

ENGINEERING INDEX PROPERTIES
Elk 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
Elk 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 | | | | | | |
| | In | | | | Pct | Pct | | | | | Pct | |
| 015CS: Clime----- | 0-9 9-33 33-37 | Silty clay Silty clay Unweathered bedrock | CH CH, CL | A-7-6 A-7 | 0 0 --- | 0-5 0 --- | 90-100 95-100 --- | 90-100 95-100 --- | 85-100 95-100 --- | 80-95 85-95 --- | 50-60 45-65 --- | 25-35 20-40 --- |
| Sogn----- | 0-7 7-11 | Silty clay loam Unweathered bedrock | CH, CL, MH, ML | A-6, A-7 | 0 --- | 0-10 --- | 85-100 --- | 85-100 --- | 85-100 --- | 70-100 --- | 25-55 --- | 10-25 --- |
| 015LA: Labette----- | 0-13 13-38 38-42 | Silty clay loam Silty clay Unweathered bedrock | CL CH, CL, GC, SC | A-6, A-7 A-7-6 | 0 0 --- | 0 0-20 --- | 85-100 55-80 --- | 85-100 50-75 --- | 75-100 50-75 --- | 68-95 45-70 --- | 35-50 45-60 --- | 15-25 20-35 --- |
| 015LD: Labette----- | 0-13 13-38 38-42 | Silty clay loam Silty clay Unweathered bedrock | CL CH, CL, GC, SC | A-6, A-7 A-7-6 | 0 0 --- | 0 0-20 --- | 85-100 55-80 --- | 85-100 50-75 --- | 75-100 50-75 --- | 68-95 45-70 --- | 35-50 45-60 --- | 15-25 20-35 --- |
| Dwight----- | 0-5 5-33 33-37 | Silt loam Silty clay Unweathered bedrock | CL, CL-ML, ML CH | A-4, A-6 A-7 | 0 0 --- | 0 0 --- | 100 100 --- | 100 100 --- | 95-100 95-100 --- | 85-100 90-100 --- | 25-40 50-70 --- | 5-15 25-40 --- |
| 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 |
| 035FA: Florence----- | 0-14 14-17 17-45 45-49 | Gravelly silt loam Very gravelly silty clay loam Extremely cobbly clay Unweathered bedrock | CL, GC, SC GC, SC | A-2-7, A-7, A-7-6 A-2-7, A-7 | 0 0 0 --- | 0-10 10-20 10-40 --- | 30-90 30-70 30-90 --- | 20-75 20-50 20-75 --- | 20-75 20-50 20-75 --- | 20-70 15-40 15-70 --- | 40-50 50-70 65-75 --- | 20-30 30-45 40-50 --- |
| 035SD: Sogn----- | 0-10 10-14 | Silty clay loam Unweathered bedrock | CH, CL, MH, ML | A-6, A-7 | 0 --- | 0-10 --- | 85-100 --- | 85-100 --- | 85-100 --- | 70-100 --- | 25-55 --- | 10-25 --- |
| 073CA: Chase----- | 0-14 14-45 45-60 | Silty clay loam Silty clay Silty clay loam | CL CH, 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 | 95-100 95-100 95-100 | 90-100 90-100 90-100 | 43-51 51-71 43-66 | 22-29 29-45 22-41 |
| 073EB: Eram----- | 0-10 10-33 33-37 | Silty clay loam Silty clay Weathered bedrock | CL CH, CL, MH | A-6, A-7 A-6, A-7 | 0 0 --- | 0 0 --- | 85-100 95-100 --- | 85-100 95-100 --- | 85-100 90-100 --- | 70-95 80-98 --- | 36-43 43-61 --- | 15-21 21-35 --- |
| 073RE: Reading----- | 0-15 15-41 41-60 | Silt loam Silty clay loam Silty clay | CL CL CL | A-6 A-6, A-7 A-6, A-7 | 0 0 0 | 0 0 0 | 100 100 100 | 100 100 100 | 90-100 95-100 95-100 | 80-90 85-95 80-95 | 30-35 35-45 40-50 | 10-15 15-20 20-30 |
| 125BF: Bates----- | 0-15 15-27 27-31 31-35 | Loam Clay loam Gravelly clay loam Unweathered bedrock | CL, CL-ML, ML SM, CL, ML, SC SC, SC-SM, SM | A-4, A-6 A-4, A-6, A-7 A-2, A-4, A-6 | 0 0 --- | 0 0 0-15 | 90-100 85-100 70-90 | 85-100 85-100 70-90 | 80-100 80-100 50-80 | 55-90 45-85 20-40 | 20-40 25-45 20-35 | 3-15 8-20 8-15 |
