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Faculty of Transportation Sciences
Department of Applied Informatics in Transportation

Comparison of Transportation Accessibility in the Czech Republic and Mexico

Master thesis

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Thesis advisors: Ing. Jan Krčál, Ph.D

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- přehled stávající legislativy v souvislosti s osobami s omezenou schopností pohybu a orientace v obou zemích
- analýza dopravní přístupnosti významných institucí vybraných měst v obou zemích pro osoby s omezenou schopností pohybu a orientace
- konkrétní návrhy úprav vybraných problematických míst pro zvýšení přístupnosti, bezpečnosti a samostatnosti osob s omezenou schopností pohybu a orientace

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Abstract

Author: Bc. Lucie Čiháková

Title of the Thesis: Comparison of Transportation Accessibility in the Czech Republic and Mexico

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The master thesis is focused on the comparison of the legislations of barrierless accesibility in the Czech Republic and in Querétaro, México. The theoretical part of this thesis concentrates on the important parameters and laws of barrierless access, which are illustrated by functional related examples in practice in both countries. There is one route in each country evaluated according to the laws of that country. The practical part of the thesis deals with the analysis of the current situation in both countries on the basis of which there are included proposals for new solutions and modifications. At the end there is a comparison between the legislations of the two countries. As a part of the thesis there is included a technical drawing showing a possible barrierless access.

Keywords: disabled people, barrierless access, guideline, crosswalk, México, visually impaired persons

Abstrakt

Autor: Bc. Lucie Čiháková

Název práce: Porovnání dopravní přístupnosti v České republice a Mexiku

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Diplomová práce se zaměřuje na porovnání legislativy bezbariérového přístupu v České republice a ve městě Querétaro ve Spojených státech Mexických. V teoretické části se soustředím na důležité parametry a zákony týkající se bezbarierového přístupu, které jsou doloženy praktickými příklady v obou zemích. V každé zemi je vyhodnocena jedna trasa podle zákonů dané země. Praktická část práce se zabývá analýzou současné situace v obou zemích, na jejímž základě jsou navrhnuta řešení a změny. Na závěr je srovnání legoslativ obou zemích. Jako část práce je i nákres ukazující možný bezbarierový přístup.

Klíčová slova: osoby s omezenou schopností pohybu a orientace, bezbarierový přístup, Mexiko, přechody, vodicí linie

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List of used abbreviations

cm	centimeters
m	meters
ČSN	Czech technical standard (Česká technická norma)
POV	Prague Organisation of Wheelchair Users (Pražská organizace vozíčkářů)

Contents

Introduction

There are many people with disabilities , who have to have the same right to live as an independent life as other people in this world. To support their daily activities, they require technical aids as whleechairs, guide dogs, tactile paving and many others. In this thesis I will ease their daily activity, the movement, by evaluating specific routes and finding a better solution. The main subject of my thesis is a comparison of the legislation in México and the Czech Republic. The comparison of the legislatiion is important for both countries so that they can get the knowledges of the other one.

The routes are about the ease of access to the university (Tecnológico de Monterrey and Czech Technical University in Prague) in the city of Querétaro, México and Prague, the Czech Republic, with a specific focus on disabled people with physical disabilities and Visual impairment. These people are disabled because of an accident, progressive neuromuscular disease or from a congenital defect.

Disabled people are people with the same needs and wishes as non-disabled people. The primary difference is that disabled people need more help or assistance to ease their disability. Disabled people need to reach the same places as non-disabled people, and our aim as a society should be to provide disabled-access means of transportation in order to enable everyone to get to the places they need. It means that all people should have the same rights to access any place in order to fulfill their needs without depending on others.

When disabled persons do not have complete access to various destinations, it means that for them the Right to the City is not effective and that they are not independent and that they can not fulfill their needs. The Right to the City is possible for every non-disabled citizen. We can speak about a non- democratic state if it does not allow all citiziens to reach their destinations (fulfill their needs).

Freedom of people in social relations can be understood as the absence of coercion by other people. People have enough space for their own decisions which are voluntary and based on their wills.

I consider the state of Querétaro, México. The laws in each state in México regarding transportation can be different. The aim of this work is to evaluate the accesses of 3 public stops to the university and from one department for the students to the school entrance. I also take into consideration the sidewalks their width, their surface, quality and obstacles, to ascertain the level of disability-friendly access.

Firstly, I define the terms needed for this topic, then I summarize the legislations in Querétaro and the Czech Republic. Before applying these laws for changing the project,

I analyse possible routes to access the university. At the end, I write a conclusion discussing how legislation is applied to real projects and I suggeste an improvement.

In the second part of my work, I considere Prague in the Czech Republic. The laws, legislation, standards in connection to the free accessibility for physically handicapped people. I evaluated the route between two buildings of the university, which are frequently used by the students.

The aim is to compare the situation and the legislation in both countries and suggest solutions to both countries. In my opinion, each country has something that the other countries can learn from them and adopt that rule.

1. Definition of terms - internacional

1.1. Transport

Transport refers to any vehicle that you can travel in or carry goods in.

Public transport is a system of vehicles such as buses and trains that operate at regular times on fixed routes and are used by the public.

Transportation system shall be simple and intuitive. The design and regulation shall be the same in all the system. It means that similar traffic situation should be solved on the same or similar way which enables faster and reliable user behavior. (1)

1.2. Handicap

Handicap arises in a situation where the difficulties of the environment exceed the physical or sensual abilities of the individual (eg. a barrier accesss, lack of information in Braille). It is therefore not obtained or inborned characteristics, but a temporary condition caused by a combination of certain specific needs of the individual and inappropriately-designed environment that does not meet these requirements.

1.3. Persons with reduced mobility (PRM)

By Decree no. 398/2009 Sb. these persons are defined as (2):

- physically handicapped persons: wheelchair users, people using motion various mobility aids eg. walkers,
- visually impaired persons,
- hearing impaired people,
- mentally limited persons,
- the elderly,
- pregnant women,
- accompanying children (three years), or strollers.

1.4. Barrier

When barriers are spoken of in terms of transportation, one is essentially referring to obstacles (barrier material) or circumstances (a situation intangible barrier), which restrict or completely obstruct the use of public transportation. Barriers can be divided into the tangible, and the intangible. Physical barriers are vertical (height) and horizontal (spaces) differences, eg: the stairs, curbs, clearways, doors, portable barriers in corridors for pedestrians (billboards,

garbage bins, bicycle stands). Intangible barriers arise by failure or absence of something, eg. an information system, lift, lifting platforms, bypassing guaranteed low-floor joints, etc.

1.5. Barrier-free accesssibility

The definition of the “wheelchair accessibility” concept changes throughout regions of Europe. Some countries define the concept explicitly by laws and regulations, some do not mention at it at all. Generally a wheelchair accessible public transport system can be defined as "such a state of public transport system that enables its access and usage by everybody fully and independently – everyone is able to use the system and move unassisted." Mobility is not dependent on place, time or a facility.

If we want the whole system be wheelchair-accessible, all its subsystems must be wheelchair-accessible: infrastructure (roads, ways, buildings) direction, information and communication systems, and facilities and services (shops, luggage storage, etc.).

A facility is considered wheelchair accessible if it has no stairs or the stairs are accompanied by equipment for wheelchair-accessibility (elevator, ramp, stair lift, elevator or lift).

1.6. Right to the City

We should start with the following question: “how can we create a city as a positive, active, collective polis rather than an atomised, accidental antheap?“ (3)

The Right to the City is far more than the individual liberty to accesss urban resources: it is a right to change ourselves by changing the city. It is, moreover, a common rather than an individual right since this transformation inevitably depends upon the exercise of a collective power to reshape the processes of urbanization. The freedom to make and remake our cities and ourselves is, arguably, one of the most precious yet most neglected of our human rights. (3)

In this century, according to the WHO, there is 54 % of all the population living in urban areas. (4) Moreover, this number is increasing. The population in the city uses lots of economic, environmental, political and cultural wealth and diversity. It is our responsability to provide the Right to the City to all of the inhabitans.

The Right to the City should be the same for everybody, irregardless of their age, gender, health and economic, social, cultural and ethic characteristics. Unfortunately the cities are far from reaching these standards for all inhabitants. In the First World Social Forum (2001), the possibility was discussed of building a sustainable model of society and urban life, which would be based on the principles of solidarity, freedom, equity, dignity and social justice. Since that time, many organizations (nongovernmental organizations, forums, professional

associations) started to fight against this inequality, so that it can be built a democratic, just, humane and sustainable cities. The results of their work is the World Chapter for the Right to the City. Afterwards, this Chapter should be taken in consideration by local and national goverments, parlament and international organizations, so that it can be reached the dignity in all cities. (5)

The Right to the City is based on two facts. The first is that the city was made by the collective of people. Also the maintenance, the smooth traffic and functioning is based on the collective of people. The second fact is based on the existence of a common culture. Despite the collective creative process there is not a law to influence the character of the city. The tools to determine the form of the places is in the hands of limited group of powerful people.

According to the Harvey (3) the differences which are between the collective and the powerful group can be solved by distortion the contemporary relationship between the city and the capital. The city is the centrum of capital formation and provied the platform for the continuous processes of production and consumption of goods. Through the advertisements, which are mostly placed in the city, there is increasing the consumption. So the capitalists need the cities: the profits can be invested so that they can stably gain other capital, mainly through the urban development. (3)

The phrase "Right to the City" was coined by the Marxist intellectual Henry Lefebvre in 1968 in response to the upsurge of urban struggle that exploded in France during May of that year.

All persons have the Right to the City free of discrimination based on gender, age, health status, income, nationality, ethnicity, migratory condition, or political, religious or sexual orientation, and to preserve cultural memory and identity in conformity with the principles and norms established in this Charter.

We should understand, that the street are here for us, that the streets are ours and so they should fulfill the criterias which are based on our needs.

Why should disabled people have the access to the cities?

- They are equal as other people.
- They need to be independent on the help of others.
- If the city stays without changing and disabled people need the help of others, it can bother them, because they don´t feel independent.
- Not having accesss to the buildings, shops, public transportation can be taken as a discrimination. And we are living in the democracy, so there is no space for having discrimination.

- Disabled people have the same right to access all the places as other people.
- „All people have to have the same opportunities in the life.“ – human rights. (3)

1.7. Universal access

According to the WHO (World Health Organization) there is aroung 15 per cent of the worlld´s population disabled. They are the world´s largest minority. That is the reason why we should think about the universal access in broader range of people. (6)

Universal access is an aim of enabling all citizens to reach all destination which are part of the public street or pathway system. The universal access is as well as for the pedestrians and also for the vehicles. Universal access shall enable to reach all the destination in the wheelchairs, on bike or walking. Everybody shall be and feel independent to reach his goals. The areas shall be absolutely safe for each person who is using the public space. If this universal access can not be reach in this meaning, there should be another system, which can help disabled people to reach their destination.

All people have the same rights of use the roads and the public places. There shall not be any segregation of the differente models of vehicles or aid for walking (eg.wheelchair). The surfaces shall be clear to enable to drive to all types of vehicle and to walk every pedestrian. The distance at the non signalized roadways should be as wide, that the pedestrian can cross the street before a vehicle comes from beyond sight distance. The signalized crossroads should provide as much time as all types of pedestrians and assistive vehicle need for comfortable crossing. (6)

1.8. Liberty

México is a federal presidential representative democratic republic. The most important condition for democracy is a liberty.

Freedom is the ability to choose, decide and act, "according to our will," whatever it is and assume all adequate responsibilities. It in philosophy, involves free will as contrasted with determinism. In theology, liberty is freedom from the bondage of sin. (3)

Freedom is a very broad term and because it is essential for humans. Most of an area, it derives from the absence of a negative limitation or coercion, compulsion another person.

2. The legislation in México – Querétaro

México is a federation on the American continent. México is divided into 31 states and one federal district (Ciudad de México). This means that each state has its own legislation. I will consider just the laws from the state of Querétaro. There can be little changes in other states. The reason why I am only considering this legislation is that I am working on the project in Querétaro.

I have been living in Querétaro for one year, so I have observed all the conditions, all the problems, that people face while walking or driving. Then I decided to map the problem here about the barrier-free transportation, which seems to be a very big problem in Querétaro. On the other hand I have seen that when there are private university, the barrier-free transportation is perfectly solved. So I am sure that it is possible to build barrier free net in Querétaro.

The legislation for the integracion of the social development of disabled people in the state of Querétaro incorporates the principals of the convention of the rights of disabled people.

2.1. Parameters

Each disability has its own space, which has to be followed to achieve the highest comfort of all kinds of disabilities. All these parameters has to be comply in order to make fully working barrier free space. There are various types of disabilities.

2.1.1. Areas of the free passing and the elements which are projecting into the corridor or the way

Architectural elements that make up the profile of a facade such as pilasters, curbs and door frames and windows at a height less than 250 cm above the sidewalk, can stand up to 10 cm alignment. These same elements located to greater heights, they can stand up to 20 cm. See following Figure 1.

The urban equipment and other outstanding elements of the hanging walls and foliage trees that are in the accessible routes should be kept to a minimum height of 220 cm from the finished floor level. (7)

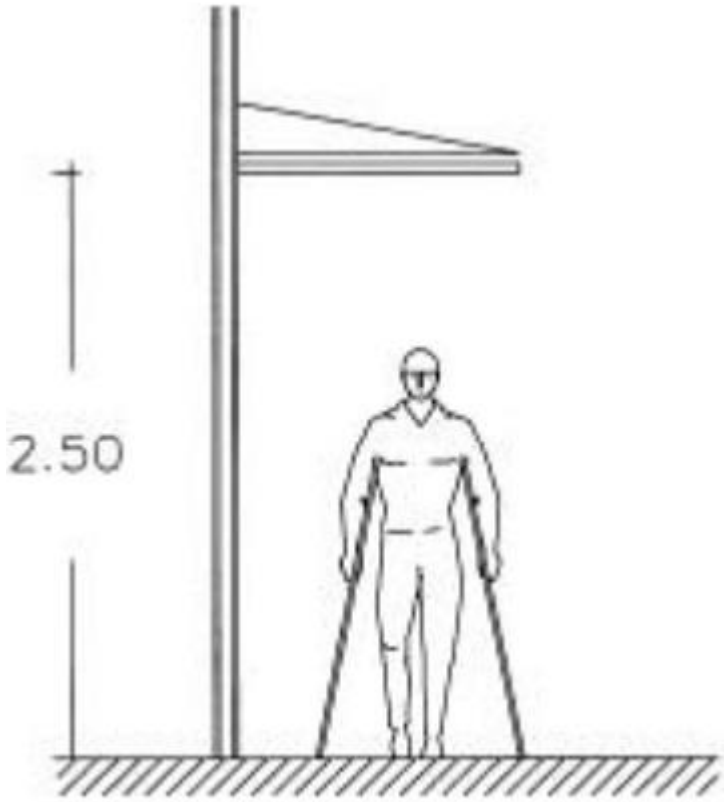

Figure 1: Area of the free passing

2.2. The physically handicapped persons – conditions of construction

The area of the exact space which the person in wheelchair takes is different than the area of the space which the person in the wheelchair needs. The space which the person take up is the smallest dimension where the person can not move comfortably. It is the dimension of the person and of the wheelchair. The space which the person needs is much bigger. Let's call it the area of being.

2.2.1. Maneuvering area

Minimal maneuvering space for turning around the wheelchair to an angle smaller than 180° is 140 cm x 170 cm. To turn around to an angle 360°, the minimum maneuvering space is 170 cm x 170 cm.

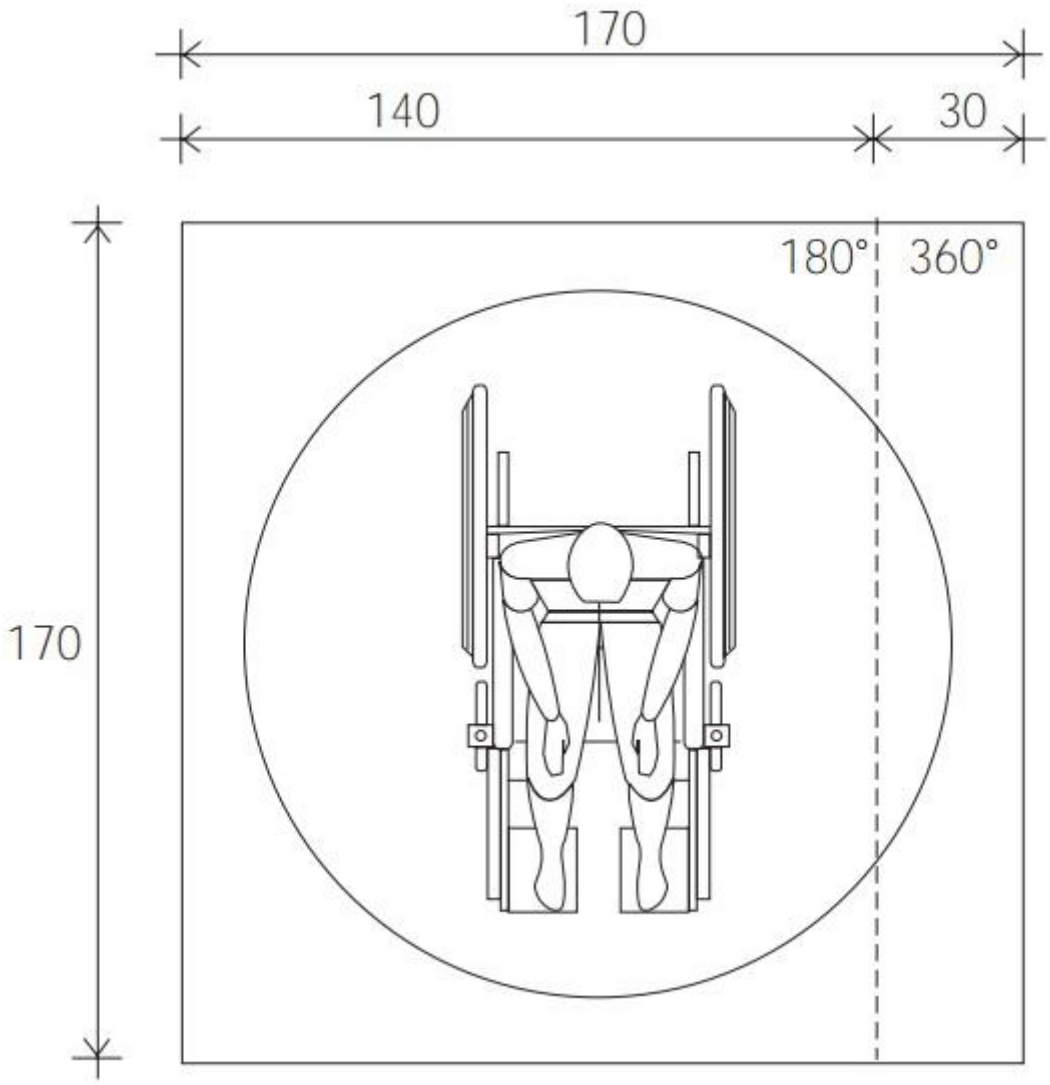

Figure 2: Maneuvering area on the wheelchair

2.2.2. The area of approximation

The area of approximation is a space needed to achieve an element or equipment.

