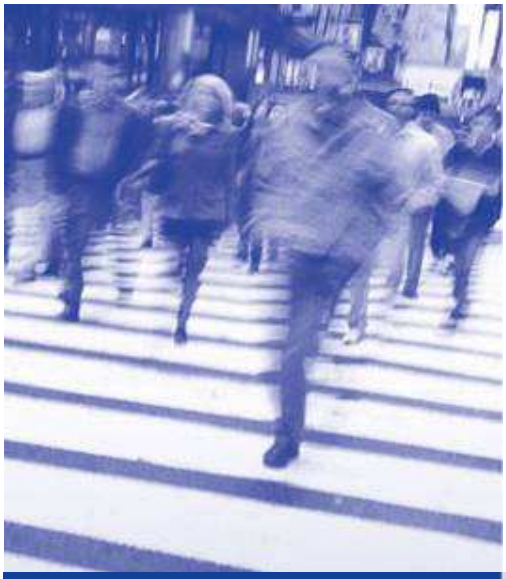

CiViTAS
Cleaner and better transport in cities

ARCHIMEDES
AALBORG • BRIGHTON & HOVE • DONOSTIA - SAN SEBASTIÁN • IAŞI • MONZA • ÚSTÍ NAD LABEM

Ústí nad Labem

R49.1 – Safety Audit in Ústí nad Labem

20 December 2010

THE CIVITAS INITIATIVE
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Contents

1. Introduction

1.1 Background CIVITAS

CIVITAS - cleaner and better transport in cities - stands for CIty-VITAlity-Sustainability. With the CIVITAS Initiative, the EC aims to generate a decisive breakthrough by supporting and evaluating the implementation of ambitious integrated sustainable urban transport strategies that should make a real difference for the welfare of the European citizen.

CIVITAS I started in early 2002 (within the 5th Framework Research Programme);
CIVITAS II started in early 2005 (within the 6th Framework Research Programme) and
CIVITAS PLUS started in late 2008 (within the 7th Framework Research Programme).

The objective of CIVITAS-Plus is to test and increase the understanding of the frameworks, processes and packaging required to successfully introduce bold, integrated and innovative strategies for clean and sustainable urban transport that address concerns related to energy-efficiency, transport policy and road safety, alternative fuels and the environment.

Within CIVITAS I (2002-2006) there were 19 cities clustered in 4 demonstration projects, within CIVITAS II (2005-2009) 17 cities in 4 demonstration projects, whilst within CIVITAS PLUS (2008-2012) 25 cities in 5 demonstration projects are taking part. These demonstration cities all over Europe are funded by the European Commission.

Objectives:

to promote and implement sustainable, clean and (energy) efficient urban transport measures

to implement integrated packages of technology and policy measures in the field of energy and transport in 8 categories of measures

to build up critical mass and markets for innovation

Horizontal projects support the CIVITAS demonstration projects & cities by:

- Cross-site evaluation and Europe wide dissemination in co-operation with the demonstration projects
- The organisation of the annual meeting of CIVITAS Forum members
- Providing the Secretariat for the Political Advisory Committee (PAC)
- Development of policy recommendations for a long-term multiplier effect of CIVITAS

Key elements of CIVITAS:

- CIVITAS is coordinated by cities: it is a programme “of cities for cities”
- Cities are in the heart of local public private partnerships
- Political commitment is a basic requirement
- Cities are living ‘Laboratories' for learning and evaluating

1.2. Background ARCHIMEDES

ARCHIMEDES is an integrating project, bringing together 6 European cities to address problems and opportunities for creating environmentally sustainable, safe and energy efficient transport systems in medium sized urban areas.

The objective of ARCHIMEDES is to introduce innovative, integrated and ambitious strategies for clean, energy-efficient, sustainable urban transport to achieve significant impacts in the policy fields of energy, transport, and environmental sustainability. An ambitious blend of policy tools and measures will increase energy-efficiency in transport, provide safer and more convenient travel for all, using a higher share of clean engine technology and fuels, resulting in an enhanced urban environment (including reduced noise and air pollution). Visible and measurable impacts will result from significantly sized measures in specific innovation areas. Demonstrations of innovative transport technologies, policy measures and partnership working, combined with targeted research, will verify the best frameworks, processes and packaging required to successfully transfer the strategies to other cities.

1.3. Participant Cities

The ARCHIMEDES project focuses on activities in specific innovation areas of each city, known as the ARCHIMEDES corridor or zone (depending on shape and geography). These innovation areas extend to the peri-urban fringe and the administrative boundaries of regional authorities and neighboring administrations.

The two Learning cities, to which experience and best-practice will be transferred, are Monza (Italy) and Ústí nad Labem (Czech Republic). The strategy for the project is to ensure that the tools and measures developed have the widest application throughout Europe, tested via the Learning Cities' activities and interaction with the Lead City partners.

1.3.1. Leading City Innovation Areas

The four Leading cities in the ARCHIMEDES project are:

- Aalborg (Denmark);
- Brighton & Hove (UK);
- Donostia-San Sebastián (Spain); and
- Iasi (Romania).

Together the Lead Cities in ARCHIMEDES cover different geographic parts of Europe. They have the full support of the relevant political representatives for the project, and are well able to implement the innovative range of demonstration activities.

The Lead Cities are joined in their local projects by a small number of key partners that show a high level of commitment to the project objectives of energy-efficient urban transportation. In all cases the public transport company features as a partner in the proposed project.

2. Ústí nad Labem

Ústí nad Labem is situated in the north of the Czech Republic, about 20 km from the German border. Thanks to its location in the beautiful valley of the largest Czech river Labe (Elbe) and the surrounding Central Bohemian Massive, it is sometimes called 'the Gateway to Bohemia'. Ústí is an industrial, business and cultural centre of the Ústecký region.

Ústí nad Labem is an important industrial centre of north-west Bohemia. The city's population is 93,859, living in an area of 93.95km2. The city is also home to the Jan Evangelista Purkyně University with eight faculties and large student population. The city used to be a base for a large range of heavy industry, causing damage to the natural environment. This is now a major focus for improvement and care.

The Transport Master Plan, initiated in 2007, will be the basic transport document for the development of a new urban plan in 2011. This document will characterise the development of transport in the city for the next 15 years. Therefore, the opportunity to integrate Sustainable Urban Transport Planning best practices into the Master Plan of Ústí nad Labem within the project represents an ideal match between city policy framework and the ARCHIMEDES project.

The project's main objective is to propose transport organisation of the city, depending on the urban form, transport intensity, development of public transport, and access needs. The process, running until 2011, will include improving the digital model of city transport that Ústí currently has at its disposal. The plan will have to deal with the fact (and mitigate against unwanted effects that could otherwise arise), that from 2010, the city will be fully connected to the D8 motorway, running from Prague to Dresden.

3. Background to the Deliverable

Walking and cycling journeys are key elements of the integrated transport strategy in Ústí nad Labem and European transport objectives. This measure is aimed at increasing the quality of urban space towards encouraging greater take-up of such transport modes and to make sure, where possible, walkers and cyclists can do so as safely as possible. Ústí nad Labem has a target to reduce the number of deaths and injured people by 40% - 50% in 2012 by improving safety conditions on local roads. As part of the ARCHIMEDES project, accident data were studied to identify necessary safety actions and to determine how to implement speed reduction in the city. Based on the findings, actions will be implemented and supported by campaigns.

