

COVID-19 AND LIBRARY PUBLIC SPACE TRANSFORMATIONS

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Abstract

The paper discusses the transformation of library spaces that occurred as a result of the spread of the SARS-CoV-2 coronavirus, as well as the directions of further spatial changes in library spaces under new pandemic conditions. The study is based on the integrated use of research methods. As part of the study, the functional-planning organization of library spaces was analyzed before and during the pandemic, and the content of the crisis of the social institution of libraries in the new conditions was formulated. The experience of transformations of other types of buildings – offices, restaurants, hospitals, etc. – was examined and the appropriateness of using these design techniques in library spaces was examined, individual planning techniques were highlighted as fundamental for further space-planning transformations, and considered as basic recommendations for adaptations, reconstruction and construction of new library buildings. Particular attention is paid to updating the focus on maintaining public health, including through the more active implementation of appropriate environmental standards in the construction.

Keywords: Architecture; COVID-19; Library; Public space; Safety; Social distancing; The actual normal; The new normal.

1. INTRODUCTION

COVID-19 pandemic has introduced radical changes in people's everyday lives. New restrictions placed on society have become a catalyst for rethinking what is considered the norm of social behaviour. Over the course of several months, quarantine measures changed the way people interact with each other, and these social transformations gradually began to affect the arrangement of urban spaces, public and residential buildings.

Today's global crisis has revealed a large number of problems in various fields of human activity. In his study, M. Kimmelman suggested that an outbreak of coronavirus will change the most basic ideas about the community and, in particular, about urban life [1]. The scientific community has an idea of a new "normal

state", which has a different understanding of human interaction with the environment. Making an attempt to formulate a holistic view of the depth of the influence of coronavirus on the field of urbanism and architecture, AM Salama identified the following areas of knowledge related to urbanism, which should be taken into account in further studies of the impact of COVID-19 on the city and urban structures: ethnography and anthropology, information and telecommunication technologies, urban and human geography, transportation engineering, environmental and disaster psychology, public health and identified key areas of research in the field of urbanism and design, where multidisciplinary research will be urgently needed [2]. As one of the key issues, he highlighted the need to discuss the reorganization of spaces that will take into account new lifestyles.

City planners and architects can observe how the urban environment and architectural structures they created recently are outside of modernity – they suddenly ceased to meet current living needs. As a result, additional obstacles are built up quickly and situationally in the existing urban environment, the internal spaces of buildings are divided into smaller ones, engineering networks are complicated and refitted, the trajectories and modes of use are changed, and the established functional zoning is reviewed.

Turning to the experience of the past, it can be traced that other mass infections by various pathogens – the epidemic of plague, tuberculosis, smallpox, and flu – had spatial consequences, and they led to dramatic changes both in the appearance of urban spaces and in the theoretical understanding of the mission of the architectural profession [3]. Studying the scientific and popular publications that were published in the first half of 2020, devoted to changes in urban spaces due to COVID-19, it should be noted that most of these studies are devoted to transformations of spaces that are vital for maintaining the health and working ability of the population: spaces of medical institutions [4], residential buildings [5], various manufacturing enterprises and offices [6], catering facilities [7], as well as public urban spaces (streets, parks, beaches, etc.) [8]. Because of the acuteness of the problem of adapting these spaces to the requirements put forward by medical science, the problems of transforming the spaces of cultural institutions, as well as education, have fallen into the background. Meanwhile, the processes of change in such spaces are already taking place spontaneously, and the form they will acquire will be important in the future direction of the development of human culture. In this context, it becomes necessary to track the spatial transformations that have already taken place and to formulate the conditions under which cultural institutions will operate in the future.

One type of public space that has undergone major changes as a result of the pandemic is the public space of libraries. Since all the activities of public library systems are based on social and cultural communication and its propaganda, this structure, to the greatest extent than any other, should be transformed and adapted to the new situation. Under quarantine conditions, the mission of libraries as institutions of mass and affordable education is in doubt.

It is still unknown whether COVID-19 will become a constant threat, will it turn into a seasonal disease, or will humanity be able to find a vaccine and cope with it in the coming years. According to Hud Abu Bakar,

even if the pandemic and quarantine restrictions do not last long and the physical changes in the spaces that provided social distance are temporary and short-term, such effects as new hygiene habits, spontaneous social distance, change in behavior will inevitably lead to a rethinking of everyday life and will affect the formation of spaces in the city [9]. Being at the epicenter of events, we cannot make an accurate forecast of what these physical changes in libraries will be, but to add up a comprehensive picture of them, we can study and generalize current trends, design tactics, and individual design concepts that have arisen in the architectural communication space from the beginning pandemics. An important task is the systematization and development of temporary measures that libraries are taking to turn their spaces into a relatively safe environment. This issue has already been partially investigated in the work of E. Pandolfi [10]. She examined the various roles that public libraries play in the context of the COVID-19 crisis, the process of introducing remote access to library collections, as well as the public program. However, descriptive studies that only capture the current state of affairs are no longer enough. As the crisis drags on and takes on a permanent character, it seems necessary to consider the problem of cultural integration of public library spaces in urban systems of the world with COVID-19 more broadly.

The present study aims to determine the content of transformations of library spaces due to the spread of the SARS-CoV-2 coronavirus and to identify directions for further spatial changes in library spaces under new pandemic conditions. The study is based on the integrated use of certain research methods. Using retrospective and comparative methods, information on the functioning of modern library buildings was systematized, the organization of library spaces before and during the pandemic was analyzed, which made it possible to formulate the content of the library crisis in new conditions. As part of the conceptual analysis, the experience of transforming other types of buildings – offices, restaurants, hospitals, etc. – was examined and the feasibility of using these design techniques in library spaces was examined. The combination of methods allowed us to consider the subject of research from different points of view and highlight the actual planning techniques that can be considered as basic recommendations for organizing libraries of the future.

