

ENGINEERING INDEX PROPERTIES
Sumner County, Kansas

Engineering Index Properties table gives the engineering classifications and the range of index properties for the layers of each soil in the survey area. Depth to the upper and lower boundaries of each layer is indicated. Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. Loam, for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, gravelly. Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1998) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1998). The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection. If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in Engineering Index Properties table.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

ENGINEERING INDEX PROPERTIES--Continued
Sumner County, Kansas

(Absence of an entry indicates that the data were not estimated.)

| Map symbol and soil name | Depth | USDA texture | Classification | | Fragments | | Percentage passing sieve number-- | | | | Liquid limit | Plas- ticity index |
|-----------------------------|---------------------------------|---|---|---|--------------------|--------------------|--------------------------------------|-----------------------------|--------------------------------------|--------------------------------------|----------------------------------|---------------------------------|
| | | | Unified | AASHTO | >10 inches | 3-10 inches | 4 | 10 | 40 | 200 | | |
| | | | | | Pct | Pct | | | | | Pct | |
| 015LS: Ladysmith----- | 0-8 8-38 38-66 | Silty clay loam Silty clay Silty clay | CL CH CH, CL | A-6, A-7 A-7-6 A-7-6 | 0 0 0 | 0 0 0 | 100 100 100 | 100 100 100 | 95-100 95-100 95-100 | 85-95 85-95 85-95 | 30-45 50-70 40-65 | 15-25 30-50 25-45 |
| 035LG: Lincoln----- | 0-9 9-60 | Fine sandy loam Stratified fine sand to clay loam | CL-ML, ML, SC-SM, SM SM, SP-SM | A-4 A-2, A-3 | 0 0 | 0 0 | 100 100 | 98-100 98-100 | 94-100 82-100 | 36-60 5-35 | 15-24 --- | NP-7 NP |
| Tivoli----- | 0-7 7-60 | Loamy fine sand Fine sand | SM SM, SP-SM | A-2 A-2, A-3 | 0 0 | 0 0 | 100 100 | 95-100 95-100 | 90-100 80-100 | 15-35 5-25 | --- | NP NP |
| 035VC: Vanoss----- | 0-12 12-38 38-60 | Silt loam Silty clay loam Silt loam | CL, CL-ML, ML CL CL | A-4, A-6 A-6, A-7 A-4, A-6, A-7 | 0 0 0 | 0 0 0 | 100 100 100 | 100 100 100 | 96-100 96-100 96-100 | 65-95 80-98 65-98 | 22-37 33-43 30-43 | 2-14 12-20 8-20 |
| 035VD: Verdigris----- | 0-38 38-60 | Silt loam Silty clay loam | CL, CL-ML, ML CL | A-4, A-6 A-4, A-6, A-7 | 0 0 | 0 0 | 100 100 | 100 100 | 95-100 95-100 | 65-100 80-100 | 22-35 30-45 | 2-13 8-23 |
| 077AN: Kaski----- | 0-26 26-40 40-60 | Loam Clay loam Sandy loam | CL, CL-ML CL, SC CL, ML, SC, SM | A-4, A-6, A-7 A-4, A-6, A-7 A-2, A-4, A-6 | 0 0 0 | 0 0 0 | 100 100 100 | 100 95-100 95-100 | 85-100 85-100 60-100 | 50-85 45-85 30-80 | 20-45 25-45 15-35 | 5-25 7-25 NP-20 |
| 077BM: Lincoln----- | 0-21 21-60 | Loamy fine sand Stratified fine sand to clay loam | SM SM, SP-SM | A-2 A-2, A-3 | 0 0 | 0 0 | 100 100 | 98-100 98-100 | 90-100 82-100 | 15-35 5-35 | --- | NP NP |
| 077BP: Woodward----- | 0-24 >24 | Silt loam Weathered bedrock | CL, CL-ML, ML | A-6, A-4 | 0 --- | 0 --- | 100 --- | 100 --- | 90-100 --- | 51-95 --- | 15-31 --- | NP-12 --- |
| Port----- | 0-27 27-60 | Silt loam Silty clay loam | CL CL | A-4, A-6 A-4, A-6, A-7 | 0 0 | 0 0 | 100 100 | 100 100 | 96-100 96-100 | 65-97 65-98 | 27-37 27-43 | 8-14 8-20 |
