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IRA A. FULTON COLLEGE

CAPSTONE

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Springville Performance Evaluation & Pavement Design for Minor Collectors

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Scope

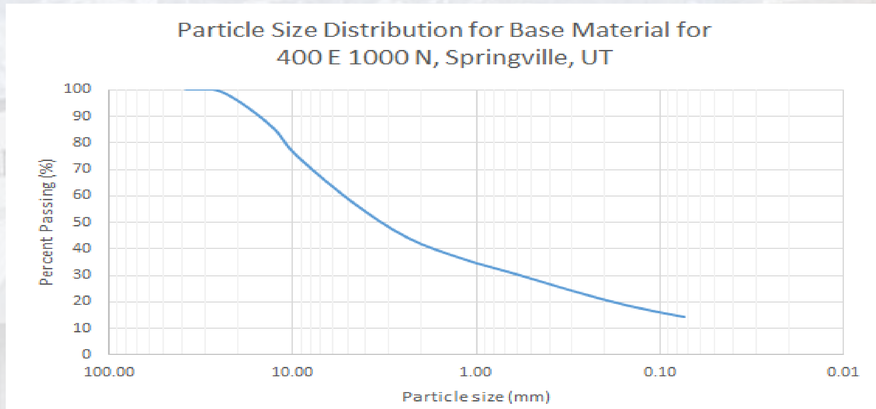
A recently completed study of pavement performance in Springville City indicated that minor collectors were failing prematurely. Evaluations of selected minor collectors were needed to determine the cause(s) of premature failure, and a new pavement design will likely be warranted. Field work and laboratory tests were performed to determine the failure mechanisms, and pavement designs were conducted.

Traffic Counts

24-hour traffic counts were performed on five minor collectors in Springville. Lifetime ESAL values were determined for each of these locations. It was observed for the critical pavement section that after ¼ of its design life (5 yrs) it had already been subjected to 83% of its allowable ESAL loads.

Gradations

Soil gradations were performed on base, subbase and subgrade materials to determine particle distribution. As indicated in the graph below, large amounts of fine material is present in these samples, which is a probable cause of early failure. Water retention in the fines led to approximately 1.5 in. of frost heave in some locations.



Mechanistic-Empirical Analysis

A mechanistic-empirical analysis was performed to design pavement thicknesses. Asphalt and Cement-Treated Base (CTB) layers were designed based on the laboratory tests. These analyses indicated that asphalt layer thicknesses could be reduced to 3 in with CTB layer thicknesses of 10 in or 3.5 in asphalt with a 8 in CTB layer, depending on soil characteristics.

Recommendations

Three recommendations have been made based on the laboratory testing:

1. Improve base materials for construction
2. Enforce quality assurance and quality control during construction
3. Improve asphalt modulus of elasticity for stiffer overlays

These recommendations will improve the overall quality of the city's asset management program. Improved base materials will mitigate the effects of frost heave stresses. Better Quality Assurance, Quality Control and design specifications will elongate pavement life. New roadway design specifications with asphalt and CTB layers are recommended in the final report.