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A Framework of Design Criteria for Elderly Facilities Using Maslow's Hierarchy of Needs

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ABSTRACT

The increase in population ageing worldwide is giving rise to the design of age-friendly cities and facilities. Recognizing elderly needs is essential to promote an active life that enables continued participation in the society. However, there is no precedent that justifies the choices in the design of spaces for the elderly, so this study proposes an evaluative model of physical design that satisfies and fulfills the needs of the elderly. The Design Pyramid is based on the Theory of Maslow's Hierarchy of Needs linking the needs of the elderly with architectural attributes. The application of this model allows evaluating the spatial design and its elements and exploring improvements to promote the well-being of the elderly.

Keywords: *architecture, Maslow's hierarchy of needs, design, elderly, well-being*

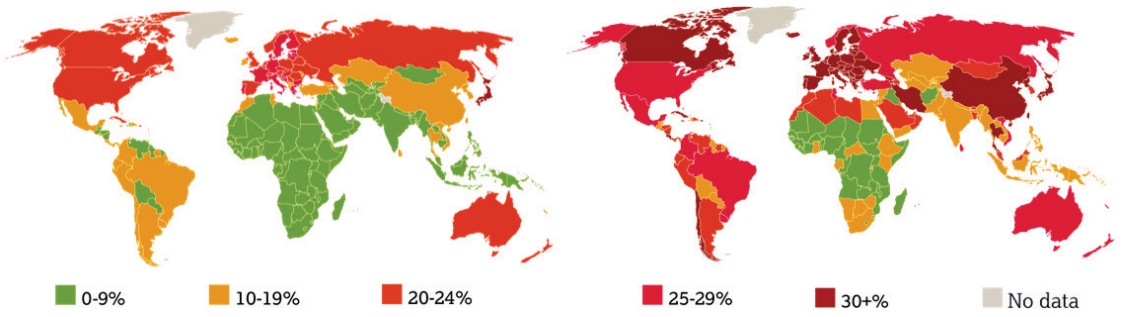


Figure 1:
Proportion of population aged 60 or over in 2015 and 2050 (Source: UNDESA Population Division, World population prospects: 2015 revision, DVD Edition, 2015. Retrieved from Global AgeWatch Index Team, 2015, p. 6).

INTRODUCTION

The population situation around the world emphasizes the global need to provide society with age-friendly cities and environments. Globally, the population of older people is estimated to be 2,092 million by 2050. The proportion of this age group will double over the course of half a century (World Health Organization [WHO], 2014) with ageing and urbanization being the two trends that characterize this period. Many studies around the world show that the ageing population is becoming the majority group in the city (US National Institute of Aging & WHO, 2011; WHO, 2015; United Nations Population Fund [UNFPA] 2017; Huenchuan, 2018). As the city grows, its residents who are 60 years old and older are increasing, with the tendency for this population to continue living in its urban centers due to familiarity with the area and proximity to the services that they are accustomed to. For this reason, mobility and accessibility are the determining factors in choosing a place to live for the elderly, since the physical environment affects their quality of life and their future.

When distinguishing the older adult as the new and future user of urban centers, it is important to update the conventional definition established according to the chronological age of 60 years old or more (WHO, 2015). Currently, it includes aspects of psychological (experiences and circumstances faced during their lives), biological (natural changes) and social (interpersonal relationships) nature. Based on these conditions, professionals from different fields agree that designing areas to socialize, to remember and to stay active promotes positive experiences and empowers the elderly through the activities. Therefore, facilities for elderly are important buildings and landscapes that provide the elderly with opportunities and spaces to socialize and be active through different activities in their daily lives.

However, WHO (2015) notes that many elderly living in urban centers are provided with elderly facilities that were not built with their needs in mind; which limits their mobility and ability to participate in social and active lives. Hence, it is necessary to improve the elderly facilities in the urban centers to fulfill their needs for quality and active living. Unfortunately, there is no existing criteria that can be readily used to evaluate whether the existing elderly facilities satisfy the activity, social and mobility needs of the elderly.

Therefore, this study seeks to establish criteria that can be used to evaluate the existing elderly facilities and to provide design guidelines for the future development. This set of criteria would emphasize the link between the needs of the elderly and the design of the physical components in the building and landscape.

As a theoretical principle, Maslow's Hierarchy of Human Needs (Maslow, 1954) is chosen as a baseline framework on how human beings prioritize their needs. This helps establish the hierarchy of needs for the elderly to translate into the physical elements that fulfill the needs. The needs in each level of the Maslow pyramid will be fulfilled through the Kano Attributes model of satisfaction that helps establish the hierarchy of physical elements corresponding to the needs from the Maslow's Pyramid—namely the Design Pyramid. The Design Pyramid will provide the evaluative model to assess existing physical design elements provided in the elderly facilities. The conceptual derivation of the Design Pyramid is displayed in Figure 2.

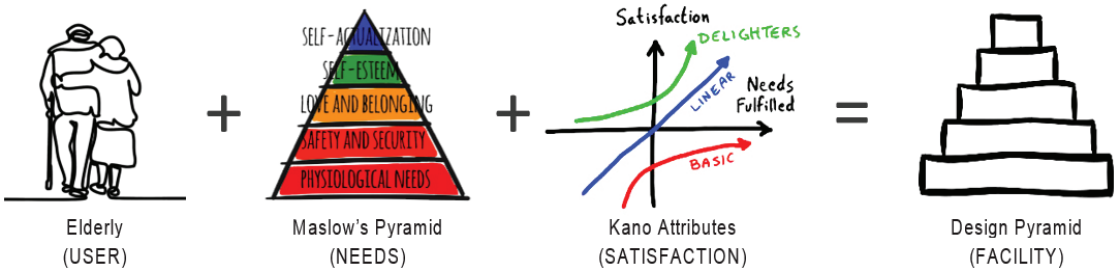


Figure 2:
Theoretical framework for the design pyramid (Source: Own production)

The Design Pyramid is validated by its application to evaluate an existing public elderly facility in the center of Lima, the capital of Peru. The evaluation results validated that the Design Pyramid can be used to assess the existing elderly facility. The evaluation results display the quality and sufficiency of the physical design characteristics that respond to the elderly needs, and finally, provide criteria for immediate improvement as well as for future development.

FROM PSYCHOLOGY TO ARCHITECTURE

Maslow's Hierarchy of Human Needs

First, we will address the needs according to their level of importance and motivation in the psychology literature. It is important to establish a framework that justifies the needs of the elderly in order to identify the relationship in the design of Elderly Facilities (buildings) according to their priorities. The Hierarchy of Human Needs Theory, Maslow (1943) is a model that explains that people are motivated by unmet needs. It states that as basic needs are met, humans develop greater needs and desires. This theory allows us to understand how people prioritize their needs and, therefore, how they seek to meet them. Human behavior obeys these needs, and determines decisions to act.

Maslow develops a 5-level pyramid model: the first four are known as Deficit Needs and the upper level as Growth Needs or Self-Realization. The aim is to satisfy the higher needs, which motivates the behavior; this means that the higher needs will be sought only when the basic needs have been satisfied. These needs are classified in:

1. **Physiological Needs.** They are basic in order to keep the body stable and survive. They refer to breathing, food, water, warmth, rest, eliminating body wastes and avoiding pain.

