

Natural Glacial Till Soils

...and what they mean to your project

In this issue of the GCES Construction Monitor, we examine glacial till, a soil that has characteristics and properties that can affect construction projects.

Glacial Influence on Landforms

The geology of northern lower Michigan was influenced predominately by interaction of the land with glaciers and post-glacial events. The advances and retreats of the glaciers left behind various types of soils at certain geographic areas. One such soil type is known by foundation engineers as "glacial till."

Glacial Till Deposits

Glacial till is a very dense, strong soil that includes a wide variety of particle sizes. Glacial till (Figure 1) typically contains up to approximately 40 percent fines (silt and/or clay) with sand and gravel comprising the remainder. Additionally, glacial till has substantial cobble and even boulder content.

Figure 2 shows grain size (gradation) of two typical glacial tills (not including cobbles and boulders). A typical sand grain size gradation is also shown for comparison. Notice the small percentage of silt or clay size particles within the sand compared with the glacial till. The "gap graded" shape - shown as a "hump" on the gradation curve of the till - indicates that the soil contains a small percentage of mid-size particles. In some cases, this gradation shape can be a signal of an "internally erodible" soil. Care must be exercised when using these soils as embankments for retention basins.

Glacial till also usually has a moisture content of about 8 to 10 percent when saturated, much less than most other soils. The relatively small amount of moisture required to create saturated conditions is an indication of an extremely low void-to-solid ratio within the soil, which suggests a broadly graded

soil. Knowing these characteristics helps us to more positively classify the soil.

Other terms for this type of soil include "subglacial till" and "supraglacial till." The material at the bottom of a glacier is referred to as subglacial till. These tills are unstratified, usually very dense, and contain rounded cobbles and boulders. The cobbles and boulders become rounded because the abrasion, friction, and pressure associated with transportation under a heavy glacier grinds them smooth. These types of tills are found throughout the area, most notably in Antrim and Leelanau Counties. Supraglacial till is soil that is transported within or on top of a glacier.

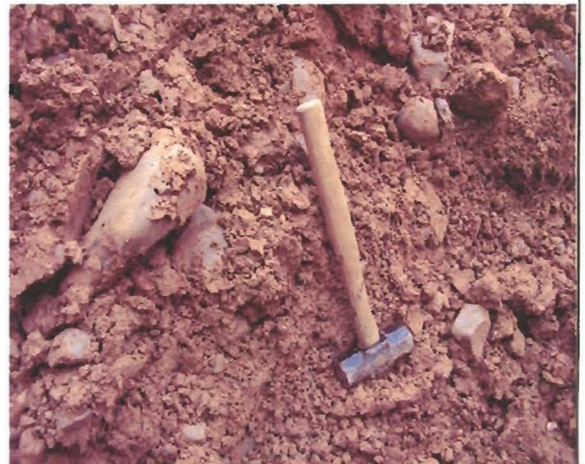


Fig. 1 Glacial till showing a variety of grain sizes, including gravel, cobbles, and boulders within the clay, silt, sand, and gravel matrix.

Glacial Till and Foundation Design

Both subglacial till and supraglacial till have unique implications on soil testing technique, foundation design and construction. For example, supraglacial till retards the vertical migration of water through the soil. This can create perched groundwater above the regional groundwater table and require dewatering for construction projects. For the purposes of foundation engineering, most engineers refer to the soil as "glacial till" or "till" and describe the consistency of the soil separately.



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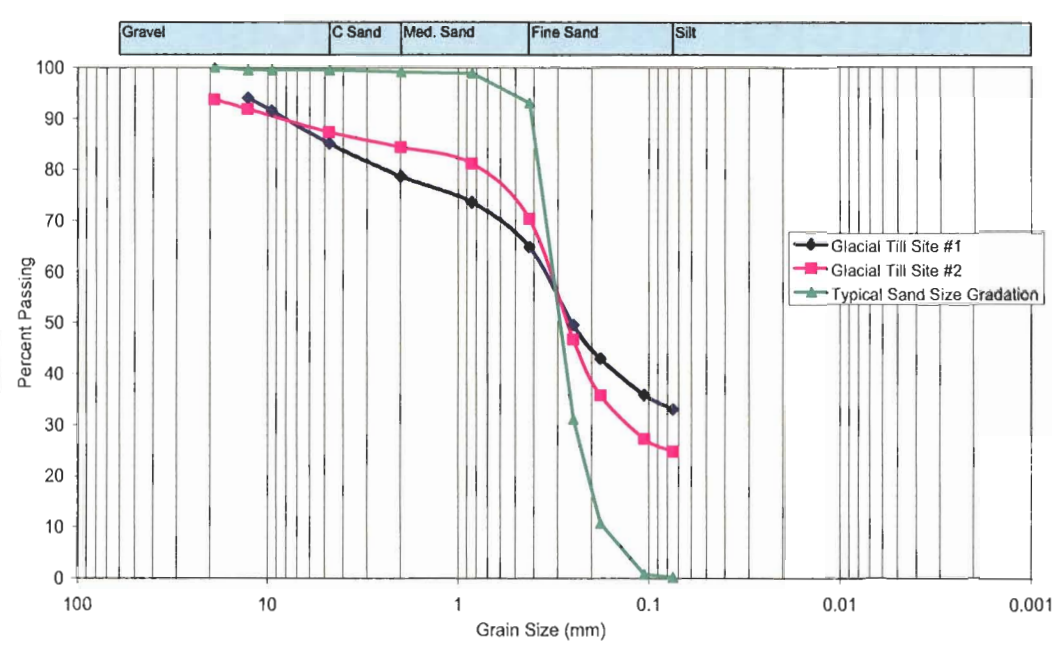


Fig. 2 Grain size distribution curves for typical glacial till soils showing the characteristic "gap graded" shape. Sand gradation shown for comparison. Cobbles and boulders are not included on this graph.

How Can Knowledge of the Geologic Conditions Help in Planning a Project?

By knowing what to expect in the soil conditions on a site in a particular area, the soil boring program can be optimized to gain the most information in a cost-effective way. In other words, the value of the investigation is substantially increased.

If glacial till soils are encountered, some special excavation considerations should be made. For example, a staged basement/foundation excavation program should be considered. This will help limit the amount of "softening" the till undergoes as the weight of the soil above it is removed.

The foundation excavations should also be protected from moisture, since precipitation introduced into the excavation tends to collect and further soften the soil.

If possible, foundation construction should be planned so that it proceeds in an expeditious manner. This will further limit gradual soil softening and instability at the subgrade

level, and reduce the need to overexcavate the soil with a compacted sand or gravel.

Call Gosling Czubak to discuss your project and discover how we can help you assess your site and provide recommendations for construction that can save you money when compared to construction on unsuitable soils. Contact Chuck Brumbaugh, P.E. at 800-968-1062.

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