An Introduction to Asphalt Paving:

History:

Naturally occurring petroleum asphalt dates back to around 4000 B.C.. Early uses include: caulking for boats, cement for jewelry, sealing of bathing pools/water tanks, embalming of mummies, coloring material in paintings, lamp illumination, and as an incendiary device for warfare. The first recorded use of asphalt as a road-building material was in Babylon between 625-650 B.C. Modern applications started in the 1860's in Scotland where builders began using hot coal tar to bond stones together on roadways reducing dust and maintenance. These roads became named after a John Loudon McAdam tarmacadam, later shortened to tarmac. The first significant paving project in North America was Pennsylvania Avenue in Washington, D.C. which was completed in 1876. By the turn of the century tarmac was being laid in major centers around the world.

Materials:

Paving asphalt is a mix of petroleum asphalt (commonly referred to as bitumen), aggregate and additives that is very commonly used as a top layer of pavement for roads. Typical paving asphalt is comprised of 90-95% aggregate and 5-10% bitumen. Paving asphalt is also sometimes referred to as asphaltic concrete or tarmac.

There are many types of paving asphalt that are used for a variety of applications. The factors that change an asphalt mix design are oil and aggregate. An aggregate with a larger average size of rock and less sand will provide greater strength, whereas one with smaller rocks and a higher sand content will look nicer, but with less strength. Stronger mixes are used as road base and on highways, and sandier aesthetic mixes are used to resurface parking lots and roadways. The "standard" paving asphalt found in Alberta has an average rock size of 1/2". Also different types of asphalt cement (oil) can provide different results. For example, the oil used for paving bridge decks has more elasticity to it, allowing the finished product to have less rigidity.

Typical lay down:

Asphalt is placed in a variety of ways. The most common method is the use of an asphalt paver. These machines receive the material in a hopper that has a conveyor system which brings the mix to the back of the machine. The material is then re-mixed by an auger system which rests

just above a large steel plate called the screed board. By adjusting the height of the screed, the depth of asphalt laid is changed.

Typically when paving over an aggregate base a thickness of 75mm or 3 "is laid. When overlaying/re-surfacing an existing asphalt surface the typical thickness is 50mm or 2". Industrial application or major roadways often require multiple layers to provide sufficient structure. In these cases emulsified asphalt oil (oil mixed with water) is sprayed between layers as a binding agent.

Asphalt pavement is not finished after the paver lays it down. It then requires compaction. An average ½" mix will compact around 25%. As a result the paver must place the asphalt in thicker than the finished depth. For example: To attain a finished depth of 50mm (2") we would lay the asphalt 63mm (2 1/2") prior to rolling.

The number of rollers required depends on the volume of asphalt being placed. Rolling asphalt is an art that requires precise timing to ensure proper densities. Asphalt needs to be rolled long enough so that any air voids are eliminated. For this reason we don't often exceed a lift of more than 75mm (3").

Often the first roller to cross the mat is has two steel drums. This first pass flattens and seals the surface. The second roller will typically have two sets of rubber tires and is referred to as a pneumatic roller or "wobbly". The rubber tires squeeze the rocks together, eliminating air voids and binding the asphalt together. The finishing pass is done with a roller with two steel drums. Finishing has to be timed so that the asphalt has cooled and hardened enough to allow the roller to hammer the final surface.