



COMPUTATION OF POLLUTION LEVEL IN INTERSECTION 13 DECEMBER WITH INDEPENDENȚEI AND TURNULUI

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Abstract: In this paper we will talk about the influence of road traffic on the pollution level in Brașov Municipality, more precisely on 13 December street. In this area, the highest level of traffic was found, especially during the hours of 7:00 - 8:00 AM and 5:00 - 6:00 PM. We made some traffic measurements between 5:00 and 6:00 PM, where we found a rather high concentration of polluting compounds and noise. In the final part we came up with a solution to optimize road traffic at one of the intersections studied and which is of greater importance than the others.

Keywords: pollution, vehicles, traffic, pedestrians,

1. THE POLLUTION GENERATED BY ROAD TRAFFIC

One of the main sources of pollution is the car, its contribution to global pollution is between 20-45% in industrialized countries.

In such conditions it is necessary that the polluting emissions of the cars be regulated by different national and international norms. One of the rules stated that each vehicle must ensure and be constructed in such a way that it does not harm the public through smoke and odor.

Transport plays a very important role in the economic and industrial development of a region, but it is also one of the most important polluting factors.

The effects of pollutants from vehicles are:

- Pollution related to the circulation of the means of transport, as a result of emissions of polluting substances resulting from fuel consumption, noise and entrainment of dust particles on the road;
- The training of serious dangers for humans and the environment, caused by the lack of security of the transports or the content of the transported goods;

Traffic is the main source of gaseous and solid pollutants, including carbon monoxide (CO), carbon dioxide (CO₂), nitrogen oxides (NO_x), volatile hydrocarbons (VOCs), sulfur dioxide (SO₂) and lead compounds (Pb). Once they reach the atmosphere through a series of transformations, including the photochemical transformation, they contribute to the formation of the ozone layer in the lower atmosphere, causing breathing difficulties and lung disorders. Their concentration depends on the traffic intensity, the terrain configuration, the prevailing winds and the weather conditions that can lead to the dispersion of the pollutants. One of the main sources of carbon monoxide (CO) pollution is road traffic. In cities, 95% of carbon monoxide pollution is due to motor vehicles.

In the central area of Brașov Municipality you can find the highest concentration of carbon monoxide, where the share is increased by cars equipped with spark ignition engines and where traffic conditions favor their frequent operation at non-economic regimes, with partial loads, speeds. reduced and incomplete fuel burns.

2. ROAD TRAFFIC STUDY

Defining the area

The route on which the measurements were carried out and analyzed the traffic flow during peak hours was Str. December 13, between the roundabout Coresi with the roundabout Lidl and the roundabout Lidl with the roundabout Făget. The choice of this section was made because it was indicated the formation of vehicle columns throughout the route with significant waiting times. Following this analysis, the causes of the traffic formed on this section will be identified and possible traffic flow solutions.

The analyzed route represents an important artery for the Municipality of Brasov, as it makes the connection between the Tractor District and the city center of Brasov. At the same time, this street also connects with the

bypass of the city. It should be noted that the intensification of traffic on this street began with the opening of the Coresi Shopping Resort mall.

It is worth mentioning that the entire section is made up of the 3 intersections that have 2 lanes / traffic lanes, which negatively influences the traffic volume recorded during peak hours.

It is also worth mentioning that on this section, in the Lidl area there are installed speed limitation thresholds for pedestrian crossings, which again negatively affects the traffic recorded during peak hours and beyond.

