Infrastructure for accessibility at university campus

Adriana Gelpi
University of Passo Fundo, Course of Architecture and Urbanism, Faculty of Engineering and Architecture, Passo Fundo (RS), Brazil
agelpi@upf.br

Rosa Maria Locatelli Kalil
Univ University of Passo Fundo, Course of Architecture and Urbanism, Faculty of Engineering and Architecture, Passo Fundo (RS), Brazil
kalil@upf.br

Wagner Mazzeto de Oliveira
University of Passo Fundo, Course of Architecture and Urbanism, Faculty of Engineering and Architecture, Passo Fundo (RS), Brazil
111919@upf.br

Nelita Pretto
University of Passo Fundo, Course of Architecture and Urbanism, Faculty of Engineering and Architecture, Passo Fundo (RS), Brazil
134338@upf.br

ABSTRACT: Accessibility is an important part of the urban mobility public policy and it requires specific infrastructure in the road network. Public roads as well as school spaces demand technical adaptation. This work presents the UPF Accessible Project whose objective is to adapt the campus infrastructure for better assist its users, mainly disabled people who find difficulty to access places. The urban design project adapted began in July 2013 and consists of students and a team of representatives from many sectors. It was divided into various stages: critical points; lack of accessibility; physical study of the local; topography analysis; road problems; measurements of the area and case studies, besides a study of norm ABNT NBR 9050:2004. Later, a redesign project of sidewalks and local roads began. With relation to the results obtained, the implementation process of the necessary modifications inside the campus has been occurring according to the plan. Among the improvements already implemented are the sidewalks, bus stops, raised crossings and intersections, where all project follows the norms. This experience shows the feasibility of adapting spaces, meeting the legal requirements and promoting the visitors and students' citizenship.

Keywords *Accessible sidewalks, Use of technical norm, Accessibility Project.*

ISBN: 978-85-92631-00-0

1. INTRODUCTION

According to the Brazilian Association of Technical Norms (ABNT NBR 9050, 2004), accessibility is "the condition for the use, with safety and autonomy, total or assisted, of urban equipment and furnishing spaces, buildings, transportation services devices, systems and communication means and information by a physically disabled person or whose mobility is limited". The objective of this paper is to present the challenges and possibilities of the infrastructure adaptation Project of Campus I of Passo Fundo University (UPF) in order to adapt it to the conditions and reality of the urban area of the university providing universal accessibility to its users, mainly those whose mobility is limited. Based on a bibliographic and legislation research, an accessibility diagnosis was carried out in the urban space and open areas of the Campus, proposing guidelines for its implementation or qualification.

Campus I of UPF, conceived in the mid-twentieth century and built outside the urban area of Passo Fundo city, organized the implementation of its university infrastructure gradually, with no urban project and master plan for future expansions. Vehicle traffic was prioritized rather than the pedestrians' and universal accessibility to the buildings was completely ignored in its urban surroundings and interior.

Urban mobility and universal accessibility are issues related to the citizen’s right to come and go and are directly related to the right of a full urban life. In this sense, barriers that limit or prevent the access, freedom of movement, safe traffic and the possibility for people to communicate or having access to information cannot be accepted.

In the context of the growing urban expansion and differentiated displacements, the importance of implementing infrastructure grows even more potent in order to make mobility feasible. New requirements need to be incorporated to the Project guidelines practice, which did not exist before, must be included in the architecture and urban party, and to works of art.

In relation to the legislation, the Federal Constitution of 1988, defines “the law shall determine norms of construction of public places and buildings of public use and manufacturing of public transportation vehicles, in order to guarantee adequate access for disabled people” (Brasil 1988: 31). In 2000, Laws 10.048 and 10.098 also establish different treatment and general norms and basic criteria for the promotion of autonomous accessibility of disable people to buildings, urban spaces, furniture and equipment. Both were regulated by Federal Decree 5.296 of December 2nd 2004, with deadlines for the adaptation of buildings to the norms of accessibility of NBR 9050 2004.

