The Method of Setting Slope Stakes in Road Construction using 3-D design model

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Objective of the study

The conventional slope stakes work requires technical experts  
Not changed for 40 years

The number of technicians is decreasing now (will be in future)  
Necessity for a new system

Development of new system

Technical Issues (1)

Require technical experts  
Positioning of 1st rail post

3-D design image on natural surface  
Suitable position

Save time

Technical Issues (2)

Replace a troublesome hand-calculating by field computer or TS  
Positioning of slope rail

Determination of intersection point between horizontal rail and design slope  
The elevation can be measured by TS

Determination of horizontal rail elevation by the top of 1st post

1st rail post

Verification of effectiveness of proposed method (1)

Surveying equipment  
3-D design data

Field computer  
Windows CE

Proposed System

Determination of location of all stakes

Calculation (Ref. And 1st rail post)  
Replace

Setting of Ref. peg  
Replace

Setting of the 1st rail post  
Measurement of Elevation

Calculation of intersection points  
Repeat

Setting of the 2nd rail post

Setting of the horizontal rail  
Setting of the slope rail
Verification of effectiveness of proposed method (2)

Comparison of conventional method with proposed method
Alignment Length: 33.192m, Arc=10m
Expert technicians

Result

<table>
<thead>
<tr>
<th></th>
<th>Conventional</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determination of 1st rail post</td>
<td>120 minutes</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Hand-calculating on site (one)</td>
<td>2 minutes</td>
<td>0</td>
</tr>
<tr>
<td>Accuracy</td>
<td>± 5cm</td>
<td>± 5cm</td>
</tr>
</tbody>
</table>

Conclusion

(1) The proposed system is applicable to setting slope stakes without technical experts.

(2) The accuracy of the system is the same as that of conventional one.

Future Works

(1) Application of this system to actual construction sites
(2) Development of data conversion system from CAD

-Thank you-