| Collinsville--- | 0-11 11-17 17-21 | Fine sandy loam Fine sandy loam Unweathered bedrock | CL-ML, ML, SC-SM, SM CL, ML, SC, SM, SC-SM, CL-ML | A-4, A-2 A-2, A-4 | --- | 0-15 0-45 --- | 85-100 55-100 --- | 85-100 55-100 --- | 75-95 50-95 --- | 30-60 20-85 --- | 15-26 15-30 --- | NP-7 NP-10 --- |
| 125ET: Eram----- | 0-11 11-32 32-36 | Silty clay loam Silty clay Weathered bedrock | CL CH, CL, MH | A-6, A-7 A-6, A-7 | 0 0 --- | 0 0 --- | 85-100 95-100 --- | 85-100 95-100 --- | 85-100 90-100 --- | 70-95 80-98 --- | 33-48 37-65 --- | 12-25 15-35 --- |
| Talihina----- | 0-17 17-21 | Silty clay loam Weathered bedrock | CL | A-6, A-7 | --- | 0-15 --- | 87-100 --- | 87-100 --- | 85-100 --- | 70-98 --- | 37-50 --- | 15-26 --- |
| 125OS: Osage----- | 0-17 17-60 | Silty clay Clay | CH CH, CL | A-7 A-7 | 0 0 | 0 0 | 100 100 | 100 100 | 100 100 | 95-100 95-100 | 50-75 40-80 | 30-55 20-50 |

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| 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 | |
| 205BA: Bates----- | 0-16 | Loam | CL, CL-ML, ML | A-4, A-6 | 0 | 0 | 90-100 | 85-100 | 80-100 | 55-90 | 20-40 | 3-15 |
| | 16-23 | Clay loam | CL, ML, SC, SM | A-4, A-6, A-7 | 0 | 0 | 85-100 | 85-100 | 80-100 | 45-85 | 25-45 | 8-20 |
| | 23-33 | Gravelly clay loam | SC, SC-SM | A-2, A-4, A-6 | 0 | 0-15 | 70-90 | 70-90 | 50-80 | 20-40 | 20-35 | 8-15 |
| | 33-37 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| 205EB: Eram----- | 0-9 | Silt loam | CL | A-4, A-6 | 0 | 0 | 85-100 | 85-100 | 85-100 | 70-95 | 30-37 | 8-14 |
| | 9-32 | Silty clay | CH, CL | A-6, A-7 | 0 | 0 | 95-100 | 95-100 | 90-100 | 80-98 | 37-65 | 15-35 |
| | 32-36 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| 205ND: Niotaze----- | 0-9 | Cobbly fine sandy loam | GC-GM, GM, SC-SM, SM | A-1, A-2-4, A-4 | --- | 25-50 | 50-75 | 50-75 | 35-60 | 15-45 | 15-26 | NP-7 |
| | 9-36 | Silty clay | CH, CL | A-6, A-7-6 | 0 | 0 | 95-100 | 95-100 | 90-100 | 90-100 | 35-65 | 15-40 |
| Darnell----- | 36-40 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| | 0-6 | Fine sandy loam | CL, ML, SC, SM | A-2, A-4 | 0 | 0-15 | 90-100 | 90-100 | 85-100 | 30-60 | 15-30 | NP-10 |
| | 6-17 | Fine sandy loam | CL, ML, SC, SM | A-2, A-4 | 0 | 0-10 | 70-100 | 70-100 | 60-100 | 25-60 | 15-30 | NP-10 |
| | 17-21 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| 205PE: Prue----- | 0-11 | Loam | CL, CL-ML, ML | A-4 | 0 | 0 | 100 | 100 | 96-100 | 65-85 | 22-31 | 3-10 |
| | 11-17 | Clay loam | CL, SC | A-4, A-6 | 0 | 0 | 100 | 100 | 90-100 | 36-85 | 25-35 | 7-15 |
| | 17-38 | Clay loam | CL, SC | A-4, A-6 | 0 | 0 | 95-100 | 95-100 | 90-100 | 36-85 | 25-35 | 7-15 |
| | 38-60 | Silty clay | CH, CL | A-6, A-7 | 0 | 0 | 70-100 | 70-100 | 65-100 | 65-99 | 35-60 | 15-35 |
| 205SC: Shidler----- | 0-10 | Silty clay loam | CH, CL | A-6, A-7 | --- | 0-25 | 75-100 | 75-100 | 70-100 | 65-98 | 33-55 | 12-27 |
| | 10-14 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Catoosa----- | 0-10 | Silt loam | CL | A-4, A-6 | 0 | 0 | 100 | 100 | 96-100 | 65-97 | 30-37 | 8-14 |
