
Propose of sustainable engineering in a place for a social support for needy population

Proposta de engenharia sustentáveis em um local de apoio social à população carente

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ABSTRACT

Leisure areas in cities are squares, urbanized green areas, museums, outdoor gyms, convention centers, multi-sports facilities, clubs, malls, theaters, cinemas, bars. Some areas that are not considered for leisure, but that play an important social role are the social assistance places where the needy population receives various types of assistance. Regarding these places, it is reasonable to ask whether they could be treated as leisure areas, associating them with green areas, gardens, outdoor gyms for a more humanized service. A descriptive/investigative research was carried out and the methods were field survey and bibliographical survey to base the hypothesis and reach the objective. The space used was a Religious Center that serves a needy population in a neighborhood of Alfenas – MG every day of the week. A plan was drawn up to make the environment more humane with alternatives to provide leisure and comfort for the population. The project proposal is feasible in accordance with the objectives of this work, but, in financial terms, other works could aim to budget and reduce the costs for its implementation, since the effectiveness of the theoretical data placed here fits within an Architecture project and Modern Civil Engineering.

Keywords: Sustainability; Engineering; Social Space; Urbanism

RESUMO

As áreas de lazer em cidades são praças, áreas verdes urbanizadas, museus, academias ao ar livre, centros de convenções, poliesportivos, clubes, shoppings, teatros, cinemas, bares. Algumas áreas que não são consideradas para o lazer, mas que exercem uma função social importante são os locais de auxílio social onde a população carente recebe vários tipos de auxílios. Em relação a esses locais, é razoável perguntar se poderiam ser tratados como áreas de lazer, associando a eles áreas verdes, jardins, academias ao ar livre para um atendimento mais humanizado. Foi realizada uma pesquisa descritiva/investigativa e os métodos foram levantamento em campo e levantamento bibliográfico para embasar a hipótese e alcançar o objetivo. O espaço utilizado foi um Centro Religioso que atende a população carente de um bairro de Alfenas-MG. Foi elaborado um plano para tornar o ambiente mais humanizado com alternativas sustentáveis para proporcionar lazer e conforto para a população. A proposta do projeto é viável em acordo com os objetivos desse trabalho, mas, em termos financeiros, outros trabalhos poderiam visar orçar e diminuir custos para a sua implantação.

Keywords: Sustentabilidade; Engenharia; Espaço Social; Urbanismo.

INTRODUCTION

Leisure areas in cities include squares, urbanized green areas, museums, outdoor gyms, convention centers, sports centers, clubs, shopping malls, theaters, cinemas, and bars (SANTOS; MANOLESCU, 2008).

Some areas that are not considered recreational, but which play an important social role include places of social assistance in churches, temples and makeshift sheds where the needy population can receive various types of aid from the organized community, such as evangelization classes and food in the form of baskets, soups, sandwiches, and juices.

It is necessary to rethink urban growth in order to bring it closer to improved social justice (CARVALHO, 2003). In relation to these places of public service, it is reasonable to ask if they could be treated as leisure areas, associating them with green areas, gardens, and outdoor gymnasiums so that social service is more humanized, in accordance with the need to offer places of leisure and well-being for the most needy population, who very often, do not have access to such places other than those offered for free (SANTOS; MANOLESCU, 2008), in which these citizens can enjoy time with the family (MACEDO, 1999).

Urban growth has come closer to disorganization and chaos than being based on a desirable structured and planned model, at least since the beginning of urban occupation in the industrial age (SILVA; ROMERO, 2010), in such a way that, since then, cities have not offered good quality of life for the people, and, contrary to what they should be, represent spaces that foster stress (LOPES; FAERSTEIN; CHOR, 2003).

