

Appendix C

Repair, Maintenance and Rehabilitation Techniques

Repair Techniques

Crack Sealing with a polymer modified asphalt material provides flexibility so that the material can flex when the pavement moves under traffic loading. The material is applied to pavement cracks after the cracks are cleaned. Crack sealing is a preventive maintenance technique that prevents water intrusion into the base material thus preventing base failure. Crack sealing done by in-house forces is \$0.48 per linear foot and through contract is \$0.55 per linear foot.

Skin Patching/Paving is the placement of asphalt concrete in thin layers up to 1½ inch, either manually (skin patching) or using paving machinery (skin paving). Patching is done in small areas or quantities where using the paving machine is not feasible or economical. This type of treatment is often done to provide a wearing surface over badly cracked and deteriorated pavement or to level pavement surfaces to provide better drainage. Skin Patching and Paving is \$1.71 and \$0.66 per square foot, respectively using in-house forces and is \$4.11 and \$1.86 per square foot using contract forces.

Base Failure Repair (Dig-Out) is the removal of existing pavement and underlying base and sub base material as necessary, to a depth where stable material exists. This void is then replaced with either full-depth asphalt concrete or a combination of asphalt concrete and aggregate base materials. The cost of base failure is \$4.33 per square foot performed by in-house forces and \$9.43 per square foot by contract.



Figure 9: Base failure repair.

Pothole Patching in good weather is similar in process to base failure repair with complete removal and replacement of affected material. Potholes often appear in inclement weather which does not permit full repair. In this situation, temporary repair involves cleaning out the hole and filling it with a premixed asphalt patching material. The cost of pothole repairs varies by the size of the damage and the type of repair. The average cost for in-house repair is \$12 per pothole.

Maintenance Techniques

Slurry Sealing is the process of applying a mixture of asphalt, rock, additives such as lime or Portland cement and water to an existing road surface forming a thin impervious surface layer. Slurry seals need approximately six hours to fully cure depending on weather conditions. Parking and access to the street is limited on the day of application but streets are rarely closed overnight for slurry seal work.

Modified slurry seals include a latex polymer that allows the surfacing to remain more flexible through the material life rather than becoming brittle. These seals are very susceptible to damage from power steering tire scuffs but they tend to heal and smooth out with traffic depending on the severity of the damage.



Figure 5: Slurry Seal Application

The average thickness of a slurry seal is 3/8 inch. Slurry seals are used throughout the city for streets in good condition that are starting to show the early signs of deterioration. Slurry seals provide a water barrier by covering existing cracks and create a thin wearing surface over the existing pavement. Slurry seal treatments are expected to last approximately 7 years and have an average cost of \$1.05 per square yard.

Chip Seals spread a layer of hot asphalt oil on the pavement surface and cover it with rock “chips” which are compressed with a rubber tired roller. The oil holds the chips in place and also seals the surface of the existing pavement to prevent water intrusion. Chip seals can be driven on at slow speeds immediately after the roller is finished but roads are typically kept closed for approximately six hours to allow further curing before reopening to traffic.



Figure 6: Chip seal oil application is immediately followed by placement of the chip.

Chip seals are seldom used in residential areas of the City due to their unpopularity due to loose rock and the need for excessive, slow speeds when driving over them in the first few weeks after placement.

The average thickness of a chip seal is 3/8 inch. Chip seals are used for streets that are beginning to show more advanced signs of aging and more severe distresses that Slurry can not repair. Chip seals provide a water barrier by penetrating and sealing existing cracks and create a thin wearing surface over the existing pavement. Chip seals are expected to last approximately 5 years and have an average cost of \$2.50 per square yard.

Scrub Cape Sealing is a two-day, combination surface treatment that includes the chip and slurry seals and the application of a rejuvenating emulsion – a polymer modified asphalt-rejuvenating agent, mixed with water. Scrub cape seals are used as an alternative to chip seals.

