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ACCESSIBILITY TO PUBLIC SPACES WITH USE OF CONCRETE BLOCK PAVEMENTS

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Summary

Topics like accessibility and easy locomotion of the people have been discussed and applied in most countries. In Brazil, they have won a space in large and mid-size cities. The importance of these subjects is represented by the statistics of the National Association of Public Transport (ANTP). They show that in cities with population between 250 000 and 500 000 inhabitants, 45% of the inner trips are made by foot, whereas in cities with population of more than one million, pedestrian trips come to 26%.

Brazilian cities grow virtually without urban planning that could allow their citizens a fast and safe locomotion in public spaces. This situation reflects in the inadequate quality of the sidewalks everywhere.

The Brazilian Program for Accessibility and the Brazilian ABNT Standard NBR 9 050 originated as a part of the Brazilian Governmental Plan for the Accessibility, defining the basic criteria to facilitate the access and locomotion for people with deficiencies or reduced mobility.

Both, the program and the standard were the inductors of municipal programs throughout Brazil. This paper shows the origin of the "Free Walks Program" of the city of São Paulo. It deals with the reformulation and standardization of sidewalks, and how the characteristics of the concrete paver floor fulfilled the requirements (accessibility, speed of implementation and ease of maintenance), necessary for the actual urban conditions of the largest Brazilian city.

1. INTRODUCTION

In recent years, the flag of accessibility has been lifted by all levels of the Brazilian Government and the organized society. The publication of laws (Federal, State and Municipal), the creation of guidelines for the construction of public spaces and roads, apart from the dissemination of good constructive practices, demonstrate that there is already an awareness to ensure the exercise of citizenship to all Brazilians, regardless of their physical or mental condition.

This paper presents the adopted "Free Walks Program" in the city of São Paulo, where special attention is devoted to the sidewalk, as the part of the public space intended for the movement of people. It also introduced concrete block pavements as a system that meets the requirements made by accessibility.

2. DESCRIPTION

Accessibility has been in the program of the legislative body of the city of São Paulo from the end of 1980s, when the Act No. 10 508/1988 ordered the construction of walkways. Since then, an extensive legislation has been guiding the use of public space and, above all, the free access of citizens to buildings, equipment and urban furniture. In 1996, the creation of the Standing Committee of Accessibility (CPA) consolidated the disposition of the Executive to act on this issue, and provided the Committee with powers for guidance and control.

In 2004, the Brazilian Government adopted Decree No. 5 296, which regulates and establishes the basic criteria to promote accessibility of people with physical, acoustic, visual, mental or multiple impairments; pregnant women, persons with a child in arms, obese, elder and reduced mobility people. The NBR 9 050/2004 establishes the criteria and technical parameters to be observed for the design, construction, installation and the adaptation of buildings, furniture, space and urban equipment, and the conditions for accessibility.

After the introduction of some models of sidewalks between 2001 and 2004 (an incentive of the Brazilian Portland Cement Association (ABCP) to the use of the concrete block pavements), the São Paulo Municipal Government saw the opportunity to begin a program for the standardization of public walks in the city of São Paulo.

In 2005, the city of São Paulo set up a committee that joined the Municipal Secretaries and civil institutions to develop the strategy for the recovery and standardization of the public walks. This program gave as a result the First Paulista Forum on Public Walks, where the “Free Walks Program" and the Decree No. 45 904 were presented to define the new standards for the construction of sidewalks. The purpose was to make life easier for pedestrians and for people with special needs.

3. SCENARIO OF THE SIDEWALKS IN SÃO PAULO

Data shows that 44.2% of traffic accidents are related with pedestrians on sidewalks and the cost of the attention of each accident is between BR$ 400 (US$ 216) and BR$ 2 300 (US$ 1 243). Figure 1 shows the main factors contributing to these statistics.

4. THE “FREE WALKS PROGRAM” AND THE DECREE 45 904

The Decree No. 45 904 introduced some innovations: First, the mandatory character of several accessibility standards and, second, the division of the sidewalk in strips, in order to organize the public walks.

