Design Correlations for Red and Kenya Red-Brown Soils

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● WITH THE accumulation of further data and especially data in relation to particular roads, it has been necessary to revise the general curves slightly and it has been possible to produce particular curves applicable to specific roads or to lengths of specific roads each of which exists under apparently similar climatic and geological conditions. The new curves so obtained are given in Figures 7 and 8.

In a restricted way they could, perhaps, be described as pedological design curves. The curves for specific roads are, in general, based on points showing remarkably little scatter.

The most clearly defined curves were obtained for the Mau Summit-Kericho road, some 29 mi long, which, for most of its length, climbs up a narrow valley characterized by high rainfall and dark brown surface soils containing appreciable organic matter residues, until it reaches a relatively undulating area of higher rainfall where the Red Tea soils are found. As soon as the tea area is reached the correlation curve changes. Between the two there is a short transition stage in which there is some scatter.

The Thika-Sagana-Nyeri road (some 65 mi) did not lend itself to any simple correlationship pattern. This road crosses plains and mountainous country passing through a number of rainfall belts.

The Mau Summit-Eldoret road (64 mi), over very fine light red soils, similar perhaps o Red Coffee soils, calls for an almost constant thickness of pavement 12 in. for Proc-or compaction throughout. The rainfall lies wholly within the same belt from one end to he other.

Though reference is made to Red Coffee and Red Tea soils, this does not necessarily mean that the subgrades were invariably constructed in such materials. Where this material was not used—and this seems of importance—they were constructed in materi-l obtained from lower horizons of such profiles. In these relatively young soils, the parent material seems to exercise a control over the road engineering properties of all orizons over that material.

There is the apparent transition between parent material and the subsoil layer which takes the form:

basic tuff——————►decomposed tuff containing mainly hydrated
halloysite——————►dehydrated halloysite where the degree of
hydration decreases as the surface layer is approached.

The decomposed tuff appears to contain montmorillonite but there is no known record f the montmorillonite persisting in the soils over that horizon. This presence may well upply an explanation for the worst correlation curves; that is, those calling for high avement thicknesses, pertaining to decomposed stone, soil adulterated with some decomposed stone, as well as to some black cotton soils. The possibility of allophane eing present at some stage or in one of the horizons is not, however, to be ruled out. t has since been ascertained by W. Arthur White, Geologist and Head, Clay Resources nd Clay Mineral Technology Section, State Geological Survey Division, Urbana, Ill., at allophane was present in two samples of soil sent him from Kenya.)

A low CBR soil from the Mau Summit-Kericho road was recently investigated to dermine, if possible, the reason for its low load carrying capacity. Though the swelling

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This paper, printed in HRB Proc., 39:683-694 (1960) represents a logical extension and practical application of the HRB Special Report 40 paper entitled, "Moisture Content and the CBR Method of Design." This is the reason for including these supplementary remarks.

