Tire Scuffing and Indentations of Asphalt Pavement

The Issue

Newly constructed asphalt parking lots or driveways may occasionally exhibit surficial tire scuff marks and indentations particularly when opened to initial or early traffic. The occurrence of these marks (see photo) is often exacerbated during periods of hot or humid weather.

The Concern

Owners of parking lots, driveways or commercial facilities will often consider the appearance of tire scuffing and tire marking as a sign of poor quality resulting in an asphalt pavement that will not last as long as intended.

This is not the case! The scuffing and tire marks are typically an aesthetic issue that will not affect the long-term performance of the asphalt pavement.

The Cause

Many factors can contribute to the cause of scuffing and tire marking:

- The switch to Performance Graded (PG) asphalt cement (the binder that holds the mix together) has improved the durability of the mix by reducing the incidence of cold weather cracking. However, in most cases, this has also resulted in the use of a 'softer' asphalt cement, which has resulted in asphalt pavement mixtures that are more prone to tire scuffing, especially during periods of hot weather during the first season of use. The use of softer asphalts is further aggravated by other factors such as:
  - Excluding the use of recycled asphalt pavement (RAP) or recycled asphalt shingles (RAS) in asphalt pavement;
  - High asphalt cement content/asphalt film thickness;
  - Hot-humid conditions can delay curing of a newly placed surfaced mixture;
  - The use of power steering while the vehicle is stationary. Front wheel drive cars tend to have higher loading on the front wheels which can cause higher contact pressures;
  - Lower profile tires frequently have higher tire pressures resulting in increased stress;
  - Imposed restrictions such as dead-loads, no vibration allowed for compaction of the asphalt pavement, and just in time construction often results in opening parking lots to traffic within hours of final paving; and
  - Tires fresh from periods of summertime highway driving are hot and can mark an already tender hot pavement.
- The mixture requirement of the pavement surface itself in many cases is a significant contributor to the scuffing issue:
  - Parking lot mixes are typically specified to contain more sand, fine aggregate, or less crushed particles and the maximum size of the stone is many times smaller to promote a tighter surface

texture and more aesthetically pleasing finish, which may make these mixes more sensitive to tire scuffing when they are warm;

- More robust mixes designed with aggregates that have proper crushing with the binder selection and with greater amounts of coarse aggregate may have a coarser, less aesthetically pleasing finish and a slightly higher cost, but will be more resistant to scuffing, indentation, point loads;
- Overall structural design of the pavement must be adequate in order to have a pavement structure that accounts for the traffic loading expected (soil conditions under the pavement must be addressed at the design stage); and
- Placement of the asphalt pavement over a membrane should also be evaluated if required (i.e. over a ramp structure).

❖ Workmanship must also be considered but with today's advances in equipment, technology and Quality Control programs used in the industry, this issue is not normally the primary factor causing the scuffing. However, some issues related to construction could influence the issue, such as:

- Equipment allowed on a newly constructed asphalt pavement may leave indentations and scuff marks; and
- Lower compaction of the asphalt pavement as a result of light compaction equipment (or no vibration allowed) on thin pavement structures may also be a contributor.

For more information on pavement design or maintenance issues, consult MAPA's Asphalt Paving Design Guide at www.asphaltisbest.com.

Considerations

There is no quick fix for scuffing or indentations without possibly causing more damage to the asphalt surface. Most marking will disappear in time under normal traffic conditions. The best approach is to be proactive in considering the facility and use, type of vehicles, traffic patterns, mixture type selection, and immediate usage after compaction of the asphalt pavement. As an example, an application of sand (5-7 lbs/sq.-yd.) to truck delivery areas, compost pads, truck scales, etc., or flooding with water to lower the mixture temperature has been successfully used to help prevent tire scuffing. Repair methods used should be evaluated to determine the long-term effect of the procedure.

The Long-Term Effects

Asphalt scuffing or marking is not a sign of a reduced pavement life. An asphalt pavement going through hot weather and marking will have, in the long run, the same life span as an asphalt pavement placed in cooler weather with no marking. If the problem is a weak subgrade, the result will usually be 'alligator skin' cracking of the asphalt pavement, reducing its service life. The structural design of the pavement must be tailored to the types of traffic and expected loading on the pavement. This may involve increased pavement thicknesses, the use of mixes with coarser crushed aggregates, inclusion of recycled asphalt pavement and/or shingles, and stiffer composite binders. The aesthetic appearance must be balanced with the structural strength needed of the pavement for a given facility.

The Conclusion

A well-constructed facility showing signs of tire scuffing and marking will still meet the specified designed life expectancy. Tire scuffing is not a sign of poor workmanship or improper materials.