

# **A COMPREHENSIVE PETROGRAPHIC INVESTIGATION OF A SEVERELY DETERIORATED CONCRETE UTILITY VAULT**

*Derek Cong<sup>\*</sup>, Frank Serafin, Lawrence Roberts, Robert Comeau, and Michael Gardner*

W.R. Grace  
62 Whittemore Ave  
Cambridge, MA 02140

## **ABSTRACT**

Petrographic examination is a powerful and indispensable tool in assessing the quality of concrete and trouble shooting concrete problems. However, in dealing with complicated deterioration problems, traditional optical petrography is often not enough, and a comprehensive approach using petrography, chemical analysis, X-ray diffraction and scanning electron microscopy is required.

A more than 20-year old concrete utility vault was severely deteriorated. Corrosion of steels, sulfate attack and/or delayed ettringite formation (DEF) have been suspected as the causes of the deterioration. However, the evidence from a comprehensive investigation using thin section optical microscopy, X-ray diffraction (XRD) of secondary deposits, scanning electron microscopy (SEM) with energy dispersive X-ray analysis (EDX) and other techniques strongly suggests that acid leaching was the primary cause of the deterioration. Many details will be presented.

**KEY WORDS:** Petrography, acid leaching, sulfate attack, thin section, SEM

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<sup>\*</sup> present address: WJE, 13581 Pond Springs Road, #107, Austin, TX 78729