THE EFFECTS OF UTILITY CUT PATCHING ON PAVEMENT LIFE SPAN AND REHABILITATION COSTS

Prepared for
City of Santa Ana
Draft Report
January 1999

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CHAPTER I. INTRODUCTION

Background

The following paragraphs are paraphrased from a City of San Francisco report on street excavation (1).

Over the past decade, many cities – including Phoenix, AZ; Los Angeles, CA; Sacramento, CA; Austin, TX; Kansas City, MO; Burlington, VT; and Cincinnati, OH – have sponsored studies to evaluate and quantify the effect of trenching and utility patching on the service life of streets. Many of these studies have used measuring devices to compare the strength and performance of trenched and untrenched sections in a sample group of streets.

The City of Phoenix, AZ measured the strength of pavement structure in and around trenched areas using a Falling Weight Deflectometer (FWD). A FWD measures the amount a pavement sags (deflection) under varying loads traveling over the surface. The FWD simulates a wheel traveling over the pavement surface and registers the amount of deflection. Stronger pavements have smaller deflections. The Phoenix Study found that, on average, the area in and around a trench registered a 24% higher deflection than untrenched areas. The higher deflections in trenched areas demonstrate reduced structural load carrying capacity, which is caused partially by the discontinuity in the street caused by the utility cut. The report determined that trenched areas would require an additional 1.25 inches of asphalt concrete to reduce deflection to normal levels. The study also concluded that trenching doubled street maintenance costs for the City by reducing pavement life (i.e. requiring more frequent repaving) and increasing required resurfacing thickness.

Several other studies, including those conducted for Kansas City, Los Angeles, and Sacramento, have included deflection testing in their analyses of the effect of utility cuts on the service life of streets. Similar to the Phoenix study, all of these studies determined that utility cuts reduce the structural strength and service life of streets, the structural damage caused by utility cuts extends beyond the perimeter of the cut itself, and utility cuts result in increased maintenance costs.

The Kansas City Study concluded, on average, the test sites evaluated would require an additional 1.5 inches of asphalt concrete to offset the structural damage caused by trenching. This study concluded utility cuts caused structural damage to the street beyond the perimeter of the initial trench.

The Los Angeles Study concluded trenches resulted in weaker structural support in and around the trenched area. This study concluded arterial streets, on average, over 2.5 inches of additional asphalt concrete would be required to make up for the weakness caused by utility cuts. For local streets, 0.65 additional inches would be required.
The Sacramento Study analyzed transverse and longitudinal utility cuts separately. For transverse utility cuts, the study concluded that the area extending an average of 3.64 feet outside the cut was weakened, requiring a structural patch prior to resurfacing of the street. It found that an additional 1.5 inches of asphalt concrete would be required to put a street that has a longitudinal utility cut in structurally adequate condition.

Some municipal studies, including the Los Angeles, Austin, Phoenix, and Burlington Studies, have also compared the condition of a sample of streets with and without trenches using pavement condition scores. Following this approach, the Los Angeles Study concluded that utility cuts reduced average pavement life from 25 to 16.5 years for arterial streets and from 34.5 to 28.5 for local streets. The Austin Study concluded that on average, pavement life is reduced 17.5% on streets where longitudinal cuts exist and 33.36% on streets where transverse cuts or a combination of both transverse and longitudinal cuts exist. It also found that even utility cuts, which were carefully repaired, showed a significant decrease in ride quality. The Phoenix Study revealed a 4.5 year reduction in the typical pavement life as the result of utility cuts (from 20 years to 15.5 years). The Burlington Study concluded that, on average, in the City of Burlington, streets without utility cut patching have a life of 18.5 years while streets with utility cut patching have a life of 10.9 years.

A report from the City of San Francisco concluded that 'street cuts disrupt pavement layers and supporting soil in the area surrounding the cut.' The disruption can be reduced, but not eliminated. Utility cuts cause unavoidable damage to the pavement layers and soil supporting the pavement around the perimeter of the utility cut. Although high quality patching may reduce the structural damage caused by utility cuts, the street will still incur ride quality and cracking damage and its service life will be diminished.

The collective results of the above reports indicates a strong relationship between the presence of utility cut patching and decreased pavement life in asphalt pavements.

Objective

The objective of this report is to calculate the effect of utility cut patching on pavement life and consequent rehabilitation costs of arterial and local streets in the City of Santa Ana, CA.

Approach

This report presents the calculation of the effect of utility cut patching on pavement rehabilitation costs for the City of Santa Ana. The calculations are based on test results from a comprehensive engineering study conducted for the City of Los Angeles (2) and cost data provided by the City of Santa Ana. In the Los Angeles study, 100
street sections were randomly selected and surveyed. Fifty of these sections were functionally classified as "Local" and the other fifty as "Select" (Arterial). All street sections were flexible (asphalt) pavements. The street sections were surveyed using the Pavement Condition Index (PCI) (Figure 1) for distress survey and the Falling Weight Deflectometer (FWD) for structural evaluation.

![Figure 1. Pavement Condition Index (PCI)](image-url)