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IDAHO BUREAU OF MINES AND GEOLOGY

A. W. Fahrenwald, Director

PUMICE AND PERLITE IN IDAHO

by

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To: Dean A. W. Fahrenwald, Director, Idaho Bureau of Mines and Geology.
From: W. W. Staley.
Subject: Report on 1950 Field Work

Mr. Ray Kurtak and I left Moscow July 17th and returned August 5th. We were away 20 days, and traveled 2295 miles.

The purpose of the investigation was a reconnaissance survey of the pumice and perlite deposits in the State. Incidental to this work about 15 per cent of the time was spent on consultations other than pumice and perlite.

Mr. Grant Wirick of Hailéy, representing the Sun-ite Corporation, 801 Continental Bank Bldg., Salt Lake City, Utah, had recently completed a trip of some 15,000 miles inspecting the pumice deposits of the western states. He expressed the opinion that Idaho pumice was superior to that found elsewhere.

A very considerable expenditure of time and money would be required to place any sort of tonnage figure on the State's pumice reserves. They are quite large.

On the other hand, the perlite deposits, as presently known, are relatively insignificant.

The manufacture of lightweight aggregate units using pumice and Portland cement has become quite substantial in South Idaho. Important plants are located in Idaho Falls, Jerome, and Boise, and many individuals make their own blocks. Information obtainable indicates about 10,000,000 units (various types of blocks) having a gross value of about \$2,500,000 were made last year. There is an insistent demand for both blocks and bulk pumice in the Middle West. Little material is shipped that far away. The local demand consumes production at present. Very high freight rates (about \$8 per ton to Chicago from Idaho Falls) practically prohibits the shipment of bulk pumice. I am told that no difficulty is experienced, in spite of its light weight, in getting 50 tons of pumice in the average railroad car. A considerable

amount of pumice is shipped to Utah.

Manufacturers of pumice blocks are confronted with a number of technical problems. They do not have the facilities, men, time, or equipment, to arrive at the right solution to their troubles.

1. At present the aggregate mixture used varies from plant to plant (the mixture used by private individual block makers is difficult to determine). Each producer has worked out a rule-of-thumb formula. It is appreciated that in industrial work of this nature a certain amount of cut and try is necessary. But, on the other hand, the raw materials, pumice and cement, are remarkably uniform in character. An investigation should be made to determine the proper mixture of various sized aggregate with cement and water which will give the greatest strength consistent with surface appearance and insulating value, in connection with the final curing of the block, consistent with the economics involved.

2. At present the blocks are placed in a curing room under steam at about atmospheric pressure. The temperature and length of time varies from plant to plant. Usually a curing period of many weeks is required. The possibility of using a pressurized chamber with steam at 300 deg. F. or more has been suggested. The main object would be to reduce the curing time. There is some indication that a better block would result. This is a piece of research that some of the manufacturers are very anxious to see undertaken. It is possible that they would be willing to advance funds toward defraying the expense.

3. Pumice seems to develop shrinkage cracks. Most walls with an uninterrupted expanse exceeding 16 feet will develop cracks at the 16-ft. point. Just what causes this is uncertain. It may be a function of the curing. The practice of directly plastering on pumice walls (which actually is very satisfactory in appearance and is easily done) is in danger of being discontinued because of shrinkage cracks in the blocks.

4. The use of coloring material for blocks is developing. Some really beautiful units are produced by the Cinder Products Co., Jerome. An investigation of mineral or organic coloring substances that are but slightly affected by sunlight and climatic conditions would be helpful. Along with this would be required the use of a colorless water proofing agent for coating the surface of the blocks after the structure has been erected.

5. Many architects in south Idaho object to using pumice blocks. Just why I do not know. The result of this lack of architectural guidance and interest is glaringly apparent in nearly all pumice block structures (residences and commercial buildings). It is not implied that such buildings are structurally unsound. The external appearance is bad. The architects in Spokane have been designing with pumice for years. An investigation setting forth a few fundamental architectural principles which would materially improve the exterior appearance of structures should be considered.

6. There are a number of irritating drawbacks to installing the inside wood finish in pumice block houses. I believe a little investigation will provide suggestions, without increasing costs, for improving this situation.

7. There is a considerable amount of very fine pumice dust produced during mining and utilization. This fine material is, in some instances, waste. The mine operators near Idaho Falls have discovered that, under the kind of use they are subjected to (pumice trucks, wheat trucks), roads having a covering of pumice stand up remarkably well. A semihardening surface results. This is apparently caused from the fact that pumice appears to have pozzolan cement properties. Even though the surface is crushed, it seems in time to reharden.

8. The use of pozzolan materials in dam construction is increasing. Pozzolanic materials have the natural property of slowly hardening with age. Some of them apparently have good waterproofing tendencies (so I am told). Blast furnace ash

from the steel mills around Chicago is shipped west for use in dam construction. This is an artificial pozzolan. Fine pumice shows indications of having the same properties as the ash. This is substantiated by the results shown from using pumice on roadways. Aside from the pozzolanic properties of blast furnace ash and pumice, there is a tremendous saving in weight of reclamation structures. The amount of Portland cement required is materially reduced, and, thus the provisions for dissipating the heat evolved from the chemical change which takes place with the setting of cement, are simplified.