It is in this context that it is included the problem of Passo Fundo University with its system of multiple campuses, that receive students, professors and the community for academic activities and university extension and services.

2. MATERIALS AND METHODS

The methodology of this research occurs in three stages. The first one, which is developed in an office, aims at collecting of information through bibliographic review of the universal accessibility norm, legislation and reference bibliography; case studies, date collection and

ISBN: 978-85-92631-00-0

interview with the technicians of the sector of work and maintenance of the university for the recognition of the road system, traffic and flow of vehicles and pedestrians; organization of the urban implementation map of Campus I in sectors, in order to prepare the field survey with diagnosis of existent sidewalks and the recognition of at least one layout of accessible route. After the bibliographic research, there was an organization and elaboration of the Project with universal draw, standard models of accessible sidewalk, urban furnishing and works of art that were implemented in the accessible route and fitted to the reality diagnosed at the Campus.

The second stage occurs through the field survey: it counts on a survey of the sidewalks, traffic areas, areas of access and urban furnishing, with photograph record to diagnose the infrastructure available to the pedestrians traffic, analysing if it shows the requirements for universal accessibility; it was verified the lanes, sidewalks and pedestrian crossings conditions, measuring widths and observing whether or not spaces for the enlargement of circulations, inclusion of works of art and urban furnishing exist; observation, record and measurement of the vegetation that interfere in the sidewalks and that, possibly, could interfere in the accessible route.

The third stage, held in office, counts on the organization of the data collection, analysis of the information researched in field and the elaboration of diagnosis on the traffic and access spaces about the data surveyed. After that, a layout of accessible route, defined in loco, was carried out, containing a team discussion on the preliminary studies and subsequent elaboration of the urban Project and digital detailing of the works of art of the accessible route: pedestrian crossings, ramps, paths, downgrades, raisings and furnishing.

3. PRINCIPLES OF UNIVERSAL ACCESSIBILITY

3.1 Urban mobility

According to Herce (2009), the main objective of the urban mobility planning is to make people to walk on short dislocations, and to use public transportation for longer dislocations. But it is necessary to advance towards the idea of projects of urban development and territory organization that are linked and integrated to the use of the soil. Thus according to Navas (2010), contemporaneous urban problems, are due to, in their majority, the lack of comprehension of a territorial and urban planning that integrates mobility networks, or their plan, linked to the soil use.

In this sense, a planning that consider pedestrians, the use of bicycles, public transportation, private vehicles and the rational distribution of goods, searching for sustainable mobility, seen as the one that is accomplished within a determined period, with reasonable costs and minimizing the negative effects on the surroundings and peoples' life, would be well accepted. With relation to urban mobility and universal accessibility, it is observed a gradual advance towards the comprehension of this problem and implementation of public policies for the inclusion of this idea in the construction of urban infrastructure.

Urban infrastructure can be understood as the set of physical components necessary to the services which are important for a society in determined space and time. It is the set of lanes, networks and buildings that structure the territory of the town and provide public

ISBN: 978-85-92631-00-0

services to the dwellers. In the case of the university campus, the infrastructure is consisted of road system, energy and communication networks, and education and management buildings. To Mascaró (1989), the road system can be formed by one or more traffic networks, according to the type of urban space, in order to receive vehicles (private and public), bicycles or pedestrians. Legislation and the improvement of technical norms have contributed significantly to this reality.

3.2 Universal Accessibility

To Duarte & Cohen (2010), accessibility is reached when the spaces are attractive, easy to cross, clear to understand, where they are spaces that make meeting and living easier, and it will only be reached from the urban attitude that re-evaluates the notion of deficiency, thus the spaces are not good enough when they do not suit all people.

Accessibility became a contemporaneous challenge, where elimination of architecture and urban barriers are necessary in the cities, buildings, urban surroundings, communication and transportation. It also can be understood as the citizen's right to come and go, including those people who are occasionally or permanently disabled.