Since not so much time has passed since COVID-19 spread around the world, the number of scientific papers devoted to the impact of the pandemic on var-

ious aspects of the architectural sphere is scarce. The actual basis of the study is the recommendations of individual profile committees, including official recommendations of the World Health Organization [11], webinars of professional organizations that were devoted to the changes due to quarantine restrictions, messages and articles in the professional press, and freely available statistics. Of particular interest are recommendations and guidelines for the gradual resumption of offices [12, 13]. The study also examined design developments of architects, which are regularly published on professional online platforms [14, 15, 16], and interviews with leading architects and project bureau managers [17, 18].

An important event, for an attempt at a theoretical understanding of the influence of the disease and quarantine measures on urbanism and architecture, was a public discussion of the heads of national committees of DOCOMOMO Int. on the topic “How Do You Map Modernism Under/After Covid-19?”, which was held online June 17, 2020; It was attended by A. Tolstoës, Sh. Muramatsu, Z. Borocz, P. Cook, T. Suzuki, H.-J. Henket et al. Researchers. As a result of this meeting, the following five key areas of further research on the impact of COVID-19 on the architecture of the future were formulated: survival instincts, solidarity and reassess the values, a chance to reset, digital escalation, innovation imperative [19].

2. THE MISSION OF THE MODERN PUBLIC LIBRARY SYSTEM AND GENERAL TRANSFORMATION AFTER THE INTRODUCTION OF QUARANTINE MEASURES

Before the coronavirus pandemic, libraries were the main urban systems that provided open access to information and were considered key players in the development of the global democratic information space [20]. Among the tasks that have been implemented by modern library spaces in recent decades, the key ones were: preservation of the intangible cultural heritage; providing access to diverse information resources and navigation in arrays of information; acting as a kind of forum for local communities, constructing new and strengthening existing socio-cultural ties; public education. Modern libraries are an information and public center, the main qualities of which are free and public access. To maximize the implementation of the tasks over the past decade, libraries have proportionally increased the share of public spaces by almost three times, compared with

libraries of the twentieth century, where most of the space was allocated for storage areas of library collections [21].

The COVID-19 pandemic has created unexpected challenges for public library activities. From the beginning of March 2020, part of the library staff was transferred to a remote form of work, some institutions were completely closed [22]. The main problem faced by working libraries is to ensure the safest environment for public library spaces for visitors in an environment of unprecedented protection. In this regard, the following measures have been taken:

- in conditions of the need for social distance, access to working libraries was limited – up to 50 users simultaneously with social distance and regular disinfection of surfaces;
- to reduce the number of visitors who are in the hall at the same time, hours of work have been increased and a preliminary record has been introduced for the issuance or return of books for a specific time;

Non-contact customer service was introduced – workers left books on a specific shelf inside the library or installed a special book shelf on the covered external wall of the library.

- the service of booking material in advance through electronic catalogs was actively introduced to reduce the time spent by the user in the library.
- alternative materials delivery services were offered, which included different types of home order delivery: bicycle couriers; book delivery to the doorstep for high-risk groups and people over 70; “Take-away bags” – pre-ordered books were left at the library at the indicated time; book delivery by mail; return and acceptance of books without leaving the car.

Given the fact that physical media can store viruses for a long time at the height of a pandemic, in most countries book return has been suspended, fines have been sent out and books have been automatically held for retention. In the libraries where the returns were accepted, the employees at the reception used gloves, disinfected the returned books and the surfaces where they were lying. There were also recommendations on the need to comply with the “quarantine” for books – from ten to fourteen days [23].

In recent months, there has been a decrease in demand for services to provide physical materials – books, audio books, CDs. And, on the contrary, the demand for digitized materials and virtual resources, access to which could be obtained without leaving

home, has grown significantly. The process of virtualization of library collections took place earlier, modern libraries expanded digital databases every year, created virtual portals to ensure full connectivity to the global information space, however, due to quarantine restrictions, digital resources and access to them have acquired key importance. In a short period, the range of available online services has been expanded, some restrictions on access to digital materials have been lifted, more licenses for electronic materials have been acquired by libraries. Besides, communication through social networks was strengthened, regular mailing lists were organized, relevant information on websites began to be updated more often. A form of library services such as a video chat was also introduced, thanks to which users could get advice on resources that users can access digitally. New streaming strategies began to be developed. For example, in Lithuania, some public libraries have launched a service for older members of the community, with which they can select library books so that library staff can read them over the phone.

Such fast and non-systemic virtualization of libraries revealed the following problems that called into question the reliability and stability of the entire library system:

- 1) the availability of library services has become dependent on the availability of the necessary technical support by the user; this manifested the digital inequality of the population, which came into conflict with the mission of the library system – providing universal access to the global information space, regardless of race, social and material status [24];
- 2) the level of technical support, information and digital readiness of most of the libraries was insufficient to satisfy the needs of users of information and library services in the remote mode – additional investments are needed to develop the information and telecommunication infrastructure of the library system;
- 3) library workers do not have sufficient qualifications and skills to work online – to ensure effective work, it is necessary to provide remote continuous professional education for library workers.

Besides, in connection with the transfer of most of the functions to virtual space, the vast areas of public spaces of library buildings were unclaimed and empty; the question arose about the future of these spaces – how it is possible to restart them, taking into account the fulfillment of all requirements for social

distance, contactless environment and disinfection of premises, or whether these spaces need to be adapted for another (temporary) function until the pandemic ends.

