

THE BASIC EQUIPMENT OF

Asphalt Compaction

Asphalt paving contractors use four types of self-propelled compactors: steel wheel static, steel drum vibratory, pneumatic tire, and combination rollers. Here's a look at the proper application for each.

Steel Wheel Static Rollers

For many years, the steel wheel static roller was the standard machine for compacting asphalt. On many jobs, it was the only roller. However, increasing demands on asphalt pavement have shown steel wheel rollers alone cannot provide adequate density, especially on mats thicker than 2 to 3 in (50 to 75 mm).

Also, they can bridge, and leave, soft spots in a mat. So today, contractors use steel wheel rollers mostly for finish rolling. Their ironing effect smooths out previous drum marks as long as the mat

is still hot enough to let the material move slightly.

The lines of force under a steel wheel static

roller bend back up toward the surface of the mat as they meet resistance from the subgrade and from confining pressure within the mix (Figure A). Some material may be pushed up, forming a hump next to the edge of the drum. If this occurs, the succeeding pass should overlap the previous pass by 3 to 4 in (75 to 100 mm).

The only operator-controlled variables with steel wheel static rollers are rolling speed and distance behind the paver. Changing ballast is possible, but rarely used. In any event, you should not change the rolling pattern and weight after they have been proved on a test strip.

Steel Drum Vibratory Compactors

You can use double drum, vibratory compactors in all phases of asphalt compaction: breakdown, intermediate and finish.

The vibration is created by eccentric weights rotating inside the drums. Their action generates rapid blows that transmit compactive energy to the mat. The distance the drum moves up and down is called amplitude. The greater the amplitude, the greater the compactive energy.

Frequency of impact is measured in vibrations per minute. Ten impacts per foot of mat is a good rule of thumb (Figure B). For example, if the impact frequency of your machine is 2000 vibrations per minute, your operator should adjust rolling speed to about 200 fpm (61 mpm). A target working speed of 300 fpm (91 mpm) matches a frequency of 3000 vpm.

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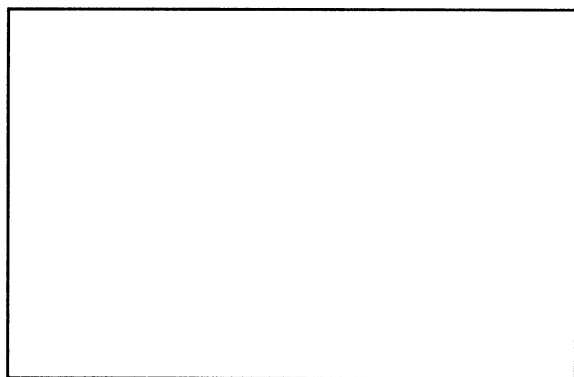


Figure A

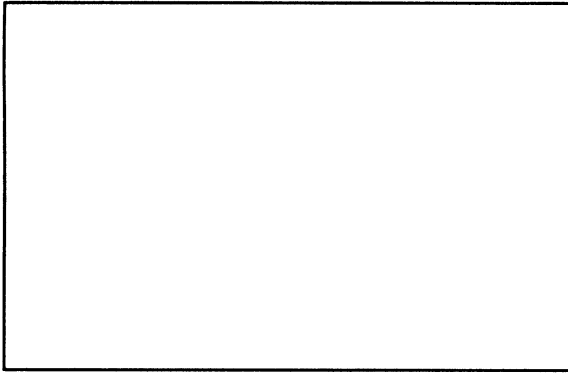


Figure B

Many vibratory compactors deliver variable amplitude. Experiment with various amplitudes when compacting the test strip. Settle on the one that produces density in the fewest number of passes.

Recent design vibratory compactors also offer other features that help improve mat quality:

- Independent drum vibration gives your operator broad flexibility in matching vibration to the type and depth of mix. Your operator can have both drums vibrating, both static, or one vibrating and one static.
- Automatic vibratory shut-off suspends vibration when the roller stops. This way, the drum doesn't hammer the mat in one place when the roller pauses, even briefly, when changing directions.
- Automatic reversing eccentric weights change direction when the roller does. When the weights always rotate in the same direction as the machine is traveling, your compactor produces a smoother mat.

Pneumatic Tire Compactors

Contractors use pneumatic tire compactors for breakdown and intermediate compaction. They can also be used to condition finished surfaces.

The critical difference in pneumatic tire compactors is the kneading action rubber tires exert (Figure C). This characteristic helps the multi-wheel, pneumatic tire machine manipulate the mat under and between its wheels. The result is a stable, tight finish.

Tire inflation pressure is critical to the performance of a pneumatic tire compactor. The higher the pressure, the smaller the ground contact area and, thus, the higher the compactive force transmitted to the mat (Figure D). Keep pressure high for breakdown and intermediate compaction.

Reducing tire pressure causes the bottom of

the tire to flatten out, increasing the contact area and reducing the ground contact pressure. Compactive effort is less, but the kneading action is accentuated. So reduce your tire pressures for finish rolling.

The roller's water spray system is especially

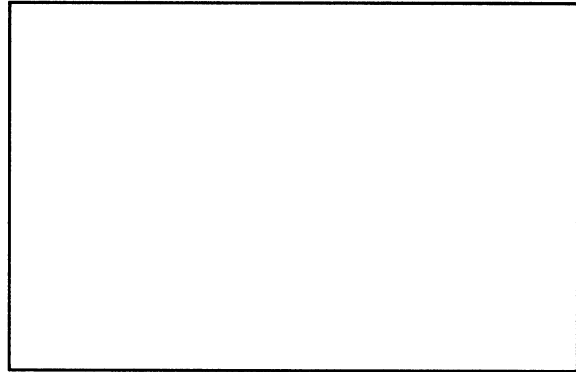


Figure C

important when compacting with a pneumatic tire machine. When the roller starts to work, the tires will be cold and, unless they are wetted, hot asphalt will stick to them. As the roller works, the tires will heat, the asphalt will no longer stick, and your operator can turn off the water spray system.

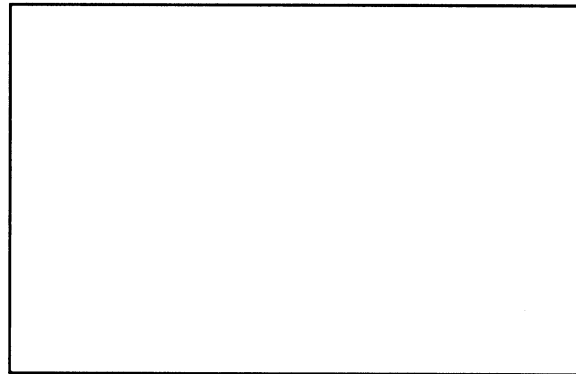


Figure D

Combination Rollers

Combination rollers marry a vibrating drum on one end of the machine to three or four pneumatic tires on the other. They attempt to combine the characteristics of both types in a single machine. Their use can reduce the number of machines needed on a job where both vibratory and pneumatic compactors are required.

However, a single "combi" machine is not as effective as two separate rollers. Therefore, use of combination rollers is not widespread.

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