Soon after the Industrial Revolution began in the UK, epidemics broke out in cities due to poor hygiene, sewage and treated water (SPERANDIO, FRANCISCO FILHO; MATTOS, 2016). In search of improving the degrading conditions within the cities, the construction of urban parks was initiated with the creation of landscaping techniques (BRUM *et al.*, 2013) and, later, these parks made their way to the United States and France in the form of gardens, providing spaces of relaxation and leisure for the population (SCALISE, 2002). With the need to create pleasant places in cities in the twentieth century, Urbanism was born with the intention of solving the problems generated by the disorganized formation/construction of urban spaces (SPERANDIO, FRANCISCO FILHO; MATTOS, 2016).

Nowadays, in addition to serving as recreational areas, parks and green areas are considered important factors in improving the ecosystem of urban regions as they function as air filters, microclimate regulators, rainwater drains, odor eliminators/reducers (SHUDA; RAVINDRANATH, 2000), reducers of sound pollution and wind intensity, and they encourage the use of vegetation borders and the depollution of solid or gaseous particles in the air (TEIXEIRA; SANTOS, 2007).

In addition to the problems mentioned above, among the factors that cause stress and mental disorders in Brazil and Latin America, is the accelerated growth of cities and industries (LOPES; FAERSTEIN; CHOR, 2003). In fact, stress and mental disorders are factors that seem to increase along with the age of the population (LIMA *et al.*, 1996).

However, the stress that the urban population is submitted to can be reduced by the establishment of leisure areas which have become, at least in the present day, a social necessity (ZANIN *et al.*, 2005) and can be used in activities for relaxation, fun, tranquility after work, and stress relief.

Therefore, increasing the creation and maintenance of green areas in urbanized areas should be one of the strategies implemented to improve the quality of life of the population, (GOMES, 2014; ZANIN *et al.*, 2005), promote health and improve collective well-being in an inclusive and accessible manner (SPERANDIO; FRANCISCO FILHO; MATTOS, 2016), which is already foreseen in the National Policy for Health Promotion in Brazil (BRASIL, 2010).

Then, the objective of this work was to create a project to establish an open place in a religious institution, where care is provided for the needy community in an urbanized space, where teaching for children and prepared food are offered, that is more welcoming and comfortable, aside from offering a space in which people can relax and exercise at other times. As the study for this type of site is incipient, we strive to create a workable project for all similar spaces.

MATERIAL AND METHODS

This work is a qualitative descriptive/investigative research, mainly, but not exclusively. The methods included a field survey to obtain a practical example and a bibliographical survey to substantiate the hypothesis and reach the proposed objective.

The space used is a Religious Center that attends to the needy community of Bairro Jardim São Paulo every day of the week, morning and afternoon, in the city of Alfenas–MG.

The municipality of Alfenas is located in the south of Minas Gerais with an approximate population of 79,000 inhabitants, with an altitude of 888 meters above sea level and an average annual temperature of 19.6° C.

The field survey consisted of measuring the lot and checking the structure already built in loco.

The space has an area of 280.33 m² in a triangular format. Only a portion of the base of the triangle on the lot is used, with precarious brick facilities and walls with no plumbing all built without any planning.

The more acute portion of the triangle [lot] is an unfinished space partly lined with grass and some plants on the border, with one side facing the street. This was the focus of the urbanization project (figure 1).

Figure 1- Unbuilt part of the lot used as the basis for this work.



Source: Authors

RESULTS AND DISCUSSION

On the tapered portion of the base lot, to accommodate the purpose of the work and to take advantage of this type of format, a triangular fountain was designed to have the water spouting from the smaller angle and falling into a small pool with a base of 2 m and lengths of 1.5 m, with a depth of 0.40 m. The height will then be 1.12 m and the area 1.12 m². The filled volume will be approximately 0.3 m³ or 300 L.

Ornamental aquatic plants of the species *Nelumbo nutea* (American lotus) will be placed in the middle of the pool. The water outlet will be made via angel statues (Figure 2A, B), where a sound box will be placed to play relaxing music, according to the proposal.