2. **Security and Protection (Safety) Needs.** Is a condition, to feel protected and safe. They are needs of physical and health security, security of resources (e.g. home, work) and housing (protection).

3. **Social (Belonging/Love) Needs.** Related to the social nature of the human being, relationships: friendship, partner, colleagues, family and social acceptance.

4. **Esteem (Recognition) Needs.** Has two types: High for one's own value (self-respect) and; Low, desire of reputation from others. Together these are called Self-Esteem, an individual's overall subjective emotional evaluation of his/her worth.

5. **Self-Realisation Needs.** The highest fulfillment is what motivates life through the development of activities.

The theory concludes that only unsatisfied needs influence human behavior, while satisfied needs do not produce action. Furthermore, that the Physiological or Basic Needs are given at birth, while the others develop as one grows (ages). And lastly, the Highest Needs do not arise if the Basic ones are not satisfied; so the Basic Needs will always influence the higher ones. This theory has been used in other fields of study such as psychology, sociology and engineering sciences (Allen, Muñoz, & Ortúzar, 2019; Asad Poor Zavei & Mohd Jusan, 2012; Salado & Nilchiani, 2013; Vanus, Koziorek, & Hercik, 2013). Thus, it is a valid tool to establish the needs of older adults.

Architectural Attributes

In architecture, a coherent design is conceived to communicate, motivate and connect with the user. For an elderly facility, it is essential to understand the qualities and limitations of older people. The understanding help to better define the needs they face (physical or mental) in order to provide a solution that gives them some degree of satisfaction in their daily lives. Therefore, the needs will be transferred to the field of architectural design. For each level, a condition will be posed to defines an attribute (characteristic) of the spatial design. The proposals for the different attributes are detailed below:

1. **Location - Physiological Condition.** For the elderly, it relates to the condition of the immediate space that allows the maintenance of a stable state. In the design, the base of a building begins with the access; this means the physical connections (roads, paths) to get there. The location is the architectural nexus, it generates the link with the community and the amenities of the city (Nettleton, Buse, & Martin, 2018).

2. **Environment – Safety Condition.** For the elderly, living in a cohesive environment reinforces a sense of security and control. In the design, the building is seen as a refuge in relation to its surroundings. Therefore, the environment defines the utilitarian characteristics of the facade.

3. **Outdoor Space - Social Condition.** For the elderly, establishing social relationships grants mental well-being. In design, it is providing the areas to promote activity. Therefore, the configuration of the volume (building) should facilitate this relationship from the outside to the inside.

4. **Social Space - Esteem Condition.** For the elderly, it means oneself, their independence to carry out activities. In design, it is providing the facilities to move around and explore areas for socializing. Therefore, the spatial sequence must be continuous to and in social spaces.

5. **Sensory Pleasure - Self-Realization Condition.** For the elderly, it is an achievement, subordinated to their personal experiences. In design, the connection is achieved by stimulating the senses. However, the response varies, as spatial perception is subjective. Moreover, it includes all the attributes nearby, so it is not possible to establish a single basis that causes the same response, but it is possible to highlight the variable elements that add spatial value.

This approach categorized the types of attributes based on the level of priority of the elderly. The relationship to a new structure in architecture goes from the global aspect of the building to the particularities that it might involve. However, this structure does not necessarily reflect the degree of satisfaction required by the elderly. For this reason, it is adequate to search for a theory that allows for the inclusion of a satisfaction assessment in the list of design attributes.

The Kano Model

To address the attributes of satisfaction, studies in marketing refer to the degree of satisfaction that a product or service can generate in its user. In architectural design, every intervention generates a spatial condition determined by the characteristics of the building itself. Therefore, the types of attributes can also be defined according to the degree of satisfaction they provide based on their function or service. This implies the spatial quality. Consequently, it is relevant to identify the levels of satisfaction (quality) and relate them to the design attributes of Elderly Facilities. The theory of Attractive Quality, known as the Kano Model (Allen, Muñoz, & Ortúzar, 2019; Roldán, 2017), provides the framework for organizing the attributes, which are detailed in 4 types:

1. **Basic or Expected Quality.** These are the attributes that meet the minimum requirements, so they do not serve to increase satisfaction, but their absence would produce the opposite reaction (dissatisfaction). In terms of design, the basic relationship is given by the urban context to provide access and support safety.

2. **Desired or Performance Quality.** These are essential attributes according to the user. They provide satisfaction or dissatisfaction, because their efficiency (regardless of their current level) can improve or diminish the result. In design, the relationship is given to the attributes of space itself, configuration and composition.

3. **Motivating or Exciting Quality.** These are attributes that surprise, provide an unexpected contribution but their absence does not generate

dissatisfaction. In design, it is related to details, to specific elements.

4. **Neutral or Indifferent Quality.** They are attributes that have no influence, because they do not have a direct relationship with the user. In the design, it could be considered the time of use; most buildings, when offering a service, establish an operating schedule and, unless it is modified, does not generate impact.

For this research, only some attributes may be considered, since their valuation will depend on the city context and this may vary over time. This means that some attributes would go from being excitement attributes to being basic attributes; for example, at the beginning, air conditioning or heating were supplementary elements that added satisfaction because they were not offered in all places; but over time they became basic attributes, as they were expected to be found everywhere. Also, some attributes will depend on the available technologies and levels of demand, according to the preferences of the user (elderly population), so it can be perceived differently depending on the levels of expectation and experience.

The Design Model

Based on Maslow's Hierarchy of Human Needs and the adaptation of Kano's model, a classification is proposed for the design attributes for elderly facilities: The Design Pyramid. Based on the previous analysis, the design attributes are established considering their spatial hierarchy and formulates a relationship by levels. The attributes should follow an order of preference: (i) Functional Attributes, (ii) Dependable Attributes and, (iii) Hedonic Attributes.

i. **Functional Attributes - Environment.** These attributes are related to availability and mobility, which provide the first support and access to the design: the basic standard. In relation with the design - planning, it is the analysis of the urban environment: (1) Location refers to accessibility for the elderly and proximity to urban resources (2) Environment, in relation with the Form, the exterior appearance is the visual relationship that allows the recognition of the building in its physical surroundings.

ii. **Dependable Attributes - Service** It refers to the perception of being secure and protected; where the space supplies a sense of safety. In design, the attributes are related to the service of the facility and the built space, where the elderly develop their social skills (interpersonal relationships) and reinforce their independence. The areas of study for the elderly are the (3) Outdoor Spaces and the (4) Social Space.

iii. **Hedonic Attributes – Custom** These attributes refer to accessory aspects that the elderly will perceive positively, therefore bringing an additional (sensory) Pleasure (5). This level implies the totality of all the design elements, to create sensory pleasure in the environment, to bring comfort into the design.