| | 10-30 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 85-100 | 85-100 | 85-100 | 70-98 | 33-48 | 12-22 |
| | 30-34 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| 205SF: Steedman----- | 0-8 | Stony silt loam | CL, GC, SC | A-6 | 1-5 | 0-15 | 60-95 | 50-90 | 45-90 | 35-80 | 30-35 | 10-15 |
| | 8-32 | Silty clay | CH | A-7 | 0 | 0 | 95-100 | 95-100 | 90-100 | 80-95 | 55-70 | 33-45 |
| | 32-36 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| 205SM: Stephenville--- | 0-17 | Fine sandy loam | CL, ML, SC, SM | A-4 | 0 | 0-15 | 85-100 | 85-100 | 80-100 | 36-60 | 15-30 | NP-10 |
| | 17-27 | Sandy clay loam | CL, SC | A-4, A-6 | 0 | 0 | 100 | 98-100 | 90-100 | 36-65 | 20-37 | 7-16 |
| | 27-31 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Darnell----- | 0-6 | Fine sandy loam | CL, ML, SC, SM, CL-ML | A-2, A-4 | 0 | 0-15 | 90-100 | 90-100 | 85-100 | 30-60 | 15-30 | NP-10 |
| | 6-17 | Fine sandy loam | CL, ML, SC, SM, CL-ML | A-2, A-4 | 0 | 0-10 | 70-100 | 70-100 | 60-100 | 25-60 | 15-30 | NP-10 |
| | 17-21 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| 205WO: Woodson----- | 0-8 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | 0 | 100 | 100 | 90-100 | 85-100 | 25-40 | 5-20 |
| | 8-28 | Silty clay | CH | A-7-6 | 0 | 0 | 100 | 95-100 | 95-100 | 90-100 | 50-65 | 30-45 |
| | 28-60 | Silty clay | CH, CL | A-7-6 | 0 | 0 | 100 | 95-100 | 95-100 | 90-100 | 45-65 | 20-40 |
| AED: Arents, Earthen Dam----- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ba: Bates----- | 0-10 | Fine sandy loam | ML, SM | A-4 | 0 | 0 | 90-100 | 85-100 | 80-100 | 40-55 | 15-30 | NP-5 |
| | 10-14 | Loam | CL, ML, SC, SM | A-4, A-6, A-7 | 0 | 0 | 85-100 | 85-100 | 80-100 | 45-85 | 25-45 | 3-20 |
| | 14-32 | Clay loam | SC, SC-SM | A-2, A-4, A-6 | 0 | 0-15 | 70-90 | 70-90 | 50-80 | 20-40 | 20-35 | 5-15 |
| Bb: Bates----- | 32-36 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| | 0-10 | Loam | CL, CL-ML, ML | A-4, A-6 | 0 | 0 | 90-100 | 85-100 | 80-100 | 55-90 | 20-40 | 3-15 |
| | 10-14 | Clay loam | CL, ML, SC, SM | A-4, A-6, A-7 | 0 | 0 | 85-100 | 85-100 | 80-100 | 45-85 | 25-45 | 3-20 |
| | 14-30 | Gravelly clay loam | SC, SC-SM | A-2, A-4, A-6 | 0 | 0-15 | 70-90 | 70-90 | 50-80 | 20-40 | 20-35 | 5-15 |
| Bf: Benfield----- | 30-34 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| | 0-10 | Gravelly silt loam | CL, GC, SC | A-6, A-7 | 0 | 0-15 | 60-90 | 55-75 | 50-75 | 40-70 | 30-45 | 10-20 |
| | 10-30 | Silty clay loam | CH, CL, MH | A-7-6 | 0 | 0-15 | 60-100 | 55-100 | 50-100 | 50-95 | 45-60 | 20-30 |
| | 30-36 | Gravelly silty clay loam | CH, CL, MH | A-7-6 | 0 | 0-5 | 60-100 | 55-100 | 50-100 | 50-95 | 45-60 | 20-30 |
| | 36-40 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |

ENGINEERING INDEX PROPERTIES--Continued
Elk 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 | |
| Cd: Catoosa----- | In | | | | | | | | | | | |
| | 0-10 | Silt loam | CL | A-4, A-6 | 0 | 0 | 100 | 100 | 96-100 | 65-97 | 30-37 | 8-14 |
