BESTWALL GYPSUM COMPANY

SEMI-ANNUAL RESEARCH AND DEVELOPMENT REPORT

Jan. 1, 1964 to June 30, 1964

PLAINTIFF'S EXHIBIT

GP-1312

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FOREWORD

This report covers the activities and accomplishments of the Research Division for the first 6 months of 1964. There has been no personnel change in the Research Division during this period.

It was estimated last January that the total 1964 R&D expenditures would approximate $150,000. The first half figures show that $65,895 has beenspent thus far.

The Research Division had its third anniversary in June. A rundown of the last 6 months' market performance of products resulting from our efforts since that time follows. Some of the accomplishments, such as fire ratings acquired, cannot be directly assessed. However, the fact that our 1/2" Firestop sales are up 106% and our 5/8" Firestop sales up 27% for the first 6 months of 1964 over a like-period in 1963 is a good indication of the value of this effort.

The major portion of this report is devoted to the progress made on the various projects during the past 6 months. It is divided into three sections, namely:

1. Projects Completed
2. Projects Nearing Completion
3. Projects Underway

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*MARKET PERFORMANCE OF NEW PRODUCTS

JANUARY THRU JUNE 1964

	PRODUCT	SALES VOLUME	MILL BASE SALES	ESTIMATED GROSS PROFIT
1.	Firestop 120 Ceiling Tile	306,000 sq.ft.	$ 42,371	$ 12,557
2.	"Grabit" Masonry Adhesive	22 Tons	4,211	2,403
3.	One Day Joint Compound	264 Tons	46,633	12,484
4.	Dens-Cote Plaster	718 Tons	38,908	7,750
5.	Dens-Cote Base (all)	3,821.6 M.Sq.Ft.	161,387	63,921
6.	Dens-Cote Tape	6,462 Rolls	6,305	2,672
7.	1½" Drywall Screws	872 Gross	2,321	305
8.	Ready Mix Joint Compound	2,414 Pails	11,008	1,617
9.	Water Resistant Board	23,700 Sq. Ft.	1,684	1,046
10.	Model Densite	1 Ton	35	14
11.	High Expansion Densite	.7 Ton	31	7
			$314,894	$104,776

*Obtained from Paoli machine accounting records.

PATENT INFORMATION

Patents Issued - None

Patent Applications Prepared -- Dens-Cote Plaster
Dens-Cote Base

Patents Applied For - None

Patent Applications Previously Submitted -- Processing of Synthetic Gypsum
One Day Joint Compound
Grabit Adhesive

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PROJECTS COMPLETED

1. READY MIX JOINT COMPOUND - R & D 211

Objectives To develop a ready mixed or paste type joint compound to be competitive with other similar products on the market.

Investigation: About two years ago, a basic ready mix formula was developed and successfully field tested. At that time, it was decided that the product would not be put into the line, because (1) the product was not economical due to the freight involved in shipping the pails of ready mix to the potentially good markets; the freight involved in shipping the dry premix from Acme to other plants for conversion to the paste compound; and the relatively high cost of the formula. (2) The questionable market potential. Surveys indicate that the demand was spotty and confined to a few areas which would be least economical for us to ship. (3) The relatively large investment required for equipment to mix, fill pails, store and transfer emulsion, and provide storage for raw materials and finished products.

The second phase of this investigation was begun because of renewed interest from certain parties in Sales, a second basic joint system plant put on stream at Akron, and our own realization that ready mix was becoming a product we would have to reckon with sooner or later. In order to overcome the necessity to purchase large tanks and provide warm storage for binder (PVA emulsion), a ready mix formula which contained a dry binder was developed. This formula cost was also high, but it did circumvent the large equipment expenditure. A small facility was set up at Akron to furnish the requirements of a large high-rise job. The job never materialized; the ready mix froze and thawed several times during the subsequent winter; and it was obvious that the area serviced by Akron was not a good ready mix market, in view of the meager sales.

In spite of this bad taste from ready mix, it had become apparent that ready mix was the preferred joint system in some markets. It is becoming a factor in other markets and is being used for touchup and by "do-it-yourselfers" even in the areas where other joint system products are preferred. Our previously expanding joint system business has leveled off the past two years, and it is felt that lack of a ready mix product has been one cause. It was decided that ready mix should be available from Acme, Akron, Brunswick, Fort Dodge, and Wilmington. This constituted the third phase of the ready mix investigation.

Result: Brunswick and Fort Dodge have already been put into operation, and Akron is continuing to furnish their own requirements as well as supplying Wilmington. Based on the performance of these operations, the other facilities at Acme and Wilmington will be installed. The cost of the equipment including mixer, lid closer, pail filling ram & pump, accessories and installation of the equipment is about $6000 per plant. The pail filling device which is rather inexpensive has improved the capacity of these installations. Some economies in the formula have also been realized, so that the ready mix operation should be more profitable

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than originally expected. We returned to the emulsion binder, in view of its lower cost and also because it gave a better end product than the dry resin binder. If the volume can justify the purchase of emulsion in large quantities, a further savings of up to 20¢/pail can be realized. A photograph of a 5-gallon pail of ready mix is shown below:



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2. WATER RESISTANT WALLBOARD - R & D 264

Objective: To develop a water resistant wallboard for use in moist areas.