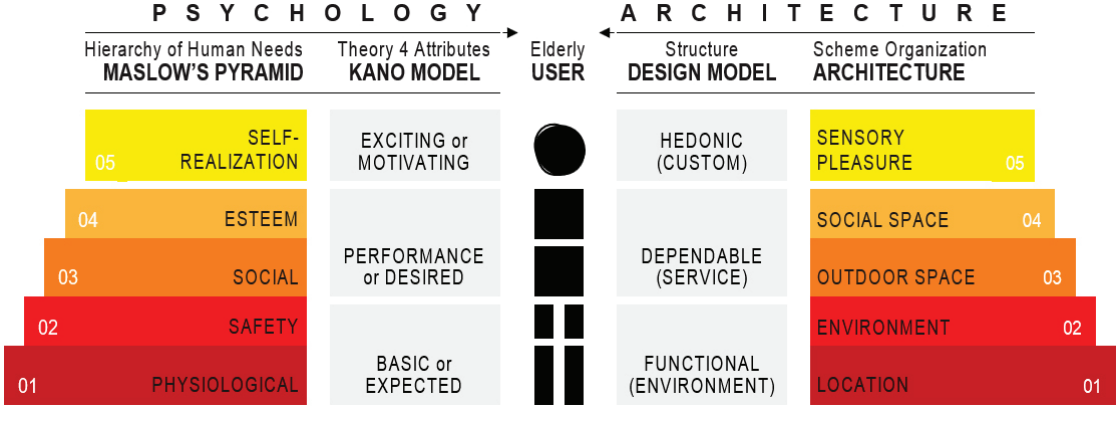


Figure 3:
Theoretical sequence from Psychology to Architecture
(Source: Own production, based on Maslow's Hierarchy of Needs (1943) and Kano Model (1984)).

The structure of the attributes is established under the gradual concept of needs and, in turn, are transformed under the spatial scale concept in Architecture in practical terms. The Functional Attributes are established at an urban scale as a part of the composition of the city and its organization within the existing systems. After fulfilling the basic requirements, the structure continue towards the Dependable Attributes, established at a human scale. In this sense, the perception has a role, because the definition of the spaces is based on the dimensions of the human body, taking into account whom it serves and who will inhabit it; which for this exercise is the older adult. Finally, the Interior Design of the space given by the Hedonic Attributes, which are part of a process of spatial experience.

For this study the attributes are classified according to their functional-spatial scale in the design, which is consistent with Maslow's Theory, and emphasizes the preferences of the older adult. Under this structure, the attributes are distinguished into components for each level or scale: Functional Attributes in (1) Location and (2) Environment; Dependable Attributes in (3) Outer Space and (4) Social Space; and Hedonic Attributes in (5) Sensory Pleasure. Components are expected to meet a minimum design standard to achieve satisfaction. In other words, if a building for the elderly is poorly located (e.g., difficult to access) it becomes a relevant attribute for not meeting the minimum standard. If it meets the standard, but the design of the building (e.g. the openings) do not relate to the exterior then space will become critical, so the Dependable Attributes become more important. If both are met satisfactorily, then the Hedonic Attributes, the personal experience of the older adult, will manifest. In this way, the framework for the conditions of analysis is established.

EVALUATION METHOD

This research examines the spatial configuration properties of buildings for the elderly to prioritize design components. Three hierarchical levels of analysis were constructed.

Functional Attributes - Urban Scale is recognized as the first in line to establish contact with the building as a part of the city network. The first level also defines the spatial configuration of the building-environment in relation to accessibility for the elderly. The types of access are classified as follows:

1. In relation to **Location**, ease of access means:
   - The rapid or short movement of the elderly.
   - The connection to public transport networks.
   - The proximity of resources or amenities programs.

   In spatial terms, movement, connection and proximity are established in relation to the distance to be covered by the older adult. The first condition comes from the limitations of movement of the user himself, the older adult. Therefore, the analysis of displacement is established based on the medical recommendation of physical activity (daily walks) of 400m/10min intervals. This is the maximum recommended distance before the older body becomes tired. This allows for a limited radius of movement for mapping access points and area of influence. Second, the connection is established by the distance to be covered between the elderly facility and the access points of the urban network. The analysis of the satellite and radio plan are the basis for the mapping of Road Access [RA] and Pedestrian Access [PA]; these maps show the hierarchy of the streets. Thirdly, proximity is established in relation to the distance between the elderly facility and the urban services that assist the elderly. The analysis of complementary services is established on the basis of full and empty plan, and the condition of the physical space. The mapping identifies the Urban Nodes [UN] related to services for the elderly, such as medical stays, commercial and educational institutions, the built areas. But, on the other hand, complementary elements are also identified in the public space such as green areas, urban furniture and spiritual areas. These nodes are defined as Restorative Nodes [RN], as they help to rest the body at intervals. Finally, the overlap of the layers will define whether the access to the building (the street) meets the conditions of ease of access, or needs to be improved.

2. In relation to the **Form** of access, the ease of access is defined by its visual condition based on its relationship with the physical environment, it is defined in two moments:
   - When approaching
   - The Entrance

The first moment is defined by the path and arrival at the building. Ching (2012) refers to it as the distance view and classifies it as: Frontal, the path is clear and direct; Oblique, the path can be redirected to delay and prolong the sequence, and Spiral, the path prolongs the sequence and move around its perimeter. The last two are also known as indirect and are not the best option for the older adult, as they tax their physical condition by prolonging the journey and could confuse them. The second moment, Ching (2012) defines it as From Outside to Inside, is the perception of access and formally they are categorize in: Flush (maintains the continuity of the surface), Projected (forms a transitional space) and Recessed (receives a portion of the exterior space into the building). For the elderly, a projected entrance is visually more recognizable from a distance, as it stands out and announces its function to the outside.

The spatial configuration analysis is based on the shape around its environment, the schemes of the façade allow evaluating the perception of access from all reference points.

Dependable Attributes - Human Scale, this level relates to visual and physical contact with the building. The perception has a role; consequently, the analysis is established from the external perception towards the interior. The second level defines the configuration of the space itself, how the space is perceived in relation to its continuity. The types of spaces are classified as follows:

3. In relation to its **spatial composition**, composition is defined as the union established between two different spaces, the relationship with outdoor space. The union happens through the opening and can generate different degrees of relationships between the spaces.

   Philipe Boudon (1972) establishes three types of openings: the visual, which refers to the suppression of the limit through transparency; the physical, when between two spaces the limits are suppressed, and the transition is allowed; and the space-time involves a sequence of events, where other elements in the space guide the movement. On the other hand, the formal analysis of the Ching (2012), establishes the relationship based on the planes and their relation with the space and classifies in Enclosed, Open on One Side and Open on Both Sides.

   The analysis of the building starts as volume to disintegrate, until reaching the basic elements of relation with the exterior, from the outside the profile is the point of contact between the building and its surroundings, and its configuration articulate the interior with the exterior. The scheme analyses the transformation of the volume into two bases, the dimensional configuration and its transformation, which allow recognizing the proportion of the building and the access areas to be recognized. Then, the plane, both vertical and horizontal defines an area and establishes the visual and physical limits; its analysis is governed by the type of element (base, elevated, depressed or overhead) and the area defined by the use and its user. Finally, the space, the openings in the plane generate the visual and physical connection between the interior and the exterior (the environment), classified as open, expand and enclosure.

