Graduation Project

DESIGN OF HIGHWAY USING EXCEL PROGRAM

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Abstract

The aim of current study is to attempt to computerize using Excel program, the three main branches of typical design of highway namely:

1- Geometric Design  
2- Lateral Design  
3- Structural Design

The idea of the project can be summarized in developing an introductory Excel sheet gathering all different types of data concerning any highway project. As a starting point, the group of data related to geometric design are used as an input to the global flow chart for this particulate path in developing specific group of Excel sheets related to horizontal alignment, Vertical alignment and Intersections [At grade and interchanges]. Also, the same scenario is followed for lateral and structural design.

Throughout the study, various flow charts are introduced to facilitate the different steps of developing of Excel sheets. A total of seventeen Excel sheets are included, finally an application to demonstrate the workability of this proposed computerized method is presented for a rural highway with approximately 5 km.
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>Velocity</td>
</tr>
<tr>
<td>F</td>
<td>Longitudinal coefficient of friction</td>
</tr>
<tr>
<td>f_s</td>
<td>Side coefficient of friction</td>
</tr>
<tr>
<td>e</td>
<td>Super elevation</td>
</tr>
<tr>
<td>SSD</td>
<td>Stopping Sight Distance</td>
</tr>
<tr>
<td>PSD</td>
<td>Passing Sight Distance</td>
</tr>
<tr>
<td>R</td>
<td>Radius</td>
</tr>
<tr>
<td>L_s</td>
<td>Length of spiral</td>
</tr>
<tr>
<td>L_c</td>
<td>Length of curve</td>
</tr>
<tr>
<td>PC</td>
<td>Point of Curvature</td>
</tr>
<tr>
<td>PI</td>
<td>Point of Intersection</td>
</tr>
<tr>
<td>PT</td>
<td>Point of Tangency</td>
</tr>
<tr>
<td>VPC</td>
<td>Vertical Point of Curvature</td>
</tr>
<tr>
<td>VPI</td>
<td>Vertical Point of Intersection</td>
</tr>
<tr>
<td>VPT</td>
<td>Vertical Point of Tangency</td>
</tr>
<tr>
<td>TS</td>
<td>Tangent Spiral point</td>
</tr>
<tr>
<td>SC</td>
<td>Spiral Curve point</td>
</tr>
<tr>
<td>CS</td>
<td>Curve Spiral point</td>
</tr>
<tr>
<td>ST</td>
<td>Spiral Tangent point</td>
</tr>
<tr>
<td>CL</td>
<td>Center Line</td>
</tr>
<tr>
<td>OE</td>
<td>Outer Edge</td>
</tr>
<tr>
<td>IE</td>
<td>Inner Edge</td>
</tr>
<tr>
<td>δ</td>
<td>Perception reaction time</td>
</tr>
<tr>
<td>LO</td>
<td>Level Of Service</td>
</tr>
<tr>
<td>SF</td>
<td>Saturation Flow</td>
</tr>
<tr>
<td>MSF</td>
<td>Max. Saturation Flow</td>
</tr>
<tr>
<td>N</td>
<td>Number of lanes in one direction</td>
</tr>
<tr>
<td>F_d</td>
<td>Adjustment factor for directional distribution</td>
</tr>
<tr>
<td>F_w</td>
<td>Adjustment factor for lane width and lateral obstruction</td>
</tr>
<tr>
<td>F_g</td>
<td>Adjustment factor for the operation of passenger car on grade</td>
</tr>
<tr>
<td>F_HV</td>
<td>Adjustment factor for the presence of heavy vehicles</td>
</tr>
<tr>
<td>P_T</td>
<td>% of trucks</td>
</tr>
<tr>
<td>P_B</td>
<td>% of trucks</td>
</tr>
<tr>
<td>P_R</td>
<td>% of trucks</td>
</tr>
<tr>
<td>v/c</td>
<td>Ratio of flow</td>
</tr>
<tr>
<td>P_P</td>
<td>Proportion of passenger car in traffic stream</td>
</tr>
<tr>
<td>I_P</td>
<td>Impedance factor for passenger car on grade</td>
</tr>
<tr>
<td>E</td>
<td>Passenger car equivalent for length, grade and speed</td>
</tr>
<tr>
<td>E_o</td>
<td>Passenger car equivalent for average speed</td>
</tr>
</tbody>
</table>
AAHSTO : American Association of State Highway and Transportation Officials
SN : Structural Number
Ai : Layer confident
mi : Drainage coefficient
Di : Layer thickness
C : Actual cycle length
L : Total lost time
Yi : Max volume of the ratio of lane to max. flow for phase
Li : Lost time for phase
R : Total all red time
Gte : Total effective green per cycle
Gre : Effective green time for phase
Gai : Actual green time for phase
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