ON-SITE TRAFFIC MANAGEMENT EVALUATION AND PROPOSALS TO IMPROVE SAFETY OF ACCESS TO WORKPLACES

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Resume

Transport is a phenomenon currently used in almost every sector. That is why attention is to be paid to transport safety, which should not only be addressed in relation to situation in cities or urban areas, but it is also necessary to deal with transport safety in larger enterprises where motor traffic encounters non-motorized traffic. The authors elaborated a similar research study. The introductory two sections analyze the current situation in terms of identifying bottlenecks of the traffic organization on the industrial site and possible separation of motor from non-motorized traffic to ensure safe access to workplaces and improve safety of transport on the site. In the most important part of the study, the obtained results are presented, wherein the “load” of the individual entry and exit points is specified. Thereafter, based on the acquired data, particular solutions related to transport safety with appropriate discussion are proposed.

Keywords:
traffic management, transport safety, access to workplace, manufacturing enterprise

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1 Introduction

Transport safety represents a fundamental issue for any state or region and public, as well as private, authorities concerned are confronted with a problem of identifying a certain location wherein the specific safety restrictions and improvement measures are to be undertaken [1]. The very aspects associated with the three elements of transport safety; i.e. driver, vehicle, transport infrastructure and its surroundings, are often evaluated and investigated by implementing a variety of advanced information systems and technologies and have an influence on the particular consideration of transport safety and quality [2-3].

Transport safety will continue to be a crucial issue for each society, especially for low-income states. The most relevant aspects affecting a road safety level and hence, may be considered to be key attributes in the context of introducing specific safety measures are as follows [4-7]:

• parameters of route (foundation, slopes, curves, gradients, designed parameters for vehicles and so forth),
• parameters of an entrance to the area concerned (access point),
• parameters of vehicles,
• infrastructure maintenance level,
• infrastructure network saturation degree,
• location visibility,
• long-term and short-term weather conditions,
• drivers and population features,
• previous statistics of drivers associated with transport safety in the given territory,
• preferences and special requirements.

Analogous topics have been addressed in a series of publications presented by numerous authors. For instance, the subject of the traffic safety in terms of social and economic aspects, such as working conditions, job strain and driving accidents, is emphasized in [8] by Useche et al. by Meszaros et al. [9] and by Malka et al. [10].

As far as another similar aspect is concerned, literature sources [11-12] deal with an issue of traffic safety systems in water transport, while Jurkovic et al. designed an advanced technology to increase navigation safety encompassing a system for monitoring the life functions of a crew member, as well as a position of the vessel towards the fairway/shore [11], whereas Wang et al. [12] tried to eliminate a risk of occupational hazards and thus improve safety conditions when strengthening hazard knowledge and enhancing safety behavior for water port employees.
regarding the traffic organization, identify potential bottlenecks in this particular regard and thereafter, propose possible scenarios in terms of separating motor from non-motorized traffic, as well as streamlining parking situation in order to secure safe access to individual workplaces and enhance transport safety on this site.

To this end, as alternative methods to be applied, following recommendations for their implementation into the examined industrial site are presented in the next sections of this research study: a) classification of roads and pathways on the site to secure better traffic management resulting in a more favorable orientation of drivers and pedestrians; b) design of a new parking area for heavy trucks to eliminate traffic jams currently emerging on the main road); c) design of new parking bays allowing vehicles to wait for handling while not obstructing the free passage of other vehicles; d) separation of road transport from pedestrians; i.e. establishment of a new pathway method for more convenient orientation of employees.

As for the access to workplace, regarding the examined enterprise, the main entrance (hereinafter referred to as HVST) is designed for employees, contractors, visitors and vehicles up to 3.5 tones. Persons enter the site through turnstiles 1 to 5 at the gate and only one person passes through in the car - the driver. The modified data set includes a breakdown of incoming vehicles into vehicles of visitors (hereinafter referred to as HVST-Visits) and other vehicles (hereinafter referred to as HVST-Vehicles) [17].

