

*"The Reliable Hands of Lancaster"*

March 25, 1974

Mr. Joseph J. Freebery
Cropper and Thomas, Inc.
P. O. Box 3013
Wilmington, Delaware 19804

[Handwritten signature]
3-27-74

Dear Mr. Freebery:

Confirming our telephone conversations of March 22, I shall set forth for the record our findings and recommendations concerning the Gypsum by-product after analysis of the sample submitted by you (our #G-1820) and conversations with both Mr. Canzano and Dr. Otto of the State of Delaware.

First of all it should be stated that our involvement as well as the Solid Wastes Division of the Delaware Department of Environmental Control is limited to a consideration of the Environmental impact of the use of this material as road base (specifically any potential ground water pollution from it) the efficacy of the material as "road base" having already been established with the Delaware Department of Highways.

It is obvious by reason of my preliminary discussion of results with Dr. Otto that not all lots of the Gypsum residue are the same in relation to leachable heavy metals content. Based on my discussions with you it is apparent that our sample has come directly from the current Allied operation and the materials tested by Dr. Otto may have come from a stockpile representing residue prior to process modification. If such were indeed the case, then the results gathered thus far by Dr. Otto and by us (he found significant quantities of leachable heavy metals, we did not) would be encouraging, in that they would suggest that the currently produced Gypsum residue is relatively innocuous.

At this point I should like to interrupt my interpretive comments in order to present a summary of our tests on the sample submitted by you. Several pounds were fine ground in a hammermill, mixed well and sub-sampled for analysis. We did not perform a free moisture determination but know it to be very low since the product is quite dusty. Four hundred (400) mg of the finely ground powder was digested in several ml of aqua regia and then diluted to 25 ml with distilled water. The various elements except mercury and selenium were determined via conventional atomic absorption spectroscopy using background correction for all those elements having absorption below 4000 A. Mercury was determined by flameless AA and selenium by a microfluorometric procedure. Also to a 60 gram portion of the sample in a plastic bottle was added 600 ml of distilled water and the slurry placed on a shaker for 72 hours. The slurry was transferred to a beaker, allowed to settle overnight and the supernatant was withdrawn, filtered, and concentrated 10 fold by boiling. The various analyses already discussed



ASI 00021757

were performed as well as a fluoride determination via specific ion electrode. Table I summarizes the data collected. It should be noted that both total and leachable elements are expressed in units of $\mu\text{g/g}$ of sample.

Table I
Gross Composition, Leachable Elements of Gypsum Residue (G-1820)

<u>Element</u>	<u>Total Concentration ($\mu\text{g/g}$)</u>	<u>Leachable ($\mu\text{g/g}$)</u>
Copper	13.7	0.48
Cobalt	< 3.1	< 0.05
Chromium	41.1	0.26
Iron A	785	0.17
Aluminum	480	1.8
Lead	6.2	0.10
Cadmium	< 0.31	< 0.005
Manganese	11.8	0.10
Beryllium	< 0.62	< 0.01
Zinc	16.2	0.24
Nickel	6.2	0.09
Mercury	< 1.3 (est. 0.9)	< 0.05
Selenium	1.8	0.04
Fluoride	-	66

Although I cannot recite specific analytical and extraction techniques used by Dr. Otto, he did indicate to me that he was concerned, based on one sample or the other, with leachable copper, zinc, chromium, nickel, iron, lead, and manganese and that in some cases (e.g., lead) his values were 10 - 100 times greater than ours.

Based on all information gathered to date, I offer the following recommendations for an immediate course of action:

1. You should arrange with Allied for the daily collection of a representative sample of Gypsum residue, having these samples retained for possible future analysis.

ASI 00021758

2. We should request a meeting with Mr. Canzano and Dr. Otto at their earliest convenience in order to work out a mutually satisfactory system for sampling and leachable metal assay on the current Allied product. Sampling, leaching, and analytical procedures need to be agreed upon as well as the list

Mr. Joseph J. Freebery
Page 3
March 25, 1974

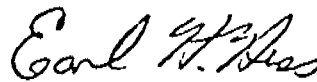
of elements which should be assayed. Agreement beforehand on these points can avoid misunderstandings at a later time and insure you that only such assay work as considered essential by the state of Delaware will be performed.

3. If either Dr. Otto or Allied Chemical wishes to be involved in a collaborative analytical program, arrangements should be made for splitting of samples, for a free exchange of analytical data, and a joint meeting to evaluate and interpret it as soon after the completion of the study as possible.

4. Hopefully, the results of these studies will be such that clearance to use the material would be granted based on them. Otherwise the situation at that point would need to be realistically assessed and a decision made as to the wisdom of further testing and/or its nature. Further tests would likely involve accelerated leaching studies such as already discussed with you.

We stand ready to move along the lines suggested above, or along any other course preferred by you within the limits of ethical conduct. Shortly after April 1 I can give you specific cost information for services to date. Also immediately following our proposed meeting with Mr. Canzano and Dr. Otto I could project rather accurately our charges for the analytical program which we will have outlined at that meeting. I shall look forward to hearing from you.

Sincerely yours,



Earl H. Hess, Ph.D.
President

EHH:by