| 077CE: Corbin----- | 0-16 16-30 30-55 55-60 | Silt loam Silty clay loam Clay Silty clay loam | CL, CL-ML CL, ML CH, CL CL | A-4, A-6 A-6, A-7 A-7-6 A-6, A-7 | 0 0 0 0 | 0 0 0 0 | 100 100 100 100 | 100 100 100 100 | 90-100 95-100 95-100 95-100 | 75-100 85-100 90-100 85-100 | 25-35 35-45 45-60 35-45 | 5-15 10-20 25-35 12-20 |
| 077CF: Corbin----- | 0-16 16-30 30-55 55-60 | Silt loam Silty clay loam Clay Silty clay loam | CL, CL-ML CL, ML CH, CL, MH CL | A-4, A-6 A-6, A-7 A-7-6 A-6, A-7 | 0 0 0 0 | 0 0 0 0 | 100 100 100 100 | 100 100 100 100 | 90-100 95-100 95-100 95-100 | 75-100 85-100 90-100 85-100 | 25-35 35-45 45-60 35-45 | 5-15 10-20 25-35 12-20 |
| 077GN: Grant----- | 0-11 11-33 33-50 >50 | Silt loam Silty clay loam Silt loam Weathered bedrock | CL, CL-ML, ML CL, ML CL, CL-ML, ML --- | A-4 A-4, A-6, A-7 A-4 --- | 0 0 0 --- | 0 0 0 --- | 100 100 70-100 --- | 100 100 70-100 --- | 90-100 90-100 65-100 --- | 70-90 70-90 55-90 --- | 20-32 30-42 20-32 --- | 1-10 8-19 1-10 --- |
| 077GS: Grant----- | 0-11 11-33 33-50 50-60 | Silt loam Silty clay loam Silt loam Weathered bedrock | CL, CL-ML, ML CL, ML CL, CL-ML, ML --- | A-4 A-7, A-4, A-6 A-4 --- | 0 0 0 --- | 0 0 0 --- | 100 100 70-100 --- | 100 100 70-100 --- | 90-100 90-100 65-100 --- | 70-90 70-90 55-90 --- | 20-32 30-42 20-32 --- | 1-10 8-19 1-10 --- |
| 077KR: Kirkland----- | 0-12 12-34 34-60 | Clay loam Silty clay Clay | CL CH, CL, MH CH, CL, MH | A-4, A-6, A-7 A-7 A-6, A-7 | 0 0 0 | 0 0 0 | 100 100 100 | 100 100 100 | 96-100 96-100 96-100 | 80-98 88-99 76-99 | 30-43 41-65 37-65 | 8-18 18-38 15-38 |
| Renfrow----- | 0-9 9-13 13-60 | Clay loam Clay loam Clay | CL CL CH, CL, MH | A-6, A-7 A-6, A-7 A-6, A-7 | 0 0 0 | 0 0 0 | 100 100 100 | 100 100 100 | 96-100 96-100 96-100 | 80-98 80-98 80-99 | 33-49 37-49 37-70 | 12-26 15-26 15-38 |
| 077KW: Kirkland----- | 0-6 6-34 34-60 | Clay loam Silty clay Clay | CL CH, CL CH, CL | A-4, A-6, A-7 A-7 A-6, A-7 | 0 0 0 | 0 0 0 | 100 100 100 | 100 100 100 | 96-100 96-100 96-100 | 80-98 88-99 76-99 | 30-43 41-65 37-65 | 8-18 18-38 15-38 |
| Renfrow----- | 0-6 6-60 | Clay loam Clay | CL CH, CL | A-6, A-7 A-6, A-7 | 0 0 | 0 0 | 100 100 | 100 100 | 96-100 96-100 | 80-98 80-99 | 33-49 37-70 | 12-26 15-38 |
| 077PH: Dale----- | 0-22 22-60 | Silt loam Silt loam | CL, CL-ML CL | A-4, A-6 A-4, A-6, A-7 | 0 0 | 0 0 | 95-100 95-100 | 95-100 95-100 | 90-100 90-100 | 65-98 65-98 | 25-35 30-43 | 5-15 8-20 |
| 077PT: Pratt----- | 0-12 12-20 20-60 | Loamy fine sand Loamy fine sand Fine sand | SM SC-SM, SM SM, SP-SM | A-2 A-2, A-4 A-2, A-3 | 0 0 0 | 0 0 0 | 100 100 100 | 95-100 95-100 95-100 | 70-100 90-100 80-100 | 15-35 15-40 5-35 | --- | NP NP-6 NP |
| Tivoli----- | 0-5 5-60 | Loamy fine sand Fine sand | SM SM, SP-SM | A-2 A-2, A-3 | 0 0 | 0 0 | 100 100 | 95-100 95-100 | 90-100 80-100 | 15-35 5-25 | --- | NP NP |
| 077SO: Shellabarger--- | 0-13 13-38 38-60 | Fine sandy loam Sandy clay loam Coarse sandy loam | ML, SM SC SC, SC-SM, SM, SP-SM | A-2, A-4 A-4, A-6 A-2, A-4 | 0 0 0 | 0 0 0 | 95-100 95-100 80-100 | 95-100 85-100 70-100 | 75-100 70-90 50-80 | 30-55 35-50 10-40 | 15-30 25-40 15-30 | NP-5 8-20 NP-10 |
| Albion----- | 0-6 6-21 21-60 | Sandy loam Sandy loam Loamy sand | ML, SM ML, SM GM, GP-GM, SM, SP-SM | A-2, A-4 A-2, A-4 A-1, A-2, A-3 | 0 0 0 | 0 0 0-5 | 100 85-100 40-100 | 75-100 75-100 40-90 | 60-90 45-90 30-70 | 25-55 30-55 5-30 | 15-30 20-35 15-30 | NP-5 NP-10 NP-5 |

ENGINEERING INDEX PROPERTIES--Continued
Sumner County, Kansas

(Absence of an entry indicates that the data were not estimated.)

