Literature Cited


A COMPACTION MACHINE FOR TURF-GRASS AREAS

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SOIL compaction is a constant problem on golf course putting greens, football fields, and other intensively used turf. Root growth of turfgrass is restricted or halted by compacted soil layers. Annual bluegrass (Poa annua (L.)) becomes the dominant species in these compacted areas. Annual bluegrass is a shallow rooted species by nature and under conditions of compacted soil becomes even more shallow rooted. Thus, it is favored over the deeper rooted perennial grasses.

In order to determine the effects of compaction on experimental turfgrass areas, a controlled rate of traffic or compaction must be employed. Too many uncontrollable variables exist on golf courses and play areas to permit accurate interpretation of data. For this reason, a compaction machine was designed and constructed for the purpose of producing uniform compaction with various rates of traffic.

The basic unit of the compactor was a model JR aerifie r manufactured by West Point Corporation, West Point, Pennsylvania. Specially designed legs and shoes were mounted in the place of regular springs and tines.

The legs were constructed from mild steel 15/16 inch by 15/16 inch, and 7 inches long. They were slotted at 1 end and two 1/2-inch holes were drilled for bolting to the mounting flange where the aerifie r tines are normally mounted. The opposite end was also slotted and one 1/2-inch hole was drilled to receive an articulating, spring loaded shoe 2-7/16 inches wide X 15-1/8 inches long, made from 1/4-inch mild steel. The shoes are curved at each end, which prevents turf gouging. Figure 1 shows the side view of the compaction foot. Figure 2 shows the overall view of entire machine. This basic machine will accommodate 4 rows of shoes, 4 to the row. When the machine is in operation, there are two shoes in contact with the ground at any time.

The weight of the machine is 300 pounds. It is constructed so that part of the weight can be carried on the wheels. The area of the present shoe is 10.6 square inches. The static unit pressure of 2 shoes on the ground is 9.55 psi when the wheels are on the ground, and 13.6 psi when the wheels are up. The unit pressure exerted by the compaction machine when walking was determined to be 11.1 psi with the wheels down, and 17 psi with the wheels up. By contrast, 180-pound man exerted a pressure of 6.7 psi when standing on 1 foot and 8 psi when walking. (Since shoe size varies, 3 individuals weighing 160, 180, and 200 pounds, respectively, may exert almost identical unit pressures.)

If each shoe area is enlarged to 14.75 square inches, a unit operating pressure of 8 psi would be applied to 125 square inches in 30 inches of travel. This is about a normal stride for a man. A walking man would apply the same pressure to a 27 square inch area. Since a man must walk behind the machine, the total compaction area in 30 inches would be 125 + 27 = 152 square inches. This means that the machine and operator are equivalent in compaction to that of 5.6 walking men.

Any desired type of compaction can be produced with this machine. By altering the shoe size, the pressure exerted per square inch can be changed. Different sole modifications can also be used on the shoes to simulate football cleats, golf spikes, baseball shoes, tacked shoes or regular shoes. It is believed that both compaction and scuffing factors can be determined from this machine.

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