SPATIAL GUIDELINES FOR THEIR DESIGNING

The design of pre-school facilities should consider the basic guidelines listed below, which facilitate the achievement of well-functioning structure and the creation of an environment that is friendly to children: [5]

A. Optimal square area of the site: 0.5-0.8 ha.

B. The facilities should be easily accessible, situated in the vicinity of housing areas.

Table 4.

GENERAL CONCLUSIONS	DESIGN GUIDELINES
<p>SITE LOCATION</p> <ol style="list-style-type: none"> 1. Mediocre quality of open space. 2. Sufficient transportation connections with the centre. 3. Absence of bicycle tracks/lanes and parking places. 4. Absence of inconveniencies or nuisance from the surrounding buildings; absence of acoustic comfort. 	<p>Improvement of the quality of open space on the basis of site management project.</p> <p>Location of the site in the vicinity of the main arteries with easy access to public transport.</p> <p>Obligatory planning of parking space available for the staff and parents picking up the children.</p> <p>Location of the building in a quiet place characterised by low noise emission, among structures that do not cause nuisance.</p> <p>Noise level reduction by means of the green and other acoustic barriers.</p>
<p>NEIGHBOURHOOD</p> <ol style="list-style-type: none"> 5. Common acts of vandalism and instances of petty crime in the neighbourhood. 6. Good availability of basic services (commercial, educational, medical, etc.) 	<p>Location of the site in a safe and quiet town district; proper protection against intruders.</p> <p>Easy access to basic services in the vicinity of the site.</p>
<p>SITE MANAGEMENT</p> <ol style="list-style-type: none"> 7. Mediocre outlay and functionality of site management. 8. Sufficient legibility of the main entrance, absence of foreground. 9. Absence of control of the access to the site. 10. The building, its height in relation to its size, exposure to natural light and percent of green on the site were assessed by the respondents as suitable. 11. Unsuitable quality of the façade and the green area, more gardening care required. 12. Absence of small architecture. 	<p>The image of the site and the building should be related to their function.</p> <p>The main entrance should be manifested and the foreground designed in view of exposing the functions.</p> <p>The site should be protected from external intruders when the facility is closed.</p> <p>A certain part of the site should include green areas of good aesthetic quality.</p> <p>The facades signalling the function of the building should be designed in view of the character of external architecture, details, colours and materials selection; the green areas should encourage children to play and relax. The site should be furnished with essential elements of small architecture in the common zone – entrance zone and private zones – recreational playground).</p>

<p>THE BUILDING BEHAVIORAL QUALITY</p> <p>13. Proper protection against intruders.</p> <p>14. Demarcation of evacuation routes in view of the absence of alarm and fire warning system, fire plugs and hoses.</p> <p>15. Common drafts do not contribute to the conform of work, too many glazed doors lead to thermal losses in the building.</p> <p>16. Possibility of having privacy at the workplace.</p> <p>17. Unsatisfactory aesthetic quality of the interiors, minimal furnishings.</p>	<p>Site monitoring system, control of the access to the building. Demarcation of evacuation routes, fire protection system.</p> <p>Fewer glazed walls, the orientation of the walls towards the four geographical directions.</p> <p>Securing the sense of privacy at the workplace by correct layout of the functional zones.</p> <p>High aesthetic quality of the interiors and their proper furnishings promote comfortable use.</p>
<p>FUNCTIONAL QUALITY</p> <p>18. Good layout of common space, clear functional arrangement; however, not always adequate (absence of zones structure).</p> <p>19. Absence of support facilities (gym, dining room, toilets that are accessible directly from classrooms).</p> <p>20. Hindered access to the building by the disabled (including the integrative kindergarten!)</p>	<p>Division into functional zones, the functional arrangement should be clear to all users, good visual legibility.</p> <p>A comprehensive program of all essential facilities supporting the functions of the building.</p> <p>Unhindered access for the disabled, removal of architectural barriers.</p>

- C. The distance between the facility and the place of residence of the children attending it should not exceed 250 m, which translates into 7 minutes of walking distance (even 800 m – 24 minutes of distance are allowed in sprawled detached housing). Accordingly, the facility’s service radius should not be less than 500 m.
- D. There should be at least one kindergarten with 4 age wards for every 5000 inhabitants. Such figures are considered as optimal in view of educational purposes. The groups should not exceed 20 children and should be formed in line with the age divisions of 3, 4, 5 and 6.
- E. Remarks concerning the facility:
- The floor area should be about 1.5-3 m² per child.
 - There should be a glazed porch or arcade between the fencing and the interiors.
- F. Remarks concerning the site:
- The level of ground waters should be below the foundation footings.
 - The soil quality should enable easy maintenance of the green areas.
 - There should be a wind shield that also provides essential ventilation in the summer.

