

# Advance Technique for Construction of Road using Soil Stabilizer Base Seal (BS-100)

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**Abstract :** Good transportation facility is important part to improve the economy of the country. Economy can be achieved by providing best facility to users with optimal cost and best strength to the road. In conventional method of flexible road construction, the base course may changes its property with the effect of weather. So, to reduce the construction cost and cost for man power, base course can be make fix by using stabilization technique and materials. Soil stabilization means alteration of the soil properties to meet the specified engineering operation. Soil stabilization can be done by compaction, soil reinforcement, etc. Recently, Base-seal (BS-100) as stabilizing agent can be use by mixing it with soil to make base course stable and durable for extended period of time. Maintenance cost of the flexible pavement is also reduced.

**IndexTerms – C Road Construction, soil stabilization, Base-seal (Bs -100)**

## I. INTRODUCTION

Roadway transportation system plays important role for mobility and economical development. Road is the indigenous mode of transport in India. It is through which every village and hamelet can reached. India has road network of over 5,903,293 km and the second largest network in world.

Road construction in most growing countries involves the use of soil materials for the subbase and base of the roads, but some of these soil materials may not be directly satisfactory for use due to their deficient strength characteristics, and when such occurs, the engineer is left with the choice of taking suitable materials from other sites or better the strength of the available ones. Bringing soils to site normally increase the cost of construction due to delay in construction, increased absorption cost and wastage of tiem and this may lead to the other alternative of the adding stabilizing agents to improve the properties of the available soil (Megan et al., 1999).

The natural durability and strength of the soil can be improved through the process of 'soil stabilization' using different types of stabilizers. The main methods (Shun 1998; Tong 2003) by which soils are stabilized for road purposes are:(1) mechanical or granular stabilization;(2) cement stabilization;(3) lime and lime-pozzolan stabilization (Wei 2003); (4) bituminous stabilization; and (5)stabilizer reinforced soil. In recent years, the use of cementations material like Portland cement, hydraulic lime and lime-pozzolana mixes as stabilizer is quite common. But for these stabilized soils, their early strength is usually very low, and they have inadequate frost stability and water resistance (Xiang 2006). Therefore, a new type of lime-liquid stabilizer material is used as road base material in order to improve the typical clay's workability in seasonally frozen regions.

The rapid booming traffic growth induces higher axle load on roadway pavements resulting premature distress. The concept of utilization of Base-Seal (Bs-100) has been done in since 29 years in USA internationally and in china, Australia, Spain, Nigeria. Areas paved with Bs-100 as a result, there is no need for repair crews to handle maintenance of roads. So the use of Base-seal (Bs-100) soil stabilizer used as a mechanical binder and soil modifier for soil stabilization and useful reclamation. Soil stabilizer is recent kind of energy and environment protecting material and application is now worldwide. Base-seal is polymer based material used in road construction and strengthening applications.

## II. MATERIAL

Liquid stabilizer—'BS-100', it contains no acids or explosive materials and is environmentally safe, non-toxic, non-corrosive, non-flammable, non-allergenic.

Slake-lime—It is in line with the technical requirements for the III grade with 55.3% reactive CaO+MgO.

Cement—C32.5 ordinary Portland cement.

Soil—The engineering properties of the original soil are consider.

### Properties of Base Seal (BS-100)

- **Appearance:-** It is colourless liquid
- **pH :-** pH ranges from 11.0 to 12.0
- **Odour:-** It is odourless liquid
- **Boiling point :-** Boiling point greater than 100<sup>0</sup>c
- **Freezing Point :-** Freezing Point less than 0<sup>0</sup>c
- **Solubility in water :-** It is soluble in water

### Stability and reactivity of base-seal Bs-100

- **Reactivity :-** The product is stable under a normal handling and use.
- **Possibility and hazardous reaction:-** Hazardous polymerization will not occur
- **Conditions to avoid :-** extreme temperature
- **Incompatible materials :-** strong acids

**Ecology of base-seal Bs-100**

- [1] **Toxicity :-** The product is low toxic to the environment and aquatic life , however, large spills may increase risks .
- [2] **Bioaccumulation potential :-** These product will prevent bioaccumulation .
- [3] **Mobility in soil :-** No mobility is found when mixed properly , however spills could result in higher mobility.
- [4] **Degradability and persistence :-** This product is non-biodegradable and inorganic substance.
- [5] **Other adverse effect :-** A hazard cannot be excluded in the event of unprofessional disposal or handling .

**Exposure controls of base-seal (BS-100)**

1. **Control parameters :-** Contents no substances with occupational limit values.

2. **Exposure controls :-**

- **Engineering Measures :-** Appropriate working operations and technical measures should be given priority over the use of personal protective equipment. Use of good ventilation. Local exhaust is preferred.
- **Individual protection measures :-** Wear protective clothing to prevent prolonged or repeated contact with skin.
- **Eye protection :-** Wear protective splash goggles or safety glasses with unperforated side shields.
- **Skin protection :-** Wear protective clothing. If the situation requires than were protective boots.
- **Hygiene Measures:-** Havesafety shower and eyewash station available. Wash hands thoroughly after use , before drinking , eating or using lavatory. change contaminated clothing.
- **Respiratory protection :-** Use approved air-purifying respirators if fresh air ventilation is unavailable.