Spaces must allow traffic and access to all spaces in the city such as public buildings, institutions, use of transportation, public equipment and urban furniture like telephones, restrooms, banks net, booths, seats, water dispenser, etc. Important and priority, it is in the approach of architecture, urbanism and urban mobility through universal draw, accessible, creating a city which is within every citizen's reach, whether they are disabled or not, democratizing all spaces, seeing the universal draw as the ability to communicate and integrate everybody.

3.3 The inclusive school, the universal design and accessibility

In relation to teaching spaces, the school's role in social inclusion was incorporated to the educational system through the Guidelines and Basis Law of National Education (LDB), followed by the federal constitution of 1988, where it was reinforced in Education seminars and meetings, reaching priority and progressive theme detailing in the late decade of 1990. With the LDB n° 9.394/1996, the inclusion of physically or intellectually disabled student was improved beyond the Special Education, recommending his or her enrolment, preferably, in their own public regular teaching net.

According to Duran & Esteves (2010), from the 2000s, in response to legal requirements, to the public power inspection and the society's own demand, school buildings began to be designed and adapted, meeting the norms of NBR 9050, trying to guarantee accessibility to all environments. Thus it is undeniable that an accessible environment qualifies the performance and production of activities, mainly when it comes to school activities.

In the schools, universal design becomes a tool for the equalization for opportunities in the development of all students. To Cruz & Pires (2010), the promotion of accessibility is a Project attribute, which must contain the basic conditions for the promotion of access and permanence in all environment designed. But, besides this, it is very important that the conditions to make the school or any other space inclusive also consider the building surrounding, solving access and traffic, reducing or eliminating unevenness, searching for regular floors, providing visual, tactile and sound signalling, adapting environment and

ISBN: 978-85-92631-00-0

furniture. As surrounding adaptations, pedestrians' crossing raised to the sidewalk level, when the traffic of people is higher than the vehicles, and sidewalks lowering with tactile signalling, when the inverse situation occurs. Parking spaces, embarking and disembarking must be signalled.

4. ADAPTATION OF CAMPUS I OF PASSO FUNDO UNIVERSITY

Passo Fundo is classified as a pole city in the northern state. It stands out as an important railroad intersection, strengthen the region of medium soybean producing properties and its economic development occurs mostly around productive arrangements of regional character, where the industry is linked to rural activities. It has a population of 190.000 inhabitants, with 780 km^2 territorial area and 50 km^2 urban area, being a pole city for more than 100 towns.

The central campus of Passo Fundo University is a regional educational pole, bringing into it vehicles from many towns of northern RS, from automobiles, buses and bicycles, besides vehicles for supply and load. Due to all these characteristics, this campus becomes a reference as an educational institution in the state, with around 14 thousand students, considering that 26 present disabilities (visual, hearing disabilities and wheelchair users). Counting on greater access and demand of students for college education and to the system of CAMPI of UPF, it came up the need for adapting spaces to the new demand of 21th Century, City Statute, Guidelines of Ministry of Education and universal accessibility, lacking greater attention to several legal and social requirements with relation to accessibility and democratization of public spaces and democratic teaching in the institution from these guidelines.

4.1 Definition on the accessible route of the path

In the diagnosis carried out by means of photograph survey, measurements and observation of flows the following situations were found: (a) with relation to accessibility of pedestrians: great flow of pedestrians and precarious crossings of vehicular routes; lack of accessible routes to the main educational and supportive spaces; ramps of accessibility with inadequancy in quantity, dimensioning and quality; large number of narrow sidewalks and forestation obstacles, besides excessive slopes. (b) with respect to vehicular mobility of pedestrians: flow of private vehicles from 4,500 to 6,000 per day; parking arranged in several places, but it is not enough; high flow of buses of public or private transportation, around 100 vehicles per day, concentration on the night shift; bus stops which are not adequate and do not have enough spaces to shelter users.

The adaptations were carried out based on Brazilian norms and legislations (Table 1), and practices applied in educational institutions and urban spaces (Cambiaghi 2010; Cohen and Duarte 2010; Ministry of Cities 2007; Herce 2009; Prado, Lopes and Ornstein 2010).