| Map symbol and soil name | Depth | USDA texture | Classification | | Fragments | | Percentage passing sieve number-- | | | | Liquid limit | Plas- ticity index |
|-------------------------------------|-------|----------------------|-----------------------|--------------------|---------------|----------------|--------------------------------------|--------|--------|-------|-----------------|--------------------------|
| | | | Unified | AASHTO | >10 inches | 3-10 inches | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | Pct | | | | | Pct | |
| 077TH: Tivoli----- | 0-5 | Fine sand | SM, SP-SM | A-2, A-3 | 0 | 0 | 100 | 95-100 | 80-100 | 5-25 | --- | NP |
| | 5-60 | Fine sand | SM, SP-SM | A-2, A-3 | 0 | 0 | 100 | 95-100 | 80-100 | 5-25 | --- | NP |
| 095DA: Dillwyn----- | 0-8 | Loamy fine sand | SM, SP-SM | A-2, A-3 | 0 | 0 | 100 | 95-100 | 70-90 | 5-35 | --- | NP |
| | 8-60 | Loamy fine sand | SM, SP-SM | A-2, A-3 | 0 | 0 | 100 | 90-100 | 70-90 | 5-35 | --- | NP |
| Plevna----- | 0-11 | Fine sandy loam | SC-SM, SM | A-2, A-4 | 0 | 0 | 100 | 95-100 | 70-100 | 20-50 | 15-26 | NP-6 |
| | 11-36 | Fine sandy loam | SC-SM, SM | A-2, A-4 | 0 | 0 | 100 | 95-100 | 70-100 | 30-50 | 15-26 | NP-6 |
| | 36-60 | Sand | SM, SP | A-2, A-3 | 0 | 0 | 100 | 90-100 | 50-90 | 4-35 | --- | NP |
| 095OA: Wellsford----- | 0-6 | Clay loam | CL | A-6, A-7-6 | --- | 0-5 | 95-100 | 95-100 | 90-100 | 75-95 | 35-50 | 15-30 |
| | 6-16 | Clay | CH, CL | A-7-6 | --- | 0-5 | 95-100 | 95-100 | 85-100 | 75-95 | 45-70 | 20-40 |
| | >16 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| 095RA: Renfrow----- | 0-8 | Clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 33-49 | 12-26 |
| | 8-12 | Clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 37-49 | 15-26 |
| | 12-50 | Clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-99 | 37-70 | 15-38 |
| 173EA: Elandco----- | 0-40 | Silt loam | CL, CL-ML, ML | A-4, A-6 | 0 | 0 | 100 | 100 | 95-100 | 85-95 | 20-40 | 4-20 |
| | 40-60 | Silt loam | CL, CL-ML, ML | A-4, A-6, A-7-6 | 0 | 0 | 100 | 100 | 95-100 | 65-95 | 20-45 | 4-25 |
| 173LA: Lesho----- | 0-10 | Loam | CL | A-4, A-6 | 0 | 0 | 100 | 100 | 85-100 | 60-85 | 25-40 | 7-20 |
| | 10-27 | Loam | CL | A-4, A-6, A-7-6 | 0 | 0 | 100 | 100 | 85-100 | 65-95 | 25-45 | 7-22 |
| | 27-60 | Fine sand | SM, SP-SM | A-1, A-2, A-3, A-4 | 0 | 0 | 100 | 95-100 | 30-85 | 5-45 | --- | NP |
| 173PB: Plevna----- | 0-9 | Fine sandy loam | SC-SM, SM | A-2, A-4 | 0 | 0 | 100 | 95-100 | 70-100 | 20-50 | 15-26 | NP-6 |
| | 9-35 | Sandy loam | SC-SM, SM | A-2, A-4 | 0 | 0 | 100 | 95-100 | 70-100 | 30-50 | 15-26 | NP-6 |
| | 35-60 | Fine sand | SM, SP | A-2, A-3 | 0 | 0 | 100 | 90-100 | 50-90 | 4-35 | --- | NP |
| 173RA: Renfrow----- | 0-9 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 33-49 | 12-26 |
| | 9-13 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 37-49 | 15-26 |
| | 13-60 | Silty clay | CH, CL | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-99 | 37-70 | 15-38 |
| 1439: Crisfield----- | 0-12 | Sandy loam | SC, SM | A-6, A-2-6, A-4 | 0 | 0 | 95-100 | 95-100 | 65-75 | 30-45 | 10-20 | NP-12 |
| | 12-24 | Sandy loam | SC, SM | A-6, A-2-6, A-4 | 0 | 0 | 100 | 95-100 | 70-75 | 30-60 | 10-20 | NP-12 |
| | 24-80 | Coarse sand | SP-SM | A-3, A-1-b, A-2-4 | 0 | 0 | 95-100 | 90-100 | 45-55 | 5-40 | 0-5 | NP-2 |
| AED: Arents, Earthen Dam----- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ba: Bethany----- | 0-14 | Silt loam | CL, CL-ML, ML | A-4, A-6 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 21-37 | 2-13 |
| | 14-18 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 33-50 | 15-26 |
| | 18-80 | Clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 100 | 96-100 | 90-99 | 37-60 | 15-33 | |
| Bb: Bethany----- | 0-14 | Silt loam | CL, CL-ML, ML | A-4, A-6 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 21-37 | 2-13 |
| | 14-18 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 33-50 | 15-26 |
| | 18-80 | Clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 100 | 96-100 | 90-99 | 37-60 | 15-33 | |
| BOA: Borrow Areas--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Br: Brewer----- | 0-12 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 100 | 98-100 | 90-98 | 37-45 | 15-22 |
| | 12-50 | Silty clay | CH, CL | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-99 | 37-70 | 16-38 |
| | 50-80 | Silty clay loam | CH, CL | A-4, A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 30-70 | 8-38 |
| Bs: Brewer----- | 0-12 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 100 | 98-100 | 90-98 | 37-45 | 15-22 |
| | 12-50 | Silty clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-99 | 37-70 | 16-38 |
| | 50-80 | Silty clay loam | CH, CL, MH | A-4, A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 30-70 | 8-38 |
| Drummond----- | 0-8 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 37-50 | 15-26 |
| | 8-30 | Silty clay loam | CH, CL, MH | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 35-60 | 15-35 |
| | 30-60 | Variable | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Ca: Canadian----- | 0-15 | Sandy loam | CL-ML, ML, SC-SM, SM | A-4 | 0 | 0 | 100 | 98-100 | 94-100 | 36-65 | 15-26 | NP-7 |
| | 15-40 | Fine sandy loam | CL, ML, SC, SM | A-4 | 0 | 0 | 100 | 98-100 | 94-100 | 36-85 | 15-31 | NP-10 |
| | 40-60 | Loamy fine sand | CL, ML, SC, SM | A-2, A-4 | 0 | 0 | 100 | 98-100 | 90-100 | 15-85 | 15-31 | NP-10 |
| CAA: Canadian----- | 0-28 | Fine sandy loam | CL-ML, ML, SC-SM, SM | A-4 | 0 | 0 | 100 | 98-100 | 94-100 | 36-65 | 15-26 | NP-7 |
| | 28-36 | Fine sandy loam | CL, ML, SC, SM, CL-ML | A-4 | 0 | 0 | 100 | 98-100 | 94-100 | 36-85 | 15-31 | NP-10 |
| | 36-60 | Fine sandy loam | CL, ML, SC, SM, CL-ML | A-2, A-4 | 0 | 0 | 100 | 98-100 | 90-100 | 15-85 | 15-31 | NP-10 |