During the reference (examined) period, it was identified that about the same number of vehicles entered the site through the main entrance, which is over 6,000 vehicles per month, with a daily average of more than 200 vehicles (see Figure 1). However, these

![Figure 1 Number of vehicles entering the site through the main entrance in the reference period](image)

| day of the Week | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | total daily average for 5 days of the week in the reference period |
|----------------|--------|---------|-----------|----------|--------|----------|--------|--------------------------------------------------|
| total daily average in the reference period | 303.7  | 333.75  | 334.82    | 317.4    | 277.6  | 43.8     | 39.1   | 313.6                                            |

On the other hand, in publications [6, 13-14], a topic concerning an effect of a human factor on generating the traffic congestions is analyzed. Lizbetin and Bartuska were focused on creation of the traffic congestions, specifically on urban roads, wherein they confirm that the driver reaction (perception) time affects a number as well as an extent of such congestions [6]. In relation to manuscript [13], Kubanova and Poliakova highlighted importance of scheduling the truck-driver time, as one of the essential elements associated with the transport safety. As for Useche et al., their practical research study [14] investigates a relation between the stress-creating work conditions of bus-rapid-transport drivers and risky driving behaviors, as well as looks into whether fatigue entails a factor intermediating a relationship between these two attributes.

Even Posuniak et al. elaborated related publication, in which they presented the restraint safety systems for children (i.e. booster seats) when carrying in vehicles [15]. In particular, they conducted several experiments when utilizing child dummies under simulated traffic circumstances to better comprehend an impact on both the traffic dynamics and kinematics of the technology being applied.

And last but not least, description of different techniques for vehicle data detection used when the road traffic counting, during the largest traffic survey conducted in the Czech Republic, focused mainly on the traffic safety data, is outlined in article compiled by Hanzl et al. [16].

2 Data and methods

The objective of this manuscript is to analyze the current state on the specific industrial site regarding the traffic organization, identify potential bottlenecks in this particular regard and thereafter, propose possible scenarios in terms of separating motor from non-motorized traffic, as well as streamlining parking situation in order to secure safe access to individual workplaces and enhance transport safety on this site.

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provides statistical evaluation of those entrances during the reference period [18-19]. As far as the number of vehicles during the reference period is concerned, entrance 3 with a total of 86,535 vehicles was the most occupied, followed by the main entrance with 86,347 vehicles and entrance 4 with a total of 62,820 vehicles.

The percentage of vehicles entering the site per entrance and month of the reference period is shown in Figures 2 and 3.

The overall data shows that this percentage does not even change with the day of the week [19].

The daily average of vehicles entering the site through the entrances investigated on each day of the week is shown in the following Figure 4. The average of 300 vehicles enter the site through entrance 3 and values are affected by a significant decline in vehicles on Saturday and Sunday.

That is why the daily average of vehicles passing through the main entrance every day of the week is also provided (see Table 1). The daily average in the reference period was 300 vehicles from Monday to Friday with Tuesday and Wednesday (330 vehicles) being the busiest days and with a partial decline on Monday (300 vehicles) and especially on Friday (280 vehicles). The average on Saturday and Sunday was 40 vehicles.

In addition to the main entrance, two other entrance gates on the site, identified as entrance 3 (in figures and tables, referred to as VST3) and entrance 4 (in figures and tables, referred to as VST4) of the enterprise, were considered. Based on the processed data, Table 2
“unattended” workplaces and two workplaces with zero number of employees were not included in calculations. In addition, the office building (3) with the largest number of employees (300) of all the workplaces was not considered, since this building is not accessed through the main entrance [20]. In addition, the administrative building (97) was not considered, since it is used for training of contractors - the west entrance from the parking lot or the east entrance to the site for the foreign language courses.

Consequently, tabular data is presented graphically for all the shifts (see Figure 5).

Based on the analysis of the input data (number of employees, the expected financial investments, etc.), a proposal may be made to prioritize repairs/