Investigation: This project was prompted by National & USG introducing special wallboard products for use in bathrooms and other moist areas. We decided to pattern our product after the USG W/R board, because it was decided that USG's product was more acceptable to the trade. This board consists of a special asphalt wax emulsion treated water resistant core and a special highly sized face paper to resist the effect water has on gypsum board. As a further precaution, a vinyl tape was found which is used to seal all cut edges and joints. USG recommends that a special sealer be used for the cut edges. It is felt that the tape is more foolproof and more practical. In order to use the sealer, brushes and thinner are needed; and the sealer must be applied before the board is installed. The tape overcomes these disadvantages.

Result: Two successful runs of this board were made at Brunswick and Fort Dodge. Sales has processed a request to add this product to the line and have it available from those plants. Subsequently, Fort Dodge has made a run, but the water resistance was not satisfactory. It is felt, however, that this product can be manufactured within the limits set and will be fully competitive with USG and National's water resistant wallboard products.

3. FIRE RATED COLUMNS - R & D 270

Objective: To find a means of encasing a steel column with wallboard so that 2 and 3 hour fire ratings can be obtained.

Investigation: An encasement was devised consisting of 3 layers of 5/8" Firestop attached to metal studs with a wire tie around the first 2 layers. The metal studs have two functions: They offer a secure attachment for the layers of Firestop, and they enable 2 sides to be prefabricated, which greatly simplifies the installation.

Result: The 3 layer 5/8" Firestop encasement protected the column for 3 hours and 45 minutes. This success prompted us to quickly test the same construction with 2 layers of 5/8" Firestop and no wire ties. The desired 2 hour rating was easily achieved as the construction lasted for 2 hours and 20 minutes. A request is being made to Underwriters' that they give us the h ur rating for one layer and 4 hour rating for 4 layers of 5/8" Firestop without running the tests. Designs of one layer and 4 layer applications have been prepared.

These fire ratings give us a big advantage over our competition in this area. The only company which has a 3-hour rating with 3 layers of 5/8" Firestop is USG, and their protective encasement is considerably more difficult than ours to install.

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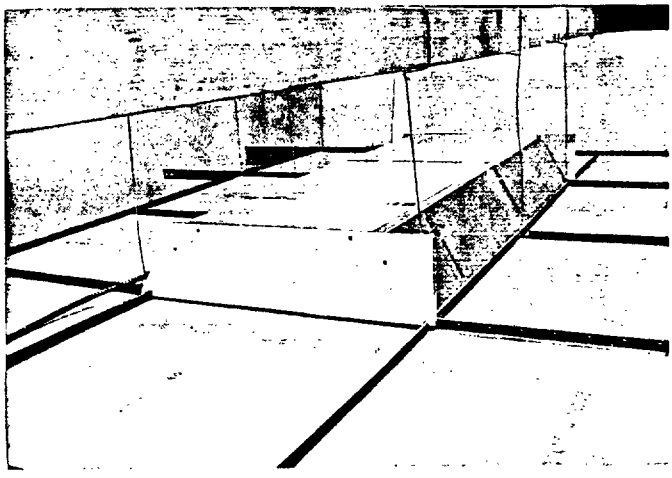
4. 2-HOUR FIRESTOP 120 CEILING WITH LIGHT & VENT OPENINGS - R&D 2[illegible]

Objective: To incorporate light and vent openings in our Firestop 120 Ceiling and retain the 2 hour rating. The test is to be conducted at Underwriters', in order to get the U. L. label.

Investigation: Quite a lot of time was devoted to the light protection system used, inasmuch as this would probably decide whether or not the test would pass. Adequate protection was only one objective. It was decided that 5/8" Firestop should be used for this light protective covering, and we wanted it to be easy to install, so that the relatively low cost of the installation could be promoted.

Result: A 3-piece covering was devised that can be installed in a matter of few minutes. The construction passed the 2 hour test, so the U. L. label and the economical light protection should help sell the Firestop 120 Ceiling. A picture of the light protective method is shown below.



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5. ONE HOUR FIRE RATED INCOMBUSTIBLE FLOOR & CEILING - R & D 267

Objective: To develop a one hour rating for a 2" concrete and steel bar joist deck protected with 1/2" Firestop.

Investigation: This deck was constructed in a similar manner to that used in the 2½" deck protected by 5/8" Firestop, for which we already have a 2 hour rating. Furring channels were located on 24" centers and screw fasteners on 12" centers, as had been done on the 2 hour deck.

Result: The assembly lasted for one hour, 45 minutes, and therefore received a 1½ hour rating. After our successful test, National Gypsum tested a similar deck with 2½" of concrete and received a 2 hour rating. This somewhat took the edge off our achievement, but we are still the only company to have 1½ hours for this lower cost construction.