The space of the approximation for having a rest of the stairs or the ramps can not be overlaped by areas of approximation of other elements (not the other stairs, the space for the doors, etc.).

The area of approximation for transfer from the wheelchair to a chair should be parallel and should be at least 90 cm wide and 120 cm long.

The area of approximation of changing the direction should be at least with diameter 150 cm. See in Figure 3.

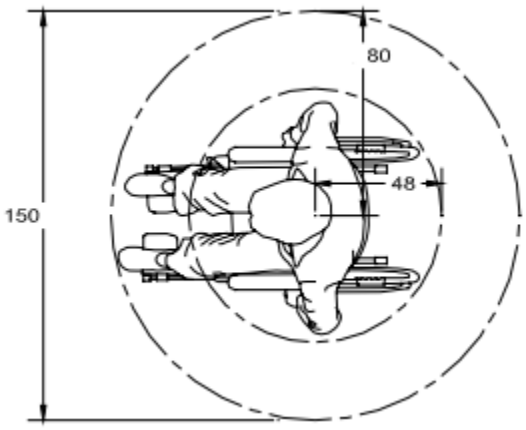

Figure 3: Maneuver and change of the direction (8)

The area of approximation of staying should be for the person in the wheelchair 90 cm wide and 130 cm long. See in Figure 4

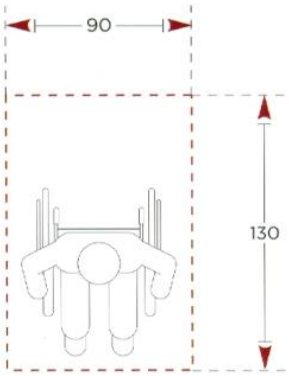

Figure 4: Space of being

We should not forget that there should always be space for a person who may be acompanying the person in wheelchair. The width should be 120 cm, so that the person in wheelchair and the standing person can fit next to each other. See in Figure 5.

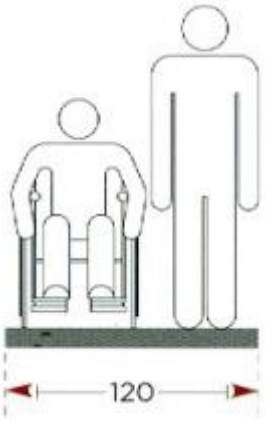

Figure 5: Person in wheelchair and the companion

To be sure that two people in wheelchair can pass next to each other, we need 150 cm. See Figure 6 below.

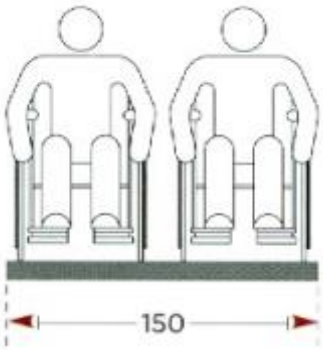

Figure 6: Two people in wheelchairs

There are many ways to solve the issue with the sidewalks. If there is not enough space to make the whole sidewalk 150 cm wide, rest places can be built, where the disabled can turn around (in order to change directions) or, if there are two people at the same time, they can make a resting space one of these places. The important dimension is the one on that resting place, where it has to be at least 150 cm in diameter, in order to be able to turn around. This station should be at most 30 meters away in order to provide smooth traffic. See Figure 7.

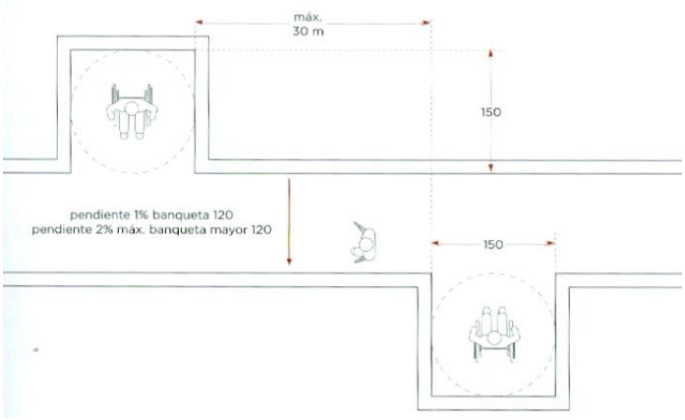

Figure 7: Turn of the people in wheelchair on the corridors

2.2.3. Space for people with equipment

A person with crutches needs 90 cm for standing and 15 cm on both sides for moving with crutches. (7) See Figure 8.

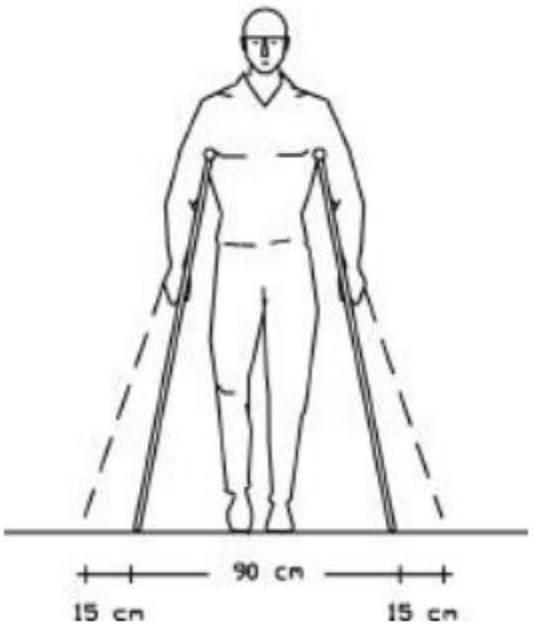

Figure 8: Person with crutches

People with walkers for seniors need less space than the people with crutches, but also we have to remember them. They need during standing and also during walking 60 cm wide space. See in Figure 9.

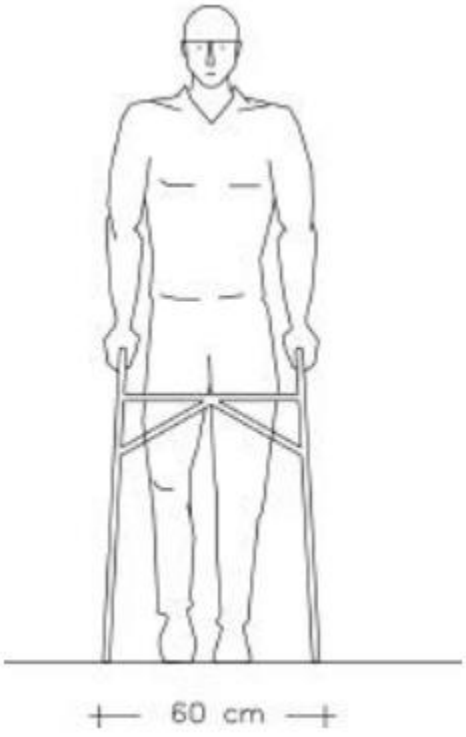

Figure 9: Person with walker for seniors

2.2.4. The wheelchairs

The wheelchairs need special space for moving and maneuvering on the street. The space needed by people in the wheelchairs is bigger than the space needed by pedestrians without any disabilities. See Figure 10.

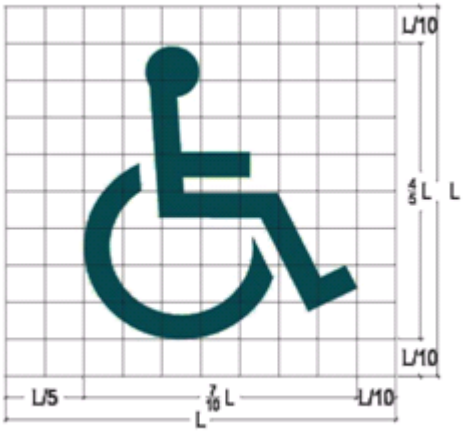

Figure 10: International Symbol of Accessibility

Accessible routes should be marked with the international symbol of accessibility, as illustrated in figure, of this rule, except when it coincides with the natural routes of travel of all other users.

2.2.4.1. Reaching distances of wheelchair users

The width of the approach area must be door width plus 30 cm from the side of the lock and at least 120 cm deep. (7) (9) (10) (11) (12) (13) (14)

2.2.5. Wheelchair accessibility of roads and public areas

2.2.5.1. Longitudinal slope

The ramp is considered from longitudinal slope greater than 4 % and less than 10 %. The maximum length of the ramp without a rest stop should be 600 cm long and the maximum longitudinal slope should be at most 6 %. For the rest of the length, see Figure 11.

Length	Max. slope
600 - 1 000 cm	6 %
300 - 600 cm	8 %
1 - 300 cm	10 %

Figure 11: Table of the maximal longitudinal slope

The rest stops are located between ramp sections. They should have a minimum length of 120 cm. At the beginning and at the end of the ramp, there must be a clear area 120 cm wide and at least 150 cm long. See Figure 12.

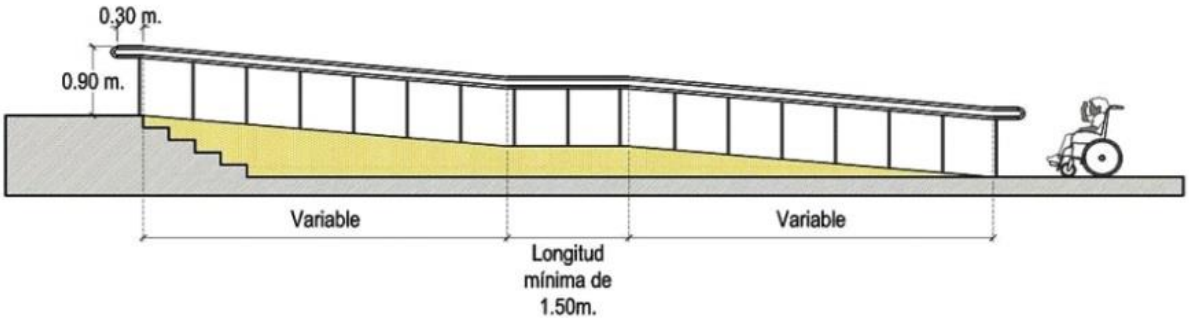

Figure 12: Ramp with the resting area (13)

Sidewalks must have ramps, located in crosswalks. The ramp´s slope should not be more than: 8 % for unevenness of 16 cm and 6 % for unevenness of 32 cm or greater. (9) (10) (11) (12) (13) (14)

2.2.5.2. Pedestrian routes

If there is a difference in altitude between the sidewalk and the roadway, the crosswalk must have ramps and preferably should be located close to the street corners. The width of the ramp should be at least 90 cm in its central area. The central area of the ramp should carry a maximum gradient of 10 %. When the ramp interferes with the free passage area of the sidewalk, the ramp should be compensated by three ramp surfaces and / or with different levels. The three ramp surfaces have a slopeon the two side surfaces according to the following table. (9) (10) (11) (12) (13) (14). See Figure 13 and Figure 14.

Free passage area	**Max. longitudinal slope**
Less then 120 cm	8 %
More then 120 cm	10 %

Figure 13: Maximum longitudinal slope

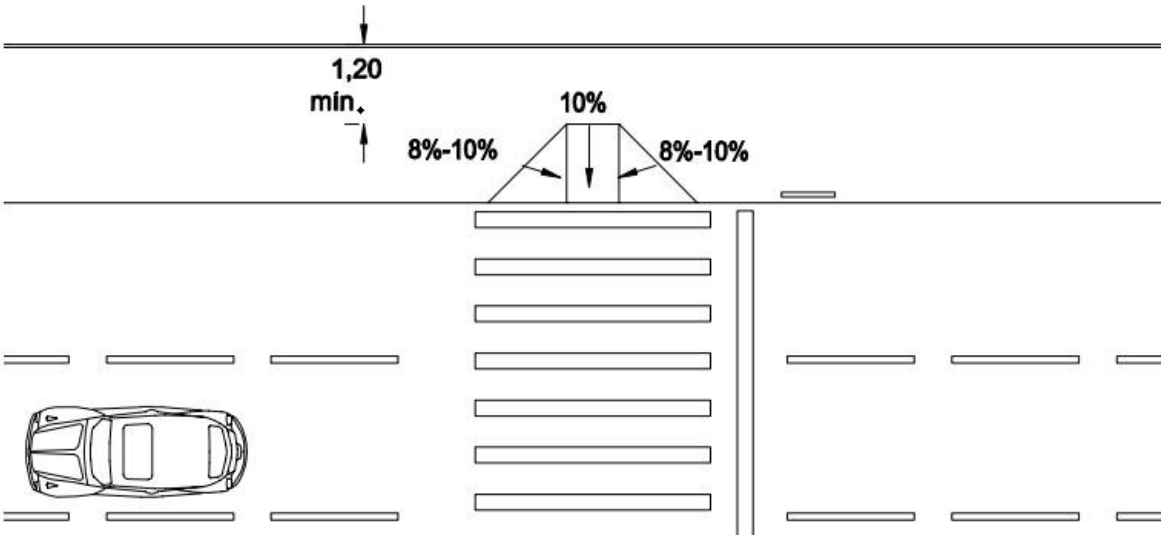

Figure 14: Barrier free crosswalk ramp (14)

2.2.5.3. Parking space

Parking space should be reserved for the use of cars that transport or are driven by people with disabilities. They should make up 4 % of all parking places. There should always be at least one parking place when the proportion does not reach the minimum required. The parking space has to be as close to the entrance as possible. The minimum parking place dimensions must be at least 380 cm wide and 500 cm long, as you can see on the following Figure 15.

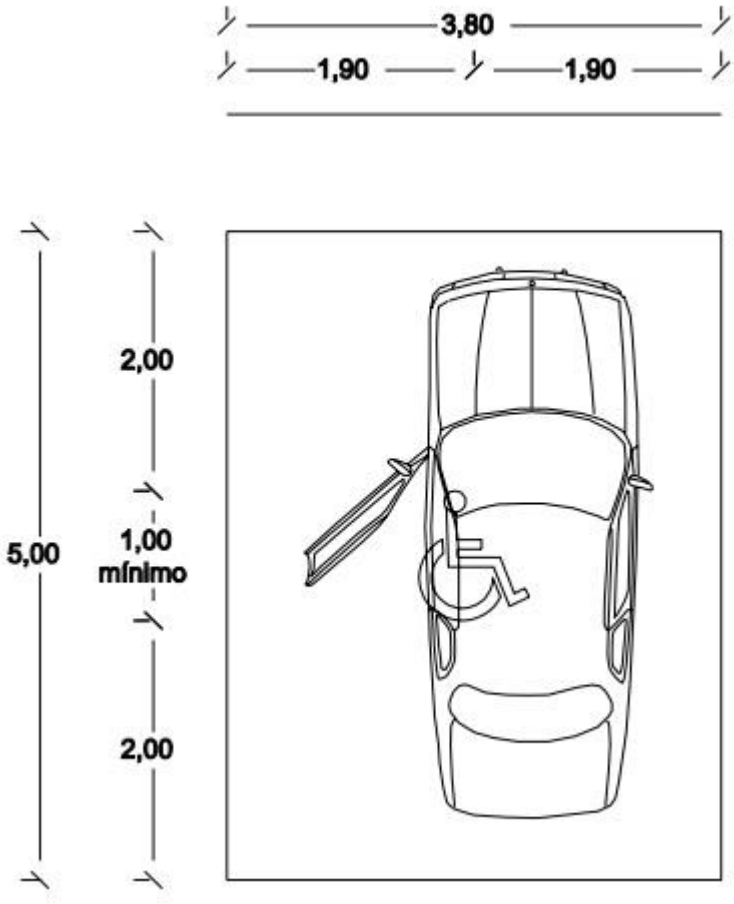

Figure 15: Parking space for a disabled person (14)

2.2.5.4. Public transportation

There are three bus steps to get on the bus. They are really high, so many times elderly people have difficulties to get on. See figure Figure 16.

Figure 16: Bus in Querétaro (15)

2.2.5.4.1. The barrier – free public transportation

In the year 2014 in Querétaro there were integrated buses with barrier free accesibility. Now there are 6 new public buses. Each bus has the ability of 29 seats and two places in wheelchairs. In addition, the units feature a lifting ramp for those who are in such a condition that does not allow them to climb steps. All these 6 buses are on 5 routes in Querétaro and connect the places which the disabled need most - for example the Centrum of Rehabilitation or Gerontology Center. The buses are on the streets from 06:30 to 15:30 avaliable to transport disabled people, elderly people and mothers with baby carriages. See Figure 17. (16) (17) (18) (19)

Figure 17: Barrier free bus in Querétaro (20)

2.2.5.5. The unevens of the floor

The surface of the floor should be firm, uniform and even. The maximum free space of the floor should be 1.3 cm wide and 1 cm deep. (8) See in Figure 18.

