



OFFICE MEMORANDUM

DATE: July 8, 1980

TO: L. T. Oehler
Engineer of Research

FROM: R. W. Muethel

SUBJECT: Petrographic Analysis and Insoluble Residue Determination of Coarse Aggregate: Thornton Quarry, Pit No. 21-67 (Testing Laboratory Sample No. 80 A-1075), Research Report No. R-1149.

On June 18, 1980, 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 Thornton Quarry, Pit No. 21-67, located in the northeast 1/4 of the southwest 1/4, Section 3, T40N, R19W, Delta County. The material was submitted to the laboratory to be tested for information. Petrographic analysis and insoluble residue determination of a portion of the sample was requested by G. H. Gallup.

Summary

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

The sample was found to contain approximately 90 percent gray to buff or brown dolomite, and 10 percent gray to buff dense chert. The total insoluble residue content of the sample is 13.44 percent, predominantly chert and argillaceous material.

Detailed tabulations of petrographic composition, specific gravity, absorption, and insoluble residue content are included in Tables 1 through 3.

Detailed Petrography

Petrographic examination was conducted in general conformance with ASTM C295, "Petrographic Examination of Aggregates for Concrete." Representative portions—300 particles (see exception)—of each sieve fraction of the sample were identified megascopically, along with acid testing and a scratch test for hardness, and microscopically with a stereomicroscope.

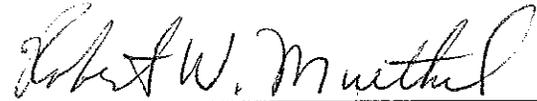
Specific Gravity and Absorption

Specific gravity and absorption determinations were performed in general accordance with ASTM C127, "Specific Gravity and Absorption of Coarse Aggregate." Determinations included all material analyzed for petrographic composition.

Insoluble Residue Determination

Determination of insoluble residue content was conducted according to Michigan Test Method 103-79, "Test Method for Determination of Insoluble Residue in Carbonate Aggregate Materials." Approximately 250 grams of representative material from each sieve fraction of the sample was composited and crushed to passing 3/8-in., retained No. 8. The material was quartered to approximately 100 grams for dissolution in 1:1 hydrochloric acid.

TESTING AND RESEARCH DIVISION



Geologist

Petrography and Hydrology Group

RWM:bt

TABLE 1
 PETROGRAPHIC COMPOSITION
 Testing Laboratory Sample No. 80 A-1075

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	
Buff to Brown Dolomite	52.3	53.0	60.0	52.4	54.4
Gray Dolomite	37.5	37.0	30.4	37.0	35.5
Gray to Buff Chert	10.2	10.0	9.3	10.3	10.0
Microcrystalline Quartz	--	--	0.3	0.3	0.1
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, excepting the 1 to 3/4-in. fraction which contained 88 particles.

TABLE 2
 SPECIFIC GRAVITY AND ABSORPTION DATA
 Testing Laboratory Sample No. 80 A-1075

Rock Type	Specific Gravity			Absorption, percent	Composition, percent by weight
	Bulk, dry	Bulk, ssd	Appar-ent		
Buff to Brown Dolomite	2.68	2.72	2.80	1.54	54.2
Gray Dolomite	2.71	2.75	2.82	1.43	36.9
Gray to Buff Chert	2.60	2.64	2.71	1.60	8.8
Microcrystalline Quartz	*	*	*	*	0.1
Total Sample	2.69	2.72	2.79	1.44	100.0

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

* Sample fraction too small for accurate determination.

TABLE 3
INSOLUBLE RESIDUE CONTENT
Testing Laboratory Sample No. 80A-1075

Insoluble Residue Retained on No. 200, percent	8.67
Insoluble Residue Passing No. 200, percent	<u>4.77</u>
Total Sample Insoluble Residue, percent	13.44

Character of Insoluble Residue

Retained on No. 200: Fragments of gray to buff chert and porous siliceous to argillaceous fragments, predominantly retained on No. 4 and No. 8; and a few discrete quartz grains.

Passing No. 200: Predominantly grayish brown argillaceous material; and porous siliceous fragments.

SEDIMENTARY ROCKS

Rock Type	Dolomite	Dolomite	Chert
Color	buff to brown	gray; and mottled gray and buff to brown	gray; buff; and mottled gray and buff to brown
Texture	very fine grained to microcrystalline	very fine grained to microcrystalline	microcrystalline
Luster	dull	dull	dull to subvitreous
Hardness	Mohs 3-1/2 to 4	Mohs 3-1/2 to 4	Mohs 7
Porosity	non-porous to slightly porous	non-porous to slightly porous	non-porous to slightly porous
Particle Shape	angular	angular	angular
Particle Surface	fresh, rough to moderately smooth, dented to ridged	fresh, rough to moderately smooth, dented to ridged	fresh, moderately smooth to smooth
Remarks	A number of particles contain quartz grains.		Some particles contain exposures of buff to gray dolomite

SEDIMENTARY ROCKS	
Rock Type	Microcrystalline Quartz
Color	white
Texture	sugary, very fine grained to microcrystalline
Luster	dull to earthy
Hardness	Mohs 7
Porosity	finely porous
Particle Shape	subrounded
Particle Surface	fresh, smooth