4. In relation to its **spatial sequence**, the design of the building is projected in relation to the service it provides and the areas established by the activities performed. The simplicity of sequences or interior paths reinforces the sense of independence and stability for the elderly. The spatial analysis is done by observing social processes during active hours. Then, collect the user sequence, from which the points are set; here is where the nodes or active points of the social areas are established. The study uses three-dimensional representation as a means of identifying spatial priorities.

Hedonic Attributes, area established in Interior Design, this level is related to personal preferences; the perception of social space is subjective depending on each individual.

5. Sensory Pleasure, the higher level is established as a personal interpretation, where satisfaction could be achieved due to the organization of elements that are part of the design. This is where the particularities take center stage for the user, since the perception of an element can have a different meaning for each one.

   The study can only take the added elements (fixed or movable) in its composition as references that help to increase user satisfaction, but which vary according to culture, society, among other aspects.

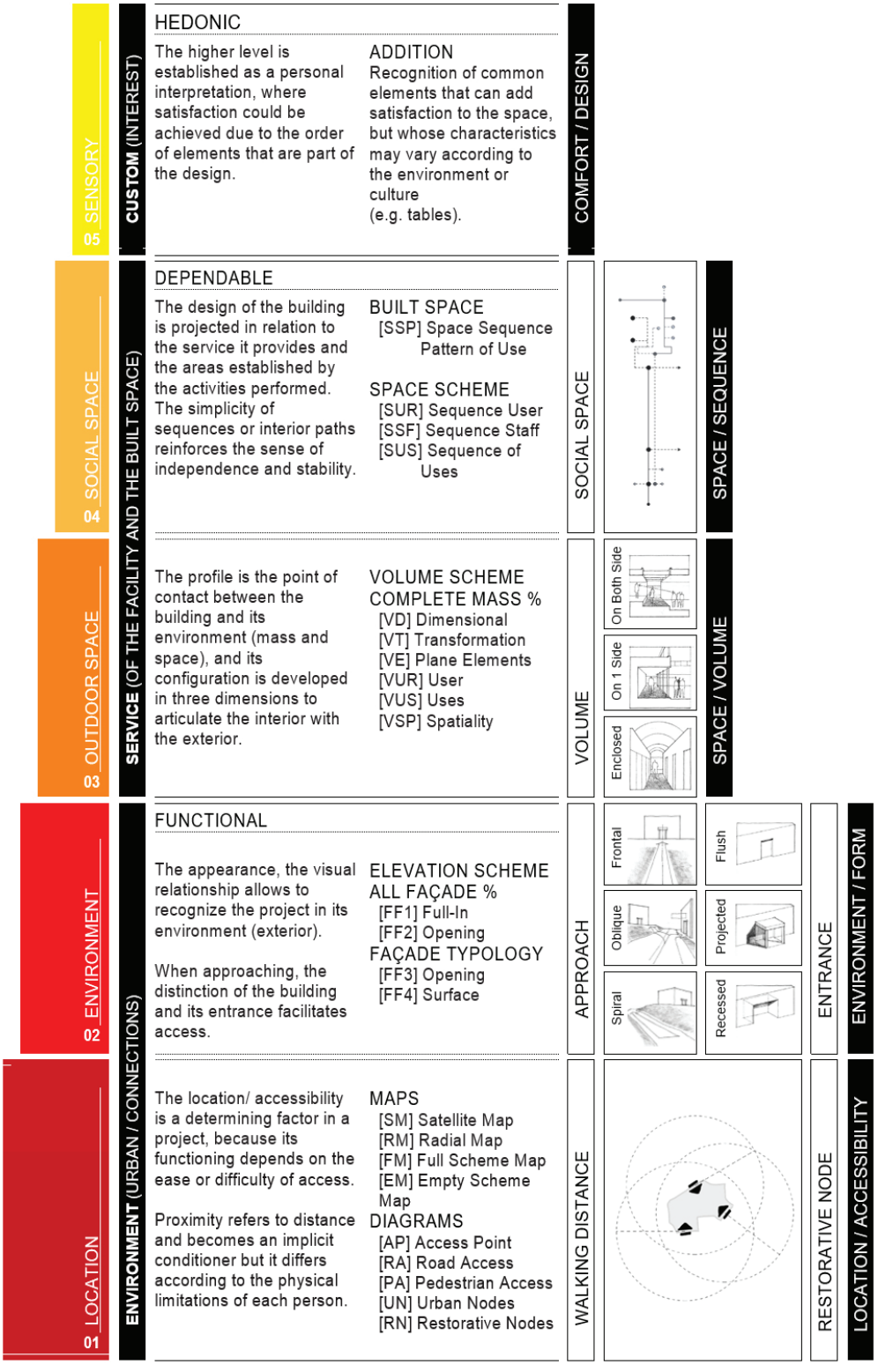


Figure 4:
Organization of analysis schemes for case studies (Source: Own production)

CASE STUDY AND SAMPLES

In the 1950s, the Peruvian population structure was basically made up of children; for every 100 people, 42 were under 15 years old, but by 2018, 27 of every 100 inhabitants were under 15 years old. In the period of half a century, the elderly population (60 and over) proportion increased from 5.7% to 10.4%. (INEI, 2018). Attention to the elderly became a topic of discussion regarding a great variety of care for the elderly. From public facilities to private, this diversity was reflected in the architectural expression of the new buildings, mostly located in the urban environment. These new urban building typologies can range from a small scale to large projects, or adapted buildings as an option to satisfy the needs of older adults.

The State, aware of this change, generated new conditions for this population and promulgated the Law on the Elderly - No. 28803 (Ley de las personas adultas mayores, 2006). Among several issues, the law determines the creation of services for the elderly, aimed at promoting their autonomy and independence, called the Comprehensive Adult Center (CIAM – Centro Integral del Adulto Mayor). For this reason, each local government started to create new conditions for developing and updating urban plans in the cities, in order to develop public projects for the benefit of the community. In the Lima Region, the district of San Borja was one of the first places where these new policies were implemented. The district municipality was in charge of the construction of the new projects: Tambo I (2011) and Tambo II (2012). (Figure 5)

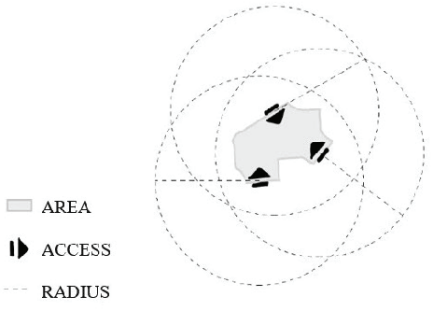
Figure 5:
San Borja District. Location of the most important services (Source: Edit from Google Earth 2019).

Tambo I was chosen for the case study, because it was the first model to be executed. Built within the facilities of the Limatambo sports center, it serves the Limatambo Residential Complex (a national housing project developed by the state in 1980). The municipality took measures to integrate it into the complex due to the increase in elderly residents in that particular sector.

TAMBO I
the building is located inside the Limatambo Sports Complex, shares the area with other social service programs, but works independently.

Figure 6:
Location of Tambo I in Limatambo Sports Complex (Source: Edit from Google Earth 2019).

