Forest Road Location and Geometric Design

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Outline

- Road location / geometric design
- Inputs
- Strategies
- Process
- Geometric design
- Watercrossings
- Road location in NE region
ROAD LOCATION / GEOMETRIC DESIGN
Road location / geometric design

Road Location:

- Finding a “corridor” – strip of land ¼ to ½ mile wide, from origin to destination
- Deciding between this valley or that, this ridge or that

Geometric design

- Specific alignment – the centerline’s grades, curves
ROAD LOCATION INPUTS
Road location inputs

- Purpose of the road
  - Harvesting system
- Terrain
- Road-building materials
- Construction expertise
- Construction equipment
- Vehicles
  - Roads are built for vehicles!
ROAD LOCATION STRATEGIES
Road location strategies

- Stay on ridges
- Stay in valleys
- Run across the drainage pattern
- Run along the shoulders of hills
- Ignore the topography
ROAD LOCATION PROCESS
Road location process

- Office study
- Field reconnaissance
- Route survey
- Location survey
- Construction surveys
- As-built survey
A paradox

<table>
<thead>
<tr>
<th>Decisions on route</th>
<th>Cost to company</th>
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<tbody>
<tr>
<td>BIG</td>
<td>Small – just the locator’s salary</td>
</tr>
<tr>
<td>Road location process proceeds</td>
<td>LARGE – construction of change in alignment</td>
</tr>
</tbody>
</table>

small
GEOMETRIC DESIGN
Geometric design - gradients

7% gradient
8 HP/ton
(e.g. 400 HP, 50 tons)
Geometric design – horizontal curves

\[ ma = \frac{mV^2}{R} \]

left hand curve

\[ F = fN \]

\[ 1 \]

\[ e \]

\[ \theta \]

\[ N \]
moment caused by centrifugal force rolls truck over

truck following left hand curve

tire "lift off"

mg = mV²/R
**Minimum radius for roll-over criterion,**
based on maximum lateral acceleration of 0.15G

<table>
<thead>
<tr>
<th>Design speed (km/hr)</th>
<th>Minimum radius (m)†</th>
<th>Design speed (mi/hr)</th>
<th>Minimum radius (ft)‡</th>
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</thead>
<tbody>
<tr>
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<td>525</td>
<td>60</td>
<td>1600</td>
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</tbody>
</table>

† rounded to nearest 5 m
‡ rounded to nearest 10 ft
Geometric design – vertical curves

\[ K = \frac{L}{A} \quad \text{ft} / \% \quad \text{or} \quad \text{m} / \% \]
Watercrossings

- Major sediment sources – we must do them well!
  - Hydraulic considerations

- Road location issues
  - Approaches: horizontal and vertical alignments
  - Span requirements
ROAD LOCATION IN NE FORREST OPERATIONS
Road location in NE forest operations

- Most of the roads needed are complete
- Rare to locate a road from scratch - rare to start with a “clean slate”
- Rare to be locating a high-class road – new roads usually short accesses to cut blocks
• May need to improve an existing road
  ▲ Straighten a dangerous alignment
  ▲ Better radius curve
  ▲ Change an intersection into a curve
• More a matter of geometric design
Resort to computerized solutions
Need to know the topography
LiDAR
Thanks!

See you at the workshop!

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