**Environmental Exposure controls:-** Avoid dispersal of spilled material and do not entry into drains , waterways and sewers.

**III CASE STUDY**

Fig.1.shows the construction of Base-seal roads in western country of 2.5 mile (4km) of 20 years life for same amount of money that of a 1 mile (1.6km) prior to their new road rehabilitation program.



Fig.1. Road constructed by base-seal (Bs-100) in Walton country.

When Hurricane George slammed into the panhandle coast at Walton country Florida on September 27,1998, the Hurricane hit and made its way through the country, bringing 27 inches of rainfall in a36 hour period. The flood water washed out several road and caused major damage.

Road which remained solid after 23 inches flood waters from Hurricane George washed out two feet of earth from under the BASE-SEAL BS-100 and lime stabilized base (shown in fig 2).



Fig.2.Roads in Hurricane Gerge

**IV METHODOLOGY OF CONSTRUCTION OF ROADS USING BASE-SEAL (BS-100)**

**Preparation of the surface:-**If situ soil is used and taken to final elevation. Eliminates the requirement of any aggregate and uses on-site soil /past road (i.e. does not need to be selected aggregate). Shown in fig 3



Fig.3.Final Elevation

Check infrastructure to locate pipelines and cable before construction begins. (shown in fig .4.)



Fig .4.Checking infrastructure to locate pipe line

When recycling old asphalt no previous milling s necessary. Shown in fig .5.



Fig .5. Road without milling

## V APPLICATION

To achieve a uniform distribution a base-seal, additive and water into the base material, a modern computerized injection system is recommended (shown in fig.6.). Then the reclaimer mixes the soil base-seal solution and dry additives at the desired depth.The mix must reach OMC to achieve maximum density.



Fig.6.Modern computerized system for uniform distribution a base - seal additive and water

Then compaction is carried out. In compaction 12 ton smooth drum vibratory compactor runs behind the reclaimer. Approximate 4 passes are enough to reach maximum density.

After that grading is done. In grading mortar grader takes care of final elevation lines and crowning. Then one extra pass of the smooth drum reincorporates the material loosened during grading. Then sealing is done using pneumatic compactors. Then the bases are released to traffic right after maximum density is reached, minimizing traffic interruption (shown in fig.7.) Hydrating the base is recommended when working with sandy soil and extremely hot weather.



Fig.7.Road with maximum density

Five to seven days after stabilization the wearing surface is installed. Base-seal provides a sturdy base for any type of wearing surface: concrete, seal coating, chip and seal etc.(shown in fig.8.)

Example:- Natural cold asphalt being installed over a base-seal



Fig.8. Road with wearing surface

## VI GENERAL DILUTION RATES FOR BASE-SEAL BS-100 CONCENTRATE

Generally 0.088 to 0.118 litres of base-seal Bs-100 is required to treat 0.91 meter square of road base to a depth of 0.1524 meter when diluted with water and properly applied. 3.78 litres of base-seal BS-100 gets diluted with approximately 121 litres of water in the water truck. When the mixture is completely uniform at optimum moisture content then compaction must begin. The required density is a minimum of 98% standard proctor and can be easily achieved by a vibratory compactor. To achieve optimum moisture content (OMC) additional water can be added to the base-seal Bs-100 and water solution. Typically, a road 1mile long and 24 ft wide treated to a depth of 6 inches requires 7 to 8 drums of base-seal Bs-100.

## VII CONCLUSION

The use of Base-seal BS-100 soil stabilizer used as mechanical binder and soil stabilization and useful reclamation reduces cost up to 50%, which prevent environmental pollution due to less toxicity.

## REFERENCES

- Megan, M.A, Ellis, S.J, Mercer, J. (1999): Use of Alternative Aggregates and Binders in Highway Construction in the UK, Highways Agency, Department of Environment, Transportation Research Laboratory, Crowthorne, UK
- Negi, A. S., Faizan, M., Siddharth, D. P., & Singh, R. (2013). Soil stabilization using lime. *International Journal of Innovative Research in Science, Engineering and Technology*, 2(2), 448-453.
- Shun-ni, L.(1998). "On the stabilizer for the soil with higher water content." *Chinese Journal of Geotechnical Engineering J.*, 20(4): 83—86.
- Tong, L. (2003). "Study on indoor tests of fly ash and quick lime improving soft soils." *Rock and Soil Mechanics J.*, 24(6): 1049—1052.
- Wei- rong, H.(2003). "Research on properties and application of road base materials stabilized by QJ-type soil-solidified agent." *Highway J.*, (7): 156—159.
- Xiang-wei, F.(2006). "Study on engineering properties of improved soil by GT soil firming agent." *Rock and Soil Mechanics J.*, 27(9): 1545—1548.
- Chen, Y., Dai, W. T., & Wang, L. (2010). Test study on road performance of soils stabilized by liquid stabilizer in seasonally frozen regions. In *ICCTP 2010: Integrated Transportation Systems: Green, Intelligent, Reliable* (pp. 3245-3252).