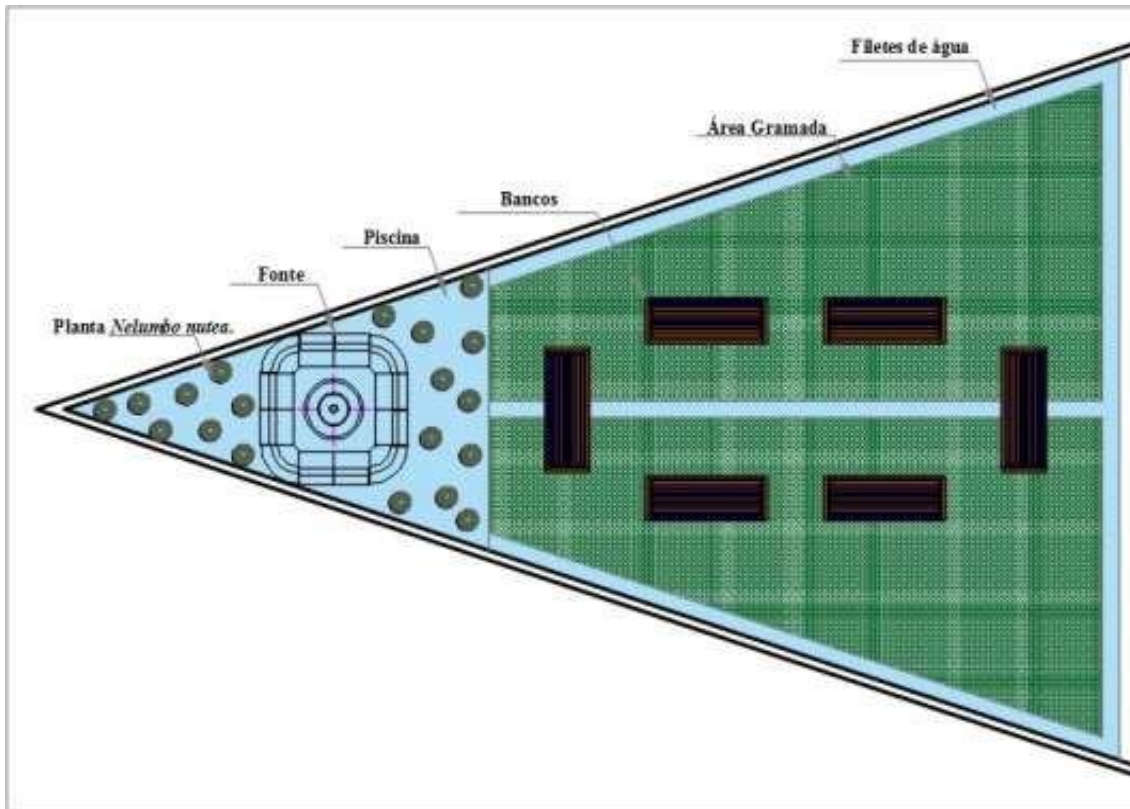
Figure 2 - Statue with 3 angels for the fountain's water outlet and specimens of the plant *Nelumbo nutea*.



Source: [A] Creative Commons. Pixabay. <https://pixabay.com/pt/photos/fonte-est%C3%A1tua-anjos-pedra-figura-5677655/>. [B] The National Gardener Association. Plants Database. <https://garden.org/plants/photo/55992/>

A larger triangle will be formed utilizing the smaller one described above, where, by the edges and by the height of the triangle, the running water will return to the pool (Figure 3). The water from the height of the triangle will pass through the center of a kiosk and a mini-garden with benches and the water channels will be covered with glass. The rest of the area will be grassed (Figure 3).

Figure 3 - Sketch of the structures to be implemented at the institution, mentioned partially above.