LOCATION OF PUMICE DEPOSITS IN IDAHO

Clyde Fry, 923 11th Ave. South, Nampa, has done a limited amount of work toward developing a deposit in Owyhee County. His deposit is east of highway 95 about 7 miles south of the intersection of highways 95 and 20 out of Marsing. About 4 1/2 miles past the highway intersection, just over the brow of the hill, a road is taken to the left and followed for 2 miles, passing through a deserted bombing range. This road finally makes a very sharp left turn and goes down a steep grade for an additional 3/10-mile. At the foot of the road is located the pit. A little bulldozer work has been done.

Angus Brooks, Fairfield, exposed pumice west of his ranch on Willow Creek. Several small open cuts have been made on the hillside. Willow Creek road turns north from the Fairfield-Hailey road. There is a white school house at the junction of the roads. Mr. Brooks' house is the first on the east side of the Willow Creek road. The pumice exposed in the cuts is brown and dirty and shows considerable weathering. Deeper exposure will more than likely pass through this zone.

Ora Jones, near Hollister, Twin Falls County. One-half mile south of Hollister, turn east on a gravel road. This road is followed for 3.2 miles. Turning south at this point, the Jones' farm is 1.6 miles.

Mr. Jones had done considerable work toward exposing the pumice on his property. There are several pits and deep cuts. The pumice is fine grained with a minimum of

large lumps. This deposit, in common with others south of the Snake River (Idaho Falls, Rockland, Tetonia), has scattered small grains of black volcanic glass. The material is light grey in color. After exposure to the air it shows a tendency to harden. The deposits appear to be quite extensive. Mr. Jones makes his own blocks from this deposit.

Eliason Brothers Ranch, near Rockland, Power County. This ranch is 6 miles west of of Rockland on Rock Creek. The pumice exposure should be visited under the guidance of one of the ranchers. Several years ago I examined this deposit and was favorably impressed with the exposure. Only a very limited amount of work had been done at that time. Now the exposure has become covered with hill wash and is difficult to find. I have little doubt but that a deposit can be exposed with a moderate amount of trenching.

Idaho Falls. By far the bulk of the pumice mined in the state comes from this area. The deposits are in reality near Ammon, 5 to 10 miles southeast of Idaho Falls. They are the most extensively developed pits in operation. From this area the Clark Concrete and Construction Co., Idaho Falls, operate the Clark pit at Ammon; Idaho Pumice Distributors and Pumice Products Co., Boise, obtains material from a pit at Ione; Cinder Products Co., Jerome, is mining at Indian Siding; Idaho Pumice Products Co., Pocatello, has a pit at Ammon; and the Idaho Falls Brick Co., Ammon, is operating a pit of red pumice nearby.

In this vicinity, pumice outcrops on nearly all of the farms. The material is very widely distributed. Most of the pumice is overlain by a basalt flow. About 100 ft. below the top of the bed is a layer of red pumice. The white pumice beneath the red bed appears to rest on basalt.

Sun-ite Corporation, 801 Continental Bank Bldg., Salt Lake City 13, Utah. The property, in which this company is interested, is located in Blaine County, just north of the Magic Reservoir (sec. 14, 15, 22, and 23; T. 1 S., R. 17 E., Boise Meridian). This deposit has been estimated to contain over 15,000,000 tons of pumice. From my own observations, I am inclined to suggest this figure is on the

conservative side. The deposit has been investigated by pits and cuts over a considerable area. Pumice caps the hills and extends down the flanks into the valleys. In this area the pumice has a light brown color; all that I saw elsewhere is white to light grey. A number of tests have been made on the Sun-ite pumice. All of these appear to be favorable. Accompanying this report are copies of various tests and reports submitted to the Sun-ite Corporation.

R. S. Rammell, Tetonia. Mr. Rammell owns some 2000 acres of farm land adjoining the town of Tetonia, Teton County. He has opened up probably a dozen pits and excavations at widely scattered intervals over his farm. Physically, the pumice, around Tetonia, appears to be identical to that in the Ammon area. Aside from the Magic Reservoir deposit, Mr. Rammell has the largest potential occurrence of any property inspected. This, of course, does not include the Idaho Falls area.

LOCATION OF PERLITE DEPOSITS

Development of perlite in Idaho is still very much in the prospect stage. On the basis of the widespread igneous activity, with its great variety of rock types, it is reasonable to expect perlite deposits. The perlite that has been investigated does not have quite the desirable properties shown by the Oregon, Arizona, and New Mexico material.

Five samples were brought back to Moscow for test. One of these had been tested by the U. S. Bureau of Mines, Tucson, Arizona, and proved to be perlite of medium grade. Later a 25-lb. sample from one of the other deposits was sent to Tucson for testing. It also proved to be better than fair perlite.

