Draining the turfgrass areas

Soil texture, structure and topography can be just as troublesome as climate.

By ROY GOSS

Normally, we think that the prevailing climate is the chief cause of drainage problems in our local areas. This is only one part of the problem, when we consider the equally important factor of soil characteristics.

When we think of soils, we should consider such things as texture, that is, are the soils heavy or light, clayey or sandy? Another important point, is the structure. Are these soils well aggregated or do they have no structure? Are they puddled and compacted, so that water will have a difficult time of entering and percolating through? Topography, of course, is always a must to consider in the problem of drainage. The problem of topography is one that quite often we cannot change, but we must follow the contours of the land.

The chemical properties of the soil are reasonably important in any drainage problem. In the arid sections of the United States, it is not uncommon to find soils with high amounts of sodium or potassium carbonates. These high percentages will bring about a loss in soil structure, thereby causing severe drainage problems if the condition is not relieved.

Mechanical effects on the soil are most important, especially in the surface few inches. Heavy equipment working on these areas will cause compaction down to a few inches and will render drainage tiles, that have been previously placed, in a useless condition. Soils that are worked in wet conditions lose their structure, and hence will compact and will not allow good drainage.

Benefits of Proper Drainage

Many benefits are evident from proper drainage, and a few of those can be outlined as follows:

1. It deepens the effective profile for root penetration.
2. It conserves the soil since more water will percolate through the soil and less will run off.
3. It lengthens the season that the area can be used, that is, areas can be used earlier in the spring.
4. It raises the soil temperature. Dry soil is much warmer than wet soil. Due to the latent heat of water, it actually takes five times as much heat to raise water one degree as it does to raise an equal volume of soil one degree.
5. It permits uniform use of the area. Mowing around these wet spots on turf areas is a nuisance, as well as the fact that problems arise because this grass gets too long before the areas dry up so it can be mowed.

Where is Drainage Needed?

Actually, there are only about three general areas where drainage is required and they are as follows:

1. Where water stands for more than 24 hours after heavy rainfall.
2. Where high water tables exist at all times, or during certain seasons.
3. Where clay subsoils exist.

The exception to the rules above would be on such specialized areas as putting greens, where rapid drainage would be necessary and would not hold true to the 24 hour factor as listed above. In this case, we are limited by the type of soils that we have, which again points out that the sandiest soils would be preferable for putting green construction in the wetter areas.

Planning the Drainage System

It is needless to say, that the main line is used only for carrying water from the source of pick-up to the source of exit.

Continued on page 76

DRAINING

Continued from page 74

The mains, of course should be as straight as possible, and where curves are necessary, make them as gentle and gradual as possible. Also, avoid grades that are too flat and those that are too steep. And, of course, perhaps the most important factor, is to use adequate pipe size. The laterals are the actual working mechanism of any drainage system; they are the lines that regulate the water table, even though the mains do intercept and carry away some drainage water on their own. The lateral pattern is regulated by topography and soil type, for the most part.

There are a number of lateral systems that can be used in drainage work for turf areas, but the natural or random system, is probably the one most used by turf people, since it is most adaptable to sloping and rolling terrain. For some of the more specialized areas, a herringbone system or the gridiron system, is the one that would be most logical to use.

Design of the System

Depth and spacing of laterals are governed by the characteristics of the soil and whether it is on fairway, which would represent all lawn type turf, or on putting greens. Since deeper mats of grass are encountered on the lawn type turf, and they do not usually become soft and soggy as on putting greens, the depth in spacing of laterals can be increased over that on putting greens. On lawn type turf, such as fairways, the laterals should not be any more than 40 to 50 feet apart for good drainage. In putting greens the spacing of laterals should not be any greater than 10 to 15 feet apart, *if maximum* drainage is desired.