The city contracted organisation CityPlan Ltd. to carry out the safety audit and to develop an action plan for Ústí nad Labem.

3.1. Summary Description of the Task

The safety audit was aimed at assessing the current state of traffic infrastructure in Ústí nad Labem and revealing safety deficits. The task was performed in the following fields:

- development of methodology
- training of personnel
- selection of localities with the majority of road accidents
- on spot inspections of the selected localities in terms of safety deficits, traffic load, potential for accidents and other hazards
- proposal of actions to improve safety, assessment of costs and benefits
- measurements of traffic speed by static radars
- analysis of traffic flow characteristics based on measurements
- data collection from local school and preschool facilities
- on spot safety inspections by the local school and preschool facilities
- analysis of traffic safety situation at school and preschool facilities
- on spot inspections of all the major roads in the city
- analysis of the current safety conditions of major local roads, identification of safety deficits and proposal for corrective actions.

4. Safety Audit in Ústí nad Labem

4.1. Methodology

City employees were trained by a certified auditor and by transport experts to be acquainted with a number of aspects: road safety problems; systematic procedures for safety improvements; road safety data collection; assessment of accidents revealing safety deficits and the corresponding legislative background. A handbook about the methodology was elaborated and used during the training sessions as study material. After training employees were directly involved in the process of conducting safety inspections under the guidance of the transport experts and thereby gained valuable theoretical and practical experience.

4.1.1. Analyses of Records

Based on records from the Municipal Police database in Ústí nad Labem, local traffic accidents were analysed. Particular emphasis was laid on the circumstances of accidents and the consequences with respect to the protection of sensitive personal data. As a result, critical accident locations were identified.

4.1.2. Radar Measurements

Specific road profiles were selected for radar measurements of traffic speed and of other characteristics of the traffic flow (number of vehicles and their category). All the collected data were evaluated.

4.1.3. Traffic Inspections

Major roads in the city and roads with the majority of road accidents were selected for safety inspections. It was carried out by a floating vehicle, which recorded videos of each route, encoding road parameters, tracing its location by GPS and detecting safety deficits by a specific tablet with software. Based on the training, city personnel were directly involved in the inspections under the leadership of traffic experts. All data were analysed by the inspection team. Captured videos and collected data were processed. Please see Section 4.2 for more detail.

4.1.4. Inspections by School Facilities

Questionnaires about road safety deficits were distributed to all directors of local primary and secondary schools and preschools. Responses were analysed and served as a basis for road safety inspections by local school facilities conducted by traffic experts. The results were discussed with school directors to find the most suitable solutions improving road safety.

4.1.5. "*Safe Transport Infrastructure*" Conference

City employees repeatedly participated in a conference "Safe transport infrastructure and risk management" organised annually for national and international participants. The focus of the lectures was on causes and consequences of traffic accidents, on safety issues of local roads and on preventative solutions (such as highlighting zebra crossings by reflective lights), constructional solutions (such as elevated crossing and bypasses), technical solutions (such as deceleration lanes, rails by roads), administrative solutions (such as marking selected road sections as low speed zones) and repressive solutions ensuring compliance with traffic rules (such as police control, installation of monitoring cameras, radar measurements, etc).

4.2. Localities with the Majority of Road Accidents

4.2.1. Evaluation of Safety Conditions on Local Roads

Road sections, where the majority of road accidents occur, were selected for thorough road safety inspections to reveal safety deficits and find suitable recovery measures. The identified localities in Ústí nad Labem were as follows. (The corresponding maps showing each locality and identified safety hazards are presented in the documentation Safety Audit Report, Part 1):

1) the intersection Seifertova x Opletalova street
2) the intersection Opletalova x Opletalova street
3) the intersection Panská x Revoluční x U Trati
4) the intersection Žukovova x the exit from the industrial area Setuza
5) intersections on Masarykova street
6) the intersection Na Rondelu
7) the intersection Pražská x Střelecká x Přístavní
8) the road section between the shopping area Pod Větruší and the intersection Pražská x Střelecká x Přístavní

9) the shopping area OK Pod Větruší
10) Předmostí
11) the intersection U Vlečky x Textilní x Průmyslová
12) the intersection Božtěšická x Vinařská
13) the intersection Havířská x the entrance to the shopping house Tesco
14) Pražská street
15) intersections on Přístavní street
16) intersections on Sociální Péče street
17) the railway inderbridge on the street Střelecká
18) the intersection U Trati x Malá Hradební
19) the intersections on the street Velká Hradební

4.2.2. Methods for Localisation of Accidents

Based on the accumulation of traffic accidents, locations with the majority of road accidents were identified. Number of road accidents, causes of accidents and their consequences were determined by analysing accident records and the data from geographic information system "Integrated traffic vector map". The tasks were gradually developed as follows:

1. The analysis of information gathered about accidents was processed in terms of:
   - Overview of road traffic accidents in the region of Ústí nad Labem in 2009 and compared with the previous year 2008
   - Report on road traffic accidents for the period 2005 - 2008 in Ústí nad Labem
   - Integrated traffic vector maps covering the period from 1st January 2007 to 29th March 2010 on localised problematic areas in terms of road safety
2. Methodical materials were developed and training was held (as outlined in Section 4.1)
3. Safety audits were performed, reports conducted and recommendations for actions designed according to:
   - Radar measurements on local roads Vinařská, Sociální Péče and Výstupní, where the traffic inspections were performed to determine: frequency distribution of vehicle speed, frequency distribution of vehicles according to the daily variations, dependency of speed on the daily variations (peak intensity and saddle intensity), dependency of average speed on the intensity of traffic flow and on weekly variations in percentages.
   - Based on the integrated traffic vector map, individual hazardous localities in the city were identified. The current traffic situation for each locality was described and a proposal to increase safety level in the area was developed.
4. Prioritisation of measures and a draft "Action Plan" with a list of alternative measures was produced including:
   - Vertical and horizontal traffic signs
   - Psychological calming elements
     - Point narrowing
     - Line narrowing
     - Optical brakes
     - Optical change of the local road surface
   - Physical calming elements
     - Speed bumps (narrow, wide, pillow)
     - Increased surface of specific areas (zebra crossings, intersections, entrances to residential areas)

4.2.3. Overview of Traffic Accidents in the Region of Ústí nad Labem

The collected data were evaluated for the year 2009 and compared to the year 2008 (+/-). For the period from 1st January 2009 to 31st December 2009, the total number of accidents recorded was 1,620, in which 8 (-1) persons were killed, 39 (0) persons were seriously injured and 320 (-27) persons were slightly injured. Alcohol was detected on 56 drivers involved in road accidents, from which 1 person was killed, 2 persons were seriously injured and 31 people were slightly injured.

Table 1 – Road accidents in Ústí nad Labem in 2009 compared to the year 2008 (+/-)

	no. of accidents	+/-	deaths	+/-	serious injuries	+/-	light injuries	+/-	alcohol at a driver	+/-	Civitas corridor	+/-
total number of accidents	1620	-696	8	-1	39	0	320	-27	56	-39	1304	-608
accidents with physical consequences	1329	-685	-	-	-	-	-	-	32	-31	1074	-602

1 275 traffic accidents happened on working days, which is 81.3% from the total. The most frequent day for accidents was Tuesdays (269 road accidents). The resulting data (see the documentation Safety Audit Report, Part 1) present a decrease in the number of road accidents compared to 2008, when the most frequent occurrence of accidents was on Fridays (411 road accidents).

