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Evaluation of Temporary COVID-19 Testing Sites at Brussels Airport, Belgium: Users' Comfort and Privacy

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Abstract: This paper explored the temporary facilities created during the pandemic for use as COVID-19 test centers at Zaventem Airport, the main airport for the city of Brussels, Belgium. The possibilities of modular construction technology and the impact of the building envelope on users' perception of indoor space comfort and privacy were closely observed. The three main problem statements were as follows: (1) the COVID-19 crisis indirectly influenced the creation of temporary modular buildings with glass envelopes; (2) the modular envelope is adaptable to the existing context; and (3) the envelope meets the needs of the users. This study's objectives were to identify the critical factors for users' well-being in temporary modular buildings, and to conduct factor comparisons among different users and between different building-enclosure systems. The study data were collected through a subjective assessment using a SWOT analysis and a survey questionnaire. The glass facade affected the users' acceptance levels of comfort and privacy. The main results show that the users were satisfied with the level of comfort and dissatisfied with the level of privacy. This information can be used to identify areas for improvement and provide useful feedback to designers and engineers about specific design features and operating strategies for temporary modular emergency healthcare buildings.

Keywords: Brussels; building envelope; comfort; COVID-19 test center; emergency situations; questionnaire; SWOT; temporary modular building; users; Zaventem Airport

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1. Introduction

The coronavirus disease 2019 (COVID-19) brought about significant changes in people's lifestyles, working environments, and travel patterns, as well as mobility, etc. [1]. The virus's rapid and uneven spread affected many people across the EU [2]. The fact that the COVID-19 pandemic is still active at the time of the creation of this research speaks of the duration of the infection. The pandemic is no longer in the foreground and does not have such critical daily numbers as it did at the beginning. The COVID-19 pandemic has posed a challenge to healthcare buildings, demanding more building space with a healthy environment to reduce the overload of care in hospitals during peak health emergencies, and requiring the development of flexible structures capable of absorbing the surplus of patients [3]. The national governments of all countries established quarantine policies and restrictions. It was imperative to provide a suitable clinical space that met the requirements for treating the virus, as well as support spaces to replace areas re-appropriated as high-dependency environments [4]. The crisis resulted in the construction of much temporary healthcare infrastructure [5–8]. There was a strong emphasis on having additional sites in place, ready-to-place additional treatment areas, such as testing and treatment centers, critical care and first aid facilities, isolation units, quarantine tents, and command and distribution centers. The construction strategies most commonly used in constructing additional healthcare systems to prevent further COVID-19 infection are modular construction, adaptive use, lightweight and adaptable structures, and hygienic building materials [9]. The modular construction strategy has been successful in providing temporary buildings after natural disasters [10–12] and during the recent pandemic [4,13–16]. Surveys of indoor environmental quality in temporary buildings have mainly been applied to residential modular buildings built after disasters [17], residential buildings during COVID-19 [3,11,18], and temporary healthcare buildings [19]. The adoption of modular construction can speed up the project-delivery process to provide structures in the shortest time possible, and it can mitigate the risk of cross-infection during construction due to minimized on-site labor [15]. Modular constructions are durable, require little maintenance, are in line with building legislation [20], and create a smaller footprint than permanent structures [21]. The pandemic offers us an opportunity to reimagine the design of the next generation of temporary facilities while planning and preparing for the next health emergency or natural catastrophe [22,23].

Architects, engineers, and urban planners are some of the first to respond to natural disasters. It is surprising that disasters such as pandemics result in the less-active involvement of architects and urban planners. One argument for this strategy is that emergency responses, with their short timespans, are seen mostly as an engineering challenge rather than a design challenge [24]. Today, temporary structures bring new possibilities and respond to different scenarios, from a basic container concept [25,26] to sophisticated, fully equipped operating facilities [19]. The testing strategies vary from country to country due to their circumstances, but all countries adopt a well-designed generic model [27]. To provide an inclusive solution for the public, two testing and verification options are available at testing points: a walk-through facility, and a drive-through for cars and buses. To understand the conceptual logic of the system design, it is necessary to consider the definition of testing. Testing is primarily a short and frequent action performed on many people at large gathering places. The concept of COVID-19 tests at airports, with the goals of minimizing quarantine periods and reducing the potential risk of further spread, has been supported in many countries [28]. Since travel movements and border traffic can spread infections and lead to new hotspots of infection, the testing station provides travelers with easy access to a COVID-19 PCR test directly at the airport and the ability to receive the results digitally within a short time frame. The mobile testing facilities at various airports across Europe aim to support governments, airports, and airlines by detecting positive cases and breaking the infection cycle [29].

Since COVID-19 has caused many uncertainties, current research projects span many areas and disciplines in many fields. Numerous measurement methods are available for body-temperature screening protocols as a prerequisite for accessing controlled areas and facilities. The noncontact temperature measurement method has been identified as the most practical solution [30]. In the Rome–Fiumicino International Airport case study, remote-sensing techniques were used to monitor environmental factors following the spread of the COVID-19; they identified that different airport surface areas have changed their functionality [31].

This study explored the distinctiveness and utility of two temporary COVID-19 test centers at Brussels Airport to investigate the factors affecting their users' indoor well-being [32]. In the process of formulating the hypotheses, all variables relevant to the study were identified. Our statements started with the initial issue of the creation of temporary modular structures as an immediate response to the COVID-19 pandemic that led to the appearance of the glass envelope element in the observed context. Then, detailed statements about the interactions between the environment and the newly created temporary space, and between the envelope and users, were formulated. In sum, the hypothesis is defined in the three main problem statements: (1) the COVID-19 crisis indirectly influenced the creation of temporary modular buildings with glass envelopes; (2) the modular envelope is adaptable to the existing context; and (3) the envelope meets the needs of the users.

The concept of a visual connection between the users and the outside was incorporated into the design by using glass envelopes. Glass building envelopes have become widely adopted not only for aesthetic reasons but also to increase building energy savings and improve users' comfort [33]. However, they can also have a significant and sometimes unintended impact inside the building envelope [34]. The limited number of scenes tested prevents us from confirming the accuracy and validity of the threshold.

The objectives of this study were to identify the critical factors for users' well-being in temporary modular buildings, to compare these factors between different users, and to compare the factors between different building enclosure systems.

Available human comfort models (thermal, acoustical, visual conditions, and perceived air quality) are limited in their ability to predict human responses [35]. Users' behavior, awareness, and level of adoption of indoor conditions are important in maintaining good indoor comfort [36]. Healthcare workers are affected by the working conditions in COVID-19 temporary sites, so it is important to address aspects related to the well-being of employees [37]. This problem was addressed by creating special areas where healthcare workers could rest or engage in social interactions to recover from their work. Many psychological difficulties experienced by workers change over time; therefore, the considerations necessary for the future well-being of workers are difficult to assess. Each study conducted on the subject involves a population that may be biased in certain ways or not fully representative of the working population.

Users' responses to the physical environment in buildings may be influenced by a range of complex factors. Overall well-being depends not only on physical factors but also on psychological factors, in which social and cultural contexts play a significant role. Environmental conditions in buildings are changeable and are frequently difficult to measure with accuracy [38]. These include climate and weather conditions, building-related factors such as design, disposition, and control, and the individual characteristics of the users.

This study uses a subjective user survey as a qualitative indicator for ensuring satisfactory operations within temporary buildings. This study data were collected using a SWOT analysis and a survey questionnaire. As perceptions and subjective evaluations differ for individuals, a certain level of dissatisfaction among the building's users is inevitable [39]. Standards set the minimum requirements for indoor environmental quality [40]. These represent a basic framework for occupants' well-being. Different methods and tools for a subjective survey of buildings' indoor environmental quality have been employed in various studies [41]. The post-occupancy evaluation process requires the occupancy of the building through at least one, and preferably several, heating and cooling cycles [42]. The lack of a methodology for assessing thermal comfort in non-standard spaces is often encountered when dealing with non-conventional buildings [43]. Users are usually not satisfied with the thermal environment of temporary buildings and improvements to the envelope performance are key to optimizing the thermal comfort of temporary buildings [44]. There was a gap between the human thermal comfort model and the results of field studies for predicting the thermal comfort of temporary buildings.

Although the pandemic began a few years ago, and it is still relevant today, it is apparent that we need to expand our understanding of temporary buildings. The ability to offer feedback and obtain an insight into users' comfort and privacy in temporary modular buildings can be valuable and offer a credible learning opportunity. Since social distancing has become a new standard, spaces and their use have changed. An assessment of the architectural solutions considers the ability of designed buildings to fulfil their functional purpose and does so contextually, with respect to the surrounding buildings.

Following this introduction, the paper elaborates on the data collection and research methods implemented. Based on the results, we discuss and justify our hypothesis. Finally, we draw our conclusions.

2. Data Collection

2.1. Study Area

This study used the COVID-19 test centers at Brussels Airport, Belgium, as a case study to determine the factors affecting users' well-being. The study examined the temporary COVID-19 test centers built in 2020 at Zaventem Airport, the main airport for the city of

Brussels, and one of the largest transit airports in Europe [32]. These COVID-19 facilities were built as a response to preventive measures by Belgium's government as part of a nationwide testing platform for the performance of large-scale testing. For airline travelers, if a test is required, it can be taken prior to departure or upon arrival at the airport. Test centers at the Brussels Airport, operated by Ecolog [45], are in public areas and therefore easily accessible to all travelers, as well as to those who need a test for other reasons (Figure 1).

Figure 1. Brussels Airport: location and access roads (the departure COVID-19 test center is marked with a red line) (source: Google Earth, 2022).

The basic modular unit (a standard unit) can be used alone or combined horizontally to form a more expansive space (a multi-unit building). Modular construction systems with prefabricated parts were used to assemble both COVID-19 test centers. The containers were delivered from the vicinity of Antwerp in the Netherlands [46]. From the dimensional point of view, the container (DS-box) is a metal parallelepiped that measures 6000 mm × 2500 mm × 2800 mm (15 m^2 area) [47]. It consists of a mainframe steel structure skeleton and the building envelope. Most of the enclosure materials used are laminated multilayered glass and steel composite board walls. Steel plate finishes and filler materials are included to form composite wall panels, top panels, and bottom panels. The box roof is equipped with a waterproof and thermal insulation system, and drainage systems are hidden in the four corners (Figure 2).

Many units do not have openings and closures because of the need for the constant intensive ventilation of the space. Later, basic elements, such as the curtains that separate the inner space from the outer one, were added. Without these, there was a significant energy loss, which had an impact on the quality of the users' stays; additionally, the m terials deteriorated when in direct contact with atmospheric conditions. The modules are fully self-sufficient. After the installation of the on-site module, the final electrical, water, and mechanical installations were carried out, and air conditioning and ventilation systems, as well as sewage and sanitary facilities, were installed (Figure 3).