3. CHANGES IN THE SPATIAL ORGANIZATION OF THE MAIN FUNCTIONAL AREAS IN LIBRARIES

The modern public library space, designed as part of the “The four-space model” by Henrik Jochumsen [25], is a complexly organized spatial structure of the following basic functional zones (Fig. 1): 1) entrance zone; 2) space for the study of library materials; 3) educational space; 4) the space of active actions (creativity); 5) space for inspiration; 6) space for meetings; 7) common multifunctional zone. The accelerated virtualization of library services and the need to comply with quarantine measures have affected the spatial organization of each zone.

The library entrance zone before COVID-19 was usually a busy area where visitors actively interacted. The reception was located here, near which visitors lined up to get a subscription, get advice on using the services, and pick up a reservation. Often this zone merged into a space for meetings, which was intended for searching and meeting with like-minded people, which allowed expanding the scope of knowledge, discovering new information, and hearing a different position. The layout of this zone proceeded from the task of creating a platform for the possibility of the transition of passive library visitors to active participants in society [26]. Often, such zones were inhomogeneous free spaces with a flexible layout, which allowed communications of various formats and which had a direct relationship with other functional zones. The planning organization provided interpersonal communication, the opportunity to hold meetings of small and large groups and increase the likelihood of random meetings (for example, creating lounge areas or making small “pockets” for partial privacy, organizing coffee houses and small cafes). Thanks to this zone, the library turned into a “third space” – a place that is no longer home, but, meanwhile, is not yet work.

The meeting space was usually integrated with a common multifunctional area – a central place that had physical connections between public and special functional areas: foundations and administrative buildings. It was assumed that this space should support a variety of activities – from individual reading a book to a theatre performance, concert, or exhibi-

tion. The main elements of this zone were the stage, exhibition equipment, places for video installations and demonstration of video materials and a cafe, which, when entertaining, could be transformed into an auditorium.

Under quarantine conditions, the flow of people in the entrance and adjacent areas was significantly rarefied; a special zone for contactless collection of books appeared. The front desk was limited from visitors to a special plexiglass screen. Some computers in the entry area were disconnected from the network. Separate pieces of furniture where visitors could sit in groups were cleaned or rearranged, there were seats for one visitor.

Similar transformations have occurred in the spaces for the study of library materials – reading rooms. The integral space of the reading room was divided into compartments by means of furniture, some computers were turned off, tables were adapted for one or several people with sufficient distance. In certain libraries, reading rooms were completely closed and familiarization with the materials became possible either in virtual mode or through pre-order, which implies familiarization with the material at home. Some libraries began to work actively on the remote presentation of books – video reviews were prepared with comments by the authors, which were posted on YouTube.

Before the pandemic, the educational zones of libraries were at the same time both informal education venues and auxiliary learning spaces in educational institutions – schools or universities. In this case, training was considered in the broad context of public education, and the area of spaces was calculated on the permanent stay of large groups of people who are close and often communicate with each other. Such spaces were designed half-closed, they were partially separated from other zones so that it was possible to demonstrate openness of learning and attract new students – any visitor could see what was happening in the group of students and, if they wanted to join them.

The educational zone also provided for the placement of permanent and temporary exhibits, interactive objects, visitors were allowed to directly interact with the educational environment. Such educational spaces were often distinguished into separate functional zones – spaces of active actions, or creative zones. They allowed users to carry out creative and innovative activities. Here visitors could get access to various tools, including professional support of artists, designers, developers and users of software,

publishers and other specialists. Such zones were intended for seminars, master classes and even turning them into thematic workshops. The interior elements of these zones were freely and easily transformed to the needs of a particular activity. An effective storage system for the work of participants in workshops and workshops was organized here, which was also an exhibition and advertising of events. It was here that an important place was occupied by the possibility of involving children and adolescents in the educational process. Such spaces were well suited for game cognition, which involves the inclusion of different senses in the learning process.

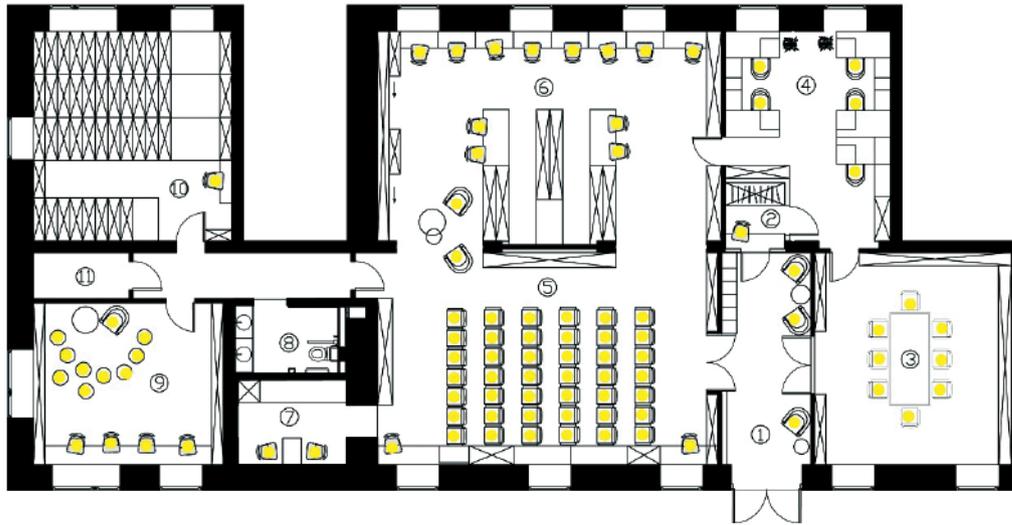
Another educational space that stood out in a separate functional area was a space for inspiration, which provided free access to various materials, including literature, cinema, music, art, entertainment, board and video games, and performances. Public events were also held here – meetings with interesting people, book presentations, thematic evenings, public discussions. The activity of libraries, which was carried out in this zone, carried out the cultural-forming function of the social system – fixed landmarks, which at the moment is the most valuable, avant-garde, high-quality content of modern culture [27].