Table 2 - Road accidents in Ústí nad Labem distributed throughout a week

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
the year 2009	265	269	224	258	259	182	163
+/- in 2008	-127	-70	-165	-103	-152	-61	-18

The most frequent type of a road accident is collision with a moving motor vehicle (46.2% of all traffic accidents, which is lower than in the previous year). 92.3% of road accidents (1 496 accidents) were caused by a driver of a motor vehicle. 61.8% of vehicles involved in road accidents were in personal cars without a trailer. The main cause of road accidents was incorrect driving (63.5% of all accidents). The second most common cause was not giving priority of way. Detailed information about local road accidents are described in the Safety Audit report, Part 1.

Table 3 - Types of road accidents in Ústí nad Labem in 2009 compared to 2008 (+/-)

	no. of accidents	+/-	deaths	+/-	serious injuries	+/-	light injuries	+/-	alcohol at a driver	+/-	Civitas corridor	+/-
collision with a passing motor vehicle	748	-456	4	1	11	-8	175	-17	15	-19	636	-419
collision with a parked vehicle	326	-185	0	0	0	0	3	-4	8	-5	307	-164
collision with a stationary obstacle	330	-34	2	-1	10	5	54	-1	28	-8	228	-27
collision with a pedestrian	81	-4	2	-1	15	3	65	-4	3	-4	78	-3
collision with a child	17	-7	0	0	1	1	16	-8	0	0	17	-7
collision with a wild animal	48	-26	0	0	0	0	0	0	0	0	7	-15
collision with a domestic animal	3	-2	0	0	0	0	0	0	0	0	2	-1
collision with a train	3	0	0	0	0	0	1	-1	0	0	3	1
breakdown	42	-2	0	0	1	-2	19	3	2	-3	20	9
other kind of accident	32	13	0	0	2	2	3	-3	0	0	23	11

4.2.4. Police Reports on Road Accidents

Another source of information on accidents in the city were police reports on traffic accidents. These reports were collected by the Municipal Department of Transport. All the personal information was removed in order to be transferable. The total number of analysed traffic accidents from the reports for the years 2005 - 2008 was 448 accidents, which serves as a sample for the city.

Approximately 60% of traffic accidents were caused by not respecting the safe distance between vehicles. Another major cause of traffic accidents was not giving priority of way (20%) and accidents caused by negligence (15%) - mainly by not paying full attention while driving and parking.

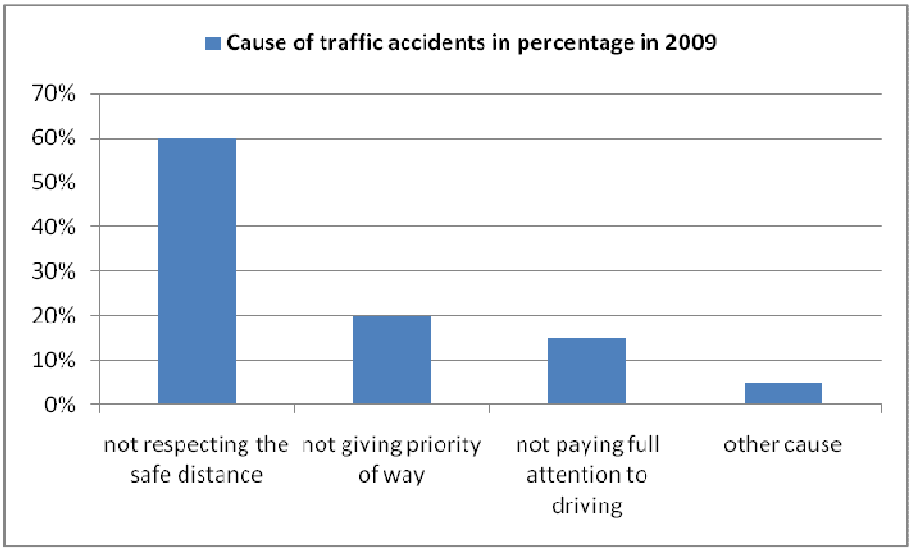

Figure 1 - Cause of traffic accidents in Ústí nad Labem in 2009

When not respecting the safe distance, approximately 80% of accidents happen due to the fact that the driver gives priority to pedestrians on a pedestrian crossing and the driver behind is unable to avoid crashing into the stationary car in front of him/her. Another cause is a pedestrian entering the road in front of a vehicle without looking. The remaining 20% of accidents happened when a vehicle enters the road in front of another vehicle, which manages to avert crashing by stopping early, but the following driver lacks sufficient distance to react and therefore causes an accident.

Personal injuries and property damages are common consequences of road accidents caused by not giving priority of way. From the total number of 448 traffic accidents, 2 persons were killed on intersections Jateční x Za Válcovnou and Petrovická x Široká due to not giving priority of way. About 95% of accidents happened in urban areas. Such accidents were usually not serious and caused rather mild physical damage due to lower speed. The remaining 5% of accidents realised in outer areas caused serious injuries and considerable material damages.

Unified traffic vector map

Additional data on accidents were gathered from a “Unified traffic vector map” (UTVM) (http://www.jdvm.cz/pcr). Localities with the majority of accidents for periods with available statistics were identified for safety inspections.

The inspections were carried out, based on the UTVM, on 37 locations in the city. For the period from 1st January 2007 to 27th March 2010, 925 traffic accidents were analysed, from which 3 people were killed, 28 seriously injured and 159 slightly injured. Alcohol content in the blood up to 0.99%, was found in 31 drivers and over 1 % in one driver involved in traffic accidents. 791 traffic accidents were recorded on working days, which is 86% of the total number of road accidents. Detailed list of injuries, number of drivers under the influence of alcohol involved in traffic accidents and the number of road accidents is described in the document Safety Audit Report, Part 1.

From the total number of traffic accidents, 74.3% of accidents were caused by collision with a moving motor vehicle. The collision was typically realised from the rear (39.4%). Most traffic accidents were recorded on straight sections (37.3%). A vehicle involved in an accident was typically a car without a trailer (67.6% of all accidents). The main cause of traffic accidents was not keeping a safe distance (28.7% of all accidents). A detailed list of casualties, number of drivers under the influence of alcohol involved in traffic accidents, number of traffic accidents, types of accidents, directions of crashes and main reasons of accidents are described in the documentation Safety Audit Report, Part 1.

4.2.5. Safety Inspections

Sites identified by JDVM with the majority of cumulated accidents were subjected to safety inspections. Inspections carried out by an auditor involved detail descriptions of safety deficits with photographs and identifications of potential hazards.

Data on road accidents were evaluated for the past three years to avoid the influence of short term increases in localised accidents (caused for example by construction works in the area and temporary organisational changes of traffic). Since that time, some improvements of the safety issues may have been realised on several locations. Therefore, such localities were evaluated at their present state to determine efficiency of the realised safety measures.

4.2.6. Findings from the Inspections

Based on the analyses of road accidents, individual accidental localities were identified and described in detail in the documentation Safety Audit Report, Part 1, including photographs and measures proposed for improvements.