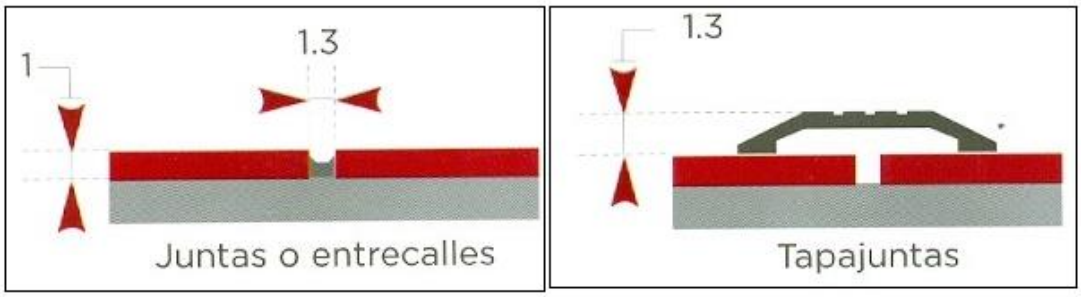

Figure 18: Surface of the floor

The unevens from 0.6 cm high should be rounded in the vertical meaning. The unevens between 0.6 and 1.5 cm should be horizontal separated. See in Figure 19 and Figure 20.

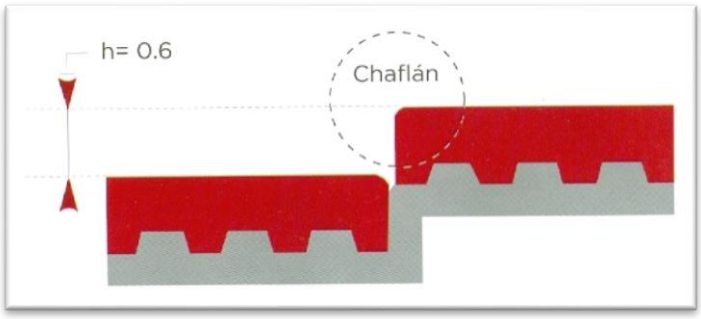

Figure 19: Unevens of the high 60 mm

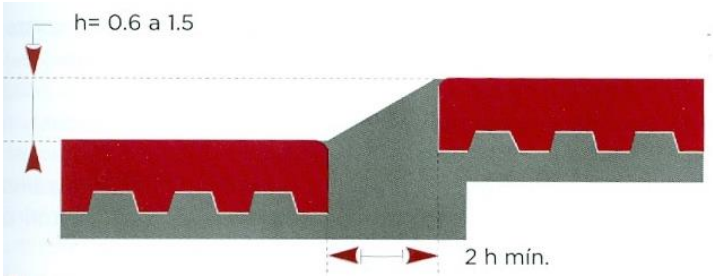

Figure 20: Surface with the unevens

The mats should be fixed. The thickness of the base frame should have at most 1.3 cm with the tissue firmed and leveled. See Figure 21. The cross slope should not be higher then 2 %.

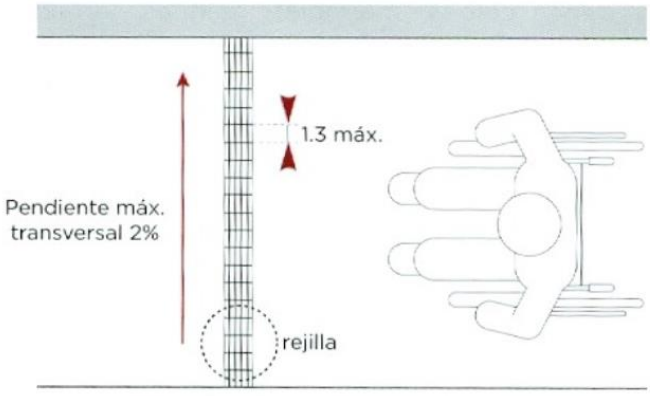

Figure 21: Grids

2.2.5.6. The ends of the surface

The finishing on the surface of the floor should be antiskid and resistant for long term use. Sun rays and artificial lighting should be avoided eg. by the type of material. The material used

should allow use of the sidewalks by people in wheelchairs, people with crutches and people with other disabilities. For the parking places, for the disabled, should not be used the pavers.

2.3. Solutions for visually impaired persons

When building a safety way for physically handicapped persons, we also have to build a safety way for visually impaired persons. They generally are not physically handicapped, so they can walk on foot. The danger is that they can enter into the roadway or that they would not be able to find the way to their destination. In all places where architecture is constructed for visually impaired persons, the worldwide symbol for the blind should be placed. (21). See Figure 22.

Figure 22: Visually Impaired Symbol

2.3.1. Objects on the side of the wall

Any object which is higher than 68 cm and is protruding into the street more than 10 cm, should be marked on the floor in the same width as the subject is, in order to warn the disabled (in this case a blind person) that there is an object in a higher position. (8) See Figure 23.

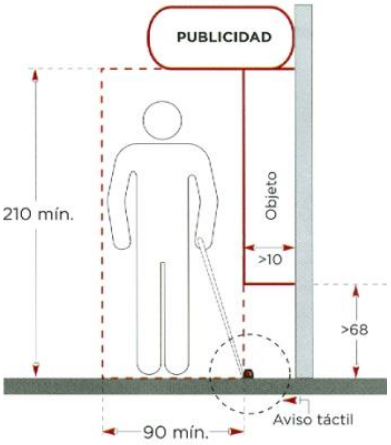

Figure 23: Objects which are on the way

Objects which are lower than 68 cm and are at least 10 cm width, should be signed with a white line on the floor and also with changing the material of the surface. (8) See Figure 24.

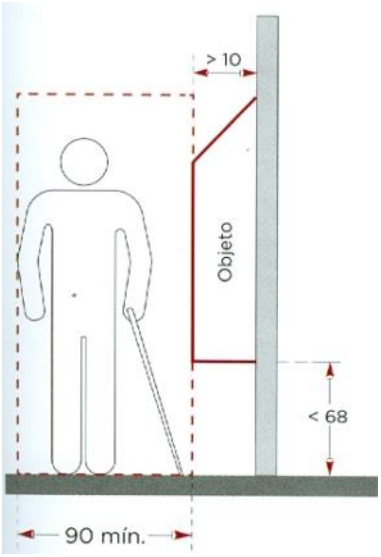

Figure 24: Objects which are lower than 68 cm and wider than 10cm

Objects that are higher than 68 cm and are narrower than 10 cm, do not have to be marked on the floor by any change of the surface material, nor by the white line. (8) See Figure 25.

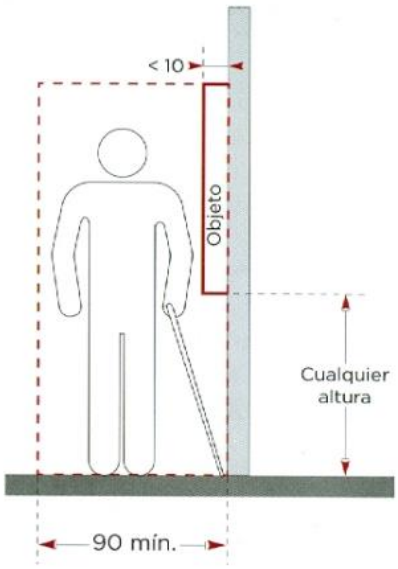

Figure 25: Objects which do not have to be marked

2.3.2. Space needed

People using the guide dog need space from 76 to 80 cm wide. People using the white cane need a space at least 109 x 95 cm. (8) See Figure 26.

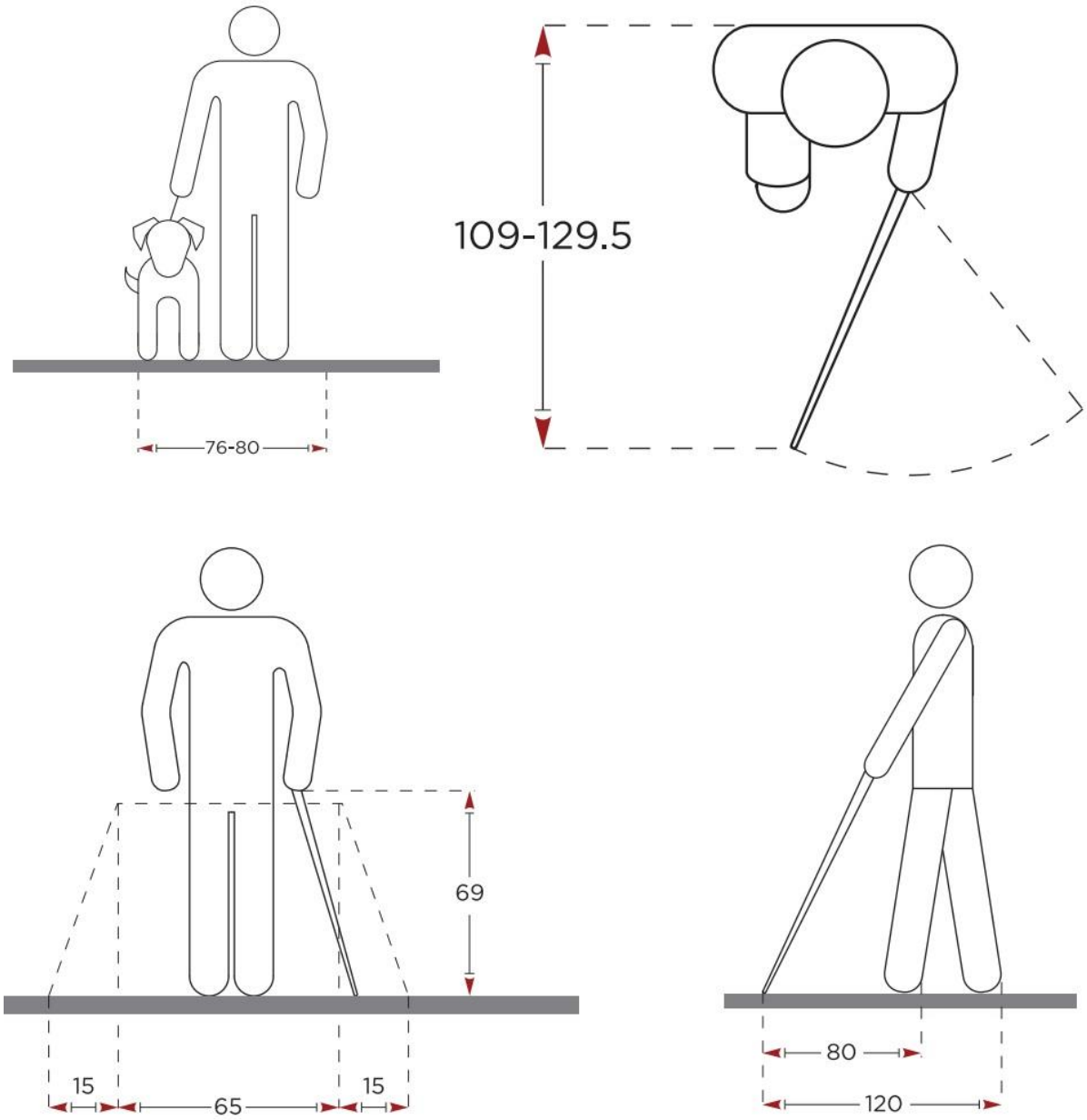

Figure 26: Needed space for the visually impaired people (8)

2.3.3. Detections

On the floor surface a strip of pavement warning detection should be placed, with change of texture or finish, or finished level superimposed floor without exceeding 1 cm in height. The detection pavement should have a strip on the floor of at least 15 cm in width. For warning limits should be placed a fixture at floor level of 5 cm minimum height. (22)

2.3.4. Ramps

There should be a side protection on the curbs, which should be at least 5 cm high if there are no railings or walls. See Figure 27.

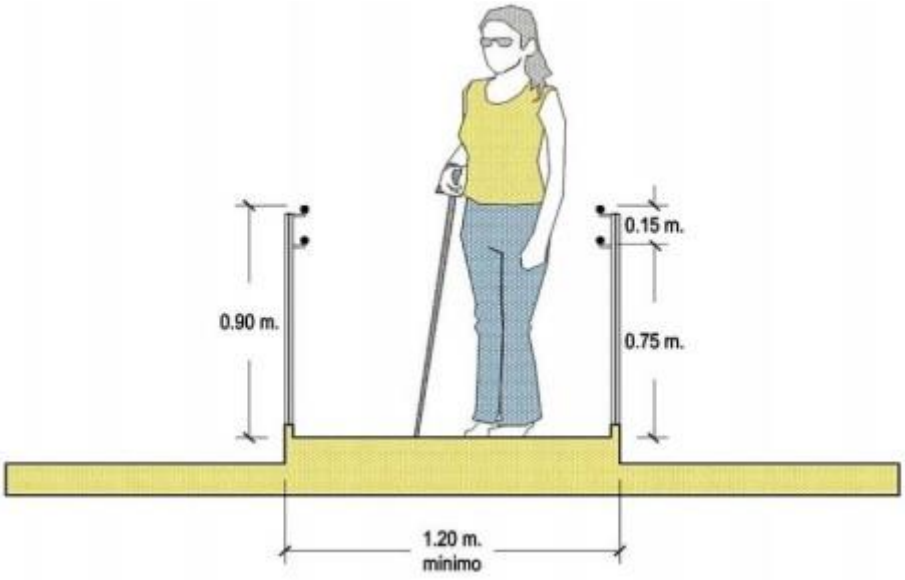

Figure 27: Ramp for the visually impaired person (13)

2.3.5. Streets

On the streets in the centre, there are street signs written in the braille alphabet so that blind persons can know where they are. (21)

2.3.6. Constructions of the sidewalks for visually impaired persons

To indicate the route accessible to people with visual disabilities, there should be a design with warning strips, combined with guidelines. The guidelines should connect with tactile paving to approach elements. The touch route should be placed in the safest area of circulation. The guide direction must be placed at least 40 cm from the center of the module from the wall. (8) See Figure 28.

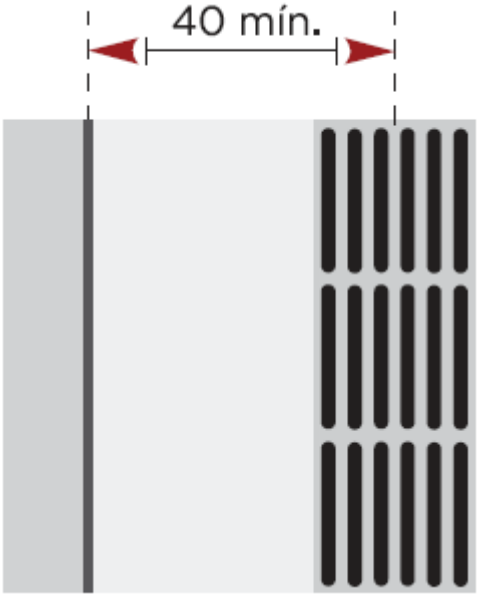

Figure 28: Location of the guidelines (8)

To indicate the start and end of a touch path, they must be at least 3 modules of pavement warning strips perpendicular to the guide direction.

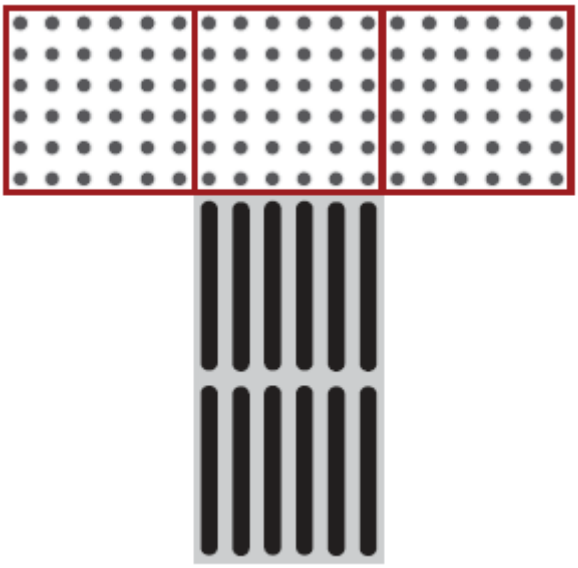

Figure 29: Finish and start of a touch path (8)

In the change of direction at 90 °, it should be noted with a module of warning strip or four modules (where does not constitute an obstacle) arranged in square, in the center of the intersection of the guideline. See Figure 30. The angle cannot be allowed to be smaller than 45 °.

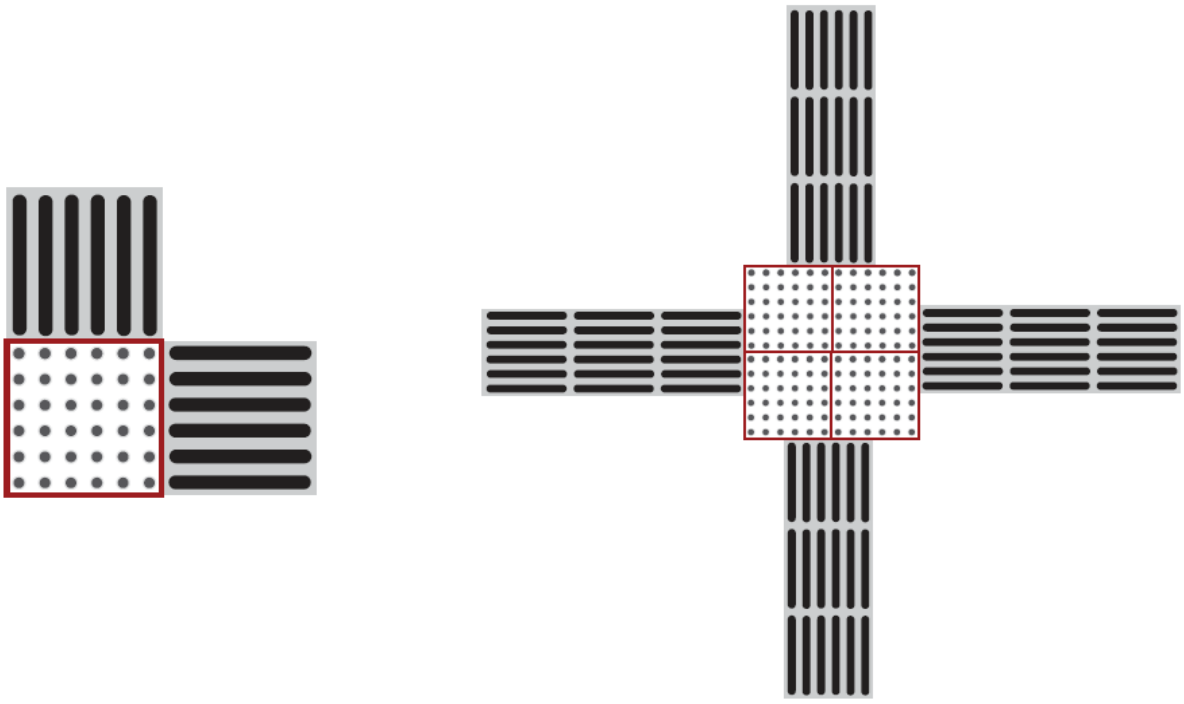

Figure 30: Warning strips with the guidelines (8)

If there is in the waz a grid, then there are two solutions. It depends on the length of the grid. If the grid is bigger then module of the guideline, then the guedline can stop and continue after. If the grid is longer then one module of the guideline, there has to be a constructed warning module. See Figure 31.