ENGINEERING INDEX PROPERTIES--Continued
Sumner County, Kansas

(Absence of an entry indicates that the data were not estimated.)

| Map symbol and soil name | Depth | USDA texture | Classification | | Fragments | | Percentage passing sieve number-- | | | | Liquid limit | Plas- ticity index |
|-----------------------------|-------|----------------------|-------------------------|------------------------|---------------|----------------|--------------------------------------|--------|--------|--------|-----------------|--------------------------|
| | | | Unified | AASHTO | >10 inches | 3-10 inches | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | Pct | | | | | Pct | |
| Cc: Carwile----- | 0-10 | Fine sandy loam | CL-ML, ML, SC-SM, SM | A-2, A-4 | 0 | 0 | 100 | 98-100 | 90-100 | 36-60 | 15-26 | NP-7 |
| | 10-15 | Sandy clay loam | CL, SC | A-6, A-7 | 0 | 0 | 100 | 100 | 90-100 | 36-90 | 35-50 | 14-26 |
| | 15-35 | Clay | CH, CL, SC, MH | A-6, A-7 | 0 | 0 | 100 | 100 | 90-100 | 40-95 | 35-70 | 14-38 |
| | 35-60 | Sandy clay loam | CH, CL, SC, MH | A-4, A-6, A-7 | 0 | 0 | 100 | 100 | 90-100 | 36-95 | 25-70 | 7-38 |
| Cr: Corbin----- | 0-12 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | 0 | 100 | 100 | 90-100 | 75-100 | 25-35 | 5-15 |
| | 12-31 | Silty clay loam | CL, ML | A-6, A-7 | 0 | 0 | 100 | 100 | 95-100 | 85-100 | 35-45 | 10-20 |
| | 31-60 | Silty clay | CH, CL | A-7-6 | 0 | 0 | 100 | 100 | 95-100 | 90-100 | 45-60 | 25-35 |
| | 60-70 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 100 | 95-100 | 85-100 | 35-45 | 12-20 |
| Da: Dale----- | 0-21 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | 0 | 95-100 | 95-100 | 90-100 | 65-98 | 25-35 | 5-15 |
| | 21-60 | Silt loam | CL | A-4, A-6, A-7 | 0 | 0 | 95-100 | 95-100 | 90-100 | 65-98 | 30-43 | 8-20 |
| Dr: Dale----- | 0-21 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | 0 | 95-100 | 95-100 | 90-100 | 65-98 | 25-35 | 5-15 |
| | 21-60 | Silt loam | CL | A-4, A-6, A-7 | 0 | 0 | 95-100 | 95-100 | 90-100 | 65-98 | 30-43 | 8-20 |
| Reinach----- | 0-80 | Silt loam | CL, CL-ML, ML | A-4 | 0 | 0 | 100 | 100 | 94-100 | 51-97 | 15-31 | NP-10 |
| Ea: Elandco----- | 0-40 | Silty clay loam | CL | A-4, A-6, A- 7-6 | 0 | 0 | 100 | 100 | 95-100 | 85-95 | 25-45 | 8-25 |
| | 40-62 | Silty clay loam | CL, CL-ML, ML | A-4, A-6, A- 7-6 | 0 | 0 | 100 | 100 | 95-100 | 65-95 | 20-45 | 4-25 |
| Ec: Elandco----- | 0-40 | Silt loam | CL, CL-ML, ML | A-4, A-6 | 0 | 0 | 100 | 100 | 95-100 | 85-95 | 20-40 | 4-20 |
| | 40-62 | Silty clay loam | CL, CL-ML, ML | A-4, A-6, A- 7-6 | 0 | 0 | 100 | 100 | 95-100 | 65-95 | 20-45 | 4-25 |
| Fa: Farnum----- | 0-16 | Loam | CL, CL-ML | A-4, A-6 | 0 | 0 | 100 | 100 | 90-100 | 60-85 | 20-35 | 5-15 |
| | 16-22 | Loam | CL | A-6 | 0 | 0 | 100 | 100 | 85-100 | 60-80 | 30-40 | 10-15 |
| | 22-44 | Clay loam | CL, SC | A-6, A-7-6 | 0 | 0 | 100 | 100 | 70-100 | 45-80 | 35-50 | 15-30 |
| | 44-76 | Clay loam | CL, CL-ML, SC, SC-SM | A-2, A-4, A-6 | 0 | 0 | 100 | 95-100 | 65-100 | 30-80 | 20-35 | 5-15 |
