ROAD CONSTRUCTION OPTIONS

ASPHALT OVERLAY

An asphalt overlay is an additional layer of asphalt that covers imperfections in existing asphalt. Asphalt overlays are commonly applied to driveways, parking lots, and pavement that have minor damage like light cracking, mild deterioration, or slightly sunken areas. The process of overlaying asphalt commonly includes a leveling out of the old asphalt's shape, ensuring a smooth, even surface on which to add additional layers.

After the minor imperfections in the original asphalt have been filled in, butt joints are typically utilized to ensure the base layer remains level. This guarantees the asphalt overlay will match the height of doorways, garage thresholds, roads, sidewalks, and curbs. A special primer is then applied to the surface; this primer acts as the glue that secures the second layer of asphalt to the first. At this point, crushed stone may be necessary to further ensure a level asphalt overlay design. Once the stone has been compressed and graded, the paving begins. Asphalt concrete overlay is poured over the original layer, primer, and crushed stone. The butt joints make certain the asphalt meets the perimeters of the area and remains level. Once it is dried, the overlay has a sleek, smooth appearance that is free of defects.

When preparing to administer an asphalt concrete overlay, it is important to bear a couple of considerations in mind. First, it is important that the damage on the original layer not be too deep. If it is, the second layer will simply seep into the cracks and indentations of the foundation, and the problem will remain unsolved. Second, drainage of the area to be paved should be considered. All surfaces need to have runoff for excess water, and, if this step is overlooked, water could rush unchecked into homes, garages, yards, and streets.

There are special products currently on the market that are specifically designed to enhance the appearance of an asphalt overlay. One such product is a mat-like covering that is installed over the original layer before the asphalt pavement overlay is put down. Made of special fibers, this layer is designed to absorb excess water and maintain a smooth appearance, prolonging the life and appearance of the overlay.

While an asphalt overlay may be necessary to repair a damaged surface, there are ways to avoid having to invest in this process in the first place. Maintaining a level surface by regularly filling in cracks and potholes is one of the most important. Guaranteeing that proper drainage areas are installed, or creating additional exit routes for excess water, also helps to avoid the need for an overlay in the future.

CHIP-SEAL

Chip-seal is a pavement surface treatment that combines one or more layer(s) of asphalt with one or more layer(s) of fine aggregate. In the United States, chip-seals are typically used on rural roads carrying lower traffic volumes, and the process is often referred to as "asphaltic surface treatment". In Australia and New Zealand, chip-sealing is referred to as a "sprayed seal" or "tarseal" and is used on a larger percentage of roads, both rural and urban. This type of surface has a variety of other names including "tar and chip," "sprayed seal," or "surface dressing".

Uses: Chip-sealing is cheaper than resurfacing an asphalt concrete or a Portland cement concrete pavement, but not as long-lasting. In some states of the United States, chip-sealing is used in conjunction with new road construction to make the road bed more durable and longer lasting.

Installation: Chip-seals are constructed by evenly distributing a thin base of hot bitumen or asphalt onto an existing pavement and then embedding finely graded aggregate into it. The aggregate is evenly distributed over the seal spray, then rolled into a smooth pavement surface. A chip-seal-surfaced pavement can optionally be sealed with a top layer, which is referred to as a fog seal or enrichment.

The introduction of polymer-modified bitumen and emulsion binder has increased chip-seal's ability to prevent crack reflection and improve stone retention by improving the properties of the bitumen binder. Newer techniques use asphalt emulsion (a mixture of liquid asphalt, surfactant, and water) instead of asphalt. This has been shown to help reduce aggregate loss and reduce cost of installation, but can increase stripping. It reduces emissions of volatile organic compounds (VOCs) due to the lower solvent content.

It can keep good pavement in good condition by sealing out water, but provides no structural strength and will repair only minor cracks. While the small stones used as surface yield a relatively even surface without the edges of patches, it also results in a very rough surface that leads to louder rolling noise from automobile wheels.

Although chip-seal is an effective low-cost way to repair road, it has some drawbacks. Loose crushed stone is often left on the surface, owing to under-application of bitumen or over-application of stone. If not removed, this can cause safety and environmental problems such as cracked windshields, loss-of-control crashes (especially for motorcyclists, bicyclists and small trucks), and deposition of foreign material into drainage courses. Therefore, it is very important to sweep the road after the emulsion sets. Asphalt is the binder used in chip-seal applications.

Noise and vibration effects: The rough wearing surface of the chip-seal generates more roadway noise at any operating speed than does typical asphalt or concrete surfaces. This typically is not a major concern at very low operating speeds, moreover, chip-seals are typically used on low volume rural and urban roadways. These sound intensities increase with higher vehicle speeds. There is a considerable range in acoustical intensities produced depending upon the specific tire tread design and its interaction with the roadway surface type.

The rough surface causes noticeable increases in vibration and rolling resistance for bicyclists, and increased tire wear in all types of tires. Vehicle speed can affect the set up time with chip-seal. Shortly after construction (depending on weather conditions) the set speed for chip-seal is 10–15 miles per hour.

FULL DEPTH RECYCLING/FULL DEPTH RECLAMATION

Full depth recycling, or full depth reclamation (FDR), is a process that rebuilds worn out asphalt pavements by recycling the existing roadway. It is a rehabilitation technique in which the full thickness of the asphalt pavement and a predetermined portion of the underlying materials (base) is uniformly pulverized and blended to provide a stronger, homogeneous material.

The quality of the existing materials will dictate the strength of the resultant pulverized material, which in some cases, may not be sufficient to support traffic loads and volumes. If the existing road materials will not provide adequate strength after FDR, virgin aggregate, recycled aggregate, reclaimed asphalt pavement, or crushed concrete may be added. Common Stabilizing Agents are Portland cement, fly ash, lime, emulsion, and foamed asphalt.

The reclamation process removes the existing asphalt pavement cracks and deterioration since the entire asphalt layer is pulverized to produce an improved, homogeneous granular material on which a new pavement structure can be placed immediately upon completion. Pavements composed of distorted subgrades are only candidates for FDR when additional work is undertaken to correct drainage and subgrade deficiencies.

Reclaiming machines are very mobile and maneuverable to process a wide range of road geometries including urban environments. Due to its versatility, energy savings and reduced natural resource requirement, Full Depth Reclamation provides asset owners with a cost effective means of rehabilitating roads.

Old asphalt and base materials are pulverized using a specialized machine called a reclaimer. On top of the pulverized material, water is added to reach the optimal moisture content for compaction and then a variety of materials, such as dry cement, lime, fly ash, or asphalt emulsion are incorporated for stabilization. A reclaimer is used again to mix all the materials. After shaping and grading, the new base is compacted to produce a strong, durable base for either an asphalt or concrete surface.

Since this method recycles the materials *in situ*, there is no need to haul in aggregate or haul out old material for disposal. The vehicle movements are reduced and there is no need for detours since it can be done under traffic, making this process more convenient for local residents.

FDR with cement saves money while preserving natural resources by using existing materials and conserving virgin aggregates. The road performance is improved through better stabilization, building a stronger, low-maintenance road that will last for many years.

With proper engineering and testing protocols the FDR process provides a design life-cycle of 30-years. It is important to note that FDR is a manufacturing process and not an installation. Other pavement materials, such as concrete, asphalt, or aggregate base go through a rigorous quality control program that meets a qualified standard prior to site delivery and contractor installation. The FDR process requires the same level of understanding and product controls during lab testing and field verification to meet long-term performance goals.