Source: Eng^a Paloma Aparecida Alves

The channels through which the water will pass will be covered with grass. The total area of the larger triangle will be approximately 4.5 m^2 , the kiosk area will be 3.35 m^2 , given a thickness of 0.3 m of the water channels on each side and the center. The height of the larger triangle will be 4.48 m and the kiosk region will be 3.36 m . This distance will allow the placing of 2 benches of 1.40 m on each side of the central channel and 2 more perpendicular benches (figure 3). The moving water will be cycled without the need for external sources, most of the time, because a hydraulic pump of 0.5 Hp will be installed to draw water from the pool and feed to the statue.

On the larger portion of the base of the lot, an 8m -length square-shaped hall will be built, with an area of 64 m^2 , with wide doors on three sides and a smaller door facing the already built area of the land, where there is already a kitchen.

The hall must present characteristics that allow for it function as a place for serving meals and teaching/lecturing. In terms of sustainability, the hall will allow for the collection of rainwater as well as the implementation of photovoltaic cells on the roof. In order to collect rainwater, an underground cistern will be built in the back, opposite the

entrance of the institution, with dimensions that accommodate the rains of the region and the roof area.

The roof area will be 81 m² with a length of 8 m plus 1 m on each side. Using the Azevedo Neto method (AMORIM; PEREIRA, 2008), the volume of the cistern shall be given by

$$V = 0,0042 \cdot Pa \cdot A \cdot T \text{ [Eq. 1].}$$

Where:

V is the volume of the cistern in L;

Pa is the average annual precipitation per year in L/m²; A is a catchment area in m²;

T is the number of months consisting of little rainfall or dry weather conditions (dimensionless). The annual rainfall index in Alfenas is 1516 mm/year, with 6.5 months of drought, so, $V = 0,0042 \cdot 1516 \cdot 81 \cdot 6,5$, therefore, $V = 3353\text{L}$.

The volume of the tank will be 3.4 m³. Before the water enters the cistern, it will pass through a filter (water tank with a capacity of 3,000 L)

The installation of the photovoltaic cells must be done by a company that specializes in the organization of the necessary documentation and the execution of the installation with little or no interference in the work.

The height of the walls of the hall will be 5 m with windows at the top with exhaust fans on the roof for natural air conditioning.

The hall will be constructed with drywall steel framing. The roof will be made with anti-thermal tiles with some of them being translucent placed in greater quantity at the points of sunrise and sunset.

In order to maximize the space of the hall and to make it a multifunctional space, the tables used will be those that can turn into benches, accommodating for both meals and teaching-learning activities (figure 4).