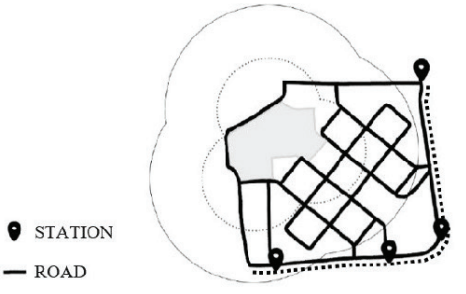
TAMBO I: Location & Accessibility



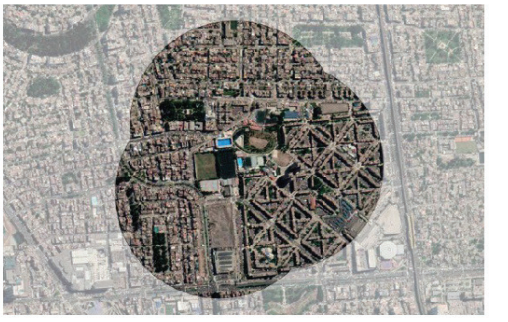
ACCESS POINTS [AP]
Radius of influence based on entry/exit points

The location analysis is established by the access point(s) to the building, from which the radius of influence (determined by the user) to achieve access is plotted. The elderly becomes a parameter to consider, the limited physical condition (changes in gait) is a restriction for the radius. Access is limited to 400m as the maximum distance allowed for walking from or to the entrance of the building without the need for a stop. In addition, depending on the scale of the project, an analysis of the interior system can be continued in order to establish the priority paths.

Since the building is included in another complex, it is necessary to add several radii depending on the number of accesses of the larger complex to determine the actual area of influence. In this case, the complex has three access to take as reference points (see diagram AP). Placing the project in its physical environment gives us a tool to understand its relationship with the city, the plot and network to which it belongs.

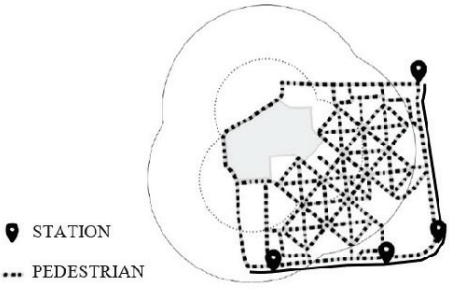


ROAD ACCESS [RA]
Vehicle roads in relation to the station stops.



SATELLITE MAP [SM]
3D terrain analytical base (volume)

[RA] The scheme is made according to the stops or stations that connect the complex at a district level. The flux and access by public transport is located at the edge of the south side corner, from there, the branches are to lower traffic roads for private vehicles. This diagram shows the first points for pedestrian access.

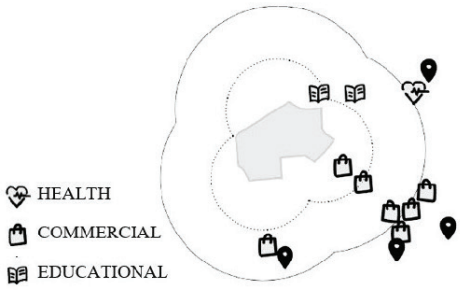


PEDESTRIAN ACCESS [PA]
Pedestrian roads in relation to the station stops.

RADIAL MAP [RM]
2D terrain analytical base (footprint)

[PA] The scheme is based on public transport stops. The sidewalks accompany the roads, but also branch off into secondary internal roads within the residential complex that allow a permeable framework of external and internal axes, which facilitate the mobility of pedestrians.

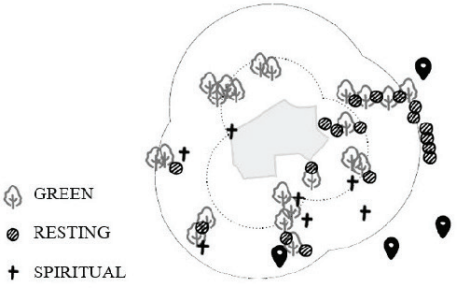
The reason for any activity of a person is their needs. Understanding this principle establishes the importance of urban amenities and their influence on the use of the street.



URBAN NODES [UN]
Amenities that support the daily life of older adults, such as medical stays, business or educational institutions.

FULL SCHEME MAP [FM]
Built map showing the construct environment in relation with the radius of influence.

[UN] The scheme relates the support amenities around the Elderly Facility, which influence their daily life, with the built space. The Full-scheme map [FM], graphically explains the type of space and accessibility in the urban context, that relates to the use of it. Therefore, it allows the recognition of preferred routes based on proximity and use of services. This scheme establishes the main axes of movement for the next support factor, the restorative areas.

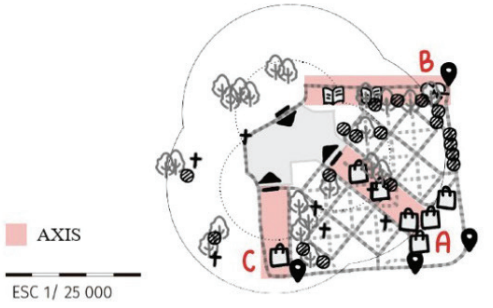


RESTORATIVE NODES [RN]
Public Areas that support the daily life of older adults, such as green areas, resting areas and spiritual areas.

EMPTY SCHEME MAP [EM]
Empty map showing the public space within the radius of influence.

[RN] The scheme is also related to support spaces for the elderly, open and public areas for both physical and mental rest. These areas are related to the Empty Scheme Map [EM], which graphically explains the type of surface and accessibility. The nodes are elements in between, it might not be the end for an activity but it allows to get closer to fulfilling it.

Figures 7:
[SM] - Satellite Map with the influence radius from the access points (Source: Edit from Google Earth 2019).
[RM] - Radial Map with the influence radius from the access points (Source: Edit from Google Maps 2019).
[AP], [RA], [PA] - Graphic diagrams of accessibility (Source: Own production).



OVERLAYING ACCESIBILITY

The urban-scale complex is visible for its user from the access points to the stations, it has three connection axes marked by urban and restorative nodes. These influence the choice of the route to follow since the older adult must take rest intervals in order to prevent mistreating their condition and physical health. The axis scheme is configured in three sectors: A is generated as a commercial corridor by the urban nodes that form it, while B acts as a green corridor, buffer at the edge of the complex. C presents a limited quantity of elements, making it the least attractive alternative, but the shortest access.

TAMBO I: Location & Accessibility

Comparative sequence of the interior roads of the complex towards the Tambo I. The measured distance must comply with the pre-established criteria of 400m or otherwise provide the restorative spaces for the use of the older adult.

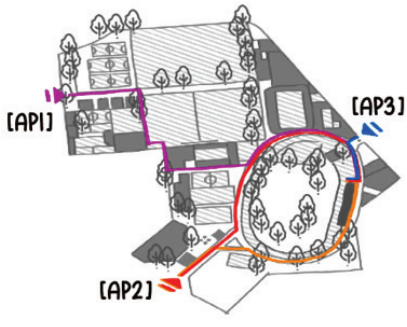
[AP1]
PRINCIPAL - EAST GATE

[AP2]
RESIDENTIAL - SOUTH GATE

[AP3]
ZONE - NORTH GATE

Figure 8 :
Interior accessibility [AP1] - Principal Gate (Vehicle Access) is the inter-district connection, the entry has a parking area and bicycle park zone; [AP2] - Residential Gate (Pedestrian and Cycling Access) is the direct connection with the residential complex, its axis borders the Huaca before reaching the facility; and [AP3] - Zone Gate (Pedestrian Access & Services) is the back connection, auxiliary access (Source: Own Production).