- The air should be protected against dusting and pollution with harmful substances.
 - The site should be provided with adequate natural lighting of the playground: minimum 5 hours a day between March 21st and September 21st.
- The management of the site, entails, apart from the building, the following elements:
- foreground area,
 - playground area and its fittings,
 - green areas for aesthetic quality as well as for fencing;
 - pedestrian routes;
 - access and maintenance area;
 - parking.
- In the design of the foreground area there are some symbolic and aesthetic considerations to be included in planning the entrance to the building (decorative green areas details such as fountains or sculptures). The external playground should consist of:
- Playgrounds for particular age wards adjacent to the classrooms; the solutions should consider the fact that children play both on their own and in groups, hence appropriate facilities should be provided, for example with sandpits.

- Play rooms and playgrounds for group activities-with some specific equipment such as: sledge slope flower beds, construction games (especially for developing imagination and intellectual skills). The design of play areas should consider the safety and psychological issues.

The structural zones should be divided depending on the types of contacts among their users characterised by different degree of frequency, scale and intensity rate. In case of kindergartens the contacts entail:

- social ones – occurring in the foyer (hall) waiting rooms, cloakroom and gymnastic room especially during public events;
- semi-private – rooms for group educational and game activities;
- private – smaller rooms for group activities coupled with general classroom activities.

Meals can be served in two organizational modes:

- in consideration of catered meals supplied to the youngest children (3 and 4 year olds)
- design of the dining room for older children.

The gymnasium should also serve the function of children artistic exhibition hall and place of meetings with tutors, therefore it should be well connected to the entrance zone.

As far as the height of the facility is concerned, the ground floor arrangement is generally preferred to the storey layout – taller buildings are generally not recommended, but the decision depends on specific prerequisites.

Natural lighting is a very important consideration in pre-school facilities. In view of relatively long time that children spend inside, it is essential to their mental condition. Natural lighting secures the provision of proper hygienic conditions, contributing to bacteria prevention. On the other hand, it should not be too aggressive, hence, artificial window shades could be helpful, as well as light reflectors, sunshades regulating light penetration, window shades.

Natural lighting may be lateral (penetration through walls), often from many sides, or through the ceiling – which is not so commonly applied. There are also solutions combining the two arrangements. In consideration of their advantages and drawbacks, the functional and spatial considerations should set priorities, as well as the economic and technical ones.

Proper acoustics of pre-school space should provide the division into silent and noisy zones – by shaping the rooms in a proper way it should be possible to install not too many noise reduction measures. Otherwise, damping materials and sound reflecting materials should be used as well as partitions that do

not permeate sound penetration.

The shape of the facility layout is also of considerable importance, the square layout is much better than the rectangular one.

4.1. ORIENTATION OF THE ROOMS TOWARDS THE GEOGRAPHICAL DIRECTIONS

Pre-school buildings should be situated on sites that secure natural light from the eastern, south eastern and southern direction. Lighting from the south-western direction is also possible, although it is not that favourable.

The activity rooms should have double natural lighting from the east and south.

As far as the neighbouring buildings are concerned, the pre-school building should be located in such manner that the penetration of sunrays is not hindered and noise emissions are eliminated. (Fig. 1)

4.2. SCHEMATIC LAYOUT OF THE FUNCTIONS OF PRE-SCHOOL FACILITIES

The following zones are essential: (Fig. 2)

- Entrance zone, hall, cloakroom.
- Playground and educational zone, including classrooms for child groups that fulfill their spatial and utility criteria.
- Bigger floor area rooms, such as: gymnasium, dining room.
- Service area including: administration, kitchen and technical accessory rooms.
- Public zone, e.g. internal playground area.
- External areas, i.e. properly managed entrance zone with foreground emphasising the function of the facility, access, drive, parking places, and well-equipped green playground.