ISBN: 978-85-92631-00-0

Table 1: Legal references and norms of universal accessibility and urban mobility

Brasil. 1988. *Constituição da República Federativa do Brasil*. Brasília: Imprensa Oficial.
Brasil. 2004. *Decreto nº 5.296 de 02 de dezembro de 2004*. Regulamenta as Leis 10.048 e 10.098. Brasília.
Brasil. 2000. *Lei nº 10.048, de 8 de novembro de 2000*. Dá prioridade de atendimento às pessoas que especifica e dá outras providências. Diário Oficial da República Federativa do Brasil, Brasília.
Brasil. 2000. *Lei n. 10.098, de 19 de dezembro de 2000*. Estabelece normas gerais e critérios básicos para a promoção de acessibilidade das pessoas portadoras de deficiência ou com mobilidade reduzida, e dá outras providências. Diário Oficial da República Federativa do Brasil, Brasília.
Brasil. Ministério da Educação. *Portaria n. 3.284 de 7 de novembro de 2003*. Dispõe sobre requisitos de acessibilidade de pessoas portadoras de deficiências, para instruir os processos de autorização e de reconhecimento de cursos, e de credenciamento de instituições. Brasília.
Brasil. Lei n. 12.587 de 3 de janeiro de 2012. Institui as diretrizes da Política Nacional de Mobilidade Urbana. Brasília.
MINISTÉRIO DAS CIDADES. *PlanMob:* construindo a cidade sustentável. Caderno de Referência para Elaboração de Mobilidade Urbana. Brasília: Ministério das Cidades, 2007.
MINISTÉRIO DAS CIDADES. *Política de mobilidade urbana sustentável*. Cadernos MCidades n°6. Brasília: Ministério das Cidades, 2004.
Associação Brasileira de Normas Técnicas 2004. *NBR 9050 de 31 de maio de 2004*: Acessibilidade a edificações, mobiliário, espaços e equipamentos urbanos. Rio de Janeiro.
Associação Brasileira de Normas Técnicas. 2005. NBT 15320. Acessibilidade à pessoa com deficiência no transporte rodoviário. Rio de Janeiro.
Passo Fundo. Prefeitura Municipal. *Lei complementar n. 38 de 12 de dezembro de 1995.* Dispõe sobre o acesso de deficientes físicos às dependências franqueadas ao público, nas edificações destinadas a órgãos e serviços públicos, estabelecimentos bancários, comerciais, de serviços sociais, recreativos, hospitalares e nos logradouros públicos.

With the diagnosis of the problems related to the lack of accessibility and the study of the current legislation in order to draw an mobility route with universal design, strategic points, which are going to be worked, were established, such as: ramps, raised crossings, bus shelter adapted, sidewalks, intersections and flow of vehicles (Fig. 1).