The main safety deficits revealed by inspections were:

- Uncoordinated movement of vehicles on intersections (large conflict areas, undrained intersections, etc.)
- Oversized width of roads
- Absence of psychological differentiation of superior and inferior roads (a "minor" road appears to drivers as a "main" road, which results in overlooking the road sign P4a)
- Worn-out horizontal road marks
- Poor conditions for pedestrian movement (mostly long undivided zebra crossings, lack of highlights for crossings in areas with large volume of pedestrians)
- Lack of cycle infrastructure (missing cycling elements, warning signs)

Individual locations can be divided into the following two categories in terms of safety deficits:

1st degree importance:

High relative accident rate with significant personal consequences (number of accidents / fatalities / seriously injured persons / slightly injured person), urgent need for recovery:

- The intersection U Vlečky x Průmyslová (28/0/0/17)
- The intersection Masarykova x Brněnská x Pařížská (27/1/1/5)

2nd degree importance:

Medium degree of the relative accident rate, medium personal consequences (number of accidents / fatalities / seriously injured persons / slightly injured person):

- The intersection Opletalova x Opletalova (20/0/1/4)
- The intersection Na Rondelu (42/0/0/2)
- The intersection Pražská x Střelecká x Přístavní (50/0/1/3)
- The roundabout Pod Větruší (108/0/0/1)
- The intersection Božtěšická x Vinařská (27/0/3/7)
- The intersection Havířská x the entrance to Tesco (24/0/1/11)
- The intersection Předmostí x Přístavní (42/0/2/4)
- The rail across the street Přístavní (19/0U/1T/4L)
- The intersection Božtěšická x Petrovická x Sociální Péče (27/0/3/7)
- The street Velká Hradební in the section between Bratislavská x Dvořákova (40/0/1/3)

Most of the identified deficits (both of 1st or 2nd degree importance) can be solved by low-cost measures and consistent maintenance. Specific corrective measures proposed for each individual locality can be found in the Safety Audit Report, Part 1.

Table 4 - Number of injured people and number of drivers under the influence of alcohol

Localities	Number of accidents	Number of killed people	Number of seriously injured people	Number of slightly injured people	Alcohol in blood detected at a driver	% of accidents on working days	Number of accidents on working days
The intersection Seifertova x Opletalova	13	0	0	4	0	85	11
The intersection Opletalova x Opletalova	20	0	1	4	2	75	15
The intersecion Panská x Revoluční x U Trati	16	0	0	3	1	89	14
The intersection Žukovova x the exit from the industrial area Setuza	20	0	1	0	0	95	19
Masarykova street	98	1	2	20	5	88	86
The intersection Na Rondelu	42	0	0	10	2	82	34
The roundabout Pod Větruší + the intersection Pražská x Střelecká x Přístaviště	50	0	1	3	1	86	43
Předmostí	78	0	1	2	1	92	72
The intersection U Vlečky x Textilní x Průmyslová	28	0	0	17	0	71	20
The intersection Božtěšická x Vinařská	27	0	2	7	0	81	22
The intersection Havířská x entrance to the shopping area Tesco	24	0	1	11	0	75	18
Pražská street	116	1	3	21	5	90	104
Přístavní street	86	0	3	13	4	92	79
Sociální péče street	148	1	11	28	6	86	127
The rail crossing Střelecká street	30	0	0	0	0	87	26
The intersection U Trati x Malá hradební	20	0	0	1	1	75	15
The street Velká Hradební	117	0	2	17	4	88	103
TOTAL	**925**	**3**	**28**	**159**	**32**	**86**	**791**

4.3. Measuring Violations of Traffic Rules and Characteristics of Traffic Flow

In cooperation with the Municipal Police, traffic surveys were performed at selected localities to reveal vehicles exceeding the maximum permitted speed and to measure the effect of the presence of the Police (overt/covert) on the speed of passing vehicles. Measurements were realised by radars detecting the traffic flow continuously for several days to record all variants of traffic intensities and of other related characteristics for individual road profiles.

The Municipal Police was measuring only speed of vehicles several hours per day. Data on traffic rule violations were compared with data from stationary monitoring points (traffic light detectors, zones with permanently measured traffic speed, etc.).

4.3.1. Stationary Radars

To obtain the necessary data on the structural and operational characteristics of individual localities, the areas were examined by automatic traffic counting statistic radars based on the principle of evaluating the traffic by integrated data acquisition. Radars used for such measurements were SIERZEGA SR4 (see Figure 1).

The advantage of automatic traffic counting equipment is the fact that measurements can be realised in longer time periods with relatively high accuracy (the error is around 10%) and objective values (measuring medium does not affect road users).

Outcomes of the measurements are information on the composition of traffic flow based on measuring vehicle lengths (1st category – motorcycles, 2nd category – cars, 3rd category – fright vehicles, 4th category – buses and trucks with a trail), their speed in km/h, the exact time of measurement, the date and directionality of each vehicle.

Figure 2 - Measuring equipment Sierzega SR

Measurements realised by statistic radars covered the streets Vinařská, Sociální Péče and Výstupní. The resulting data on the structure and on operational characteristics are listed in the documentation Safety Audit Report, Part 1, containing detailed description of each locality, photographs and measurements. Based on the measurements, each locality was divided according to "Frequency distribution of vehicles by speed," "Variations of profile load", "Daily variation of speed – in peak periods and in the saddle," "Dependency of the average speed on the intensity of traffic flow" and "Weekly variations in percentage".

4.3.2. Traffic Speed Measured by the Municipal Police

To determine levels of compliance with the maximum permitted traffic speed, data from the Municipal Police of the Statutory City of Ústí nad Labem were gathered and compared with measurements performed by the processor. Municipal police performed measurements on specific locations at random times. Drivers were mostly aware of the Police presence and adapted their speed accordingly. The measurements were carried out at two modes:

- Visibly marked by traffic sign “Measured speed" (IP 31a and 31b IP)
- Unmarked with no repression to drivers

The Police measurements were realised on 29th April 2010 – 7th May 2010 at different times on working days. Measurements were carried out by certified equipment of a Municipal Police car allowing to record speed exceeding the permitted limit and deal with violations directly on the site or by administrative proceedings.

4.3.3. Speed Measurements on Designated Sections

Measurements on sections marked by vertical traffic signs IP 31a and IP 31b "Measured speed” took place at:

1) Sebuzínská street in Brná
2) Pražská street in Vaňov
3) Výstupní and Rabasova street
4) Klíšská and U Panského dvora street
5) Neštěmická and Žežická street

Measurements of the Metropolitan Police were carried out at different time intervals and only on working days. The measurements show that drivers generally do not violate speed limits in sections marked by vertical traffic signs IP 31a and IP 31b. The overview of measured vehicles is stated in the documentation Safety Audit Report, Part 1.

100% of drivers (610 vehicles) passed through the monitored section within the maximum permitted speed. It was thus verified that the apparent control of the Municipal Police has a major impact on behavior of drivers with 100% efficiency. It is recommended to ensure Police control on problematic road sections and in areas with many vulnerable users to improve safety conditions (in agreement with the Municipal Police).

