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WORKING OF BENKLEMAN BEAM DEFLECTOMETER

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Abstract - *Benkleman is an instrument used to measure deflection of the road surface. This instrument is costly and gives the results which are further calculated using software. These readings are useful for maintenance purpose as well as construction of new pavement over existing one. [3] In the following paper working, data required for test and specifications of Benkleman instrument are mentioned. This instrument can be used by government authority only. For checks purpose private agencies can also use this instrument but this readings will not be taking into consideration as it must be taken by government authorities.*

Key Words: **Road evaluation, specification, working of benkleman beam, road deflection measurement, uses.**

1.INTRODUCTION

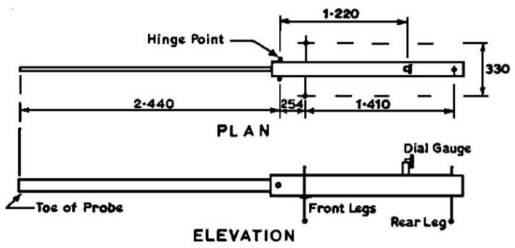

Fig 1. Diagram showing critical dimensions of Benkelman

The Benkelman beam instrument is used to measure the deflection of the road. This instrument gives us reading in millimeters. Whenever new pavement is to be laid this reading is helpful. This instrument is available M.E.R.I. the readings taken by the private agencies are not valid. Readings must be taken by government authorities. The price of Benkelman beam instrument is approximately Rs. 30,000. The values taken by private authority are not valid only readings of government authorities are valid. For 1 km of roadway the price offer by government are Rs. 12687 for government's authority and Rs. 25374 for private sectors. [2] Methodology and working of the Benkelman beam is as follows:-

2. WORKING

The readings are taken at every 50m interval. So in 1 km roadway total 21 readings are taken. After 250m and 750m sample collection is done. Sample is brought to lab and plasticity index, Liquid Limit, Specific gravity etc. tests are done. For sampling purpose hole of 3ft. X 3 ft. or 5ft. X 5ft. is dug manually or with the help of JCB. The excavation is done till the natural strata are achieved.

The instrument is brought to the site where readings are to be taken. The end tip of the instrument is place in between two tyres of rear side of the truck. The truck should be loaded with 8.2 tonnes. After taking the weight of the truck one receipt is attached to the documentation. The care should be taken that the tip should not touch the wheels. When the readings are to be taken the truck's engine should be on even when truck is steady. Once the truck is in position the reading is noted down. The truck is then slowly moved forward for 9 ft. and second reading is noted. Again truck is moved for next 9ft. and third reading is taken. So total 3 readings are taken at each 50 meters. The initial value is set for 10 in the instrument. The reading observed on dial gauge is added to value 10. For example if the gauge shows the 2 then then reading is 10.2. Total readings are observed throughout the roadway and noted manually. There is one software install in computer on which only readings are typed and required data will be obtained in printed format.

10 labours are required for this experiment.

4 - Handling of instrument
2 - Driving of vehicle
2 - Traffic controlling
2 - extra

Care should be taken that no vehicle should pass while the readings are measured. Because it will affect the deflection of road. So, traffic controlling is a hard work to do.

If there is divider in the roadways then readings are noted in zig-zag manner. First, readings are taken from right side at 0m, 100m, 200m, 300m… and after 1 km then readings are noted from left side at 950m, 850m, 750m…

3.BENKLEMAN BEAM DEFLECTION TEST:-

Following points are considered [4]:-

1. IRC 81-1991
2. Tyre pressure- 5.6kg/cm^2
3. Rear axle load- 8170kg
4. Total load- 12 ton
5. Tyre type- 10 X 20, 12 ply

4.DATA FOR ANALYSIS OF BENKLEMAN BEAM TEST:-

1. Present traffic intensity – In term of CVD
2. Width of the road pavement.
3. Type of road – National Highway /State Highway
4. Type of road surface.
5. Single lane / Double lane.
6. Temperature of pavement.
7. Annual Rainfall.
8. Subgrade sample
9. Present M.C. of subgrade.

The most effected parameters of above are temperature, annual rainfall, lane type.

The temperature of road is measure by digging a hole in the road. The glycerine is applied and the temperature is measured with the help of thermometer.

The annual rainfall data of last 10 years is taken into consideration.

CONCLUSIONS

The Benkelman Beam is used to measure the deflection for various purpose mentioned above. Road projects are costly and a slight error in mm can causes financial losses. This paper gives you detailed information about how the Benkelman beam deflect-meter is used and its specification. Many papers related to this topic will give you information about the evolution of their project. This paper will help you to know the features of Benkelman Beam deflect-meter. The detailed description of working, specification and factors considered while using this instrument are mentioned in this paper.

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