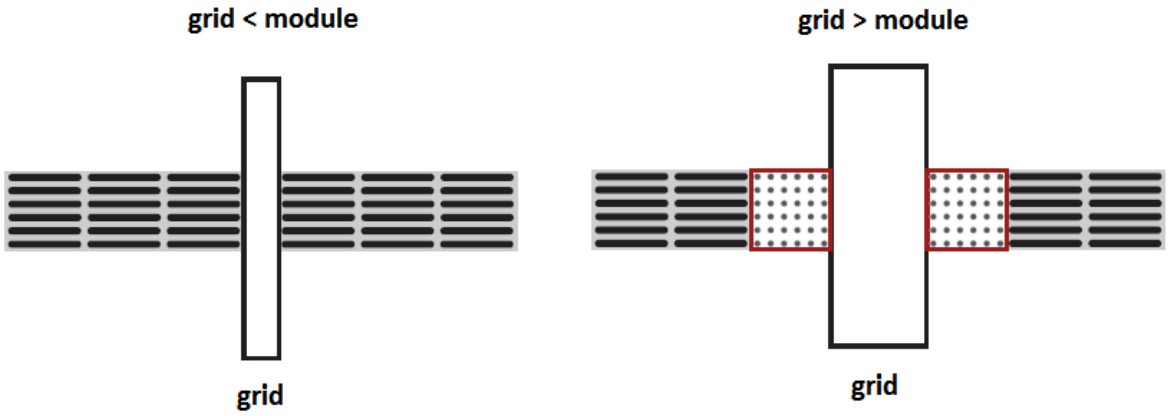

Figure 31: Grid in a way of the guidelines (8)

2.3.6.1. Guidelines

On the ramps or stairs, there must be a warning strip placed from 15 to 45 cm from the center of the guideline. In the ramps, which have a longitudinal slope lower than 5 %, would not be necessary to place a warning strip. SeeFigure 32.

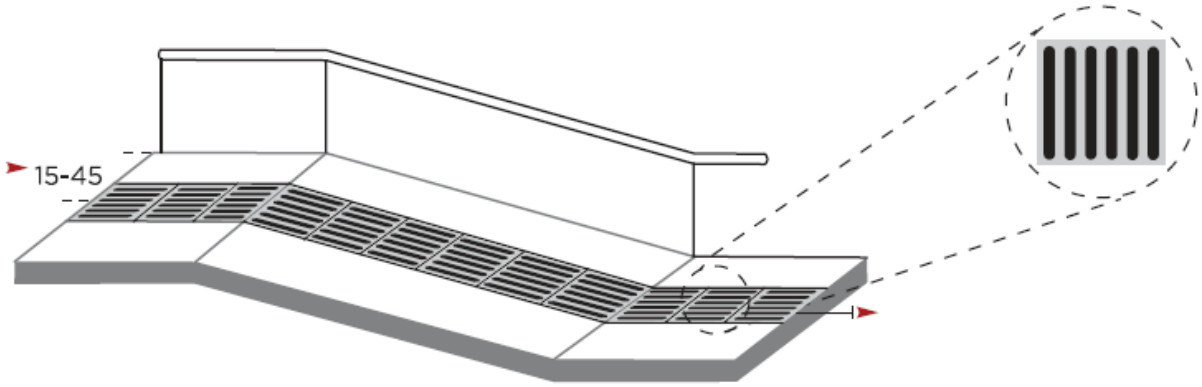

Figure 32: Ramp and the guidelines (8)

2.3.6.2. Warning strip

The pavement is used to indicate warnings: a warning or danger zone, an approach to an object or obstacle, change of address, change of level and end of travel. They are also used to signal the approach to architectural elements, furniture, vertical signaling or object. The warning strip should be placed on the sidewalk, not in the road. There should be a strip of three modules or the minimum width of the junction, by 30 cm long. The crossroad has be minimal 120 cm wide. See Figure 33.

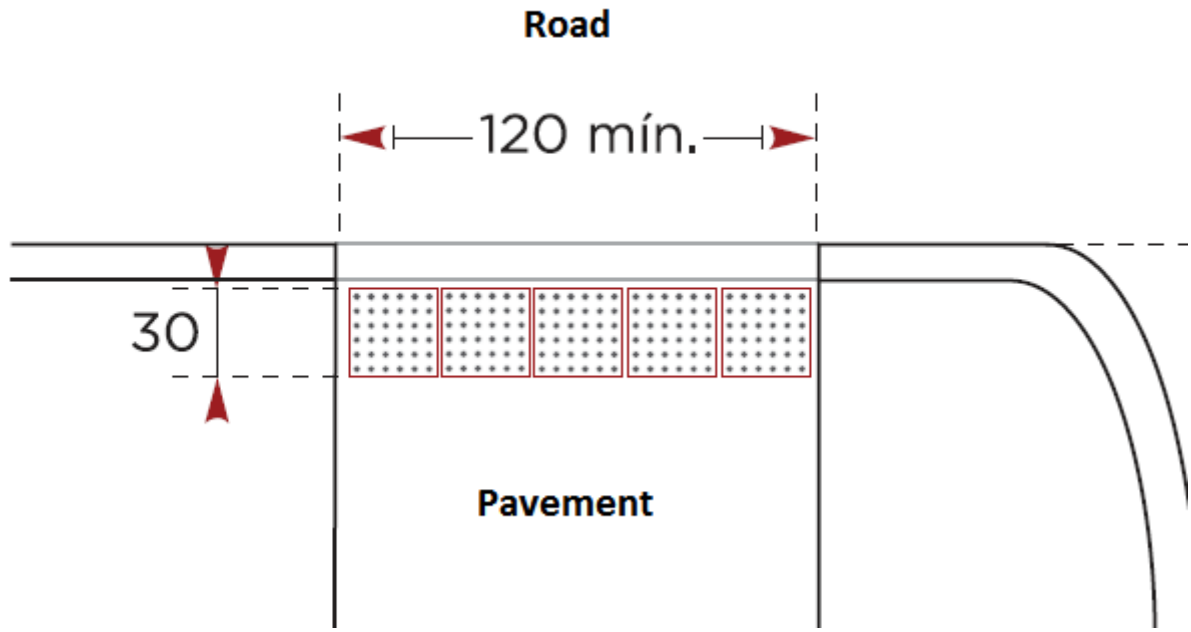

Figure 33: Warning strip on the crosswalk

On the ramps where the longitudinal slope higher is than 5 %, there should be a warning strip of 30 cm in front of the slope. The width is always 30 cm. See Figure 34.

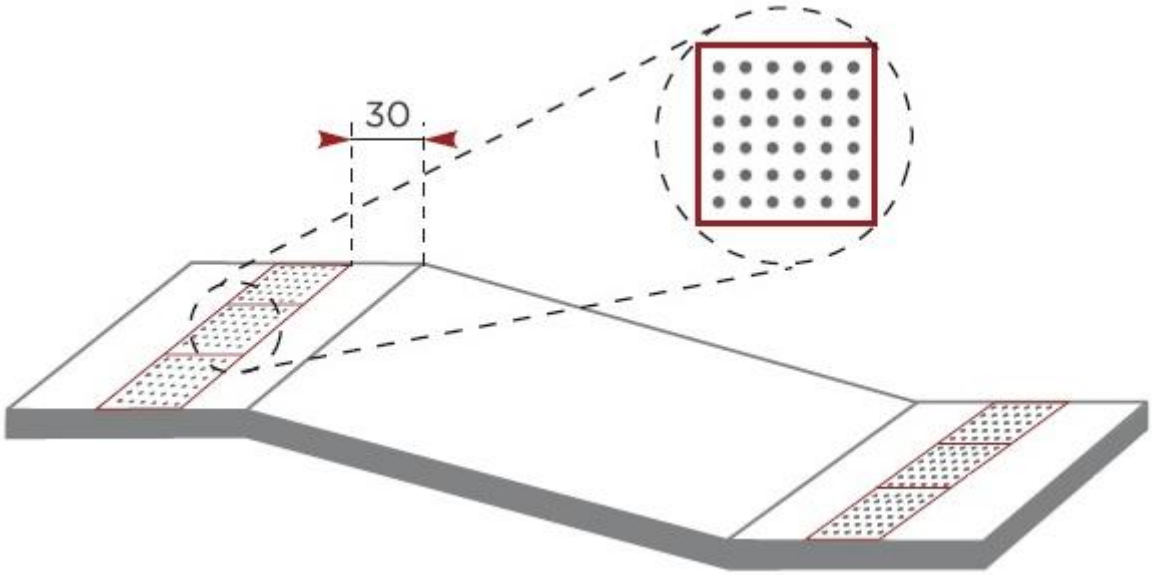

Figure 34: Warning strip on the ramp (8)

3. Czech laws, regulations and standards concerning accessibility for disabled people

3.1. Laws

The following chapter enumerates laws concerning wheelchair accessibility for buildings, roads and communications in general and protected real estates.

3.1.1. Law number 183/2006 Sb.

This law regulates city planning and building construction (building code/act). Among other things, it defines the requirements for wheelchair accessibility in regards to building construction and defines technical standards. It defines persons with limited mobility (PLM, see above) as "persons of advanced age, pregnant women, persons accompanying a child under 3 years or using a pram/baby carriage, mentally handicapped persons or persons with limited mobility or sensory limitation as stated in executive regulation."

3.1.2. Law number 361/2000 Sb.

Road Traffic Law and other related laws amendments. It regulates the rights and obligations of road users, road traffic regulations, driving licenses, delimits jurisprudence and responsibilities of state authorities and the Police of the Czech Republic in matters relating to road traffic. It defines obligations of all the concerned parties with respect to the disabled, as well as the rights and restrictions of the disabled relating to road traffic.

3.1.3. Law number 20/1987 Sb

Cultural Preservation law. It states "The state protects historic monuments as an integral part of the cultural heritage of the people, the evidence of its history, significant environmental factor and irreplaceable wealth of the country. The purpose of the law is to create general conditions for the further deepening of political, cultural and educational functions of the state in regards to cultural monuments, their conservation, availability and appropriate use, so they can contribute to culture, arts, sciences and education, form traditions and patriotism, aesthetic education of working people and thus contribute to the further development of the society."

3.2. Regulations

The following chapter enumerates regulations concerning wheelchair accessibility.

3.2.1. Regulation number 398/2009 Sb.

General technical regulation concerning requirements for ensuring wheelchair accessibility of buildings, states general technical requirements for buildings and their components so as to ensure their use by persons with mobility, visual, hearing and mental handicaps, the elderly, pregnant women, persons accompanying a child up to 3 years or using a pram. (2)

3.2.2. Regulation number 146/2008 Sb.

ČSN č.146/2008 SB. Rozsah a obsah projektové dokumentace leteckých staveb pro ohlášení stavby. 2008.

The regulation defines the scope and contents of project documentation for aircraft facilities, railways and railway facilities, highways, roads, local roads and roads accessible by general population. Defines accessing and using of buildings by a person with limited mobility and building modifications for persons with limited mobility and/or orientation on roads.

3.2.3. Regulation number 133/1964 Sb.

ČSN Č.133/1964 SB. Ministerstva dopravy ze dne 29. června 1964 o silničním přepravním řádu. 1964.

Regulation on road transport rules: "There must be 2 seats reserved in each vehicle for the sick, the disabled and pregnant women and those seats must be clearly marked. If those seats can be reserved in advance, the reservations are sold only to persons for which they are reserved and which prove their claim. For services with mandatory reservations, these seats can be reserved only when all the other seat reservations are sold out."

3.2.4. Regulation number 499/2006 Sb.

The regulation regarding construction documentation lists: "Documentation for building or facility construction, documentation for issuing decision on function change, documentation for issuing decision of change of land use, documentation for issuing decision on an change effects when buildings in the territory change function, joint documentation for issuing decision on joint land and building permits, project documentation for notification on construction, project documentation for issuing decision on building permits, documentation for planned building construction process and documentation of the actual process. It considers wheelchair accessibility of joining areas and roads accessible to general population, as well as building site boundary and any other land requirements for adaptations for persons with limited mobility and orientation on the roads."

3.3. Standards

The following chapter enumerates standards concerning wheelchair accessibility.

3.3.1. ČSN 73 6110

Local road planning. Considers local road areas. Among other things, defines clearway dimensions for the disabled on sidewalks, in-road islets, etc.

3.3.2. ČSN 73 6425-1

Bus, trolley and tram stops, transfer joints and stations. The standard defines terms for placing of the bus, trolley and tram stops, their layout, marking, signs and equipment. Suggests wheelchair access general rules and parameters regarding the stops.

3.3.3. ČSN EN 81-40

Safety rules for construction and installation of lifts. Part no. 40 defines “a stair lift” as a device for the transport of persons sitting, standing or in a wheelchair on a guided platform that moves along an inclined track. Stair lifts are not suitable for use by general public.

3.3.4. ČSN EN 81-70

Safety rules for the construction and installation of lifts. Part 70 defines specifics for lifts intended for the transport of persons and goods – wheelchair accessibility including persons with limited mobility and orientation.

3.3.5. ČSN ISO 9386

Machine-powered lifting platforms for persons with limited mobility, part 1 (vertical lifting platforms). The standard specifies safety regulations, dimensions and requirements for operation for permanently mounted powered lifting platforms intended for persons with limited mobility.

3.4. Institutions

In The Czech Republic concern about the inclusion of persons with handicaps has steadily increased. The telltale sign is the number of organizations formed to support, promote or inform people with limitations. The situation in the cities is improving thanks to these organizations. They also provide support for people in wheelchairs. Some of these organizations will be described in this chapter.

3.4.1. Prague Wheelchair Users Organisation (POV, Pražská organizace vozíčkářů)

“POV is an association of citizens moving in a wheelchair, their family members and friends who have the best knowledge of their needs, for people who provide assistance to people with similar problems."

POV is a citizens’ association was founded in 1991 to provide services to people in wheelchairs, helping them to participate actively in civic life and provide equal conditions as have people without limitations. The purpose of POV activity is the integration of people with limitations into society so they themselves can lead good and active lives.

POV is trying to achieve these objectives by improving legislative conditions leading to the elimination of obstacles in architecture, transport etc. (23)

3.4.2. National Council of People with Limitationies (NRZP, Národní rada osob se zdravotním postižením ČR)

NRZP is a citizens' association, which represents persons with limitations in negotiations with government and public institutions. NZRP defends human rights and contributes to the integration of people with limitations by commenting on standards and the proposed implementation of "inclusive" projects in all areas concerned. (24)

3.4.3. Handicap transport

The company operates wheelchair accessible minibuses for people with limitations and on its website states: "The reason why we operate this service is the fact that people confined to a wheelchair have slim chances for passenger transportation due lack of fully accessible public transport. Without this service, many would not get e.g. to doctors, schools, cultural or even on a vacation. This service is not used only by individuals, but also by various civic associations throughout the Czech Republic to organize various courses, conferences, cultural and sports events." (25)

3.4.4. Societa, o.p.s.

Charitable company (o.p.s.) Societa provides full transport service for people with restricted mobility. The company's goal is to enable these people to fully participate in everyday life and have access to health services, cultural and social events.

The company frequently transports clients to homes for the elderly, sheltered workshops, medical facilities and rehabilitation centers, social and cultural events, etc. Vehicles are designed to carry up to six wheelchairs and are equipped with wheelchair fixtures and electric-powered elevating platforms. (26)

3.4.5. SONS - Sjednocená organizace nevidomých a slabozrakých ČR (Czech Blind United)

SONS is the organization where people who are blind or partially sighted, along with their families and friends can learn about the blindness. SONS provides social and other related services. Their motto is:

"We are not an organization that decides for the blind and acting; We are blind citizens who decide and act for themselves." (27)

3.5. Internet resources

3.5.1. VozejkMap.cz

VozejkMap.cz is a web application containing a database of wheelchair accessible places in the Czech Republic. Accessible sites are entered and verified by the users themselves. Regional institutions and portals are also involved. (28)

3.5.2. Imobilita.cz

Imobilita.cz is website with the moto "For an easier life". The site acts as an information server, which contains information about wheelchair accessible transport, mobility aids and advice on how to arrange housing for a wheelchair user. There is also catalogue of driving schools for the disabled. (29)

3.6. Wheelchair accessibility in public transport

In the process of designing wheelchair access, it is necessary to think of all groups of disabled people. All environments should be wheelchair accessible as soon as possible. In subsequent chapters, I will address only access for wheelchair users.

Spatial dimensions and maneuvering areas when designing buildings and roads are derived from the needs of people in wheelchairs and people with prams/baby carriages. This is because these dimensions are larger than the dimensions required for the passage of people with crutches, white stick or a walker. The dimensions are primarily larger because of medical devices these persons use. Dimensions of a wheelchair and a pram are therefore a limiting factor for the design of buildings and roads. (30)

3.6.1. Basic parameters and properties of wheelchair accessible environment

Regulation number 398/2009 Sb. defines minimum dimensions for accessible spaces and maneuvering areas for disabled persons. The regulation is aimed at people in wheelchairs, people with a pram and blind people. (30)

3.6.2. Solutions for people with limited mobility

The solutions are based on the needs of people in wheelchairs, people with a pram, people using crutches, canes, walkers or other walking aids, pregnant women and persons accompanying children under three years of age.

