State Department of Geology and Mineral Industries

702 Woodlark Building
Portland, Oregon

AMERICAN TUFA STONE COMPANY Mt. Angel, Oregon

2825 S. W. Montgomery Drive
Portland 1, Oregon
August 20, 1946.

American Tufa Stone Quarry, Inc.
Portland, Oregon

Attention: Mr. Fred Franklin

Dear Mr. Franklin:

At your request I have examined the deposit of tuff which lies near the headwaters of Little Abiqua Creek in Section 30 TWP 7, S. Range 2 E Willamette Meridian, Marion County, Oregon, and submit my findings herewith.

History: This deposit has been known for more than fifty years, and is on land which was acquired by homestead right by members of the Abbey at Mt. Angel, and which has been in its ownership to date. The quarry was opened up before 1900 and the blocks used as building stone, in the construction of several buildings in Marion County, and one church in Portland. It has proved to be durable, and well suited for this purpose.

Geology: The area has not been mapped by the United States Geological Survey nor by other private or state parties; therefore no topographic or geologic maps or data are available for reference study.

The deposit lies upon a segment between the main Abiqua Creek and the Little Abiqua Creek, of a peneplain which extends roughly from the Molalla River about fifteen miles to the north,

to the Santiam River about twenty miles south. The topography can be noted in Photographs Numbers 1 and 2, showing the area from a distance of three miles at the valley floor, and looking southwest across the surface of the deposit.

The tuff is composed of about equal parts of pumice fragments of varying size, from minute particles to pieces nearly three inches in cross section, and volcanic ash. Both components probably have a common origin, as ejected material from some volcanic eruption in recent geologic time, and from a source not determined.

The eruption of Mt. Mazama which existed where Crater Lake now is, laid down extensive deposits of pumice and ash - mostly to the east, some nearly two hundred feet in thickness. Howell Williams, geologist at the University of California, in his excellent report on the Geology of Crater Lake, estimates this ejected pumice and ash to be several cubic miles in volume. Although no litholithic examination was made of the tuff, it appears to be rhyolitic in origin, and if so would be quite high in percentage of silica. Rocks of this character are highly resistant to alteration, or breakdown by weathering.

Most tuff deposits are formed by volcanic material being deposited in water. The character of this tuff indicates that it was formed in a different manner. The abundance of pumice fragments interspersed with volcanic ash with no evidence of bedding or stratification, suggests that the tuff was formed by a dry flow as

it were, which became compact while some of the material was viscous. C. M. Gilbert described a similar deposit of tuffaceous material in a paper in the Geological Society of America bulletin, which covers an area of many square miles near Bishop, California. The origin of this tuff has also not been determined. These are known as welded tuffs or ignimbrites. Deposits of this nature usually are quite large in extent, covering miles rather than acres.

Tuff occurs on the top of the flattened ridges for several miles to the south of Section 30, TWP 7 S. This has been named for one of the ridges, the Fern Ridge Tuff. All these tuff beds probably have a common origin, and remain as separated segments; erosion having formed the canyons which lie between them.

A number of holes were put down in Section 30 with a 6 inch post hole auger to determine the existence of the tuff below the top soil. The overburden above the tuff is rather thin, varying the holes put down from two to six feet. Tuff was found over a distance of 1000 feet in a northeast southwest direction parallel to the quarry face, and for a distance of 2200 feet in a northwest southeast direction at right angle to the line parallel to the quarry face. There is much evidence to indicate that the tuff forms the entire top of the hill which comprises most of Section 30, an area of about four hundred acres. In the section examined, seven hundred yards by three hundred yards, there exists in excess of two million cubic yards of tuff, using an average thickness of fifteen yards. Should the tuff occur over the entire section as indicated, the total volume of tuff will be in excess of ten million cubic yards.

The deposit is reported to have been diamond drilled extensively about the year 1910. The records are not available for examination due to their loss through fire at the Abbey at Mt. Angel. Father Sebastian, Professor of Physics at the College, examined the drill cores, and reports that all consisted of tuff, and that many of the drill holes penetrated more than 60 feet of tuff. Father Sebastian is a graduate in Geology as well as other branches of science, and undoubtedly is qualified to identify rocks properly. His integrity is unquestioned.