In the context of the spread of COVID-19, any format of educational services that was offered earlier became almost impossible. Educational spaces, in most cases, were closed, and the courses themselves and training sessions began to be held online. Public events were canceled, rescheduled indefinitely or broadcast live. In some cases, events were held in the library, but with a significant reduction in the number of visitors and maintaining the necessary distance.

The transition to the remote mode could not fully compensate for the loss of the general educational field of interaction and communication between students and curators that arose during full-time classes. It was found that a more effective organization of social and cultural events in the remote mode is possible if not spectacular, but discussion forms are used.

After the introduction of quarantine measures, most of the libraries quickly adapted to new working conditions, they made a kind of quantum leap into new social practice. Besides, it was noted that the implemented protective measures led to the release of libraries beyond the boundaries of their public, the number of users of library services increased significantly and the geography expanded.

before COVID-19



after COVID-19

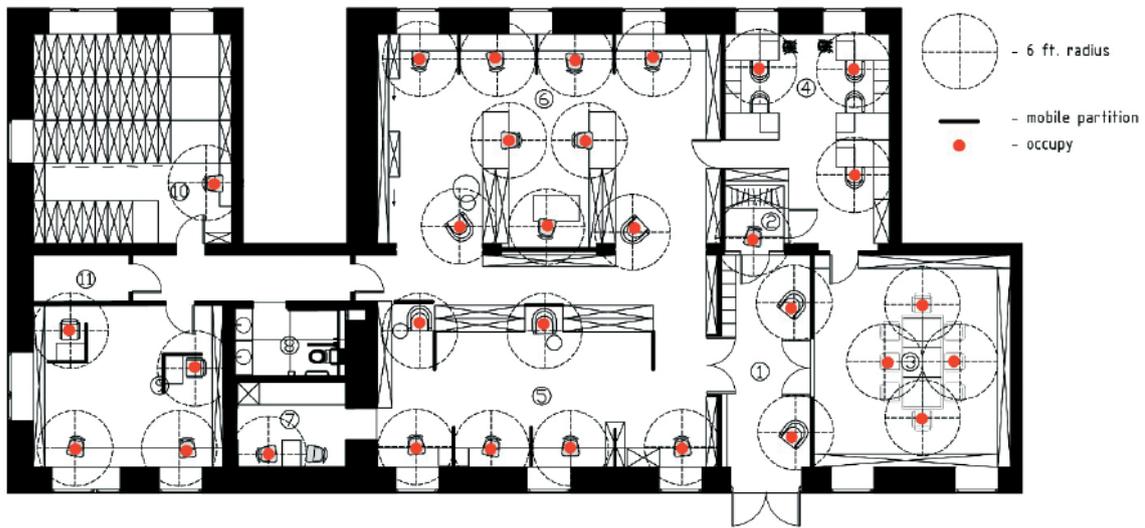


Figure 1. Spatial changes in the public library of Odesa after COVID-19. Explication of premises: 1 – hall; 2 – dressing room/information post; 3 – meeting room; 4 – office of the library workers; 5 – lecture/multifunctional space; 6 – media library; 7 – kitchen; 8 – bathroom; 9 – children’s room; 10 – archive / server room; 11 – pantry. Designed and provided by T. Rumilets

4. THE SET OF FACTORS FOR THE TRANSFORMATION OF THE SPATIAL STRUCTURE OF LIBRARIES IN THE QUARANTINE AND POST-QUARANTINE PERIOD

In early summer, instructions began to appear on the gradual quarantine of libraries. So, in the Concept of the organization of occupational health and the Plan for the opening and resumption of work of the Munich City Library, four main principles were presented that all library managers and workers should rely on in their activities: (Protection above all; Everyone maintains the minimum permissible distance; Contactless operation is maintained as long as possible; library users themselves are responsible for protecting their health) and some specific measures that need to be taken in the workrooms and public spaces of the libraries are described.

It should be noted that these recommendations and concepts are focused, first of all, on immediate measures, on the way out of the paralyzed state of the social system as a whole, and they do not involve working with the qualitative transformations that are happening today with library spaces. Immediate transformations of spaces associated with the observance of medical recommendations have already occurred in primary human life environments – in

hospitals, at workplaces – in offices and enterprises, at airports and railway stations, in supermarkets and shops, in open city spaces. Now, as part of the slow exit from quarantine in many countries, it is possible to track which of the developed methods for transforming public spaces of other typologies can be taken into account and implemented in the reconstruction and design of new public spaces of libraries.

In recent months, urban planners, architects, and designers have been offering their vision of spatial change to adapt the urban environment to new conditions. Based on the dominant design conditions, these solutions can be divided into two groups (Fig. 2):

- 1) in the context of an exacerbation of a pandemic – immediate changes in public spaces; the key characteristics of such spaces are social distance, contactlessness and high-quality disinfection of space and air;
- 2) in the context of prolonged quarantine – deep and long-term changes in public spaces; the main characteristics of such spaces is their correspondence to ideas about health parameters.