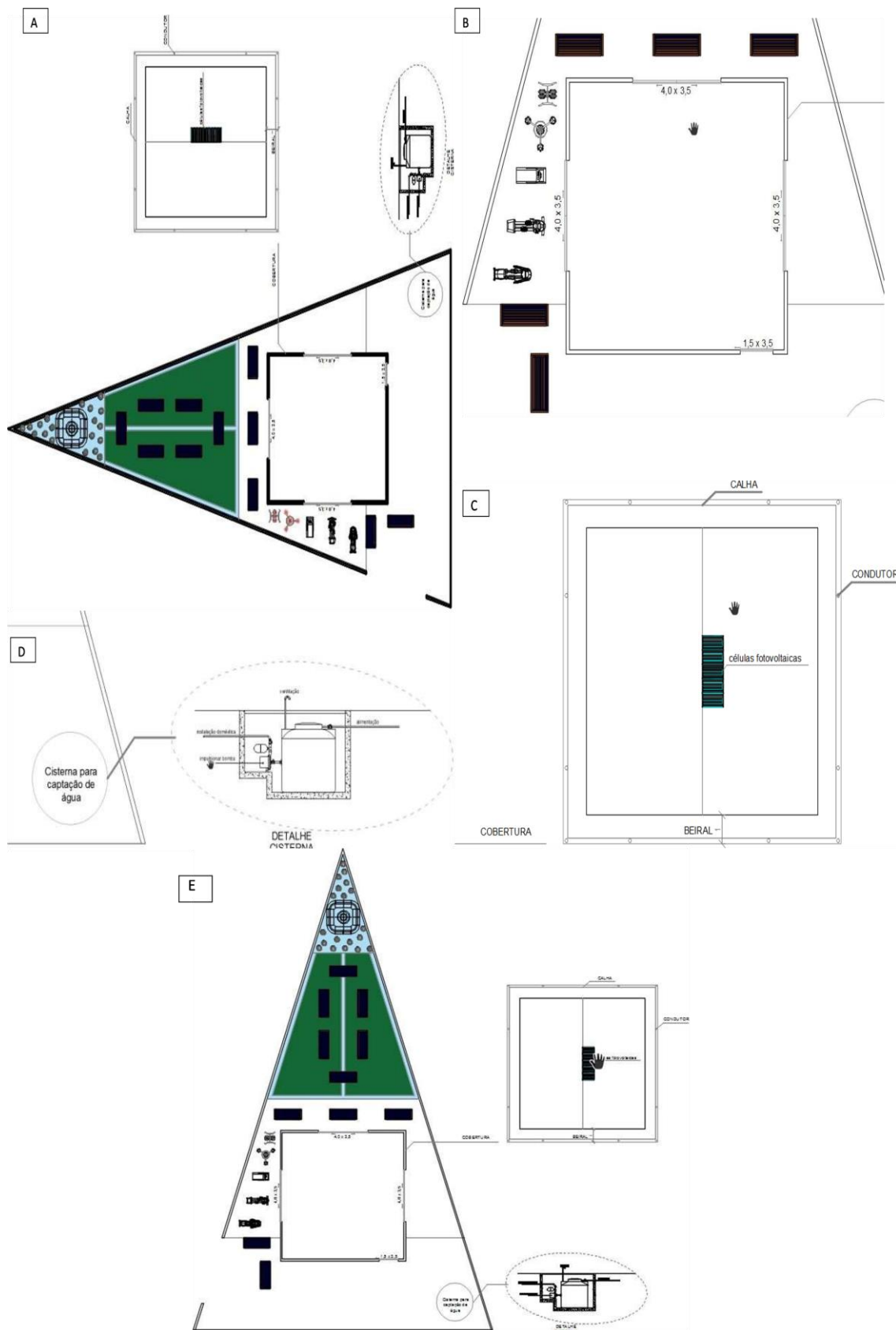
Figure 4 - Bench that converts into a table.



Source: Mercado Livre. https://produto.mercadolivre.com.br/MLB-3193828490-banco-vira-mesa-15m-madeira-macica-06-lugares-_JM?matt_tool=47780295&matt_word=&matt_source=google&matt_campaign_id=14302215540&matt_ad_group_id=134553704068&matt_match_type=&matt_network=g&matt_device=c&matt_creative=539425529161&matt_keyword=&matt_ad_position=&matt_ad_type=pla&matt_merchant_id=697384037&matt_product_id=MLB3193828490&matt_product_partition_id=1799305355696&matt_target_id=aud-2009166904988:pla-1799305355696&gclid=EAIaIQobChMI1_CdwZOW_wIVpCrUARII-ApiEAQYAiABEgLNmvD_BwE