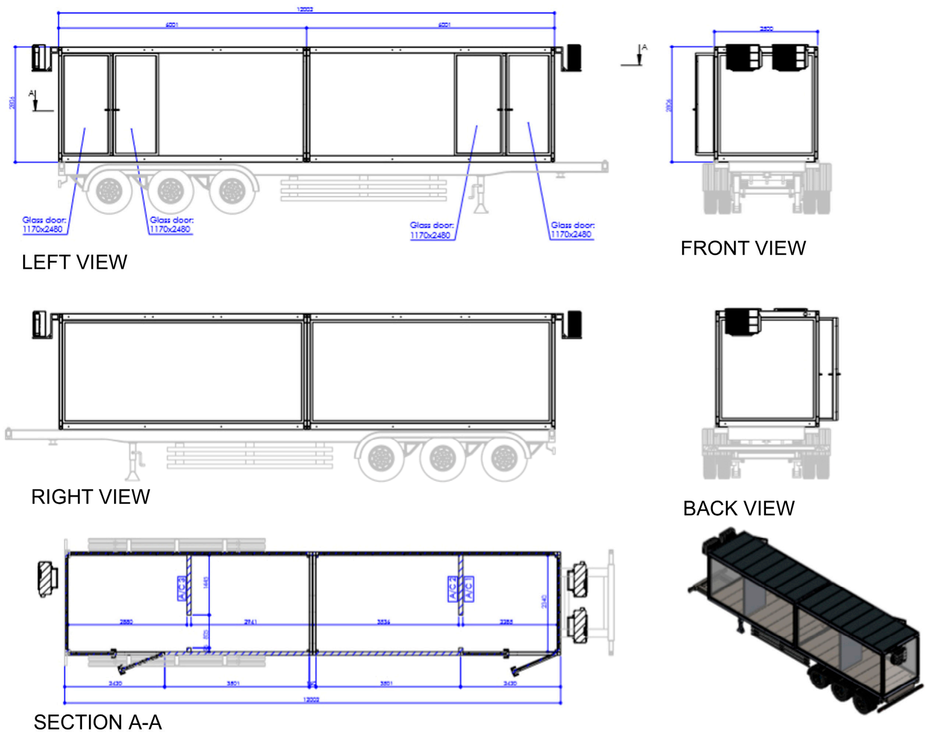


Figure 2. Drawing of the two glass units (source: Ecolog International GmbH, 2022).

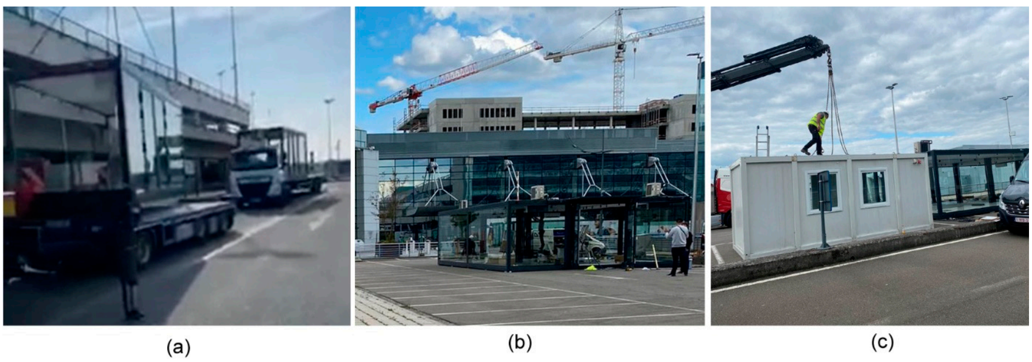


Figure 3. Module transportation and on-site module installation, 2020: (**a**) container trucks; (**b**) clustered glass containers; and (**c**) metal container positioning. (Source: authors, 2022).

Modules allow for flexible and changeable zoning layouts. The zoning of a test center contributes to the containment of viruses. The test center operation flow has several phases: website registration, flow control, active zone, and control. A schematic explanation of the COVID-19 test center organization from the first entrance steps, registration (green), administration (blue), testing (yellow), and final control system (orange) until the end of the testing procedure, is shown in Figure 4.

The test centers have two main parts: the administration area and the area for the medical procedure. The circulation between these two areas and the flow organization are highly important (Table 1).

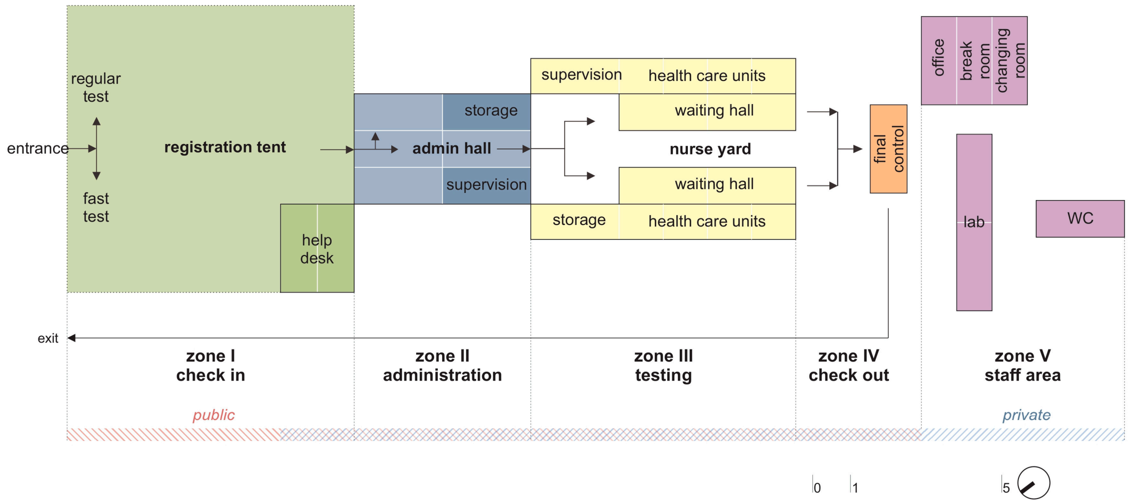


Figure 4. Operation flow displayed at the departure COVID-19 test center, updated ground floor plan, August 2021. (Source: authors, 2022).

Table 1. COVID-19 departure test center: operation flow. Operation flow (website registration, flow control, active zone, and final control) displayed at the departure COVID-19 test center.

Operation Flow	
Website registration	Stewards in front appoint passengers to the correct line and registration QR code. (Administrators who are standing in these areas are sometimes also called stewards). Stewards can be replaced by visual signalization (lights, color signals). The help desk unit provides extra information and helps register.
Flow control	The entrance steward appoints passengers to the correct line based on their payment obligations. The cash desk is located on the right, and the help desk for people with special needs is on the left. The exit steward appoints passengers to correct available nurse cubicles based on their test type.
Active zone	Divided into individual health care administration cubicles and waiting halls. Health care supervisor location. Flexible administrational and medical operations: - One cubical accepts individually one patient and can register and perform both Antigen and PCR/rapid PCR tests, depending on the flow necessity. - Cubicles can be separated into two different flows to keep Antigen and PCR flow clean and independent. - Possibility of importing arrivals test zone in this location.
Final control	Steward in the last position checks every passenger registration and payment transaction to have 100% correct test center operation.

The entire testing procedure starts with the traveler registration. The administration area is therefore divided into several separate points with specific micro-tasks. In the administrative zone, employees are regularly exposed to the risk of infection, regardless of all prescribed measures; therefore, their work is regularly altered with a change of micro-location and shortened (on a daily and weekly basis). The zone for medical procedures (the active zone) is the second part of the test center and is divided into individual healthcare (nurse) cubicles. The procedure of operating in one healthcare unit is strictly defined. Due to the need for direct contact with the patients, the unit is organized under the health norms prescribed by national health authorities. The transformation of health workers into hybrid health administrators was successfully undertaken to reduce the total number of employees. It also reduced the time the users stayed in the test center. Both parts of the test center are always spatially separated and organized in such a way that every employee has their own specially defined working area (minimum two square meters). At the end of the process, after the final control, travelers are directed to the exit path. For the safety of all users, the test center has a strictly organized plan of movement for everyone present in the operating area (Figure 5).

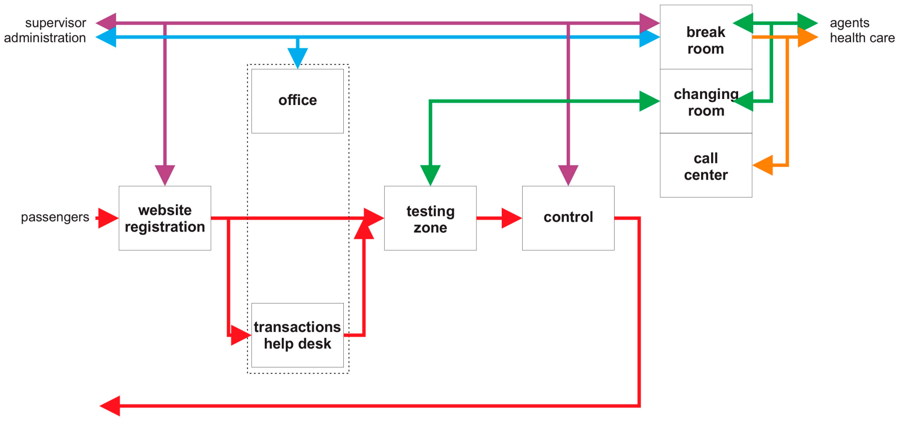


Figure 5. The circulation between areas and flow organization (passengers, supervisors, administrators, agents, and healthcare workers) is displayed at the departure COVID-19 test center. (Source: authors, 2022).

There are no overlapping user pathways. The movement pattern is separated between the clearly demarcated non-contaminated zones and contaminated zones to exclude the possibility of contamination throughout these channels. The pathway of travelers' movement is different from the employee's pathways. Healthcare workers and administrators should never meet in the same place at the same time. Such a strict rule results in a rapid user flow and a reduction in the potential spread of COVID-19.

2.1.1. COVID-19 Departure Test Center

The COVID-19 test center for departing passengers was built on the free-standing platform previously used as a service parking lot in the departures level (at level 3) (Figure 6).