4.1 Objectives of the program

- To implement the concept of "PUBLIC WALK". The sidewalk as an instrument of urbanization and the rescue of urban sociability.
- To structure in the public administration, the tools for inspection, maintenance and construction of walks.
  To raise the conscience of the average professional about the new construction technologies for sidewalks.
- To open a new work market for the entrepreneurs.
- To standardize the sidewalks.
- To ensure the right of circulation throughout the city, for all the citizens of the municipality, with or without a reduced mobility.



Lack of maintenance.



Badly executed repairs.



Obstacles.



Badly-built pedestrian ramps.



Corners without pedestrian ramps.



Unstable surfaces.

Figure 1. Situation of the pavements.

4.2 Stages of the program

- Updating of the legislation.
- Development of the courses and material to disseminate the new Decree to architects, engineers and others professionals involved as well as to all interested people.
- Training of the technicians of the Mayor's Office for them to update the teams of workers and quality control personnel.
- Social integration of the population of the street or hosted in it, trained to work as “stone layers” and with the creation of cooperatives and work fronts for this population.
- Establishing societies with companies, associations and entities for the recovery of the sidewalks under the responsibility of the Municipality and the requalification of the commercial roads.
- Construction of the sidewalks under the responsibility of the of the Mayor's Office and its operative links.

4.3 Legislation

The city of São Paulo defined through Decree No. 45 904 a new architectural pattern that divides the sidewalk in strips. Sidewalks up to 2 m wide, area divided into two (2) strips differentiated by texture and color, and sidewalks more than 2 m wide, are divided in three (3) strips, as shown in Figure 2.

4.3.1 1a. Strip, Service Strip

Destined for the planting of trees, access ramps for vehicles or for people with deficiencies (access ramps), lighting poles, transit signals and street furniture as benches, florists, phones, mailboxes and trashcans.

4.3.2 2a. Strip, Free

The Free Strip is exclusively destined to the circulation of pedestrians, should therefore be free from any unevenness, temporary or permanent physical obstacles, or vegetation. It must have the following characteristics:

- To have a regular, firm, continuous and skid resistant surface, under any condition.
- To be continue without any patching, repair or fissure. Therefore, after any intervention, the floor must be repaired in all its strip width following the original model.

4.3.3 3a. Strip, Access

Area in front of a property or terrain, where there is vegetation, ramps, propaganda and street furniture as bar tables and florists, as long as they do not prevent the access to buildings.

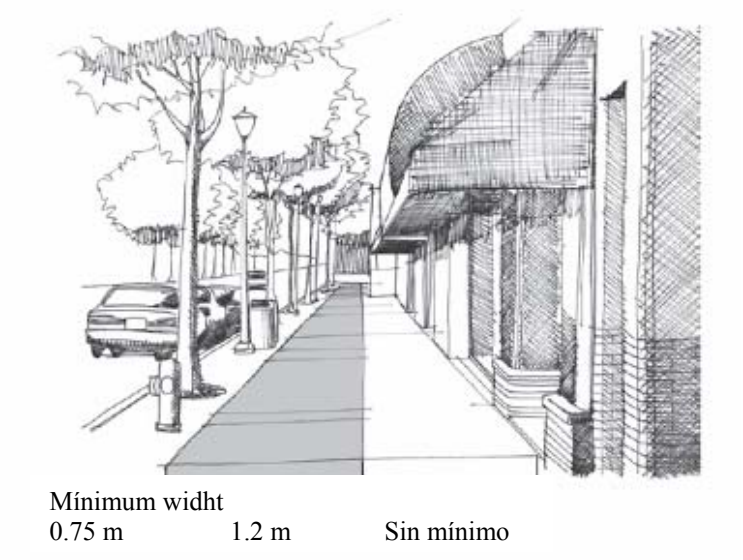

Figure 2. Division of the pavement in strips.

4.4 Adopted floors

Three types of floors had been adopted previously: Concrete, Portuguese stone and hydraulic tile [terrazzo (grain) tiles].

Decree No. 45 904 excluded floor surfaces with irregular texture and/or slipping, surfaces that could be separated in pieces, rocks or stone slabs, unevenness, steps and contrasting colors. In addition, it cared for the no generation of holes in the floors.