The basic size of wheelchair is set to 120 cm x 80 cm. Width requirements for self-sustained motion are 90 cm for wheelchair and 70 cm for prams. (30)

3.6.3. Height difference

Maximum height difference on the roads for pedestrians is set at 2 cm, otherwise an elevator, ramp, sloping platform connected to the communication with a longitudinal inclination or other technical devices must be present. (30)

3.6.3.1. Longitudinal slope

The pavements for pedestrians may have a slope not exceeding the scale of 1:12 (8.33 %). This parameter must be taken into account e.g. when designing routes with the longitudinal slopes (on the sidewalks). For sloping ramps with length up to 3 m, the maximum slope is set at 1:8 (12.5 %).

Sections steeper than 1:20 (5.0 %) and longer than 200 m must have resting areas – a landing of 150 cm of length at least. Landing inclination may be only in one direction and not more than 1:50 (2.0 %).

Failure to comply with these values may put unassisted wheelchair users at high risk. (30)

3.6.3.2. Cross slope

Pedestrian routes' cross slope must not exceed 1:50 (2.0 %), and bridges are restricted to 1:40 (2.5 %).

Failure to comply with these values makes riding in a wheelchair very exhausting. There is much greater force pressing on the inner wheel thus the resistance of the ground (pavement) is greater. (30)

3.6.3.3. Anti-slipping measures

The surface of pedestrian areas must be even, solid and proofed against slipping. The friction coefficient must be min. 0.5 for horizontal surfaces and 0.5 + tangent(α) for sloping surfaces. This parameter should be complied with on pavement surfaces, stairs, sloping ramps, but also on internal communications or bus stops. If the surface is a grid, the maximum gap alongside the walking axis must not exceed 1.5 cm.

The higher the slip resistance, the safer are the users. This is also applies to bus floors, where complying with the coefficient provides stability to standing persons. (30)

3.6.3.4. Passage width

Passage width varies widely depending on traffic intensity and traffic participants. For one-way traffic, pedestrian road width is set at 90 cm.

Two-way routes are more common and their width is set by the standards to a minimum of 150 cm.

My design proposes width of 180 cm, so a route can be used by 2 users simultaneously, they can walk side by side even when there are:

- two wheelchair users
- or person with a pram and a person in a wheelchair
- or a person with a pram and two pedestrians.

Space requirements are shown in Figure 35.

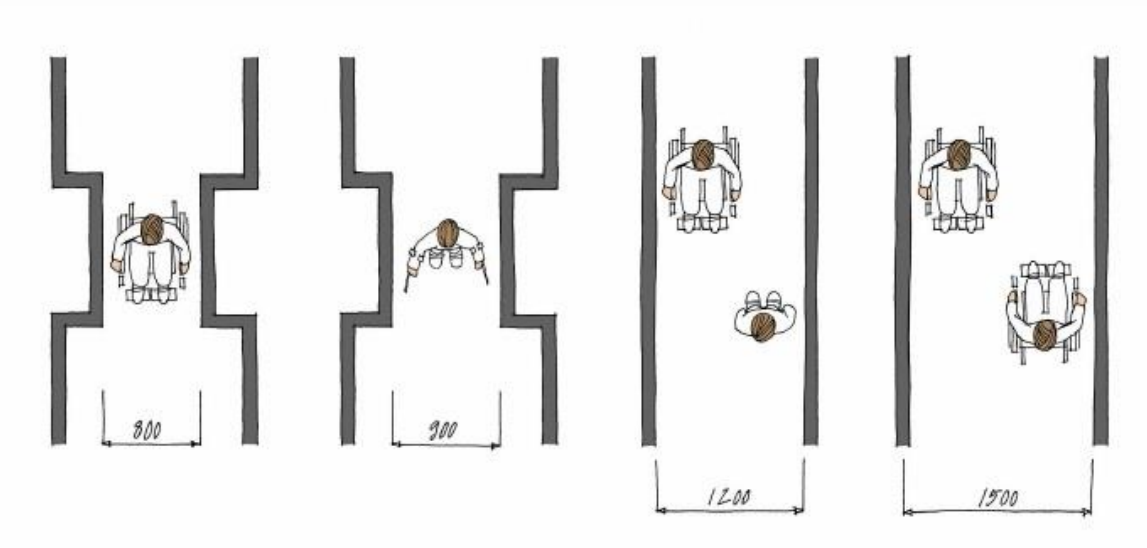

Figure 35: Proposed pass-through dimensions (30)

In the case there is no place for two-way traffic along the entire length of the road it is possible to design the route with width of 120 cm with maneuvering areas. Maneuvering area is the only area where it is possible for a wheelchair user to pass/overtake another wheelchair user. This added space should be at least 200 cm in length and at least 60 cm wide (30)

3.6.3.5. Maneuvering area

Necessary maneuvering requirements to rotate from 90° to 180° are:

Pedestrian	60	x	60	cm
person with baggage	110	x	110	cm
person on crutches	120	x	120	cm
a person in a wheelchair	120	x	150	cm

This space is needed wherever a wheelchair is supposed to rotate.

Minimal maneuvering space for turning the wheelchair to an angle greater than 180 ° is a circle with a diameter of 150 cm. (30)

3.6.3.6. Reaching distances of wheelchair users

A wheelchair user is able to reach to a maximum of 120 cm and 25 cm above the ground. Therefore, all objects used by people in wheelchairs, should be positioned within this range.

To the sides users are able to reach objects with one hand within a half-circle with a radius of 60 cm; the center of the circle is their spine. We must consider the fact that a person

in a wheelchair approaches an object at a distance of the length of the arm and shoulder from the outer boundary of the wheelchair. All the necessary objects for a person in a wheelchair should thus be located within 40 cm of the sides of the wheelchair.

Regarding the range of hands in front of wheelchair, a person in a wheelchair reaches to the distance marked by their legs. Without tilting forward (some users are not capable of this maneuver) a person reaches to the distance of 60 cm. (30) Reaching distances are shown in Figure 36.

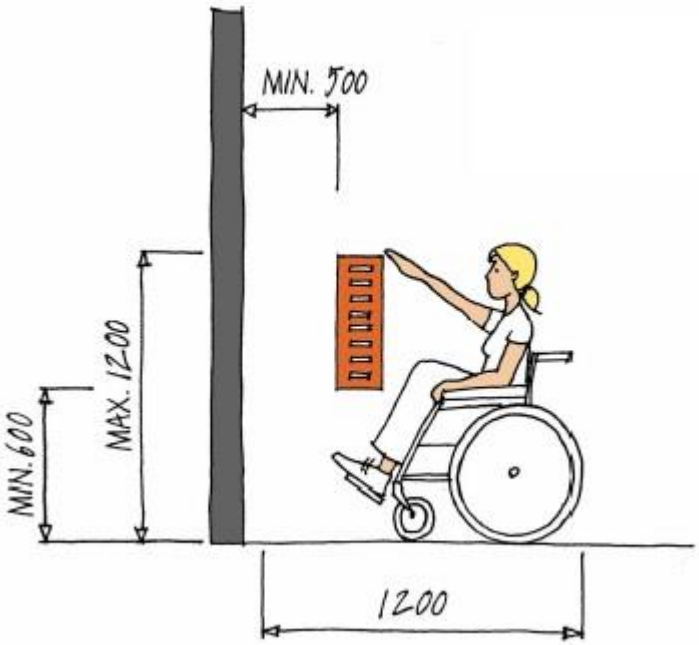

Figure 36: Reaching distances of wheelchair users (30)

Controls must be placed between 60 to 120 cm above the floor and at a distance of 50 cm from fixed objects. Controls include light switches, fire alarms, communication systems, bell panels, etc. The distance for the individual elements varies minimally. (30)

3.7. Wheelchair accessibility of roads and public areas

3.7.1. Pedestrian crossings

Pedestrian crossings are an essential part of both large and small towns. They enable safe crossing from one side of the street to the other. Pedestrian crossings are used by people without limitations, by wheelchair users or by people with other limitations. Transition while crossing poses a risk for people without any limitation – this risk is much higher for people with limitations.

For the safety of wheelchair users and other disabled people, it is very important to comply with the slope and height differences limits. Buildings and adjacent constructions must meet

regulatory requirements, so the construction style is uniform and individual elements connect seamlessly.

Pedestrian crossings without traffic lights can be designed across two lanes with different traffic flow. The newly designed roads have the largest undivided length of the transition between curbs of a maximum 650 cm. When adapting already finished crossings this number can be increased to 700 cm.

Pedestrian crossings controlled by traffic lights are always built over two or more lanes. Crossings such as those on newly designed roads have the largest undivided length of the transition between curbs of a maximum 950 cm.

The adjacent inclined surface slopes used by pedestrians may be maximum of 1:8 (12.5 %) for longitudinal slope and 1:50 (2.0 %) for cross slope. Pedestrian crossings and places for crossing[1] must meet all of the aforementioned properties. (2)

3.7.2. Parking place

On all designated exterior and interior and parking areas and in collective garages for personal motor vehicles there must be reserved parking space for vehicles carrying physically disabled persons. The following are minimums based on the total number of parking places:

2 to 20 parking places	1 reserved parking place
21 to 40 parking places	2 reserved parking places
41 to 60 parking places	3 reserved parking places
61 to 80 parking places	4 reserved parking places
81 to 100 parking places	5 reserved parking places
101 to 150 parking places	6 reserved parking places
151 to 200 parking places	7 reserved parking places
201 to 300 parking places	8 reserved parking places
301 to 400 parking places	9 reserved parking places
401 to 500 parking places	10 reserved parking places
501 and more parking places	2 % reserved parking places

[1] Crossing is marked by horizontal (V7) and vertical (IP6) traffic signs and pedestrians have the right of way, places for crossing do not have this right.

Expressed in percentages, the number of reserved parking places is from 2 % to 5 %, depending on the number of parking places. (2)

3.7.3. The barrier free buses

There are 826 barrier free busses of the total amount of 1242 busses. The first barrier free buses were used in the year 1994. The public transport company always cooperates with the Prague Wheelchair Users Organisations and the United Organisation of the Blind and Visually Impaires while designing the internal organization of the bus (e.g. marking and signaling elements).

The barrier free buses are on most of the lines. There is one special line (the whole barrier free), which means that there are stops, barrier free elevators (to the metro) and other conditiones for disabled people. (31)

Figure 37: Bus with the ramp (31)

3.8. Solutions for visually impaired persons

Solutions for people with visual impairment are based on dispositions, capabilities and needs of: (30)

- the 100 % blind person, who uses a white cane, command radio, or a guide dog
- the person partially blind or otherwise visually impaired – purblind, sand-blind.

3.8.1. Guidelines

The guidelines help blind and purblind persons orient themselves indoors and outdoors. No objects are placed on or near the guidelines; guidelines can be natural or artificial.

A natural guideline is a natural part of the environment, e.g. wall of a house, curb or railing with white cane stoppers.

An artificial guideline is a specially designed part of the building used for the orientation of people with visual impairments. An artificial guideline consists of grooves width at least 30 cm wide indoors and 40 cm outdoors. Changes of direction and branches are set up primarily at right angles. Branching must be marked by interrupting the guide line smooth surface at a length corresponding to the width of the guide line. No obstacles can be closer than 80 cm from the axis of the artificial guide line (each side). An artificial guide line must follow a natural guide line. (30) (32) (33) (34)

3.8.2. Signal strip

A signal strip is a special form of artificial guide line indicating the spot where the guideline branches to signal an important point. It determines (among other things) access to the pedestrian crossing or access to stairs. The signal strip must have a width of 80-100 cm and the length of guidance must be at least 150 cm; when adapting already finished buildings this can be reduced to 100 cm in justified cases (see Figure 19). (30) (32) (33) (34)

3.8.3. Crossing guidelines

Crossing guidelines are a special form of artificial guideline which serves visually impaired persons when orienting on a crossing. Crossing guidelines are made only when the crossing distance is greater than 800 cm. It must have a minimum width of 55 cm and consists of 2 x 3 or 2 x 2 strips. (30) (32) (33) (34)

3.8.4. Warning strip

The warning strip is a special form of artificial guide line, which marks an inaccessible or dangerous spot for people with visual impairments. Its main goal is to provide tactile marker for curb-to-lowered pavement spot. The warning strip must have width of 40 cm and have a clearly different surface (see Figure 38: Signal and warning strip). (30) (32) (33) (34)

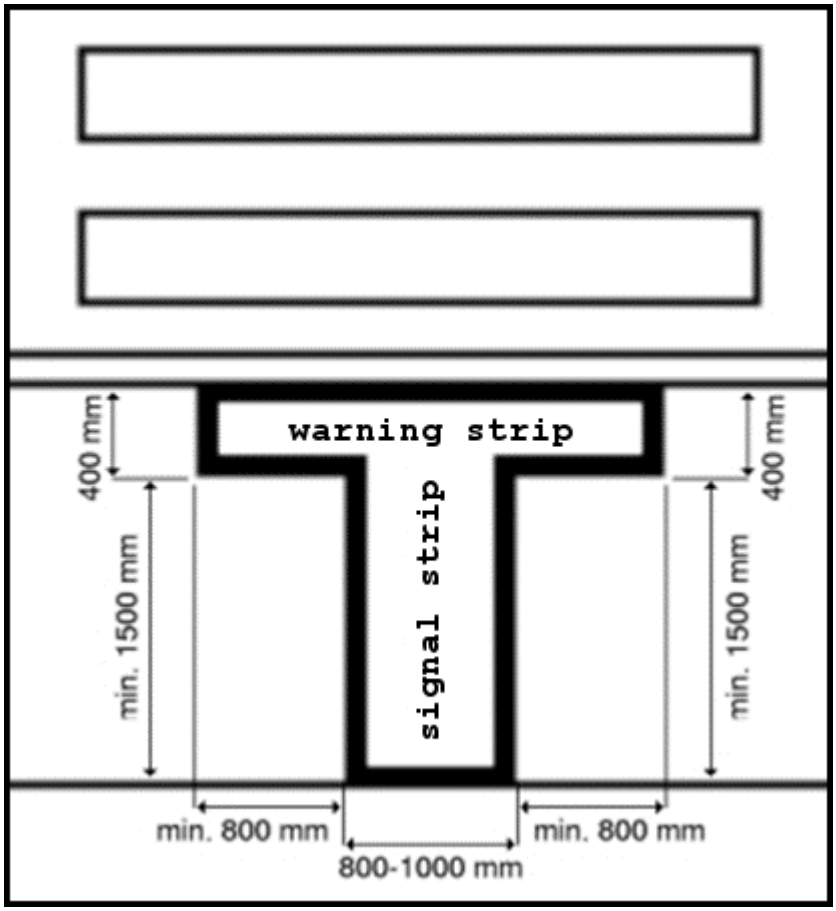

Figure 38: Signal and warning strip (34)

3.8.5. Blister tactile

Blister tactile is a special form of warning strip delimiting areas on sidewalk which is shared by pedestrians and bicyclists (or in-line skaters). Blister tactile must have width between 30 and 40 cm. Surface to distance of at least 25 cm of strip must be flat on both sides. Blister tactile must overlap the signal strip on both sides at least 80 cm. (30) (32) (33) (34)

3.8.6. Elevators, lifting platforms, escalators and moving walkways

Elevator and entry point controls must rise above the surface of the surrounding area by at least 0.1 cm. Embossed markings shall not be engraved and to the right of a control must be the appropriate Braille character written with standard type and size. (30) (32) (33) (34)

3.8.7. Pedestrian crossings

Crossings with traffic lights must be fitted with an acoustic signal reserved for roads. Pedestrian signal control must not be positioned further than 75 cm from a safe distance and mostly be at the axis of the signal strip. (30) (32) (33) (34)

3.8.8. Acoustic signals

Acoustic signals under Regulation number 30/2001 Sb. are used for orientation of visually impaired persons together with pedestrian lights used by pedestrians and bicyclists. Acoustic signal is regularly interrupted sound (“ticking”) at 450-550 Hz. Ticking frequency is approximately 1.5 Hz to signal Stop! And about 8 Hz signal for Go. On some crossings personal control radio must pressed to activate the acoustic signal. (30) (32) (33) (34)

4. Evaluation of the route from the student apartment, Felipe Angeles, to the University Tecnológico de Monterrey

Around the University there are lots of apartments, where mostly students from TEC (Tecnológico de Monterrey) live. These apartments are up to 15 minutes away from the TEC. The students living in these apartments are walking to and from the school, which means they are using the sidewalks and streets. The interior of the TEC is built with barrier-free accesses, so if there are disabled students who are attending the school, they should be easily able to travel from the TEC to their houses.

I have chosen the apartments Felipe Angeles in the Felipe Angeles Street 178 because I am living here. The apartments are 10 minutes distance from the TEC, 750 m away. From the apartments, where approximately 380 students of the university Tecnológico de Monterrey are living, there are three different bus routes. All of them are the same length, 750 m. The "orange" route is on the main street and the "blue" and "yellow" routes are in a residential neighborhood. The colour of the routs does are chosen just to distinguish the routes.See Figure 39.

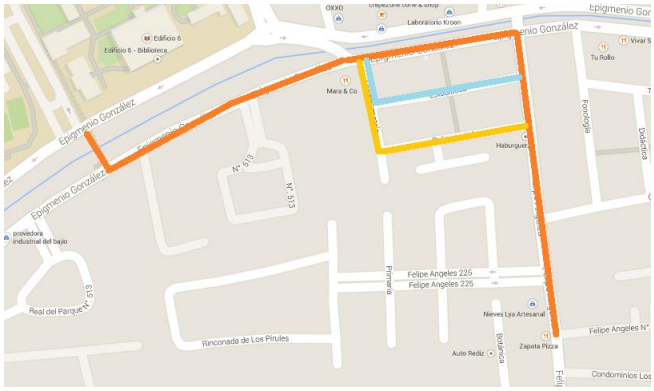

Figure 39: Map of the evaluated way: departments – university

4.1. The "orange" route

This way is supposed the be the best way for disabled people, because this way is in the main street and there is enough space for the barrier-free transportation. Also, it is the main conection between the main street Epigmenio González and downtown. See Figure 40.