Figure 9:
Aerial view, Limatambo Sports Center. Re-elaborated image from photographic bases (Source: San Borja Municipality, 2019. Retrieved from http://www.msb.gob.pe/externas/DeportesV2/polideportivo-limatambo.html).



OVERLAYING ACCESIBILITY

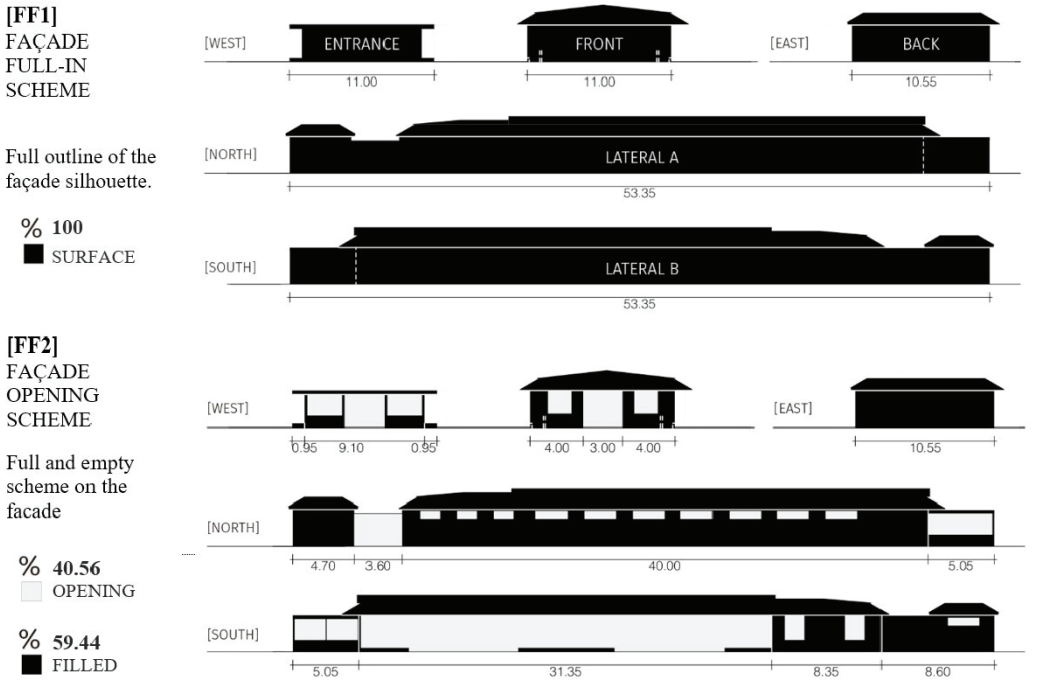
The complex has its own network of connections between its services facilities and sports fields. The interior analysis is given by the Access points of the Complex [AP1], [AP2] and [AP3], from these points the walking path is measured to the entrance of the facility (organized from the longest to the shortest route). Although distance is a factor that conditions the user, the visual relationship becomes a more relevant factor when approaching the project. The pedestrian walkway allows having an open view to the conservation zone (Huaca) which is the most attractive feature for the elderly, since they tend to sit and talk surrounding this space.

TAMBO I: ENVIRONMENT & FORM

Figure 10:
Exterior views [EE1] Pedestrian Approach, [EE2] Entrance, West Façade, [LB1] Lateral Side, South View Façade, and [LB2] Lateral Side, South View Façade. (Credits: Silvana Vasquez)

The Form and its proportions relative to the environment are a utilitarian condition that allows a good management of lighting and ventilation, but will always be conditioned by their location. Tambo I has the advantage of being located within a complex in an open green area without party walls. It was built under the influence of this space network, where the Huaca takes the leading role, so its location is closely related to the natural archaeological zone. Due to this, it has the advantage of presenting the four facades: North (Lateral A), South (Lateral B), East (Back) and West (Entrance). In addition, it has an intermediate facade Front, a rest area.

The visual analysis of the shape is based on the Full-in [FF1] and Opening [FF2] schemes of the facade. From the first, the geometric ratio 1,2,4 is obtained as the spatial dimensional relationship, while the second shows the dimension of the openings with the environment

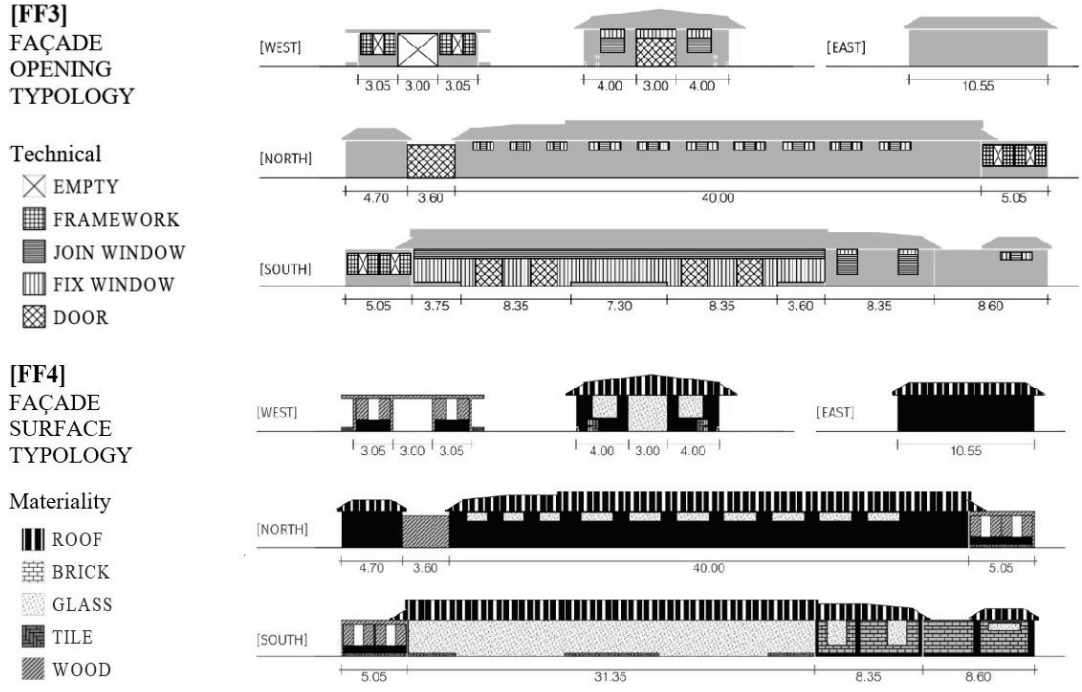


TAMBO I: ENVIRONMENT & FORM

Figure 11:
Exterior views [LB3] Lateral South Façade. [BB1] Back Side, East Façade, [LA1] Lateral Side, North View Façade, and [FF1] Front Intermediate. (Credits: Silvana Vasquez)

In the southern hemisphere, the most appropriate orientation for the openings is related to the northern facade, however, the user ends up defining the relationship with the context.