| | 10-34 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 85-100 | 85-100 | 85-100 | 70-98 | 33-48 | 12-22 |
| | 34-38 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Cf: Catoosa----- | 0-9 | Silt loam | CL | A-4, A-6 | 0 | 0 | 100 | 100 | 96-100 | 65-97 | 30-37 | 8-14 |
| | 9-26 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 85-100 | 85-100 | 85-100 | 70-98 | 33-48 | 12-22 |
| | 26-30 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Sogn----- | 0-8 | Silty clay loam | CH, CL, MH, ML | A-6, A-7 | 0 | 0-10 | 85-100 | 85-100 | 85-100 | 70-100 | 25-55 | 10-25 |
| | 8-12 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Ck: Clime----- | 0-2 | Stony silty clay loam | CL | A-7-6 | 1-5 | 1-5 | 85-100 | 80-100 | 75-100 | 70-95 | 40-50 | 20-25 |
| | 2-10 | Silty clay loam | CH, CL | A-7-6 | 0 | 0-3 | 95-100 | 95-100 | 95-100 | 85-95 | 40-60 | 20-35 |
| | 10-27 | Silty clay | CH, CL | A-7 | 0 | 0 | 95-100 | 95-100 | 95-100 | 85-95 | 45-65 | 20-40 |
| | 27-33 | Silty clay | CH, CL | A-7 | 0 | 0 | 95-100 | 95-100 | 95-100 | 85-95 | 45-60 | 20-30 |
| | 33-37 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Cm: Clime----- | 0-10 | Silty clay | CH | A-7-6 | 0 | 0-5 | 90-100 | 90-100 | 85-100 | 80-95 | 50-60 | 25-35 |
| | 10-24 | Silty clay | CH, CL, MH | A-7 | 0 | 0 | 95-100 | 95-100 | 95-100 | 85-95 | 45-65 | 20-40 |
| | 24-31 | Silty clay | CH, CL, MH | A-7 | 0 | 0 | 95-100 | 95-100 | 95-100 | 85-95 | 45-60 | 20-30 |
| | 31-35 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Cs: Clime----- | 0-10 | Silty clay | CH | A-7-6 | 0 | 0-5 | 90-100 | 90-100 | 85-100 | 80-95 | 50-60 | 25-35 |
| | 10-24 | Silty clay | CH, CL | A-7 | 0 | 0 | 95-100 | 95-100 | 95-100 | 85-95 | 45-65 | 20-40 |
| | 24-31 | Silty clay | CH, CL | A-7 | 0 | 0 | 95-100 | 95-100 | 95-100 | 85-95 | 45-60 | 20-30 |
| | 31-35 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Sogn----- | 0-8 | Silty clay loam | CH, CL, MH, ML | A-6, A-7 | 0 | 0-10 | 85-100 | 85-100 | 85-100 | 70-100 | 25-55 | 10-25 |
| | 8-12 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Cv: Collinsville--- | 0-8 | Fine sandy loam | CL-ML, ML, SC-SM, SM | A-2, A-4 | --- | 0-15 | 85-100 | 85-100 | 75-95 | 30-60 | 15-26 | NP-7 |
| | 8-14 | Fine sandy loam | CL, ML, SC, SM | A-2, A-4 | --- | 0-45 | 55-100 | 55-100 | 50-95 | 20-85 | 15-30 | NP-10 |
| | 14-18 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Bates----- | 0-8 | Fine sandy loam | ML, SM | A-4 | 0 | 0 | 90-100 | 85-100 | 80-100 | 40-55 | 15-30 | NP-5 |
| | 8-14 | Clay loam | CL, ML, SC, SM | A-4, A-6, A-7 | 0 | 0 | 85-100 | 85-100 | 80-100 | 45-85 | 25-45 | 3-20 |
| | 14-28 | Gravelly clay loam | SC, SC-SM | A-2, A-4, A-6 | 0 | 0-15 | 70-90 | 70-90 | 50-80 | 20-40 | 20-35 | 5-15 |
| | 28-32 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| De: Dennis----- | 0-12 | Silt loam | ML, CL, CL-ML | A-4, A-6 | 0 | 0 | 100 | 100 | 96-100 | 65-97 | 20-37 | 1-15 |
| | 12-20 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 98-100 | 98-100 | 94-100 | 75-98 | 33-48 | 13-25 |