### Table 2 Number of vehicles entering the site through the entrances investigated

| month | VST3-NA | VST3-other | VST3-overall | VST4-wood | VST4-waste | VST4-other | VST4-overall | HVST-vehicles | HVST-visits | HVST-overall |
|-------|---------|------------|--------------|-----------|------------|------------|--------------|--------------|-------------|-------------|
| 01    | 2,770   | 3,846      | 6,616        | 3,747     | 560        | 163        | 4,470        | 6,592        | 293         | 6,885       |
| 02    | 2,587   | 4,002      | 6,589        | 4,269     | 514        | 178        | 4,961        | 6,571        | 339         | 6,910       |
| 03    | 2,681   | 4,440      | 7,121        | 5,857     | 640        | 125        | 6,622        | 6,419        | 351         | 6,770       |
| 04    | 2,552   | 4,249      | 6,801        | 5,079     | 829        | 113        | 6,021        | 6,058        | 363         | 6,421       |
| 05    | 2,569   | 4,391      | 6,960        | 5,577     | 620        | 120        | 6,317        | 6,734        | 369         | 7,103       |
| 06    | 2,546   | 4,399      | 6,945        | 3,486     | 778        | 316        | 4,580        | 6,690        | 310         | 7,000       |
| 07    | 2,531   | 4,945      | 7,458        | 4,300     | 1,087      | 120        | 5,507        | 6,059        | 271         | 6,330       |
| 08    | 2,394   | 5,652      | 8,046        | 4,684     | 1,204      | 232        | 6,120        | 7,006        | 312         | 7,318       |
| 09    | 2,147   | 5,328      | 7,475        | 3,741     | 1,228      | 171        | 5,140        | 9,266        | 341         | 9,607       |
| 10    | 2,783   | 5,177      | 7,960        | 4,641     | 597        | 157        | 5,395        | 7,787        | 381         | 8,168       |
| 11    | 2,687   | 5,032      | 7,719        | 4,072     | 646        | 124        | 4,842        | 7,177        | 312         | 7,489       |
| 12    | 2,003   | 4,842      | 6,845        | 2,177     | 586        | 102        | 2,845        | 6,147        | 199         | 6,346       |
| total | 30,232  | 56,303     | 86,535       | 51,630    | 9,289      | 1,921      | 62,820       | 82,506       | 3,841       | 86,347      |

### Table 3 Number of personnel using the access points at a distance of less than 500 m

| no. | description                                      | distance from the main entrance in meters | number of employees using the given entrance |
|-----|-------------------------------------------------|--------------------------------------------|---------------------------------------------|
| 5   | PM 16 - material preparation plant              | 100                                        | 22  10 6 6                                 |
| 6   | channel storage system of finished goods PS 16/17| 145                                        | 6  6                                       |
| 1   | finished goods store                            | 200                                        | 30  11                                    |
| 37  | electric motor store                            | 200                                        | 2                                         |
| 8   | treatment plant for PS 7 - processing machine hall | 217                                      | 31  20 8 8                                 |
| 2   | PS 1 - preparation plant                        | 218                                        | 23  12                                    |
| 7   | administrative building of the timberyard + workshops | 260                                      | 5  0                                       |
| 10  | timberyard - decortication and cutting machines ANDritz | 409                                      | 22  11 11                                 |
| 12  | near mechanical workshops                       | 477                                        | 5  0                                       |
| 11  | sanitation facilities                           | 478                                        | 3  0                                       |
| 13  | mechanical workshops                            | 500                                        | 23  2                                       |
| total|                                              |                                            | 172 72 25 14                              |

the main entrance daily from Monday to Friday and the average of over 200 vehicles through entrance 4.

### 3 Use of the main entrances to the site by pedestrians

A breakdown of workplaces by distance from the main entrance was based on the available data [13]. Table 3 shows workplaces at a distance of less than 500 m from the main entrance - a total of 11 workplaces. Table 4 shows workplaces at a distance of 500 m to 1,000 m from the main entrance - 10 workplaces. Table 5 shows workplaces at a distance of more than 1,000 m from the main entrance - 10 workplaces. Two
Table 4 Number of personnel using the access points at a distance of 500 m to 1,000 m

| no. | description                          | distance from the main entrance in meters | number of employees using the given entrance |
|-----|--------------------------------------|-------------------------------------------|---------------------------------------------|
|     |                                      |                                            | shift 1 | shift 2 | shift 3 | shift 4 |
| 14  | mechanical maintenance workshops     | 550                                        | 17      | 6       |         |         |
| 15  | chemical store                       | 600                                        | 1       | 1       |         |         |
| 17  | COV - chemical water treatment plant | 650                                        | 1       | 1       | 1       |         |
| 16  | celpap warehouses + new cafeteria    | 680                                        | 5       | 0       |         |         |
| 18  | COV - operations building            | 740                                        | 32      | 7       | 7       |         |
| 19  | control room of the cooking plant    | 760                                        | 15      | 5       |         |         |
| 20  | administrative building of the pulp mill | 900                                      | 36      | 2       |         |         |
| 21  | boiler house (RK1 + KB)              | 972                                        | 38      | 12      | 12      |         |
| 27  | workshops and locker room            | 997                                        | 4       | 1       |         |         |
| 28  | water treatment plant                | 1,000                                      | 5       | 2       |         |         |

| total | 154 | 37 | 20 | 0 |

Table 5 Number of personnel using the access points at a distance of more than 1,000 m