6. ONE HOUR WOOD FLOOR CEILING - R & D 256

Objective: To test a wood joisted floor protected with 1/2" Firestop attached to resilient channels for sound transmission. A fire rating of 1 hour has already been obtained.

Investigation: A panel was constructed at Riverbank Acoustical Laboratories to be tested for airborne sound transmission.

Result: An STC rating of 47 was obtained. This compares with 45 for National Gypsum Cush-N-Clip system and provides us with a relatively inexpensive fire rated and sound rated wood floor as a means to promote our 1/2" Firestop.

7. 2-HOUR RATED STEEL CORRUFORM & CONCRETE FLOOR & CEILING - R & D 272

Objective: To have Underwriters' make a study using their exploratory test equipment, comparing concrete and steel Corruform versus concrete and steel bar joist construction. The objective is to permit them to allow us a 2 hour rating on the Corruform construction.

Investigation: U. L. informed us that the steel deck construction developed higher plenum temperatures during the course of the test, and therefore they could not extend the rating.

Result: Sales has requested we conduct the full scale test necessary to gain the rating. American Gypsum Company, our licensee, has sold a job on which the insurance can be substantially reduced, if the 2 hour rating is obtained. The only possible difficulty may be the necessity to adhere to certain details of the construction, if they happen to be detrimental to a good test construction.

8. CO-OPERATIVE TESTS ON HOF-KOR HONEYCOMB PANELS - R & D 257

Objective: To test a partition of Hof-Kor prefab panels consisting of a paper honeycomb core and 5/8" Firestop Eternawall faces to achieve a one hour rating. Union Bag-Camp Corporation has shared in the cost of this test.

Investigation: The fire endurance test was passed on the second try, but three efforts to pass the hose stream test have been unsuccessful. It is felt that the small headed Kolorpin fastenings required in this construction, and the tendency of the vinyl surfacing to act as a moisture barrier, caused the failure.

Result: It has been decided to close the project with an unsuccessful conclusion. Sales is requesting that another test be made with regular instead of Eternawall Firestop faces, but this will be handled as a separate project, if the test is approved.

9. ONE HOUR RATED DENS-COTE PARTITION - R & D 219

Objective: To gain the one hour rating with a metal stud partition faced with 1/2" Firestop Dens-Cote Base and Dens-Cote Plaster.

Investigation: Two previous partitions with Tigerskin and 1/2" Firestop Dens-Cote Base had failed. The partitions were constructed at Underwriters' and 1/8" of Dens-Cote applied. In the test of the first partition, a crack developed in the center board, and the test reached only 53 minutes. Thinking the board may have been precracked, the second partition was tested. This time one of the joints opened up and failure occurred at 55 minutes. The Dens-Cote obviously did not offer any protection in itself, and possibly did some harm by causing some unusual stresses.

Result: No further efforts are planned, inasmuch as we appear to have exhausted ideas to allow us to pass. No competitor has passed one hour with this construction at U. L. Pabco has passed the test at Berkely, and this was one reason we were asked to develop the rating.

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10. CO-OPERATIVE TESTS WITH DONN PRODUCTS - R & D 259

Objective: To co-operate with Donn Products in a test of their Modumaker partition using 5/8" Firestop Eternawall faces.

Investigation: We were obligated to cooperate in this test, because by error, 5/8" regular Eternawall was sent to Ohio State for Donn's first attempt; and they failed at 53 minutes.

Result: With 5/8" Firestop Eternawall in the same construction, the endurance time was 72 minutes, indicating the difference in fire protection between regular and Firestop boards.

11. IMPROVED SOUND TRANSMISSION USING THE COMBINATION OF INSULATION BOARD & GYPSUM BOARD - R & D 260

Objective: To assimilate the data from tests conducted by the Insulation Board Institute and dispense them to our Sales, showing the use of our products in these constructions.

Investigation: The data was put into order showing our wallboard and joint system products and presented to Sales for use in promoting our products with these systems.

Result: The information was sent out in a sales bulletin, with a

PROJECTS NEARING COMPLETION

1. JOINT SYSTEM TEXTURES - R & D 261

Objective: To develop pre-aggregated textures for spray application. Specifically, these textures are:

1. Simulated Acoustic (coarse aggregate)
2. Sand Finish (fine aggregate)
3. Masonry (coarse aggregate with rust inhibition properties)

A further object is to develop textures that can be used over surfaces where One Day Joint Compound has been used for the joint finishing, without the necessity of first using a primer.

Investigation: The three products listed above were developed to the trial stage sometime ago. This was during the reorganization of the Sales Department, and the trials never materialized. In some instances the material was lost or used and never reported on. Additional trials were requested, and these were slow to be scheduled. In desperation, it was decided to make these textures available in the area served by the Fort Dodge plant. A quantity of each of the various textures, including a plain (non-aggregated) texture designed to cover One Day without a primer, was shipped to Fort Dodge. Wherever possible, the trials were witnessed by Laboratory personnel. The trials provided some differing opinions but, in general, some unfavorable characteristics prevented their acceptance. These were:

1. When dry, the textures developed a sheen that made the ceilings appear blotchy under severe lighting conditions.

2. The textures would build up locally instead of flattening out as they were applied. This was not too detrimental for the simulated acoustic but caused the sand finish to be coarser than desired.