4.3.4. Speed Measurements on Unmarked Sections (Hidden)

Measurements were carried out by the Municipal Police in different time intervals on working days and on weekends at the following sections:

1) Železničářská street
2) Litoměřická street
3) Sebuzínská – Brná street
4) Vinařská street
5) Pražská street
6) Hrbovická street
7) Výstupní street
8) Stříbrnická street
9) Neštěmická street
10) Opletalova street
11) Havířská street
12) Klíšská street
13) Drážďanská street
14) Masarykova street
15) Šrámkova street
16) Děčínská – Plšinky street
17) Karla IV street
18) Seifertova street
19) Palachova street

On sections, where drivers were not aware of speed measurements, 10, 708 vehicles (94,7%) did not exceed the speed limit on working days and 454 vehicles (74.9%) on weekends. Increased speed by up to 20 km/hour was detected at 468 vehicles (4.1%) on working days and 118 vehicles (19.7%) on weekends. Increased speed by 20 – 40 km/hour was detected at 115 vehicles (1%) on working days and 31 vehicles (5.1%) on weekends. Permitted speed was exceeded by more than 40 km/hour by 12 vehicles (0.1%) on working days and 3 vehicles (0.5%) on weekends. Even from such short-term measurements, it is inevitable that the speed limit in the city is being exceeded.

4.4. Analysis of Spot and Section Measurements of Speed and of Passes on the Red Light

The analysis was performed by the NTD Group Ltd. (www.ntd.cz), which operates and manages signal traffic lights and stationary equipment for section speed measurements in Ústí nad Labem. Selected data from detectors are submitted to authorities responsible for addressing traffic rule violations. Provided data from measurements are on immediate speed, speed in the section and on passing on a red light signal at intersections. These data were measured in the period between 28th April and 5th May 2010.

4.4.1. Spot Measurements of Immediate Speed (MIS)

Measurement of immediate speed on a single road profile is based on detectors of traffic light signals. The measured characteristics of individual detectors are listed in the documentation Safety Audit Report, Part 1.

It was monitored on following sections in the city:

Table 5 - Location of individual detectors

Specification	Locality	Detector
UJPM - L1	K06	Jircháře towards Předmostí, line 1
UJPM - L2	K07	Jircháře towards Předmostí, line 2
URSP - L1	K07	U Trati towards Forum (left turn)
URZI - L1	K07	U Trati towards Žižkova (stright)
UZPA - L1	K07	U Trati towards Panská (stright), line 1
UZPA - L2	K07	U Trati towards Panská (stright), line 2
UZMH - L1	K07	U Trati towards Forum (right turn)
MHZI - L1	K07	Connection to Forum towards Žižkova (left turn)

(Source: NTD Group)

The analysis carried out on these road profiles showed that in majority of cases, the permitted speed limit is not exceeded. The exception is the street U Trati, where 40% of drivers exceed the maximum speed limit on the section towards the shopping centre Forum, and 18% of drivers in the section towards the street Žižkova. From the total number of 125 887 measured vehicles, 13 567 vehicles (10.8%) were passing above the permitted speed limit.

Table 6 - Number of vehicles violating the permitted traffic speed based on the measurements of NTD Group

	exceeding the speed limit		within the speed limit		Total
	No.	%	No.	%	
Jircháře towards Předmostí, line 1	6	0,27	2 196	99,73	2 202
Jircháře towards Předmostí, line 2	0	0,00	40 504	100,00	40 504
U Trati towards Forum (left turn)	158	40,72	230	59,28	388
U Trati towards Žižkova (stright)	7 055	18,00	32 143	82,00	39 198
U Trati towards Panská (stright), line 1	1 350	15,55	7 331	84,45	8 681
U Trati towards Panská (stright), line 2	4 891	17,86	22 494	82,14	27 385
U Trati towards Forum (right turn)	107	2,09	5 021	97,91	5 128
Connection to Forum towards Žižkova (left turn)	0	0,00	2 401	100,00	2 401
Total	**13 567**	**10,78**	**112 320**	**89,22**	**125 887**

4.4.2. Section Speed Measurements

Measurements were carried out on marked road sections, where the technical equipment forms a gate above the measured traffic line. The speed warnings are marked by both horizontal and vertical traffic signs, therefore, drivers are aware of being monitored. Measured characteristics of individual sections are listed in the documentation Safety Audit Report, Part 1. The speed of passing vehicles was measured on the following sections in the city:

Table 7 - Location and identification of individual detectors

Specification	Detector
KL - PA	Klíšská towards Panská -> Špitálské square
MR – VS	Masarykova-Štefánikova towards Všebořice -> Masarykova - Rondel
MS – CE	Masarykova-Štefánikova towards the city centre -> Masarykova-Sadová
MT – CE	Masarykova - Rondel towards the city centre -> Masarykova - Štefánikova
MT – VS	Masarykova-Sadová towards Všebořice -> Masarykova-Štefánikova
PL – ZI	Pražská towards Drážďany -> Pražská-Přístavní
SP – KL	Špitálské square - Klíšská -> Klíšská towards Ovčí hill
UP – LI	Pražská-Přístavní to Děčín towards Lovosice -> Pražská towards Litochovice

The performed analyses of speed of vehicles in the city described in the documentation Safety Audit Report, Part 1, showed that in majority of cases, the speed limit is not exceeded. The exception is the section of Pražská street towards Lovosice, the section U Špitálského square towards Ovčí hill and the section of Masarykova street towards Na Rondelu, where more than one fifth of vehicles passes above the speed limit. From the total number of 202 155 measured vehicles, 25 163 vehicles (14,5%) was driving faster than the permitted speed limit. For most of the vehicles, their speed exceeded the limit by 50 – 65 km/hour.

Table 8 - Number of vehicles exceeding the permitted speed limit according to section measurements of NTD Group

	exceeding the speed limit		within the speed limit		Σ
	No.	%	No.	%	
Klíšská towards Panská -> Špitálské square	930	3	26 993	97	27 923
Masarykova-Štefánikova, towards Všebořice -> Masarykova - Rondel	11 229	24	34 946	76	46 175
Masarykova-Štefánikova towards the city centre -> Masarykova-Sadová	876	5	15 624	95	16 500
Masarykova - Rondel towards the city centre -> Masarykova - Štefánikova	3 047	7	41 823	93	44 870
Masarykova-Sadová towards Všebořice -> Masarykova - Štefánikova	1 755	11	14 961	90	16 716
Pražská towards Dresden -> Pražská-Přístavní	752	4	18 591	96	19 343
Špitálské square - Klíšská -> Klíšská towards Ovčí hill	3 279	20	13 225	80	16 504
Pražská-Přístavní to Děčína towards Lovosice -> Pražská towards Litochovice	3 295	23	10 829	77	14 124
Total:	**25 163**	**12**	**176 992**	**88**	**202 155**

4.4.3. Records of Vehicles Passing on the Red Light Phase

Monitoring of vehicles passing on the red light phase took place on the following intersections and marked pedestrian crossings controlled by traffic light signals:

Table 9 - Location of individual detectors

Specification	Locality	Detectors
BR	Bílinská crossing	BR-UN-D1
MT	Masarykova x Štefánkova	MT-CE-D1, MT-VS-D1, MT-ST-D1
MS	Masarykova x Sadová	MS-CE-D1, MS-VS-D1, MS-SR-D1
PR	Přažská x Přístavní	PD-LO-D1, PL-ZI-D1
SN	Špitálské square	SK-MA-D1, SP-KL-D1, SK-PA-D1, SM-PA-D1
UN	U Nádraží crossing	UJ-PM-D1
UT	U Trati x Spojka	UR-MH-D1

The collected data shows that the amount of vehicles passing on the red light phase is small. From 318 449 monitored vehicles, only 321 vehicles (0.1%) passed on the red light phase. The following table shows the average and maximum time intervals from the beginning of the red light phase to the passage of a vehicle over the stop line. While the average time intervals present a good interpretive value, the maximum intervals may be distorted by the passage of a vehicle with turned on blue warning beacon.

