University of Rome Tor Vergata

Faculty of Engineering

Project adjustment of road intersection

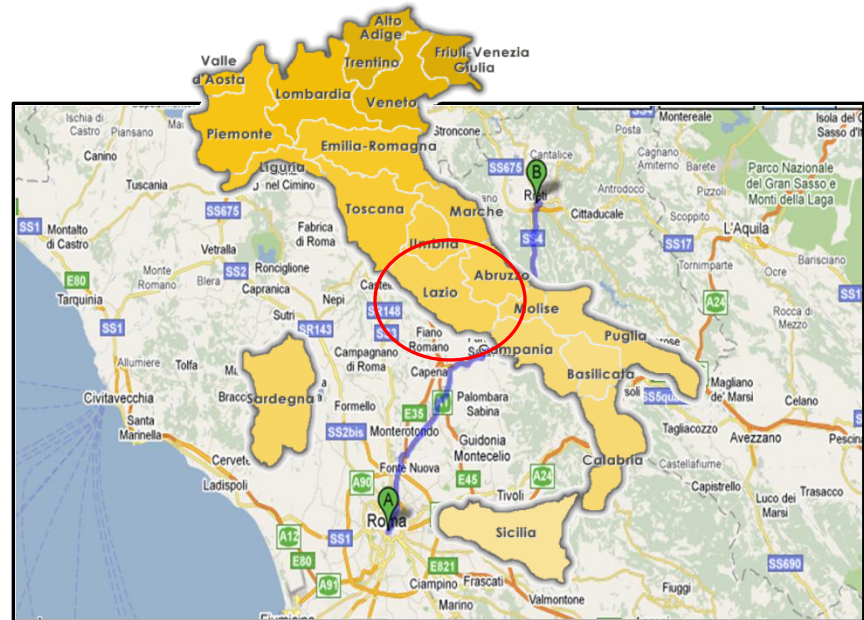**Davide Iaboni – davideiab@libero.it**

Description of the study area

Isolated intersection at grade between Salaria National road and Settebagni motorway interchange.

SS4 Salaria:
- ✓ Lazio region;
- ✓ connecting Rome to Rieti;
- ✓ stretch of road many busy;
- ✓ high level of accidents.

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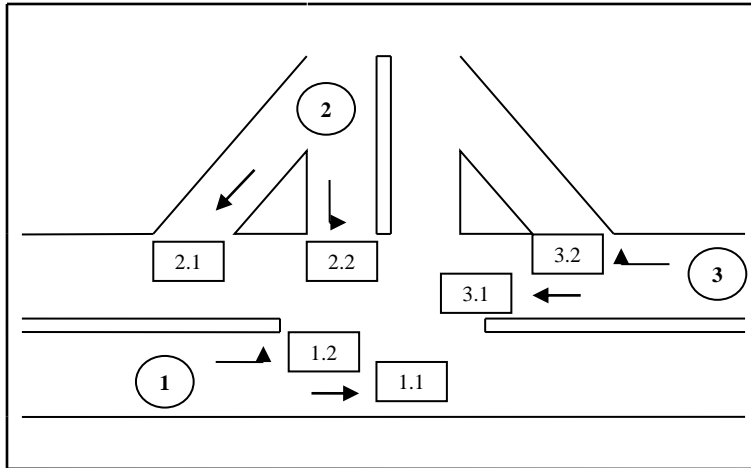Università

Description of the study area

Linear intersection with **priority right**

Intersection characteristics:
- ✓ three access;
- ✓ three groups of maneuvers;
- ✓ turning and crossing maneuvers allowed.
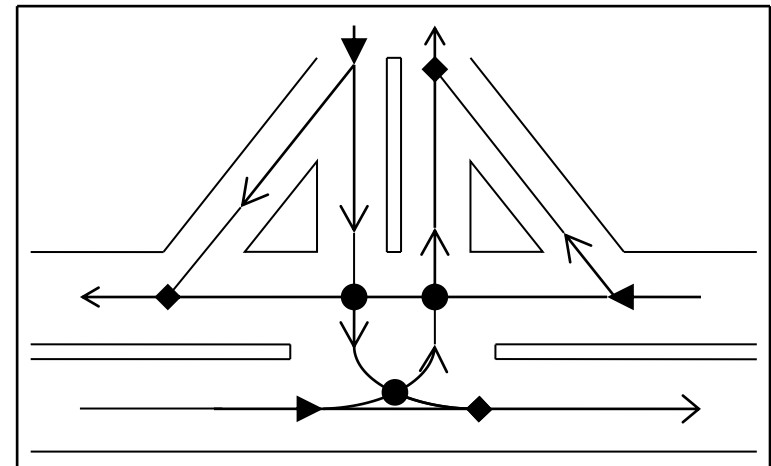
Description of the study area

Traffic streams priority:
1) 1.1, 3.1, 3.2;
2) 1.2, 2.1;
3) 2.2.

