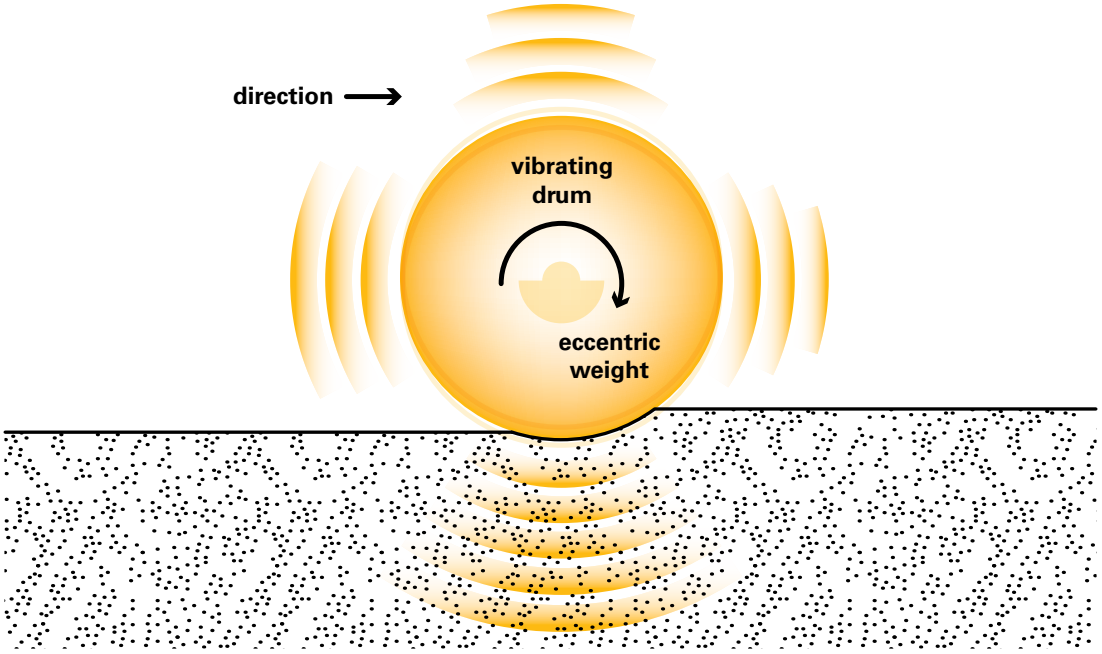
ASPHALT COMPACTION

VIBRATION/AMPLITUDE/FREQUENCY

VIBRATION

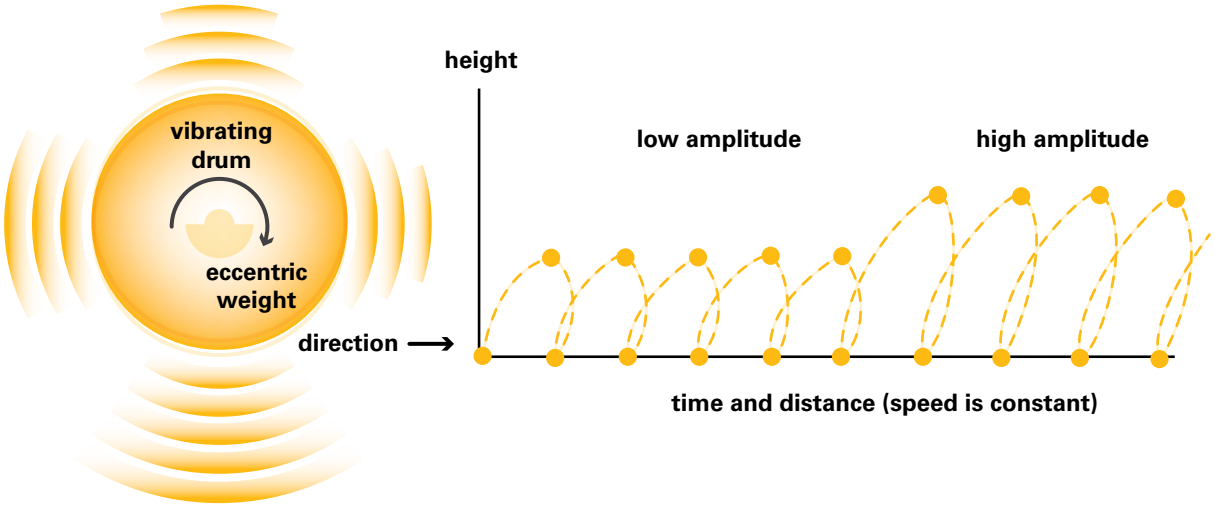


The force of vibration is the most complex of the four compaction forces. Vibratory forces increase the energy developed by weight and impact.

A vibratory shaft is inside the steel drum. On the center of the vibratory shaft, there is an eccentric weight. When the vibratory system is activated, the vibratory shaft begins to spin rapidly. The rotation of the eccentric weight shaft causes the drum to move, or vibrate, in all directions. Vibration causes a series of pressure waves to be released into the mat. The vibratory pressure waves cause the aggregates in the mat to move. Aggregate movement helps to reorient the larger aggregates so the impact force can more easily reduce the air voids between the aggregates, thereby locking them into contact position.