3. The plain texture covered the One Day satisfactorily in some cases but not in others, so it also failed to achieve our expectations.

On the basis of this experience, it was decided to return all of this texture to Akron and rerun it at a later date. The texture project was brought back to the experimental stage, and means were sought to overcome the objections. It became evident at this time that we should develop the basic textures needed for addition to the line, without regard to their ability to cover applications of One Day Joint System.

After reformulating the products on this basis, some trials were conducted in the Brunswick area. The trial of masonry texture did not materialize, but the sand finish and simulated acoustic products were found to be satisfactory and overcame the previous objections. The field testing will be continued with additional trials in Kansas City and Hartford, Conn. Trials previously conducted at these locations drew unfavorable comments, so this will confirm whether the necessary corrections to the formula have been made. If these trials are successful, we will consider

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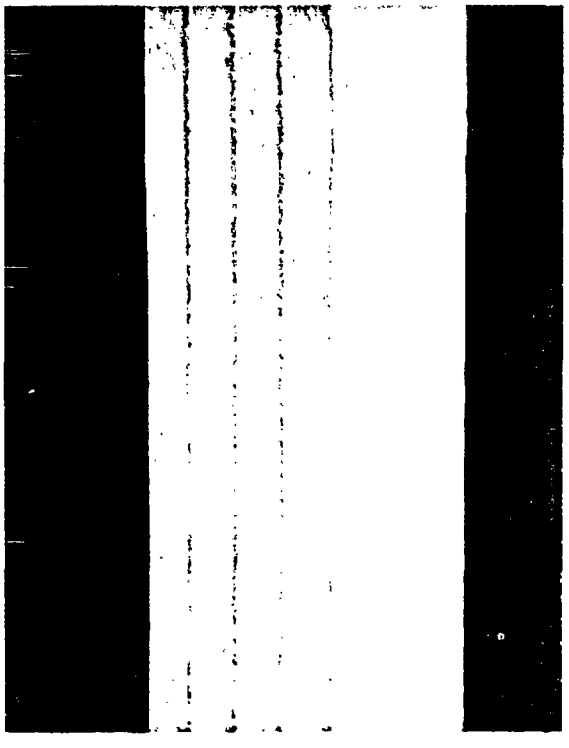
approving the two products for release. As yet, insufficient trials of the masonry texture have been conducted to determine whether this product is going to be acceptable.

2. HUMMER SYSTEM - R & D 209

Objective: To develop improved laminated gypsum ribs for Hummer partition systems.

Investigation: It was previously reported that a 2½" thick x 3" wide rib had been developed, and field trials were being requested. After some futile attempts to have trial partitions constructed with these ribs, one was finally found in Washington, D. C. for approximately 100 linear ft. of partition. The advantages brought out in this trial were (1) the ease of installing electrical facilities, and (2) the increased stiffness of this partition. Concurrent with this development, Mr. Hummer modified the installation procedures for the Hummer "B" System, so that the ribs could be set in metal U channels similar to the manner metal studs are set in place before the faces are applied. The new rib and the improved method of installation should overcome all of the advantages previously held by metal stud systems. The next phase is to have one large trial job completed with the new ribs, so a more thorough evaluation will be possible. A picture of the new rib is shown below:



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3. HIGH EXPANSION DENSITE - R &D 132

Objective: To develop a high expansion Densite suitable for use as a casting plaster for Kirksite dies used in the formation of automobile bodies.

Investigation: A product was developed based on the use of a sugared land plaster accelerator which gave the desired expansion in the required length of time. The presence of the sugar gave the formula resistance to ageing, which is very important in this product. The patterns cast from the plaster must expand 1/8" per foot, as this will counteract the same amount of shrinkage in the Kirksite normally cast in such molds. If the expansion is insufficient, excessive machining of the Kirksite is necessary.

The sugared land plaster formula was made up in a small quantity at Blue Rapids and sent to Clapman Pottery Shop in Detroit for trial. The trial was very successful on both large and small scale molds. The sugared land plaster has been made by hand in the lab, and some more practical means of manufacturing this raw material was sought. It was finally decided to have Fort Dodge manufacture sugared accelerator blocks on their block machine. In a subsequent trial of the high expansion plaster using the Fort Dodge block, the formula was found to lose its expansion characteristics with age. It is theorized that casting large blocks permitted migration of the sugar and therefore loss of its anti-ageing effect. New means are being studied to make the sugared land plaster. Further trials have been called off and will not be resumed until this problem has been solved.

4. RAM PROCESS DENSITE - R & D 132

Objective: To develop a special pottery plaster for use in the Ram Pottery making process.