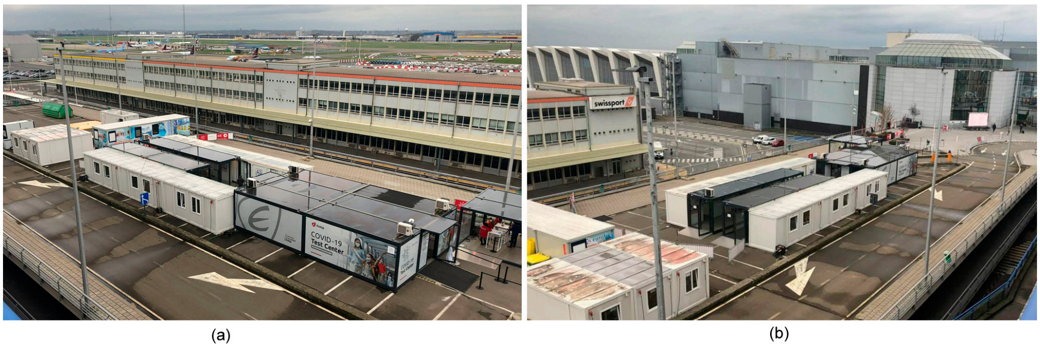


Figure 6. COVID-19 departure test center: aerial views (**a**) to the northeast; and (**b**) to the southeast. (Source: authors, 2022).

The test center was built in just two weeks. The on-site installation started at the beginning of September 2020 and was finished on September 14, 2020. The containers were ready-made, consisting of a steel load-bearing structure and enclosures made of glass and metal panels. Twenty modules were constructed on-site and clustered as shown in the detailed design drawings (Figure 7).

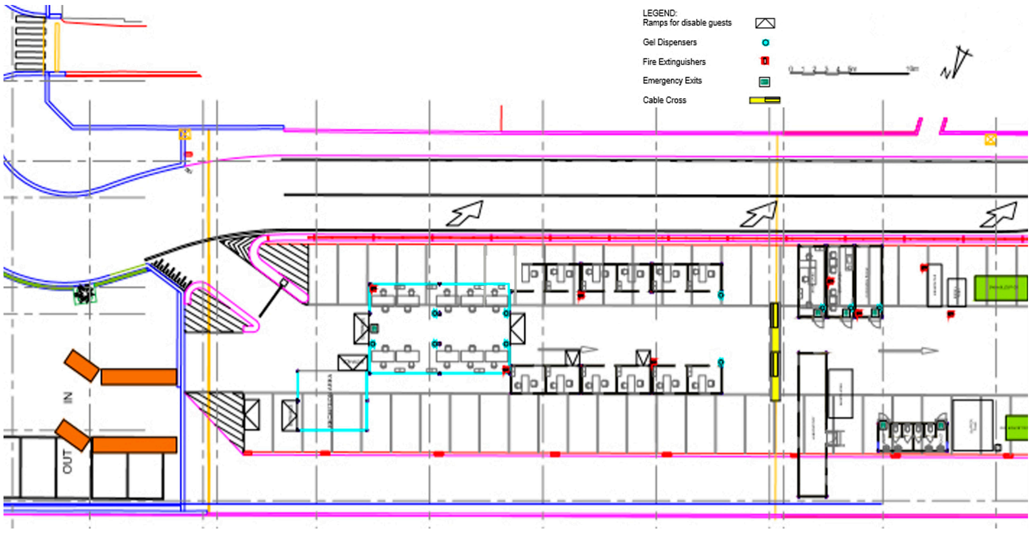
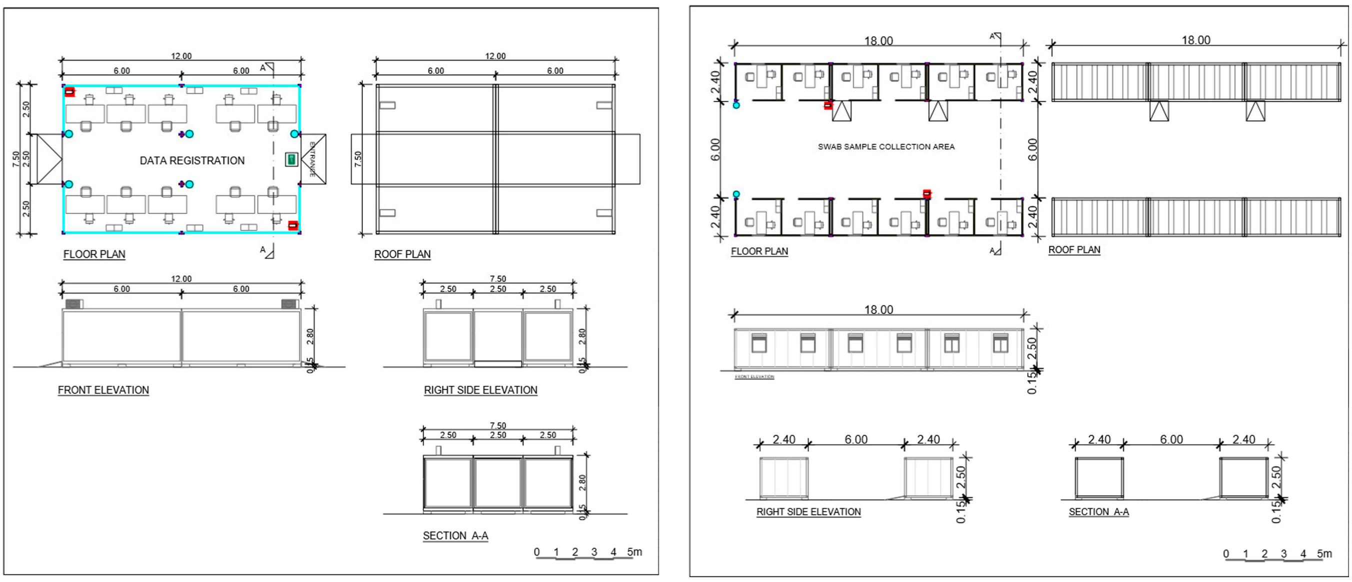


Figure 7. COVID-19 departure test center: floor plan. (Source: Ecolog International GmbH).

The floor plan shows the zoning of a test center and the dispersion of different zones. The departure COVID-19 test center consists of two main parts—the administration area and the area for medical procedures. The test center has a registration area, an administration hall, a testing area, staff facilities, a laboratory, sanitary facilities, and specially regulated waste. Six modules with glass building envelopes are clustered together for data registration and a large open space was created (Figure 8a).



(**a**) (**b**)

Figure 8. COVID-19 departure test center: floor plans: (**a**) the data registration area is a cluster of glass containers; and (**b**) the swab sample collection area is a cluster of metal containers. (Source: Ecolog International GmbH).

The only permanent partitions in the space were structural columns. Later, an indoor modification was designed. The office and stock room were separated by partition walls from the open plan space in the administration area (Figure 9a,b). The flexibility of the space made it possible to zone the initially completely open space into subsequent office/storage zones.

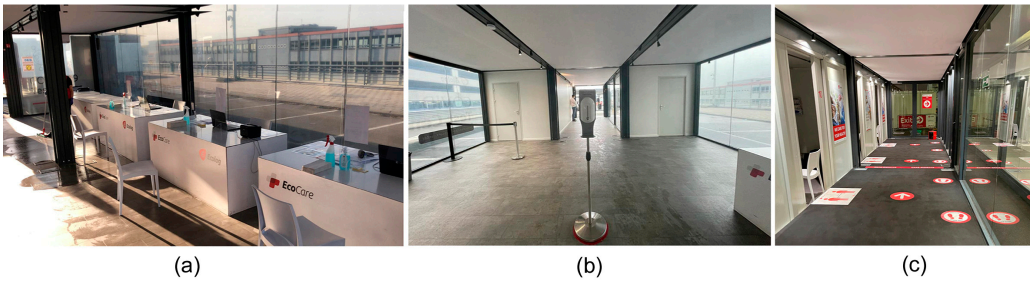


Figure 9. COVID-19 departure test center: indoor views with the glass building envelope: (**a**) open-space administration area; (**b**) separated office and storage zone in the administration area; and (**c**) waiting hall (communications) in front of the healthcare cubicles. (Source: authors, 2022).

The second part of the test center is the area for medical procedures. It is structured as two rows of three clustered white metal containers, which are placed opposite each other with a large outdoor area between them (Figure 8b). The containers have windows but no doors. This is where the swab sample collection takes place. Three metal containers are divided into six individual healthcare cubicles. The healthcare cubicles contain the most basic interior elements and are half the size of a standard metal container. This is the minimum required space where it is possible to test visitors.

Three separate metal container structures house all staff-related functions (e.g., changing room) (Figure 10).

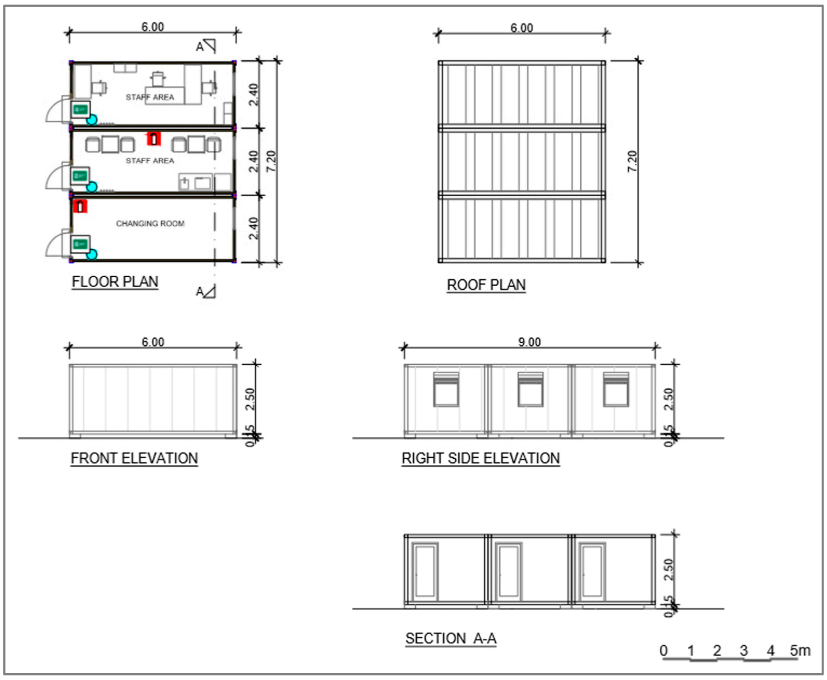


Figure 10. COVID-19 departure test center: the staff area and changing room are made up of a cluster of three metal containers. (Source: Ecolog International GmbH).

Long lines for testing, most of which stretched outside, resulted in extended architectural spatiality to create covered outdoor spaces around the test center. To minimize long waiting times outside and in the cold, additional elements to protect users from weather conditions were constructed in several places (Figure 11).

(a) (b) (c)

Figure 11. COVID-19 departure test center. Entrance views: (**a**) on a sunny day, 2020; (**b**) on a rainy day, 2020; and (**c**) on a cold day with a tent, 2021. (Source: authors, 2022).