Figure 40: Departments

The first problem is inside the departments, where there is a step which is 16 cm high and there is no secure way how to get down or up. See Figure 41.

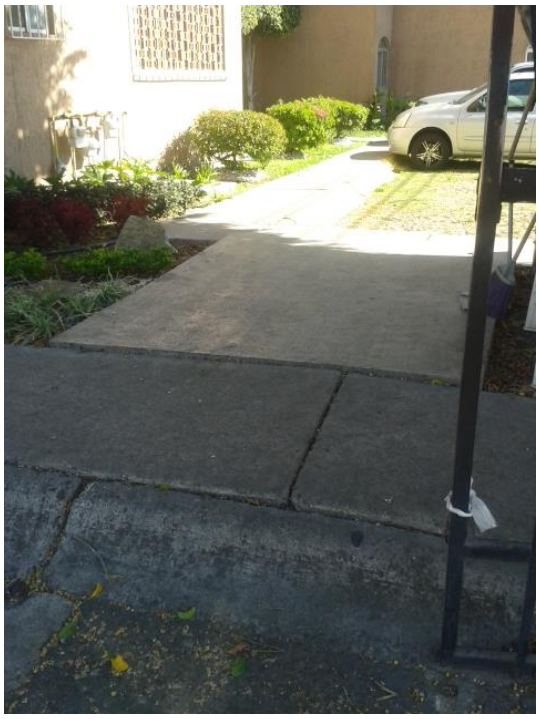

Figure 41: Step in front of the department

On the main street Felipe Angeles it is possible to walk on both sides of the street. But on both sides we can find many problems (eg. not enough space, trees and public lights in the middle of the sidewalk) or destroyed sidewalk as you can see in following figures. In Figure 42 you can see the hole, which is 23 cm wide and 8 cm deep. As written, the uneven areas can vary in height by up to 1.5 cm, which is far from reality in this case. Also you can see the longitudinal slope which can be uncomfortable for the wheelchair user as well as disabled people with other equipment.

Figure 42: Hole on the main streets sidewalk and the longitudinal slope

In Figure 43 you can see the step to the sidewalk, which represent an irresolvable problem for disabled people. In this case they can not get to the sidewalk without help of other people Also, this makes it dificult for mothers with strollers who need to navigate the streets. So, here we are able to see what can happen when we do not build the barrier free accesses that people need. The height of the sidewalk is 12 cm, which is not up to standard.

Figure 43: Step on the sidewalk

In Figure 44 we can see the other step to the sidewalk from the street 6 cm is above the permitted hight difference.

Figure 44: Other step to the sidewalk

In Figure 45 we can see the problem of trying to pass by the tree to the tree. Here in Querétaro, it is very common that the width of the sidewalk is correct according to the law, but there is a growing tree on the edge of the sidewalk, which allows less space for pedestrians. Also there is a bus stop at this location, so it is sometimes difficult to pass between the waitting people, the tree, and the uneven sidewalk. This section is impossible to pass In a wheelchair or with other walking aids.

Figure 45: Unevens on the main street

In Figure 46 we can see the parking lot dedicated for disabled people. The parking lot is in front of the shop OXXO. The shop is small and there are only 3 parking spaces, that is why this parking lot is mostly occupied by cars with disabled parking permits and also by the people without the permition.

Figure 46: Parking lot dedicated for disabled people

As we can see, the entraces to the shop features a ramp. In general most of the shops in Querétaro have the barrier free entrances and parking lots. See Figure 47.

Figure 47: Entrance to the shop OXXO

Continuing into the main street, we can see many uneven areas, which are deeper than the law allows. It is caused by destruction, maybe from age, and maybe from the pedestrians not caring about the sidewalk. Able people also have to be aware of not falling down, because the uneven areas are high for them as well as for us. See Figure 48.

Figure 48: Main streets sidewalk

In Figure 49 we can see the surface of the street, which has to be crossed to continue on the way to the university. There are two problems. The first problem is that the stones,

which have larger gaps than permitted, and the wheelchair cannot pass. The second problem is the change of material, which can be difficult and uncomfortable to cross.

Figure 49: Surface of the street

In Figure 50 we can see another high step to the sidewalk, which also causes problems to elderly people as well as to young people. But especially the disabled are unable to walk here. You can see the step from both sides in Figure 50 and Figure 51.

Figure 50: Very high step to the sidewalk

Figure 51: Same step to the sidewalk from the other side

In Figure 52 and Figure 523 you can see correct passing signals (yellow ones), but again you can see the high steps. I saw a person in a wheelchair walking on the street because she could not get up onto the sidewalk.

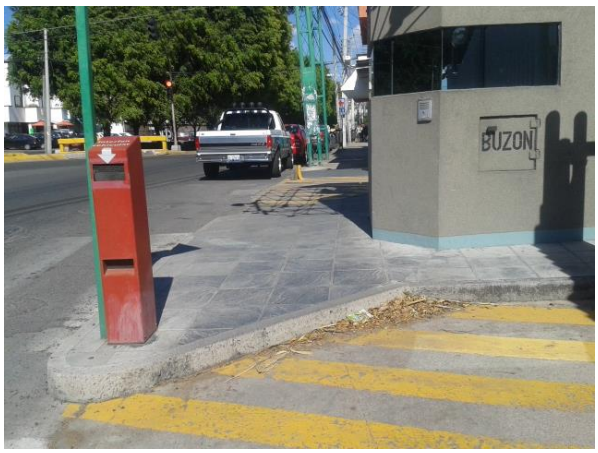

Figure 52: Step to the sidewalk

Figure 53: Step to the sidewalk

In Figure 54 you can see the unevenness which can be caused by the growing tree. In this case the walkway follows the rule that the sidewalk should be wide 90 cm, but because of the tree the surface is destroyed and passing is impossible.

Figure 54: Unevenness caused by the tree in the sidewalk

4.2. Conclusions from the observed walkway

The walkway from the apartment to the university has 6 steps to the sidewalk and 5 uneven spots, one of which is 150 m long. This condition of the sidewalk is such that disabled people can not walk on the sidewalk, and they are forced to walk in the street or in many cases not to walk this way. Even for people without a disability this sidewalk is not that easy to walk, because people have to take care with each stepsince the unevenness never stops and in every meter there is the risk of an injury by stepping in a hole.

4.2.1. Felipe Angeles street

On this street there is enough space for changes because the width of the whole street is 11.5 m, so if we assume that there are two lanes for cars (3.5 m), the rest is for the sidewalk.

Now, the sidewalks are wide: the left one is wide 1.5 m and the trees and public lighting take 0.5 m from the sidewalk on the side of the roadway. So it means that for walking there is left just 1 meter in the better areas. I say in the better areas because the problem in Querétaro are the trees whose branches are very low. Sometimes they even begin at the height of 1.2 m.

The other problem with the sidewalk is the surface, which has a lot of bumps. With the word "unevens" I mean that the sidewalk used to be in better condition, when it was built.Now nature has changed the even surface to a surface where it is dangerous to walk even for non-disabled people. Mostly it is the problem of the panels which have moved over the years. So at the border of each panel there is always an bump. Unfortunately, most of the bumps are more than 3 cm, which causes big problems for disabled people. In the worst cases the bumps are caused by tree roots which are more powerful than the panel. It means that the panels get destroyed or form a little mountain over the root. This surface is absolutely incompatible with driving a wheelchair. Also the bumps in the middle of the street are unexpected by anyone, so the blind people can have difficulties which can also cause some injuries.

In conclusion, I want to point out that the Mexican people are accustomed to less personal space and for me when I came here this space was really small. Maybe that is why the sidewalks are in bad condition, because the mexicans do not care that much about their personal space andthey are happy with what they have. But this is just my opinion from living here. The more technical view has been already written. Walking on the street, people have to be aware of the surface of the sidewalk and also of the trees.

The roads which are in figure 15 marked in yellow and blue once are in much worse condition than the orange (main) road. The biggest problem is the surface of the roadway. So disabled people would not be able to cross the street without any help of other people. The sidewalk does have a lot of rough spots, which are caused by the garage entrances to family houses. Because there is not a solution which will make a compromise for both the residents and disabled people we have to choose just the main street to use for a walkway from the apartment to the university.

4.2.2. Changes on the orange route

As described above, it is more than clear that the walkways should all be changed. On the street Epigmenio Gonzales the width is 1.9 m and the next 0.6 m is allocated for the trees and the public lighting. The only thing that should be changed here is the surface of the sidewalk (they should be changed) and the roots of the trees which extend into the sidewalk.

Bigger changes should be made to the Felipe Angeles Street. In figure 31 you can see the current state of the street. The whole walkway is 1.8 m wide but the tree is taking up 0.8 m

of the sidewalk, so there is just 1 m for walking space. But also the tree has very low branches, so we should cut the tree and make the space 2 m high, where we need the same space as for our feet. See Figure 55.

Figure 55: Current state of tha sidewalk on the Felipe Angeles Street

My proposal for the changes is in Figure 56. The sidewalk should be made wider by about 30 cm and also the public lighting and the trees should be moved 20 cm closer to the street. According to the Reglamento de Construcción para el municipio de Querétaro the minimum width has to be 120 cm. (35)

In Figure 57 you can see a whole cross-section of Felipe Angeles Street. The whole width of the street is 11.5 m so it is enough space for the two lanes and to make the sidewalk wider. There would not need to be any displacement of houses.

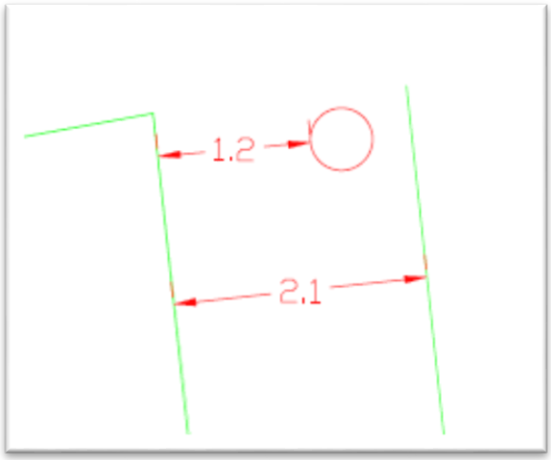

Figure 56: Changes to the sidewalk

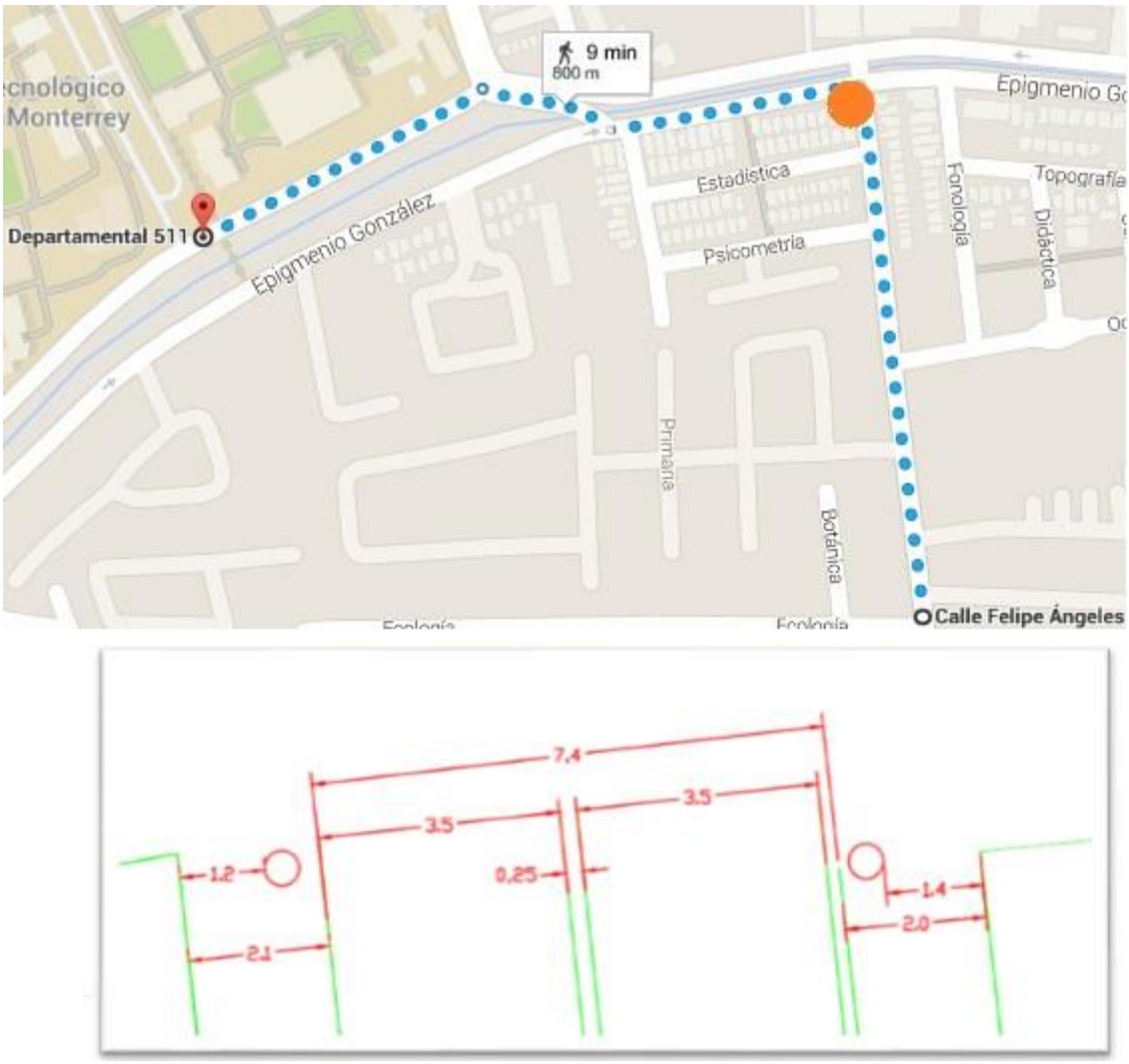

Figure 57: Changes to Felipe Angeles Street

Speaking of Epigmenio González Street, there is enough space on both sides of the street. The whole street is 60 m wide. Each lane is 3.5 m wide and the sidewalk close to the university is 3 m wide, which is absolutely satisfactory for transport by wheelchair in both directiones. The only thing that should be changed are the bumps in the panels.See Figure 58 and Figure 59.

