# OFFICE MEMORANDUM

DATE: July 29, 1981

TO: L. T. Oehler
Engineer of Research

FROM: R. W. Muethel

SUBJECT: Petrographic Analysis of Crushed Stone Coarse Aggregate: Michigan Foundation Pit No. 82-6 (Testing Laboratory Sample No. 81 A-462). Research Project 78 TI-510, Research Report No. R-1176

On April 10, 1981, a sample of crushed stone coarse aggregate was received by the Department's Testing Laboratory Section. Information accompanying the sample stated that the material was obtained from the Michigan Foundation Quarry Co. Pit No. 82-6, location NE of NW, Section 7, T4S, R11E, Wayne County. The material was submitted to the Laboratory to be tested for information. Petrographic analysis of a portion of the sample was requested by G. H. Gallup.

## Summary

| Rock Class | Condition of Particles | Percent of Sample |
|---|---|---|
| Sedimentary | Moderately hard, fresh, and porous to non-porous | 100.0 |

Approximately 92 percent, by weight, of the sample was found to be contained in carbonate rock categories having absorption values from 2.8 to 6.2.

Detailed tabulations of petrographic composition, specific gravity, and absorption are included in Tables 1 and 2.

## Detailed Petrography

Petrographic examination was conducted in general conformance with ASTM C295, "Petrographic Examination of Aggregates for Concrete." Representative portions—300 particles—of the noted sieve fractions of the sample were identified megascopically along with acid testing and a scratch test for hardness, and microscopically with a stereomicroscope. Specific gravity and absorption determinations were performed in

general accordance with ASTM C127, "Specific Gravity and Absorption of Coarse Aggregate." Determinations included all material of the rock types analyzed. The following sheets contain the rock type descriptions.

TESTING AND RESEARCH DIVISION

R. W. Muethel

Geologist - Materials Research Unit

RWM:bt

Attachments

cc: K. A. Allemeier
M. L. O'Toole
D. F. Malott
G. H. Gallup
J. W. Burge
M. G. Brown
R. H. Vogler

TABLE 1
PETROGRAPHIC COMPOSITION
Testing Laboratory Sample No. 81 A-462

| Rock Type | Sieve Fraction Analyzed | | | | Computed Sample Composition |
|---|---|---|---|---|---|
| | 1 to 3/4-in. | 3/4 to 1/2-in. | 1/2 to 3/8-in. | 3/8 to No. 4 | |
| Dense Limestone to Dolomite | 12.0 | 15.3 | 16.0 | 15.7 | 14.8 |
| Porous Limestone to Dolomite | 6.7 | 4.0 | 3.7 | 7.3 | 5.4 |
| Porous Gray Dolomite | 9.3 | 2.7 | 3.3 | 4.7 | 5.0 |
| Porous Brown Dolomite | 72.0 | 78.0 | 77.0 | 72.3 | 74.8 |
| Totals, percent | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

NOTE: Computed sample composition is based upon counts of 300 particles contained in each of the sieve fractions noted.

TABLE 2
SPECIFIC GRAVITY AND ABSORPTION DATA
Testing Laboratory Sample No. 81 A-462

| Rock Type | Specific Gravity | | | Absorption, percent | Composition, percent by weight |
|---|---|---|---|---|---|
| | Bulk, dry | Bulk, ssd | Apparent | | |
| Dense Limestone to Dolomite | 2.69 | 2.71 | 2.76 | 0.98 | 7.0 |
| Porous Limestone to Dolomite | 2.54 | 2.62 | 2.74 | 2.81 | 13.5 |
| Porous Gray Dolomite | 2.53 | 2.61 | 2.74 | 3.08 | 7.6 |
| Porous Brown Dolomite | 2.29 | 2.43 | 2.67 | 6.25 | 71.9 |
| Total Sample | 2.36 | 2.48 | 2.69 | 5.17 | 100.0 |

NOTE: Values are computed from determinations made on all sample material contained in the categories noted.

SEDIMENTARY ROCKS (Cont.)

| Rock Type | Gray Dolomite | Brown Dolomite |
|---|---|---|
| Color | gray to buff, and mottled gray and buff | light brown to buff; and laminated brown and dark brown to black |
| Texture | fine grained to microcrystalline, slightly vuggy | medium to very fine grained, slightly vuggy |
| Luster | dull | dull |
| Hardness | matrix, Mohs 3-1/2 to 4<br>quartz grains, Mohs 7 | matrix, Mohs 3-1/2 to 4<br>quartz grains, Mohs 7 |
| Porosity | finely porous | porous to finely porous |
| Particle Shape | angular | angular to subangular |
| Particle Surface | fresh, rough, dented to ridged or pitted | fresh, rough, dented to ridged or pitted |
| Remarks | A few particles contain scattered quartz grains. | Many particles are slightly to moderately arenaceous. Some particles are highly laminated with dark brown, thin shaley traces. A few particles contain dark brown stylolite structures. |

SEDIMENTARY ROCKS

| Rock Type | Dense Limestone to Dolomite | Porous Limestone to Dolomite |
|---|---|---|
| Color | light brown to gray, and mottled brown and gray | buff, gray, and mottled buff and gray |
| Texture | fine grained to microcrystalline | very fine grained to micro-crystalline |
| Luster | dull | dull |
| Hardness | matrix, Mohs 3 to 4<br>quartz grains, Mohs 7 | Mohs 3 to 4 |
| Porosity | dense to slightly porous | finely porous |
| Particle Shape | angular | angular |
| Particle Surface | fresh, rough to moderately smooth, and dented to ridged | fresh, rough to moderately smooth, and dented to ridged |
| Remarks | Particles in this category have similar color, texture, grain size, and porosity. Particles are variable from limestone to dolomite. A few particles contain scattered quartz grains. | Particles in this category have similar color, texture, grain size, and porosity. Particles are variable from limestone to dolomite. |