At the entrance, a large two-sided roof/tent was built in the website registration area (Figures 11c and 12). The waiting halls in front of healthcare cubicles were built of glass modular units and created additional elements to protect users from weather conditions while waiting for the medical procedure (Figure 9c). Glass units proved to be useful for communications. The outdoor spaces are an extension of the built environment, which also gives users a sense of protection and comfort.

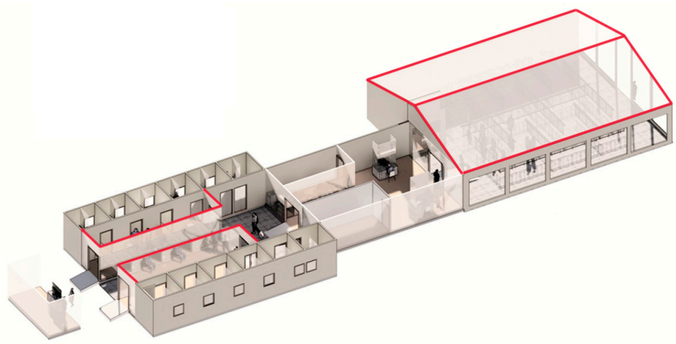
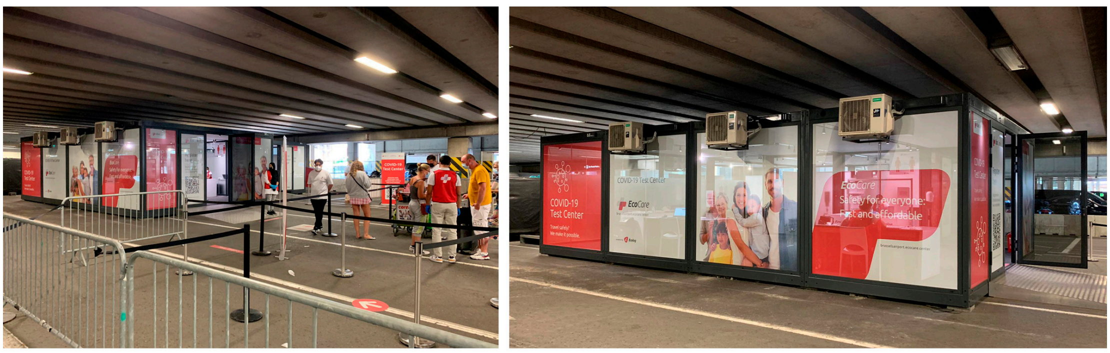


Figure 12. COVID-19 departure test center: axonometric view with additional constructions (marked with a red line). (Source: authors, 2022).

2.1.2. COVID-19 Arrivals Test Center

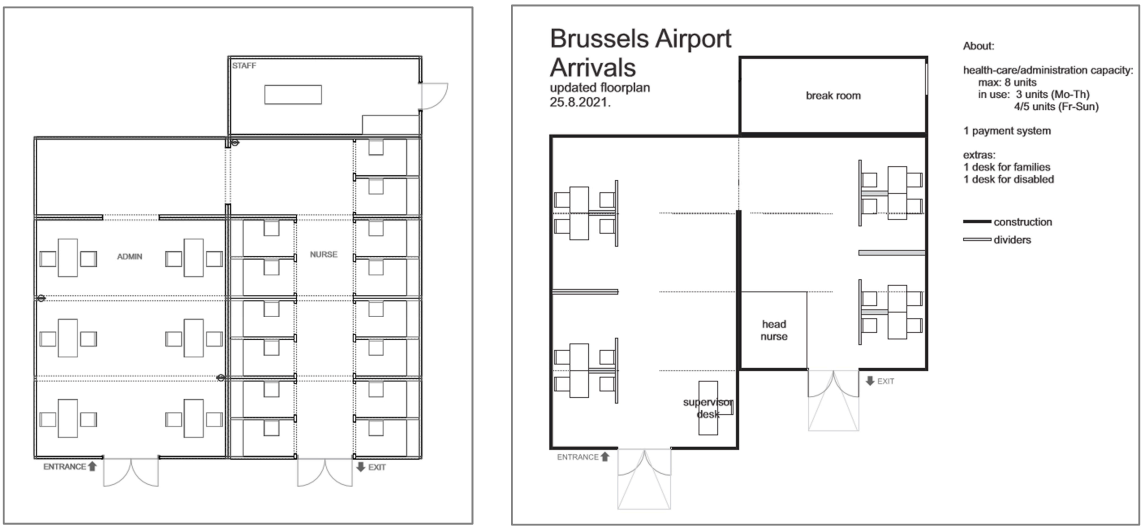
The COVID-19 test center for arriving passengers was built at the same place but in a different context and for a different purpose. The site was inside the airport terminal, in a semi-closed space, in the basement of the arrivals level (level 2) (Figure 13).



(a) (b)

Figure 13. COVID-19 arrivals test center: views (**a**) from a distance; and (**b**) from close-up. (Source: authors, 2022).

The arrivals test center is a small test center and must fulfill the role of testing a smaller capacity of people but with double the rush hour capacity, in keeping with the logic of arriving travelers. The installation and construction of the test center on-site were completed in a very short time. The test center opened in December 2020, a month after the design completion and a week after the on-site module installation. Eight glass containers form a cluster, which provides clear zoning and a hierarchy of spaces (Figure 14a).



(**a**) (**b**)

Figure 14. COVID-19 arrivals test center: (**a**) floor plan; and (**b**) updated floor plan. (Source: authors, 2022).

The test center is organized into three zones: a large check-in zone with a small subzone for administration, and a flexible space for the healthcare unit. A supportive glass module was built as a separate space for medical personnel's break activities and resting spaces. The check-in zone is in a protected environment (indoor building), and it is a part of the administration area, from where many users were diverted to the walk-in zone at different waiting points. Users are already registered in the system, so the second zone is reserved only for those with special data-filling conditions or procedures. Users are then diverted to rapid-testing points, which should be able to process all data sent from both zones simultaneously.

The entire test center is built from glass containers. The all-glass facility in a low-ceiling space without direct sunlight showed some shortcomings. The transparency of the building envelope causes discomfort and a lack of privacy in the indoor space. The separation of the space between the different zones was created by indoor movable spatial separators placed in the glass container. The floor plan of the test center was updated after the national regulatory change, the change in passengers' capacity, and the training of health workers for hybrid employee positions (Figure 14b). The initial arrangement of the test center after placing the furniture in the space, the readaptation of those initial plans into new hybrid positions, and the final appearance of the space are shown in Figure 15.

(a) (b) (c)

Figure 15. COVID-19 arrivals test center, indoor views: (**a**) initial arrangement; (**b**) readaptation of the initial plans; and (**c**) final arrangement of the healthcare unit. (Source: authors, 2022).

The COVID-19 test centers were produced in "modules" that, when put together on site, have design intent and specifications identical to the most sophisticated site-built facility. The two temporary buildings were built very near to one another but in different contexts. Both indoor and outdoor environments, large and small sizes, spacious and cramped spaces, and glass and metal envelopes offer different experiences and conditions.

As a case study, the COVID-19 test centers at the Brussels Airport showcase the principle of modularity during planning and design, construction, and flexible use over time.

3. Methods

First, as a method of collecting qualitative data, field research was conducted in 2020–2021 with the aim of understanding, observing, and interacting with users in their natural settings. Then, behavioral observations and interviews were utilized as complementary research methods, mainly during the first draft study, to understand how users used the facility as part of our search for key places to disseminate the questionnaire. Then, interviews with experts were conducted to identify the critical factors that affect workplace well-being [46]. Interviews with project stakeholders were carried out to identify and validate the relevant critical challenges and strategies [48]. Additional sources of necessary and official information were the archives of the database and the experiences of managers, employees, and users of one of the leading organizations in the European Union, which, from the very beginning of the pandemic, undertook disease prevention through migration point testing. After a detailed discussion with long-term employees of test centers, we decided to develop a small-scale survey as a research method. Questions reflect the perception, preference, and acceptance of indoor comfort in metal and glass containers. The level of comfort and the kind of privacy that occur in such limited areas appear to be important aspects of the indoor space related to the job description of each employee and to the users' perception of the space. The process of this study is shown in Figure 16.

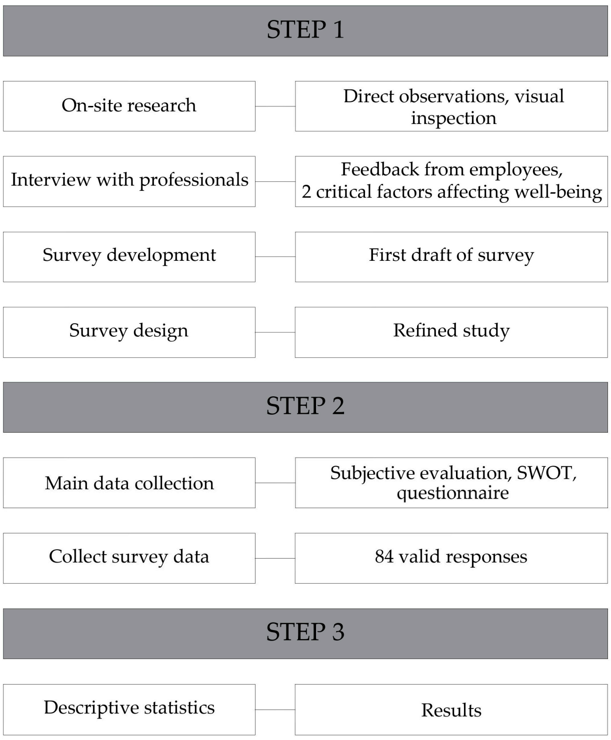


Figure 16. Study process.

Subjective methods were used in the research. The SWOT and questionnaire/survey methods analyze two closely related buildings. The SWOT analysis was used to compare external and internal influences on real-world sites, and the questionnaire was used as the main data collection tool in assessing different users' experiences of temporary spaces. The process of developing this micro-research is shown in Figure 17.

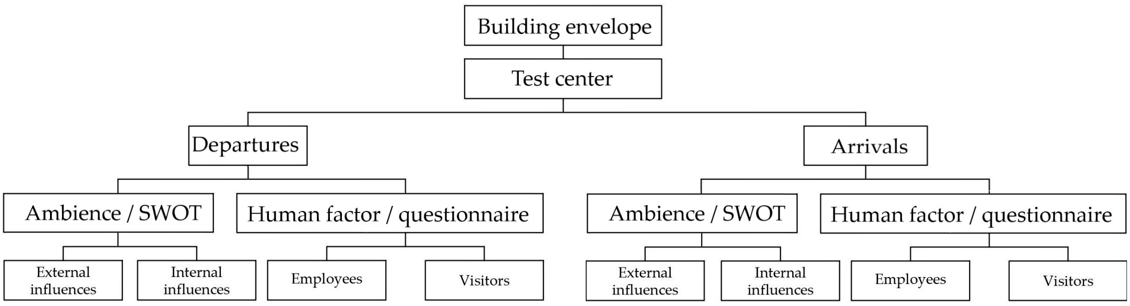


Figure 17. Survey development.

