V－284 BACKCALCULATION OF LAYERS MODULI USING FWD.

MIYAZAKI UNIVERSITY: J. MAINA
MIYAZAKI UNIVERSITY: H. YOKOTA

1: INTRODUCTION.

Deflection measurements from Non-Destructive Testing is one of the most useful methods of evaluating structural capacity of insitu pavement as well as the underlying subgrade. The Dynamic Slab-Ground theory (DSGT), which was developed by one of the authors was used for the analysis and the results were compared to those obtained using AASHTO and NIPPON HODO methods.

2: EVALUATION RESULTS.

FWD deflection measurements were done on route 219 at the Miyazaki prefecture and the results were analyzed using DSGT, which is our method, AASHTO and NIPPON HODO methods. From the evaluation results, see fig. 1, on the 0-500m stretch, we observed noticeable differences of the backcalculated subgrade elastic modulus values, E_0 between those of DSGT and those of the other two methods.

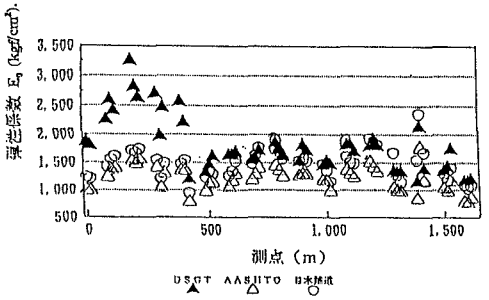


Fig. 1: 各測点における弾性係数の比較

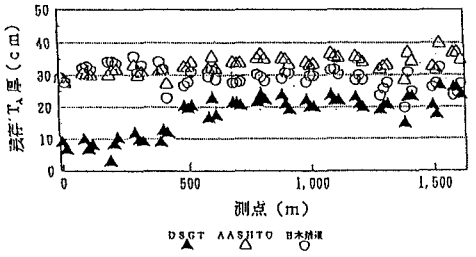


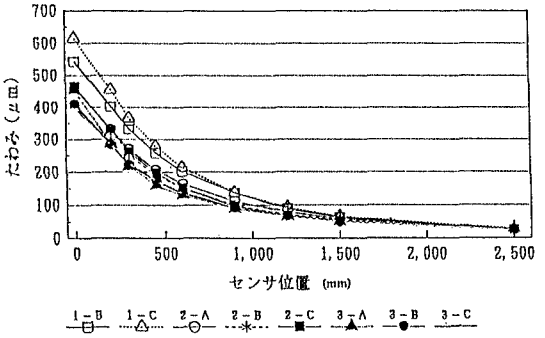
Fig. 2: 各測点における残存Ｔａ厚の比較

Similar differences were also observed, for the case of the backcalculated full depth AC pavement thicknesses, T_A on the same stretch, i.e 0-500m. see fig. 2.

3: THE ANALYSIS.

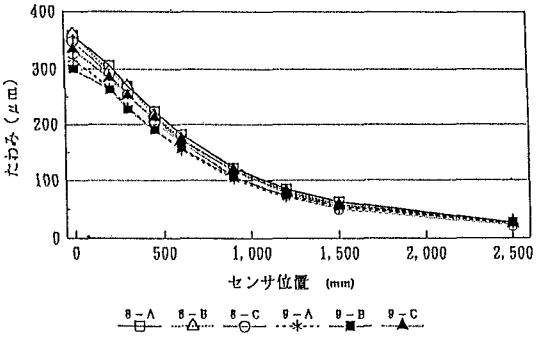
Having observed those differences, we decided to investigate for the reasons behind.

When we looked at the deflection basins, the ones for the measured points along the 0-500m stretch were quite different from those along the 500-1500m stretch not only interms of shape but also magnitude, see figs. 3 and 4.



:A sample of measured points.

Fig. 3: Deflection basins for the 0-500m stretch.



:A sample of measured points.

Fig. 4: Deflection basins for the 500-1,500m stretch.

