

**Table 7. Comparison of miscellaneous inorganic soil amendments used in golf green construction.**

Soil Amendment	pH	Cation Exchange Capacity	Water Holding Capacity	Durability (years)
Calcined clay	neutral	poor	fair	10+
Perlite	neutral	poor	fair	10+
Pumice	neutral	poor	low	10+
Vermiculite	neutral	poor	low	10+
Colloidal phosphate	neutral	good	good	10+

Other organic materials have been successfully used in the root zone component including rice hulls, and various animal and vegetable by-products. However, availability must be considered as well as their consistency. When considering organic sources, make sure to use one that is: (1) finely shredded to achieve the best possible mixing; (2) low in silt, clay and salt; (3) well decomposed; and, (4) free of toxic chemicals.

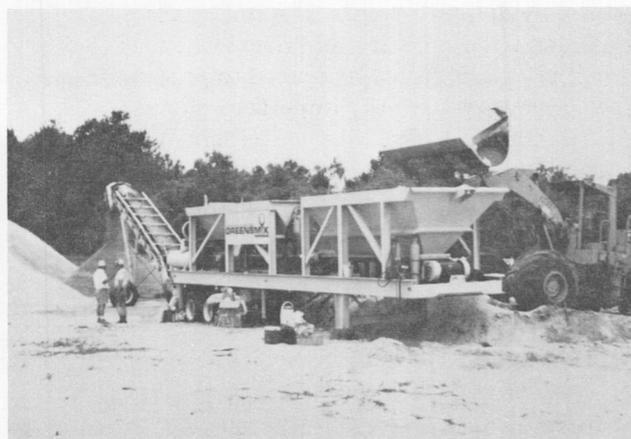
Other amendments are sometimes used and may be considered if they are readily available, meet the infiltration and percolation parameters, and are affordable. Table 7 lists several of these alternate soil amendments.

Once a suitable particle size sand is determined, the laboratory will then run several trial mixes containing varying proportions of the sand, organic matter and soil being considered by the golf course. The synthetically composed samples will then be compacted and evaluated as previously discussed for hydraulic conductivity and pore space distribution. This process is repeated until a ratio that approaches the optimum standard is found for each component. Once this is determined, the laboratory can then make a recommendation to the volume of each component to be used in the root zone mix.

## Root zone mix installation

### Procedure

Once the laboratory determination has been made concerning the type and amount of each component needed for a desired mix, the next step is to uniformly mix the components. **All root zone mixing should be completed off-site.** Greens mixed on-site (e.g., soil components placed on top of each other and roto-tilled in) are poorly distributed, resulting in localized areas of wet and dry spots. The use of commercial blending equipment is strongly suggested to obtain desired results



**Figure 9. Commercial mixing of the components of a golf green root zone "off-site."**

(Fig. 9). For smaller jobs, mixing can be performed by tumbling in a concrete mixer or by spreading the measured quantities on a hard, smooth surface (such as pavement) and then moving by a front-end loader or tractor in several directions. Once the mixing operation is underway, random samples should be obtained and checked by the laboratory to ensure that specifications are being met. If this can not be performed, then every truckload of each component utilized in the root zone mix should be checked at delivery to insure that specifications are met as outlined by the laboratory.

During the mixing operation, sand should be periodically moistened to facilitate more uniform distribution. Fibrous organic matter should also be moistened to prevent it from clinging excessively to wet sand. Incorporating a starter fertilizer and/or lime, as needed, at this time is also recommended to aid in early rooting and sod formation. Soil test results should be used as the basis for determining amount of fertilizer or lime needed. A complete fertilizer such as 2.5 to 3 pounds of 10-20-20 or equivalent should be added to each cubic yard of mix when soil test results are unavailable.