3.1. SWOT Analysis

The SWOT analysis was used by the authors to analyze the interaction between the glass building envelope and the indoor space comfort of temporary modular buildings. The analysis of strengths, weaknesses, opportunities, and threats facilitates an analysis of the internal strengths and weaknesses of temporary test centers and the external environmental opportunities and threats that test centers face during their operational process. SWOT analysis is used to anticipate how internal and external influences impact the conditions of the used space. More specifically, strengths and weaknesses are factors that have an internal origin, over which there is some measure of control. Opportunities and threats are external factors that are very difficult to influence.

3.2. Survey Development

User-experience research methods are important for producing data and insights. In this study, surveys were used as a tool to gain a deeper understanding of individual perspectives relative to space layout design and perimeter design variables. The respondents of this study were all users of COVID-19 test centers, divided into two categories based on different uses and activities. Users were divided into two groups based on their long-term and short-term usage of the space (Figure 18).

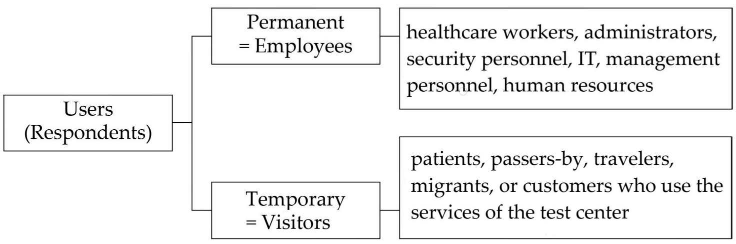


Figure 18. Diagram of the survey respondents.

The permanent users are employees of the test centers, such as healthcare workers, administrators, students, security personnel, information technologists, management personnel, human resources, etc. Temporary users are visitors, people to be tested, patients, passers-by, travelers, migrants, or customers who use the services of the test center.

The perception of such a specific temporary space cannot be separated from the activities that are carried out in COVID-19 test centers, which are strongly associated with positively or negatively charged psychological prejudices. The experience of a short-term visit is not the same as the experience of a long-term employee who works at a center over an extended period. It is precisely for these reasons that the survey offers the simplest examination of the necessary information, which is related only to the experience of users and the influence of the building envelope in the temporarily designed space.

Employees are the permanent group, characterized by their prolonged stay at the workplace. Employees have a constant and continuous relationship with the space and can offer more detailed information related to its shortcomings or benefits. As respondents, employees can give clearer answers about their long-term feelings at the workspace because they are exposed to various atmospheric changes during working hours, during the change of night to day, temperature changes, windy intervals, etc.

As temporary users, visitors are a more interesting group of respondents than employees. For this reason, a questionnaire was created for all users to learn about their satisfaction with the indoor space. Visitors do not have a long-term relationship with the space, but this does not diminish the value of their experience. Surveying occasional users is exactly the purpose of this investigation. Being in a place for any length of time provides a level of comfort, security, privacy, and sometimes complacency. It is important to note that this kind of architecture, although temporary, should serve all users equally. It is expected that different groups of users will have different experiences and understandings of the space.

3.3. Survey Design

The questionnaire was designed and developed by the authors. The study methods included a two-stage survey; in the first stage, personal interviews were conducted; then, in the second stage, based on input from these in-person interviews, a web-based survey was designed. The research data were collected online using a survey questionnaire (Google Forms). The researchers studied two testing centers of diverse types (the test center for departures and the test center for arrivals). A similar questionnaire design was used to measure the factors affecting the spatial well-being of the respondents. The questionnaire consisted of a set of questions for the purpose of gathering information about the users' general first impressions, and their perceptions of comfort and privacy, followed by questions about the influence of the glass and metal façades. Specific sets of questions were designed for the two groups (employees and visitors). A questionnaire involves a series of easy-to-answer multiple choice questions. Respondents were asked to rank the level of comfort and privacy on a five-point Likert scale, with 1 = very bad, 2 = bad, 3 = good, 4 = very good, and 5 = excellent. The questionnaire was in English.

4. Results of SWOT Analysis

A SWOT analysis was conducted on case studies assessing the interaction of glass building envelopes and indoor space comfort and privacy. The SWOT analysis process includes an examination of every aspect of the space and its surroundings and whether it has a positive or negative impact on the project (Figures 19 and 20). This method is constructed around two different categories of factors that make up the SWOT analysis: first, the internal factors were introduced to analyze issues of strengths and weaknesses. Second, external factors were introduced to explain opportunities and threats.

4.1. Internal Influences: Privacy, Transparency, and Enclosure

Enclosure plays an important role in achieving privacy in indoor spaces. Large areas of glass in the facades of modular units ensure the natural lighting of the space, provide a connection to the outside, and increase comfort inside the building. In the departure COVID-19 test center (outdoors), additional measures were implemented to protect the indoor space from direct sunlight. Glass graphics (high-performing films), both full-length and up to shoulder height, were added. Perforated films allow people to see through a graphic from one direction. Additionally, they give glass surfaces a visual element. Glass envelopes are both highly functional and aesthetically pleasing. The uncomfortable glare from daylight is predictable.

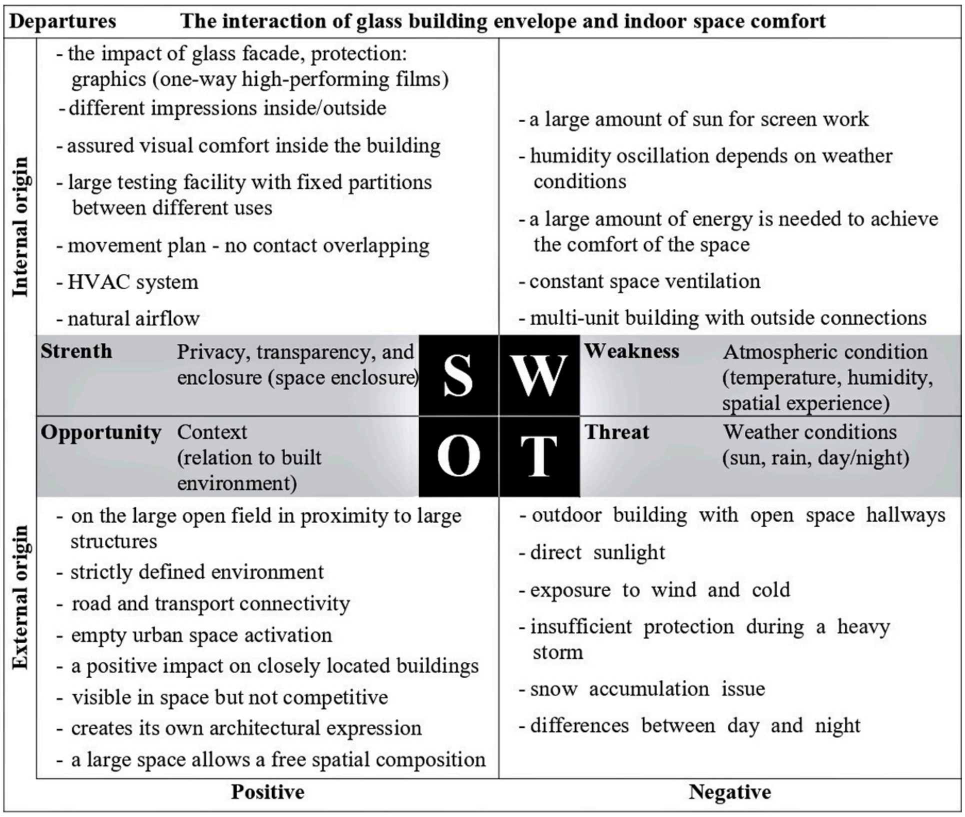


Figure 19. COVID-19 departure test center: SWOT analysis results.

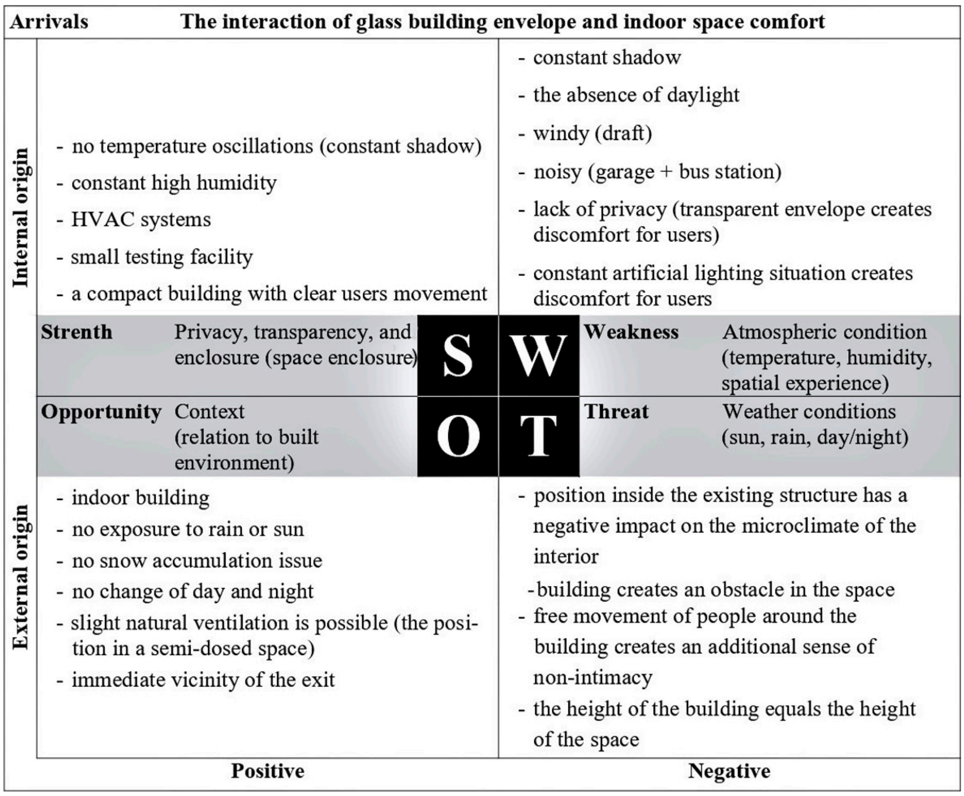


Figure 20. COVID-19 arrivals test center: SWOT analysis results.