| no. | description                          | distance from the main entrance in meters | number of employees using the given entrance |
|-----|--------------------------------------|-------------------------------------------|---------------------------------------------|
|     |                                      |                                            | shift 1 | shift 2 | shift 3 | shift 4 |
| 25  | paper processing plant PM18          | 1,300                                      | 65      | 30      |         |         |
| 26  | solo packaging                       | 1,300                                      | 25      | 8       |         |         |
| 23  | paper making machine hall PM 18      | 1,400                                      | 31      | 11      | 9       | 9       |
| 31  | warehouses                            | 1,400                                      | 3       |         |         |         |
| 33  | porter’s lodge - entrance CIII       | 1,400                                      | 3       | 3       |         |         |
| 34  | finished goods store PM 18           | 1,400                                      | 13      | 6       |         |         |
| 32  | spare part store                     | 1,500                                      | 6       |         |         |         |
| 35  | dock and workshop                    | 1,550                                      | 3       | 0       |         |         |
| 30  | fire station - SD-pallets            | 1,600                                      | 17      | 12      | 4       |         |
| 36  | entrance gate for vehicles           | 1,954                                      | 4       |         |         |         |

| total | 170 | 70 | 13 | 9 |

Number of personnel depending on distance of the workplace from the main entrance— all shifts

![Chart](image)

Figure 5 Number of personnel depending on distance of the workplace from the main entrance - all shifts
investigated are not used and workplaces with less than 20 employees in the first shift.

5 Analysis of the most occupied access points for vehicles and pedestrians

The data obtained from an analysis of the most occupied access points for vehicles and pedestrians is provided here. Persons who access the site through the main entrance are hereinafter referred to as VST1 01 and persons who exit the site through the main entrance as VST1 02 and cars entering (P) or exiting (O) the site.

Table 6 summarizes values concerning a number of pedestrians and vehicles entering and exiting the site through the main entrance and entrance 3 during one selected week. Figure 6 depicts all the values regarding a number of pedestrians and vehicles entering and exiting the site through the main entrance and entrance 3 by days [21-23].

The analysis identifies the largest number of constructions of pavements leading to the workplaces at a distance of less than 500 m, or the most occupied roads. In the next stage, the workplaces at a distance of over 500 m, or cycling solutions for workplaces at a distance of more than 1,000 m can be provided.

4 Use of the existing roads and pavements by pedestrians

To evaluate how the existing roads and pavements are used by pedestrians, workplaces with more than 20 employees in the first shift were selected. The largest number of employees is in the PM18 Paper Processing Plant (25). There are 65 employees in the first shift and this also applies to the second shift with 30 employees as illustrated in Table 6. The most occupied part of the road accounts for 160 employees in the first shift. This road should be prioritized to take into consideration a possible construction of a separate pavement [10].

Table 6 does not include workplaces where the roads investigated are not used and workplaces with less than 20 employees in the first shift.

Table 7 Number of pedestrians and vehicles moving through the main entrance and entrance 3 during week

| day of the week | VST1 01 | VST1 02 | VST1 /P | VST1 /O | VST3 /P | VST3 /O | Total |
|-----------------|---------|---------|---------|---------|---------|---------|-------|
| 1               | 1,135   | 1,070   | 314     | 314     | 384     | 359     | 3,576 |
| 2               | 1,217   | 1,143   | 319     | 342     | 371     | 334     | 3,726 |
| 3               | 1,253   | 1,195   | 336     | 349     | 374     | 356     | 3,863 |
| 4               | 1,333   | 1,226   | 345     | 368     | 303     | 263     | 3,838 |
| 5               | 1,085   | 1,056   | 269     | 263     | 287     | 273     | 3,233 |
| 6               | 578     | 574     | 39      | 36      | 48      | 37      | 1,312 |
| 7               | 13      | 52      | 29      | 32      | 46      | 29      | 201   |
| total           | 6,614   | 6,316   | 1,651   | 1,704   | 1,813   | 1,651   | 19,749|