In conclusion, the evidence indicates that there exists on the area in mention, a quantity of tuff sufficient to justify any contemplated operation.

Respectfully submitted,

K. E. Hamblen

KEH:fh
Member - American Institute of Mining
and Metallurgical Engineers.
Registered Professional Engineer.

OREGON VOLCANIC TUFFS

Volcanic Tuff — Baker County

Volcanic tuff, a rather unique building material which gives much promise, occurs over a wide area in eastern Oregon, and is found also in some parts of western Oregon. The body of this rock is made up of volcanic ash particles, through which are scattered darker fragments of volcanic glass, broken pieces of feldspar crystals and occasional masses of pumice. These particles vary from the size of fine-grained sand to that of the gravel pebble. The tuffs are probably formed by the accumulation of ash and other volcanic materials which were ejected from some prehistoric volcano of the explosive type. It is likely that in most instances the deposition took place in much the same manner as the recent accumulation of volcanic ash over large areas in Alaska during the eruption of Katmai volcano. Whatever its exact origin this deposit of fragmental materials was later buried by lava flows and sedimentary rocks, which consolidated it into a firm rock. At times the lava particles which were by the eruption explosively projected into the atmosphere, may have fallen into bodies of water where they would become sorted to some extent into layers of coarse and fine.

Volcanic tuff has been quarried and used in many places in the John Day Valley, Wallowa, Baker and other eastern Oregon counties. Very similar rock is also found in two or three localities in Marion county. In different places it varies materially in color, texture and general qualities.

The tuffs are very light in weight, being only about two-thirds as heavy as ordinary sandstone. The color is usually light, which gives a pleasing appearance for many purposes from an architectural standpoint. They can be worked very easily, sawed or carved into all kinds of shapes and possess sufficient compressive strength to safely meet any proper conditions that will be imposed upon them even in our largest public buildings.

Its uses in many places has demonstrated the adaptability of the stone to the climate of eastern Oregon. It is considerably less costly than some of the harder building stones, such as granite, sandstone and limestone. In this report space will not be taken to describe all of the different quarries and localities where this material has been used. Since this type of building stone has been most largely developed and more generally used in Baker county, only that general region will be discussed. Figures XX are views of a number of buildings in Baker, Oregon, which are built of this stone.

The two quarries from which the bulk of the Baker county stone is obtained are about thirteen miles southeast of the City of Baker, on the Oregon-Washington railway, near the station of Pleasant Valley. One of these, known as the Ideal Quarry, is less than one-half mile north of the station, and is owned and operated by James Grant of Baker. The other quarry is about 1,000 feet south of the station and is the property of the Oregon Lava Stone Company of Baker.

The rocks in the general region of Pleasant Valley are chiefly of series of lava flows, tuffs and lake-bed deposits overlying the older greenstones. These rhyolitic flows and the deposition of the volcanic tuffs and lake sediments in this region seem to have taken place during about the same period of time. That is to say, volcanic eruptions of varying nature accompanied or succeeded each other, thus giving at times both solid and glassy rocks, and the loose-textured fragmental materials, which are now consolidated into tuffs; while sediments were at the same time accumulating in the bottom of lakes that covered portions of that region.

In very few of the quarries examined are any indications of bedding found. This shows that water probably had in most cases very little to do with the deposition of the rock strata. One exception to this rule is observed at the Ideal quarry, where the true lake beds are apparently overlain by volcanic tuff which later also seems to show some bedding. These beds have a strike of north seventy degrees west and a dip to the northward of thirty-five degrees.

The Ideal quarry is opened on the south slope of the hill, the beds dipping directly against the slope. On account of this relation between the attitude of the beds and the slope of the land surface greater difficulties have to be met in quarrying, on account of the increasing overburden, than if the quarry could be located at a point where the dip and surface slope are more nearly in the same direction. It seems probable that a more favorable site in this respect could be selected within a few hundred feet.