| Fb: Farnum----- | 0-16 | Loam | CL, CL-ML | A-4, A-6 | 0 | 0 | 100 | 100 | 90-100 | 60-85 | 20-35 | 5-15 |
| | 16-22 | Loam | CL | A-6 | 0 | 0 | 100 | 100 | 85-100 | 60-80 | 30-40 | 10-15 |
| | 22-44 | Clay loam | CL, SC | A-6, A-7-6 | 0 | 0 | 100 | 100 | 70-100 | 45-80 | 35-50 | 15-30 |
| | 44-76 | Clay loam | CL, CL-ML, SC, SC-SM | A-2, A-4, A-6 | 0 | 0 | 100 | 95-100 | 65-100 | 30-80 | 20-35 | 5-15 |
| Fc: Farnum----- | 0-16 | Loam | CL, CL-ML | A-4, A-6 | 0 | 0 | 100 | 100 | 90-100 | 60-85 | 20-35 | 5-15 |
| | 16-22 | Loam | CL | A-6 | 0 | 0 | 100 | 100 | 85-100 | 60-80 | 30-40 | 10-15 |
| | 22-44 | Clay loam | CL, SC | A-6, A-7-6 | 0 | 0 | 100 | 100 | 70-100 | 45-80 | 35-50 | 15-30 |
| | 44-76 | Clay loam | CL, CL-ML, SC, SC-SM | A-2, A-4, A-6 | 0 | 0 | 100 | 95-100 | 65-100 | 30-80 | 20-35 | 5-15 |
| Fd: Farnum----- | 0-16 | Loam | CL, CL-ML | A-4, A-6 | 0 | 0 | 100 | 100 | 90-100 | 60-85 | 20-35 | 5-15 |
| | 16-22 | Loam | CL | A-6 | 0 | 0 | 100 | 100 | 85-100 | 60-80 | 30-40 | 10-15 |
| | 22-44 | Clay loam | SC, CL | A-6, A-7-6 | 0 | 0 | 100 | 100 | 70-100 | 45-80 | 35-50 | 15-30 |
| | 44-76 | Clay loam | CL, CL-ML, SC, SC-SM | A-2, A-4, A-6 | 0 | 0 | 100 | 95-100 | 65-100 | 30-80 | 20-35 | 5-15 |
| GRP: Gravel Pits---- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| INT: Aguolls----- | 0-60 | Variable | | | --- | --- | --- | --- | --- | --- | --- | --- |
| IRR: Irwin----- | 0-13 | Silty clay loam | CL | A-6, A-7-6 | 0 | 0 | 100 | 95-100 | 90-100 | 80-95 | 35-45 | 15-20 |
| | 13-40 | Silty clay | CH | A-7-6 | 0 | 0 | 100 | 95-100 | 95-100 | 85-95 | 50-60 | 25-30 |
| | 40-60 | Silty clay | CH, CL, MH | A-7-6 | 0 | 0 | 100 | 100 | 95-100 | 80-95 | 40-60 | 20-30 |
| Ka: Kirkland----- | 0-10 | Silt loam | CL, CL-ML, ML | A-4 | 0 | 0 | 100 | 100 | 96-100 | 80-97 | 22-30 | 2-10 |
| | 10-42 | Clay | CH, CL, MH | A-7 | 0 | 0 | 100 | 100 | 96-100 | 88-99 | 41-65 | 18-38 |
| | 42-72 | Clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 76-99 | 37-65 | 15-38 |
| | 72-80 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Kb: Kirkland----- | 0-10 | Silt loam | CL, CL-ML, ML | A-4 | 0 | 0 | 100 | 100 | 96-100 | 80-97 | 22-30 | 2-10 |
| | 10-42 | Clay | CH, CL, MH | A-7 | 0 | 0 | 100 | 100 | 96-100 | 88-99 | 41-65 | 18-38 |
| | 42-72 | Clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 76-99 | 37-65 | 15-38 |
| | 72-80 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Kc: Kirkland----- | 0-10 | Silty clay loam | CL | A-4, A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 30-43 | 8-18 |
| | 10-42 | Clay | CH, CL, MH | A-7 | 0 | 0 | 100 | 100 | 96-100 | 88-99 | 41-65 | 18-38 |
| | 42-72 | Clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 76-99 | 37-65 | 15-38 |
| | 72-80 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Lo: Lesho----- | 0-18 | Clay loam | CL | A-6, A-7-6 | 0 | 0 | 100 | 100 | 95-100 | 65-85 | 35-45 | 15-22 |
| | 18-32 | Clay loam | CL | A-4, A-6, A- 7-6 | 0 | 0 | 100 | 100 | 85-100 | 65-95 | 25-45 | 7-22 |
| | 32-60 | Fine sand | SM, SP-SM | A-1, A-2, A- 3, A-4 | 0 | 0 | 100 | 95-100 | 30-85 | 5-45 | --- | NP |

