Improvement of the West road corridor for accessing to the new hospital of Lucca (Tuscany, Italy)

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Outline

✓ Location and design goals
✓ Present Situation
✓ Design Situation
✓ Results & Comparisons
✓ Conclusions
Location and design goals

Lucca

Pisa

Firenze
Location and design goals

City Renaissance Walls

Ring Road

Area of interest
Location and design goals

Old Hospital

Road Corridor

New Hospital
SIDRA INTERSECTION 6.0 (NETWORK version) to study the “Present Situation” and the “Design Situation”
Main references:

This work has been developed taking into account of international references:

• NCHRP report 772: “Evaluating the Performance of Corridors with Roundabouts”.


“Present Situation”
Present Situation
Road corridor & intersections

Via Di Tempagnano
Via Castracani
Via Alighieri
Via Romana

Piazzale Don Aldo Mei
Via di Toglio
Via Barbantini

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Present Situation

• Piazzale Don Aldo Mei

Intersection n.1
Intersection n.2
Intersection n.3
Present Situation

✓ Intersection n.1
Present Situation

✓ Intersection n.2
Present Situation

✓ Intersection n.3
Present Situation

✓ Intersection n.4
Present Situation

✓ Intersection n.5
Present Situation

✓ Intersection n.6

But…
Present Situation

✓ Intersection n.7
Present Situation

Road corridor layout (SIDRA)
“Design Situation”
Design Situation

• Piazzale Don Aldo Mei

... to remind you of the Present Situation ...
Design Situation

Main geometric characteristics of Porta Elisa's roundabout:

<table>
<thead>
<tr>
<th>Geometric characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Major axis (m)</td>
<td>69.00</td>
</tr>
<tr>
<td>Minor axis (m)</td>
<td>61.00</td>
</tr>
<tr>
<td>Central island diameter (m)</td>
<td>39.00</td>
</tr>
<tr>
<td>Circulating road width (m)</td>
<td>9.00</td>
</tr>
<tr>
<td>Number of circulating lanes</td>
<td>2</td>
</tr>
</tbody>
</table>
Design Situation

- Traffic Island at the Intersection n.4:

... to remind you of the Present Situation ...
Design Situation

Roundabout at the Intersection n.6:

- Intersection n.6

... to remind you of the Present Situation ...
Design Situation

Main geometric characteristics of the roundabout:

<table>
<thead>
<tr>
<th>Geometric characteristics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major axis a (m)</td>
<td>33.00</td>
</tr>
<tr>
<td>Minor axis b (m)</td>
<td>27.00</td>
</tr>
<tr>
<td>Central island diameter (m)</td>
<td>15.00</td>
</tr>
<tr>
<td>Max Circulating road width (m)</td>
<td>8.50</td>
</tr>
<tr>
<td>Min Circulating road width (m)</td>
<td>5.50</td>
</tr>
<tr>
<td>Number of circulating lanes</td>
<td>2 N/S</td>
</tr>
<tr>
<td>Number of circulating lanes</td>
<td>1 E</td>
</tr>
</tbody>
</table>
Design Situation

- Roundabout at the Intersection n.7:

... to remind you of the Present Situation ...
Design Situation

Road corridor layout (SIDRA)
Present situation

91 vehicles in line on Cadorna street
LoS “F”

HCM 2010

Design situation

6 vehicles in line on Cadorna street
LoS “D”

HCM 2010

Results & Comparisons

Los A Los B Los C Los D Los E Los F Continuous
Results & Comparisons

Present situation

85 vehicles in line on Castracani street

LoS “F”

HCM 2010

Design situation

11 vehicles in line on Castracani street

LoS “C”

HCM 2010

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Results & Comparisons

Design situation without roundabout

15 vehicles in line on Alighieri street

LoS “C”

HCM 2010

Design situation

HCM 2010

9 vehicles in line on Alighieri street

LoS “B”

HCM 2010
### Results & Comparisons

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Units</th>
<th>Network A PRESENT SITUATION</th>
<th>Network B DESIGN SITUATION</th>
<th>Difference Network B - Network A</th>
<th>% Difference Diff / Network A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Level of Service (LOS)</td>
<td></td>
<td>LOS F</td>
<td>LOS D</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Travel Time Index</td>
<td></td>
<td>0,07</td>
<td>3,99</td>
<td>3,92</td>
<td>5868,0</td>
</tr>
<tr>
<td>Speed Efficiency</td>
<td></td>
<td>0,11</td>
<td>0,46</td>
<td>0,35</td>
<td>333,0</td>
</tr>
<tr>
<td>Congestion Coefficient</td>
<td></td>
<td>9,43</td>
<td>2,18</td>
<td>-7,25</td>
<td>-76,9</td>
</tr>
<tr>
<td>Travel Speed (Average)</td>
<td>km/h</td>
<td>5,3</td>
<td>22,9</td>
<td>17,6</td>
<td>333,0</td>
</tr>
<tr>
<td>Degree of Saturation</td>
<td></td>
<td>3,383</td>
<td>1,178</td>
<td>-2,205</td>
<td>-65,2</td>
</tr>
<tr>
<td>Cost (Total)</td>
<td>$/h</td>
<td>12804,54</td>
<td>4506,74</td>
<td>-8297,80</td>
<td>-64,8</td>
</tr>
<tr>
<td>Fuel Consumption (Total)</td>
<td>L/h</td>
<td>1505,0</td>
<td>824,9</td>
<td>-680,1</td>
<td>-45,2</td>
</tr>
<tr>
<td>Carbon Dioxide (Total)</td>
<td>kg/h</td>
<td>3536,8</td>
<td>1938,6</td>
<td>-1598,1</td>
<td>-45,2</td>
</tr>
</tbody>
</table>
We obtained some very interesting results analysing the two networks as well as analysing individual intersections (especially in terms of reducing queue length and average delay).
Conclusions (2)

• Substantial improvements are indicated in all performance measures.

• The results of the modelling effort strongly support the design proposal of improving the West road corridor for accessing the new hospital of Lucca. This finding is emphasized considering that ambulances are the most crucial users of the road corridor.

• Our analyses also showed that improved traffic conditions in the corridor could be obtained only considering the proposed road corridor improvements as a whole.
Today, the works for building the large roundabout of Porta Elisa are in progress. We are pleased to think that such a practical result is also due to our detailed modelling effort.
Everybody are welcome in Tuscany to visit the new roundabout (and more, and more, obviously!) ...

Thank you!