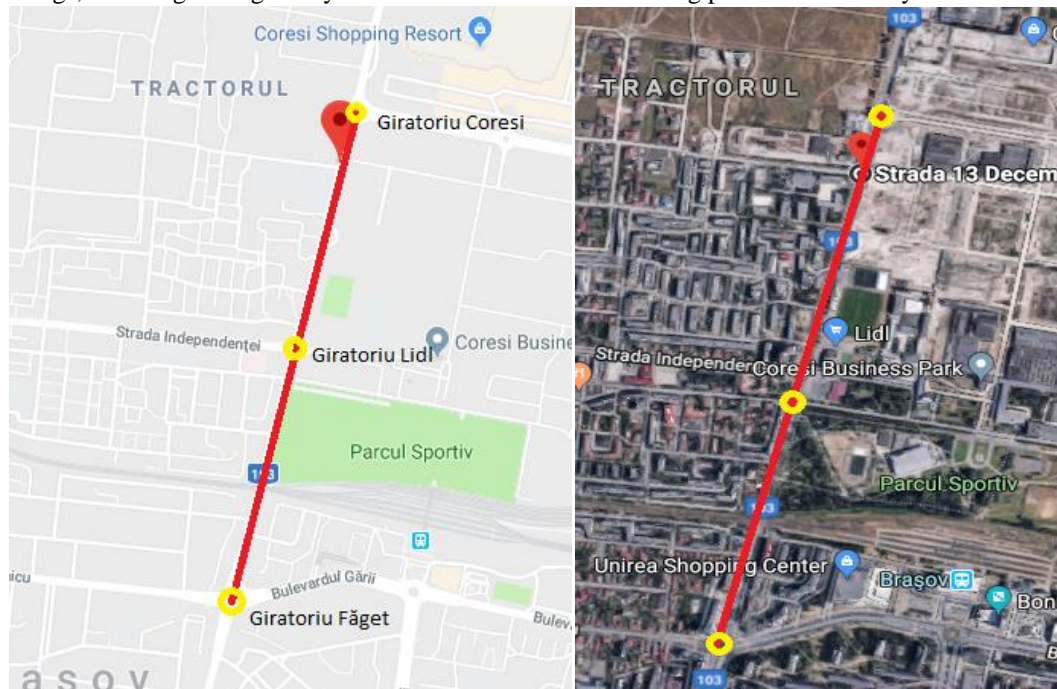


Fig. 2.1. – The route analyzed

3. THE POLLUTION LEVEL ON THE ANALYZED ROUTE

Analysis of the intersections from the point of view of pollution

The following instruments have been used to carry out pollution measurements:

- “MultiRAE IR” portable gas analyzer, used to determine pollution
- "Bruel & Kjaer 2250" sound level meter, used for noise determination



Fig. 3.1. – Use of sound level meter for noise measurement at the intersections studied

Choosing the measuring points and making the measurements

Following the measurements, the concentrations of the pollutants are determined for the areas where they were studied. The estimation of the pollutant concentrations, for a study area, is carried out by means of mathematical models that simulate the atmospheric structure, the emissions and the transport of the pollutants.

In the case of chemical pollution and noise measurements, they were made by a team of three persons, assisted by the coordinating professor. The measurements were made at the peak evening time between 5:00 pm and 6:00 pm.

At each intersection, a number of measurement points were established, from seven to 12, where the concentrations of pollutants were recorded: carbon monoxide, volatile organic compounds and carbon dioxide.

As a result of the measurements We noticed that the factors that influence the level of chemical pollution are:

- The size of the flow of vehicles passing through the intersections, as well as their composition;
- The operating conditions of the vehicles at the time of crossing;
- Weather conditions recorded at the time of measurement.

An important factor contributing to the dispersion of the pollutants, which caused us nine problems at the time of measurement is its wind and direction. The higher the wind, the greater the dispersion of polluting compounds.

Intersection Str. 13 Decembrie – Str. Turnului – Str. Independenței

To determine the level of pollution in the area of intersection, 8 points were chosen in which the measurements were made. They are located in the proximity of the tread, an equal number of 2 points for each access.

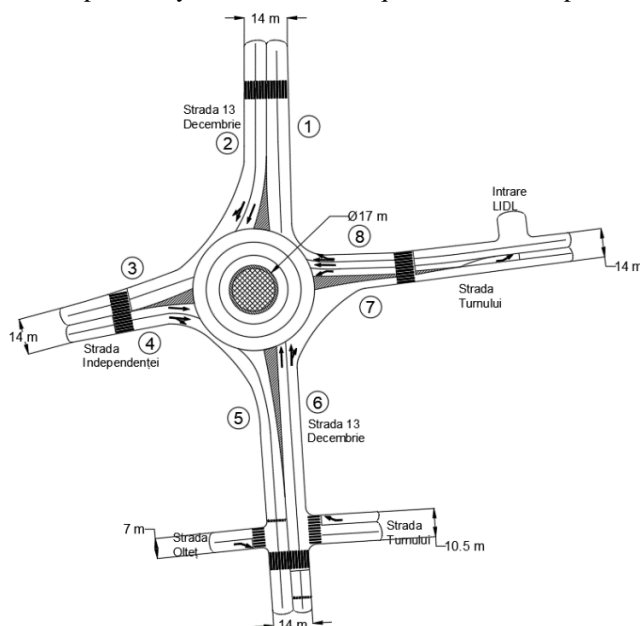


Fig. 3.2. – The diagram of the intersection together with the representation of the measurement points