ENGINEERING INDEX PROPERTIES--Continued
Sumner County, Kansas

(Absence of an entry indicates that the data were not estimated.)

| Map symbol and soil name | Depth | USDA texture | Classification | | Fragments | | Percentage passing sieve number-- | | | | Liquid limit | Plas- ticity index |
|-------------------------------------|------------------------|--|---|----------------------------------|-------------------|-------------------|--------------------------------------|----------------------------|----------------------------|-------------------------|-------------------------|--------------------------|
| | | | Unified | AASHTO | >10 inches | 3-10 inches | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | Pct | | | | | Pct | |
| Ls: Lincoln----- | 0-11 11-60 | Loamy fine sand Stratified fine sand to clay loam | SM SM, SP-SM | A-2 A-2, A-3 | 0 0 | 0 0 | 100 100 | 98-100 98-100 | 90-100 82-100 | 15-35 5-35 | --- --- | NP NP |
| M-W: Miscellaneous Water----- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ma: Milan----- | 0-10 10-70 | Loam Clay loam | CL, CL-ML CH, CL, MH, SC | A-4, A-6 A-6, A-7-6 | 0 0 | 0 0 | 95-100 95-100 | 95-100 95-100 | 95-100 65-100 | 65-85 45-80 | 20-35 35-55 | 5-15 11-25 |
| Mb: Milan----- | 0-10 10-70 | Loam Clay loam | CL, CL-ML CH, CL, MH, SC | A-4, A-6 A-6, A-7-6 | 0 0 | 0 0 | 95-100 95-100 | 95-100 95-100 | 95-100 65-100 | 65-85 45-80 | 20-35 35-55 | 5-15 11-25 |
| Mc: Milan----- | 0-10 10-70 | Loam Clay loam | CL, CL-ML CH, CL, MH, SC | A-4, A-6 A-6, A-7-6 | 0 0 | 0 0 | 95-100 95-100 | 95-100 95-100 | 95-100 65-100 | 65-85 45-80 | 20-35 35-55 | 5-15 11-25 |
| Md: Milan----- | 0-10 10-70 | Loam Clay loam | CL, CL-ML CH, CL, MH, SC | A-4, A-6 A-6, A-7-6 | 0 0 | 0 0 | 95-100 95-100 | 95-100 95-100 | 95-100 65-100 | 65-85 45-80 | 20-35 35-55 | 5-15 11-25 |
| On: Wellsford----- | 0-5 5-17 17-21 | Clay loam Clay Weathered bedrock | CL CH, CL, MH | A-6, A-7-6 A-7-6 | --- --- --- | 0-5 0-5 --- | 95-100 95-100 --- | 95-100 95-100 --- | 90-100 85-100 --- | 75-95 75-95 --- | 35-50 45-70 --- | 15-30 20-40 --- |
| Oo: Wellsford----- | 0-5 5-17 17-21 | Clay loam Clay Weathered bedrock | CL CH, CL, MH | A-6, A-7-6 A-7-6 | --- --- --- | 0-5 0-5 --- | 95-100 95-100 --- | 95-100 95-100 --- | 90-100 85-100 --- | 75-95 75-95 --- | 35-50 45-70 --- | 15-30 20-40 --- |
| Op: Wellsford----- | 0-5 5-17 17-21 | Clay loam Clay Weathered bedrock | CL CH, CL, MH | A-6, A-7-6 A-7-6 | --- --- --- | 0-5 0-5 --- | 95-100 95-100 --- | 95-100 95-100 --- | 90-100 85-100 --- | 75-95 75-95 --- | 35-50 45-70 --- | 15-30 20-40 --- |
| Elandco----- | 0-40 40-62 | Silt loam Silty clay loam | CL, CL-ML, ML CL, CL-ML, ML | A-4, A-6 A-4, A-6, A-7-6 | 0 0 | 0 0 | 100 100 | 100 100 | 95-100 95-100 | 85-95 65-95 | 20-40 20-45 | 4-20 4-25 |
