

BESTWALL GYPSUM COMPANY  
SEMI-ANNUAL RESEARCH AND DEVELOPMENT REPORT  
JULY 1, 1963 TO DECEMBER 31, 1963

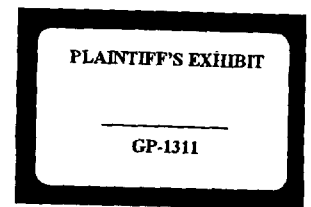


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## FOREWORD

This report covers the activities and accomplishments of our research program for the last six months in 1963. Our personnel was changed somewhat when Mr. E. A. Smith left the Company in August to attend medical school. Mr. N. F. Morrone was transferred from the Quality Department, bringing the Research Division back to six men including the writer. We believe that Mr. Morrone's talents can be put to broader use in the Research Division.

On the basis of the record of last year's R&D expenditures, projects presently underway and future projects being contemplated, a budget for 1964 was prepared and submitted to Management. The purpose of the budget is to have a record of the expenses, and to see that our money is wisely spent. Our total 1964 Research expenditure is expected to approximate \$150,000.

Included in this report is the market performance of products which have been developed through research. The fire ratings and other technical information developed for Sales and certain product improvements cannot be clearly assessed. However, we trust that these accomplishments have made us more competitive and therefore have favorably affected our Sales.

The major portion of the report is devoted to the progress of the various projects. For clarification, it is separated into three sections:

- (1) Projects Completed
- (2) Projects Nearing Completion
- (3) Projects Underway

MARKET PERFORMANCE OF NEW PRODUCTS

JULY THRU DECEMBER 1963

| <u>PRODUCT</u>                | <u>SALES VOLUME</u> | <u>MILL BASE SALES</u> | <u>ESTIMATE<br/>GROSS PRO</u> |
|-------------------------------|---------------------|------------------------|-------------------------------|
| 1. Fireston 120 Tile          | 95,000 sq.ft.       | \$ 13,572              | \$ 4,372                      |
| 2. Grabit Adhesive            | 37 tons             | 6,899                  | 3,977                         |
| 3. One Day Joint Compound     | 388 tons            | 64,501                 | 18,293                        |
| 4. Ready Mix Joint Compound   | 482 pails           | 2,136                  | 61                            |
| 5. Dens-Cote Plaster          | 67 tons             | 3,894                  | 1,220                         |
| 6. Dens-Cote Tape             | 1452 rolls          | 1,452                  | 591                           |
| 7. Dens-Cote Base (T.C.Lath)* | 240,000 sq.ft.      | 9,720                  | 3,620                         |
| 8. 1½" #8 Drywall Screws      | 372 boxes           | <u>1,098</u>           | <u>284</u>                    |
|                               |                     | \$103,272              | \$32,418                      |

\*Amount of Dens-Cote Base which normally would be sold with 67 ton of Dens-Cote Plaster. Actually, increase in volume of Dens-Cote Base over the first half of 1963 was 220,000 sq. ft.

PATENT INFORMATION

Patents Issued - None

Patent Applications Submitted (Method of Processing Synthetic Gypsum  
(One Day Joint Compound  
(Grabit Adhesive

Patent Applications Being Prepared: Synthetic Gypsum (Canadian)  
Continuous Calcination (2)

A. NEW PRODUCTS

1. Thincoat Plaster - R & D 219

Objective: To develop a competitive thincoat lath and plaster system.

Investigation: The basic thincoat plaster formula, developed over a year ago, has been undergoing field trials since that time. The trial stage was recently brought to a successful conclusion, and on November 4, Bestwall's Dens-Cote System was announced at the CPLIA Convention.

A limited amount of Dens-Cote has been available out of Wilmington, and Fort Dodge was also stocked with raw materials to prepare for a limited release of Dens-Cote. However, after the CPLIA Convention, the Sales Department requested that Dens-Cote be made available at all plants. Plans were put into motion to have Brunswick and Blue Rapids manufacture Dens-Cote. Blue Rapids will furnish the requirements of Acme, Akron, Grand Rapids, New Orleans, and Sigurd.

Result: By the end of the year, all plants except Grand Rapids, Acme and New Orleans were prepared to make Dens-Cote shipments. The latter three plants will receive stocks of Dens-Cote shortly after the first of the year. Some pictures were taken of a recent installation of the Dens-Cote System in the Concord Hotel at Kiamisha Lake, N. Y. Some of these are included in the following pages.

