



**WACKER  
NEUSON**

# Soil and Asphalt Compaction Equipment



Selection Guide



## What factors influence the selection of soil and asphalt compaction equipment?

A series of factors must be taken into consideration such as type of soil, particle size distribution, moisture, and required final density of the soil or asphalt. The evaluation of the mentioned factors is done mainly for two reasons:

1. To determine which type of machine is most suitable for the job.
2. To determine which piece of equipment achieves the required results in the most economical way.

The basic distinction that should be made when choosing compaction equipment: Will the machine be used on asphalt, granular, or cohesive soils?

### Granular Soils



Granular soils are compacted best through vibratory plates and rollers. Granular soils by their name are very grainy in structure. Because of their coarse nature, it is the friction between individual particles that holds the material in place. Granular soils also range from uniform materials that contain only one particle size to well graded soils that have a large variety of particle sizes. These materials will result in soils of greater strength as there are medium and smaller particles that fill in the voids between the larger ones and result in a dense material of great load bearing capacity. The most efficient method to compact granular soils is to apply vibratory energy to the material.

These vibrational impulses will penetrate the soil and create movement between the soil particles. When vibration is applied to granular material, as the particles vibrate, they will actually begin to rotate in the same direction that the exciter in the machine is rotating. This makes the particles turn and tumble, and after the machine passes over them, gravity will cause the particles to settle into a denser configuration.

**TAKE NOTE:** When choosing compaction equipment for use on granular to semi-cohesive soils always consider a vibratory plate or smooth drum vibratory roller

### Cohesive soils



For compaction of cohesive soil (clay), impact or shearing forces are required in the form of vibratory rammers or sheepfoot rollers to obtain proper compaction. Clay particles (cohesive soils) are actually made up of tiny “pancake like” platelets that layer upon each other. The gaps between them can either be filled in with air or with water. The molecular bonding between the plates holds them in position.

Impact force is required to release trapped air and excess moisture from cohesive soil. Because of the nature of cohesive soils, machines like rammers produce an impact or shearing type of force required for compaction. The high shoe stroke combined with a high frequency create a great amount of shearing force at the front of the shoe to break down the molecular bonds and allow the soil to compact. Sheepfoot rollers create shearing forces in the soil due to the cleats found on the surface of the drum. As the drums rotate, the edges of the cleats entering the soil will cut or shear the soil, breaking down the molecular bonds between adjacent soil particles.

**TAKE NOTE:** When choosing compaction equipment for use on semi-cohesive to highly cohesive soils always select a rammer or a vibratory roller sheepfoot drums.

### Asphalt

Various types of compaction equipment are used for compacting asphalt. Vibratory plates are used in confined areas and patching jobs, but vibratory rollers are by far the most widely used piece of equipment for asphalt compaction. Rolling asphalt typically consists of three consecutive phases: breakdown or initial rolling, intermediate rolling, and finish rolling. Breakdown rolling obtains practically all of the needed density. Intermediate rolling densifies and seals the surface. Finish rolling removes roller marks and other blemishes left from previous rolling. Vibratory compaction relies on sending high frequency centrifugal force blows radiating downward through the asphalt-aggregate mix. When those forces hit a stable base structure, they “bounce” back and shake the material from the bottom up. This is the key concept in the vibratory principle - compaction actually starts at the bottom and works its way back to the surface.





*Vibratory Rammer*



*Vibratory Roller*



*Roller with sheepfoot drums*

The next time you are purchasing compaction equipment, remember the type of soil will determine the type of machine you will need.

1. Granular Soil – Vibratory plate or smooth drum roller
2. Cohesive Soil – Vibratory rammer or sheepfoot roller
3. Asphalt – Vibratory plate or smooth drum roller

**For more information regarding equipment for compaction, feel free to visit us at [www.wackerneuson.com](http://www.wackerneuson.com) or give us a call at 1 (800) 770-0957.**