During the period of active spread of the disease, when it is quickly possible to accustom the population to new rules of behavior, it is an almost impossible task – in every community there will be some skeptics who will accidentally or intentionally ignore the observance of medical recommendations, and

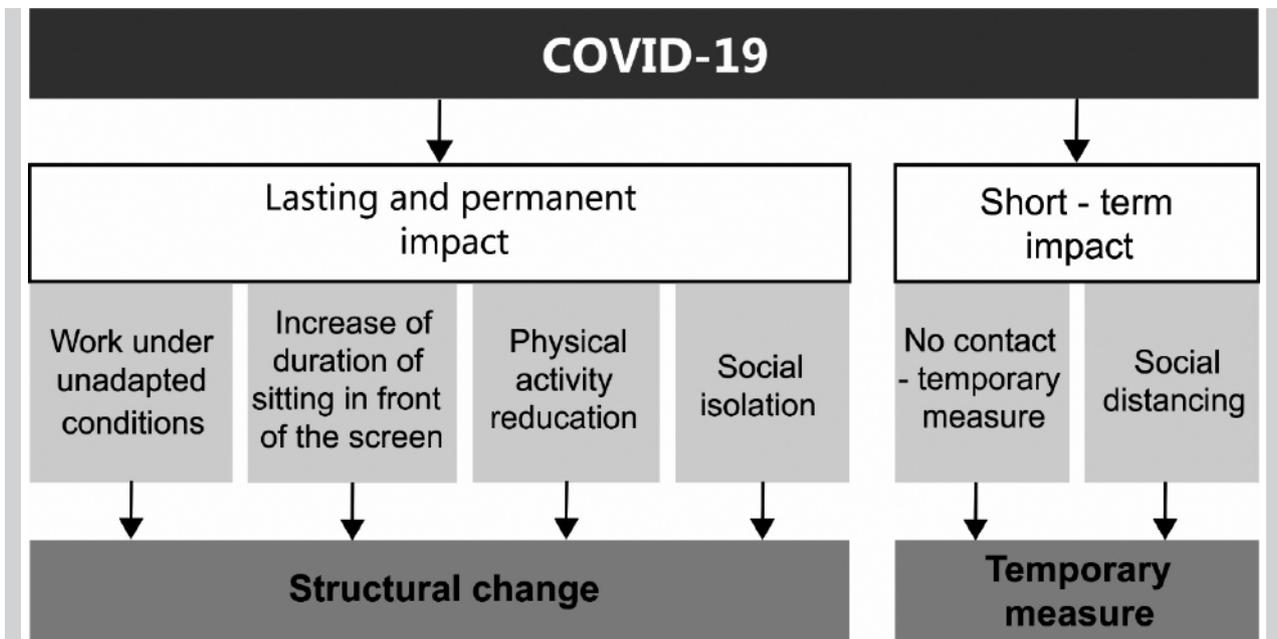


Figure 2. Factors of influence on spatial changes in architectural objects due to the spread of COVID-19. Developed by N. Antonenko and T. Rumilets

public safety can be achieved through the immediate and widespread introduction of Smart City technologies /“smart House”. Today, this system involves the automation of all engineering systems of the building, controls heating, ventilation, air conditioning, air quality, lighting, appliances and home robots, entertainment and security systems, “smart kitchen”, auto irrigation; controls the level of CO₂; monitors gas leaks and the occurrence of fires; helps in caring for the elderly and people with limited mobility, children and animals. This technology has been actively distributed in recent years, and from 2013 to 2020 the demand for this system has increased almost 3 times [28].

Architects must work closely with engineers to ensure space-planning quality and functional matching of spaces, taking into account the implementation of all the necessary systems of a smart building.

Due to the prevailing airborne spread of COVID-19, the development of efficient and safe automatic ventilation systems is becoming a key task in the design and reconstruction of buildings. Based on studies, it was found that the viability of SARS-CoV-2 coronavirus in aerosol form and on surfaces is highest at low relative humidity levels of 30–40%, and air pollution is an additional threatening factor – viruses can persist on fine dust particles and spread along with the air. Some organizations recommend compulsory placement of C (UVC) installations, which will be automatically included in periods when there are no people on the premises.

Another popular smart building technology that will limit the spread of the virus, is the placement of automatic sensors for measuring body temperature. When a person with a high temperature is detected, the ventilation system automatically creates an environment with negative pressure in the area where the disease was detected and prevents possible contaminated air from entering another area of the building. This technology of automatic temperature measurement has already been implemented in some airports, which significantly reduced the time of registration and quickly isolate potentially infected passengers.

The main planning requirement introduced by improved ventilation systems in library spaces is to reduce the area of premises, since the outputs of ventilation shafts should be as decentralized as possible. To a greater extent, this requirement will affect decisions regarding the organization of entrance zones, which now often represent large multifunctional spaces. Perhaps, as in buildings for other purposes, the halls and rooms will be divided, the number of

exits is increased, several receptions are created, which will reduce the volume of individual entrance spaces and ensure autonomous operation of ventilation ducts. It should also be noted that an increase in the number of system elements to provide autonomous ventilation outputs and an increase in traction power will entail an increase in the volume of the subceiling space.

Also, according to medical recommendations, to minimize the likelihood of spreading the virus inside a separate room, it became necessary to provide a room ventilation scheme in which it is possible to use natural ventilation along with forced ventilation. For such a combined system to work efficiently, windows for natural ventilation must also open automatically. This technology was already introduced in the design of the PNC tower in Pittsburgh – sensors were installed in the double glass panels that monitor the optimal weather conditions and open the panels to ensure fresh air [29]. An additional protective measure may be automatic dimming of facade panels, which will allow you to abandon dust-collecting blinds and curtains on windows.

The recommendation of frequent natural airing of premises actualizes the inclusion of outdoor areas, balconies, terraces, roof gardens in architectural solutions of public buildings. A return to biophilic buildings and porous spaces may lead to the creation of library buildings with public areas that are partially or fully taken out onto the street. These changes also affect the external appearance of buildings – the plastic of elegant facades of whole buildings with smooth glass planes made of glass will become more complicated, overgrown with large textures and additional protruding surfaces.

