

Long-Term Performance of Contaminant Barrier Systems

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Abstract

Barrier systems for waste containment facilities typically include both permeable drainage and low permeability liner components and are constructed using a combination of natural and geosynthetic materials. This lecture describes the latest findings with respect to the long-term performance of these systems based on theoretical developments, laboratory studies and observed field behaviour. It draws together consideration of both soil mechanics and geosynthetics and demonstrates that the components of the barrier system should be considered as part of a system where the characteristics and performance of one component impact on that of another.

Field measurements and theoretical calculations show that composite liners are substantially better than single liners in terms of controlling leakage from landfills. It is shown that composite liners involving a GM over a geosynthetic clay liner (GCL) gave rise to substantially less leakage than those involving a compacted clay liner (CCL). The observed leakage through composite liners can be explained by the holes in, or adjacent to, wrinkles/waves in the GM and this leakage can be calculated using simple equations.

High density polyethylene (HDPE) GMs are shown to provide an excellent diffusive barrier to ions. However non-polar organic compounds readily diffuse through HDPE GMs and a combination of GM and an adequate thickness of liner and attenuation layer are required to control impact to negligible levels. The long-term performance of HDPE GMs is discussed and service life predictions are provided for MSW landfills.

Resume

Dr. Kerry Rowe is Professor of Civil Engineering and Vice Principal (Research) at Queens University, Kingston, Canada where he is responsible for the administration of all research across the university – from the humanities to health sciences. Prior to joining Queen's University in 2000, Professor Rowe was educated at the University of Sydney BSc('73), BE(Hons I, '75), PhD('79), D.Eng ('93), worked for the Australian Government Department of Construction in Sydney for 6 years, and spent 21 years at the University of Western Ontario. Author of more than 200 refereed journal papers; 3 books; 14 book chapters; 200 full conference papers, he has extensive research and consulting experience in the geotechnical and geoenvironmental engineering field. His research has been recognized by numerous awards including being a former NSERC Steacie Fellow, a Killam Prize winner (Canadas highest award in Engineering), and was selected to present the 45th Rankine Lecture in March 2005. He is a fellow of both the Royal Society of Canada and the Canadian Academy of Engineering as well as Professional Societies in Australia, Canada and USA. He is currently President of the Engineering Institute of Canada and editor of the highest impact geotechnical and geoenvironmental journal: *Geotextiles and Geomembranes*.

Prof. R. Kerry Rowe from Queens University is visiting IIT Madras on 8th October (Wednesday). He is giving a lecture as detailed in the attachment. Please discuss with Prof. Gandhi if we can invite local IGS members to attend this lecture at 1600 hours on that day.