| | 20-60 | Silty clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 98-100 | 98-100 | 94-100 | 75-98 | 37-65 | 15-35 |
| Df: Dennis----- | 0-13 | Silt loam | CL, CL-ML, ML | A-4, A-6 | 0 | 0 | 100 | 100 | 96-100 | 65-97 | 20-37 | 1-15 |
| | 13-20 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 98-100 | 98-100 | 94-100 | 75-98 | 33-48 | 13-25 |
| | 20-60 | Silty clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 98-100 | 98-100 | 94-100 | 75-98 | 37-65 | 15-35 |
| Dg: Dennis, eroded- | 0-7 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 98-100 | 94-100 | 75-98 | 33-48 | 13-25 |
| | 7-13 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 98-100 | 98-100 | 94-100 | 75-98 | 33-48 | 13-25 |
| | 13-60 | Silty clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 98-100 | 98-100 | 94-100 | 75-98 | 37-65 | 15-35 |
| Dw: Dwight----- | 0-4 | Silt loam | CL, CL-ML, ML | A-4, A-6 | 0 | 0 | 100 | 100 | 95-100 | 85-100 | 25-40 | 5-15 |
| | 4-27 | Silty clay | CH | A-7 | 0 | 0 | 100 | 100 | 95-100 | 90-100 | 50-70 | 25-40 |
| | 27-42 | Silty clay | CH, CL | A-7 | 0 | 0 | 100 | 100 | 95-100 | 90-100 | 45-60 | 25-40 |
| | 42-46 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Em: Eram----- | 0-10 | Silt loam | CL | A-4, A-6 | 0 | 0 | 85-100 | 85-100 | 85-100 | 70-95 | 30-37 | 8-14 |
| | 10-33 | Silty clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 95-100 | 95-100 | 90-100 | 80-98 | 37-65 | 15-35 |
| | 33-37 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| En: Eram----- | 0-10 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 85-100 | 85-100 | 85-100 | 70-95 | 36-43 | 15-21 |
| | 10-33 | Silty clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 95-100 | 95-100 | 90-100 | 80-98 | 43-61 | 21-35 |
| | 33-37 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Eo: Eram, eroded--- | 0-6 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 85-100 | 85-100 | 85-100 | 70-95 | 33-48 | 12-25 |
| | 6-31 | Silty clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 95-100 | 95-100 | 90-100 | 80-98 | 37-65 | 15-35 |
| | 31-35 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |

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| 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 | |
| Es: Eram----- | 0-10 10-30 30-34 | Silt loam Silty clay Weathered bedrock | CL CH, CL, MH | A-4, A-6 A-6, A-7 | 0 0 --- | 0 0 --- | 85-100 95-100 --- | 85-100 95-100 --- | 85-100 90-100 --- | 70-95 80-98 --- | 30-37 37-65 --- | 8-14 15-35 --- |
| Dwight----- | 0-4 4-41 41-45 | Silt loam Silty clay Unweathered bedrock | CL, CL-ML, ML CH | A-4, A-6 A-7 | 0 0 --- | 0 0 --- | 100 100 --- | 100 100 --- | 95-100 95-100 --- | 85-100 90-100 --- | 25-40 50-70 --- | 5-15 25-40 --- |
| Fe: Fiat----- | 0-11 11-30 30-34 | Silty clay loam Silty clay Unweathered bedrock | CL CH, CL, MH | A-6, A-7 A-7 | 0 0 --- | 0 0 --- | 100 95-100 --- | 100 95-100 --- | 95-100 95-100 --- | 75-100 75-100 --- | 35-50 41-70 --- | 15-25 20-40 --- |