The recommended functional connections of the above zones involve:

- playground areas and educational areas should be situated between the publicly accessible common space and the external playground;
- bigger floor area room should be located in the direct vicinity of the educational facilities, in consideration of their supporting role;
- the servicing zone should be located in the vicinity of the entrance zone.

4.3. DIAGRAM OF FUNCTIONAL CONNECTIONS

The proposed diagram incorporates two basic zones: common access area (entrance) and private zones (classes, services and playgrounds). Further more detailed divisions may be considered in the above-mentioned zones: [3]



Figure 1. Author's schematic diagram of arrangement of rooms according to world's side-parts in functional building of nursery school. [6]



Figure 2. Author's schematic diagram of arrangement of the nursery school building. [6]

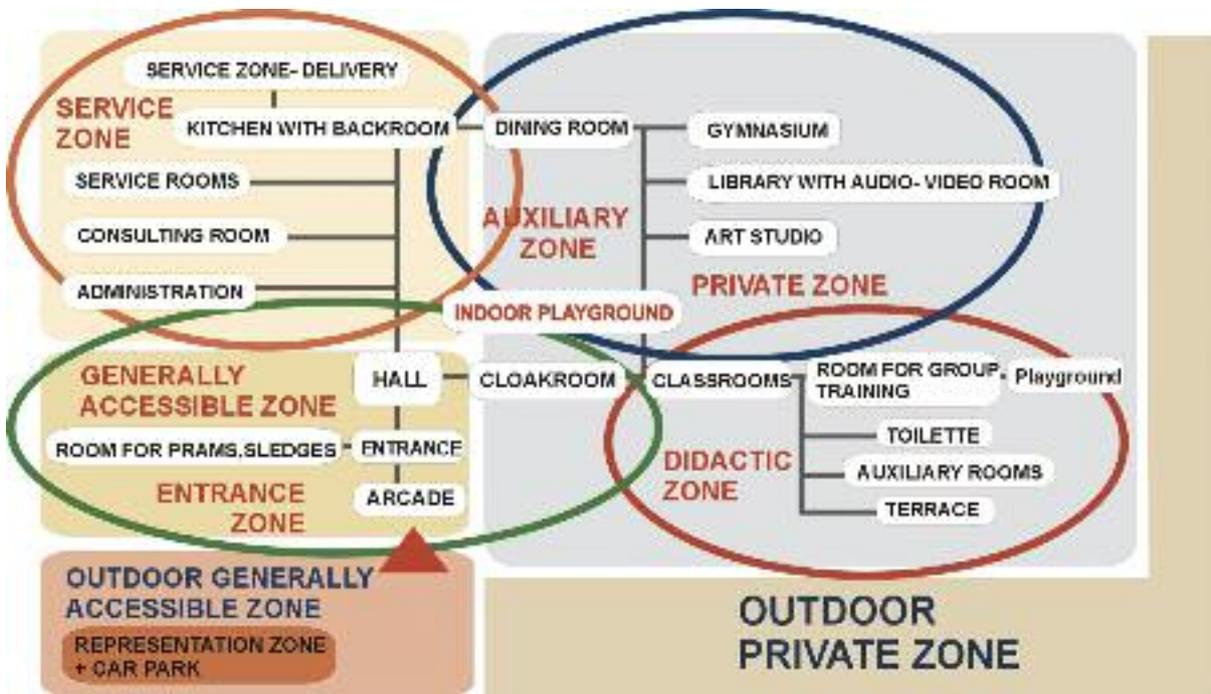


Figure 3. Schematic diagram of functional connections in the building of nursery school. [3]

- Additional activities facilities located in accessory rooms .
- The kitchen divided into: accessory room with social room, storage room, cooking area, dining area and administration with office facilities.

- Thus, the spatial arrangement should meet the safety and comfort needs of its users. (Fig. 3)

On the grounds of the functional program of a pre-school facility, in consideration of all the collected data, design guidelines and location parameters, the concept of the new facility may be developed.

The creation of a functional program depends on several essential elements, starting with literature analyses, through the authors' own investigations of real facilities and determination of the users' needs and requirements, and summing up with detailed analyses and conclusions drawn from the design guidelines. The specific design/project that will emerge on the grounds of such functional and spatial program shall surely include all the essential elements that should characterise a good architectural design. It is very probable, indeed, that the structure designed in such way shall function efficiently and its performance shall be friendly to all its users.

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