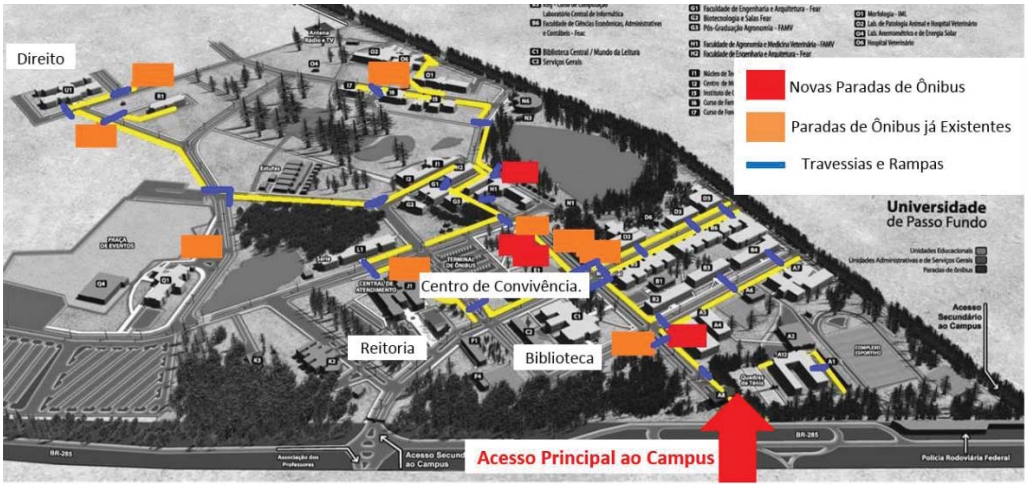

Figure 1. Main access to Campus I UPF.

In the initial stage it was prepared the proposal for implementation of an accessible route comprised of directional line upon and at least one side of the sidewalks already existent, along the campus, observing the norms related to sidewalks width, alert and directing podotactile floor, ramps slope and suitable paving in areas where there are more flow of pedestrians.

ISBN: 978-85-92631-00-0

4.1.1 Ramps

According to the Brazilian Norm ABNT NBR 9050: 2004, the sidewalks must be lowered along with the pedestrian crossing lines whenever there is pedestrians flow. The sidewalks lowering must be built in the direction of pedestrians flow and presenting slope of 8.33%. The ramp minimum width accepted is 1.20 meters and the minimum recommended is 1.50 meters. In the case of raised crossing, the ramp must be as wide as the crossing line.

In Figure 3 left, the ramp showed various errors before the norm, such as inadequate slope, insufficient width, unevenness between the crossing and lowering, besides inadequate flaps slope and length. In figure 3 right, the ramp already modified presents necessary lowering, adequate signalling with podotactile floor, correct flaps width and slope according to the crossing.

Figure 3. Ramp before and after modifications. Source: Authors, 2015.

4.1.2 Sidewalk

According to the Brazilian Norm ABNT NBR 9050: 2004, sidewalks and pedestrian routes must have minimum width of 1.20 meters, but pedestrian crossings must present minimum width of 4 meters long or according to the flow of people. In the case of service crossings, the sidewalk must present the following dimensions of Figure 4:

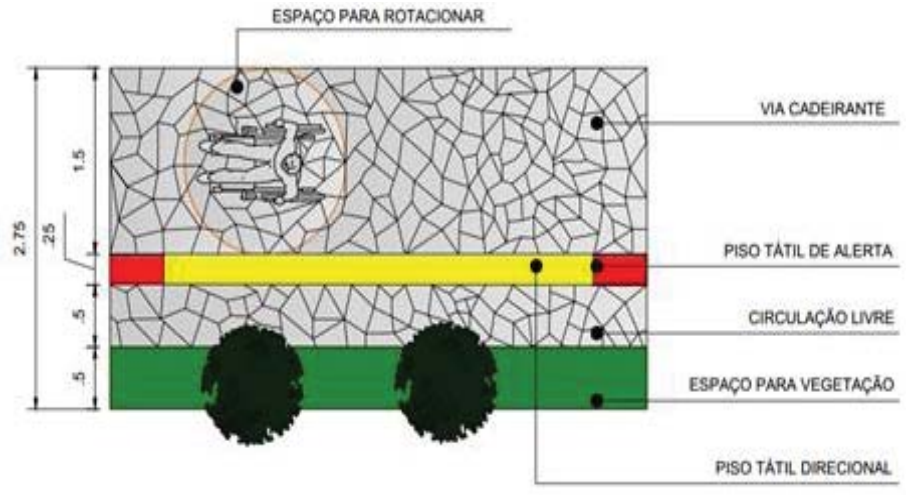

Figure 4. Sidewalk according to NBR 9050. Source: Authors, 2015

ISBN: 978-85-92631-00-0

In Figure 5, the sidewalk is in the stage of implementation with of the local markings where the podotactile floor will be implemented. According to the image, the sidewalk does not present the minimum dimension recommended, then being necessary to enlarge the sidewalk.