Table 10 - The average and maximum time from the beginning of the red light phase to the time a vehicle passed the stop line

Specification	Average time from the beginning of the red light phase [s]	Maximum time from the beginning of the red light phase [s]
BR	8,04	16,364
MA	6,82	38,658
PR	14,83	38,427
SN	17,47	81,371
UN	8,04	19,664
UT	20,74	56,523
Average value	**12,66**	**41,83**

The average time from the beginning of the red light phase to the time a vehicle passes the stop line is 12 seconds, which is quite a long time, mainly at locations U Trati x Spojka (UT) and Špitálské square (SN). During this time, there is a significant risk of collision with a vehicle passing in another direction. The most frequent type of road accidents occurring on intersections during the red light phase are frontal and side collisions, causing very often fatal

and severe injuries. Therefore, it is necessary to deal with such traffic violations thoroughly and repressively.

4.4.4. Comparison of Speed Measurements Gathered by the Processor, by the Municipal Police and by the NTD group

Speed of 12,519 vehicles was measured at selected road sections in Ústí nad Labem during the nine-day period by the Municipal Police. From the total number, the speed of 586 vehicles (4.7%) exceeded the limit by up to 20 km/h, 146 vehicles (1.2%) by more than 20 km/h and 15 vehicles (0.1%) by more than 40 km/h.

Measurements realised by the processor found, that from the total number of monitored vehicles, speed of 43 029 vehicles (50.27%) was within the speed limit, which means that more than half of drivers exceeded the speed limit. The average speed of vehicles according to their category was:

- Motorcycles 50.5 km/hour
- Personal cars 51.4 km/hour
- Freight vehicles 47.3 km/hour
- Buses and trucks with trailers 43.0 km/h

The average speed of vehicles shows that the speed of vehicles exceeding the speed limit is only slightly higher than the permitted limit.

The results of speed measurements realised by the NTD group presents, that from the total number of 328 042 measured vehicles, 38 730 vehicles (11.8%) drove above the permitted speed limit.

Comparing the speed measurements realised by the Municipal Police, the NTD group and the processors, there is apparently a wide variation of results (see Figure 9). 94.0% of vehicles follow the speed limit according to the Municipal Police, 88.2% of vehicles according to the NTD group and only 50.3% of vehicles according to the processor. These differences may be caused by different means of measurements - the processor used quite imperceptible device placed on the post of a vertical traffic sign by the road, while the Municipal Police measured passing vehicles from a car parked by the road, which may be perceived as a warning signal for drivers. Stationary devices used by the NTD group were also apparent and marked by speed warnings on both horizontal and vertical traffic signs. Furthermore, the difference may be caused by different tolerances of the measuring equipment used by individual partners.

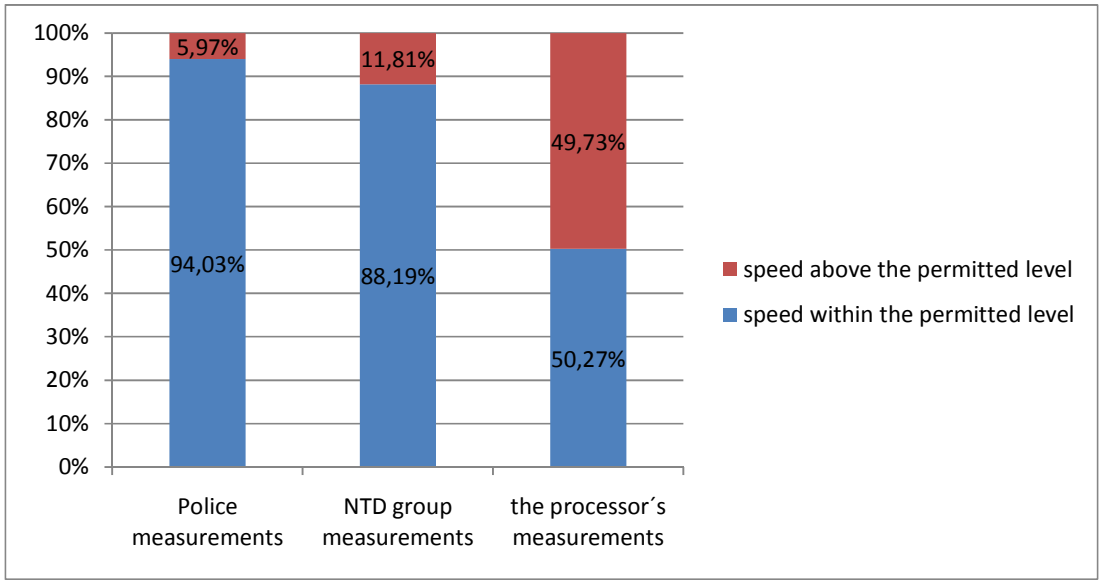

Figure 3 - Comparison of speed measurements realised by different partners

Examining the level of compliance with traffic rules according to the indicator of passage on the red light phase located on traffic lights concluded that the violations are not significant. From the total number of 318 449 monitored vehicles, only 321 vehicles (0.11%) drove on the red light phase. Nevertheless, passing on the red light phase is very serious traffic rule violation, which cannot be tolerated.

In general, the measurements show that drivers tend to violate traffic regulations but are able to correct such behavior on road sections, where the speed control and possible repression is expected. Supervision of compliance with traffic rules is an important preventive tool to eliminate accidents and to reduce material and personal consequences. Therefore, frequent random preventive supervision of the Police at various road sections in the city is recommended (including the sections currently with no Police supervision).

4.5. Safety at School Facilities

4.5.1. Methodology

Children are among the most vulnerable road users due to their frequent inattention, high activity and poor predictability, resulting in significant risk of potential accidents. It is necessary to focus on their safety and on safety issues of locations, where children frequently appear, such as school and preschool facilities:

- **Nursery schools:** It is not presumed that children without attendance will commonly move around preschool facilities without guidance. Still, the risk of a child running unexpectedly into the road needs to be addressed.

- **Elementary schools:** Children move around the locality accompanied by adults, older pupils make the journey by themselves. The main access routes need to be provided with extra level of security.

- **Schools of higher degree:** Children are supposed to be already educated about the principles of safe movement in traffic. It is desirable to warn drivers about the presence of children on roads and to calm the traffic adequately.

Road safety education for children is the basic necessary tool for safety improvements. Such education should be carried out by both parents and teachers as early as possible, beginning at nursery schools and especially intensively at elementary schools. The extent of the traffic training needs to correspond with the age of the child, taking place preferably in an entertaining and engaging way.