Four (4) systems were approved for the surfacing of the sidewalks, with a regular, non-slippery surface, able to provide comfort and security to users (see Figure 3).

The uses of materials for the reconstruction and the construction of sidewalks were determined according with the classification of the street besides the sidewalk (see Table 1).

5. ACCESSIBILITY STANDARDS

The program established the standards for ramps, alert and directional (guide) tactile ties, location of the access ramps and the urban furniture, access ramps to garages, vegetation and “green” sidewalks. The program was based on the ABNT NBR 9 050 (2004).



Concrete slabs.



Concrete paver floor.



Hydraulic tiles [Terrazzo (grain)].



On site stamped [print] concrete.

Figure 3. Suitable systems for the construction of sidewalks.

Table 1. Sidewalks configuration according the type of street.

CLASSIFICATION	CHARACTERISTICS	STANDARD MATERIAL
Structural (main)	Used as a union between the capital and the municipalities of the metropolitan region and other municipalities of the State of São Paulo, or used as internal union within the municipality.	Pavers floor. Hydraulic tile floor [terrazzo]. Prefabricated concrete slabs.
Collecting	Used as a union between local roads and structural (main) roads.	Pavers floor. Hydraulic tile floor [terrazzo]. On site printed [stamped] concrete.
Local	Defined by its predominant function of providing access to the peripheral properties, and are not classified as structural or collecting.	Pavers floor. Hydraulic tile floor [terrazzo]. Prefabricated concrete slabs. On site printed [stamped] concrete.

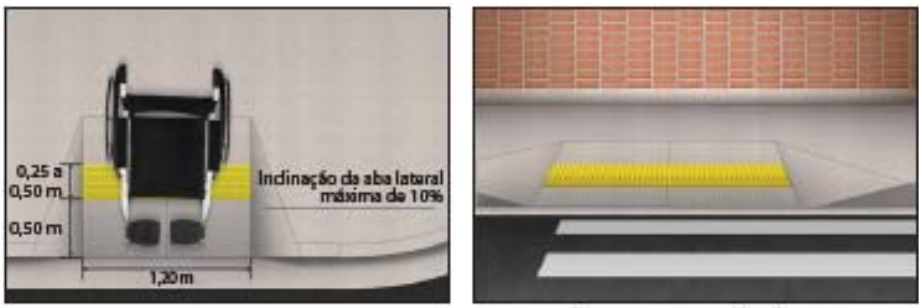

Figure 4. Model of the precast concrete access ramp with the alert tactile surface.

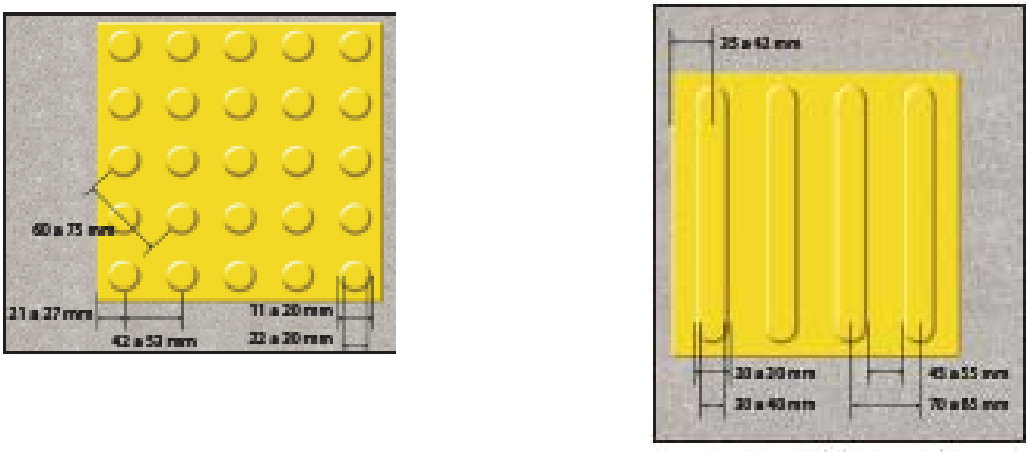

Figure 5. Alert and directional [guidance] tactile tiles. Reliefs with a height of 3 mm to 5 mm.