As COVID-19's second main distribution path is through the surface, the idea of more extensive implementation of contactless control technologies (automatic doors, voice-controlled elevators, access control using a smartphone, face recognition technology, contactless registration, automatic lighting control, which are professional community) is relevant when designing secure library spaces. As a minimum measure, the already implemented practices of contactless receipt and return of books in the future can be supplemented by the installation of contactless kiosks and reception desks and help desks, as is already being implemented at some airports. The organization of the internal space will not be based on the concentration of people at the entrance to one point with gradual dispersion, but the initial dispersion without dullness – the number of contactless

reception kiosks should be enough to ensure this. Besides, public bathrooms in libraries should become automatically controlled – automatic draining, turning on water, regular self-cleaning, control of the amount that are in the room at the same time. Elevator designs will also be changed – instead of such a characteristic of elevator efficiency as the maximum number of passengers, engineers will need to develop a design based on the minimum number of people, but at a significantly increased speed, so as not to increase the waiting time for the elevator, which can form a large group of people, and resistance to wear of driving mechanisms. Serving libraries with robots – for example, order delivery, similar to the service practices in hospitals, hotels and restaurants, which are already implemented in some – will also not be ignored.

It should be noted that although smart building systems must be quickly implemented in public buildings, there are factors that significantly slow down this process: 1) the high cost of development – not all enterprises can afford to reconstruct the entire building ventilation system or purchase automation systems; 2) many already developed smart engineering systems require time and financial investment for improvements; 3) the problem of fragmentation of the common platform for smart building systems remains – some systems work inconsistently with others; 4) there are no uniform technical standards; 5) these systems are not sufficiently protected and can be hacked. Because of this, the implementation of these systems will be slowed down, but there is no doubt that the period during and after the pandemic will push for a wider adoption of technologies and their accelerated development, which should be taken into account when designing new architectural and planning solutions for buildings libraries.

Immediate transformations of spaces of public buildings also occur directly in connection with social distance and contactlessness, the accounting of which has turned into a new design norm [30]. They occur at three levels: micro level – the level of messages and verbal messages about the need to observe precautionary measures and interior transformations; mid level – the level of reversible transformations, which include changing the motion paths, the use of transformable structures and furniture elements, modular structures; macro level – new planning decisions taking into account the danger of the spread of an infectious disease, major reconstruction, the development of adaptive architecture – the creation of universal spaces.

The main purpose of placing textual, visual and spatially organized instructions and reminders in public buildings is to train the population to consciously perform new rituals to minimize the risks of infection with COVID-19. Such reminders will affect the internal appearance of the interiors of public library spaces and will be included in the interior design decision as decorative elements: tablets with a general description at the entrance to the building; special dividing lines that fix the acceptable interval (in the form of flat ribbons or geometric structures; screens with running messages; reminders in toilets and near work desks; signs that focus on the location of hand sanitizing stations; information stands informing about the permissible number of people in indoors.

In some offices, a specific person was attached to his workplace and certain bathrooms and restrooms were fixed to limit his internal migration, this made it possible to quickly respond to messages about an illness of one of the employees – all possible contact persons are easily calculated, quickly sent to quarantine, sanitary cleaning is carried out in the premises, access to the infected area is temporarily closed. A similar security technology could be implemented in libraries, when the common space is temporarily divided into separate cabin modules with a limited number of people inside, a user's fixation and a separate duct. If necessary, such modules can be temporarily closed or undergo complete disinfection. Modular systems allow you to transform the space for specific needs. A similar system of adjustable walls and screens has already been developed by the Australian architectural firm Woods Bagot for segmenting open-plan apartments [31] (Fig. 3).

Inside the buildings, the trajectories of visitors were carefully revised to provide new routes with one-way traffic; furniture and temporary partitions were often used as barriers; increased number of inputs. In some hospitals, furniture was removed from the corridors to provide a wider passage, waiting areas were placed in them, as well as in other empty spaces, which allowed dispersing visitors and not creating places of concentration of a large number of people [32]. A similar practice of dispersing visitors throughout the library could be applied – floor plans should be analyzed by placing circles with a radius of 1 m [33]. This method of checking the safety of spaces is already actively used in the redevelopment of offices, catering facilities, as well as in the organization of street public events.