Safety inspections at school and preschool facilities were conducted in the vicinity of the following 22 facilities (maps showing location of each school, location of a specific safety hazard and streets, where the majority of children are walking, are presented in the Safety Audit Report, Part 1)

- Nursery school Kameňáček, Kamenná 1430/1, Ústí nad Labem
- Nursery school Pohádka, Bezručova 323/7, Ústí nad Labem
- Nursery school Skřivánek, Stříbrnické nivy 6, Ústí nad Labem
- Nursery school Sluníčko, Jožky Jabůrkové 601/1, Ústí nad Labem
- Nursery school Stříbrníky, Stříbrnická 3032/6, Ústí nad Labem
- Nursery school U Plavecké Haly, Na Spálence 1022/27, Ústí nad Labem
- School Na Kamenném Vrchu, Nová 1432/5, Ústí nad Labem
- School and Nursery school SNP, SNP street 2304/6, Ústí nad Labem
- School Ústí nad Labem, Karla IV. 1024/19
- School Ústí nad Labem, Stříbrnická 3031/4
- School Ústí nad Labem, Vojnovičova 620/5
- Faculty school, České mládeže 230/2, Ústí nad Labem
- School E. Krásnohorské, E.Krásnohorské 3084/8, Ústí nad Labem
- School Palachova, Palachova 400/37, Ústí nad Labem
- Nursery school Marxova, Marxova 28, Ústí nad Labem
- School Hluboká, Hluboká 150, Ústí nad Labem
- Nursery school Písnička, Studentská 6, Ústí nad Labem
- Nursery school Pomněnka, Přemyslovců 14, Ústí nad Labem
- Nursery school Vojanova, Vojanova 34, Ústí nad Labem
- Nursery school Brná, Sebuzínská 42, Ústí nad Labem
- School Jitřní, Jitřní 277, Ústí nad Labem
- Nursery school Nová, Svatojakubská, Ústí nad Labem

Directors of all primary and secondary schools and preschool facilities in Ústí nad Labem region were asked to participate at finding solutions for safety issues at their premises. On behalf of the city, questionnaires were distributed to determine the issues and the desired solutions. The directors answered the following short survey:

1. What are the main safety hazards for children coming to/from your (pre) school facility?

2. What do you think would best increase the security level of children in the vicinity of your (pre) school facility?

3. From which direction comes the majority of children?

4. Please, estimate the percentage of children commuting to the (pre) school facility by public transport.

5. Please, estimate the percentage of children being transported to and from the (pre) school facility by car.

Based on the survey, 9 schools and 12 nursery schools provided responses. Details of their answers and from safety inspections are listed in the documentation Safety Audit Report, Part 1.

4.5.2. Statistics Resulting from the Responses of School and Preschool Directors.

Table 11 - Safety deficits

The most common safety issues	Frequency
dangerous pedestrian crossing	14
violations of the speed limit by the school/preschool	6
not respecting the vertical traffic sign "entrance prohibited"	3
vehicles parked and passing by the entrance to the school/preschool	3
unsecured entrance from the school/preschool directly to a road	3
insufficient maintenance of pavements	3
poor view over the road	2
missing vertical traffic sign warning drivers about children	2
missing the vertical traffic sign marking the pedestrian crossing	2
no pedestrian crossing	2

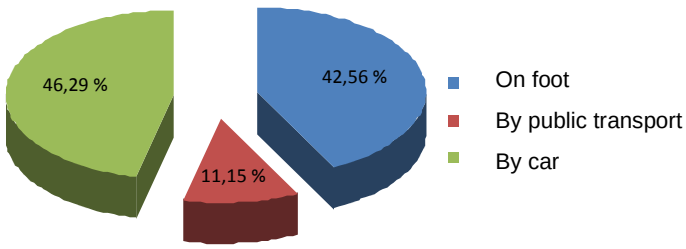

Figure 4 - Modes of transport of children to and from preschool facilities

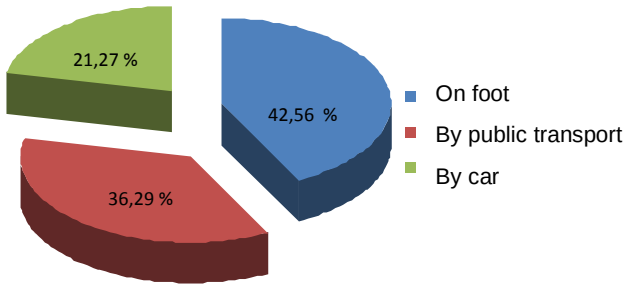

Figure 5 - Modes of transport of children to and from school facilities

4.5.3 Findings from Safety Inspections by School and Preschool Facilities

Not many serious shortcomings were revealed during the inspections. Most of the localities have already undertaken some preventive safety features, but improvements are still desirable due to high concentration of children by roads. Such facilities are suitable for continuous monitoring to immediately detect any potential security risks. Particular attention should be directed at safety at pedestrian crossings and public transport stations, which should be connected to a continuous pedestrian infrastructure. It is desirable to focus on their proper construction and clear view for both pedestrians and drivers. A necessary step is to ensure safe space for parents to drop off children at schools by car.

Another important tool is traffic education of children - the rules of movement in the streets should be taught at Nursery school and trained and practiced, often repeated and regularly extended.

4.6 Safety Inspections by Passage of a Vehicle

These safety inspections were carried out by visual clarity and safety assessment of roads from the driver point of view. The findings were recorded and the major visible safety deficits in each direction of way were documented.

The safety inspections were conducted by a passing vehicle in both directions without stopping due to the scale of the road network. Such analysis is not as thorough as detailed safety inspections according to the PIARC (the World Road Association – www.piarc.org) methodology.

The work was carried out by the expert team using the inspection devices for data gathering from the driver's perspective. The team was not familiar with the road network, which was a benefit for evaluating safety deficits in terms of random users.

The goal was to identify any visually detectable safety deficits with no regard to technical, legal and financial viability and reliability. These findings served as input for a proposal of recovery solutions, priority of implementation with respect to the statistics of accidents, location, costs, and seriousness of safety deficits, speed and importance of each road.

The aim of the documentation Safety Audit Report, Part 2, is to further develop steps leading to more accurate identification of the necessary measures, to identify those organisations responsible and to create an action plan for enhancing safety level of the city road network. The overall objective is to reduce the number of accidents and lower their consequences.

4.6.1. Scope of Work

The inspections were conducted on all the major local roads and other selected roads in Ústí nad Labem, throughout the whole length or on particular sections. (The maps showing individual routes undertaken by the monitoring vehicle can be found in the documentation Safety Audit Report, Part 1.) The assessed roads were:

Opletalova, Podmokelská, Přístavní, Pražská, Hlavní, Seifertova, Drážďanská, Krčínova, Neštěmická, Výstupní, Na Návsi, Malátova, Hoření, Krušnohorská, Sociální péče, Božtěšická, Všebořická, Havířská, U Trati, Panská, Klíšská, Jateční, Textilní, Tovární, U Vlečky, Průmyslová, Okružní, Masarykova, Winstona Churchilla, Bratislavská, Velká hradební, Předmostí, Bělehradská, Roosveltova, Důlce, Sebuzínská, Litoměřická, Železničářská, Děčínská, Vítězná.

4.6.2. Approach

Every road user should be allowed to move safely on roads (the rule of safe return). Therefore, the roads should be in the appropriate state in terms of their profile, management, traffic organisation, equipment, maintenance, and the immediate surroundings to eliminate accident and to minimize consequences caused by human error.

Safety inspections revealed safety deficits for road users, which were submitted to the road administrator with a proposal for corrective actions. The results were further used for identification of localities suitable for a detailed inspection and for establishment of priorities

and systematic programs of improvements (elimination of typical defects within possibilities of the road administrator).

The safety inspection is not as efficient as a standard evaluation process used to determine appropriateness of proposed measures (traffic engineering assessments, feasibility studies, safety audits), which is always necessary for designing or changing traffic organisation in the city (in terms of spatial review, capacity assessment, etc.).