Figure 5. Sidewalk before modifications and in the stage of the project implementation. Source: Authors, 2015.

4.1.3 Raised crossing

According to the Brazilian Norm ABNT NBR 9050: 2004, raised crosswalk is the increase of the path level, consisted of raised flat area, signalized with crossing line and ramp for vehicles crossing. It is addressed to promote balance between the levels of the sidewalks in both sides of the lane. Yet, it must present transversal slope of 3% maximum. The raised crossing must show minimum dimension of 4 meters width, being dimensioned according to the traffic of people in the local (Fig. 6).

Figure 6. Raised sidewalk before and after modifications. Source: Authors, 2015.

4.1.4 Bus shelter sites

The idea and the project of public spaces must plan access conditions and use by disabled people. According to the Brazilian Norm ABNT NBR 9050:2004, along with the accessible routes, together with traditional seats (fixed seats), spaces for wheelchair people must be planned, allowing their access to the embarkation platform. The local must contain tactile

ISBN: 978-85-92631-00-0

embossed signalling, braille or embossed figures, but it is necessary to implement alert tactile floor (Fig. 7).

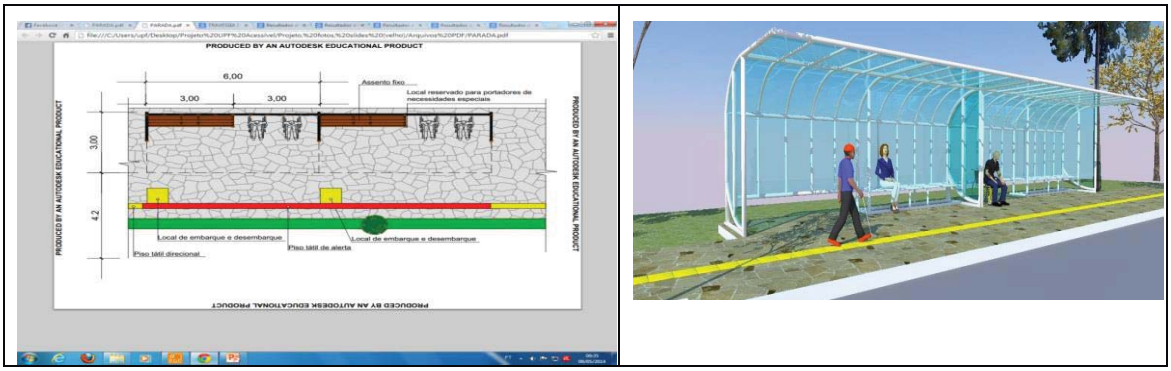

Figure 7. Bus shelter sites according to ABNT NBR 9050:2004 Source: Authors, 2015

With relation to urban furnishing, the existing project was revitalized, suggesting small adaptations like placing a seat, lateral protection in transparent polycarbonate and, of course, the planning of a local for wheelchair people. The sites are still being implemented

5. CONCLUSION

Universal accessibility must be present in all urban spaces, assisting the most diverse groups of society. With relation to school environments, the term inclusive school and the use of universal design become essential so that the search for knowledge may occur in such adequate manner. In relation to the implementation of an accessible route at Campus I of UPF, the authors report that many of the problems related to accessibility in the spaces studied could be avoided if there was concern by designers and work performers as for the elimination or “no creation” of physical barriers and in the promotion of continuous routes taking into account the universal design principles.

The implementation of technical norms has proved possible and suitable, but the greatest difficulty was the managers’s understanding that it is mandatory, where it is important to obtain the right to access the university campus with no urban and architecture barriers.

The authors emphasize that adaptations and improvements of routes or buildings in order to make them accessible are even more expensive than built them accessible, besides the fact of, very often, being impossible to fix. In this sense, it is important to consider accessibility in the architecture and urban infrastructure Project idea as being in the same relevance plan as the plastic, functional and structural factors are. As it was an adaptation in an existent space, detailed studies were necessary so that the interference was not significant and required more effective fewer resources in the application of the universal design, leading to new citizenship levels.