| Fm: Florence----- | 0-6 6-12 12-32 32-49 49-53 | Gravelly silt loam Gravelly silt loam Extremely gravelly silty clay Extremely cobbley clay Unweathered bedrock | CL, GC, SC CL, GC, SC GC, SC CH, GC, SC | A-2-7, A-7, A-7-6 A-2-7, A-7, A-7-6 A-2-7, A-7 A-2-7, A-7 | 0 0 0 0 --- | 0-10 5-20 10-20 10-40 --- | 30-90 30-75 30-70 30-90 --- | 20-75 20-70 20-50 20-75 --- | 20-75 15-70 20-50 20-75 --- | 20-70 15-65 15-40 15-70 --- | 40-50 40-50 50-70 65-75 --- | 20-30 20-30 30-45 40-50 --- |
| Martin----- | 0-9 9-60 | Silty clay loam Silty clay | CL, CH, MH CH, CL, MH | A-7 A-7 | 0 0 | 0 0 | 100 100 | 100 100 | 95-100 95-100 | 80-100 80-100 | 43-56 51-71 | 22-33 29-45 |
| Iv: Ivan----- | 0-33 33-60 | Silt loam Silt loam | CL 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 | 70-100 65-100 | 25-40 25-45 | 7-20 7-25 |
| Iw: Ivan----- | 0-33 33-60 | Silt loam Silt loam | CL 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 | 70-100 65-100 | 25-40 25-45 | 7-20 7-25 |
| Kd: Kenoma----- | 0-8 8-50 50-60 | Silt loam Silty clay Silty clay loam | CL, CL-ML, ML CH CH, CL | A-4, A-6 A-7 A-7 | 0 0 0 | 0 0 0 | 85-100 85-100 85-100 | 85-100 85-100 85-100 | 85-100 85-100 75-100 | 85-100 85-100 75-95 | 25-40 50-75 45-65 | 3-18 30-48 25-44 |
| La: Labette----- | 0-9 9-30 30-34 | Silty clay loam Silty clay Unweathered bedrock | CL CH, CL, GC, SC, MH | A-6, A-7 A-7-6 | 0 0 --- | 0 0-20 --- | 85-100 55-80 --- | 85-100 50-75 --- | 75-100 50-75 --- | 68-95 45-70 --- | 35-50 45-60 --- | 15-25 20-35 --- |
| Ld: Labette----- | 0-9 9-30 30-34 | Silty clay loam Silty clay loam Unweathered bedrock | CL CH, CL, GC, SC, MH | A-6, A-7 A-7-6 | 0 0 --- | 0 0-20 --- | 85-100 55-80 --- | 85-100 50-75 --- | 75-100 50-75 --- | 68-95 45-70 --- | 35-50 45-60 --- | 15-25 20-35 --- |
| Dwight----- | 0-4 4-27 27-42 42-46 | Silt loam Silty clay Silty clay Unweathered bedrock | CL, CL-ML, ML CH CH, CL | A-4, A-6 A-7 A-7 | 0 0 0 --- | 0 0 0 --- | 100 100 100 --- | 100 100 100 --- | 95-100 95-100 95-100 --- | 85-100 90-100 90-100 --- | 25-40 50-70 45-60 --- | 5-15 25-40 25-40 --- |
| Lg: Labette----- | 0-9 9-26 26-30 | Silty clay loam Silty clay Unweathered bedrock | CL CH, CL, GC, SC, MH | A-6, A-7 A-7-6 | 0 0 --- | 0 0-20 --- | 85-100 55-80 --- | 85-100 50-75 --- | 75-100 50-75 --- | 68-95 45-70 --- | 35-50 45-60 --- | 15-25 20-35 --- |
| Sogn----- | 0-8 8-12 | Silty clay loam Unweathered bedrock | CH, CL, MH, ML | A-6, A-7 | 0 --- | 0-10 --- | 85-100 --- | 85-100 --- | 85-100 --- | 70-100 --- | 25-55 --- | 10-25 --- |
| Ln: Lanton----- | 0-7 7-36 36-60 | Silty clay loam Silty clay loam Silty clay | CL CL CL, CH | A-6, A-7 A-6, A-7 A-6, A-7 | 0 0 0 | 0 0 0 | 100 100 100 | 100 100 100 | 98-100 98-100 98-100 | 90-97 90-98 90-98 | 33-42 33-42 33-55 | 12-19 12-19 12-30 |
| M-W: Miscellaneous Water----- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mb: Martin----- | 0-12 12-18 18-54 54-58 | Silty clay loam Silty clay loam Silty clay Unweathered bedrock | CL CL CH, CL | A-6, A-7 A-6, A-7 A-7 | 0 0 0 --- | 0 0 0 --- | 100 100 100 --- | 100 100 100 --- | 95-100 95-100 95-100 --- | 80-100 80-100 80-100 --- | 43-56 43-56 56-71 --- | 22-33 22-33 33-45 --- |