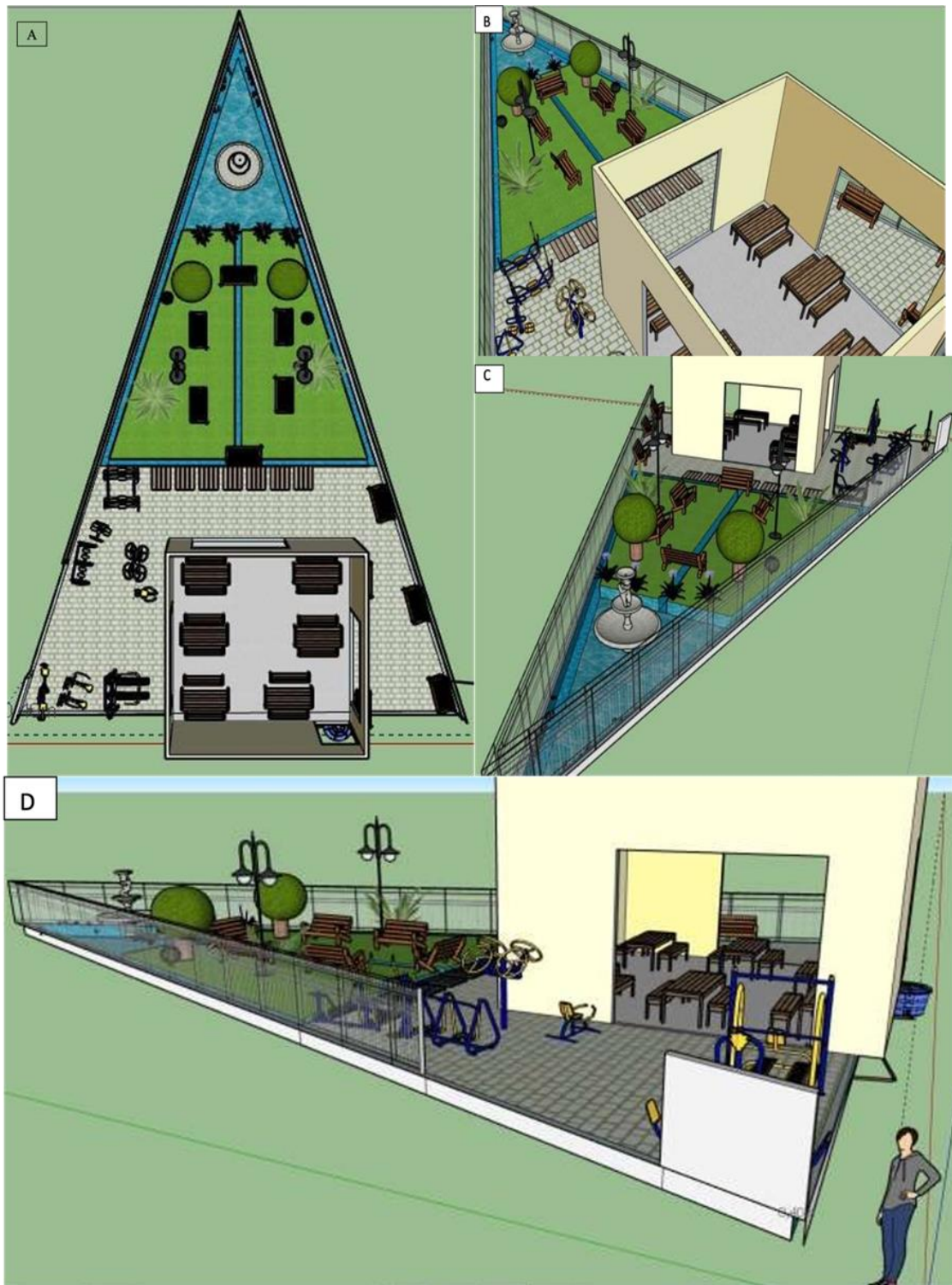
Gardens will be made in the area surrounding the hall, with the mentioned benches that become tables. At the entrance, an area will be reserved for the construction of an outdoor gymnasium (figures 5, 6).

Figure 5 - A to E, sketches of the main structures of the charity's urbanization project.



Source: Eng^a Paloma Aparecida Alves

Figure 6 - Three-dimensional perspective of the space. A General view. B Detailed view of the hall and garden. C View of the pool and fountain. D General view of the entrance



Source: Eng^a Paloma Aparecida Alves

The general guidelines adhered to currently set forth by specialists, indicate the use of natural resources in the construction of the proposal for the urbanization of the community space, while upholding sustainability requirements.