Large areas of glass in the arrivals COVID-19 test center provide visual comfort inside the building, but the transparent envelope creates discomfort for users of the space.

The constant artificial lighting situation creates discomfort for users. Additionally, the free movement of passers-by around the test center creates an additional sense of non-intimacy for users inside. The lack of privacy can lead many users to experience feelings of discomfort and dislike of the space.

4.2. Internal Influences: Atmospheric Conditions

The spatial experience is not only functional but also sensory and material. The atmosphere can be defined as the immediate experience of a space. Heating, ventilation, and air conditioning (HVAC) are used to control the temperature, humidity, and purity of the air in both test centers. In the departure test center, a large amount of energy is needed to achieve comfort in the workspace and the well-being of users because the building envelope does not play a key role in the climatic protection of the interior from the exterior. The atmosphere is created by the changing levels of light and shadow throughout the day, so different experiences of inside/outside spaces can be expected. In the arrivals test center, constant shadows and artificial lighting situations created discomfort for users.

4.3. External Influences: Context

The location of the building has a significant influence on the users' experience of the space. Both test centers are in an urban built environment but in different contexts. The departure test center is an outdoor building created in a large empty space that allowed for free spatial composition, although the environment was subject to strict regulations. The relationship between the surroundings and the public is very important. The surrounding built environments can affect the building either positively or negatively. The ground floor building is noticeable (discreet) in comparison to closely related large airport buildings and creates its own architectural expression, having a positive impact on closely located buildings.

The arrivals test center is built inside the existing structure, creating an obstacle in the existing space. The environment is not subject to strict aesthetic regulations, so a positive impact on the architectural expression and spatial glass solutions can be observed.

4.4. External Influences: Weather Conditions

Exposure or non-exposure to weather has a significant influence on the indoor environment. The departure test center, which is situated in a large open space, is affected by weather and solar radiation. Sunlight, air, and rain all penetrate the opening and create a particular environment and experience based on the time of day and the season. During the cold season, the most significant problem is the loss of heat through external walls and openings, which means greater energy costs. Differences in comfort are expected to be seen between night and day. The outdoor environment and the design of waiting rooms and platform shelters with good weather protection are important for a wide range of users. In the beginning, visitors were exposed to the weather conditions when queueing or waiting outside. Later, outdoor covered spaces were added as waiting halls for visitors to provide weather protection for people waiting outside.

The arrivals test center built inside the existing building is completely protected from weather conditions.

4.5. SWOT Model Validation

Based on the SWOT analysis, the positive and negative impacts related to the interaction of the glass building envelope and the indoor space design were assessed for two temporary COVID-19 test centers built in different contexts. The built-environmental context is defined here as the context and climate, including indoor and outdoor spaces; users adapt to these spaces and behave in different ways toward these elements.

Regarding the strengths and weaknesses of glass building envelopes in relation to spatial comfort and privacy, the test centers have several strengths, such as visual contact, exposure to light and especially to daylight, the aesthetics of the space, and visual expression. On the other hand, the weaknesses include a lack of privacy and comfort within the test center (because of constant shadows and insufficient daylight). Regarding the external influences on glass building envelopes, adaptability, and flexibility in relation to existing environments represent opportunities. The main threats are related to weather conditions, which are impossible to influence.

5. Survey Results

5.1. Response Rate

The survey was carried out continuously within a period of two months from November until December 2022. A total of 84 valid responses were obtained. The survey responses were divided into those related to the test center at the departure terminal and those related to the test center at the arrival terminal, so that a comparison could be made. A similar set of questionnaires was given to the respondents in each location. Additionally, for the sake of easier interpretation of the answers, we grouped the questions into those related to the level of comfort and those related to the level of privacy. The results are summarized in the form of tables and graphs, which show the differences between the answers given by the users. While the number of responses is considerably low, it is recognized that the COVID-19 pandemic has placed substantial strain on people globally, which could justify the low response rate. Many people feel anxious while waiting for their test results; in particular, users who are in critical condition or stuck between connecting flights are individuals with a reason not to want to participate in the questionnaire. Thus, the response rate was considered satisfactory and adequate for this primary research, particularly when taking into consideration the low motivation of the respondents. All data collected during the two-month period were organized, coded, and analyzed using the statistics data editor analysis tool known as the Statistical Package for Social Sciences (IBM SPSS Statistics 25) and Microsoft Excel, Microsoft 365 (version 2205, Croatia). Descriptive statistics were employed when analyzing the questionnaire items.

5.2. Visitors Data Analysis

A total of 38 employees responded to the questionnaire within the two-month period (Table 2). The table shows descriptive statistics for the two locations (arrivals, departures). For each question from the questionnaire, the frequencies (frequency—f) and percentages (percent—%) of responses for each level of assessment on a five-point scale (1—very bad, 5—excellent) are listed. The median (median—M) is shown as a measure of the mean value, and the interquartile range (IQR) is shown as a measure of variability.

The results for the arrivals test center indicate that respondents had a neutral first impression of the center, based on the mean value obtained (M = 3.00). However, a large variability in respondents' answers is also visible (IQR = 2.25). The assessment of the level of comfort in glass containers is neutral (M = 3.00, IQR = 1.25), and, in metal containers, it is relatively high (M = 4.00, IQR = 1.25). The assessment of the level of privacy in glass containers is relatively low (M = 2.00), with relatively variable responses (IQR = 2.00); in metal containers, it is neutral (M = 3.00, IQR = 1.25). The assessment of workers' level of comfort in glass containers is neutral (M = 3.00), with a relatively high variability of responses (IQR = 2.00), and in metal containers it is neutral (M = 3.00, IQR = 1.25).

The results for the departures test center indicate a relatively high degree of positive evaluations in terms of first impression of the center (M = 4.00, IQR = 1.00). The assessment of the level of comfort in both glass and metal containers is neutral (M = 3.00, IQR = 1.00). The assessment of the level of privacy in glass containers is relatively low (M = 2.00, IQR = 1.00), and in metal containers it is neutral (M = 3.00, IQR = 1.00). Workers' assessment of their sense of comfort in glass and metal containers is neutral (M = 3.00, IQR = 1.00).

A summary of visitors' responses to the study questions is shown in Figure 21. Each of the pictures below graphically shows the percentage of individual degrees of answers for the question stated in the title for the arrivals and departures test centers.

Table 2. The visitor response rate to study questions and descriptive statistics for the two locations.

VISITORS
Did you visit the test center in departures terminal or arrivals terminal?

	Frequency	Percent
Arrivals terminal	14	36.8
Departures terminal	24	63.2
Total	38	100

ARRIVALS
General first impression of the test center

		Very bad 1	2	3	4	Excellent 5	Total	Median	IQR
What is your general first impression of the test center?	f	3	3	2	4	2	14	3.00	2.25
	%	21.4	21.4	14.3	28.6	14.3	100.0		

Level of comfort in containers

		1	2	3	4	5	Total	Median	IQR
How would you rate the level of comfort in glass containers?	f	1	4	6	2	1	14	3.00	1.25
	%	7.1	28.6	42.9	14.3	7.1	100.0		
How would you rate the level of comfort in metal containers?	f	0	0	6	5	3	14	4.00	1.25
	%	0.0	0.0	42.9	35.7	21.4	100.0		

Level of privacy in glass containers

		1	2	3	4	5	Total	Median	IQR
How would you rate the level of privacy in glass containers?	f	4	6	2	1	1	14	2.00	2.00
	%	28.6	42.9	14.3	7.1	7.1	100.0		
How would you rate the level of privacy in metal containers?	f	0	0	8	3	3	14	3.00	1.25
	%	0.0	0.0	57.1	21.4	21.4	100.0		

Level of comfort for the workers

		1	2	3	4	5	Total	Median	IQR
In your opinion, how would you rate the level of comfort for the workers in glass containers?	f	4	2	6	1	1	14	3.00	2.00
	%	28.6	14.3	42.9	7.1	7.1	100.0		
In your opinion, how would you rate the level of comfort for the workers in metal containers?	f	1	1	6	3	3	14	3.00	1.25
	%	7.1	7.1	42.9	21.4	21.4	100.0		

DEPARTURES
General first impression of the test center

		1	2	3	4	5	Total	Median	IQR
What was your general first impression of the test center?	f	2	2	7	8	5	24	4.00	1.00
	%	8.3	8.3	29.2	33.3	20.8	100.0		

Level of comfort in containers

		1	2	3	4	5	Total	Median	IQR
How would you rate the level of comfort in glass containers?	f	2	7	11	2	2	24	3.00	1.00
	%	8.3	29.2	45.8	8.3	8.3	100.0		
How would you rate the level of comfort in metal containers?	f	0	5	10	5	4	24	3.00	1.00
	%	0.0	20.8	41.7	20.8	16.7	100.0		

Level of privacy in glass containers

		1	2	3	4	5	Total	Median	IQR
How would you rate the level of privacy in glass containers?	f	5	9	6	2	2	24	2.00	1.00
	%	20.8	37.5	25.0	8.3	8.3	100.0		
How would you rate the level of privacy in metal containers?	f	0	5	12	3	4	24	3.00	1.00
	%	0.0	20.8	50.0	12.5	16.7	100.0		

Level of comfort for the workers

		1	2	3	4	5	Total	Median	IQR
In your opinion, how would you rate the level of comfort for the workers in glass containers?	f	3	6	11	2	2	24	3.00	1.00
	%	12.5	25.0	45.8	8.3	8.3	100.0		
In your opinion, how would you rate the level of comfort for the workers in metal containers?	f	1	4	11	3	5	24	3.00	1.00
	%	4.2	16.7	45.8	12.5	20.8	100.0		