*Vibratory Plate*

## Dynamic compaction equipment: Typical applications

MAIN APPLICATION AREAS	TYPE OF EQUIPMENT					
	Vibratory rammers	Vibratory plates	Single drum vibratory rollers	Double drum vibratory rollers	Universal rollers (sheepsfoot)	Articulated vibratory rollers
<b>Soil compaction</b>						
Narrow services or cable trenches	Δ	•	-	-	-	-
Trenches	Δ	Δ	•	-	Δ	-
Foundation jobs	Δ	Δ	•	Δ	Δ	-
Backfill around structures	Δ	Δ	•	Δ	Δ	-
Landscaping and gardening	Δ	Δ	Δ	Δ	•	Δ
Foot and bicycle paths	•	Δ	Δ	Δ	-	Δ
Garden and courtyard drives	•	Δ	Δ	Δ	-	Δ
Sports and games facility	-	Δ	•	Δ	-	Δ
Parking lots and industrial areas	-	•	-	Δ	-	Δ
Road construction	•	•	-	Δ	•	Δ
Railway construction	•	Δ	-	Δ	•	-
Hydraulic engineering, refuse dumps	•	•	-	•	Δ	-
<b>Asphalt compaction</b>						
Small patch applications	•	Δ	Δ	Δ	-	Δ
Foot and bicycle paths	•	Δ	Δ	Δ	-	Δ
Garden and courtyard drives	•	Δ	Δ	Δ	-	Δ
Parking lots and industrial areas	-	•	•	Δ	-	Δ
Road construction	•	•	•	•	-	Δ
<b>Other types of compaction applications</b>						
Natural or concrete paving stones	•	Δ	-	-	-	-
Roller compacted concrete	•	Δ	•	Δ	•	Δ
Stabilized sand	•	Δ	-	-	-	-

Δ well suited    • relatively suited    - Not suited

## Dynamic compaction equipment: Layer depths and number of passes in relation to type of equipment and type of soil







AREAS AND TYPE OF COMPACTION EQUIPMENT		TYPE OF SOILS								
		I. Granular soils (non-cohesive to cohesive)			II. Mixed soils (slightly cohesive to cohesive)			III. Fine-grain soils (cohesive)		
	Operating weight lbs.	Suit-ability	Lifts inch	# of passes	Suit-ability	Lifts inch	# of passes	Suit-ability	Lifts inch	# of passes
<b>Light compaction equipment</b>										
Vibratory rammers (light)	up to 55	•	up to 6"	2-4	•	up to 6"	2-4	•	up to 4"	2-4
Vibratory rammers (medium)	55-132	•	8" - 16"	2-4	•	6" - 12"	3-4	•	4" - 12"	2-4
Vibratory plates (light)	137-200	•	up to 8"	3-5	•	up to 6"	4-6	-	-	-
Vibratory plates (medium)	220-661	•	8" - 12"	3-5	•	6" - 10"	4-6	-	-	-
Vibratory rollers (light)**	up to 1320	•	8" - 12"	4-6	•	6" - 10"	5-6	-	-	-
<b>Medium heavy and heavy compaction equipment</b>										
Vibratory rammers (medium)	55-132	•	8" - 16"	2-4	•	6" - 12"	2-4	•	4" - 12"	2-4
Vibratory rammers (heavy)	132-440	•	16" - 20"	2-4	•	8" - 16"	2-4	•	8" - 12"	2-4
Vibratory plates (medium)	661-1653	•	12" - 20"	3-5	•	8" - 16"	3-5	-	-	-
Vibratory plates (heavy)	more than 1653	•	16" - 28"	3-5	•	12" - 20"	3-5	-	-	-
Vibratory rollers**	1320-17,036	•	8" - 20"	4-6	•	8" - 16"	5-6	-	-	-

• well or relatively suited      - Not suited

For Soil: The recommended layer depths (lifts) shown may vary according to the type of soil and its properties such as, amongst others, the particle-size distribution curve and water content.

\*\*For Asphalt: The actual number of passes is dependent on mat thickness, mix design and environmental temperatures. To determine the number of passes for a given job, a test strip should be constructed and tested for density.

## Compactor Selection Guide

		SOIL (COHESIVE/CLAY AND MIXED)	SAND/GRAVEL	ASPHALT
CONFINED AREA	<b>RAMMERS</b> For excavations 4" – 24" wide, or adjacent to structures		<b>SINGLE DIRECTION PLATES</b> For smaller areas and shallow lifts less than 12"	
	<b>SHEEPSFOOT ROLLER</b> For excavations 24" wide, or adjacent to structures		<b>REVERSIBLE PLATES</b> For areas with lifts deeper than 12"	<b>RIDE-ON ROLLERS</b> Compaction of asphalt, gravel sub base, driveways and more.
LARGER AREA				
			<b>SMOOTH DRUM ROLLERS</b> For parking lots, sidewalks, etc.	
				



**WACKER  
NEUSON**