The emulsified oil is sprayed on the surface of the pavement and then a specially designed drag broom scrubs the oil into the pavement, which fills the voids and cracks in the pavement. This is followed by a layer of rock chips as is done in the chip seal application. On the second day of application – often separated from the initial application by a few days to a few weeks - a slurry seal is applied over the rock chips creating a smoother surface. Both days of treatment will have the road closed during the work day.



Figure 7: The drag broom is attached to the oil spray truck and the brooms force the oil into the pavement.

The average thickness of a scrub cape seals is 3/4 inch. The treatment is more advanced than a chip seal and is sufficient even for roads with mild to severe distresses. The scrub cape seal treatment rejuvenates the existing pavement surface by adding fresh asphalt oil. It also provides a water barrier by penetrating and covering existing cracks and creates a double layer wearing surface on the existing pavement. Scrub cape seals have an expected life of 7-9 years and an average cost of \$3.23 per square yard.

Fabric Cape Sealing is a two-day combination treatment similar to the scrub cape seal. On the first day, before the first layer of oil is placed, hot asphalt oil is sprayed on the pavement immediately followed by the placement of paving fabric which becomes fully embedded in the oil. This is followed by a standard chip seal process. The chip rolling ends day one and the roads can be opened. On the second day of application – often separated by a few days to a few weeks - a slurry seal is applied over the rock chips. Both days of treatment will have road closures during the work day.



Figure 8: Fabric rolls are mounted on oil trucks; the fabric is applied immediately to the hot oil.

The fabric cape seal has been used recently as a way to save failed pavements that have sound base material. In extreme cases where the pavement is severely broken, a thin overlay will be placed before the treatment to provide a smooth surface for the fabric to adhere to. The fabric helps prevent reflective cracking – when cracks from the original surface propagate up through to the new surface. The fabric also stabilizes distressed pavement that is beyond typical repair methods until such time that reconstruction is possible.

The composite thickness of the fabric cape seal is approximately 3/4 inch. Fabric cape seals provide a water barrier by penetrating and covering existing cracks, prevent reflective cracking and create a double layer wearing surface over the existing pavement. The expected life of the treatment is 10-12 years at a cost of \$5.40 per square yard.

Micro Surfacing is a polymer modified paving system developed in the 1970's in Europe. The product was developed as a very thin paving surface that could be applied in multiple layers to fill ruts. The material remains hard enough to fill the ruts and the polymer modification allows it to stay flexible and not get brittle.

Micro surfacing is a a one day treatment unless rut filling is required. It is similar in application and cure-time to a slurry seal and will also require road closures and parking restrictions. Micro surfacing cures into a harder surface and as a result is less susceptible to power steering tire scuffs. It is also good for use in areas with higher traffic volumes.

The average thickness of micro surfacing is 3/8 to 5/8 inch. Micro surfacing creates a water barrier by covering existing cracks and creates a thin wearing surface over the existing pavement. The treatment is expected to last 7-9 years at a cost of \$2.31 per square yard.

Rehabilitation Techniques

Thin Asphalt Overlay is a type of pavement rehabilitation that improves the driving surface and extends the life of the pavement. This treatment may include grinding off the surface layer of pavement and replacing it with a new layer of hot-mixed asphalt. The grinding is often used to prevent excessive crown on the road, to ensure drainage in the case of edge only grinding or to provide a rough surface for better adhesion between asphalt layers. The street is typically closed to traffic and parking for all or part of the work for most roadways. Thin asphalt overlays up to 2" thick cost on average \$20/square yard.

Thick Asphalt Overlay is similar in placement to a thin overlay. Thick overlays in contrast are intended to increase the structural section of the roadway. The grind does not remove a significant amount of the existing pavement if it is in good condition. The intent is to add asphalt concrete to the pavement section. Access is typically limited or completely restricted for all or part of the project. The cost of an overlay between 2-4 inches is \$35/square yard.

Reconstruction is the complete removal and replacement of an existing pavement, base and sub-base. The work associated with road reconstruction usually will typically incorporate any underlying utility repair or upgrade requirements to avoid unnecessary trench cuts through the new pavement for this work. The road is typically closed for the duration of the project with limited, non-work hour, access for local traffic. The average cost of road reconstruction is \$90/square yard.