The samples tested at Moscow were crushed to about minus 1/4-in. and heated in one of the fire assaying furnaces. The specimens were placed in the furnace when the temperature had reached 1290 deg. F. At the end of 10 min. they were removed; the temperature then was 1580 deg. F. Expansion of the particles started soon after

they were placed in the furnace. At the end of about 5 min. expansion appeared to have ceased. The U. S. Bureau at Tucson heats the perlite to 1040 deg. C (1904 deg. F).

Murphy Deposit. Near Murphy, Owyhee County is a deposit of perlite. The location is on the road between Murphy and Silver City. A new road (in reality, an old one put in good shape for a cattlemen's recreational (?) meeting in Silver City) passes the deposit. However, with my usual foresight, I took the other road. This road turns off the Murphy-Oreana highway 5 miles out of Murphy; there is usually a sign there pointing to Silver City on the south. Three miles on, the right hand fork in the road is taken. Proceeding another 4 1/2 miles, a line fence and cattle guard is passed. About 0.1-mile beyond this fence, just off the road on the left hand side, down the slope, the perlite outcrops. The outcrop is black with bluish-grey alteration products. It is almost identical in appearance to that found just out of Boise (see E. E. Thompson description).

This material was tested by the U. S. Bureau of Mines and found to be perlite. Tests that I made here confirm this. The exposure is not extensive. A little way on toward Silver City there is said to be another exposure. I did not find this one. Trenching with a bulldozer will have to be done to show the extent of the Murphy perlite.

Grant Wirick, Hailey, Blaine County, sent in a specimen for test. It was not perlite.

Ora Jones, Hollister, Twin Falls County. Samples were taken of material, which appeared to be perlite, from the Ora Jones farm. It failed to expand on testing.

Cinder Products Company pit near Ammon. A sample of a black-glassy-obsidian-like flow rock was brought back for testing. It did not expand when heated.

E. E. Thompson, Rt. 2, Maple Grove, Boise. Mr. Thompson lives on Maple Grove Road; turn south from highway 30 (Boise-Nampa). The turn is made at the Harbert Electric Company. Go 0.6 mile. Mr. Thompson lives on east side of road.

The perlite deposit is on Picket Pin Creek, several miles east of Boise. One outcrop is at Whiskey Rock at the fork of Picket Pin and Cottonwood Creeks. Another outcrop (where my sample was taken) is on up the Picket Pin Creek road. It is about 200 yards west of Don Oberbillig's house and is part way down the slope of the hill to the south. There is a dark grey outcrop of rather soft material.

When tested in the assay furnace for 10 min. at 1580 deg. F. a nice expansion was observed. The expanded perlite was a greyish-white color. Some unexpanded quartz remained. This test was later confirmed by the U. S. Bureau of Mines at Tucson, on a 25-lb. sample sent them by Sam Barton, Boise, Idaho.

This deposit is still in the outcrop stage. Very little work has been done toward extending the exposure. Mr. Thompson states that other outcrops may be found in the general vicinity.

ADDITIONAL MINERAL INVESTIGATIONS

In addition to the pumice and perlite investigation, the following services were rendered.

A. A sample of the quartz-feldspar sand from Freezeout Hill, near Emmett, was obtained for Prof. N. F. Hindle, Mechanical Engineering Department, University of Idaho. Prof. Hindle is interested in finding a suitable silica sand for making high temperature casting patterns. There is an unlimited supply of material near Emmett. If a satisfactory method of separating the silica from the feldspar can be worked out a market may become available for both products.

B. A. I. Myers, Continental Casualty Co., Kahn Bldg., Caldwell. Mr. Myers was under the impression that he had a large deposit of uranium-bearing material (carnotite). This turned out to be an iron-stained layer near the top of a loosely consolidated quartz-feldspar bed (probably the Freezeout Hill deposits). This

exposure was followed, with occasional Geiger counter tests, for some miles between Caldwell and Emmett. No reaction with the Geiger counter could be observed.

C. Mrs. Ruth R. McCoy, Rigby. Mrs. McCoy had a specimen of pegmatite dike and had been told it was uranium ore. She had not been to the property for six or eight years and sent us to Frank Hall, Rigby, for additional information. The dike was up a canyon between Tetonia and Driggs. The specimen had no metallic minerals in it. Later I got track of the same material at Tetonia and found the deposit was located about 5 miles over the line in Wyoming. The investigation was dropped.

D. L. M. Hale, P. O. Box 764, Idaho Falls. Mr. Hale has several manganese prospects near Cleveland. They are similar to those on the McGregor farm at Cleveland. He believes his deposits are more extensive than the McGregor ones.

E. The present operator of the Paymaster Mine, Lava Creek District, Arco, Butte County, asked for about a day's advice on some geology and engineering problems. They are driving about a 700-ft. tunnel to get under an outcrop high above the tunnel level.

Reference Material

On file in the Director's office, Moscow, are a number of reports and data sheets of tests on the Sun-ite Corporation pumice. The results of the testing of the Murphy perlite and the E. E. Thompson perlite are also on file in the Director's office.