Maneuvers develop **9 conflict points**:
- ✓ 3 diversion ⟶ ;
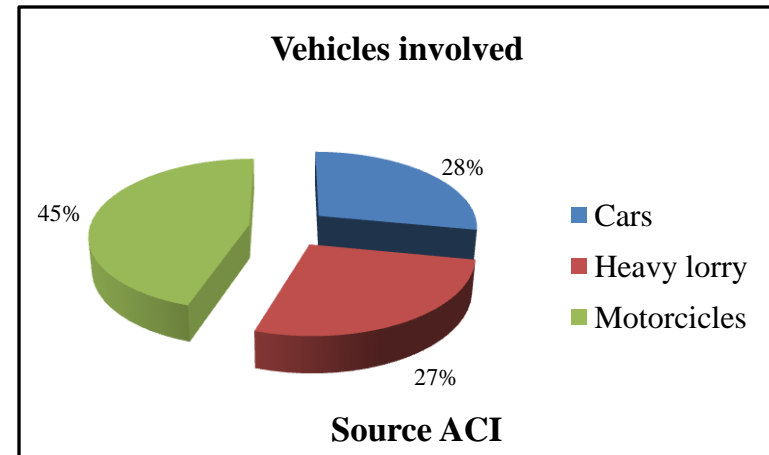- ✓ 3 admission ⟶◆ ;
- ✓ 3 crossing ⟶● .

Accident analysis

33 accidents occurred between 2005 and 2008:
- ✓17 frontals-sides;
- ✓ 7 collisions;
- ✓ 5 frontals;
- ✓4 n.c.

These events produced:
- ✓ **2 dead**;
- ✓ **49 people injured**.

The vehicles more involved were **motorcycles**

Accidents

12,1%

15,2%

51,5%

21,2%

- ■ Frontal-sides
- ■ Collisions
- ■ Frontal
- ■ n.c.

Source ACI

Vehicles involved

28%

45%

27%

- ■ Cars
- ■ Heavy lorry
- ■ Motorcicles

Source ACI

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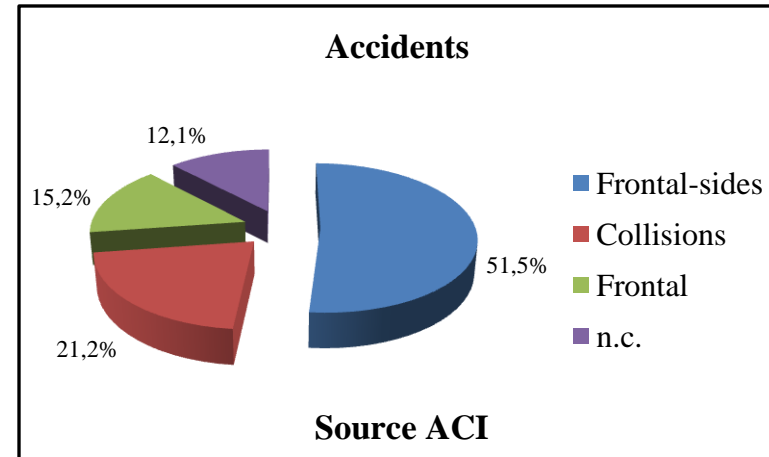
Safety problems identification

Problems can be fall into two categories:

Human factor (behavior):
- ✓ high outflow velocity on the major;
- ✓ utilization turns lane to overtake;
- ✓ disrespectful of right of way;
- ✓ utilization exchange area for reverse maneuvers.

Conditions of the road and its environment:
- ✓ road markings absent or degraded;
- ✓ splitter islands roadsides degraded;
- ✓ edge road margins degraded;
- ✓ lose material on carriageway;
- ✓ reflective inserts absence;
- ✓ any traffic calming intervention are absence.

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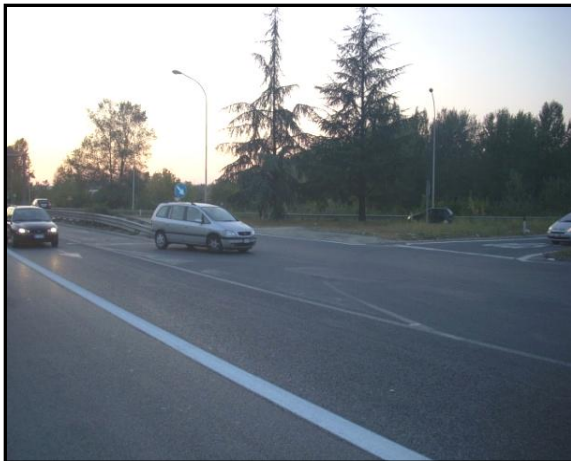
Safety problems identification

Critical maneuver is left turn, cause of accidents at:
✓ difficulty in binding the exchange area;
✓ difficulty of insertion on lane;
✓ flow vehicular quantity in opposition;
✓ high velocity of vehicles in opposition;
✓ poor perception of vehicles in opposition (**in particular motorcycles**);
✓ difficulty in determining the time frame to make the maneuver safely.

