ENGINEERING CHARACTERISTICS OF BEDROCK UNITS, KNOX COUNTY, TENNESSEE

This table presents the engineering characteristics of the bedrock units shown on the accompanying map. Although the bedrock crops out in some places, it is covered in most places by overburden of variable thickness (see sheet 1). The thickness and characteristics of this overburden must be considered in conjunction with the bedrock for some construction purposes and must be considered in evaluating a particular kind of bedrock as a resource. The engineering characteristics of the overburden are presented on map I-767 K (Harris and Kellberg, 1972) of the Knox County Folio.

Bedrock map unit	Fresh rock					Weathering characteristics		Common problems
	Thickness of beds	Unit weight[1] (pounds per cubic foot)	Compressive strength[2] (pounds per square inch x 10^3)	Suitability for aggregate	Slopes in artificial cuts	Thickness of overburden[3] (in feet)	Contact between overburden and bedrock	
Limestone	1 in. to 3 ft	168–170	10–30	Fair to good, depending on shale content. Laboratory tests needed to determine suitability.	Slopes for any cut must be determined on the basis of the attitude of beds, joints, and faults at any particular site.[4]	0–100; outcrops numerous.	Irregular with isolated blocks surrounded by overburden and with pinnacles of bedrock projecting to surface. Subsurface cavities common.	Configuration of the bedrock surface is not predictable from surface studies. Construction of large structures on bedrock requires detailed subsurface investigation. Uneven bedrock surface causes increased excavation time and cost because excavation requires an alternation between easy removal of overburden and drilling and shooting of pinnacles and blocks. Planning and sound building practices are necessary to minimize differential subsidence owing to 1) uncontrolled surface and subsurface drainage, 2) uneven settlement of soils over uneven bedrock surface, and 3) collapse of subsurface cavities either in the overburden or in bedrock (see Harris, 1973b). Many areas underlain by limestone or dolomite contain abundant sinkholes, which are flood prone and require detailed planning for maximum use (see Harris, 1973a).
Dolomite	6 in. to 3 ft	174–180	10–40	Good to excellent, depending on chert content. Chert may react with certain high-alkali cements resulting in deterioration of concrete. Laboratory tests needed to determine suitability.		0–100; outcrops rare.		
Calcareous sandstone with subordinate shale	1 in. to 1 ft	168–170	15–30	Good, but quartz in the sandstone abrades crushing equipment.		0–80; about 35 percent of outcrop area has less than 10 feet.	Irregular with isolated blocks and pinnacles projecting to surface.	Configuration of the bedrock surface is not predictable from surface studies. Large structures that are to be founded on bedrock require detailed subsurface investigation. Uneven bedrock surface causes increased excavation time and cost because excavation requires an alternation between easy removal of overburden and drilling and shooting of pinnacles and blocks. More than 50 percent of outcrop area forms slopes greater than 25 percent, which requires detailed planning even for minimum use.
Calcareous siltstone with subordinate shale and limestone	1 to 6 in.	167–170	5–20	Poor because of high shale content.		0–70; about 50 percent of outcrop area has less than 10 feet.	Irregular with pinnacles projecting to surface.	Although bedrock surface is irregular, excavation is primarily in bedrock because overburden is generally thin. About 40 percent of outcrop area forms slopes greater than 25 percent, which requires detailed planning even for minimum use.
Shale with subordinate limestone and siltstone	¼ to 3 in.	154–169	1–5 for shale			0–45; about 75 percent of outcrop area has less than 20 feet.	Irregular but gradational into fresh rock.	Weathered material can be ripped without blasting. Fresh bedrock may require blasting and power equipment for excavation. To preserve a firm clean foundation in fresh bedrock, protective measures must be taken to prevent damage from wetting and drying, frost action, and abrasion by equipment. Areas of low relief, especially near streams, are poorly drained and require detailed studies to control water. Locally contains units of limestone more than 20 ft thick which can cause same problems discussed under limestone.
Sandstone with subordinate shale	1 in. to 1 ft	162–169	20–40			0–5		Because overburden is generally less than 5 ft thick, excavations are primarily in bedrock. Approximately 80 percent of outcrop area forms slopes greater than 25 percent, thus requiring detailed planning for minimum use. To preserve a firm clean foundation where sandstone contains beds of shale, protective measures must be taken to prevent damage from wetting and drying, frost action, and abrasion by equipment.

[1] From numerous measurements on unweathered rock samples (unpublished data of the Tennessee Valley Authority).
[2] From numerous confined compression tests on unweathered rock samples (unpublished data of the Tennessee Valley Authority).
[3] For additional data see sheet 1 and Harris and Kellberg (1972).
[4] See Harris (1972b).

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OVERBURDEN RELATED TO TYPE OF BEDROCK AND ENGINEERING CHARACTERISTICS OF THE BEDROCK, KNOX COUNTY, TENNESSEE

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