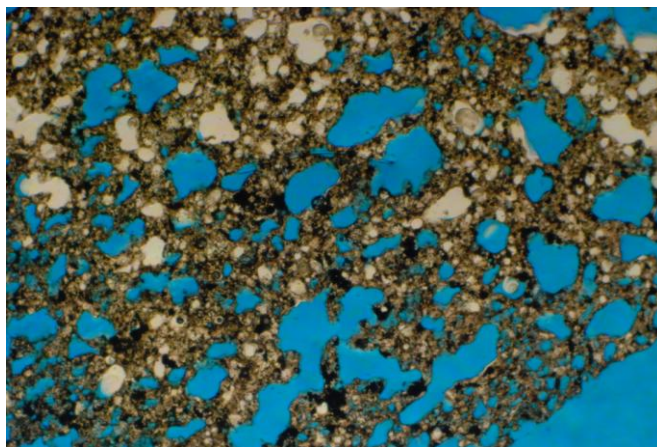


PETROGRAPHIC EVALUATION OF LIGHTWEIGHT AGGREGATE



Prepared for:

Carolina Stalite Company
Gold Hill, NC

Prepared by:

C3S, Inc.
Houston, Texas



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April 7, 2015
C3S Project No. 15-4808

Carolina Stalite Company
16815 Old Beatty Ford Road
Gold Hill, NC 28071

Attention: Jody Wall, P.E.

**Re: Petrographic Analysis of Lightweight Aggregate
Stalite Lightweight Aggregate**

Dear Mr. Wall:

C3S, INC. has completed an evaluation of the referenced lightweight aggregate sample as per ASTM C 295 "Petrographic Analysis of Aggregates for Concrete"

Please find attached the results of our findings and we do appreciate the continued use of our services.

Sincerely,
C3S, INC.

A handwritten signature in black ink that reads 'S. Ebow Coleman'.

S. Ebow Coleman, Ph.D., P. E.
Principal Consultant

I. PROJECT INFORMATION

A plastic bag of lightweight aggregates, weighing about 3 Kg, was received at our laboratory on March 30, 2015 to be evaluated by petrographic examination as per ASTM C295. “Petrographic Examination of Aggregates for Concrete” The sample was mailed from Gold Hill, North Carolina.

II. OBJECTIVE

To determine whether aggregate will have any adverse effect when used as an ingredient in concrete.

III. PETROGRAPHIC ANALYSIS

Petrographic analysis involves the optical examination of concrete specimens under low and high power magnification. Detailed instructions on conducting a petrographic examination of hardened concrete can be found in ASTM C856, “Standard Practice for Petrographic Examination of Hardened Concrete”. For our examination, a sample of the aggregate was impregnated with blue dye under vacuum. The impregnation under vacuum causes the dye to permeate every crack, micro crack and all pores, including micro pores in the aggregate sample. The impregnated aggregate is cut and placed on a glass plate, ground and polished to a thickness of about 30 microns.

The thin section of aggregate was examined for the following features:

- Forms of silica in aggregate
- The void system in aggregate
- Presence of cracks and micro cracks

The sample was examined using a magnification of 40X.

IV. FINDINGS FROM THE EVALUATION

Three aggregates of different coloration were randomly picked and evaluated. The aggregates ranged in texture from fairly dense to porous aggregates as shown in Figures 1 to 4. The blue areas in the photomicrographs represent voids in the aggregates; a wide range of air void sizes is shown.

The form of silica in the aggregate does not appear to be in cryptocrystalline form to pose a danger for its use in concrete; namely, be susceptible to alkali-silica reaction when used with high alkali cement.

No cracks or micro-cracks were found in any of the randomly picked samples that were examined.

