Durability of Concrete Produced with Alternative Supplementary Cementitious Material Dataset

Dataset available at: https://digitalcommons.lsu.edu/transet_data/109

(This dataset supports report **Durability of Concrete Produced with Alternative Supplementary Cementitious Material**)

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The related final report **Durability of Concrete Produced with Alternative Supplementary Cementitious Material**, is available from the National Transportation Library's Digital Repository at https://rosap.ntl.bts.gov/view/dot/61735.

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Abstract: Historically, Class F fly ash has been chosen as a supplementary cementitious material (SCM) in concrete for its ability to mitigate alkali-silica reaction (ASR). However, future availability of fly ash is uncertain because the energy industry has been investing in renewable energy production and removing coal burning generating stations from operation. Consequently, there is a growing need to find new, cost effective and environmentally friendly alternatives to fly ash. This study investigated a locally available natural pozzolan mined from a pumicite deposit near Espanola, NM for its ability to mediate ASR. Concrete and mortar mixtures included SCM contents ranging from 10 to 40%. Mortar bar tests and concrete tests for compressive and flexural strengths, shrinkage, frost resistance, chloride permeability, and surface resistivity were performed to assess the effectiveness of the pumicite. A minimum pumicite content of 20% was needed to mitigate ASR and that mortar mixtures containing 30% natural pozzolan had approximately 40% less expansion than mixtures containing 30% fly ash, indicating that the pumicite was substantially more effective at mitigating ASR than fly ash. Concrete mixtures containing natural pozzolan had comparable compressive strengths to specimens containing fly ash, while flexural strengths of specimens containing pumicite exceeded those of mixtures containing only fly ash. Concrete shrinkage decreased as pumicite content increased and when fly ash was used in place of pumicite. Fly ash mixtures produced at least 20% less shrinkage than similar 30% pumicite mixtures, indicating that the pumicite produced significantly greater shrinkage than the fly ash. Results also showed that mixtures containing 20 and 30% pumicite had the lowest acceptable durability factor (DF) values, and

these DF values were significantly less than the DFs obtained using 30% fly ash. Rapid chloride permeability testing results showed that increasing pumicite content decreased chloride ion penetration. The 28-day surface resistivity results showed that the mixtures most susceptible to chloride ion penetration were the mixtures that contained either 10% natural pozzolan or 30% fly ash. Mixtures containing 30% fly ash provided substantially less chloride ion penetration resistance than mixtures containing 30% natural pozzolan at 28 days, but slightly better chloride resistance at 180 days. These results indicate that pumicite can reliably replace (partially or completely) fly ash for all of the durability issues addressed in this work.
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Dataset description:
This dataset contains 1 file collection described below.

Placitas_Sand_ASR_Results.zip:
- Placitas Sand ASR Results.xlsx
- Moriarty Sand ASR Results.xlsx
- Long Term Shrinkage Data.xlsx
- FREEZE-THAW.xlsx
- Concrete Final Results.xlsx

File Type Descriptions:
- The .xlsx and .xls file types are Microsoft Excel files, which can be opened with Excel, and other free available software, such as OpenRefine.

National Transportation Library (NTL) Curation Note:
As this dataset is preserved in a repository outside U.S. DOT control, as allowed by the U.S. DOT's Public Access Plan (https://ntl.bts.gov/public-access) Section 7.4.2 Data, the NTL staff has performed ***NO*** additional curation actions on this dataset. NTL staff last accessed this dataset at https://digitalcommons.lsu.edu/transet_data/109 on 2022-05-20. If, in the future, you have trouble accessing this dataset at the host repository, please email NTLDataCurator@dot.gov describing your problem. NTL staff will do its best to assist you at that time.