



OFFICE MEMORANDUM

DATE:

TO: L. T. Oehler
Engineer of Research

FROM: R. W. Muethel

SUBJECT: Petrographic Analysis of Coarse Aggregate: Champion, Inc. Dishneau Pit No. 52-1 (Testing Laboratory Sample No. 75 A-644). Research Report No. R-1084.

On May 14, 1975, a sample of combined crushed and natural gravel coarse aggregate was received by the Department's Testing Laboratory. Information accompanying the sample stated that the material was obtained from a stockpile at the Champion, Inc. Dishneau Pit No. 52-1, location northwest of northeast, Section 26, T48N, R30W, Marquette County. The material was submitted to the laboratory for freeze-thaw durability testing. Petrographic analysis of a portion of the sample was requested by G. H. Gallup.

Summary

Rock Class	Condition of Particles	Percent of Sample
Igneous	Hard, fresh to deeply weathered, and non-porous to porous on weathered surfaces	94
Metamorphic	Hard to soft, fresh to moderately weathered, and non-porous to slightly porous	6
Sedimentary	Hard, fresh, and slightly porous	--

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 C 295, "Petrographic Examination of Aggregates for Concrete." Representative portions--300 particles--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 determinations were performed in general accordance with ASTM C 127, "Specific Gravity and Absorption of Coarse Aggregate." Determinations included all material analyzed. The following pages contain the rock type descriptions.

TESTING AND RESEARCH DIVISION

R. W. Muirhead

Geologist - Materials Research Unit

TABLE 1
 PETROGRAPHIC COMPOSITION
 Testing Laboratory Sample No. 75 A-644

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	
Granite	62.7	56.4	64.7	64.7	62.1
Diorite	10.7	14.3	9.0	5.7	9.9
Gabbro	17.4	18.3	11.3	11.0	14.5
Basalt	4.6	6.7	8.6	8.3	7.0
Felsite	--	--	1.0	1.3	0.6
Quartzite	1.3	2.0	1.7	3.0	2.0
Metasediments	1.7	1.3	0.7	1.0	1.2
Schist and Slate	1.3	0.7	3.0	5.0	2.5
Sandstone	0.3	0.3	--	--	0.2
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. 75 A-644

Rock Type	Specific Gravity			Absorption, percent	Composition, Percent by Weight
	Bulk, dry	Bulk, ssd	Apparent		
Granite	2.65	2.66	2.67	0.33	59.7
Diorite	2.74	2.75	2.77	0.44	10.9
Gabbro	2.92	2.93	2.96	0.40	18.7
Basalt	2.85	2.86	2.89	0.50	6.1
Felsite	*	*	*	*	0.1
Quartzite	2.59	2.60	2.62	0.37	1.7
Metasediments	2.55	2.61	2.72	2.47	1.5
Schist and Slate	2.65	2.69	2.76	1.62	1.1
Sandstone	*	*	*	*	0.2
Total Sample	2.71	2.72	2.74	0.42	100.0

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

* Denotes no determination due to insufficient material in sample.

IGNEOUS ROCKS

Rock Type	Granite	Diorite	Gabbro
Color	mottled pink to red, white to buff; and dark green to black	mottled white to buff or gray and dark green to black	mottled white to buff or gray and dark green to black; and mottled gray and black
Texture	medium to fine grained	medium to fine grained	medium to fine grained
Luster	dull to subvitreous	dull	dull
Hardness	Mohs 6 to 7	Mohs 6 to 7	Mohs 5-1/2 to 6
Porosity	non-porous	non-porous	non-porous to porous on deeply weathered surfaces
Particle Shape	angular to subrounded	angular to subrounded	angular to subrounded
Particle Surface	fresh to slightly weathered, rough, dented to ridged	fresh to slightly weathered, rough, dented to ridged	fresh to deeply weathered, rough, dented to ridged
Remarks	This category includes quartz monzonite and granodiorite particles.	This category includes quartz diorite particles.	This category includes basic and ultra-basic particles. A few particles are deeply weathered or altered.

IGNEOUS ROCKS (Cont.)

Rock Type	Basalt	Felsite
Color	dark gray or green to black; and mottled reddish brown, gray, and black	gray; reddish brown; and mottled buff and gray
Texture	fine grained to microcrystalline	very fine grained to microcrystal-line
Luster	dull	dull
Hardness	Mohs 5-1/2 to 6	Mohs 6 to 7
Porosity	non-porous	non-porous
Particle Shape	angular to subrounded	angular to subrounded
Particle Surface	fresh to highly weathered, rough to smooth, dented to ridged	fresh to slightly weathered, rough to moderately smooth, dented to ridged
Remarks	This category includes andesitic to ultra-basic particles.	This category includes a number of rhyolite particles. One particle is porphyritic.

METAMORPHIC ROCKS

Rock Type	Quartzite	Metasediments	Schists and Slates
Color	white; gray; and mottled buff to white, pink to brown; and gray to green	gray; reddish brown; and mottled gray and reddish brown to brown	light to dark gray
Texture	medium to fine grained; and massive	very fine grained to microcrystalline	very fine grained to microcrystalline
Luster	vitreous to dull	dull	dull to silky
Hardness	Mohs 7	Mohs 3 to 7	Mohs 2-1/2 to 4
Porosity	non-porous	non-porous to finely porous	non-porous
Particle Shape	angular to subrounded	angular to subrounded	angular to subrounded or discoidal
Particle Surface	fresh to slightly weathered, rough to smooth, dented to ridged	fresh to moderately weathered, rough to moderately smooth, dented or pitted to ridged	fresh to slightly weathered, rough to smooth, dented to ridged
Remarks	Several vein quartz particles containing granitic exposures are included in this category.	A number of particles display traces of bedding. Particles vary from chloritic, ferruginous, to siliceous.	

SEDIMENTARY ROCKS

Rock Type	Sandstone
Color	mottled pink and buff
Texture	fine grained
Luster	dull
Hardness	Mohs 7
Porosity	slightly porous
Particle Shape	angular
Particle Surface	fresh, rough, dented to ridged