| Mc: Martin----- | 0-9 9-60 | Silty clay loam Silty clay | CL CH, CL | A-6, A-7 A-7 | 0 0 | 0 0 | 100 100 | 100 100 | 95-100 95-100 | 80-100 80-100 | 35-45 40-70 | 15-25 25-40 |
| Me: Martin, eroded- | 0-7 7-60 | Silty clay Silty clay | CH, CL CH, CL | A-7 A-7 | 0 0 | 0 0 | 100 100 | 100 100 | 95-100 95-100 | 80-100 80-100 | 40-70 40-70 | 25-40 25-40 |
| Mn: Mason----- | 0-14 14-60 | Silt loam Silty clay loam | CL, ML CL | A-4, A-6 A-4, A-6, A-7 | 0 0 | 0 0 | 100 98-100 | 100 98-100 | 96-100 96-100 | 65-98 65-98 | 30-37 30-43 | 8-13 9-20 |

ENGINEERING INDEX PROPERTIES--Continued
Elk 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 | |
| Nc: Newtonia----- | 0-12 | Silt loam | CL | A-4, A-6 | 0 | 0 | 100 | 100 | 96-100 | 65-97 | 30-37 | 9-14 |
| | 12-18 | Silty clay loam | CL | A-4, A-6 | 0 | 0 | 100 | 100 | 96-100 | 80-98 | 30-40 | 9-16 |
| | 18-26 | Silty clay loam | CL | A-6, A-7 | 0 | 0 | 100 | 100 | 98-100 | 90-98 | 33-42 | 12-19 |
| | 26-60 | Silty clay | CH, CL, MH | A-6, A-7 | 0 | 0 | 100 | 100 | 96-100 | 90-98 | 37-60 | 15-34 |
| Nd: Niotaze----- | 0-7 | Cobbly fine sandy loam | GC-GM, GM, SC-SM, SM | A-1, A-2-4, A-4 | --- | 25-50 | 50-75 | 50-75 | 35-60 | 15-45 | 15-26 | NP-7 |
| | 7-30 | Silty clay | CH, CL, MH | A-6, A-7-6 | 0 | 0 | 95-100 | 95-100 | 90-100 | 90-100 | 35-65 | 15-40 |
| | 30-34 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Darnell----- | 0-4 | Fine sandy loam | CL, ML, SC, SM | A-2, A-4 | 0 | 0-15 | 90-100 | 90-100 | 85-100 | 30-60 | 15-30 | NP-10 |
| | 4-12 | Gravelly fine sandy loam | CL, ML, SC, SM | A-2, A-4 | 0 | 0-10 | 70-100 | 70-100 | 60-100 | 25-60 | 15-30 | NP-10 |
| | 12-16 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| NDD: Niotaze----- | 0-11 | Cobbly fine sandy loam | GC-GM, GM, SC-SM, SM | A-1, A-2-4, A-4 | --- | 25-50 | 50-75 | 50-75 | 35-60 | 15-45 | 15-26 | NP-7 |
| | 11-32 | Silty clay | CH, CL | A-6, A-7-6 | 0 | 0 | 95-100 | 95-100 | 90-100 | 90-100 | 35-65 | 15-40 |
| | 32-36 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | 0-14 | --- |
| Darnell----- | 0-6 | Fine sandy loam | CL, ML, SC, SM | A-2, A-4 | 0 | 0-15 | 90-100 | 90-100 | 85-100 | 30-60 | 15-30 | NP-10 |
| | 6-16 | Fine sandy loam | CL, ML, SC, SM | A-2, A-4 | 0 | 0-10 | 70-100 | 70-100 | 60-100 | 25-60 | 15-30 | NP-10 |
| | 16-20 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Os: Osage----- | 0-11 | Silty clay loam | CL | A-7 | 0 | 0 | 100 | 100 | 100 | 95-100 | 40-50 | 20-30 |
| | 11-60 | Silty clay | CH, CL | A-7 | 0 | 0 | 100 | 100 | 100 | 95-100 | 40-80 | 20-50 |
| Po: Pits, Quarries- Pr: | 0-60 | Variable | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Prue----- | 0-11 | Fine sandy loam | SC-SM, SM | A-4 | 0 | 0 | 100 | 98-100 | 90-100 | 36-50 | 15-26 | NP-7 |
| | 11-48 | Clay loam | CL, SC | A-4, A-6 | 0 | 0 | 100 | 100 | 90-100 | 36-85 | 25-35 | 7-15 |
| | 48-60 | Silty clay loam | CH, CL, MH | A-6, A-7 | 0 | 0 | 70-100 | 70-100 | 65-100 | 65-99 | 35-60 | 15-35 |