Investigation: The past history of this project has been one of repeated test failures. Partially this has been due to a lack of complete understanding of the problem. As a result of some recent cooperation from Phaltzgraff Pottery in York, Pa., it is felt this situation has changed. Phaltzgraff recently loaned us two yokes into which we could pour experimental castings. We were able to subject these castings to the purging by as much as 100 psi air pressure, which is a part of the Ram Process making process. Heretofore, we were unable to similate this operation.

The yokes were sent to Blue Rapids so that we could take full advantage of Phaltzgraff's generosity. Ordinarily this work could have been conducted at the Laboratory but, in view of the building rennovations, it was done at Blue Rapids. The tests at Blue Rapids indicated that a fast setting time was necessary to develop the greenstrength quickly, and this fact, rather than porosity, would enable the castings to withstand the purging. A formula which held up under 148 psi was selected, and a sample sent to Phaltzgraff. However, our troubles continued to haunt us, and another unsatisfactory trial was recorded. This time, accelerator lumps formed during the soaking period and caused the slurry to set before it could be used. It is

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felt that this was due to low solubility of the K_2SO_4 accelerator used. An evaluation of various other accelerators is now underway, to turn up one which will perform in the manner required.

5. IMPROVE FLAME SPREAD RATING OF ETERNAWALL - R & D 215

Objective: To achieve a flame spread rating of 25 or less.

Investigation: The flame spread rating was previously reduced from 50 to 35 by using a Borden flame retardant adhesive and the regular vinyl film used for Eternawall. This rating is acceptable in most cases, but there are certain instances where the code requires a rating of 25. The Borden Company was unable to control the quality of their adhesive so that it could be used in our laminating process. Therefore, even though we have the rating, we cannot use it. The search for a new adhesive resulted in one from Monumental Adhesive Company, which performed satisfactorily. In order to confirm this, a larger trial was conducted, and again the results were excellent. At the same time, a thinner vinyl film was suggested, and some trial runs of 6 and 8 mil vinyl were compared with the regular 10 mil vinyl. It was decided that the 8 mil seemed to be satisfactory in every respect, and in addition, it is felt that the thinner vinyl might yield a better flame spread. There is also a potential savings of about .5¢/sq. ft. in the cost of the vinyl film.

A flame spread test of the 8 mil vinyl laminated with Monumental flame retardant adhesive will be made at U. L., as soon as the necessary arrangements can be made.

6. TWO HOUR FIRE RATED WOOD JOISTED FLOOR-CEILING - R & D 273

Objective: To test a double layer 5/8" Firestop ceiling beneath wood joists in order to obtain a 2-hour rating.

Investigation: There are apparently certain codes which require a 2 hour rating for this construction, but they are not enforced because no one has such a rating. Sales has requested that we seek the rating, because they feel that it will give us a promotional advantage over our competitors, particularly in areas where this 2 hour code requirement exists.

Before spending the $5000 or so, which the large scale test costs, two exploration tests were run in Ohio State's small (4'x7') furnace. The first test was identical in detail to the one hour construction we have with resilient channels and 1/2" Firestop under wood joists. This was for comparison purposes. The second construction tested in the small furnace consisted of a layer of 5/8" Firestop nailed to wood joists, resilient channels, and another layer of 5/8" Firestop. The first test lasted for about 60 minutes and performed much like the same construction tested at U. L. The second test was stopped at 1 hour 55 minutes, which we felt was near the end; but we wanted to be able to see the condition of the joists at this point. After our examination, it was felt that the construction probably would not have lasted too much longer, which means that it would probably have been a couple minutes short of 2 hours in a large test, if our correlation is that close.

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We believe that if the face layer of 5/8" Firestop can be held in place longer, there will be a good chance of making the 2 hours. On this basis, the large scale test was recommended. Certain changes in fastening will be made to hold the face layer on longer. The AFE has been approved, and the construction and test are scheduled for late July or early August.

7. DRY VINYL TOPPING COMPOUND - R & D 211

Objective: To formulate a topping compound with a vinyl binder instead of a casein binder. It is intended that the vinyl topping will be a superior product.

Investigation: The investigation was originally directed to the development of a dry vinyl joint compound. Bonding difficulties at low temperatures caused us to direct our efforts to a topping compound, in which the bond is less critical. The advantages of a vinyl formula are:

1. Longer wet life, since it is not subject to putrefaction to the extent that casein topping is.

2. Offers better control from the plant standpoint because of simpler formula and more uniformity of the binder.

3. Requires less mixing water so there is less shrinkage.

4. Offers better working properties than its casein counterpart.

5. Is compatible with One Day, whereas casein topping is not.

Field trials of the vinyl topping were conducted in Nashville, Tenn. and Hartford, Conn. The comments were favorable, and its performance was satisfactory. Also, this product was used for some of the joint finishing in the Laboratory during the renovation of the building. Most applicators commented that it worked like ready mix. It was hoped that the vinyl formula would not be significantly higher in cost than regular topping, but this did not prove to be the case. The vinyl topping has a raw material cost of $84/ton as opposed to $65/ton for the regular topping. In view of the advantages of this topping, the Laboratory will propose that the product be released and sold at a premium price.