weekly average Monday-Friday 1,204.6 1,138 316.6 327.2 343.8 317

Table 6 Workplaces with more than 20 employees

| no. | description | distance from the main entrance in meters | number of employees using the given entrance |
|-----|-------------|------------------------------------------|---------------------------------------------|
|     |             |                                          | shift 1 | shift 2 | shift 3 | shift 4 |
| 25  | paper processing plant PM18               | 1,300 | 65   | 30 |
| 21  | boiler house (RK1 + KB)                  | 972   | 38   | 12   | 12 |
| 20  | administrative building of the pulp mill | 900   | 36   | 2   |
| 18  | COV - operations building                 | 740   | 32   | 7   | 7   |
| 23  | paper making machine hall PM 18          | 1,400 | 31   | 11   | 9   | 9   |
| 8   | treatment plant for PS 7 - processing machine hall | 217 | 31 | 20 | 8 | 8 |
| 1   | finished goods store                      | 200   | 30   | 11 |
| 26  | solo packaging                            | 1,300 | 25   | 8   |
| 13  | mechanical workshops                      | 500   | 23   | 2   |
| 2   | PS 1 - preparation plant                  | 218   | 23   | 12 |
| 10  | timberyard - decortication and cutting machines ANDRITZ | 409 | 22 | 11 | 11 |
than 200 people, followed by 9-10 p.m. with more than 150 people. In regard to exit the site, more than 160 people left at 6-6.30 a.m., more than 500 people at 1:30-3:30 p.m. and more than 190 people at 10-10:30 p.m. The detailed results obtained, i.e. quantification of average daily values, are depicted in Figures 7 to 9.

As for the access through the main entrance, more than 100 vehicles on average entered the site between 5:30 and 7:30 a.m.; later, this number decreased and stagnated until 2 p.m. Thereafter, this number dropped rapidly. Regarding the exit of the site, most of the persons with a weekly entry/exit average from Monday to Friday, namely persons who access the site - 1,204.6 and persons who exit the site - 1,138. The daily average is more than 300 vehicles entering and exiting the site through the main entrance and entrance 3.

Consequently, this data was analyzed in more detail at 30-minute intervals to determine the most exposed times regarding the number of persons who access the site through the main entrance. The most occupied time was specified the shift turnover at 5-7 a.m. where more than 600 people entered the site and 1-2 p.m. with more than 200 people, followed by 9-10 p.m. with more than 150 people. In regard to exit the site, more than 160 people left at 6-6.30 a.m., more than 500 people at 1:30-3:30 p.m. and more than 190 people at 10-10:30 p.m.

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enterprise, it is recommended to classify roads and pathways on the site in order to provide easier orientation and traffic management. It will require, for example, to assign names and characteristics and determine main and secondary roads and provide markings of important building numbers for on-site roads, e.g. loading points and so on. The systematic markings will support a possible incorporation of roads in navigation solutions, better orientation of drivers and other similar benefits [16, 24].

B. Parking of Trucks Waiting in Front of Entrance 3

Vehicle queues currently occur because of trucks waiting for entering the site on the existing road in front of entrance 3. The idea of moving trucks entering loading points on the site to public car parks near the industrial site is rather difficult. There is not a suitable parking place downtown for a larger number of heavy trucks. Nearby petrol stations do not have a sufficient capacity to play the role of a parking lot [25].

To this end, a temporary or permanent parking area for heavy trucks (see Figure 10) is suggested to be used/built on the side of the current porter’s lodge III. The very parking area should be dimensioned to allow enough space in order to avoid queues on the existing vehicles left the site at 2-3:30, specifically more than 75.

Concerning the access through entrance 3, most of the vehicles (more than 40) entered the site between 5:30 and 7:30 a.m. Then, the average was of 18 vehicles in 30 minutes until 8:30 a.m. and later, more than 10 vehicles in 30 minutes until 1:59 p.m. After 2:00 p.m., the number of vehicles entering the site decreased and stagnated until the end of the day. In terms of exiting the site, the number of vehicles increased starting at 7 a.m., with the first peak from 10.30 to 10:59 a.m. - more than 16 vehicles in 30 minutes with a similar number of vehicles exiting the site again between 1:00-1:30 and 2:00-2:30 p.m.

6 Proposals to improve transport and discussion

This section consists of specific scenarios set towards improving the current state related to transport safety.

A. Systematic Marking of On-site Roads and Pathways

Considering the differentiation among different road functions and in a view of existing and expected traffic intensity and safety, for the examined manufacturing enterprise, it is recommended to classify roads and pathways on the site in order to provide easier orientation and traffic management. It will require, for example, to assign names and characteristics and determine main and secondary roads and provide markings of important building numbers for on-site roads, e.g. loading points and so on. The systematic markings will support a possible incorporation of roads in navigation solutions, better orientation of drivers and other similar benefits [16, 24].

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with pedestrian crossings). That is why a new pathway design is to be implemented for employees who come to and leave work as well as those intervening between workplaces on the site [28-29].