According to published research report in the Transportation Research Records, deflection basins of the type of those observed on the 0-500m stretch are typical of a weak pavement.

According also to the author of DSGT, it is difficult to make a good dynamic analysis of a weak pavement by using W_0 and W_1,(see fig. 6.) deflection set, and that could possibly be the source of the observed differences. We, therefore, decided for a certain selected measured point to observe the trend of the backcalculated subgrade elastic modulus and full depth AC pavement thicknesses values with various deflection sets and the results obtained are as shown in fig. 5.

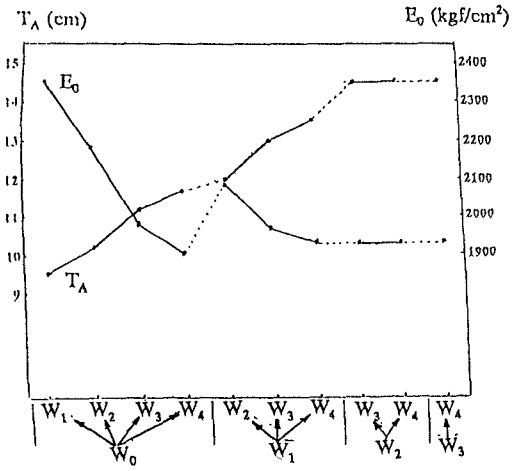


Fig. 5: Backcalculated E_0 and T_A using various deflection sets.

From fig. 5, we observed that W_2,W_3 ; W_2,W_4 and W_3,W_4 gave constant backcalculated values for both subgrade elastic modulus and full depth AC pavement thickness.

We then used the backcalculated values obtained from W_0,W_1 deflection set and W_2,W_3 ; W_2,W_4 and W_3,W_4 deflection sets to compute for the DSGT theoretical deflection basins, and then fit them on the site deflection basin.
The results obtained are as shown on figs 6. & 7.

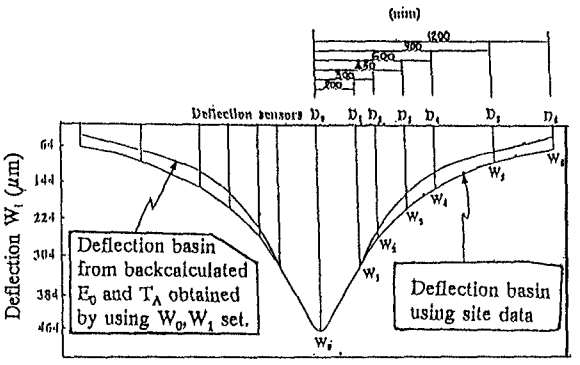


Fig. 6: Site and DSGT deflection basins.

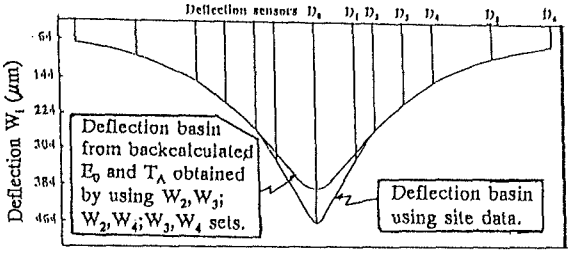


Fig. 7: Site and DSGT deflection basins.

4: CONCLUSION

Even though both DSGT deflection basins do not exactly fit the one from site, the one shown on fig. 7 shows a reasonable good fit as well as the backcalculated values used are well compared to those obtained from AASHTO and NIPPON HODO methods. It suffices, therefore, to recommend the use of deflection points a bit far from the point of loading specifically for the case of weak pavement during DSGT dynamic analysis.

5: REFERENCES.

1: DSGT documents.
2: AASHTO guide for design of pavement structures.
3: Transportation Research Records.
4: ASTM, Nondestructive Testing of Pavements and Backcalculation of Moduli, 1989.
5: Yang H. Huang, Pavement analysis and Design.