To Crown or not to Crown...

R.W. SHEARD, Ph.D., P.Ag.

Most designers of a sports field will specify a crown on the finished surface of the field. The crown or slope from the side line to centre field may range from 0.5 to 1.5 percent. James B. Beard, in his text, *Turfgrass, Science and Culture*, recommends up to 2.5% slope. This author has read reports of fields in the UK where the crown is so great that the ball sitting on the side line is not visible to the player standing on the opposite side line.

The reason most often given for having a crown on the field is that it improves drainage by removing surface water through runoff. For runoff to occur, rainfall intensity (mm/hour) must exceed the infiltration rate of the soil surface. The infiltration rate is increased by (1) increasing the sand content of the soil, (2) reducing the density of the soil, that is decreasing compaction, (3) increasing the slope and (4) increasing density of the vegetative cover.

Maximum runoff will occur on a paved surface where the infiltration rate is zero. Minimum runoff will occur on a sand-based root zone with a dense blue grass stand where the sand, even without the vegetative cover, is selected to provide an infiltration rate greater than the rainfall intensities observed in 90% of the summer storms in Ontario. Most sports fields fall between these two extremes.

Achieving Low Infiltration Rates

Factors which might contribute to lower infiltration rates are high clay contents, low permeability, compaction, thatch, and low turf density. Compaction and thatch may be controlled by adequate coring. Low turf density can be improved by overseeding and adequate nitrogen fertilization.

Grass has been accepted, second to forest with a dense undergrowth, as the most effective vegetative cover to prevent soil and water loss. A summary of 10 experiments conducted over 70 years ago showed an average water loss due to surface runoff from grass of 10 mm per year on soils ranging from sandy loam to clay and slopes ranging from 2.0 to 16.5%. A 14-year study in hurricane prone Missouri on a silt loam soil with a 3.7% slope showed an average yearly loss of 50 mm from bluegrass sod. These experiments were conducted prior to the understanding of the importance of nitrogen for increasing the density of grass stands. Furthermore, the maintenance program in these studies was probably hay or simulated pasture, not the density associated with a closely mowed sports field.

The Bottom Line

What does this all mean? That drainage by surface runoff from a properly maintained sports field in Ontario, crowned or not crowned, is insignificant. Crowning the field will not cure a potential drainage problem.

An internal drainage system for a sports field is the answer. It must be designed to meet the 10-year average rainfall intensity. In many cases this will require various types of drain installation such as tile drains, slit drains, a combination of the two, or a sand-based root zone.

Raindrops from a storm having an intensity of 25 mm per hour or less are going to be held near or at the point of contact with the soil. The soil will require an infiltration rate of 25 mm per hour to absorb the water. Storms of this intensity seldom occur more than once or twice per season and the intensity may last for less than an hour.

Since rain will not run off a well managed field and must permeate directly to deeper depths, during the rain the soil pores at the surface will become increasingly filled with water. This water acts as a lubricant allowing soil particles to slide into closer arrangements under traffic conditions. The result is compaction. Therefore for a well managed field to perform satisfactorily, adequate internal drainage must be provided. A crown will not help this drainage role.

There is, however, a reason for placing a crown on a field. This occurs at the time of construction. If the subgrade is crowned at a 0.5% slope, surface water will not pool on the newly graded surface. Thus, following a summer thunderstorm, construction work can recommence sooner than where the field is graded level. Carrying this slope through to final grading of the surface will often result in more timely seeding. ♦