In addition to this, the urbanization of community spaces must serve to make human life more dignified, comfortable, peaceful (GOMES, 2014; ZANIN *et al.*, 2005) and, ultimately, less stressful.

In this sense, the project developed presents a structure that merges urbanization and sustainability within the same space with gardens, running water, and places for conversation and relaxation. In explicit terms, in each case, a space has been carefully planned to facilitate comfort.

The installation of running water was first implemented because of its tranquilizing effects observed in hospitals (ULRICH, 1984).

Natural landscape also exerts a positive effect in the alleviation or reduction of stress (CHAGAS; SAMPAIO, 2010). The gardens and running water provide the basis for a green environment and stress alleviator as intended in this project, as well as the benches strategically placed for people to be closer and facing each other, increasing contact among the people and fostering social comfort (SPERANDIO; FRANCISCO FILHO; MATTOS, 2016). In fact, it has recently been discovered that constant conversation decreases the incidence of dementia (CACIOPPO; CACIOPPO, 2018).

Thus, the construction of this type of space meets the expectations of the National Policy for Health Promotion in Brazil (BRASIL, 2010) and supports the construction of more ecological and urbanized cities that support the microclimate (SHUDA; RAVINDRANATH, 2000; TEIXEIRA; SANTOS, 2007; SPERANDIO; FRANCISCO FILHO; MATTOS, 2016) and public health.

To provide water for washing the spaces, filling the pool and canals, and using the bathrooms, a rainwater collection system will be built on the roof, which will be stored in a cistern of approximately 3.40 m³ after being filtered. Photovoltaic cells will supply power to the electrical and water heating systems in the kitchen and toilets, which already exist in the built area. This system, with the 5 m height of the hall walls and the natural ventilation system with raised windows and roof exhausts, will generate energy efficiency.

These aspects adhere to sustainable construction practices (JACOBI; GIATTI, 2017) which are so important in Brazil, where construction is lagging behind the more

developed countries (GOMES *et al.*, 2013; LABUTO, 2014) and, therefore, non-traditional methods must be used.

Steel framing dry wall construction will allow for less use of cement, less waste of water and little waste of material (VIEIRA, 2006), aside from providing great thermal insulation, with a shallow foundation, thus being less costly (AVERSI-FERREIRA, 2018).

The use of the table-benches will make the environment conducive to meals or studies/lectures.

The outdoor gymnasium will be used for leisure activities to promote health, for example, for people with diabetes mellitus, hypercholesterolemia, and the elderly in general who need to strengthen muscles, among others.

In considering the proposal of this work, the project contemplates the health of individuals in terms of preventive and curative medicine, focusing on the alleviation of the stress that affects people living in urban spaces and/or affected by situations that may lead to syndromes of *burnout* or depression (LOPES; FAERSTEIN; CHOR, 2003) which increase with age (LIMA *et al.*, 1996).

Considering that the institution mainly serves the needy population, this project promotes an example of citizenship and inclusion providing a green and comfortable space together with a gym, gardens and a hall where properly trained people, the institution itself and NGOs can offer several courses of social interest such as maternal and child care, personal hygiene, vocational courses, and a pleasant, cozy space where, above all, the citizen feels like an integral part of society.

In conclusion, the project proposal is feasible in terms of health and sustainability, objectives of this work, however, in financial terms, other works could aim to budget and reduce the costs of its implementation because the establishment of the theoretical data presented here fits very well within a modern Civil Engineering and Architecture project, a scarcity in Brazil, that should be implemented in places that provide assistance to the population, humanizing the treatment and approaching of the families (MACEDO, 1999), considering some people only have access to this type of place if it is free (SANTOS; MANOLESCU, 2008). In short, the type of project that was shown in this work can serve as an instrument of social justice (CARVALHO, 2003) and preservation of the health of the population, as well as serve as the basis for social welfare homes to create their green and ecological spaces.

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