User Tip: *In general, select the highest amplitude that will be accepted by the mat without causing the drums to bounce or creating impact marks. Remember, amplitude selection has the greatest impact on the creation of density and, therefore, the production rate of the compactor.*

AMPLITUDE



IMPACT EQUALS AMPLITUDE

On a steel drum vibratory compactor, you have learned that the drums move up and down rapidly to create impact and vibration. The impact force caused by the drum moving into the mat is rated by the term known as amplitude.

Amplitude is the distance that the drum moves into the mat. Amplitude is the most significant factor when discussing compaction effectiveness.

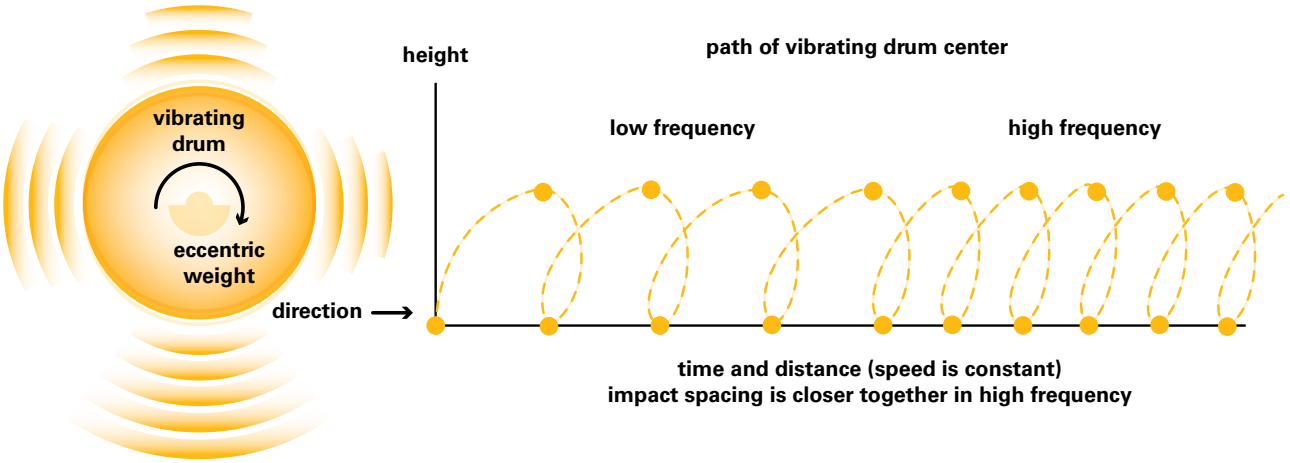
Most vibratory compactors offer a variety of amplitude settings. When the amplitude is changed by the operator, the configuration of the eccentric weight inside the drum is changed. When the eccentric weight is the most off-center, amplitude is the highest and impact force is increased. When the eccentric weight is more balanced, the amplitude is decreased and the impact force is smaller.

All personnel involved in the compaction process should know the amplitude capabilities of each compactor on the job. They should be able to develop a checklist to help them select the correct amplitude, if required.

In general there are three amplitude ranges: low, medium and high.

Low Amplitude Range	0.2 mm to 0.5 mm (0.01" - 0.02")
Medium Amplitude Range	0.5 mm to 0.8 mm (0.02" - 0.03")
High Amplitude Range	Above 0.8 mm (0.03")

FREQUENCY



VIBRATION EQUALS FREQUENCY

Vibratory force is referred to as frequency. Frequency is defined as the number of times that the drum hits the mat and is rated in Hertz, or vibrations per minute.

The primary effect of vibratory frequency is its relationship to the compactor's working speed. Because the drum is moving into the mat, you need to make sure that these impacts are properly spaced. If the impact spacing is too wide, you can actually see impact marks at the surface of the mat.

If the impact spacing is too narrow, you can see ridges in the surface of the mat. The correct impact spacing occurs when 26 to 46 impacts per meter (8 to 14 impacts per foot) are applied.

Many modern compactors have two vibratory frequencies, or sometimes frequencies that are variable. Frequencies are classified as low, medium or high.

Low Frequency	40 to 47 Hz (2,400 to 2,800 vibrations per minute)
Medium Frequency	47 to 57 Hz (2,800 to 3,400 vibrations per minute)
High Frequency	Above 57 Hz (above 3,400 vibrations per minute)

CONNECTING AMPLITUDE AND FREQUENCY

Next, you must understand the relationship between amplitude and frequency. High amplitude is created when the eccentric weight is at its most off-center configuration. When the eccentric weight is in the most off-center or out-of-balance configuration, the eccentric weight shaft has to spin slowly in order to prevent excessive heat and wear on the weight shaft bearing. Therefore, high amplitude can only be associated with low vibratory frequency.

Low amplitude is created when the eccentric weight is in a more balanced configuration. When the eccentric weight shaft is more balanced, it can be spun more rapidly without damaging the vibratory drum components. Therefore, low amplitude can be associated with either high or low vibratory frequency.

On the job, the compaction team has to determine what are the correct vibratory characteristics in order to achieve density effectively and efficiently. If the mat requires a lot of force or energy in order to reach the specified density, then the crew will select a medium or high amplitude. When higher amplitudes are selected, a lower frequency will always be in use.