

First Quarterly Progress Report
of
BENTONITE SEALING INVESTIGATIONS

During Period of
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by
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INTRODUCTION

Under terms of a recent contract with the District, the University agreed to:

1. Assist in the location, evaluation, and development of deposits of bentonite within or close to the area comprising the Southeastern Colorado Water Conservancy District.
2. Assist irrigation districts or companies within the District area in evaluating their canal and reservoir seepage problems, and in devising low-cost methods of controlling these problems with the locally available bentonites mentioned in 1 above.

As a result of recent action of the Colorado Water Conservation Board and the Colorado Legislature, the program objectives above have been extended to cover the entire State. However, while project activities have been carried on in other parts of the State, the major interest in the work and the immediate pressing demands on project time have come mostly from the District area in the Arkansas River area.

This report is restricted to the project activities during the last three months which pertain to the District area. The activities reported herein have, or will be in the near future, coordinated through the local SCS, ASC, and County Agent offices in each area.

EVALUATION OF BENTONITE DEPOSITS

Bentonite deposits within or close to the District area that have been sampled within the last three months include:

1. The Fox-Dilley claims in Garden Park about 8 miles north of Canon City.
2. The Kessler claim near Howard.

3. The Davidson prospect near Elevenmile Canyon Reservoir at the southeast end of South Park.
4. The Silver-Rocker (Lamberg) claim near Howard.

The several prospects below Pueblo, including the bentonite south of Las Animas, have not as yet been sampled for the current test program.

In the past, the Wyoming high-swell bentonite has been considered as the standard, and the amount of swell of a bentonite has been used as an evaluation yard stick. Since most of the Colorado bentonites fall into a low-swell class, they have commonly been considered as unsuitable for canal and reservoir sealing purposes. Recent experience with the Colorado bentonites, such as the Lamberg bentonite, proves that it is possible to obtain good sealing results with the low-swell clays. Thus, new evaluation standards are needed.

The bentonites from the District area, and from other areas in Colorado as well, will be evaluated in two ways. First, the bentonites will be put through an extensive laboratory test program at the University. This work will be started June 13, 1960, when the personnel becomes available. Secondly, these results will be compared with the sealing results actually obtained in field installation--including all past experience we can find, plus the new results obtained by project evaluations at new trial installations.

The laboratory tests that tie in best with the actual field trial results will be recommended as evaluation tests, and minimum standards of quality using these tests will also be recommended. The latter information is an urgent need at the present time. For example in the Canon City-Salida area bentonite(?) or clay materials from three pits are being considered for pond and ditch sealing work under the ACP program. One of the materials, the Silver-Rocker bentonite, has been used successfully for ditch and reservoir sealing for several years. The other two materials, the Fox-Dilley and Kessler materials, appear favorable but as yet no extensive installation experience has been accumulated for these latter materials.

At this stage in the development work, the following tentative bentonite standards are recommended:

1. Colloidal yield--50 per cent or better clay content or colloidal yield.
2. Mixing potential--need material that can be used in multiple-dam method in granular form directly from pit or mine.
3. Sealing potential--need material whose sealing ability has been proven by actual field tests.

The laboratory program will be directed at setting up tests and minimum standards that in addition to the clay content consideration, will depict the mixing and sealing potential of the clay materials acceptable for ditch and reservoir sealing work.

BENTONITE FIELD TRIALS

Canal and reservoir sites that have been evaluated during the past three months for inclusion in the University's evaluation program are listed below:

1. Sunnyside Park Ditch near Salida, Colorado
2. Section of Bessemer Canal in Pueblo, Colorado
3. Section of Cottonwood Creek near Buena Vista, Colorado
4. Wolf-Neerland Ditch near Buena Vista, Colorado
5. Sailor Ranch Ditch near Buena Vista, Colorado
6. Troy Kelley Ranch Ditch near Buena Vista, Colorado
7. Young Life Rance Ditch near Buena Vista, Colorado
8. Garden Park Ditch near Canon City, Colorado
9. DeWease-Dye Ditch near Canon City, Colorado
10. Goodwin Overnite Pond near Howard, Colorado
11. Adamson Overnite Pond near Howard, Colorado

For those sites selected, the seepage loss conditions before and after the bentonite treatment will be obtained. For the smaller ditch sites, this involves, in most instances, installation of a water measuring device at the upstream and downstream ends of the treated section. For the large ditches, installation of water measuring devices may not be economically feasible, but observations of nearby seepage areas will be utilized. For ponds, the rate of drop of pond level would be measured. As yet no actual installations have been made nor measurements begun, but measuring devices are scheduled for installation in one or two sites in the Buena Vista area during the first week in May.

The evaluation work, such as mentioned above, will include experimental work with varying bentonite application rates, (i.e. 1/2-lb/sq ft, 1.0 lb/sq ft, etc.) but until these results are obtained, the tentative application rates recommended for Colorado bentonites are listed below:

1. For sandy soils--2.0 lbs/sq ft of treated area or layer 1/3-inch thick.
2. For gravel and rock--3.0 lbs/sq ft of treated area or layer 1/2-inch thick.

The above rates are based on a pit-run bentonite that has been air-slaked down to 90 per cent smaller than 1-inch size and with no lumps larger than 2-inches in diameter. A 1-inch thick layer of pit-run granular bentonite is equal to about 7.0 lbs/sq ft of treated area.

The information on the thickness of bentonite layer for each application rate has been included for the farm pond installations, where the bentonite preferably is spread dry, thoroughly mixed into the top 3-inches of sub-grade soil, and then firmly packed with a sheeps-foot roller or other compaction method. Where the bentonite is floated into place with flowing water, such as in most of the recent ditch sealing applications, the bentonite spreading is not a problem, but the same minimum application rates are recommended until additional field trial experience indicates that changes should be made.

For comparison purposes, with a Wyoming high-swell bentonite, the commonly used minimum application rate for sandy soils is 1.0 lbs/sq ft of treated area. High-swell bentonite is not recommended for coarse rocky or gravelly materials unless a bridging agent, such as silt, sawdust, Colorado bentonite, etc., is used with it.

In the District area, the cost of the local pit-run bentonite delivered to the site has ranged from \$5.50 to \$9.00/ton compared with the on-site cost of \$30.00 to \$50.00 for the powdered Wyoming high-swell bentonite in 100 lb sacks.

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