The view and natural lighting are additional factors to consider. The Opening Typology Scheme [FF3] and the Surface Typology Scheme [FF4] of the facade shows how a visual connection to natural space is prioritized, without forgetting to protect the user. The application of different openings (in size and materials) helps guarantee a controlled interior environment and at the same time provides a restorative view for the elderly.
Furthermore, most of the north facade is closed with high openings, while the south facade opens directly to the Huaca. While this relationship is not ideal, it provides indirect light that is recommended for older adults, since drastic or direct light changes can hurt your eyesight.



TAMBO I: SPACE & VOLUME

The profile is the point of contact between mass and space, the configuration occurs in two dimensions to articulate the interior with the context (exterior).

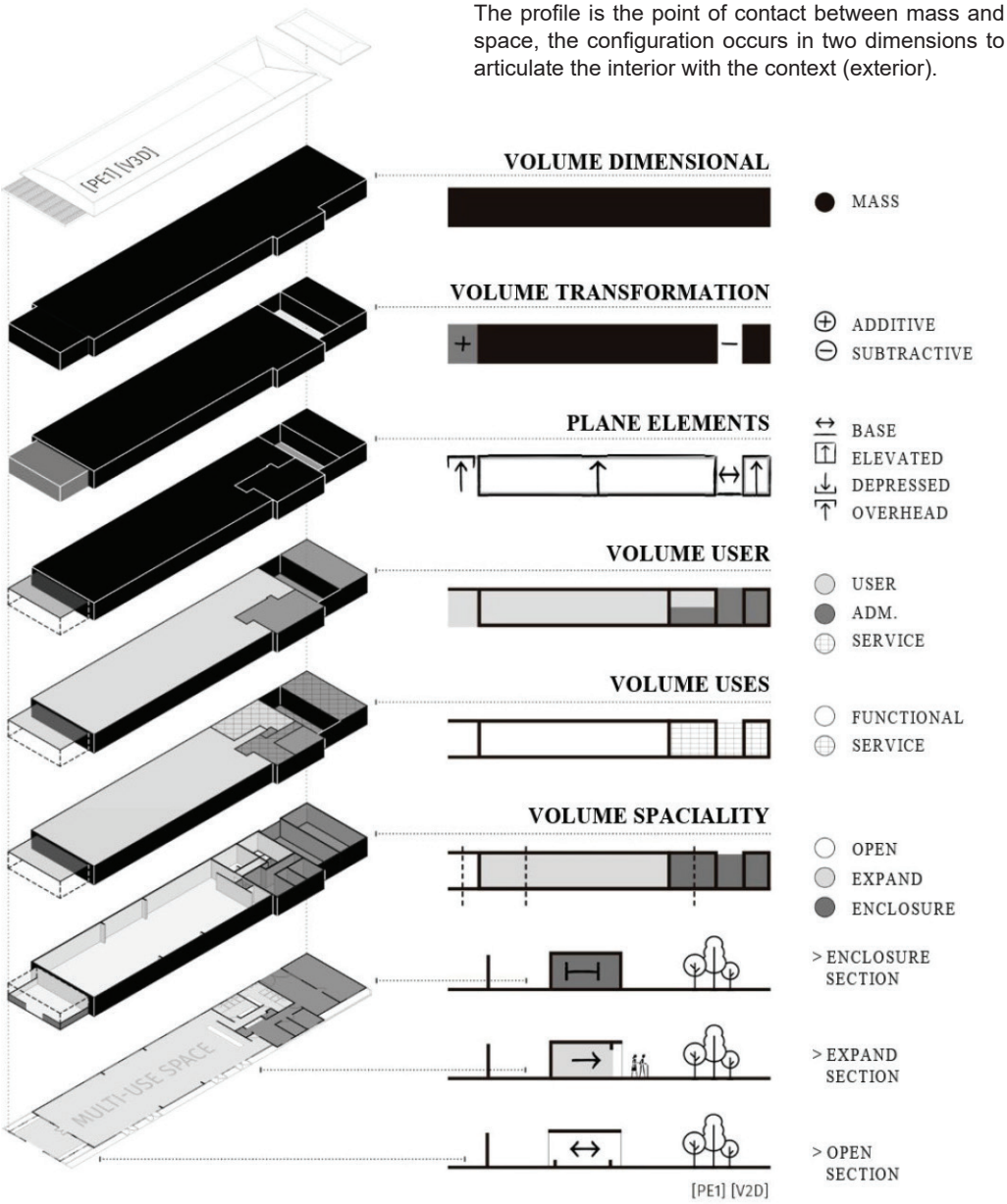
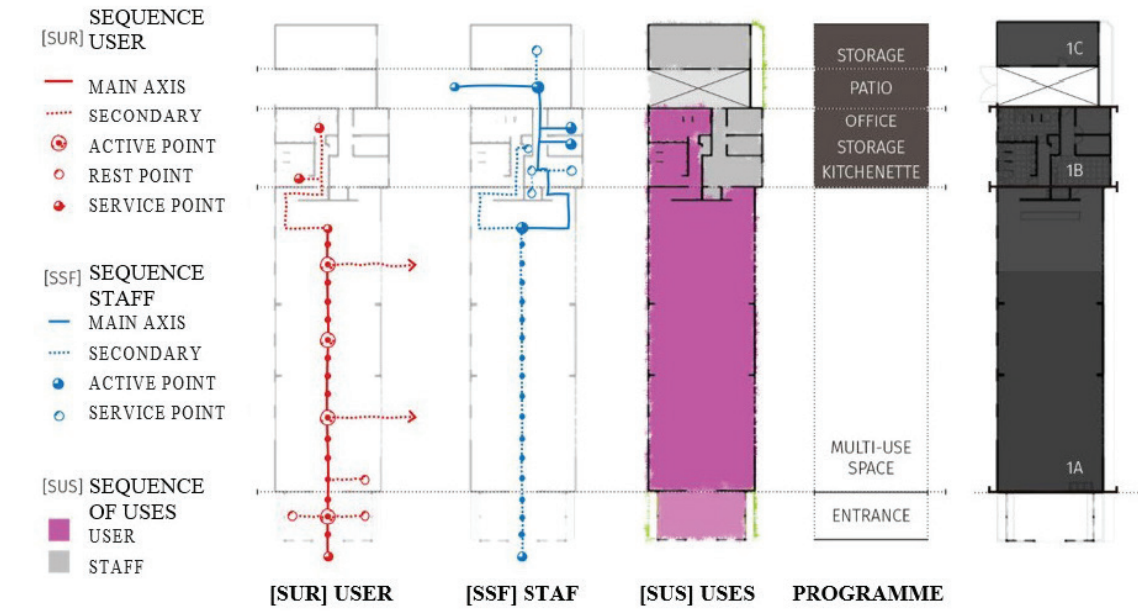
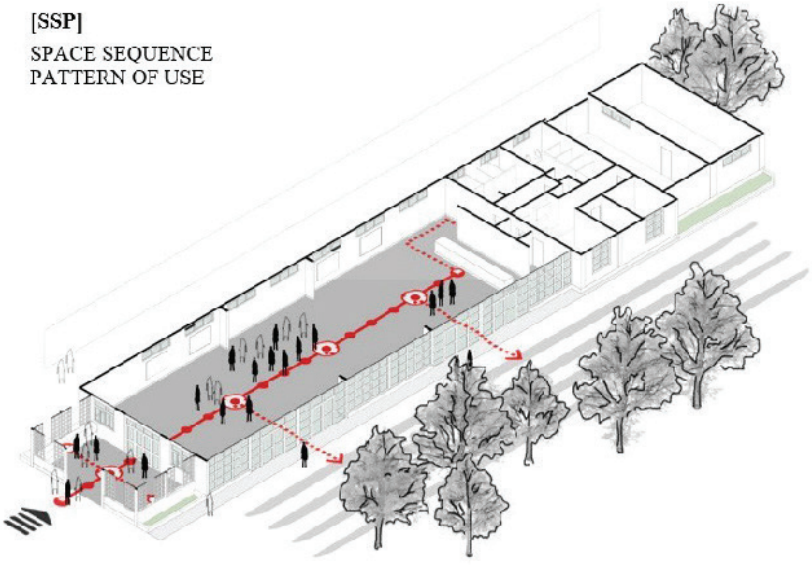


