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## 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

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

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Development of new system

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### Technical Issues (1)

Require technical experts

Positioning of 1<sup>st</sup> rail post

↓

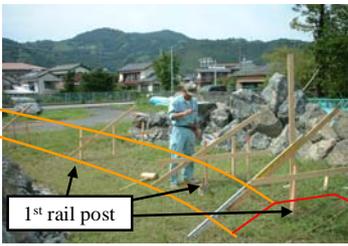
3-D design image on natural surface

↓

Suitable position

↓

Save time



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### Technical Issues (2)

Replace a troublesome hand-calculating by field computer or TS

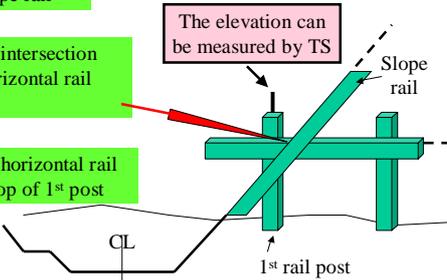
Positioning of slope rail

↓

Determination of intersection point between horizontal rail and design slope

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Determination of horizontal rail elevation by the top of 1<sup>st</sup> post



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### Determination of location of all stakes

Calculation (Ref. And 1<sup>st</sup> rail post) ← Replace

Setting of Ref. peg  
Setting of the 1<sup>st</sup> rail post  
Measurement of Elevation } TS

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Calculation of intersection points ← Replace

↓

Setting of the 2<sup>nd</sup> rail post

↓

Setting of the horizontal rail  
Setting of the slope rail

Repeat



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### Verification of effectiveness of proposed method (1)

Surveying equipment

3-D design data

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Field computer WindowsCE

↓

Proposed System



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## Verification of effectiveness of proposed method (2)

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

X-section  
 2m  
 1:1.5 / 1:1.5

— Conventional  
 — Proposed

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## Result

	Conventional	Proposed
<b>Determination of 1<sup>st</sup> rail post</b>	120 minutes	<b>5 minutes</b>
<b>Hand-calculating on site (/one)</b>	2 minutes	<b>0</b>
<b>Accuracy</b>	± 5cm	<b>± 5cm</b>

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## 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.

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## Future Works

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

-Thank you-