| Sh: Sogn----- | 0-8 | Silty clay loam | CH, CL, MH, ML | A-6, A-7 | 0 | 0-10 | 85-100 | 85-100 | 85-100 | 70-100 | 25-55 | 10-25 |
| | 8-12 | Unweathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| St: Steedman----- | 0-7 | Stony loam | CL, GC, SC | A-2, A-6 | 1-5 | 0-15 | 60-95 | 50-90 | 40-90 | 30-70 | 30-35 | 10-15 |
| | 7-36 | Silty clay | CH | A-7 | 0 | 0 | 95-100 | 95-100 | 90-100 | 80-95 | 55-70 | 33-45 |
| | 36-40 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Sv: Stephenville--- | 0-11 | Fine sandy loam | CL, ML, SC, SM | A-4 | 0 | 0-15 | 85-100 | 85-100 | 80-100 | 36-60 | 15-30 | NP-10 |
| | 11-32 | Sandy clay loam | CL, SC | A-4, A-6 | 0 | 0 | 100 | 98-100 | 90-100 | 36-65 | 20-37 | 7-16 |
| | 32-36 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Sw: Stephenville--- | 0-11 | Fine sandy loam | CL, ML, SC, SM | A-4 | 0 | 0-15 | 85-100 | 85-100 | 80-100 | 36-60 | 15-30 | NP-10 |
| | 11-32 | Sandy clay loam | CL, SC | A-4, A-6 | 0 | 0 | 100 | 98-100 | 90-100 | 36-65 | 20-37 | 7-16 |
| | 32-36 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Darnell----- | 0-4 | Fine sandy loam | CL, ML, SC, SM | A-2, A-4 | 0 | 0-15 | 90-100 | 90-100 | 85-100 | 30-60 | 15-30 | NP-10 |
| | 4-12 | Gravelly fine sandy loam | CL, ML, SC, SM | A-2, A-4 | 0 | 0-10 | 70-100 | 70-100 | 60-100 | 25-60 | 15-30 | NP-10 |
| | 12-16 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| SXX: Stephenville--- | 0-17 | Fine sandy loam | CL, ML, SC, SM, CL-ML, SC-SM | A-4 | 0 | 0-15 | 85-100 | 85-100 | 80-100 | 36-60 | 15-30 | NP-10 |
| | 17-30 | Sandy clay loam | CL, SC | A-4, A-6 | 0 | 0 | 100 | 98-100 | 90-100 | 36-65 | 20-37 | 7-16 |
| | 30-34 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Darnell----- | 0-6 | Fine sandy loam | CL, ML, SC, SM, SC-SM, CL-ML | A-2, A-4 | 0 | 0-15 | 90-100 | 90-100 | 85-100 | 30-60 | 15-30 | NP-10 |
| | 6-16 | Fine sandy loam | CL, ML, SC, SM, SC-SM, CL-ML | A-2, A-4 | 0 | 0-10 | 70-100 | 70-100 | 60-100 | 25-60 | 15-30 | NP-10 |
| | 16-20 | Weathered bedrock | | | --- | --- | --- | --- | --- | --- | --- | --- |
| Vd: Verdigris----- | 0-27 | Silt loam | CL, CL-ML, ML | A-4, A-6 | 0 | 0 | 100 | 100 | 95-100 | 65-100 | 22-35 | 2-13 |
| | 27-60 | Silt loam | CL | A-4, A-6, A-7 | 0 | 0 | 100 | 100 | 95-100 | 80-100 | 30-45 | 8-23 |
| Vf: Verdigris----- | 0-27 | Silt loam | CL, CL-ML, ML | A-4, A-6 | 0 | 0 | 100 | 100 | 95-100 | 65-100 | 22-35 | 2-13 |
| | 27-60 | Silt loam | CL | A-4, A-6, A-7 | 0 | 0 | 100 | 100 | 95-100 | 80-100 | 30-45 | 8-23 |

ENGINEERING INDEX PROPERTIES--Continued
Elk 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 | |
| W: Water----- | In | | | | | | | | | | | |
| Wo: Woodson----- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 0-8 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | 0 | 100 | 100 | 90-100 | 85-100 | 25-40 | 5-20 |
| | 8-29 | Silty clay | CH | A-7-6 | 0 | 0 | 100 | 95-100 | 95-100 | 90-100 | 50-65 | 30-45 |
| | 29-75 | Silty clay | CH, CL | A-7-6 | 0 | 0 | 100 | 95-100 | 95-100 | 90-100 | 45-65 | 20-40 |