| Or: Wellsford----- | 0-5 5-17 17-21 | Clay loam Clay Weathered bedrock | CL CH, CL, MH | A-6, A-7-6 A-7-6 | --- --- --- | 0-5 0-5 --- | 95-100 95-100 --- | 95-100 95-100 --- | 90-100 85-100 --- | 75-95 75-95 --- | 35-50 45-70 --- | 15-30 20-40 --- |
| Renfrow----- | 0-9 9-13 13-75 | Clay loam Silty clay loam Clay | CL CL, MH CH, CL | A-6, A-7 A-6, A-7 A-6, A-7 | 0 0 0 | 0 0 0 | 100 100 100 | 100 100 100 | 96-100 96-100 96-100 | 80-98 80-98 80-99 | 33-49 37-49 37-70 | 12-26 15-26 15-38 |
| Os: Wellsford----- | 0-5 5-17 17-21 | Clay loam Clay Weathered bedrock | CL CH, CL, MH | A-6, A-7-6 A-7-6 | --- --- --- | 0-5 0-5 --- | 95-100 95-100 --- | 95-100 95-100 --- | 90-100 85-100 --- | 75-95 75-95 --- | 35-50 45-70 --- | 15-30 20-40 --- |
| Shale Outcrop-- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pa: Pond Creek----- | 0-12 12-68 | Silt loam Clay loam | CL, CL-ML, ML CL | A-4, A-6 A-4, A-6, A-7 | 0 0 | 0 0 | 100 100 | 100 100 | 96-100 96-100 | 65-97 65-98 | 22-37 30-43 | 3-14 8-20 |
| Pb: Pond Creek----- | 0-12 12-68 | Silt loam Clay loam | CL, CL-ML, ML CL | A-4, A-6 A-4, A-6, A-7 | 0 0 | 0 0 | 100 100 | 100 100 | 96-100 96-100 | 65-97 65-98 | 22-37 30-43 | 3-14 8-20 |
| Pc: Pond Creek----- | 0-12 12-68 | Silt loam Clay loam | CL, CL-ML, ML CL | A-4, A-6 A-4, A-6, A-7 | 0 0 | 0 0 | 100 100 | 100 100 | 96-100 96-100 | 65-97 65-98 | 22-37 30-43 | 3-14 8-20 |
| Pd: Pond Creek----- | 0-12 12-68 | Silty clay loam Silty clay loam | CL CL | A-6 A-4, A-6, A-7 | 0 0 | 0 0 | 100 100 | 100 100 | 96-100 96-100 | 85-98 65-98 | 30-40 30-43 | 11-20 8-20 |
| Px: Pratt----- | 0-12 12-40 40-60 | Loamy fine sand Loamy fine sand Fine sand | SM SC-SM, SM SM, SP-SM | A-2 A-2, A-4 A-2, A-3 | 0 0 0 | 0 0 0 | 100 100 100 | 95-100 95-100 95-100 | 70-100 90-100 80-100 | 15-35 15-40 5-35 | --- 15-20 --- | NP NP-6 NP |
| Ra: Renfrow----- | 0-9 9-13 13-75 | Clay loam Silty clay loam Silty clay loam | CL CL CH, CL, MH | A-6, A-7 A-6, A-7 A-6, A-7 | 0 0 0 | 0 0 0 | 100 100 100 | 100 100 100 | 96-100 96-100 96-100 | 80-98 80-98 80-99 | 33-49 37-49 37-70 | 12-26 15-26 15-38 |
| Grainola----- | 0-8 8-28 28-36 | Silt loam Silty clay Clay | CH CH, CL, MH CH, CL, GC, SC, MH | A-4, A-6 A-7 A-2, A-7 | --- --- 0 | 0-15 0-15 0 | 90-100 90-100 25-95 | 85-95 70-100 20-90 | 80-90 70-95 20-90 | 51-80 60-90 15-90 | 30-37 41-70 41-70 | 8-14 20-40 20-40 |
| | 36-42 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Ro: Rosehill----- | 0-9 9-36 36-40 | Clay loam Clay Unweathered bedrock | CH | A-7 | 0 0 --- | 0 0 --- | 100 100 --- | 100 100 --- | 90-100 90-100 --- | 70-80 75-95 --- | 50-55 55-75 --- | 30-35 35-50 --- |

ENGINEERING INDEX PROPERTIES--Continued
Sumner County, Kansas

(Absence of an entry indicates that the data were not estimated.)

