KANSAS GEOLOGICAL SURVEY
OPEN-FILE REPORT 49-3

ROCKS FOR CONSTRUCTION MATERIALS IN CHAUTAUQUA COUNTY, KANSAS

by

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September 17, 1949

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This is a brief report on outcropping rocks in Chautauqua County, Kansas with reference to their suitability for construction materials.

The consolidated exposed rocks in Chautauqua County dip gently to the west or slightly north of west away from the Ozark uplift. Erosion has cut across this slightly inclined rock section and has uncovered successively older and lower rock layers along any line extending from west to east. Rocks exposed in the eastern part are several hundred feet below the land surface in the western part of the county, and the layers that are at the surface in the western part have been removed from the eastern part.

The exposed rocks in Chautauqua County are chiefly shale, sandstone, and limestone. In the central and western part limestone ledges, because they are more resistant to erosion than are the shale formations that lie between them, form more or less abrupt escarpments. Some of the escarpments, however, are grass covered slopes with the underlying rock concealed or revealed only by the presence of a band of loose limestone blocks. In some of the escarpments two or more limestone ledges are present. In the eastern part of the county massive sandstone beds have been dissected and the Chautauqua Hills are the result.

Fig. 1 is a sketch map of Chautauqua County showing the positions of lines of outcrops of some of the rock layers.

Permian rocks. — About 240 feet of lower Permian rocks are exposed in western Chautauqua County. These comprise rocks higher than the Brownville limestone. The Grenola limestone and a few feet of overlying shale are present in sec. 3, T. 32 S., R. 8 E., in the extreme northwest corner of the county. The Americus limestone and Brownville limestone outcrop lines are shown in Fig. 1 east and south of that of the Grenola formation. In sec. 15, T. 34 S., R. 8 E., an erosional channel occupied by sandstone known as the

Indian Cave cuts out the Brownville limestone and other upper Pennsylvanian rocks. The Indian Cave sandstone is the lowermost Permian rocks.

The Grenola limestone, and the Americus limestone and beds just above it comprise several feet of rock that can be used for concrete and road metal.

Pennsylvanian rocks. — About 500 feet of Pennsylvanian rocks are exposed in Chautauqua County. The lower approximately 250 feet is principally sandstone; the upper part chiefly shale and limestone. The shale greatly predominates and generally is sandy. The more conspicious limestones are mapped on Fig. 1.

The character of rocks above the Wakarusa limestone and below the Dover limestone (which is mapped on Fig. 1) is shown by the following section measured in sec. 6, T. 32 S., R. 9 E.

	Feet
Dover limestone	
Limestone, light blue gray, weathers creamy to yellow, massive, fossiliferous	1.5
Langdon shale	
Shale, bluish gray, clayey	13.0
Limestone, light bluish gray, flaggy, fossil clams	0.5
Shale, (covered when section was studied)	4.0
Maple Hill (?) limestone	
Limestone, bluish, dense, massive fossiliferous	2.0
Wamego-Willard shale	
Shale, yellow and dark gray, yellow sandy beds in mid-part	3.0
Coal	0.4
Shale, gray and yellow, limestone plates and concretions	8.0
Elmont limestone	
Limestone, dark blue, dense, even layers, vertical joints	2.0
Harveyville shale	
Shale, yellow gray, thin coal bed in mid-part, sandy in upper part	3.0

Reading limestone	
Limestone, light gray, weathers creamy white, fossil algae in upper part	1.5
Shale, yellow	0.5
Limestone, light blue gray, weathers cream yellow, one massive bed, fossils	1.0
Auburn shale	
Shale, blue-gray sand yellow,	1.5 - 2.0
Limestone, light blue gray, flaggy	0.2
Shale, blue gray	1.0
Shale, sandy and micaceous	4.0
Sandstone	2.0
Shale, blue gray, and siltstones	13.0
Limestone	1.0
Shale, blue-gray	16.0

It is presumed that these rocks are of limited interest as quarry rocks.