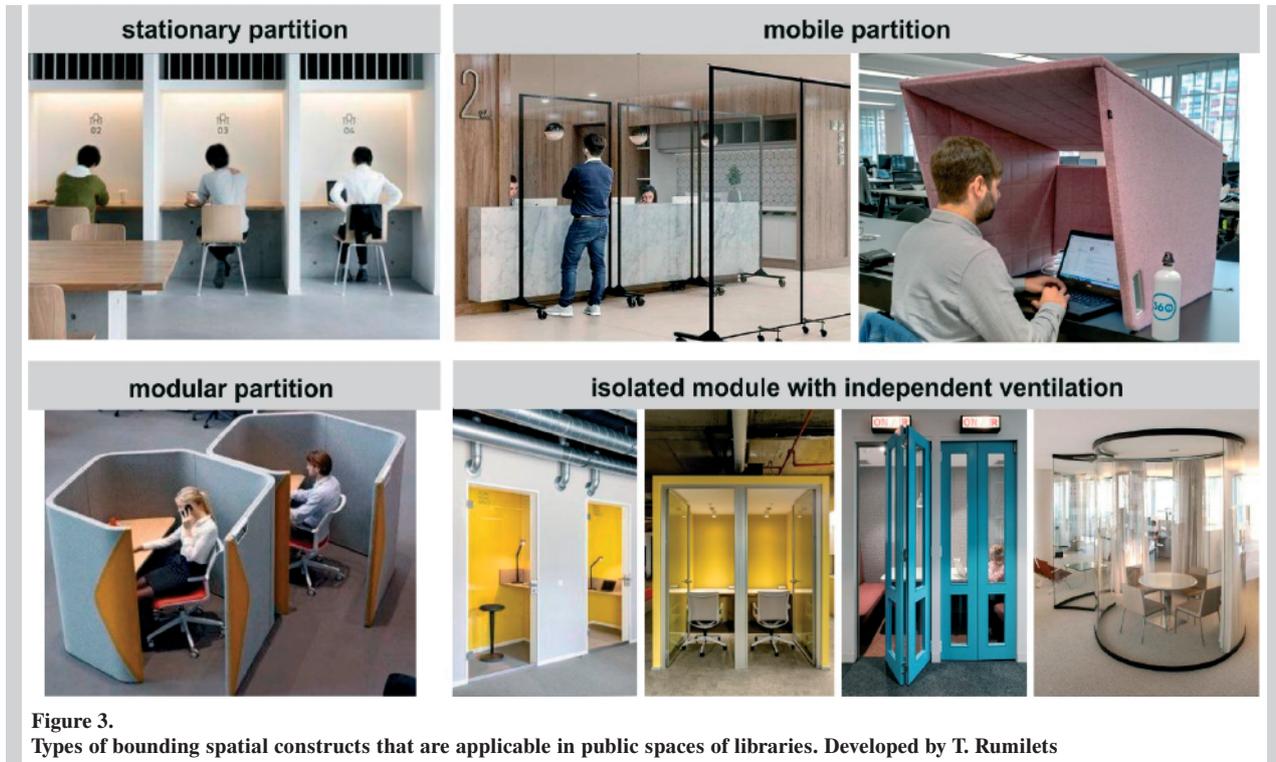


Figure 3. Types of bounding spatial constructs that are applicable in public spaces of libraries. Developed by T. Rumilets

Large internal entrance spaces were unloaded – the waiting area was partially moved to the parking lot in front of the buildings. In the same way, where climatic conditions allowed, some workplaces were transferred to the street, which made it possible to disperse workers without resorting to the remote work mode. In shops and restaurants appeared waiting areas for orders from the street, for waiting for the order external terraces were created. This technique is easily implemented when designing library spaces, many functional areas can adapt to the street layout. Special attention was paid to the use of safe and easy-to-clean materials for finishing surfaces and furniture, in particular for frequent use elements – door handles, stair railings, tabletops, buttons, toilet equipment. Many designers began to use copper surfaces in their work, whose antimicrobial qualities are well known. When designing public spaces, many designers abandoned the use of upholstered furniture and carpets. All cabinets that are designed to store personal belongings (in hotels, offices, train stations) must be quickly disassembled and disinfected after use.

The feasibility of constructing buildings in the form of large single volumes is being questioned. Joe Jacobellis, partner and design director at Greenvale, believes public spaces will change and public building

design standards need to be revised [34]. A new way of living involves a greater personal space. Office space will be larger for fewer workers, conference and meeting rooms will increase in size. The number of seats in restaurants will also be limited, and the tables will be spaced apart from each other at a greater distance, there will be more tables for one person. For libraries, such changes will mean the emergence of more areas for individual lessons – places for one. The placement of seats in the halls will become sparser, the halls themselves will become more compact and physically separated from other spaces.

The value of adaptive design as an effective and sustainable approach to creating new spaces will also increase. So, in a short time, the New York Javits Center was transformed into a hospital for 2900 beds, the New Orleans and McCormick Place conference centers in Chicago were turned into complexes for 3000 beds. Several sports facilities have also been converted into medical facilities. During the quarantine period, the degree of adaptability of the building turned out to be one of the key qualities of a modern building. Architects have got a new important task, designing a specific type of building, provide for its additional or alternative functions. Libraries, as accumulators of socio-cultural interaction, should also think over a strategy for their spatial development in

such a way that their buildings can remain socially relevant even in times of severe upheaval, natural disasters, epidemics, and military operations.

Quarantine measures harm public health to a lesser extent than COVID-19, however, they will have long-term consequences and will affect the quality of life and health of the population, this, among other things: will include mental disorders due to job loss, violence or pressure in the family a feeling of loneliness, a variety of fears, lingering depressive states; diseases associated with a decrease in physical activity (obesity, spinal diseases, muscle atrophy, cardiovascular diseases, decreased immunity, etc.). Already today there are projection images of “a man who has been on self-isolation for a long time”, which demonstrate the detrimental effect of self-isolation. The architecture should form new design decisions, taking into account the new conditions, look for compensatory mechanisms that can ensure sufficient physical activity, healthy sleep, good nutrition, social communication, taking into account mandatory restrictive measures.

The report of the World Green Building Council “On the health, well-being and productivity of people in office premises” (2015), which states that the direct performance of people on their health and comfort will become even more relevant. Because of the actualization of the issue of maintaining public health, the developed Well Building Standard [35] environmental standard, which was formed based on the results of

seven-year scientific, medical, and architectural studies, is becoming more important. In the new conditions, its focus on the health and well-being of people, as well as the developed methodology for determining the quality of a building from its healthy environment, will become very popular. The “optimistic architecture” [36], whose principles in 2016 were formulated by Will Priestley, will also become more widespread. An architecture where every aspect of design is utilitarian and designed to promote and protect people’s health, increase a sense of security, provide a healthy and safe way of communication in any kind of activity.

In his work, Schenker claims that after COVID-19 the urban form and urban planning will change. He suggests that one of the global changes will be a halt to the growth of agglomerations as business centers begin to disintegrate. The density of cities will decrease, the territory of the urbanized environment will expand. The urban population will often travel out of town, looking for safe places inaccessible to others. The pace of urban life will slow down, there will be a necessity and a need to stop, reflect, assess the place and position, the urban environment in which you are nearby. Slowness and increased sensitivity to already familiar places will help to unite local communities and strengthen their attachment to a specific place.