| Map symbol and soil name | Depth | USDA texture | Classification | | Fragments | | Percentage passing sieve number-- | | | | Liquid limit | Plas- ticity index |
|----------------------------------|--|---|---|---|-----------------------|-----------------------|--------------------------------------|------------------------------------|--|---|---|---------------------------------------|
| | | | Unified | AASHTO | >10 inches | 3-10 inches | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | Pct | | | | | Pct | |
| Rs: Rosehill----- | 0-9 9-36 36-40 | Clay loam Clay Unweathered bedrock | CH | A-7 | 0 0 --- | 0 0 --- | 100 100 --- | 100 100 --- | 90-100 90-100 --- | 70-80 75-95 --- | 50-55 55-75 --- | 30-35 35-50 --- |
| Rx: Rosehill----- | 0-9 9-36 36-40 | Clay loam Clay Unweathered bedrock | CH | A-7 | 0 0 --- | 0 0 --- | 100 100 --- | 100 100 --- | 90-100 90-100 --- | 70-80 75-95 --- | 50-55 55-75 --- | 30-35 35-50 --- |
| Sa: Shellabarger--- | 0-13 13-38 38-60 | Sandy loam Sandy clay loam Coarse sandy loam | ML, SM SC SC, SC-SM, SM, SP-SM | A-2, A-4 A-4, A-6 A-2, A-4 | 0 0 0 | 0 0 0 | 95-100 95-100 80-100 | 95-100 85-100 70-100 | 75-100 70-90 50-80 | 30-55 35-50 10-40 | 15-30 25-40 15-30 | NP-5 8-20 NP-10 |
| Sb: Shellabarger--- | 0-13 13-38 38-60 | Sandy loam Sandy clay loam Coarse sandy loam | ML, SM SC SC, SC-SM, SM, SP-SM | A-2, A-4 A-4, A-6 A-2, A-4 | 0 0 0 | 0 0 0 | 95-100 95-100 80-100 | 95-100 85-100 70-100 | 75-100 70-90 50-80 | 30-55 35-50 10-40 | 15-30 25-40 15-30 | NP-5 8-20 NP-10 |
| Sc: Shellabarger--- | 0-13 13-38 38-60 | Sandy loam Sandy clay loam Coarse sandy loam | ML, SM SC SC, SC-SM, SM, SP-SM | A-2, A-4 A-4, A-6 A-2, A-4 | 0 0 0 | 0 0 0 | 95-100 95-100 80-100 | 95-100 85-100 70-100 | 75-100 70-90 50-80 | 30-55 35-50 10-40 | 15-30 25-40 15-30 | NP-5 8-20 NP-10 |
| Ta: Tabler----- | 0-10 10-30 30-60 | Silty clay loam Silty clay Silty clay | CL CH, CL, MH CH, CL, MH | A-7, A-6 A-7 A-6, A-7 | 0 0 0 | 0 0 0 | 100 100 96-100 | 100 100 96-100 | 96-100 90-99 92-100 | 80-98 90-99 80-99 | 32-43 41-65 38-60 | 11-20 18-35 15-35 |
| Tv: Tivoli----- | 0-7 7-60 | Fine sand Fine sand | SM, SP-SM SM, SP-SM | A-2, A-3 A-2, A-3 | 0 0 | 0 0 | 100 100 | 95-100 95-100 | 80-100 80-100 | 5-25 5-25 | --- --- | NP NP |
| Us: Ustifluvents--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Va: Vanoss----- | 0-11 11-15 15-37 37-50 50-95 | Silt loam Silt loam Clay loam Clay loam Clay loam | CL, CL-ML, ML CL CL CL CL, ML, SC, SM, CL-ML | A-4, A-6 A-4, A-6, A-7 A-6, A-7 A-4, A-6, A-7 A-4, A-6, A-7 | 0 0 0 0 0 | 0 0 0 0 0 | 100 100 100 100 100 | 100 100 100 100 98-100 | 96-100 96-100 96-100 96-100 94-100 | 65-95 65-98 80-98 65-98 36-95 | 22-37 30-43 33-43 30-43 20-43 | 2-14 8-20 12-20 8-20 2-20 |
| Vb: Vanoss----- | 0-11 11-15 15-37 37-50 50-95 | Silt loam Silt loam Clay loam Clay loam Clay loam | CL, CL-ML, ML CL CL CL CL, ML, SC, SM, CL-ML | A-4, A-6 A-4, A-6, A-7 A-6, A-7 A-4, A-6, A-7 A-4, A-6, A-7 | 0 0 0 0 0 | 0 0 0 0 0 | 100 100 100 100 100 | 100 100 100 100 98-100 | 96-100 96-100 96-100 96-100 94-100 | 65-95 65-98 80-98 65-98 36-95 | 22-37 30-43 33-43 30-43 20-43 | 2-14 8-20 12-20 8-20 2-20 |
| Vc: Vanoss----- | 0-11 11-15 15-37 37-50 50-95 | Silt loam Silt loam Clay loam Clay loam Clay loam | CL, CL-ML, ML CL CL CL CL, ML, SC, SM, CL-ML | A-4, A-6 A-4, A-6, A-7 A-6, A-7 A-4, A-6, A-7 A-4, A-6, A-7 | 0 0 0 0 0 | 0 0 0 0 0 | 100 100 100 100 100 | 100 100 100 100 98-100 | 96-100 96-100 96-100 96-100 94-100 | 65-95 65-98 80-98 65-98 36-95 | 22-37 30-43 33-43 30-43 20-43 | 2-14 8-20 12-20 8-20 2-20 |
| W: Water (< 40 Acres)----- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Wa: Waurika----- | 0-12 12-32 32-57 57-72 | Silt loam Clay Clay Clay loam | CL CH, CL, MH CH, CL CL | A-4, A-6 A-7 A-6, A-7 A-6, A-7 | 0 0 0 0 | 0 0 0 0 | 100 95-100 90-100 90-100 | 100 95-100 90-100 90-100 | 96-100 90-100 80-98 80-100 | 80-95 80-98 80-98 70-98 | 30-37 41-66 38-55 33-43 | 9-14 20-40 16-30 12-20 |