Two basic concepts of inspection vehicles are distinguished worldwide within the EuroRAP (European Road Assessment Programme - www.eurorap.org) and IRAP (International Transport Statistics Database - www.iraptranstats.net):

1st System - Tablet Inspection – parameters are manually recorded to the PC by predefined input tools by a traffic expert on security during the passage, which reduces the time needed for data processing afterwards in the office. Such procedure was developed and used for road safety inspections in Ústí nad Labem. The system is independent from the particular vehicle; it is portable, easily storable and allows quick installation in a vehicle with no specific requirements. Its use is variable according to the task, structure of collected data and the purpose. The purchase costs are quite low.

2nd System - Video Inspection - the vehicle automatically monitors the road by about 5 video cameras without the assistance of a traffic expert during the passage. Data are evaluated by experts afterwards and the attributes are coded. This system does not require the presence of a qualified inspector in the vehicle and the vehicle speed does not need to be adjusted for proper recording of the input data. On the other hand, such system requires a specific vehicle equipped by high resolution weatherproof cameras and the purchase costs are quite high. Furthermore, the system is rather demanding on requirements for video recording and subsequent video processing.

Hardware equipment of the used scanning vehicle:

- PC – Laptop, tablet category running with MS XP, MS Vista or Microsoft Windows 7
- Full HD camera with a holder attachable into the vehicle
- GPS (or DGPS) with the protocol NMEA connected via a serial port or USB port
- A car power inverter for powering the CL adapter

Figure 6 - Hardware attached in the vehicle

The software allows recording events affecting security of the road network, their presentation and evaluation according to the chosen methodology (CityPlan, EuroRAP).

Software equipment:

Data acquisition module:

- Recording the parameters of a road;
- Reports of tested roads are stored in an open format, videos are recorded in MTS or AVI format;
- Possibility of transferring to a full conversion to other data structures;
- Possibility of full reconfiguration of the entered parameters;
- Possibility of macro definitions for different types of tasks.

Evaluation module:

- Presentation of inspected data;
- Display of recorded parameters and safety deficits on the map (in points, segments), filtering parameters;
- Playback of captured video synchronized with the map;
- Editing of acquired videos;
- Export to GIS.

The result of the safety inspections is a report on identified road safety deficits, their type, location, visual documentation and resolution.

4.6.3 Implementation of the Safety Inspection by Passage

Safety inspections were conducted by an inspection team of the CityPlan Company, Ltd. under the competence of the leading safety auditor Jiří Landa (a holder of the certificate for "Road Safety Audit" - No. 4/2006, the certificate for "Safe road organization").

Safety inspections recorded the state of the road network in the city by the date of their realisation. Further development and implemented measures are not included and should be repeatedly monitored in the future by safety inspections conducted over the next few years.

Safety inspections in Ústí nad Labem were performed by the monitoring vehicle equipped by the 1st system for road safety assessment. During the inspections, description and documentation of major visible safety deficits were recorded and captured on high resolution videos for subsequent evaluation. The inspection vehicle for this purpose used a special device collecting data on road, GPS location and videos. At the beginning of the inspection, date and time were registered, as well as the name of the inspector and basic characteristics of the particular road – its number (importance) and the speed limit. Other parameters were gathered during the inspections by the equipment of the vehicle.

Inspection tours were realised also in bad weather conditions, except when the conditions did not allow identification of safety deficits and recording of videos for feedback. All the acquired data are stored by the processor.

4.6.4 Identified Safety Deficits

The identified safety deficits can be in divided into following general groups:

Defects on the road:

- defects of road conditions (holes, longitudinal and transverse waves affecting the passage)
- roadside deficits (paved or unpaved side, no side, sharp edges without land elements)
- deficits in road implementation (geometry, road lanes)
- deficits in the state of horizontal traffic marks (no marks, poorly visible marks, incorrect marks)
- issues of organization and state of intersections (unclear, uncontrolled, missing turning lanes, inadequate for traffic intensity, lack of view)
- problematic movement of pedestrians (on the roadside, sidewalk, path, crossing)

Defects by the road:

- unnecessary location of unsafe obstacles by the road
- presence of trees in the immediate vicinity of the road lane
- insufficient maintenance of greenery and its growth

The various phenomena affecting the safety level or roads in individual directions are listed or statistically described with typical examples. Each phenomenon contains description of identified defects, GPS coordinates, assessment of seriousness, urgency of a solution and possibility of recovery.

The seriousness rating is indicated on a five-level scale - low risk, medium low risk, medium risk, medium high risk and high risk. It reflects the urgency of addressing the particular safety issues. Each level is within the specific range with some common defects, such as improper location of bus stations, incorrectly realised pedestrian crossings, complicated intersections, insufficient conditions for pedestrians, or problematic location of parking areas.

Solutions for identified issues are either implementation of corrective measures, eliminating defects (obstacles, items), maintenance works or repair works.

4.6.5. Proposal for Further Procedures for Road Safety Improvements

Effort for road safety improvements in Ústí nad Labem should proceed simultaneously by two approaches:

1. Reactive approach – to analyse regularly (in the yearly or multi-year cycles) rate of road accidents and locate the road sections with high/higher accident rates.

2. Proactive approach (preventive) – to implement systematic programs for elimination of typical safety deficits of the road network, to allocate funds for removal of deficits and implement solutions with regard to their level of deficit/severity.

In practice, road safety improvements in Ústí nad Labem are mainly:

1. Reactive approach

Repeated inspections on localities with the majority of road accidents:

- Identify localities with the majority of accidents by periodic analysis
- Systematically eliminate safety deficits on the basis of detailed inspections
- Determine efficiency of realised measures by periodic analysis

2. Proactive approach

According to the findings from the inspections, it is necessary to systematically follow these steps:

- Remove the most serious safety deficits identified by the inspections (see the documentation Safety Audit Report, Part 2, chapter 2.3)
- Systematically find solutions from the most dangerous roads to less severe ones
- Prioritise detailed inspections for individual road sections
- Educate administration and maintenance personnel performing the periodic inspections according to the Road Act and its implementing regulations directing to deal with safety deficits and deficits
- Include reconstruction of intersections and road sections with high accident rate as a priority in the action plan for investment measures
- Conduct the safety inspections of the road network periodically

Detailed safety inspections and regular road checks should:

- be focused on the systematic elimination of the causes of accidents at identified localities and road sections;
- be focused mainly on aspects of preventive security than just a routine road maintenance;
- identify deficits and potential deficits to all road users;
- monitor the consistency of driving conditions and quality of the road network;
- monitor the operating conditions and safe use of the road network;
- monitor aging and deterioration of security equipment, worsening of view on roads caused by vegetation, the state of information and orientation equipment;
- change the established practice of winter and summer maintenance according to the safety issues;
- initiate measures to increase security and clarity of roads and safety of their surroundings.

4.7. Conclusion

Road safety inspections revealed many deficits, some of which are quite serious and pose major safety risks. The emphasis of remedial solutions is placed on improving the safety level and assessing requirements of proposed modifications. Many identified issues can be solved just by proper and regular maintenance.

This task represents the first phase of the process towards improving the safety of the road network in Ústí nad Labem by identifying the existing safety deficits and suggesting recovery possibilities. It is necessary to systematically deal with these potential deficits and perform further regular safety inspections to gather updated data. The processor delivered a comprehensive assessment of road safety situation in the city and provided training of personnel on traffic safety.