The depth of placement of laterals on lawn type turf grass should be only deep enough to allow maximum penetration and development of the root system. The tiles should also be deep enough to avoid damage from freezing and heavy equipment. The optimum placement for tile in turf areas, as indicated above, is approximately 16 inches to 2 feet deep. On putting greens, where the immediate surface is the one that takes the greatest beating from play,

Continued on page 80

DRAINING

Continued from page 76

compaction, and wetness, and also since the grass roots are extremely shallow on most putting greens, then the immediate surface is the most important to consider when laying drainage tile. These tiles should not be laid to any depth greater than 16 to 18 inches in the putting green, and unless the soil is extremely sandy, the drains should not be laid any deeper than 12 to 14 inches.

Tile Size and Slope

It is recommended that for most drainage conditions no tile smaller than 4 inches be used under any circumstances, and 5 inch tile as a minimum is generally better. The reason for this arbitrary lower limit on size is that 5 inch tile carries nearly twice as much water as 4 inch on the same grade or slope and is much more likely to become silted or clogged. In fact, because of its additional capacity, it can lose some capacity by silting and still serve the area for which it was laid. The amount of area that the tile must serve is the primary factor that governs the size used.

One bit of information that may save some of you a lot of money, is to consider that the farther the tile line extends from the outlet, the smaller the size can become due to less area of service. At the head of the watershed, the tile may be no larger than the laterals themselves, since only a small area is being serviced.

The fall, slope, or gradient of the tile line is also an important factor. The greater the fall, the smaller the tile may be to carry the water from any given area. It is possible to have too much fall just as it is possible to have too little. Too much fall tends toward extremely high velocities, which are often responsible for causing blow holes and for washing out entire lines of tile.

Another important factor is how fast the water must be carried away. It has been generally agreed that tile drainage systems must be capable of disposing of from ¼ to ⅜ inch of percolated rainfall in 24 hours. All figures estimated on the ⅜ drainage co-efficient are generally safe for any locality that is encountered. A simple formula for determining the

Continued on page 82

DRAINING

Continued from page 80

amount of area that a tile line will have to drain is as follows: Multiply the distance between tile lines times the number of feet long the tile lines are and divide this product by 43,560 sq. ft. (per acre) and this will give you the number of acres in the drainage area.

The closer the lateral lines are spaced, the more quickly the area will drain. However, the important factor here is the cost of installing additional lines. In order to save some money, it is possible to lay the main line and a minimum number of laterals. If the desired drainage is not achieved, more laterals can be placed at a later date. It should be kept in mind, that while closer spacing will remove excess water a little more quickly, the chief advantage to be gained by closer spacing, is that the water table will be more nearly flat and at a more uniform depth than at wider spacings.

Installing surface inlets is an impor-

Continued on page 84

DRAINING

Continued from page 82

tant factor in tile drainage. Actually, wider spacing of tile lines can be used if surface inlets are freely used. Surface inlets can be installed in lower areas and allow much faster drainage of these impounded waters.

Laying the Drain Tile

At the end of the day, whenever the job is not completed, always block up each end of the tile so that small animals or unexpected cave-ins or washing, will not fill the tile and clog them. As soon as the tiles are placed in the trenches a few inches of earth should be back filled to hold them in place until the final back filling is done. In muck and sand, cradling of the tile is often necessary to assure maintenance of the grade. Wherever cradling is necessary, the board and cleat method is perhaps the best system. Simply nail small cleats on each side of a flat board and the tile can be laid so that it does not touch the bottom of the board and is supported on those cleats. This will lend more support to the tile and keep the tile from shifting or losing its position or grade.

The distance between any two tiles is determined by the type of soil. If the tile is being layed in water sand, the snuggest fit possible should be obtained to prevent their admitting sand. In other soils, the space between tiles should be between 1/16 and 1/8 inches apart.

A layer of gravel or other porous material over the joints of the tile before back filling will prevent a great amount of silting. Complete coverage of the tile line with gravel is not necessary. Only a small amount of gravel over the crack will generally prevent much silting.

Two last important points should be mentioned:

1. Inspection or clean-out points along the tile drains. These permit easy access and easy clean-out if they become clogged with silt or roots.

2. Make an accurate map of all the areas, so these lines can be located after you are gone.

(Reprinted from Northwest Turfgrass Topics—published By Northwest Turf Association)