Tab. 3.1. – Data recorded with "MultiRAE IR" portable gas analyzer

Str. 13 Decembrie - Str. Turnului -Str. Independenței			
Air pollution			
Point number	CO2	COV	CO
1	680	0	0
2	680	0.1	0
3	680	0	0
4	710	0	1
5	680	0	1
6	770	0.1	0
7	660	0	0
8	690	0	0

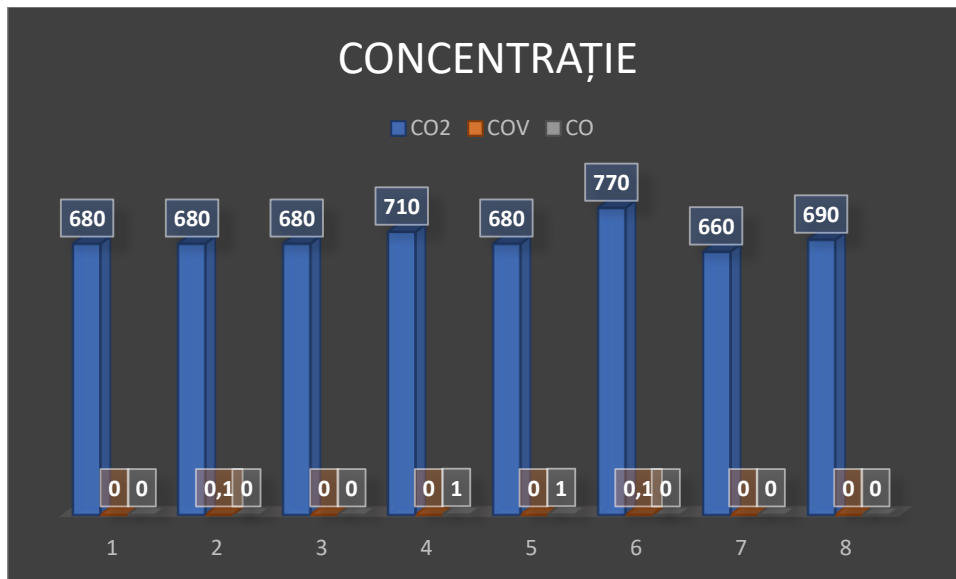


Fig. 3.3. – Graph of the concentration of polluting compounds

Tab. 3.2. – The data provided with the "Bruel & Kjaer 2250" sound level meter

Intersection Str. 13 Decembrie - Str. Turnului - Str. Independenței			
Point number	LAeq	LAFmax	LAFmin
1	69.98	83.7	59.85
2	71.57	82.41	60.68
3	68.48	79.33	61.65
4	72.14	85.05	60.9
5	71.03	82.22	58.96
6	70.02	82.02	62.52
7	68.77	78.07	60.45
8	69.15	85.14	57.15

LAeq - average noise level per time sample

LAFmax - maximum noise level

LAFmin - the minimum noise level

4. CONCLUSION

Circulation optimization solutions on the analyzed route

Following the study done on Str. 13 December, between the intersections of "Coresi" and "Făget", We realized that there is a very large flow of vehicles passing through them, creating traffic jams, a high level of chemical pollution and noise pollution and a very long journey time. big.

Based on these problems, we have come to the conclusion that urgent remediation is needed.

Such a remedy can only be achieved through:

- Fluidization of road traffic;
- Road traffic monitoring and control;
- Arrangement of a new road infrastructure for the means of public transport;
- Where it is the case to modify the road infrastructure as a whole;
- Informing citizens about the level of pollution they create with their own vehicles.

- In the case of the studied intersection, we arrived at the following idea of optimizing the traffic on the section Str. December 13:
- Eliminating pedestrian crossings around the roundabouts and creating an underpass or pedestrian walkway.

Eliminating pedestrian crossings around the roundabouts and creating a pedestrian underpass or pedestrian walkway

An important factor in hindering vehicle flow and traffic formation is pedestrian crossing. Around the roundabouts after about 50 m there is a pedestrian crossing on each access. These at peak hours make traffic even more difficult, as most pedestrian crossings are unsophoreed, and pedestrians are free to cross at any time.