The joints in this quarry are parallel to and at right angles to the bedding direction. (Fig. XXI.) More or less faulting and other evidences of movement since the rocks were consolidated are apparent in most exposures of the volcanic tuff and old lake bed deposits.

The Oregon Lava Stone Company's quarry on the south side of the railroad has a more favorable location with reference to the slope of the hill. As Fig. XVI will show, the rocks in this quarry are broken by a series of vertical joints and a second set of joint planes which are approximately parallel to the surface. These last occur much more plentifully and closer together within a few feet of the surface. The explanation seems to be that this series of shallow joints is entirely due to weathering agencies. It will be noted that some of the joint planes are smooth curves instead of plane surfaces. No bedding whatever, is evident in the Oregon Lava Stone Company's quarry.

In both of the Pleasant Valley quarries stone can be gotten out in very large blocks if desired on account of the wide spacing between joints. Cubes as large as eight feet in each dimension can be easily obtained. The rock in each of the quarries varies to some extent in different parts of the face, but is usually a light gray in color, and for the most part quite fine-grained in texture. The stone from the Ideal quarry is a shade darker than that in the quarry of the Oregon Lava Stone Company. In some parts of the exposures,

and especially in the lighter gray stone, scattered irregular fragments of glass and pumice occur. But few of the glass fragments are ever over a quarter of an inch in diameter while the inclusions of pumice are found at times to measure as high as an inch across. These larger fragments are often of a different color than the finer ground mass, sometimes lighter and sometimes darker. The glass particles are usually colored, sometimes black, while the pumice is more nearly the color of the ground mass.

In the table giving the results of tests made by the United States Bureau of Standards found on page 40 it will be found that these tuffs have an absorption of something more than twenty-five per cent and an average crushing strength of nearly 2,000 pounds to the square inch, which last is amply sufficient for building purposes. It should be noted also that the strength of the volcanic tuffs shows no deterioration due to repeated freezing and thawing.

The available supply of volcanic tuff in the Pleasant Valley area appears to be inexhaustible. The rock can be seen at the surface over an area of about 200 acres. The maximum depth is not known but a thickness of over 100 feet can be observed in places.

The amount of overburden encountered in quarrying will vary. In some places there is not more than two or three feet of waste rock while in others as much as ten or fifteen feet of soil and weathered rock is present.

On the whole, volcanic tuff as a building stone has many features in its favor. Its conspicuous advantages are its light gray color, its light weight and the ease with which it can be worked and handled. Because of its porosity and darker color when wet it has been questioned by some whether such stone can be used to advantage as a building material in a climate similar to the Willamette Valley where the winter rainfall is heavy. On drying, it of course resumes its original characteristic color. Whether its high porosity would be found objectionable in a climate so damp as this for several months of the year is a question on which sufficient data are not at hand to definitely answer. Many common brick used in building walls everywhere are, however, fully as porous and as absorbent as the tests show this type of stone to be.

TESTS OF OREGON VOLCANIC TUFFS

Name and location of quarry	Percentage of Absorption	Crushing strength in lbs/sq. in.			Specific Gravity
		Specimen tested dry	Specimen tested saturated with water	Tested after freezing and thawing 10 times	
Grant Quarry Pleasant Valley, Ore.	22.68	2916	2861	2816	1.81
Oregon Lava Stone Co., Pleasant Valley	28.96	....	1212	....	1.64
	29.29	1724	1160	1261	1.33

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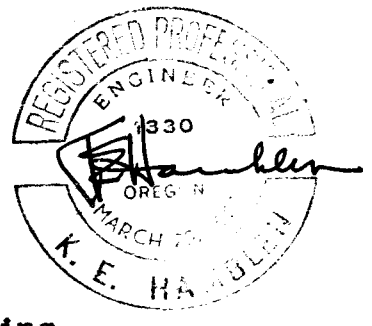

KEH:fh
Member - American Institute of Mining
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