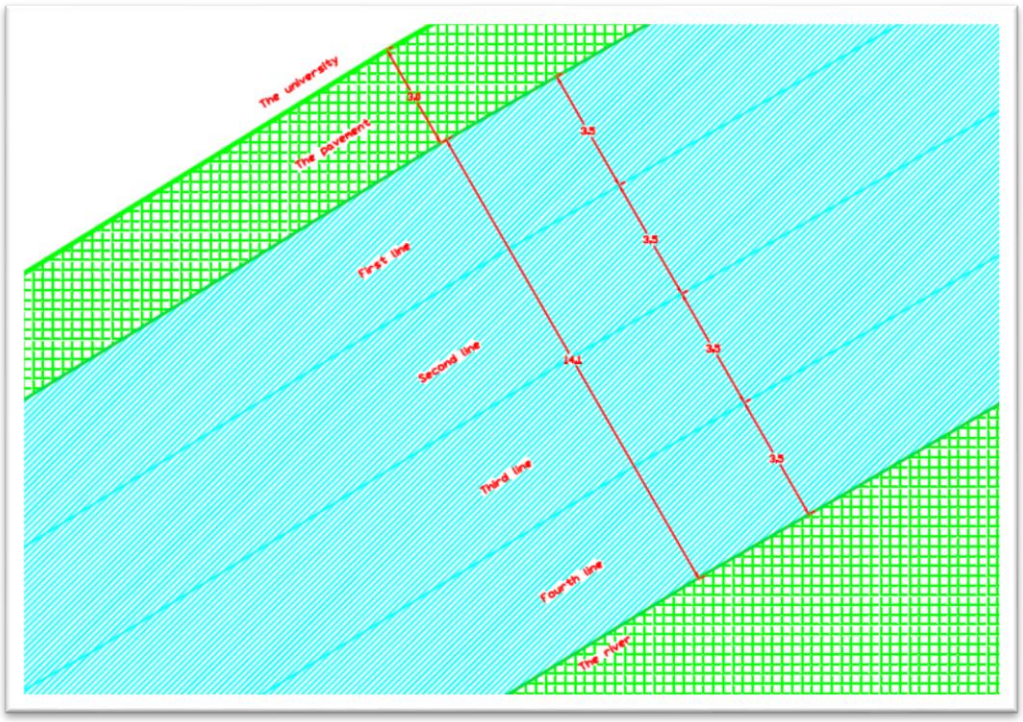

Figure 58: Epigmenio González Street next to the University

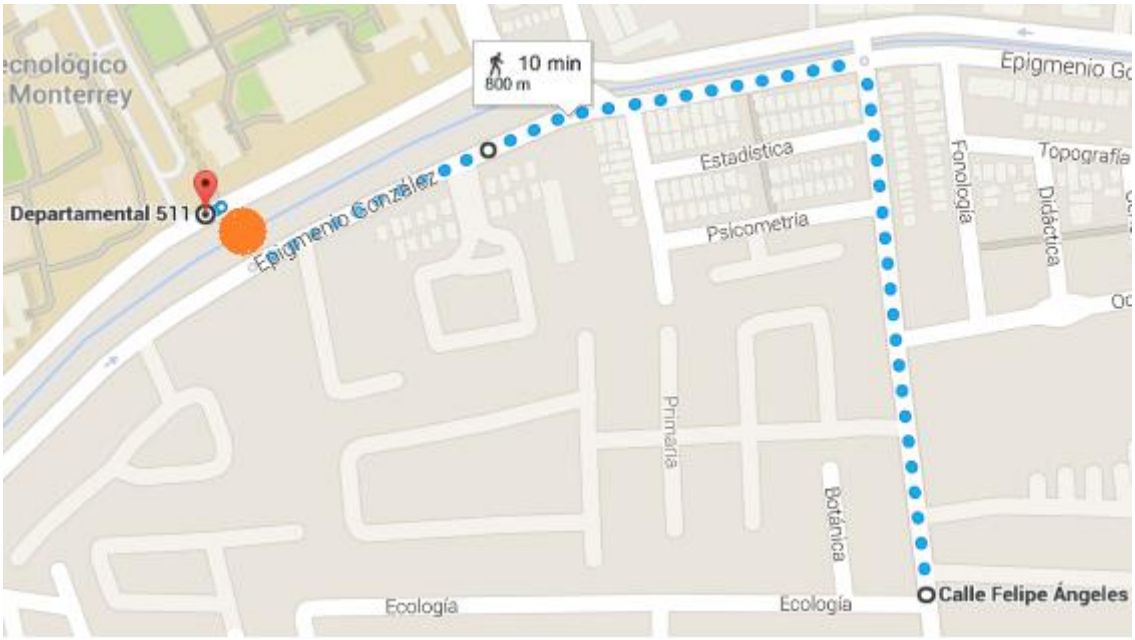

Figure 59: Map of the projected street

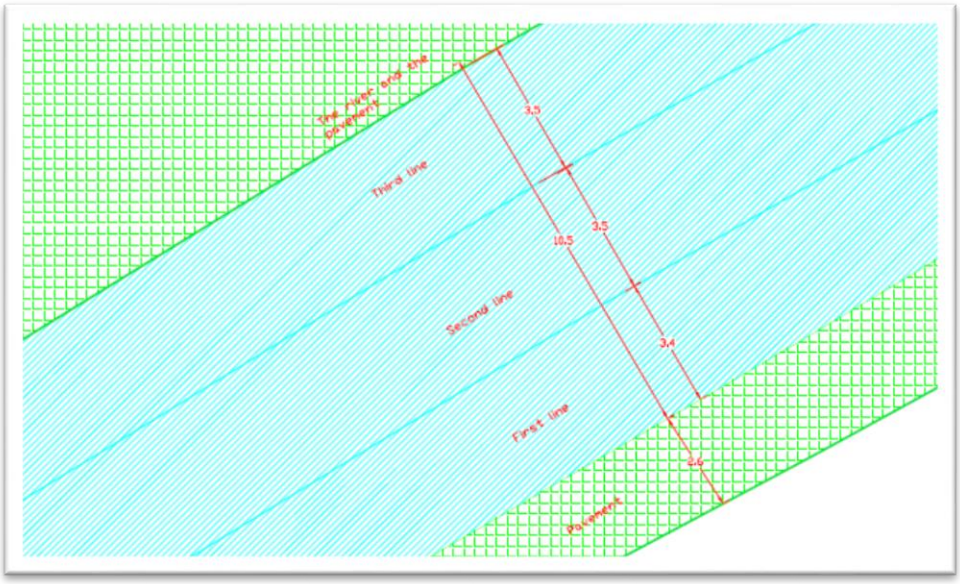

Figure 60: Epigmenio González Street on the other side of the University

The situation is the same on the other side of the main street Epigmenio González, where the sidewalk is 2.6 m wide. This is also satisfactory for disabled people to walk. The only change which should be made is the surface. Figure 60 and Figure 59.

5. Evaluation of the closest bus stops

As well as I evaluated the route from the apartments, there should be proposed some changes from the bus stops close to the TEC. There are students comming from further and using the public transportation, so in this chapter I will evaluate and suggest new proposal for the access.

There are three entrances to the school. One entrance is from the street Epigmenio González, which is also a station for the taxis. The other one is the entrance from the street Ezequiel Montes, which is also the main entrance for the cars of students and teachers. The last one from the street Prologacion Tecnológico Norte is also an entrance also for cars, but not into the whole school. See Figure 61.

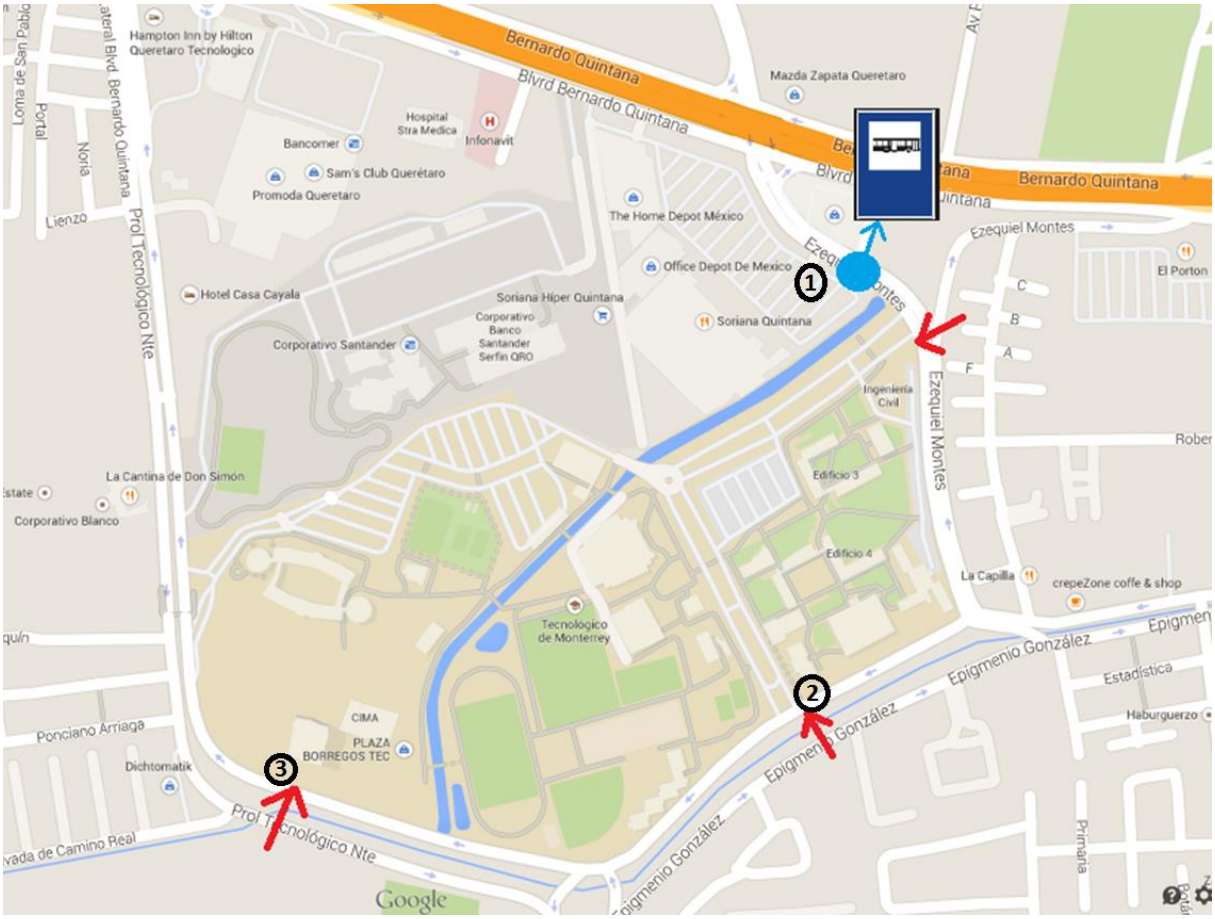

Figure 61: Map of the entrances to the school and the bus stops

5.1. The bus stop on the street Ezequiel Montes and the transportation to the main entrance for cars

This bus stop (in Figure 62) is used also for the customers of the shop Soriana, which is a grocery and department store retail chain 100 % capitalized in México. This means that this is one of the lesser bus stops, where there is a bench and a sign. To help you understand, in Querétaro there are not a lot of bus stops which are easy to notice (meaning, ones marked

with appropriate signage). Mostly the buses stop where people want to get off. This bus stop is 100 % without a problem for barrier free transportation. I would just propose to my engineering colleagues to change the buses which are used now (Figure 62) for the buses with a ramp. The buses used these days in Querétaro have 3 steps which are sometimes also problematic for the non-disabled people. The best solution is a low-floor bus.

Figure 62: Bus stop on the street Ezequiel Montes

Figure 63: Bus in Querétaro

Continuing from the bus stop to the entrance of the school, the first steps are on the sidewalk, which is wide 1.2 m and the surface is satisfactory. To get to the entrance for the wheelchairs one must cross the big street which comes out ofthe school. On this street there are only cars coming to the school or leaving the school. There are 8 lanes for the cars, so it comes to 28 m. The median between the two directions is enough for disabled people to rest. The only problem is the height difference between the sidewalk and the roadway, which you can see in figure 38. The ramp is missing on the both sides of the street. The only change should be to build the ramps on both sides. The ramp should be 1.2 m wide and 2 m long.

The access to the school is absolutely barrier free and without any issues. Also the interior of the campus is very well done and there do not need to be any changes made. (36) See Figure 64.

Figure 64: Sidewalk between the bus stop and the main entrance

5.2. The bus stop on the street Prologacion Tecnológico Norte

First, I have to write that there is not a signed bus stop close to the entrance. There is only one inn the direction to the centre. The sidewalk is 1.7 m wide and the surface is according to standard.

I propose to build a bus stop right in front of the entrance in both directions. To get to the other side of the street, which is 3 lanes in one direction and 3 lanes in the other direction, I propose to build a traffic light with touch activation. Then the cars will get a red light only when there are any pedestrians (student or teacher) who need to cross the street.

In both directions this should be done close to the sidewalk. The all ramps need to have an 8 % slope and be 1.5 m wide and 1.5 m long.

5.3. The bus stop on the street Epigmenio González

The bus stop in the direction of the city is straight in front of the entrance to the school. There is perfectly solved barrier- free transportation.

The access to the bus stop which I propose on the other side of the street is almost done, the only thing which should be changed is to renew the surface (the panels), which you can see in Figure 65 on the right side.

Figure 65: Crossing the street on the street Epigmenio González

The bus stop will be placed just to the left next to the crosswalk. Right now there is a parking lot, but this parking lot is not used 100 %, so that is where I would place the projected bus stop, which takes up 15 m. See Figure 66.

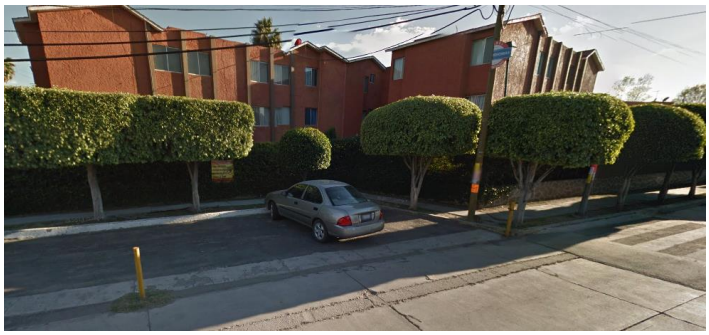

Figure 66: Space for the bus stop

6. Conclusion of the route in México

In my point of view, México is a country which is varied in many ways. Querétaro is a part of México and we can see the big differences in the infrastructure. In the private school Tecnológico de Monterrey all the entrances are designed perfectly and without any mistake. But this precision is stops outside the university. On the street of the city there are not even attemps to create barrier-free transportation.

I spoke to many disabled people who have big problems to access places in the city. They usually are poor so they can not afford to go every time by taxi. The Social Security System is paying mostly just the wheelchair and thinks that the problem is solved.

During my work I came to the conclusion that the problem in Querétaro is not about legislation. The legislation is the same as in the Czech Republic (where barrier-free transportation is higly integrated). What is different is the attitude of the government. The government in Czech Republic is using legislation to push all engineers to build the barrier-free accesses when building a new house or a street. I am sure that when one system can work in one country it can work also in another country.

Also the mentality of government in Querétaro likes to let the things stay as they are. That is why there are many sidewalks with correct dimensions but with unsatisfactory surfaces.

The changes I have proposed can provide asolution for many years if the government will take care of theproblems caused by roots of trees, which interfere with the sidewalk.

All these changes should be discussed with the company for the network of public transportation, which should make many changes in the next years.

7. Evaluation of the route from the university at Konviktská Street to the university at Florenc

In my thesis I am comparing the Czech and Mexican legislation. That is why I should also evaluate first the route in the Czech Republic to see the differences in praxis.

For this topic, I decided to choose the route from one faculty building to the other one. The Faculty of Transportation Sciences in Prague has three buildings, where the students attend classes. So it means that between the classes, they have to change places. Usually there is just 15 minutes to transport from one building to the other one. That is why the students are choosing the fastest solution to get to the other building.

As far as the evaluation of the route it should be just an example of the construction of sidewalks for barrier- free transportation. I decided to solve just transportation between two buildings, from building at the Konvikstká Street to the building at Na Florenci Street.

There are many ways to transport between these buildings. One of them is by using the public transportation. It takes 6 minutes to get from the school to the tram station, then 9 – 13 minutes to go by tram (depending on which trams we choose to use) and then 3 minutes to get from the station to the door of the building at Na Florenci Street. This means it takes 18-22 minutes from the door of one building to the door of the other building.

The other option is to go on foot, which takes 22 minutes (37). I decided to choose this route (see Figure 67) because it is the shortest and also the fastest one. We would prefer walking instead of using the public transportation in this case. To make my research comparable. I evaluated the route only from pedestrian side, without using public transportation.

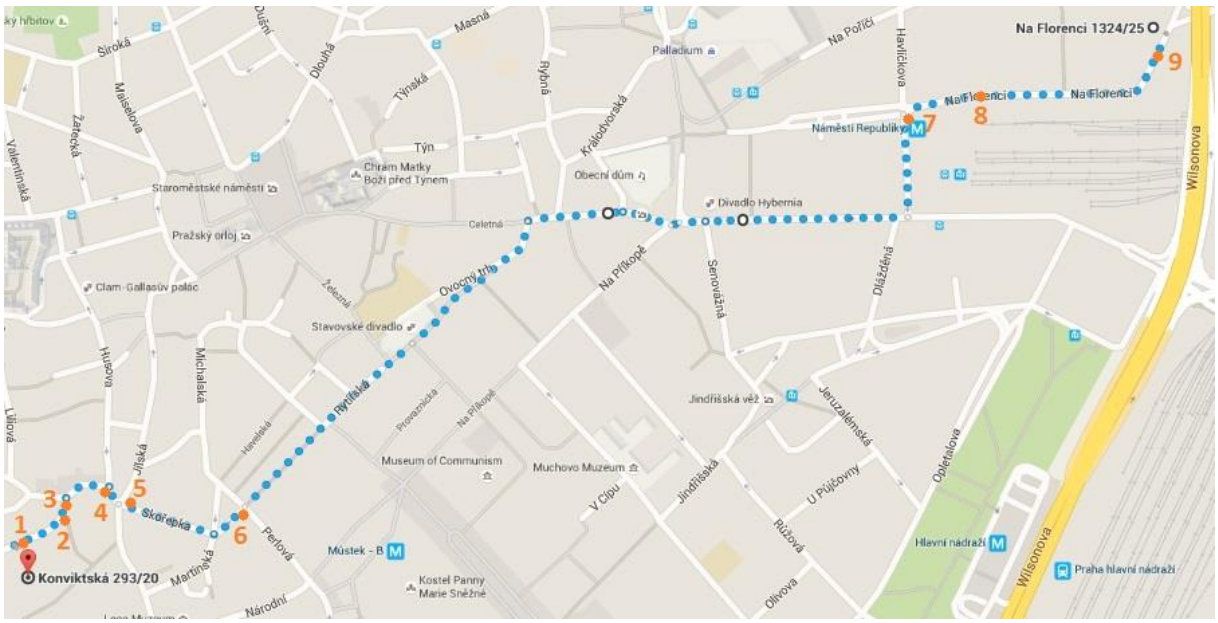

Figure 67: Chosen route between two buildings of the university

The route leads through the city center, so the streets are sometimes very narrow, and there is not enough space for the well-constructed pavement. Therefore, I focused on the width and slope of the pavements, so that disabled people can also walk easily on them. I also examined the tactile paving for the pedestrians who are blind or visually impaired.

The direction of the route is from the Kovniktská 22 to Na Florenci 25. To enter to the building on the Konviktská Street there are four stairs. See Figure 68 and Figure 67 (number 1). The interior of the building is not within of my field of specialization, which is why I didn‘t examine it. However, the pavements width in front of the university is 2.8 m, which is sufficient for a disabled person on the wheelchair to move freely.

Figure 68: Entrance to the building on Konviktská Street

Few meters after the beginning of the examination, there was a car which parked partly on the pavement. See Figure 69 and Figure 57 (number 2). There was 102 cm left so the disabled person could have walked through but with a little space left. This is a clear example that shows

us the importance of the barrier - free systems, which should be understand from many points of view and these systems should cooperate.

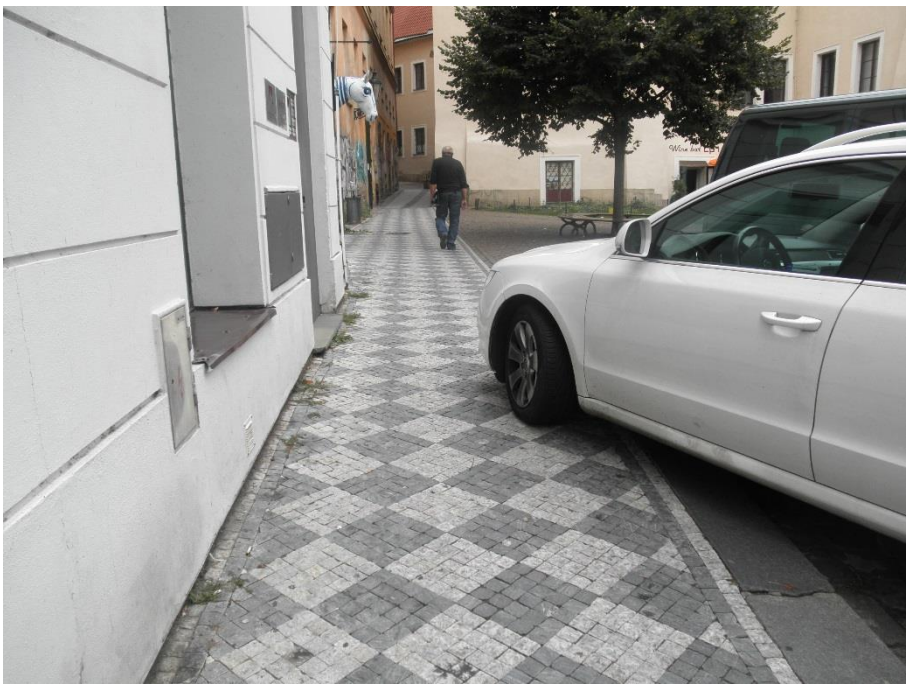

Figure 69: Incorrectly parked car on the pavement

On Figure 69 and Figure 70 (number 3), there is a stop of the road sign which is on the pavement, 24 m far away from the wall of the building. Thus, the rest of the pavement, 92 cm, is for one – way traffic.