An idea to remedy this problem is to eliminate pedestrian crossings around the intersections and create an underground passage for pedestrians, which is easily accessible for the elderly and people with a locomotive handicap. A pedestrian walkway can also be built, but this involves a problem for people with disabilities because they cannot build stairs outside.



Fig. 4.1. – Pedestrian walkway model

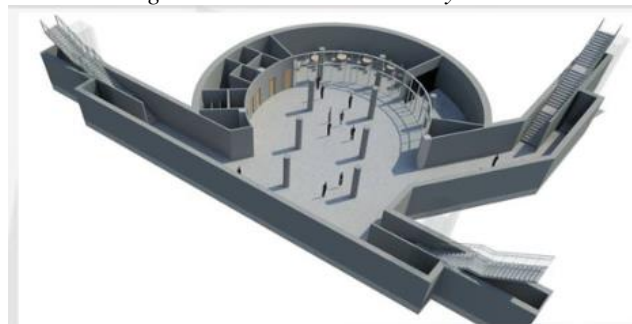


Fig. 4.2. – Pedestrian underpass model

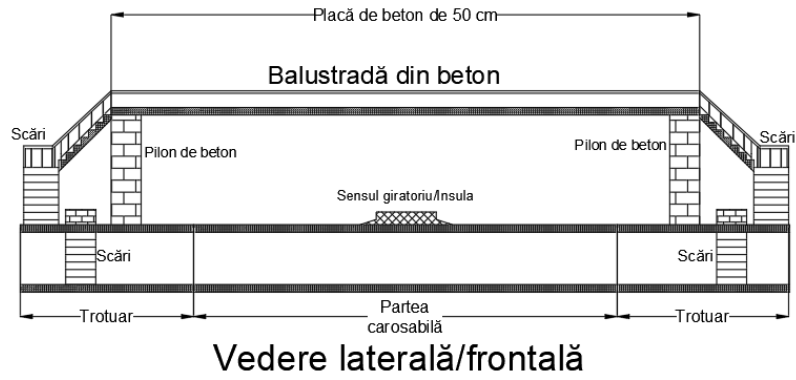
The advantages of such a passage are:

- Fluidization of road and pedestrian traffic;
- Design of some shops inside it;
- A better route for pedestrians with disabilities, as they do not need to cross between cars.

Disadvantages:

- High design and construction costs;
- High maintenance costs;

In the case of the intersections studied, such a passage would be of great help for the intersections of Făget(Str. 13 Decembrie – Str. Aurel Vlaicu – Bulevardul Gării) and Lidl(Str. 13 Decembrie – Str. Turnului – Str. Independenței).



Vedere laterală/frontală
Fig. 4.3. – The Lidl intersection changed

Model intersection design in a 3D program

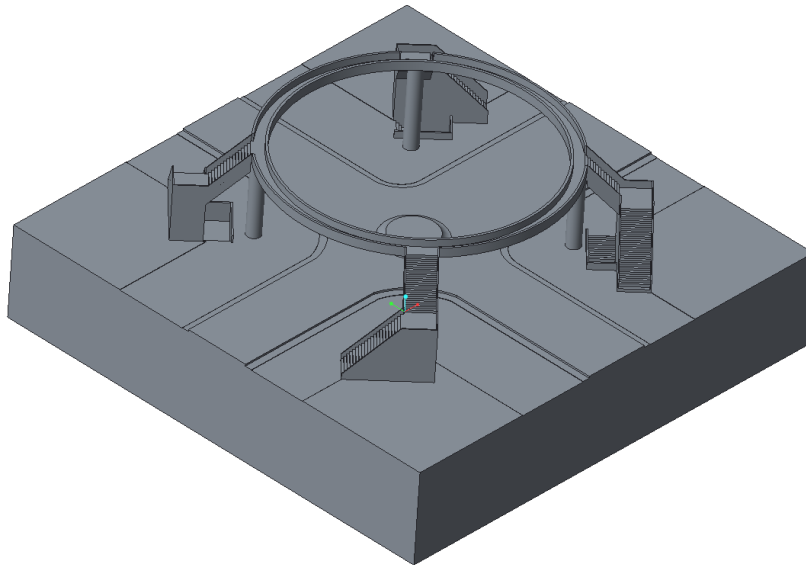


Fig. 4.4. – The intersection from Lidl designed 3D

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