6. GUIDELINES FOR THE PERFORMANCE THE PAVEMENT

The city of São Paulo City developed a booklet entitled " *Conheça as regras for arrumar sua lime* çada" ("meet the rules for the repair of your sidewalk") with the purpose of making the population aware and sensible to the importance of building, to recover and keep the pavements of the city in good condition and conservation.

7. USE OF CONCRETE BLOCK PAVEMENTS

For the reconstruction of the sidewalks in front of the public buildings, the Mayor Office of São Paulo adopted a standard image that represents the map of the city of São Paulo, using pavers in light and dark grey and red, which differentiate the use of the sidewalk strips.

7.1 Specification

The program sets the following technical parameters for the concrete paving blocks:

- Compressive strength: ≤ 35 MPa in accordance with the Standards´s specifications.
  - NBR 9780 "Concrete pavers for pavements". "Determination of the compressive strength (testing method)".
  - NBR 9781 "Concrete pavers for sidewalks". "Specifications".
- Thickness: Generally 60 mm for sidewalks (must be defined in the design).
- Surface finish: Several colors and formats.
- Type of bases: Well-graded, simple and compacted gravel.

7.2 Features

- Durability. Their durability is high, whenever the characteristics of the product and the methods for the installation and maintenance are respected.
- Displacement comfort. It is suitable for the wheel chairs and the deficiently sighted traffic.
- Slipping. The pieces of concrete present a proper roughness to prevent sipping of pedestrians.
- Time to traffic. It is immediate to the finishing of the construction.
- Cleaning. With a water jet and neutral soap.
- Advantages. Easy withdrawal and reuse of the pieces.

7.3 Typical section

The City adopted for most of the sidewalk concrete block pavements, the section appearing in Figure 8.



Rules for the repair of your sidewalk.

Figure 6. Booklet by the city of São Paulo, SP.

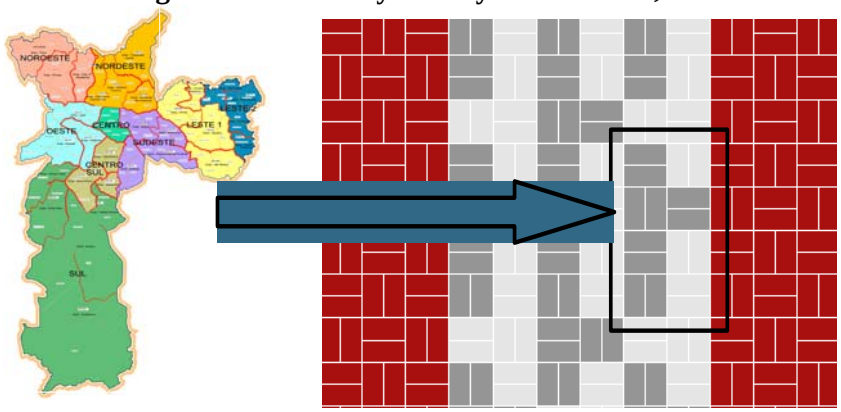

Figure 7. Design pattern for sidewalks for public space.

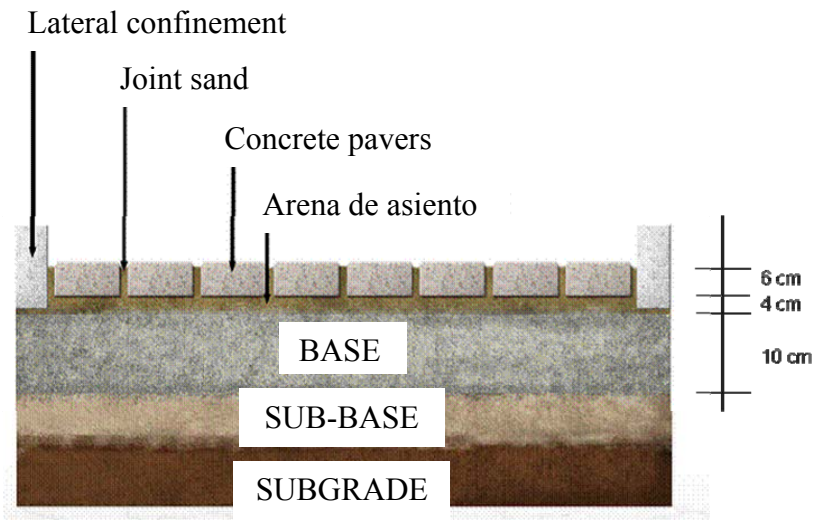

Figure 8. Type of the section.