8. SYNTHETIC GYPSUM - R & D 221

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Objective: To confirm the results of the initial trial run which indicated that synthetic gypsum could be successfully utilized for wallboard and plaster manufacture. This process involves conversion of the synthetic gypsum by product of the manufacture of phosphroic acid to a useable form.

Investigation: The basic operations of this conversion process for which a patent has been applied are as follows:

1. Drying of the synthetic gypsum as received. The latest shipment contained 20% free water.

2. Neutralization with precipitated chalk or finely ground limestone.

3. Calcination by the continuous calcination method.

4. Tube milling to impart sufficient plasticity.

5. Manufacture into wallboard by reducing the belt speed and shutting off the first section of the kiln. The slow hydration rate of the synthetic stucco makes these steps necessary.

The board produced from this run is considered to be very satisfactory and equal in all respects to wallboard made from conventional stucco. Board made by this process 6 months ago (first trial) shows no effect of deterioration or degeneration. The better than 20,000 sq. ft. of board from this latest trial run was shipped and presumably has been used without comment from the trade. No announcement or distinction of any kind was made when this board was shipped.

Advantages of synthetic gypsum over natural gypsum are:

1. Unlimited source of raw gypsum.

2. It is presumed that the synthetic will cost less than natural gypsum, providing there is little or no freight involved in transferring it to our facilities.

3. No investment in mining or quarrying equipment would be required.

The next logical step would appear to be a run of some duration, perhaps a week or so, in order to make a full and final assessment of the process successfully tried on the two previous occasions.

1. OWENS-CORNING PROJECTS - R & D 210

Objective: To evaluate a glass fiber roving with finer filaments.

Investigation: For some time we have been using a type glass fiber with about 12% DE filaments (.00026" dia.) and 88% G filaments (.00038" dia.). This fiber, called 799, is furnished by Owens Corning. A short time ago, Owens Corning advised that they are now in a position to regulate the proportions of the two different diameter filaments. Since there are twice as many individual filaments per pound of the finer fiber, we naturally asked to be furnished with 100% finer filament DE fiber. They stated that this could be done and are furnishing us with sample spools which we can evaluate. Theortically, our fiber requirement should be able to be reduced by one-half for regular board (not Firestop) if we can use this fiber. Our objective is to realize the potential savings from this fiber.

2. DENS-COTE SYSTEM - R & D 219

Objective: To evaluate Dens-Cote for application over radiant heating cables. This was requested by Sales.

Investigation: Both the smooth and texture finish Dens-Cote formulas were applied over a 4' x 8' panel to which a length of radiant heating cable had been stapled. This panel was energized and has been kept under surveillance for several months. After the initial observations showed no adverse reaction, it was agreed to approve a trial application on one unit of an apartment in Syracuse, N. Y. Texture finish Dens-Cote was specified, since any thermal cracks which might occur would be less likely to be visible. The trial application proceeded without difficulty, and the contractor expressed a desire to put radiant ceilings with our Dens-Cote on the remainder of the apartments. One further 1200 sq. ft. apartment has been agreed to, but nothing beyond this, inasmuch as we want to wait until the installation has gone through a complete heating season before giving it our final approval.

3. DENS-COTE SYSTEM - R & D 219

Objective: To modify our Dens-Cote so that it will meet the requirements of the Chicago Housing Authority.

Investigation: The Fort Dodge Dens-Cote smooth finish formula was revised by incorporating a lower T. C. tubed stucco, in order to increase the compressive strength. This change enabled the compressive strength to be increased from 2500 psi to 2800 psi. One other requirement of the C.H.A. is an abrasion test. The specifications for this test have just been received and call for a Taber abrasion test. We are looking into the possibility of having these abrasion tests made for us.

SGP 0014894

4. TOOLING DENSITE - R & D 132

Objective: To develop a tooling plaster which will meet the requirements of the aircraft industry.

Investigation: Our efforts have been directed to the development of a formula which would meet the requirements of Lockheed Aircraft. The specifications were met and passed, as witnessed by Pittsburgh Testing Laboratory. This report was submitted to Sales, and they subsequently reported back that Lockheed had changed their specifications and that a very fine grind is needed which we could not pass with our present grinding equipment. It would seem that there are some shenanigans going on here. In any event, it has been decided that we should have our tooling plaster tried by others in the aircraft industry. Without the limiting specifications of Lockheed to meet, it may be possible to develop a better product; so this is the approach being taken.

5. RADIANT HEATING PANEL - R & D 235

Objective: To develop a gypsum wallboard panel with electric radiant heating properties.