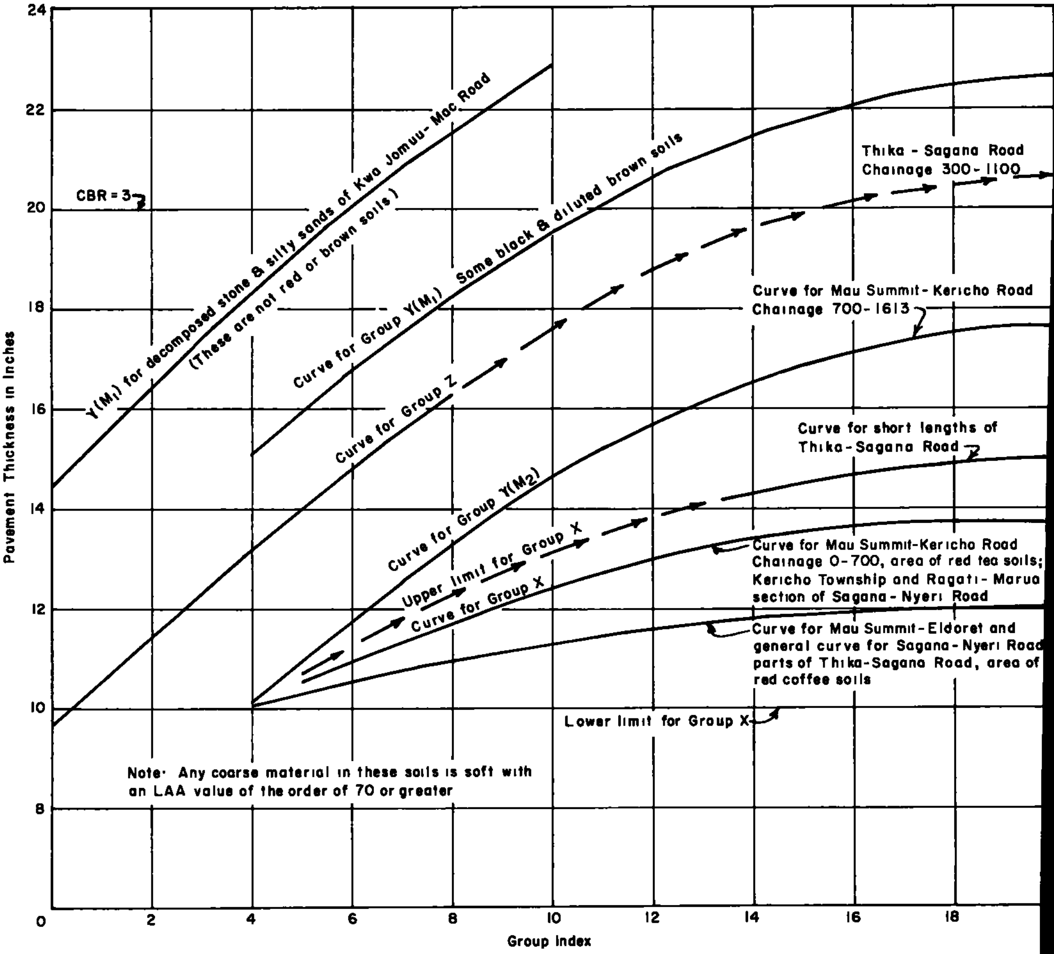
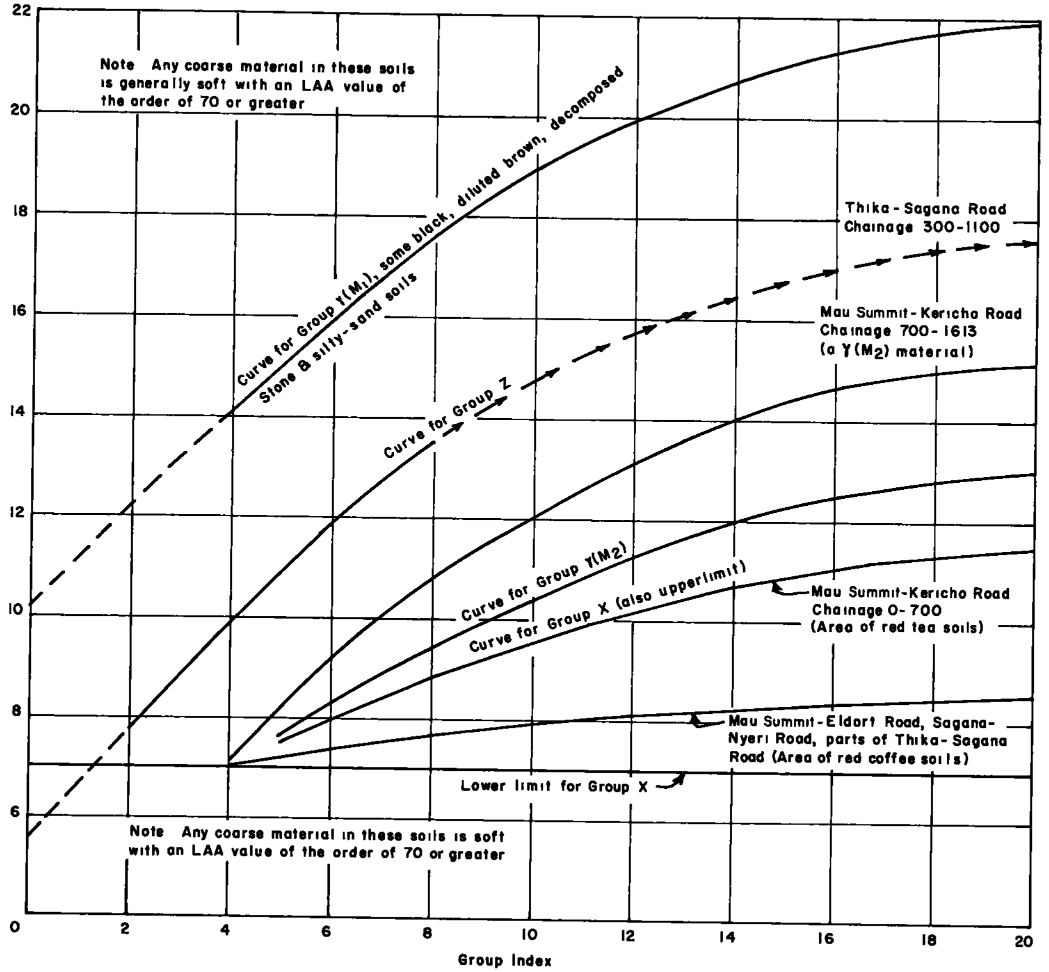


Figure 1. Pavement thicknesses for various subgrade soil groups when compacted to Pro tor maximum density (9,000-lb wheel load).

pressure was found to be just under 1 ton per sq ft at Proctor (OMC + MD), the only clay minerals recognized, by X-ray analysis, were metahalloysite and possibly a sm amount of hydrated halloysite with feldspar and quartz. (Exposure to the drying acti of the sun for a day or two is sufficient to convert thin layers of hydrated halloysite t metahalloysite. Montmorillonite appears to be formed, as an intermediate product, during the more normal weathering of hydrated halloysite to metahalloysite .)

The form of the correlation curves (Figs. 1 and 2) is of interest. A number of curves appear to pass approximately through the common point represented by a constant pavement thickness for a G.I. value of 4 representing a change from a silt-clay material to a granular material under the Don Steele method of classification. For lower G.I. values the pavement thickness required would seem to remain constant, a might be expected. For the other materials, this does not appear to apply in toto an the pavement thickness required continues to decrease as the material becomes mor granular. It should be remembered, however, that the so-called granular fraction o the vast majority of Kenya soils consists mainly of soft lateritic material or soft dec posed stone though within the larger particles there may be some small fraction of m harder small particles as of iron oxides.



gure 2. Pavement thicknesses for various subgrade soil groups when compacted to half-modified maximum density (9,000-lb wheel load).

An endeavor was made to group the various materials on the basis of their "clay ac-
ity," as determined by $\frac{PI}{100} \times \frac{(-36)}{\text{clay }\%}$, but no recognizable tie-up or semblance of a
e-up was noticeable in respect of pavement thickness.