7.4 Pilot project

The "Free Walks Program" also addressed the theme of social inclusion, to train those who live on the sidewalks as "empedradores" [stone floor builders].

Their recruitment for the training course was made by the Secretariat for Assistance and Social Development.

The National Industrial Learning Service (SENAI) and the ABCP signed an agreement with the City for the training. It was made through a pilot work in the Cardinal Arco Verde, a shopping street with a heavy flow of pedestrians.



Before. **After.**

Figure 9. Cardenal Arco Verde street.

8. RESULTS

Concrete block pavements were used in, approximately, 95% of the sidewalks built until 2007, equivalent to 242 000 m^2 and generated a cement consumption of some 7 200 t.

Due to construction and paver quality deficiencies, the Mayor's Office of the city of São Paulo adopted other than the concrete paver systems for public sidewalks, reducing their use. It is estimated that in 2008, 45 000 m^2 of concrete block pavements were built, accounting for 70% of the works. The graph in Figure 10 shows this reduction.

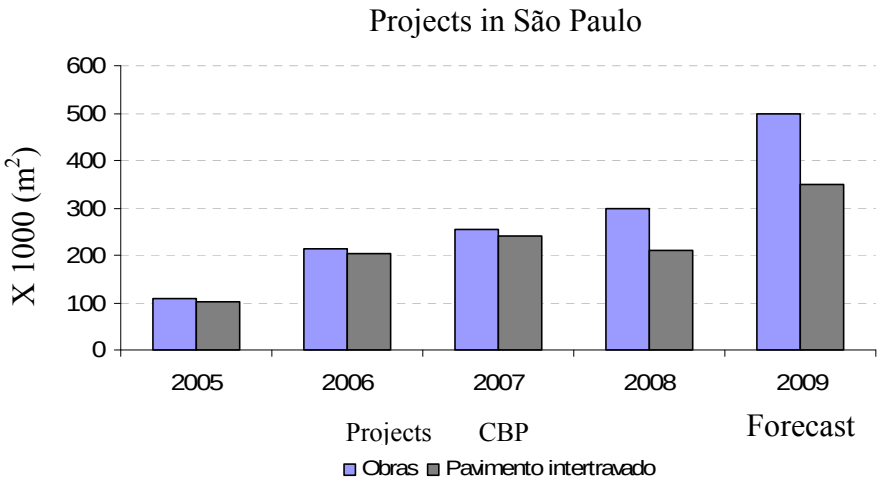

Figure 10. Works in São Paulo, SP.

The "Free Walks Program" encouraged other municipalities to implement the accessibility program like the cities of Campinas and São José, in the inner State of São Paulo.



Figure 11. The municipality of Campinas and São José de los Campos, SP.

9. CONCLUSION

The "Free Walk Program" introduced a new concept for public walks, standardizing the sidewalks, organizing the location of the urban furniture, improving the drainage and ensuring the free movement of pedestrians and people with deficiencies or reduced mobility.

The concrete block floor was the most used system in more than 200 000 m² of sidewalks, due to the characteristics of durability, abrasion, roughness, fast opening to traffic, ease for maintenance and units recycling.

As the system was previously unknown, some works presented pathologies due to problems during construction and for the insufficient quality of pavers. In order to minimize these problems, some initiatives are being taken as the training of labor, the development of a standard for the construction method of the pavement, the encouragement of the purchase of products that meet the specifications of the technical standards and have the Quality Certification Seal for the product.

Therefore, concrete block floor or pavement is a system that serves the accessibility requirements by providing comfort and security to users, as long as there is the product is right and the pavement is build in accordance with standards.

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