To introduce the new horizontal road surface markings in the main transport area, it is recommended to use parallel stripes, each of 125 mm wide, for marking of the areas for pedestrians. In accordance with the standard STN 736110 [29], an one-way pedestrian lane should have a width of 0.75 m, i.e. the recommended width of the pavement should be 1.50 m for both directions. At crossing points where pedestrians have to cross the roads, it is recommended to apply diagonal stripes, or a dashed line [29]. As far as marginal points of sidewalk are concerned, a horizontal pedestrian sign may be marked at the beginning and at the end, or at regular distances (approx. 20 m) to highlight a reserved pedestrian area [30].

The safest scenario is to separate pedestrians so that pathways on the main pedestrian diagonals are situated on a separate body in the adjacent area and secondary pathways are situated in the main traffic area and provided with the suggested horizontal road surface markings [31].

7 Conclusions

The transport safety on the industrial site could be increased by implementing at least some of the above recommendations, in particular in relation to motor and road. Better material storage management in this area can create an additional space for a new parking area [26].

An alternative scenario for the heavy trucks parking area along the road (the main access to the town) is to build a parallel parking lot, which should eliminate traffic jams that currently emerge on the main road [19, 27].

C. Parking Bays on the Site

Currently, trucks are sometimes waiting for loading or unloading on several on-site roads. A solution would be to create parking bays allowing vehicles to wait for handling while not obstructing free passage of other vehicles (see Figure 11).

Parking areas for the road vehicles are designed in compliance with the technical standard STN 736056 where, however, dimensions for parking of articulated vehicles are not specified. Figure 12 illustrates a designed parking bay for such trucks. The width of the parking bay may also be reduced to 3m.

D. Separation of Road Transport from Pedestrians

The current situation in terms of marking of sidewalks (pathways) was mapped based on the visual inspection of the industrial site. These are ensured by diagonal stripes, so called zebras along some roads. The current marking for pedestrians has many disadvantages such as it starts or leads to “nowhere” which may confuse pedestrians, as well as implementation of diagonal stripes is not appropriate with respect to form (confused with pedestrian crossings). That is why a new pathway design is to be implemented for employees who come to and leave work as well as those intervening between workplaces on the site [28-29].

To introduce the new horizontal road surface markings in the main transport area, it is recommended to use parallel stripes, each of 125 mm wide, for marking of the areas for pedestrians. In accordance with the standard STN 736110 [29], an one-way pedestrian lane should have a width of 0.75 m, i.e. the recommended width of the pavement should be 1.50 m for both directions. At crossing points where pedestrians have to cross the roads, it is recommended to apply diagonal stripes, or a dashed line [29]. As far as marginal points of sidewalk are concerned, a horizontal pedestrian sign may be marked at the beginning and at the end, or at regular distances (approx. 20 m) to highlight a reserved pedestrian area [30].

The safest scenario is to separate pedestrians so that pathways on the main pedestrian diagonals are situated on a separate body in the adjacent area and secondary pathways are situated in the main traffic area and provided with the suggested horizontal road surface markings [31].

7 Conclusions

The transport safety on the industrial site could be increased by implementing at least some of the above recommendations, in particular in relation to motor and
non-motorized traffic, above all with the emphasis on pedestrian traffic. It would also be reasonable to improve, streamline and simplify the movement of vehicles on on-site roads and thus put towards shortening the time-period of stay of trucks on the site.

In general, safety can be defined as a circumstance without a real threat or danger. Nevertheless, it has different specifications depending on the industry or situation. With regard to transportation, safety is referred to as creating conditions for minimizing conflicts and disturbances of the traffic flow in a certain mode of transport.

As for the specific proposals to be implemented in the industrial site being investigated, they can be summarized as follows:

- classification of roads and pathways on the site to secure better traffic management resulting in a more favorable orientation of drivers as well as other psychological-positive benefits,
- construction of a new parking area for the heavy trucks in front of entrance 3 (see Figure 10) to avoid queues on the existing road (i.e. to eliminate traffic jams that currently emerge on the main road),
- construction of the new parking bays allowing vehicles to wait for handling while not obstructing free passage of other vehicles (see Figure 11),
- implementation of a new pathway design for employees so that pathways on the main pedestrian diagonals are situated on a separate body in the adjacent area and secondary pathways are situated in the main traffic area and provided with the suggested horizontal road surface markings.

Aforementioned definition could also be regarded as a formulation of the objective addressed in this research study that tried to meet with the proposed scenarios - to minimize or eliminate traffic conflict situations on the industrial site in the examined manufacturing enterprise.

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