V. LIMITATION

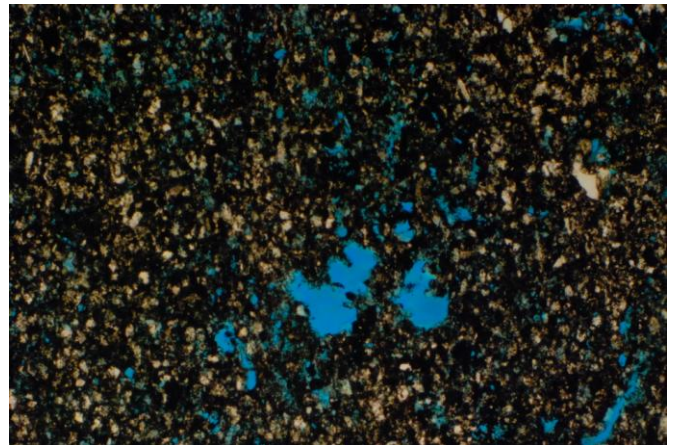
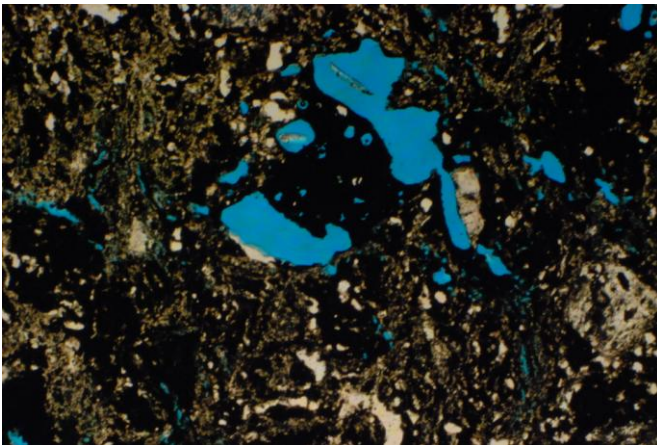
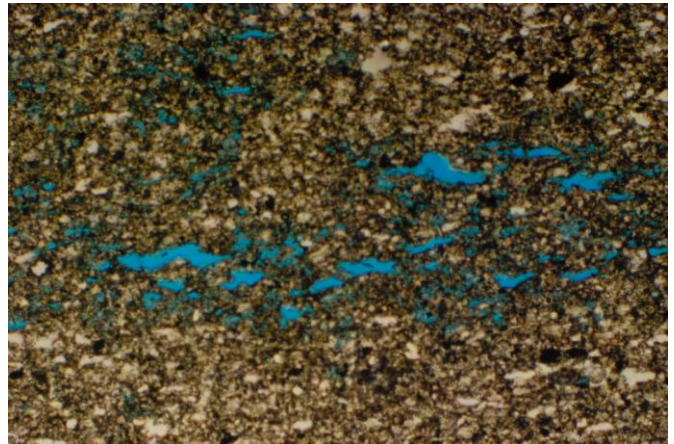
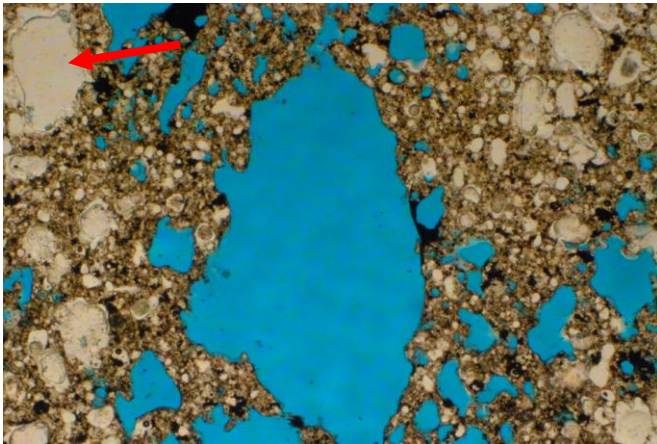
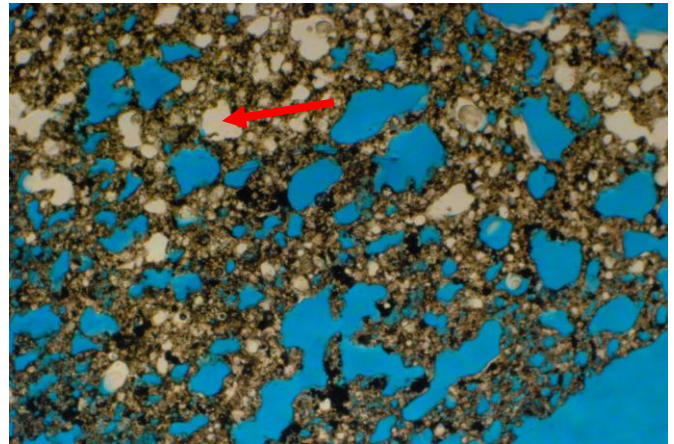
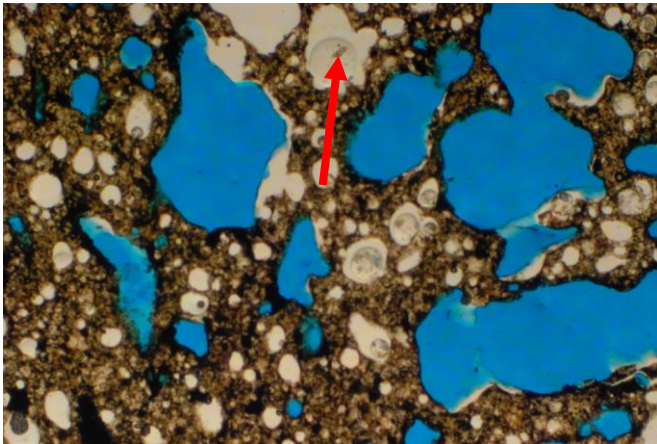
Reasonable variations from kiln batches of manufactured lightweight aggregates are assumed. If the sources of raw materials change and/or significant changes occur in firing conditions, observations made and conclusions reached in this report may not reflect the change. C3S, Inc. should be notified if conditions different from those prevailing in the preparation of this lightweight aggregate are encountered.

NOTE:

Unless other disposition arrangements are made, samples will be discarded after one (1) month upon presentation of this final report.

PETROGRAPHIC ANALYSIS OF LIGHTWEIGHT AGGREGATE

Stalite Lightweight Aggregate



Shown above are representative sections of randomly picked aggregate particles. The blue-colored areas represent voids in the matrix of the aggregate. Additionally, the uniformly cream-colored inserts in the matrix (as pointed by red arrows) are also voids which were filled by swarfs in the sample preparation. The aggregates are highly porous but the pores are predominantly closed.