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Solution proposal

I want to propose a solution that:
- ✓ **to potentiate and to improve** the intersection functional furniture;
- ✓ **to protect** the left turns.

About the intersection functional furniture:
- ✓ retrieval of road markings;
- ✓ cleaning of the road;
- ✓ retrieval of splitter islands roadsides and margin;
- ✓ installation of reflective inserts;
- ✓ installation of rumble strips on the major;
- ✓ installation of speed enforcement on the major.

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Solution proposal

About the protection left turns:
➢ passage from **intersection at grade to signalised intersection**.
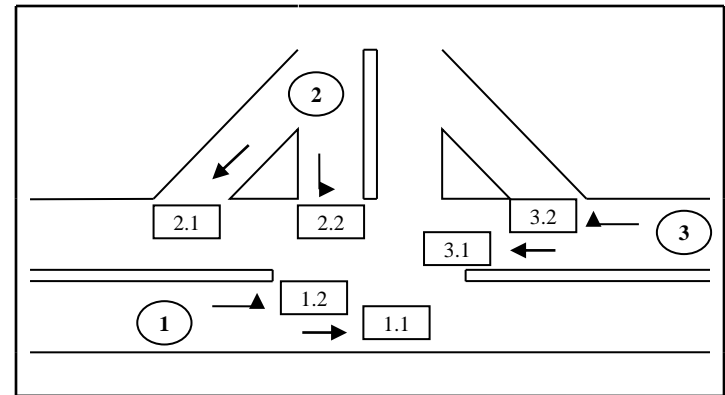
The signalised intersection:
✓ is justified by the quantity of vehicular flow;
✓ remove admission and crossing points conflict;
✓ doesn't involve the twisting of geometry intersection;
✓ can be implemented quickly;
✓ allow to protect the left turns.

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Solution proposal

Detection of vehicles flow:
- ✓ carried out from 7:00 am to 9:00 am (morning rush hour);
- ✓ on a weekday.

Man	C	7-8 Mc	HL	**Tot/h**	C	8-9 Mc	HL	**Tot/h**
1.1	576	41	24	641	593	40	31	664
1.2	183	5	4	192	215	12	16	243
2.1	899	15	49	963	709	22	38	769
2.2	365	21	30	416	368	12	19	399
3.1	823	200	33	1056	852	208	23	1083
3.2	428	30	32	490	529	65	29	623

Considered categories:
- ✓ cars (C);
- ✓ motorcycles (Mc);
- ✓ heavy lorry(HL).

Minimum flow to justify an signalized intersection			
Number lanes for each access		Traffic [veic/h]	
Major Street	By-road	Major Street (tot. two access)	By-road (access with Q max)
1	1	500	150
≥ 2	1	600	150
≥ 2	≥ 2	600	200
1	≥ 2	500	200

The **traffic flow** recorded have showed that the choice of signalised intersection is suitable

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Solution proposal

First estimation:
✓ to protect left turns the signal cycle was setting on **three phase**.
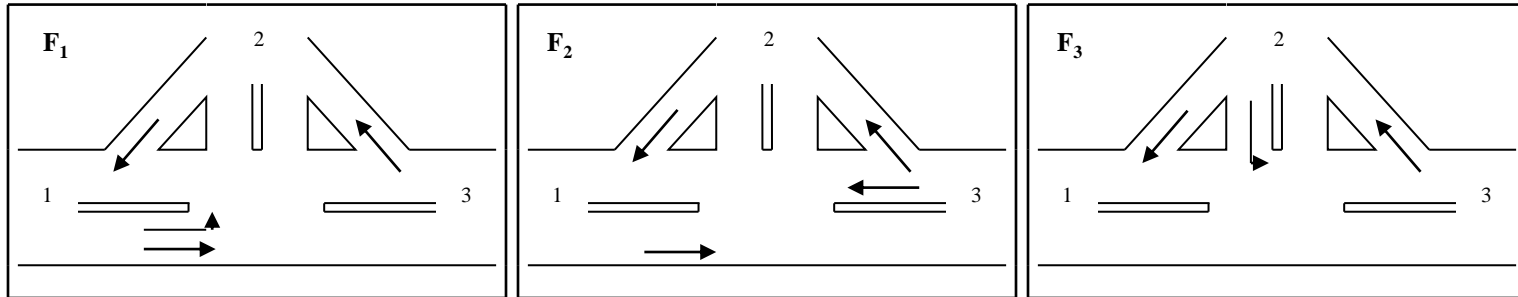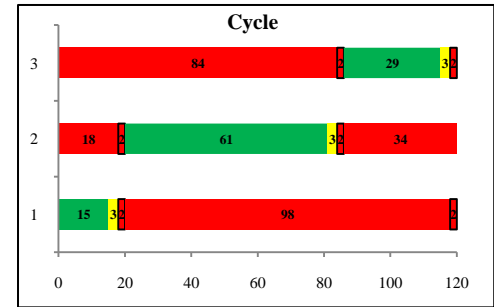