The line of outcrop of the Burlingame limestone shown on the map may be of some significance inasmuch as the Burlingame and the Wakarusa limestone, which occurs a few feet higher, locally are thick enough to be regarded as ledges suited for small quarry operations. Higher limestones in Pennsylvanian rocks in Chautauqua County are thin. A more or less representative section of strata including the Burlingame and Wakarusa formations, measured in sec. 12, T. 34 S., R. 8 E. is:

	Feet
Wakarusa limestone	
Limestone, light gray and brown, massive to slabby	1.2
Shale, yellowish brown	4.5
Limestone, light gray and brown, interbedded shale beds	5.4
Shale, gray	2.3
Limestone, gray, interbedded with shale, platy, fossiliferous	1.2
Soldier Creek shale	
Shale, gray to brown, clayey	6.0

Burlingame limestone	
Limestone, bluish gray, earthy	2.4
Shale, gray, clayey	1.0
Limestone, brown, impure, sandy	1.2
Shale, gray, fossiliferous	0.0 - 0.7
Limestone, yellow and brown, fine grained, massive, single bed, fossils	1.9
Silver Dale shale	
Shale, light bluish gray, with coal streak	0.8
Shale, yellow and brown, sandy and micaceous	25.0
Rulo limestone	
Limestone, bluish, impure	0.8
Cedar Vale shale	
Shale, gray to yellow, with 0.1' coal 1 foot from top, and 0.7' sandstone 10 feet below top	30.0
Happy Hollow limestone	
Limestone, blue, dense, hard, earthy	0.5
Shale, gray	5.0
Limestone, yellowish brown, massive, fossils	3.0
White Cloud shale	
Shale, bluish, clayey, reddish along joints, dark and fossiliferous near base	13.3
Limestone, dark bluish gray, granular, weathers into large blocks, fossils	1.9
Shale, light bluish gray, to creek level	3.7

Limestones between the Burlingame (above) and the Deer Creek are relatively thin. The Howard limestone, however, may be of some interest. This formation and adjacent beds may be seen in a highway cut about one mile west of Waunata. The section there, sec. 11, T. 34 S., R. 9 E., is:

White Cloud shale	
Shale	exposed 24.0
Howard limestone	
Church limestone member	
Limestone, dark blue with darker blotches, weathers rusty brown, fine gravel, hard, tough, two beds	3.2

Aarde shale member	
Shale, brownish yellow, clayey, abundant fossils	1.1
Shale, black, fissile, with limestone "niggerheads"	1.3
Limestone, dark blue, weathers brownish	1.2
Shale, dark bluish, clayey, plant fossils	0.5
Shale, bluish, contains carbonaceous matter and coal	0.3
Shale, light gray (underclay)	1.0
Shale, light gray, laminated	0.9
Bachelor Creek limestone member	
Limestone, light gray, upper part weathers reddish	1.2
Shale, light gray, sandy	1.0
Sandstone, light gray to yellowish	7.0
Severy shale	
Shale, lower part covered	58.0

(The top of the Topeka limestone is approximately 25 feet lower)

The above is a more or less representative section of the Howard limestone and adjacent beds. The Howard limestone's outcrop line is shown in Fig. 1.

The Topeka limestone formation comprises thin limestones and shales and hence is of little value as a source of constructional material, although some of the limestone units locally attain a thickness of a few feet. Its line of outcrop is shown on Fig. 1 in T. 32 only.

The next limestone formation below the Topeka limestone is the Deer Creek limestone.

The Ervine Creek member of the Deer Creek limestone and the Plattsmouth member of the Oread formation are the thickest limestone ledges that crop out in Chautauqua County and are the best sources of limestone for general uses. Both rocks are relatively pure limestone and occur in rather thin easily-quarried beds.

The Ervine Creek limestone is being quarried a short distance east of Moline, in Elk County. Probably this ledge no where in Chautauqua County is quite as thick as it is in the Moline quarry but it offers interesting possibilities The line of outcrop of the Deer Creek formation, of which the Ervine Creek limestone is the thickest limestone member, is shown in Fig. 1.

