

LEACHABILITY ASSESSMENT REPORT for STABILROAD

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Overview

Indian Institute of Technology Madras is one among the institutes of national importance in higher technological education, basic and applied research. The Environment and Water Resources Division of Department of Civil Engineering was approached by EIC, Panchayat Raj vide their letter dated 05.12.2019 with the following samples :-

1. Core Sample
2. Soil Sample
3. StabilRoad additive Sample

Scope of the work

1. To conduct a qualitative and quantitative leachability test for the Core samples which has a StabilRoad additive added to it
2. To understand the environmental impact of leached substances into the Soil and ground water

Preliminary work

The prelim work began with working on a Core sample which contains Murom /soil plus 7 % Cement of Soil plus 3.5% StabilRoad additive of cement, which was mixed with water and compacted. The soil samples were later finely powdered and sieved. These powdered samples were eluted with water and the resultant which has the leached compounds were analysed for inorganics (cations and anions) using Ion Chromatography and organics compounds using Gas chromatography. The samples were duplicated for better results (Trial 1 & Trial 2).

Inorganic concentration

The eluted resultants from the soil was treated with double distilled water and filtered in 0.22 micron filter to remove tracer level of floating particles. Then these samples were injected into IC (Ion Chromatography) and the results were tabulated in table 1. Assuming the leached compounds will affect the groundwater, these results were compared with IS 10500: 2012 standards

Table 1 Inorganic concentration of Leached compounds

All units are expressed in mg/L

Sample Id	Fluoride	Chloride	Sulphates	Nitrate	Ammonical Nitrogen	Potassium	Calcium
Trial 1	13.23	122.5	145.4	41.3	84	12.4	23.4
Trial 2	13.29	120.2	142.0	41.0	78	12.2	20.5
Standards	1.5 *	1000.0	400.0	45.0	50 *	-	200.0

Based on the results it has been seen that compound such as Fluoride and Ammonical Nitrogen has leached from the Core sample above the prescribed drinking water standard, while there is negligible quantity of additive (Only 2 mg per 1000 mg of Soil) was added to the Soil and Cement mix. Therefore, to ascertain the source of excess Fluoride and Ammonical Nitrogen, a specific test was carried out to find out the Domestic Fluoride & Ammonical Nitrogen contents in the Soil if any.

It was found that the leaching of Fluoride & Ammonical Nitrogen from the soil sample without the addition of cement and additive was found to be 11.95* mg/L & 46* mg/L respectively. So, the contribution of leaching of the additive is negligible and well below the standards.

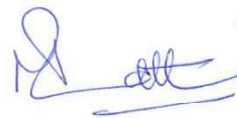
Even with percolation and dilution, the concentration reaching groundwater and surface water will be much below standard. Ammoniacal nitrogen and nitrates can be degraded by microorganisms in natural environment.

Organic concentration

Volatile Organic Chemicals (VOCs) are a class of chemicals that are carbon-containing and evaporate, or vaporize, easily into air at normal air temperatures. So, in order to track down any VOC compounds leaching through the Core, the eluted resultants from the Core and soil samples were treated with Dichloro Methane and were analysed in GC (Gas Chromatography). It has been found that VOCs such as 1 – Hexanol 2 ethyl, ethyl – dimethyl Silyloxy Cyclopentane and Benzene 1,3 bis 1,1 dimethyl ethyl are present in trace levels which are also below permissible levels due to dilution and percolation losses in the groundwater.

Conclusion

Chemical analysis of StabilRoad for both organic and inorganic compounds present indicated minimal to no impact of leached substances in the soil and ground water, hence the additive has no risk of Contamination of sub surface water and soil and is found to be not Harmful to the environment.



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