Shovelling Fact Sheet

ARE SHOVELS “ERGONOMICALLY” DESIGNED?

The design of shovels and spades did not come from an ergonomist’s drawing board. They are basic tools that have evolved over many centuries. Thousands of years of experience with such common tools has resulted in great variety of shovels and spades being developed to meet numerous needs.

In general, a

- Shovel is a tool used to dig as well as to move loose, granular materials (like dirt, gravel, grain, or snow) from one spot to another.
- Spade is a tool used for digging straight-edged holes or trenches, slicing and lifting sod, and edging flower beds or lawns.

However, in North America, the term shovel tends to be used for both shovels and spades. When selecting the right shovel for the task, ergonomic considerations are essential.

What to consider when selecting a shovel or spade?

The most important features in the selection of a shovel include:

- weight,
- handle type,
- length, and
- blade size and shape.

Why is the weight of the shovel important?

The amount of muscular effort required in shovelling depends on:

- the total weight of the shovel,
- the weight of the load it carries,
- how far the load is from the shoveller’s body, and
- where the hands are placed on the handle.

Reducing the weight of the shovel, which is unproductive weight, increases shovelling efficiency.

The weight of the shovel typically ranges from 1.5 to 3 kg (3.3 lb to 6.6 lb). The weight depends in part on the type and weight of material (e.g., steel, aluminum, plastic) that is suitable for the intended use. For example, a light shovel (e.g., 1.5 kg (3 lb)) may be suitable for shovelling light snow but a heavier, sturdier shovel (e.g., 3 kg (6.5 lb)) may be needed to shovel stones or coal.

Why is the type and length of the shaft important?

There are two conflicting opinions regarding the overall length of a shovel. Longer shafts (up to chest height) ease the strain on back muscles by reducing the amount of bending required. Shorter lengths result in better stability when transferring the load. These two factors have to be carefully balanced when deciding which shovel to choose for the task.

In general, when the blade is placed on the ground, the total length (blade plus shaft and handle) should be approximately to elbow height (when arms are at your side). Spades used for digging holes or cutting turf are usually longer than shovels.

For snow shovelling in particular, shovel shafts are now available with bends in the shaft or a second handle (usually mid-shaft) which are intended to decrease the amount of forward back-bending required. There are no studies that specifically recommend the use of bent-shafted shovels or mid-shaft handles, although some users do indicate they feel these shovels reduce back discomfort. Some of these shovels are also designed to push snow versus lift it. Take the time to determine what motions you need to perform and what type of shovel and design will be best for you.

Ultimately, the shovel shaft should be constructed to be strong and light. Fiberglass shafts and/or handles are often lighter and stronger than traditional wood shafts.

For summer shovelling, a non-slip handle can lower the force you need to hold the tool, especially in hot conditions where your sweat may interfere with your grip.

Why is the size and shape of the blade important?

Selection of blade size and shape should depend on the hardness, density (or weight), and the stability of the materials being shovelled. The less dense the material, the larger the blade size.

- Use triangular or round blades with long handles for sand and dry earth.
- Use square blades with short handles for coarse-grained materials such as gravel, coal, or ore.
- Use a smaller blade (shovel heads) to minimize the weight of material when lifting.
- Use a blade that has rolled step on the top (it can be triangular, round, or straight at the bottom) for digging in hard earth. These shovels/spades allow the users to apply foot pressure to push the blade into the earth. This action substantially reduces strain on upper body and lower back.

What factors should I consider while designing shovelling tasks?

The major components of shovelling and digging tasks are:

- shovelling rates,
- shovel loads,
- throw height, and
- throw distance.

What is the recommended rate for shovelling?

The most efficient shovelling rate is estimated at about 18-21 scoops per minute. However, fatigue builds up over a short time at this rate. Therefore, the recommended rate for continuous shovelling tasks is usually considered to be around 15 scoops per minute. Tasks involving continuous shovelling at this rate should not be carried on longer than fifteen minutes at a time. The shovelling rate per minute will also depend on how easily the shovel can be inserted into the material being moved (e.g., grain, snow, gravel, compacted earth), the stability of the material being moved, and the weight of the material.

The length of the rest break depends on many factors. Since most shovelling is done outdoors, consideration for the prevailing conditions is very important. In the more extreme conditions such as very hot and humid, or very cold and windy, 15 minutes of shovelling should be followed by 15 minutes of rest.

What is the recommended weight of the load to be lifted?

The load lifted should be adjusted according to the shovelling rate. For a high rate of shovelling (about 15 scoops per minute) the total weight (weight of a shovel plus a shovel load) should not exceed 5 to 7 kg (about 10 to 15 lb). For higher weights, a lower rate of scoops per minute is suggested (e.g., 8 kg for 6 to 8 scoops per minute). In addition, the need for precise placement of the load decreases the amount to be lifted because it takes more time and effort to aim the load at a selected location.

What is the recommended throw height and distance?

Throw height should not exceed 1.3 meters (approximately 4 feet). The optimal throw distance is slightly over l metre (about 3 feet). The load should be reduced if the task requires a longer throw.

What is the recommended workload for continuous shovelling?

There are also guidelines for maximum workloads for continuous shovelling. This table is an example of such suggested by the Kodak Company.

Maximum Amount of Material Transported, Continuous Work				
Weight Per Minute		**Total Weight Per 15 Minutes**		**Conditions**
Kg	**Lb**	**Kg**	**Lb**	
80-90	175-200	750	1,650	Lifts up to 100 cm (40 in.) above the ground – compact, non-critical load placement.
55-65	120-145	530	1,165	Lift routinely above 100 cm (40 in.) above the ground
22-33	50-75	245	535	Very precise load placement or shifting load (reduces possible lifting frequency and weight per lift).

What should you do before shovelling?

Shovelling is strenuous work and hard on both the heart and the back. For older people or persons with a history of back or heart problems it might be better to avoid this job altogether. Shovelling is especially difficult under extreme weather conditions (cold winter, hot summer). Even for the physically fit, warm-up exercises before starting shovelling is highly recommended. Flexing and stretching exercises warm and loosen the muscles and prepare them for the job ahead.

What are some other basic safety tips to know when shovelling?

Always contact your local utility providers before digging to determine the location of any cables, power lines, gas pipelines, water pipes, etc. that may be below ground. In some jurisdictions, it may be against the law to dig without locating certain services. In addition, the homeowner or contractor could be liable for any damages caused.

Wear the proper protective clothing; safety footwear, gloves, long pants if necessary

Allow for safe distance between people if you are working with other people.

What are guidelines for shovelling?

- Keep feet wide apart. Place front foot close to shovel.
- Put weight on front foot. Use leg to push shovel.
- Shift weight to rear foot. Keep load close to body.
- Turn feet in direction of throw.

What are guidelines for digging?

- Push spade down using leg muscle.
- Slide load close to body. Ensure load is loose from ground before lifting.