In a pandemic, landscaped urban public places – parks, squares – are of particular importance as a

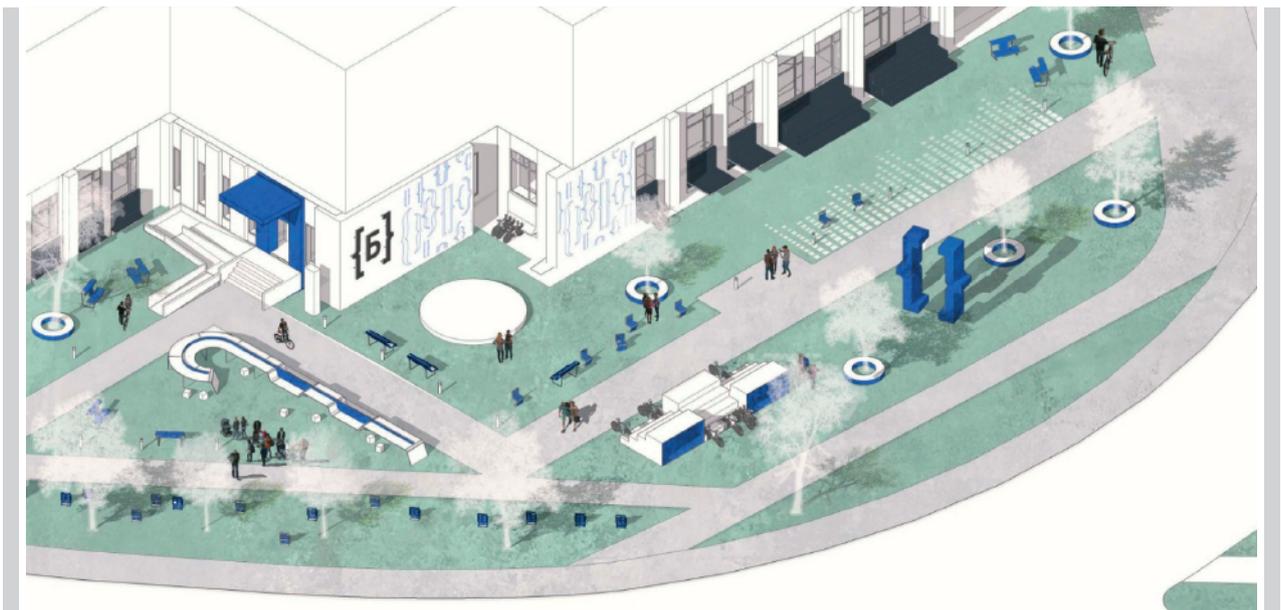


Figure 4.
Expansion of the public space of the library outside the building.
Source: <https://gubmo.ru/upload/medialibrary/726/726f987c18aa8202b9f87e42838fd765.pdf>

place to stabilize the mental state and rest. Country and state parks have also become more popular. Access to some territories even had to be restricted, since trails, beaches, and car parks were crowded and significantly violated protective measures, which created risks to public health. It was noted that staying in green areas helps to relieve stress, improve overall immunity and sleep. Architects and urban designers began to review the security of the spatial arrangement of urban public places in terms of their compliance with the requirements of social distance and proximity, representing a place of refuge. Thus, the architectural firm Studio Precht presented its idea of a city park in Vienna – “Parc de la Distance”, designed based on the Baroque French gardens and Japanese Zen gardens, which focuses on maintaining social distance, allowing people to be outdoors. The allocation of special zones for maintaining urban gardens is also becoming relevant, which not only helps to strengthen mental health, but also increases food security.

In this regard, library spaces will actively explore external territories, work with the landscape and the territory adjacent to the library building itself. The library will be surrounded by squares and park areas, or vice versa will be included in the structure of existing green areas (Fig. 4). Contemplation of nature, diffused natural lighting, contact with the textures of natural materials help create a sense of contact with nature, even while in the city. Such a biophilic approach is already being developed for buildings of a different typology. For example, Manassas Park Elementary School was built as a single complex with the Carondelet Forest Camp, where educational activities were combined with sports, as well as leisure and tourism. Thanks to this interaction, relations were optimized and relations between the internal space of the building of the educational building, the street and the environment were strengthened. The University of Virginia also has an understanding that mind, body, and nature are closely interconnected and that exposure to diverse and genuine natural environments is key to a person’s health, happiness, and productivity. Studying at the university involves a combination of academic, research and immersion learning spaces with tranquility zones in the form of untouched natural zones.

5. CONCLUSIONS

- 1) It was determined that at this stage, during the period of the active spread of the dangerous coronavirus and the introduction of strict quarantine restrictions, libraries as social institutions cannot fully perform their functions. Compensatory mechanisms provided them only partially, with the delay and continuation of quarantine, if measures are not taken to radically restructure the system, libraries may find themselves in a deep institutional crisis, which will certainly negatively affect general cultural processes.
- 2) It was revealed that after the pandemic, the functioning of library public spaces might undergo significant changes, which will lead to both functional planning and spatial changes. The design of these spaces will probably be based on an analysis of the trajectory of the individual visitor, much attention could be paid to ensuring his safety without losing the quality of the services that the library provides. Transformations await spaces that were originally intended for group learning and interpersonal communication.
- 3) An analysis of the transformations that have already occurred in buildings of a different typology has shown that these techniques can also be applied in the adaptation, reconstruction, and construction of new post-pandemic library spaces. In this case, not only urgent measures that ensure social distance and contactlessness, but also long-term measures that are designed to create a full-fledged healthy environment and promote a healthy lifestyle for the general public are of great importance. Because of this, the location of the library building and its proximity to natural landscapes is of particular importance.

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