An outcrop studied in sec. 12, T. 34 S., R. 10 E., is described as follows:

Deer Creek limestone	Feet
Ervine Creek limestone member	
Limestone, light gray, thin irregular beds, (top may be eroded, not showing entire thickness	25.0
Larsh-Burroak shale member	
Shale, light gray, weathers brownish	2.7
Shale, black, hard, fissile	1.6
Rock Bluff limestone member	
Limestone, dark blue, hard, vertical joints, one bed	2.0
Oskaloosa shale member	
Shale, bluish	17.0
Ozawkie limestone member	
Limestone, dark gray, crystalline	0.7
Tecumseh shale	

The line of outcrop of the Lecompton limestone also is shown on Fig. 1. It is the next limestone below the Deer Creek formation and the outcrops of the two formations are commonly close together. A section measured in sec. 2, T. 35 S., R. 9 E. is as follows:

Lecompton limestone	Feet
Aarde (?) limestone member	
Limestone, dark blue	1.0
Shale, bluish gray	1.5
Limestone, conglomeratic	1.5 ±
King Hill shale member	
Shale, gray	2.0 ±
Beil limestone member	
Limestone, light blue gray, thin irregular beds	7.7

The Beil limestone resembles the Ervine Creek limestone, but is a thinner ledge.

The line of outcrop of the Plattsmouth limestone in Chautauqua County is shown in Fig. 1. In the figure the line of outcrop in the southernmost part of the county is dashed because maps available to me are less definite there. Throughout its outcrop area in the county the Plattsmouth limestone is about 18 to 20 feet thick. There is a small amount of chert in the upper part of the ledge. Unquestionably it is a satisfactory source of stone for crushing for all ordinary uses. It was quarried in Wilson County for use in building the Fall River Dam and was reported to be satisfactory for concrete aggregate.

For several years the Plattsmouth limestone has been quarried in Sec. 33, T. 33 S., R. 11 E., a short distance west of Sedan. An exposure in a road cut along Highway 11 southeast of the quarry is as follows:

	Feet
Oread limestone formation	
Plattsmouth limestone member	
Limestone, light gray, thin irregular beds, abundant fossils near top	18.0
Heebner shale member	
Shale, gray and yellow in upper part, black and fissile below	4.2
Leavenworth limestone member	
Limestone, dark blue, dense, vertical joints, single bed	1.7
Snyderville shale member	
Shale, yellow and streaks of red	33.0
Toronto limestone member	
Limestone, grading into sandstone	1.7
Lawrence shale formation	

A section of the same rocks measured in sec. 23, T. 33 S., R. 11 E., two miles north of Sedan is:

Oread limestone formation		
Plattsmouth limestone member	(13.7 feet exposed)	
Limestone, mottled, dense and coarsely crystalline		6.4
Limestone, bluish gray, dense, hard		7.3
Heebner shale member	(6.0 feet)	

Shale, gray, fossiliferous	1.5
Shale, olive drab, weathers light tan	1.8
Shale, dark gray to black, fissile	2.7
Leavenworth limestone member	
Limestone, blue, weathers buff, dense, hard, single bed	1.6
Snyderville shale member (49.5 feet)	
Shale, yellow, limy	0.5
Shale, yellow, blocky	5.3
Shale, maroon, weathers light reddish tan, clayey and blocky	43.7
Toronto limestone member	
Limestone, blue gray, silty, nodular	2.1
Lawrence shale formation	

The sections above are representative of the Oread formation in Chautauqua County. In all probability many suitable quarry sites in the Plattsmouth limestone can be selected along its line of outcrop in the county. There is a well exposed section of the Plattsmouth limestone along the highway about 1½ miles west of Elgin.

Rocks that occur below the Oread limestone crop out in the eastern part of Chautauqua County. These chiefly comprise two massive sandstones that have been dissected into sandstone, oak-covered hills. The upper one of the sandstones is the Ireland sandstone that occurs in the Lawrence shale, and the lower is the Tonganoxie sandstone that occurs in the Stranger. There are also some less massive sandstones, still lower in the Weston formation. These Weston sandstones are exposed in the southeast part of the county.

The degree of cementation of these sandstones varies from place to place. Very probably locally some of the beds are suitable for rip-rap or other material.

The Haskell limestone lies between the Ireland and the Tonganoxie sandstones, but locally it has been removed by erosion that took place after the deposition of the Tonganoxie and before the deposition of the Ireland beds.