Investigation: It was last reported that a gallon of Electronics Discovery Corporation's "Aplotherm" conductive coating material had been ordered. We were charged $100 for this gallon of material after several outlandish proposals of theirs were rejected by us. A 4' x 8' panel was fabricated, consisting of a layer of "Aplotherm" between a piece of 3/8" wallboard and a piece of 1/4" wallboard. The 1/4" board is on the face side to allow the least possible thickness for the heat to pass through. The "Aplotherm" was applied in five roller coater applications and serves as the laminating adhesive as well as the heating element. Flat braided conductive strips are located in the depressions provided by the tapered edges. This panel has been energized and provided a surface temperature of 90 - 100°F. for several months.

The next step will be to actually heat a space with these panels. This will be done after we get into the new building.

6. Calcination and Particle Size Studies - R & D 263

Objective: To increase our knowledge of processing gypsum for the manufacture of wallboard and plaster.

Investigation: A new method of analysis, utilizing a vacuum oven was found not to be dependable. A modification of this method was worked out in conjunction with Mr. Kuntze of the Ontario Research Foundation. This method involves exposing the samples to 90% relative humidity in order to hydrate the soluble anhydrite.

Samples of kettle calcined and continuous calcined stucco have been analyzed by the revised method, and the results were reasonably reproducible. Differential thermal analyses prepared on these same samples by the Ontario Research Foundation agree fairly well with the chemical analyses. The revised analysis method is presently being considered in Committee C-11 of ASTM.

SGP 0014895

The second phase of this investigation deals with the study of particle size gradation. A Coulter Counter was purchased to enable us to determine the particle size distribution, which is finer than 325 mesh or 44 microns. Quite a lot of time was spent in familiarization with the Coulter Counter and tracking down and eliminating various discrepancies that occurred. This work had been completed when Mr. Hinkel, who was doing this work, had an extended illness. He has now returned and the particle analysis has been resumed.

Samples of three different grind stuccos were obtained from Blue Rapids and submitted for Coulter Counter analysis as samples 1, 2 and 3. Sieve analyses had been made, but these results were not revealed to Mr. Hinkel. The subsequent Coulter Counter analysis picked out the samples in the proper order and gave us some information that heretofore had not been available. For example, we found that 85% of the Blue Rapids tubed stucco sample was finer than 4 microns. It will take an accessory piece of equipment to measure particles finer than 4 microns, so this is now under consideration. Other testing will be done to give a more comprehensive evaluation of the equipment, but it appears that it will enable us to increase our knowledge substantially in this area.

7. NEW WOOD GRAIN PRODUCTS - R & D 268

Objective: To develop new grainboard patterns, competitive with USG's Ultrawall.

Investigation: Sample boards of Masonite grainboard, USG Ultrawall, and large samples of wood grain paper from Di-Noc were displayed alongside one another for comparative purposes. It was decided that the Di-Noc paper appeared to be very satisfactory, but that we would require the depressed striations similar to those in the USG and Masonite products. It has not yet been decided how many new patterns will be offered, whether they will have a vinyl covering, or whether we will striate some of our present grainboard patterns. The equipment to perform the striating is presently under investigation at Fort Dodge.

8. ONE HOUR PARTITION WITH GOOD SOUND PROPERTIES - R & D 271

Objective: To develop a wood stud partition which can be promoted along with the one hour wood ceiling which has a sound rating of 47 STC.

Investigation: Our first thought was to build and test a partition similar to the one hour ceiling construction, i.e., resilient furring channels attached to the studs and 1/2" Firestop, screw attached to the channels on each side. This partition was tested and failed miserably. After our sound testing program is completed, some alternate and better sound isolation constructions will be considered for another fire test.

SGP 0014896

9. GYPSUM ACOUSTICAL TILE - R & D 274

Objective: To develop a gypsum acoustical tile using the resin reinforced foam idea.

Investigation: Some previous work directed toward the development of a lightweight board confirmed a theory regarding the reinforced foams. The theory is that a foam cell containing some resin or other reinforcing material surrounding the cell will act as an aggregate in a gypsum matrix. This would provide greater strength than normally expected of a foam gypsum structure. This theory was confirmed, but the economics of its use in board were not favorable. It was felt that this theory might be applied to a product for which the additional cost could be justified. With the knowledge that acoustical tile, particularly when fire rated, sells for 15 - 25¢ per sq. ft., some exploratory work was done. Sample 2' x 2' tiles at 15 - 17 lbs/cu. ft. density were made, using reinforced foam and glass fibers to provide sufficient compressive and transverse strength. Sound absorption tests conducted by an outside laboratory indicate that our product is just about as good acoustically as Armstrong's 2 hour rated Fire-Gard tile. A fire test in our small scale furnace indicates that it performs better than either our Firestop 120 or Armstrong's Fire-Gard, both of which have 2 hour ratings. The estimated raw material cost, excluding paint, is 4¢ per square foot for 3/4" thickness, allowing 25% for waste.

This acoustical tile appears to offer good potential and when presented to Sales, it was suggested that we assign a project to proceed with its development. This all occurred during the building renovation, and there was no space to set up for casting full size slabs. As soon as the new building is ready, the necessary foaming, mixing and casting equipment will be installed. In the meantime, our old Standing Wave equipment for testing sound absorption has been sent out for repair so that it can be used to test the sample tiles which will eventually be made.