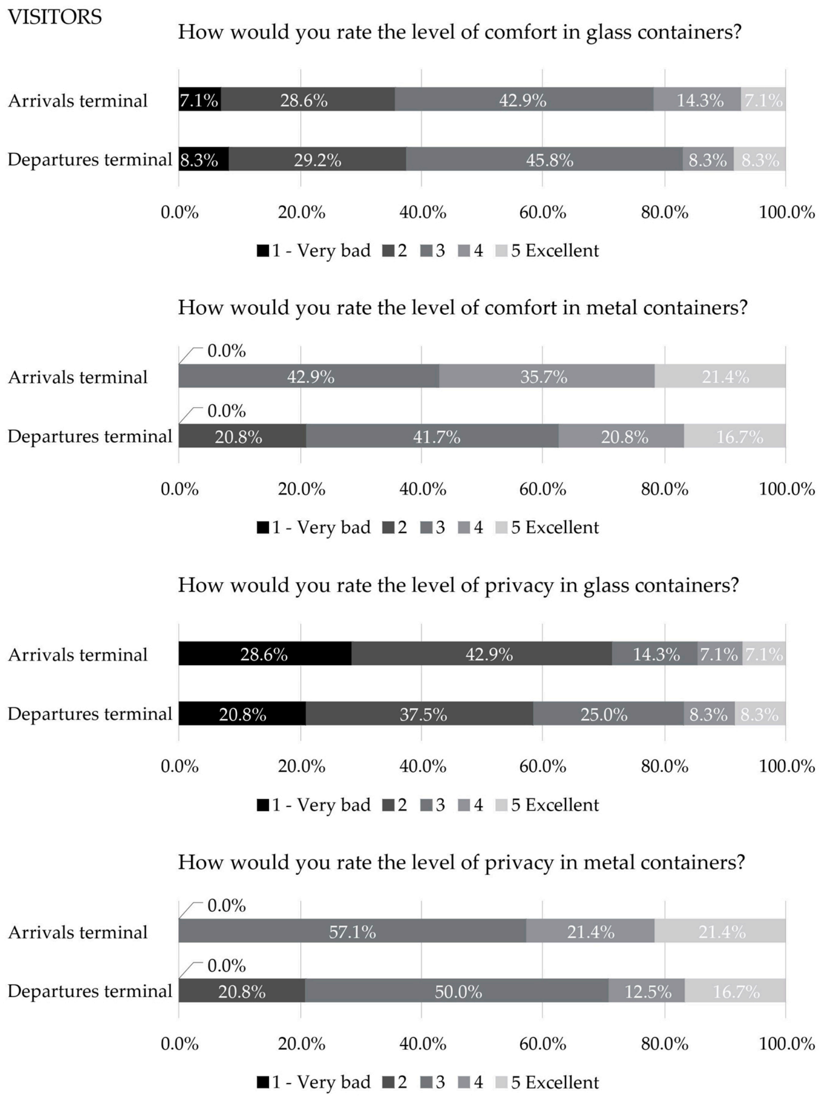


Figure 21. The responses of visitors to the study questions.

5.3. Employee Data Analysis

A total of 46 employees responded to the questionnaire (Table 3). The tables below show descriptive statistics for the two locations (arrivals, departures). For each question from the questionnaire, frequencies (frequency—f) and percentages (percent—%) of responses for each level of assessment on a five-point scale (1—very bad, 5—excellent) are listed. The median (median—M) is shown as a measure of the mean value, and the interquartile range is shown as a measure of variability (interquartile range—IQR).

Only 15 employees working in the arrivals test center responded to the questionnaire. The distribution of employees based on their years of working in glass containers were as follows: 3–6 months (33.3%), 6–12 months (46.7%), and more than 1 year (20%). The distribution in terms of the amount of time spent in the glass containers each day was as follows: 1–3 h (33.3%), 3–6 h (53.3%), and more than 6 h (13.3%).

The assessment of the level of comfort in glass containers during warm and sunny weather, during cold weather, and during bad weather was neutral (M = 3), with a relatively large response variability (IQR = 2.00). The level of privacy in glass containers was assessed as relatively poor (M = 2, IQR = 1).

Table 3. Descriptive statistics for employees at the arrivals test center.

EMPLOYEES		
Did you work in the test center in departures terminal or arrivals terminal?		
	Frequency	Percent
Arrivals terminal	15	32.6
Departures terminal	31	67.4
Total	46	100.0
ARRIVALS		
Did/Do you work in glass containers?		
	Frequency	Percent
no	0	0.0
yes	15	100.0
Total	15	100.0
For how long have you been working in glass containers?		
	Frequency	Percent
3–6 months	5	33.3
6–12 months	7	46.7
more than 1 year	3	20.0
Total	15	100.0
On average, for how long have you been working in glass containers each day?		
	Frequency	Percent
1–3 h	5	33.3
3–6 h	8	53.3
more than 6 h	2	13.3
Total	15	100.0

Descriptive statistics

		Very bad 1	2	3	4	Excellent 5	Total	Median	IQR
How would you rate the level of comfort in glass containers during warm and sunny weather?	f	1	4	6	3	1	15	3.00	2.00
	%	6.7	26.7	40.0	20.0	6.7	100.0		
How would you rate the level of comfort in glass containers during cold weather?	f	1	4	6	3	1	15	3.00	2.00
	%	6.7	26.7	40.0	20.0	6.7	100.0		
How would you rate the level of comfort in glass containers during bad weather (strong wind, snow. . . .)?	f	1	4	6	3	1	15	3.00	2.00
	%	6.7	26.7	40.0	20.0	6.7	100.0		
How would you rate the level of privacy in glass containers? (general privacy)	f	3	6	3	2	1	15	2.00	1.00
	%	20.0	40.0	20.0	13.3	6.7	100.0		

In total, 21 employees working in the departure test center in glass containers responded to the questionnaire (Table 4). The descriptive statistics for employees' duration of service in the glass container within a range of periods showed values of 0–3 months (14.3%), 3–6 months (33.3%), 6–12 months (19%), and more than 1 year (33.3%). The distribution based on the hours an employee spent within the glass container each day was as follows: 0–1 h (14.3%), 1–3 h (19%), 3–6 h (28.6%,) and more than 6 h (38.1%).

The assessment of the level of comfort in glass containers during warm and sunny weather and during cold weather and bad weather was neutral (M = 3), with a relatively large variability of responses (IQR = 2.00). The level of privacy in glass containers was assessed as neutral (M = 3, IQR = 1).

Table 4. Descriptive statistics for employees at the departures test center for the glass containers.

EMPLOYEES/Departures/Glass container **Did/Do you work in glass containers?**		
	Frequency	Percent
no	10	32.3
yes	21	67.7
Total	31	100.0
For how long have you been working in glass containers?		
	Frequency	Percent
0–3 months	3	14.3
3–6 months	7	33.3
6–12 months	4	19.0
more than 1 year	7	33.3
Total	21	100.0
On average, for how long have you been working in glass containers each day?		
	Frequency	Percent
0–1 h	3	14.3
1–3 h	4	19.0
3–6 h	6	28.6
more than 6 h	8	38.1
Total	21	100.0

Descriptive statistics									
		Very bad 1	2	3	4	Excellent 5	Total	Median	IQR
How would you rate the level of comfort in glass containers during warm and sunny weather?	f	1	6	8	5	1	21	3.00	2.00
	%	4.8	28.6	38.1	23.8	4.8	100.0		
How would you rate the level of comfort in glass containers during cold weather?	f	2	5	8	5	1	21	3.00	2.00
	%	9.5	23.8	38.1	23.8	4.8	100.0		
How would you rate the level of comfort in glass containers during bad weather (strong wind, snow. . . .)?	f	0	7	8	5	1	21	3.00	2.00
	%	0.0	33.3	38.1	23.8	4.8	100.0		
How would you rate the level of privacy in glass containers? (general privacy)	f	2	7	8	3	1	21	3.00	1.00
	%	9.5	33.3	38.1	14.3	4.8	100.0		

A total of 17 employees working in metal containers responded to the questionnaire (Table 5). The distribution of employees based on their years of service in glass containers was as follows: 0–3 months (17.6%), 3–6 months (35.3%), 6–12 months (41.2%), and more than 1 year (5.9%). The distribution of the amount of time spent in the glass containers each day was as follows: 0–1 h (11.8%), 1–3 h (47.1%), 3–6 h (29.4%), and more than 6 h (11.8%).

Table 5. Descriptive statistics for employees at the departures test center for metal containers.

EMPLOYEES/Departures/Metal containers **Did/Do you work in metal containers?**		
	Frequency	Percent
no	14	45.2
yes	17	54.8
Total	31	100.0
For how long have you been working in metal containers?		
	Frequency	Percent
0–3 months	3	17.6
3–6 months	6	35.3
6–12 months	7	41.2
more than 1 year	1	5.9
Total	17	100.0

Table 5. *Cont.*

On average, for how long have you been working in metal containers each day?	Frequency	Percent
0–1 h	2	11.8
1–3 h	8	47.1
3–6 h	5	29.4
more than 6 h	2	11.8
Total	17	100.0

Descriptive statistics		Very bad 1	2	3	4	Excellent 5	Total	Median	IQR
How would you rate the level of comfort in metal containers during warm and sunny weather?	f	2	3	5	6	1	17	3.00	2.00
	%	11.8	17.6	29.4	35.3	5.9	100.0		
How would you rate the level of comfort in metal containers during cold weather?	f	2	3	4	6	2	17	3.00	2.00
	%	11.8	17.6	23.5	35.3	11.8	100.0		
How would you rate the level of comfort in metal containers during bad weather (strong wind, snow. . . .)?	f	1	3	5	7	1	17	3.00	1.50
	%	5.9	17.6	29.4	41.2	5.9	100.0		
How would you rate the level of privacy in metal containers? (general privacy)	f	1	2	7	3	4	17	3.00	1.50
	%	5.9	11.8	41.2	17.6	23.5	100.0		

The assessment of the level of comfort in metal containers during warm and sunny weather and during cold weather was neutral (M = 3), with a relatively large variability of responses (IQR = 2.00). The evaluation of the level of comfort in metal containers during bad weather is neutral (M = 3, IQR = 1.5). The level of privacy in metal containers was assessed as neutral (M = 3, IQR = 1.5).

A summary of employee' responses to the study questions is shown in Figure 22. Each of the pictures below graphically shows the percentage of individual degrees of answers for the question stated in the title for the arrivals and departures test centers.

5.4. Survey Validation

The perception of comfort and privacy in testing centers varies across the two user groups. The variations in the perceptions of the level of comfort and privacy between the visitors' and the employees' groups were assessed by a questionnaire. The visitors' results for the arrivals test center indicate neutral first impressions of the center and a relatively highly positive evaluation of the first impression of the departure test center. The visitors' satisfaction with the level of comfort in glass containers in both test centers is neutral, unlike the relatively low level of comfort in metal containers. The visitors' satisfaction with the level of privacy in glass and metal containers is low for both test centers. Different weather conditions do not affect the level of comfort in the glass container. The employees perceived the level of comfort in the arrivals test centers as neutral, and the level of privacy as very dissatisfactory. The employees' results for the level of comfort and privacy of glass containers in the departure test center are neutral, and they are bad for metal containers. On average, the visitors' and employees' groups are satisfied with the level of comfort. There is a greater dissatisfaction with the level of privacy for both groups.