ISBN: 978-85-92631-00-0

REFERENCES

Associação Brasileira De Normas Técnicas. 2004. NBR 9050: Acessibilidade a edificações, mobiliário, espaços e equipamentos urbanos. Rio de Janeiro.

Brasil. 1988. *Constituição da República Federativa do Brasil*. Brasília: Imprensa Oficial.

_____. 2004. *Decreto nº 5.296 de 02 de dezembro de 2004*. Regulamenta as Leis 10.048 e 10.098. Brasília.

_____. 2000. *Lei nº 10.048, de 8 de novembro de 2000*. Dá prioridade de atendimento às pessoas que especifica e dá outras providências. Diário Oficial da República Federativa do Brasil, Brasília.

_____. 2000. *Lei n. 10.098, de 19 de dezembro de 2000*. Estabelece normas gerais e critérios básicos para a promoção de acessibilidade das pessoas portadoras de deficiência ou com mobilidade reduzida, e dá outras providências. Diário Oficial da República Federativa do Brasil, Brasília.

Brasil. Ministério das Cidades. 2004. *Política de mobilidade urbana sustentável*. Cadernos MCidades n°6. Brasília: Ministério das Cidades.

Brasil. Ministério das Cidades. 2007. *PlanMob*: construindo a cidade sustentável. Caderno de Referência para Elaboração de Mobilidade Urbana. Brasília: Ministério das Cidades.

CAMBIAGHI, S. 2010. *Desenho universal:* métodos e técnicas para arquitetos urbanistas. São Paulo: SENAC.

Cohen, R.; Duarte, C. R. 2010. Acessibilidade como fator de construção do lugar. In Prado, A. R. de A, Lopes, M. E, Ornstein, S. W. (org.) *Desenho Universal:* caminhos da acessibilidade no Brasil. São Paulo: Annablume.

Cruz, M. B. L. De M., Pires, T. C. V. 2010. Adequação nas escolas do Rio Grande do Norte – projetando ambientes escolares como fator de inclusão social. In PRADO, A. R. De A, LOPES, M. E, ORNSTEIN, S. W. (org.) *Desenho Universal:* caminhos da acessibilidade no Brasil. São Paulo: Annablume.

Duran, M. G, Esteves, R. G. 2010. Ações integradas para acessibilidade em escolas: um caminho para a inclusão. In PRADO, A. R. de A, LOPES, M. E, ORNSTEIN, S. W. (org.) *Desenho Universal*: caminhos da acessibilidade no Brasil. São Paulo: Annablume.

Herce, Manuel. 2009. El derecho a la movilidad. In *Sobre la movilidad en la ciudad*. Propuestas para recuperar un derecho ciudadano. Barcelona: Reverté, S.A.

Mascaró, Juan Luis. 1989. Loteamentos urbanos. Porto Alegre: Masquatro.

Ministério Das Cidades. 2006. *Implantação de Sistemas de Transporte Acessíveis*. Programa Brasileiro de Acessibilidade Urbana – Brasil Acessível n°5. Brasília: Ministério das Cidades.

Navas, Teresa. 2010 *¿Que es una via de comunicación?* A propósito de la movilidad y el territorio según Ildefonso Cerdà. In Fuster Sobreper, J. *La Agenda Cerdá*. Construyendo la Barcelona Metropolitana. Barcelona: Ajuntamiento de Barcelona, LUNWERG Editores, Institut Cerdá.

PRADO, A. R. de A, LOPES, M. E, ORNSTEIN, S. W. (org.) 2010. *Desenho Universal*: caminhos da acessibilidade no Brasil. SP: Annablume.

Santiago, Z. M. P., Taralli, C. H. 2010. Acessibilidade em escolas – experiências no Ceará. In PRADO, A. R. De A, LOPES, M. E, ORNSTEIN, S. W. (org.) *Desenho Universal*: caminhos da acessibilidade no Brasil. São Paulo: Annablume.