10. PROTEIN JOINT COMPOUND FORMULATIONS - R & D 275

Objective: To make improvements where advisable or necessary to our Joint System products.

Investigation: A water retention agent from the hydroxyethylcellulose family has been found which offers improved qualities and cost savings for our line of Joint System products. This product, called Natrosol, will be used as a substitute for Kelsize, which is a Kelp product. In conjunction with this substitution, one of the preservatives will be eliminated. This preservative was necessary because of the degenerative effects of the Kelsize.

The improvements in quality expected are:

1. Easier mixing
2. Better working
3. Greater insurance against staining problems which stem from preservatives.

SGP 0014897

The savings vary with the formula, but based on the last six months' sales, the anticipated annual savings would be $22,300.

The savings do not include ready mix in which we have already incorporated Natrosol. A slow changeover to Natrosol in all products is already underway and should be completed by the end of the year.

11. SOUND RATED CONSTRUCTIONS - R & D 276

Objective: To conduct a sound test program to establish sound ratings for various partition and floor & ceiling assemblies. Most of this is being done at Donn Products' Ohio Research facilities.

Investigation: A rather complete group of sound ratings has been attained with sound transmission Class (STC) values of 50 or better for wood stud, metal stud, and laminated gypsum partition constructions. Other partitions of each type attained ratings in the 45 - 50 STC range. Two new constructions were originated in the course of the testing. One is a metal stud partition with an STC of 52 and the other is a 2½" x 3" gypsum stud partition with an STC of 50. These can be promoted as firsts for Bestwall.

All of the data recently developed is being put into shape for distribution to the trade and to our sales people. Some further tests are planned, and this data will be added at a later date. Our problem in dispersing this information will be to present it in such a manner that it will be understood by all. On the basis of some of the sound ratings obtained, fire tests will be proposed for identical constructions. It is felt that sound and fire ratings go hand in hand, and wherever one is needed, so is the other.

12. DIMENSIONAL CHANGE OF GYPSUM PRODUCTS AT HIGH TEMPERATURES - R & D 277

Objective: To measure the dimensional changes which occur in gypsum products at temperatures up to 2000°F. and assess the significance of the data obtained. A Gaertner Dilatometer was purchased to make these determinations.

Investigation: Our initial work will involve fire rated board with the idea that we may be able to predict what happens to this board in an actual fire test. During the calibration of the instrument, the element burned out, so it has been returned for repair.

13. COOPERATIVE RESEARCH PROGRAM WITH JOHNS-MANVILLE - R & D 278

Objective: To enter into such cooperative ventures as are considered to be of interest to both companies. The first venture agreed upon is a fire test of Soundike-Firestop installation.

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Investigation: The fire test has been planned and will be held at Ohio State in the near future. The sound rating of the partition is 45 STC, and if the test is passed, Bestwall and Johns-Manville will be the only ones to have a one hour rating for this partition. Two tests by the Insulation Board Institute failed to achieve the desired one hour.

Other projects were discussed in a meeting with the Johns-Manville people, but there has been no firm commitment regarding any other cooperative ventures at this time.

14. CONCRETE & BAR JOIST CEILING WITH 1/2" FIRESTOP - R & D 279

Objective: To develop a 2 hour rating for this construction using $2\frac{1}{2}$" of concrete. One and a half hours was attained on the same construction with 2" of concrete.

Investigation: The A.F.E. is being processed, as Sales has indicated a strong interest in this test. National Gypsum Company already has a 2 hour rating for this construction.

SGP 0014899

SUMMARY

The highlights of the Research Acitivities for the past six months have been:

1. The introduction of a ready mix joint compound;
2. The development of a water resistant wallboard;
3. The second successful trial in the manufacturing of wallboard from synthetic gypsum;
4. The 2 and 3 hour fire ratings for columns;
5. The 2-hour rating for the Firestop 120 Ceiling with light & vent openings;
6. The $1\frac{1}{2}$ hour rating for the concrete ceiling with 1/2" Firestop underneath; and
7. The sound test data attained thus far for the various partitions tested.

Our efforts in certain areas have been retarded, since our shop facilities were removed during the renovation of the building. These facilities will be restored in the new building which is under construction. The installation of certain new equipment, the remodeling of some of the old equipment, and the additional space available will enhance our ability to provide information and conduct project investigations.

Our present plans for the last half of 1964 call for:

1. The continuation of our fire and sound testing program;
2. Attempts to complete the aggregated textures, new grainboard, and industrial gypsum product development;
3. The pursuit of potential cost savings in conjunction with the finer filament glass fiber and new water retention agent for joint system; and
4. Embarking on new projects such as the development of a gypsum acoustical tile.

It is also hoped that we can devote a certain amount of time to the search for knowledge, which is not necessarily directed to present objectives but which may serve as a basis for future developments.