Figure 12:
[V3D] Volume Scheme, shows the transformation of the mass in a tridimensional perspective. [V2D] Plane Scheme, shows the transformation of the space as a surface (sections) in two dimensions. (Source: Own Production)

The transformation scheme provides a way to understand the organization of the individual components that characterize a building. The perception of the mass changes as one approaches. The entrance is differentiated as an adherent, permeable and elevated element, easy to recognize for the user. Also, it allows an intermission before going into the main volume. On the other hand, the linear organization is related to the context, the form that encloses the Huaca (natural area), therefore the path configuration passes through the spaces. Then, the form of circulation may vary to determine the activities and their use.

TAMBO I: SPACE & SEQUENCE





SERVICE [1B] [1C]
Support areas for Staff and services for the user. It has independent access through the patio from the side end.

SPACE IN USE [1A]
Support areas for Staff and services for the user. It has independent access through the patio from the side end.

Figure 13:
3D Interior Model of the Space Organization in relation with the environment (Source: Own Production)

People move through a sequence of spaces, the organization of it results in different forms of circulation. The analysis in the facility explores the social area (in Sector 1A), where the elderly develop most of their activities or classes at the same time. The linear condition allows using the space by sectors. Within a large space, it is "open on one side" with complete windows that provide visual and spatial continuity with the natural environment.

TAMBO I: DESIGN PYRAMID

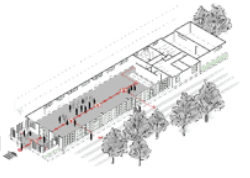
05 SENSORY — CUSTOM (INTEREST) — COMFORT / DESIGN

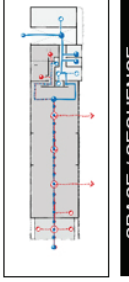
The additional elements that always remain in space are the pictures. Old black and white photographs showing the most representative areas of the district.
This provides additional excitement for older adults, for the memories it evokes in them, especially as they are residents of the district.

04 SOCIAL REALM — SERVICE (OF THE FACILITY AND THE BUILT SPACE) — SOCIAL SPACE — SPACE / SEQUENCE

The elderly develops most of their activities or classes at the same time, the linear condition allows to use the space by sectors.

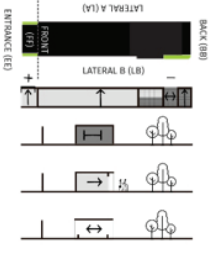
Within a large space, it is "open on one side" with complete windows that provide visual and spatial continuity with the natural environment.

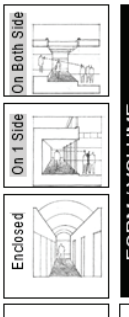




03 OUTDOOR SPACES — VOLUME — FORM / VOLUME

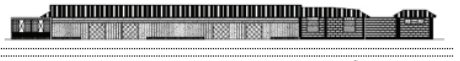
The form volume develops in one dimension (one level), with additive and subtractive spaces that provide the hierarchy for the spatial sequence.
From the volume spatiality, the view to the natural environment is prioritized.

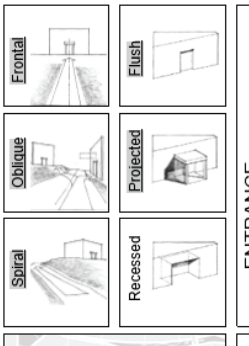




02 PHYSICAL ENVIRONMENT — ENVIRONMENT (URBAN / CONNECTIONS) — APPROACH — ENTRANCE — FORM / FACADE

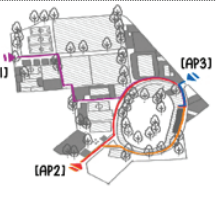
For the approach inside the complex:
AP1 and AP2 show a Spiral and longer way than AP3, an Oblique approach. However, the sequence goes around a natural environment (la Huaca) which makes it an attractive and restorative way for the elderly to get into the facility.
On the other hand, the entrance for the user is Projected to prevent any kind of confusion and to be easy to see from any access point, while the staff entrance is Flush on a side, which helps prevent any kind of confusion.

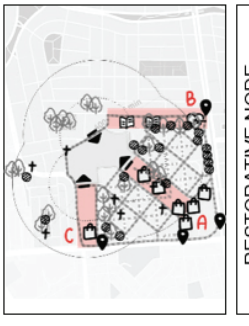




01 LOCATION ACCESIBILITY — WALKING DISTANCE — RESTORATIVE NODE — LOCATION / ACCESS

In the urban scale,
3 sectors are configured:
*A [Frontal Approach] as a commercial corridor by the urban nodes of the housing complex;
*B [Oblique Approach] as a green corridor, buffer at the edge of the complex;
*C presents a limited quantity of elements, making it the least attractive alternative, but the shortest access and the one that should be improved with more resting areas (restorative nodes) for the elderly.





CONCLUSIONS AND RECOMMENDATIONS

This study proposes a Design Pyramid, establishing the link between the needs of the elderly and the physical space where they live. It begins with the premise that the physical environment affects the quality of life of people and their future development, so there should be a psychological theory that provides information on basic needs regarding the design of spaces and how to assign their importance. Maslow's Hierarchy of Needs is chosen (Maslow, 1943, 1954), since it provides a clear framework on how human beings establish their needs. This allows systematic links to be made between the architectural attributes of the building and the user's motivation factors, which are fundamental pieces for the design.

As a case study, the model is applied in a building for older adults in an urban center, where data collection and the analysis of the results confirm the existence of a hierarchy of design attributes. The results show the importance that is given to the design of social areas, prioritizing the benefit for the user according to their immediate environment. From the Tambo I Case Analysis, the design of the social space is complemented by the proximity to a natural environment (La Huaca). The access to this green, open area supports the physical and mental restoration of the elderly residents by promoting a positive experience.

Since there is an urgent need to establish usable data on the preferred attributes for the design process, Maslow's hierarchy of needs is useful for organizing an appropriate scale to achieve person-environment balance, so this model serves as the basis for exploring some improvements in the spatial quality of elderly facilities that promote their well-being.

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