Figure 70: Widths of the pavement and the public sign

On Figure 71, there is another example where the longitudinal and cross slope is much higher than the legislation allows. The foto is made on the corner of the Husova street, at the end of Konviktská street and starting of the Na Perštýně, there is a slope 14.6 %. The slope is a part of the crosswalk, which means that the slope is defined as a cross slope. But when a pedestrian is walking straight and not using the crosswalk, the slope is a lenghtwise slope. As it was written, the maximum cross slope is 2 % and the maximum of lenghtwise slope is 12.5 %. However, the slope is higher than allowed. Likewise, there is more of these problems in the city centre and also on our route. In general, there are the slopes heading to the crosswalks that are badly made due to the higher percentage of the longitudinal and cross slope.

Figure 71: Cross slope on the pavement

Another problem we can see on Figure 72 and Figure 67 (number 4) is where the narrow pavement is placed dustbins, so this only provides a free passage of 78 cm, which is not enough for a wheelchair. Actually many times I was walking there through, the dustbins were there standing.

The tactile paving, however, is well done on the pavement, yet, it is not following the guide line on the roadway.

Figure 72: Obstacle on the pavement

A well-constructed example of a perfect crosswalk for disable people can be seen on Figure 73 and Figure 67 (number 5). There is a longitudinal slope of 8 %, which is in the norm.

Figure 73: A well done barrier - free crosswalks

On Figure 74 and Figure 67 (number 6) we can see the pavement in front of the crosswalks where are all slopes and widths are in norm. However, it is not following the guide line on the crosswalk and the tactile paving on the other side of the street, yet, there is enough space for making the tactile paving.

Figure 74: Missing tactile paving (on the other side of the street) and the guide line

On Figure 75 and Figure 67 (number 6) there is a typical surface of the roadways in the center, the tiles. The tiles are often far away from each other and so there the holes in between arise. This is problematic for disable people on wheelchairs for at least two reasons: The disabled person can get stuck on the tiles or it can be painful to walk over the tiles. The disabled person has to find other, probably longer, way to get to their destination.

Figure 75: Tiles on the street

On the following picture (Figure 76) and Figure 67 (number 7) we can see the barrier – free crosswalk on the main Havlíčkova Street in front of the train station Masarykovo nádraží. It has all the necessary systems for transportation without barriers, there is also a tactile paving.

Figure 76: Crosswalk on the main Havlíčkova Street

On the following figure we can see the typical problem in this route. On one side of the crossewalk barrier is free and the other, is not. On Figure 77: Crosswalk on the Na Florenci Street and Figure 67 (number 8), there is a crosswalk on the Na Florenci Street next to the station Masarykovo nádraží. The pavement on the left side is 14 cm high and on the right side 6.5 cm high. There is only one reason the disabled can use this crosswalk, so that one uses the sloping driveway on the right side from the crosswalk, where the slope is 19.2 %, which is higher than the norm allows. Still, it is more accessible than the step for the wheelchairs. The tactile paving here is forgotten.

Figure 77: Crosswalk on the Na Florenci Street

On the Na Florenci Street, which is the street where the Faculty of Transportation Sciences is placed, there are many mistakes. The surface is in bad condition, which means that there are holes and it is uneven, which causes the high slope. See Figure 78 and Figure 67 (number 9).

Figure 78: Na Florenci Street in front of the Faculty of Transportation Sciences

The university has got two doors entering the school. One is for most of the students and the second one is for the physicaly disabled people. Inside the building, there are two elevators, which can be used by a wheelchair. However, this issue is not in my field and thus, I will allow my colleagues from other faculty to solve it.

8. Conclusion of the route in the Czech Republic

On the route there are a lot of problematic places. There are situations, which cannot be solved without the help of another person – places where is no evidence that a solution was attempted. In these places for example there are height differences between the pavement and the sidewalk, which the disabled person cannot go over. Also there is a crosswalk with the correct longitudinal slope, but not aligned to the crossroad. It is one meter away from the crosswalk. Also in the centre on some corners there is a boundary stone by the side of the building, which occupies a place on the sidewalk, where normally the disabled can go through. But as long as there is the boundary stone, the width of the sidewalk is much narrower, so that it is impossible to go by wheelchair. In some cases even without this boundary stone, the size of the sidewalk would be less then 90 cm. In the same case there are also the traffic signs which are on the sides of the sidewalk, so they also make it narrower. The width of the pavement is caused by old buildings most of which are also historically protected and there is not much width between two buildings. These mentioned places do not fulfill the standards of the Czech Republic.

Then there are situations which may be solved by the disabled person, but with difficulties. In these cases since there is a higher cross slope, then it is allowed, because there is an exit and entrance for cars to the courtyard of the buildings (since in the centre there are not so many places to park). Also the longitudinal and cross slope on the crosswalks are higher than the allowed 8 or 10 %. In some places this situation is without reason, because the width of the sidewalk is wide enough to build the crosswalk properly. Another situation, which is causing problems fordisabled people, are the big cobblestones with the big gaps between each other. The gap is so wide, that the wheel of the wheelchair can get stuck there and then it is impossible or difficult to get out of there. By the mentioned places we can see the effort to solve the sidewalks for barrier free accesibility, but there are mistakes, which are stemming from not following the legislation.

According to the described problems on the streets , there should be some changes made, which I propose in this thesis.

9. The proposal for the changes on the route in the Czech Republic

After evaluation and conclusion of the evaluated route, it is clear that there has to be done some changes. Most of the changes is to construct the barrier – free sidewalk on the crossroad or to construct a tactile paving.

In the first situation, there are three steps to the school. This should by solved by a ramp or by any other alternative way how to get inside the building. Afterwards there should be constructed an elevator inside the building but this is out of the topic of my studies.

In the second situation, there is a car parked so deep to the sidewalk, that there is not 90 cm left for a wheelchair. The solution is to put boundary stones 10 cm closer to the street. The boundary slopes will stay still on the sidewalk, but the car will have to park closer to the street, which will not affect the traffic flow.

In the third situation, there is the width of the sidewalk 90 cm free (next to the traffic sign), so it means, that this is the minimum of the width, which the wheelchair needs. Because of the 3 m wide roadway and 90 cm wide sidewalk on the other side of the street, there is no space to make the sidewalk more comfortable. This situation can be without any changes. Actually it is correct according to the laws .

In the fourth situation, there is a problem of the absence of a crosswalk. My proposal is to use the crosswalk a few meter further than where the crossroads is just now, because there is not enough space for a barier free sidewalk closer to the crossroad. There is a curb extension at the mid-block pedestrian crossing because of the parking spaces next to the crossroad. There is just one – way traffic, where the width of the traffic lane is 3.5 m. On the both sides, there is a tactile paving and ramps with the longitudinal slope 12.5 %.

In the fifth situation, there are dustbins which obstruct. However, iit is not in my field to solve this problem. I have to say just that there should be some space inside the buildings for the dustbins.

In the sixth and seventh situation the crosswalk with the barrier free acces is correctly solved.

In the eighth situation, there were many problems all at once. There was a crosswalk 14 m long and there were neither barrier-free crosswalks nor a tactile paving. The lenght of the crosswalk should be shorted by a median island with a mid-block pedestrian crossing in the widht of 4 m, lenght of 3 m. And then there would be a tactile paving and the hight of the island would be the same as the hight of the road, so that it could be crossed here by the disabled, mothers with baby stroller and visually impaired. There could be a perpendicular parking place

for the disabled. Its parameters are 3 x 5 m. And I have narrowed both traffic lanes for slowing down the traffic. For more details see the Attachment number 1.

In the ninth situation, there will be also many changes. There would be all necesarry tactile paving, which includes the guidelines on the crosswalk, warning strips on the sidewalk and a signal strip. Also there would be changes for the physically disabled people, which means, that there is a ramp from the road to the sidewalk with the longitudinal slope 12.5 % (1:8). There would be also a ramp which is for the cars entering the university, whose slope I propose less % closer to the entrance and higher slope closer to the road, so that the cross slope is at most 2 %. For more details see the Attachment number 2.

I constructed a parking place for a disabled people straight in front of the school, to be as close as possible. The parking space is longitudinal and is 7 m long and 3.5 m wide. This contains also a traffic sign IP 12 (Parking reserved) and also a horizontal traffic sign V 10f. In my proposal I move the dustbin (which is straight in front of the crosswalk) to front of the traffic sign ZONA.

9.1. General proposal

There are also some rules, which can be applied to all of the situations. There should be changed the material of pavement on the crosswalks. Nowadays there are road blocks which are not comfortable or sometimes it is impossible to be crossed by people on a wheelchair.

The other rule is that there should be strict prohibition to put dustbins and other stuff on the sidewalks. Also the car drivers should be more thoughtful and park only on the parking places.

There shoudl be given more attention to the pavements on the sidewalks, which sometimes is in bad condition with holes.

10. Comparison of the Czech Republic and Mexico

The aim of this thesis is to analyse the different ways of solving problems of the each country. This new way of solving the issues has to be based on a general comparison of the laws in both countries.

10.1. Parameters

My biggest motivation was to compare the legislation of the construction of the sidewalks. In Mexico, the sidewalks are sometimes impossible to use also for pedestrians. I realized while writing this thesis, that the parameters are almost the same. See figure. It means that in Mexico, there is a legislation for disabled people, but as I noticed, the legislation is not compulsory to use it everywhere, or to use it as the new pavement is constructed like Czech Republic. There is also a legislation for the parameters to be built on a barrier free sidewalk, but some of the sidewalks don't fulfill these laws at all.

The parameters of the barrier free access of the sidewalks which are different are in the following figure. The parameters of México are more generous towards disabled people.

		The Czech Republic	**México**
Wheelchair	Basic size	120 x 80	130 x 90
Longitudinal slope	Maximum	8.33 %	8 %
	Ramps up to 300 cm	12.50 %	10 %
Manuevering area	Person on crutches	120 x 120 cm	120 x 120 cm
	Person in a wheelchair	120 x 150 cm	140 x 170 cm
	Reaching distance (above the ground)	25 -120 cm	30 - 120 cm
	Reserved parking place	5 % or at least 1	4 % or at least 1

Figure 79: Table of comparison of the parameters

10.2. Traffic signs

In the Czech Republic the traffic signs are always atthe correct height. They are usually built close to the building or close to the road, so that they take the least space from the sidewalk as possible. Also in the centre in the Czech Republic, there are always traffic signs by the intersections, by the pedestrian crossings etc. Actually there are many traffic signs in the centre in the Czech Republic.

In México, many times the traffic signs are in the middle of the sidewalk so they are taking the free space from the sidewalk. Sometimes the traffic signs are hidden by the trees. The traffic signs are mostly the correct height. There are fews traffic signs in the centre comparing with the Czech Republic.

10.3. Trees

The trees in Mexico don't fulfill the legislation at all (neither the Mexican one nor the Czech one). They are in many cases a real problem for people to continue on their walk. Also the roots of the trees are destroying the pavement.

10.4. Surface of the pavement

In the Czech Republic all sizes of cobblestones are used. In the centre bigger cobblestones are used, which makes the gaps bigger also.

In México, on my examined route, asphalt or large cobblestones are typically used.

In both countries, there are some sections of the sidewalk or road which are in a really bad condition and make transportaion harder.

10.5. Barrier free buses

In Querétaro, there are only 6 buses for the same number of inhabitans as in the Czech Republic. In the Czech Republic, there are 826 buses for the same amount of inhabitans of the city.

10.6. Slope on the crosswalk

In the Czech Republic there is the maximum slope 12.5 % while going from the crosswalk on the sidewalk. In Querétaro, México, the maximum slope is 10 %, which is more strict and also more comfortable for the disabled.

10.7. Condition of the present sidewalks

In Querétaro, the sidewalks are in bad condition and so some parts are impossible to walk on also by the non-disabled. There are many holes, high difference between the panels on the sidewalk and also between the sidewalk and the road. And the width is not sufficient.

In Prague, the Czech Republic, the sidewalks are in a better condition, than those in México. However, not all the crossroads are with a barrier free acces. The aim of my thesis is that all the sidewalks should be barrier free.

10.8. Names of the streets

In México, in the centre the names of the streets are written in Braille. In the Czech Republic, there are only special places written in Braille (e.g. containers for recycling, lifts, public places as a library).

10.9. Attitude of the people

In México and also in the Czech Republic, we can find many people who don´t follow the rules - people who park in reserved parking placed without being disabled, People who are parking on the sidewalks, etc. But on the other hand, we can always find some people who offer help to disabled people.

11. Conclusion

At first, I have to say that each country has its positives and negatives. I have tried to write this work very objectively, to follow the rules and the objective points of the view of a user of the streets. I was only able to use a wheelchair for research in the Czech Republic. In México, I was not able to move very far in a wheelchair. Uneven spots in Queretaro, Mexico, are so high that even not disabled pedestrians have difficulties walking there.

There are big differences in the infrastructures. In México, the legislation is more strict, which means that the acces is more comfortable than in the Czech Republic

While this diploma thesis is about the construction of sidewalks and roads for barrier-free access, I have not mentioned the area where I do see the biggest difference (between the Czech Republic and Mexico). It is the history of the two countries.

In my point of view, there are many differences in history and in attitudes, which might not be noticed at the first glance. That is why I am happy to speak with people in wheelchairs and disabled people in both countries.

We can see that the first time there was any notice about disabled people in the Charter of Fundamental Rights and Freedoms in the Czech Republic was in 1992, however, in México it had not been not introduced until 2008. So there is the time difference of 16 years. In México in 2001 there was the first notice about the elimination of the discrimination against disabled people. In the Czech Republic it was later, in 2009. In México and also in the Czech Republic, there was the first notice in the General Law for Inclusion of persons with Disabilities in 2011. Finally, the law in México set up the rules for access to buildings and public places in 2013. In the Czech Republic there was a first decree writing about the general technical requirements ensuring the use of buildings by persons with limited mobility in the year 1985. (38)

A political difference is that in México there are elections of the governor every 6 years and elections of the municipal president every 3 years. The priorities (and promises) of these candidates are always different from those of their forerunners, so it is really hard to build something constructive during 3 or 6 years. In the last years there have been changes of the main political parties. For many years there used to be just one political party who was winning. Nowadays there are two parties with the most votes and they are competing over the first place. So the changes of the political parties are really quick, every 3 years.

It is important to mention that there is a law in the Czech Republic, where it is written that with each new public building, street, or pavement built, there is to be a barrier- free access. This law hasn´t been written in México yet.

The reason why we can see Mexico's sidewalks causing difficulties for disabled people in using the sidewalks, in my opinion, is because of the Mexican legislation. I suggest the Mexican government should add the rule that whenever there is any sidewalk constructed or repaired, it should be done according to the legislation for disabled people. The result could be that for some years the infrastructure would be changing slowly and at the end, there would be a barrier free accessibility all over Mexico.

At the end I would like to mention that I was comparing two countries of two quite different continents. In bott countries, there are very different values of the people about the life. In Mexico the political system is less stable than in the Czech Republic. The sutisfied result of the study is that the Czech Republic has got the legislation where there are written all possible ways how to solve some problems. In the Czech legislation now there is one very important rule, that all the new constructions have to be built with the barrier free accesibility. This is the biggest difference that I can see

On the other hand, when speaking about the legislation or the standards (normas mexicanas), in México, the legislation as not as bad. However they miss the duty to built free accss with new buildings. However they are renewing their legislation to get the best solution and the barrier free access. According to the year, when México started to integrate the disabled to the access to the constructions (2008), México seems to make a big step in this field and for sure is going to continue to be more „disabled friendly".

I would like to change the strange looks of the pedestrians at the disabled, so that they can walk on all public places with us. My biggest aim is that it will be normal to meet disabled people on the streets, in the parks, in the forest. They have the same right as us - to use all the public places which are constructed. These places are constructed for everybody and it means the Czechs, the Mexicans, the homeless, the disabled, crying children etc. By everybody I mean all the people who live on the Earth. We should live in a harmony, with understanding and respecting each other, regardless the race, disability, nation, age, gender. Possibility of choice is an basic element of the liberty. I wrote my thesis with the aim to give the disabled a possibility of choice where to go without any external help.

12. Terminology

- **DISABLED**: incapacitated by illness or injury; also : physically or mentally impaired in a way that substantially limits activity especially in relation to employment or education (38)
- **IMPAIRMENT**: any loss or abnormality of psychological, physiological or anatomical structure or function (39)
- **DISABILITY**: any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being (38)
- **HANDICAP**: a disadvantage for a given individual that limits or prevents the fulfillment of a role that is normal (40)
- **WHEELCHAIR USER**: a person who uses a wheelchair, especially because of physical disability (39)
- **TACTILE PAVING:** (also called truncated domes, detectable warnings, Tactile Ground Surface Indicators, detectable warning surfaces) is a system of textured ground. It is a line of different stones/shaping on a footway that has an easy to detect surface, often more rough than the surrounding ground. (38)
- **CROSSROAD**: a place where two or more roads cross or a road that crosses a main road or that runs across land between main road (39)
- **CROSSWALK**: a marked path where people can safely walk across a street or road (38)
- **PAVEMENT**: the hard surface of a road, driveway, etc. (38)

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