OFFICE MEMORANDUM

DATE: June 29, 1981

TO: L. T. Oehler
Engineer of Research

FROM: R. W. Muethel

SUBJECT: Petrographic Analysis of Coarse Aggregate: Wallace Stone Co. Pit No. 32-4 (Testing Laboratory Sample No. 81 A-843). Research Project 78 TI-510, Research Report No. R-1174.

On May 12, 1981, a sample of crushed stone was obtained by R. W. Muethel from a stockpile at the Wallace Stone Co. Pit No. 32-4, location SW of NE, Section 5, T16N, R10E, Huron County. The material was reportedly produced for use as 17AA coarse aggregate in precast concrete segments for B03 of 73112, 12787A on I 75 over the Saginaw River at Zilwaukee. The material was submitted to the Testing Laboratory Section for freeze-thaw durability tests per request by J. W. Burge. 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 non-porous to slightly porous	100.0

Approximately 97 percent of the sample was comprised of limestone and sandy limestone having absorptions ranging from 1.29 to 1.40 percent.

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. Muether

Geologist - Materials Research Unit

RWM:bt

TABLE 1
PETROGRAPHIC COMPOSITION
Testing Laboratory Sample No. 81 A-843

Rock Type	Sieve Fraction Analyzed			Computed Sample Composition
	3/4 to 1/2-in.	1/2 to 3/8-in.	3/8 to No. 4	
Limestone	43.3	43.4	39.7	42.2
Sandy Limestone	54.7	52.0	58.3	55.0
Shale	0.3	1.3	0.3	0.6
Cherty Particles	1.7	3.3	1.7	2.2
Totals, percent	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-843

Rock Type	Specific Gravity			Absorption, percent	Composition, percent by weight
	Bulk, dry	Bulk, ssd	Apparent		
Limestone	2.62	2.65	2.71	1.29	43.7
Sandy Limestone	2.59	2.63	2.69	1.40	53.8
Shale	2.53	2.59	2.67	2.22	0.5
Cherty Particles	2.54	2.58	2.63	1.43	2.0
Total Sample	2.60	2.64	2.70	1.36	100.0

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

SEDIMENTARY ROCKS

Rock Type	Limestone	Sandy Limestone
Color	buff to gray, and mottled dark brown and buff	buff to gray, and mottled buff or gray and dark brown
Texture	fine grained to microcrystalline	fine grained to microcrystalline
Luster	dull	dull
Hardness	groundmass, Mohs 3; quartz grains, Mohs 7	groundmass, Mohs 3 to 2-1/2; quartz grains, Mohs 7
Porosity	non-porous to slightly porous	non-porous to slightly porous
Particle Shape	angular	angular
Particle Surface	fresh, rough, dented to ridged	fresh, rough, dented to ridged
Remarks	Some particles contain scattered quartz grains. A few particles are dark brown mottled with rounded to oblate buff colored exposures.	Particles are variably arenaceous with rounded to subangular quartz grains. Many particles contain irregular traces of dark brown shaley seams.

SEDIMENTARY ROCKS (Cont.)

Rock Type	Shale	Cherty Particles
Color	dark brown to black	mottled buff or brown, and gray
Texture	very fine grained to micro-crystalline	very fine grained to micro-crystalline
Luster	dull	dull
Hardness	Mohs 2-1/2	Mohs 3 to 7
Porosity	finely porous	non-porous to slightly porous
Particle Shape	angular to tabular	angular
Particle Surface	fresh, moderately smooth, dented to ridged	fresh, rough to moderately smooth, dented to ridged
Remarks	Some particles contain quartz grains.	Most particles are composed of limestone with small exposures of chert or silicified fossils.