Graduation Project II

Design of Northern Part of Nablus Ring Road

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Dr. Amjad Issa
DESIGN OF NORTHERN PART OF NABLUS RING ROAD

DEYAA JARARAA & HADEEL TALAHMEH
Nablus city is one of the most important Palestinian cities to its existence in the middle of the West Bank as a link between other cities.
Schematic Map of Nablus City and the location of Ring Road

Nablus Ring Road 30 Km
Northern Segment (Project Segment) 9.5 Km
Aerial Photos for the Entrance and Exit of the road.
OBJECTIVE

1. Evaluate Existing Road
2. Propose Road Design
3. Design of Road Facilities
4. Quantities & Costs Estimated
The Northern Part of Nablus Ring Road

Jurisdiction Borders Areas A,B,C
Project Steps

Data Collection
- Collect Relevant Maps.
- Study Area and Reconnaissance Visit.
- Prepared References.
- Traffic Count.
- CBR Tests for Subgrade.

Design Criteria
- Design Speed.
- Design Vehicle.
- Superelevation.

Geometric Design
- Evaluating the Existing Road.
- Design of Horizontal Alignment.
- Design of Vertical Alignment.
- Design of Cross Sections.
- Pavement Design
- Intersection Design

Final Evaluation and Review
- HOQ (Bill of Quantities).
- Cost Estimation.
- Conclusion.
- Recommendation.

Reporting
## Design Speed

<table>
<thead>
<tr>
<th>Station</th>
<th>Design Speed (Km/hr)</th>
<th>Superelevation</th>
<th>Minimum Radius (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0+000 – 0+370)</td>
<td>50</td>
<td>NON</td>
<td>116</td>
</tr>
<tr>
<td>(0+370 – 2+800)</td>
<td>70</td>
<td>6%</td>
<td>184</td>
</tr>
<tr>
<td>(2+800 – 8+200)</td>
<td>50</td>
<td>NON</td>
<td>116</td>
</tr>
<tr>
<td>(8+200 – 9+120)</td>
<td>40</td>
<td>NON</td>
<td>70</td>
</tr>
<tr>
<td>(9+120 – 9+396)</td>
<td>50</td>
<td>NON</td>
<td>116</td>
</tr>
</tbody>
</table>
DESIGN CRITERIA

DESIGN VEHICLE

WB-20

Height = 4.1 m
Width = 2.6 m
Length = 22.4 m
DESIGN OF HORIZONTAL ALIGNMENT
# Design of Horizontal Alignment

<table>
<thead>
<tr>
<th>Type of the Curve</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple curves</td>
<td>26</td>
</tr>
<tr>
<td>Compound curves</td>
<td>12</td>
</tr>
<tr>
<td>Reversed curves</td>
<td>6</td>
</tr>
</tbody>
</table>
DESIGN OF VERTICAL ALIGNMENT

RR Nablus PROFILE

HIGH PT STA: 86+59.76
HIGH PT ELEV: 520.15
PM STA: 8+794.78
PM ELEV: 454.23
K: 29.70
LVC: 236.00

LOW PT STA: 90+46.57
LOW PT ELEV: 432.93
PM STA: 8+950.57
PM ELEV: 497.37
K: 32.48
LVC: 322.80
**DESIGN OF VERTICAL ALIGNMENT**

- Max. Grade ➞ **13 %**

  **Note:** All segments match the max grade except the following.

<table>
<thead>
<tr>
<th>Station</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0+020 – 1+095)</td>
<td>15.12%</td>
</tr>
<tr>
<td>(7+075 – 7+615)</td>
<td>13.97%</td>
</tr>
</tbody>
</table>
## Design of Vertical Alignment

<table>
<thead>
<tr>
<th>Type of Curve</th>
<th>Minimum K</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crest Curve</strong></td>
<td><strong>SSD</strong></td>
<td>9</td>
</tr>
<tr>
<td>for V = 70 → k = 17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for V = 50 → k = 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for V = 40 → k = 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sag Curve</strong></td>
<td><strong>HSD</strong></td>
<td>9</td>
</tr>
<tr>
<td>For V = 70 → k = 23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for V = 50 → k = 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for V = 40 → k = 9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**DESIGN OF CROSS SECTION**

- We have two typical cross section scenarios:

<table>
<thead>
<tr>
<th>Type of the Cross Section</th>
<th>Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>With Sidewalk (Typical 1)</td>
<td>(0+000 – 1+500)</td>
</tr>
<tr>
<td></td>
<td>(7+500 – 9+396)</td>
</tr>
<tr>
<td>With Shoulder (Typical 2)</td>
<td>(1+500 – 7+500)</td>
</tr>
</tbody>
</table>
Typical Cross Section 1 (with Sidewalk)
Typical Cross Section 2 (with Shoulders)
**Traffic Analysis**

- Current ADT (Faisal Street) ➔ 31080 veh/day
- Percentage (NRR) = 23 % ➔ Take 25 %
- Estimation ADT (NRR) ➔ 7770 veh/day
- Design ESAL (20 years) ➔ 2.9 Millions
TRAFFIC ANALYSIS

HCS software check:

- Travel lanes number (N = 2) ➔ Satisfied

<table>
<thead>
<tr>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction</td>
</tr>
<tr>
<td>Desired level of service</td>
</tr>
<tr>
<td>Flow rate, vp</td>
</tr>
<tr>
<td>Free-flow speed, FFS</td>
</tr>
<tr>
<td>Maximum service flow rate allowed for desired LOS, MSF</td>
</tr>
<tr>
<td>Number of lanes required, N</td>
</tr>
</tbody>
</table>

Designers should perform an operational analysis on the possible choices for N.
PAVEMENT DESIGN

CBR Test
# Pavement Design

<table>
<thead>
<tr>
<th>Sample</th>
<th>CBR Value</th>
<th>Stations Represented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 1 (0+850)</td>
<td>27.4 %</td>
<td>(0+000 – 7+500)</td>
</tr>
<tr>
<td>Sample 2 (7+600)</td>
<td>3.8 %</td>
<td>(7+500 – 9+396)</td>
</tr>
</tbody>
</table>
PAVEMENT DESIGN

Pavement Layers

0+000 – 7+500

Asphalt Layer 8cm
Base Coarse Layer 20cm
Base Coarse Layer 20cm

Pavement Layers

7+500 – 9+396

Asphalt Layer 6cm
Asphalt Layer 7cm
Base Coarse Layer 20cm
Base Coarse Layer 20cm
Sub-Base Layer 20cm
INTERSECTIONS
U - Turn
INTERSECTIONS

INT.2
INTERSECTIONS
INTERSECTIONS

INT.5
INTERSECTIONS

INT.6
Vehicle Tracking Check
## BOQ AND COST ESTIMATION

<table>
<thead>
<tr>
<th>Items</th>
<th>Estimation Cost (Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut &amp; Fill</td>
<td>4.79</td>
</tr>
<tr>
<td>Base Coarse</td>
<td>1.41</td>
</tr>
<tr>
<td>Sub Base</td>
<td>0.1</td>
</tr>
<tr>
<td>Pavement</td>
<td>4.28</td>
</tr>
<tr>
<td>Marking</td>
<td>0.22</td>
</tr>
<tr>
<td>Paving</td>
<td>1.04</td>
</tr>
<tr>
<td>Signing &amp; Cuties</td>
<td>0.07</td>
</tr>
<tr>
<td>Walls &amp; Guard Rail</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>TOTAL PROJECT COST</strong></td>
<td><strong>13.1 M</strong></td>
</tr>
</tbody>
</table>
Conclusion

1. Decreasing Congestion and Providing Accessibility
2. The Proposed Route not match AASHTO Classification
3. The design match AASHTO around 90%
4. In high fill segments, we need layers of Rock Block
5. The Current Solutions aimed at reduction the Traffic Jam
RECOMMENDATIONS

• It is recommended to consider the other alternative modified route for the entrance of the road in order to work 4-legs intersection.

• Nablus Municipality is encouraged to attain the needed funds to construct the whole Ring Road.

• Redesign intersections after street operating.

• Reorganizing the area around the Road especially at the End.
RECOMMENDATIONS

• Complete all parts of the project surround Nablus-City.

• Select the projects that are in the priory and short list according to the strategic plan.

• Design a proper drainage system in order to avoid acceptable future problems in the road layers.

• Design the thickness of the concrete walls.
RECOMMENDATIONS

• Prevent the placing of grafts in the street area.
**RECOMMENDATIONS**

- Check Current House Levels And Stabilize Street Levels.
DISCUSSION

We Are Ready.. you can Ask!!