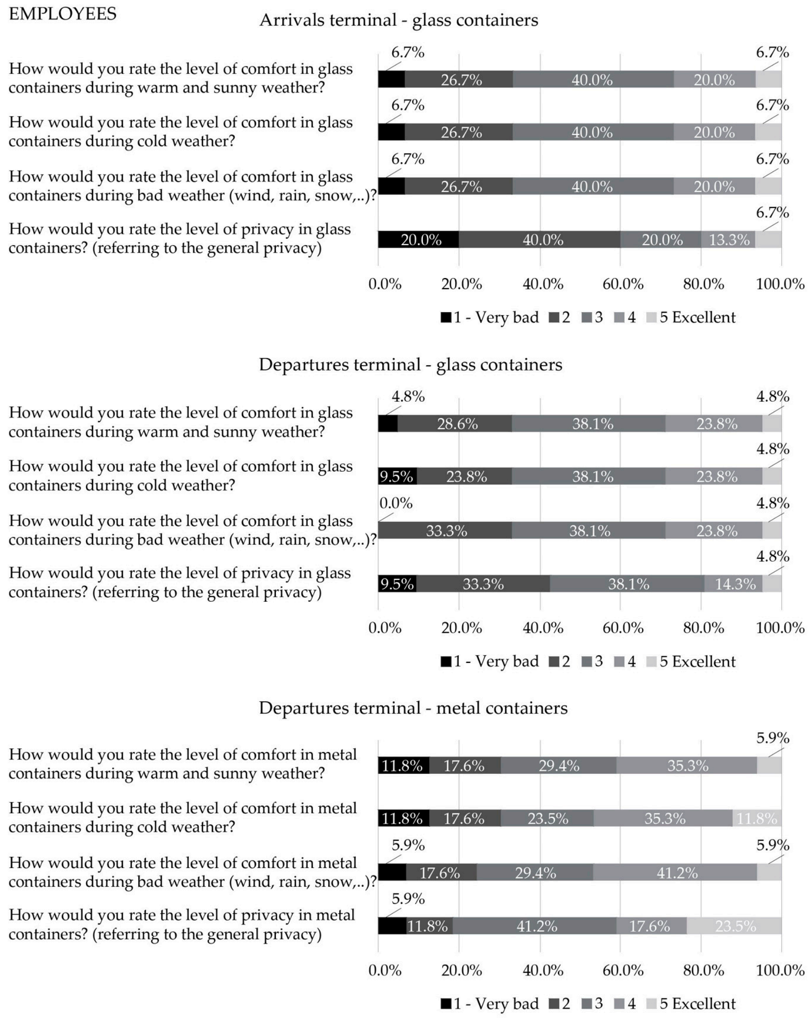


Figure 22. The responses of employees to the study questions.

6. Discussion

Based on the detailed analysis, comparison, and evaluation of the two real-world sites, and the results of the subjective methods employed, this paper now discusses the hypothesis defined in terms of three main problem statements.

6.1. Statement 1: The COVID-19 Crisis Indirectly Influenced the Creation of Temporary Modular Buildings with Glass Envelopes

The pandemic had an indirect effect on the creation of new spaces that had to meet the prescribed technical requirements in a very short time, and which were easy to assemble and dismantle within diverse existing contexts.

6.1.1. Functionality and Quality of Materials

The modular buildings have been operating for more than three years after their construction. Something that was initially considered a temporary solution, which was only supposed to exist for a few months, has lasted until today. This means that the architecture itself, which has stood for longer than the predicted time interval, has withstood the greatest test of its functionality and quality over time.

6.1.2. Durability of Construction

A modular unit is a prefabricated structure, which is produced in plants and then delivered to the required locations. It should be noted that they have very high durability, because, in three years, there was not a single mistake or technical accident in the containers that would expose their poor quality. The structure proved to be stable in different conditions, although it must be emphasized that it is a simple structural system on which no loads that were greater than those planned were ever placed, because it was always a matter of placing the containers on the ground. The only occasional additional load was snow, but it did not stay long due to the higher temperature of the envelope, due to the heating of the interior space compared to the exterior one.

6.1.3. Durability of the Glass Envelope

The envelope is the second segment that is an integral part of prefab containers. The reason why this segment is separated from the structure is that some containers were exposed to atmospheric conditions with large amounts of rainfall for years and remained safe, not leaking water or air into the space. The joints are solved to a high quality and have proven their functionality in terms of simplicity. One negative that stood out was the poor insulation of the space and the high energy consumption when achieving acceptable working conditions inside the container, but this constitutes a constant violation, not something that worsened over time.

6.1.4. Quality of Installations

In contrast to the construction and the envelope, larger violations over time could be observed with the installations. This is to be expected, because such types of installations are installed depending on the time intervals of usage and are not guaranteed; they are often subject to problems after longer periods of use. The electrical installations were almost always functional, except during heavy rain when the external connection cabinets would become soaked in drainage water that passed through the site right at the location of its installation. This problem did not occur until the first power outage. The HVAC system proved to be somewhat better than the electrical installations, in that it never stopped working; however, this is why it proved to be insufficient in ensuring ideal conditions inside the space. The WLAN installation presented the biggest problems in the test center. Connection drops occurred almost daily after certain system upgrades, and it proved to be unreliable for use as a stand-alone unit in the space.

6.1.5. Quality of Promotional Materials

Promotional materials are among the most short-lived and cheapest materials within the modular building itself. They comprise posters, stickers on envelopes, umbrellas, and leaflets. All materials derived from paper were single-use consumables. The posters were changed depending on changes in the testing rules, which were frequent, so it was not possible to evaluate their durability. The stickers placed on the floor as markings for safe movement, stopping, and mandatory distance keeping (visual signaling, e.g., light, color) have proven not only their quality, but also that they are easy to set up and easy to replace if necessary. The stickers that were used on the glass facades proved to be very durable and of high quality and did not change noticeably over time.

6.2. Statement 2: The Modular Envelope Is Adaptable to the Existing Context

The envelope has proven that it is adaptable to different contexts in the different locations where it was implemented.

6.2.1. Sustainability in Daily Adaptation, Flexibility, and Reorganization

The modular construction proved to be an ideal basis for repurposing and frequently changing the areas and uses of space. This principle allowed the modular buildings to adapt to new situations, sometimes every day, most of which were highly diametrical and required a quick and efficient approach and change of plan. Over time, the true value of this opportunity has been shown in the sense that, for years, this space has functioned without any additional investments. Instead, the existing spatial partitions, furniture, and envelopes have been rotated depending on the emergence of new needs. This has had a positive effect on the function of the modular building, as it contributed to large savings in relation to daily changes; at the same time, this speaks of the sustainability of such principles. In other words, the rotation of already existing elements in space signifies their continuous recycling and the reduction in waste accumulation.

At the end of the analysis and the three-year operation of the modular building, the question arises as to what could have been done differently in terms of sustainability and additional energy savings. The answer can be found in an interview with the main program manager, who briefly explains the difference between the categorization of crisis management and classic project management; in this case, people's safety and health, the speed of data delivery, and the most accurate results had to be considered. Such an approach did not leave time or space for the creation of sustainable sources of electricity or some other, more energy-efficient approaches to the program; this conflicted with the safety rules within the airport context, which had pre-defined installations on its plot and where it was not permitted to organize an independent energy system.

6.2.2. The Future and Possible Iterations of the Existing Structure

This type of temporary, modular, glass envelope was conceived as a solution to the emerging crisis. After three years, it is still active in fulfilling its original role, which proves that it was a good choice for the given situation. The realization that this type of envelope works well in various conditions, that its assembly is quick and easy, and that it is financially sustainable raises many new questions related to the use of these same elements for various new emergencies and new purposes. One of the possibilities is to use modular elements to solve the refugee crisis and to provide space for those in need, and time will show in which situations such constructions can be used.

6.3. Statement 3: The Envelope Meets the Needs of the Users

The results of the analysis of users of temporary COVID-19 test centers indicate that the envelope generally meets all needs, depending on individual aspects to different extents.

On average, the visitors' and employees' groups are satisfied with the level of comfort but dissatisfied with the level of privacy. There is therefore a need to recognize the effect of glass envelopes on users' levels of privacy in temporary buildings for future projects. The differences between the groups can be explained by the duration of their stay within each space. The employees are more objective in their perceptions, as the test center is a permanent place of work for them, while the visitors' perceptions constitute a response to their short visiting period. Additionally, the employees' assessments would have been influenced by their experiences in the test centers all through the year. The physiological and psychological mental states of the visitors, on the other hand, might also have contributed to their perception of the indoor environment.

The findings of this preliminary research provide useful information about the impact of various factors affecting the comfort and privacy of users in temporary modular buildings. Buildings, even temporary ones, should be designed in such a way that users' comfort and privacy are assured.

7. Conclusions

Although the study was conducted within the context of Brussels Airport, the results shed light on contextual factors that contribute to optimal indoor conditions for users in temporary modular buildings. Understanding user and building characteristics may help in providing more comfortable temporary buildings. There is no prior research on this specific topic, so the findings represent one step toward a better user experience and the improvement of indoor well-being in temporary modular buildings. According to the analyses, comparison, and discussions above, the following conclusions were reached:

(1) The COVID-19 crisis indirectly influenced the creation of temporary modular buildings with glass envelopes.

- The potential of modular buildings to address the rapid need for temporary healthcare infrastructure was proven;
- New possibilities were raised regarding how temporary modular spaces should look and how they should be perceived and used;
- The extensive use of glass creates new design possibilities characterized by substantial aesthetic values resulting from the transparency of glass.

(2) The modular envelope is adaptable to the existing context.

- The principle of modularity was used during planning, design and construction, and flexible use was demonstrated over time;
- This type of envelope works well in various conditions;
- Repurposing and frequently changing the areas and uses of space were undertaken;
- The building's adaptability to existing environments and to new situations was proven;
- These same elements could be used during new emergencies and for new purposes.

(3) The envelope meets the needs of the users.

- Regardless of their size or function, whether newly constructed or reassembled, temporary building projects can be structured to have a positive impact on people's well-being;
- Different built environments influence the users' level of comfort and privacy within the space;
- The glass facade impacts the level of comfort and the privacy of users;
- Users are satisfied with the level of comfort;
- There is a greater dissatisfaction with the level of privacy;
- Parameters such as adaptability, the user's experience, and the duration of the stay within the space also affect the acceptance levels of comfort and privacy.

Despite the importance of these findings, the study has some limitations that should be addressed in future research. The data used in this study were obtained from surveys by the users of two testing centers, so the factors only relate to the building projects. The results are also highly reliant on the local situation. The findings should be applied to other sites with appropriate alterations. Given the diversity of built environments, it is difficult to prescribe a comprehensive set of features that are effective across all settings.

The impact of time constraints for the questionnaire negatively impacted the study. To be able to generalize the collected data, a larger sample size is needed. Moreover, findings in terms of study responses to the crisis may vary from country to country based on economic conditions, the system of healthcare assistance, and the culture. Moreover, many psychological difficulties experienced by users change over time, meaning that the considerations for the future well-being of users are difficult to assess.

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