Traffic light parameters calculation by:
✓ **Webster** method;
✓ optimized with **Vissim** (micro-simulation software);

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Solution proposal

Estimated project parameters was proceeded:
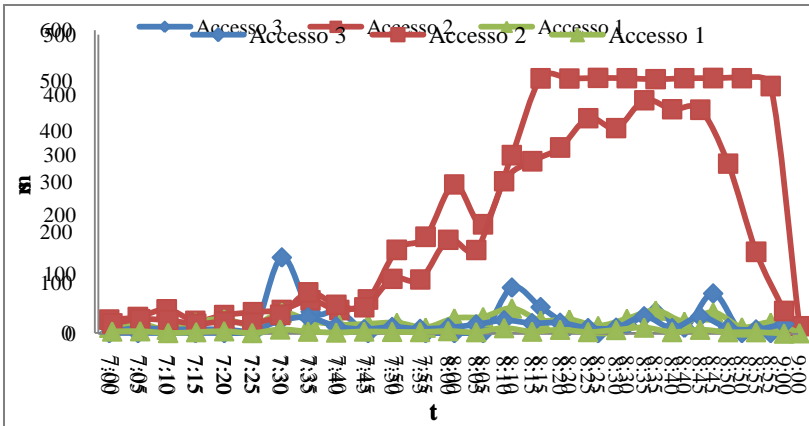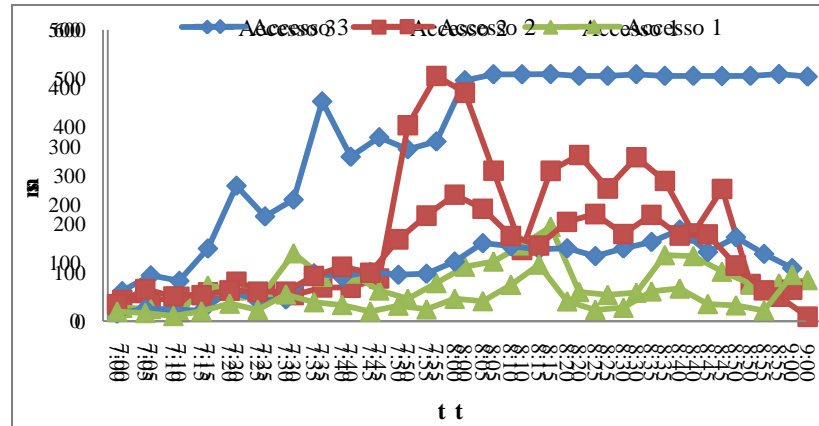➢ to compare current situation with project.

Timing diagram

The comparison showed:

✓ increase waiting times, but better distributed between the maneuvers;

✓ increase the length of the tail, but improvement of congestion on motorway interchange.

Mean delay time before

Mean delay time after

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Conclusion

Result from the comparison between the current situation and the project:
- ✓ **social cost of traffic** impact (in terms of lost time) estimated at 2 Mln €/year;
- ✓ **road accident cost** estimated at 2.1 Mln €/year.

Cost of project < average cost of road accident
The project cost will recovered within the first year

Improving solutions to be evaluated in order to lower the impact of traffic lights:
- ✓ control variable timing;
- ✓ vehicle-actuated operation.

Both solutions make it possible to reduce the waiting time, better adapted to the demand, making the project more affordable

Conclusion

During the camp I made the decision **to change** high-risk site that
I had found, because the local authorities have showed poor interest
in solving the problems that I have indentified

Moreover, being the intersection away from residential areas
I'll have more difficulty to create a public awareness campaign

After your presentations, I realized that I have identified a site falls outside the
perspective of feasibility, affordability and economy that you had specify

For these reasons and after discussing of this with some of you, I made the
decision to analyze another site that is located in my town,
a small city near Rome, so for me it is easier to contact the local
authorities and set up an appropriate awareness campaign

Thanks anyway for your attention

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