Proceedings of the Iowa Academy of Science

Volume 65 | Annual Issue Article 38

1958

A Geologic Section in Hancock County, Iowa

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With the planning of the Federal Interstate Highway System and the stepped up program for improvement of State roads in Iowa, has come an ever increasing need for the development of new sources of road building materials.

Some areas of the State have abundant resources of good limestone and sands and gravels suitable for construction of highways, whereas other sections of the State are relatively poor in good material.

One of these previously poorer areas, through which one section of the proposed four lane interstate road passes, is dealt with in this paper.

If a line were drawn roughly between the towns of Fertile in Cerro Gordo County and Alden in Hardin County and thence southward to Randall in Hamilton County curving northward and ending at Rutland in Humboldt County it would mark out an area which until now has had no known exposure of bed rock and one in which the known sand and gravel deposits are of inferior quality.

This critical situation was somewhat alleviated in the summer of 1957 by the opening of a quarry of high quality stone by the Beu & Sons Construction Company. On the basis of two cores drilled in 1949 the quarry was opened in SE corner, Sec. 11, T.95N, R.24W, Hancock County. The rock exposed is a brown calcitic dolomite about 18 feet thick under 8-12 feet of overburden. The floor of the quarry lies on 2 feet of greenish-gray siltstone.

The face of the quarry was sampled by the block stone technique, and the full face of rock, minus the top 2-3 feet of weathered stone, came within specifications and was approved for coarse aggregate for Portland cement concrete.

Since this time numerous cores have been drilled in the area by the Beu & Sons Company to determine the extent of their deposit. An adjacent section, SW¼ Sec. 12, T. 95N, R. 24W, Hancock County, has also been extensively cored by Concrete Materials & Construction Company. Some of these cores extended 40 feet below the beds exposed in the quarry giving an interesting geological record as well as providing data for future road building materials.

The core data in this paper were obtained through the cooperation of the Concrete Materials & Construction Company, Cedar Rapids,

Iowa, and Beu & Sons Construction Company, Grundy Center, Iowa. Assistance in logging cores and pertinent information were received from the entire geological staff of the Iowa State Highway Commission.

A detailed generalized geologic section of the area is as follows; the correlation is tentative until more information can be obtained:

Note: The beds have been numbered according to the method used by the Iowa State Highway Commission, putting bed 1 at the top of the section so that as lower beds are exposed they can be described in the established numerical sequence.

Bed No.	Description	Thickness In Feet
00	Overburden: brown silty clay loam. Devonian system Shell Rock formation Mason City member	13-34
1	Dolomite, calcitic, somewhat brecciated, light brown with redish cast mottled with gray, brecciated appearing in hand specimen, very hard, medium grained to coarse, calcite masses and green clay partings common, slightly arenaceous, few crinoid and tetracoral remains; beds average 0.7 foot thick.	0 - 3.1
2	Dolomite, calcitic, light gray-brown, very hard, fine grained, calcite masses, few crinoid fragments and tetracoral molds; beds average 0.2 foot thick.	1.8- 3.5
3	Dolomite, calcitic, similar to bed No. 1 gray-brown mottling more apparent; beds become slightly thicker averaging 0.8 foot thick; bottom of unit very irregular with green clay on bedding plane.	9.7-11.0
4	Dolomite, calcitic, dark gray to black, very hard and dense, calcite masses, high pyrite content; grades into bed below without any abrupt change. This level is the present floor of the quarry.	0.6- 0.9
5	Siltstone and dolomite: ± 3.0 feet a. Siltstone, greenish-gray, argillaceous, slightly calcitic; grades into lower bed. b. Dolomite, calcitic, dark gray-brown mottled with black, very hard, fine grained; full of drusies, lenses of siltstone and mudstone run through rock, pyrite common. c. Dolomite, calcitic, light brownish-gray, hard, very fine grained, silty, pyrite common.	 1.6 0.8 0.5- 0.8
6	Dolomite, calcitic, brecciated, gray-brown mottled with various shades of gray, brown and white; recrystallized. zones of limestone and white calcite masses, lenses of gray-green finely fragmental dolomitic limestone, lenses of cream-colored lithographic limestone, light green siltstone and shale on bedding planes; sparsely distributed crinoid and tetracoral fragments; bedding is uneven with various thicknesses of beds up to 1.5 feet thick.	±18.0
7	Dolomite, calcitic, gray-brown mottled with gray and black, medium hard, argillaceous, pyrite common; numerous unidentified small finely liarate brachiopod casts.	2.7
8	Siltstone, gray-green with some brown and black color mottling, some lensatic brown calcitic zones; brachiopods of overlying bed continue.	2.7

9	Dolomite, very similar in appearance to bed No. 6, brachiopods of overlying beds continue; grades into a dark brown silicified stone becoming argillaceous at bottom.	4.9
10	Siltstone, gray-green, very similar in appearance to bed No. 8 becoming almost a mudstone at bottom; brachiopods of overlying beds continue.	9.5

The following physical and chemical tests of stone taken from the quarry and cores were determined by the Iowa State Highway Commission Laboratory:

Physical Properties

Bed No.	Percent Loss Freeze and Thaw "A"	Percent Loss Freeze and Thaw "C"	Percent Loss Los Angeles Abrasion
1	10.0		
2, 3	2.0-4.6		27-31
4	17.0		
5b, 5c	30.0		
6 (upper half)	2.7-13.0		28
6 (lower half)	3.3-14.0		23-24
7	28.0		
9	21.0	4.0	

Note: Freeze and thaw "A"—16 cycles freezing and thawing in a water-alcohol solution. Freeze and thaw "C"—25 cycles freezing and thawing in a water solution.

Bed No.	Specific Gravity	Absorption
2-4 (Crushed in production)	2.78 (Average)	0.55 (Average)

Note: Both specific gravity and absorption tests are performed with the sample saturated and surface dry.

Chemical Analysis

Bed No.	Loss	SiO_2	R_2O_3	CaO	MgO
2-4 (Crushed in production)	45.34	2.00	2.53	34.27	16.43
6 (upper half)	44.94	2.31	1.87	34.20	16.08
6 (lower half)	44.67	2.75	1.69	35.20	15.35
7	39.04	14.48	4.15	25.32	16.25
9	38.0	19.2	2.0	26.8	14.0

The correlation of these beds has been quite uncertain because of the lack of control from adjacent areas and the lack of any recognizable stratigraphic or faunal horizons or sequences. The nearest exposures are the quarries and clay pits at Mason City, 15 miles to the northeast, the beds there being correlated as the Lime Creek and Shell Rock formations. Lithologically the upper brown dolomite of Hancock County resembles the beds of the Mason City member of the Shell Rock formation. The physical tests of the two are also similar, making them both suitable for use as coarse aggregate in Portland cement concrete. However, the underlying brecciated beds in Hancock County have no known counterpart in the Mason City area. It is possible that they represent a recrystallized phase of the

lower Mason City member or possibly of upper Cedar Valley formation. The brachiopod fauna and the lithology which begins to appear in bed No. 7 of the geologic description would bear out the Cedar Valley relationship, although no definite correlation can be made.

Until lower beds in the quarry are made accessible for more detailed study and information can be obtained from adjacent areas, a more closely defined correlation will remain to be presented.

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