Dens-Cote appears to have certain advantages over other thincoat plaster systems. The possibility of patent protection for the Dens-Cote system is being considered. The major benefit to Bestwall is the Dens-Cote Base sales which can be generated. Each ton of Dens-Cote sold will require about 3600 sq. ft. of Dens-Cote Base to be sold with it.

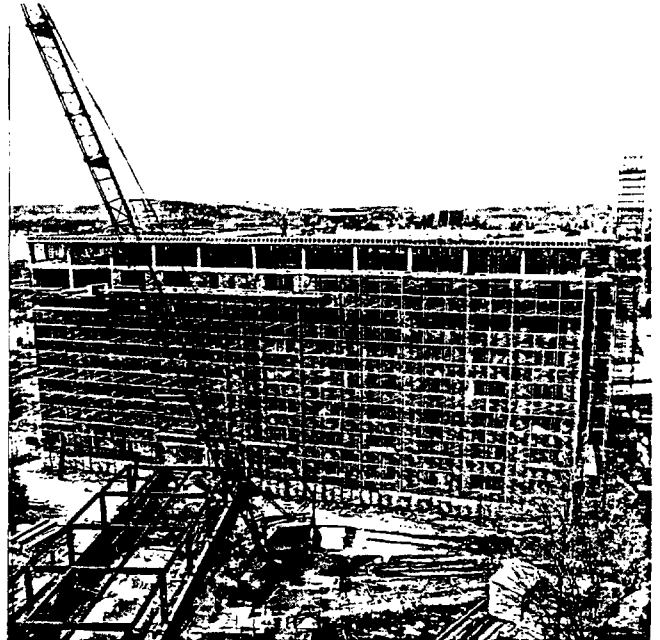
Other phases of this project which shall be continued are:

1. Test a partition with 1/2" Firestop Dens-Cote Base and 3/32" application of Dens-Cote Plaster to try to attain a one hour fire rating.
2. Reduce the amount of Densite required in the Dens-Cote plaster formula. The use of Densite in the formula limits our total Dens-Cote capacity to about 2000 tons per month because of the limited supply of Densite.
3. Investigate the use of Dens-Cote directly over masonry bases, such as block and poured concrete.

DENS-COTE APPLICATION AT KIAMESHA LAKE, N. Y.



Concord Hotel Resort



New Building



Applying Grabit to  
Dens-Cote Base



Installing Dens-Cote  
Base on Masonry Wall



Mixing Dens-Cote



Dens-Cote on Mortar Board



Dens-Cote Application



Dens-Cote Troweled Smooth

## PROJECTS COMPLETED

### 2. Pre-Fabricated Panels with Gypsum Ribs - R & D 223

Objective: To develop a pre-fabricated sandwich panel unit to be used in non-load bearing partition construction.

Investigation: Four previous trials had been held and indications were that the panel installed satisfactorily and provided an acceptable finished wall. One problem was that of damage in shipment and handling. The research department requested that one further trial be arranged, wherein a long run of panels could be installed. About 30 panels were fabricated for this purpose and shipped to Washington, D. C. This trial never materialized, and the project has now been given the lowest sales priority. Our plans are to inactivate the project and make no further effort for additional field trials at this time.

### 3. Acoustical & Ceiling Tile Products - R & D 246

Objective: To test for approval a 1/4" ceiling tile for sale to the residential market.

Investigation: The only concern of the 1/4" tile is the degree of sagging. Sag tests were run at Brunswick under existing humidity conditions and at Paoli under controlled humidity conditions. Paoli samples tested show no more sag than the 3/8" acoustical tile we presently sell. The Brunswick tests showed approximately the same degree of sag for the 1/4" ceiling and 3/8" acoustical tiles.

Result: Approval has been given, from the technical standpoint, for the 1/4" tile to be added to our line.

### 4. Acoustical & Ceiling Tile Products - R & D 246

Objective: To approve a 2' x 4' acoustical tile for addition to the line.

Investigation: The possibility of excessive sag had to be resolved before the product could be approved. This has involved sagging tests which have been conducted at Brunswick under existing humidity conditions, at Paoli under existing humidity conditions, and at Paoli under controlled conditions of relative humidity. Some of the Brunswick results were poorer than the 3/8" 2' x 2' acoustical tile but the Paoli results did not show much difference between the two.

Result: Due to problems with drilling of 1/2" tile, the Manufacturing Department has requested that this product not be added to the line at the present time.

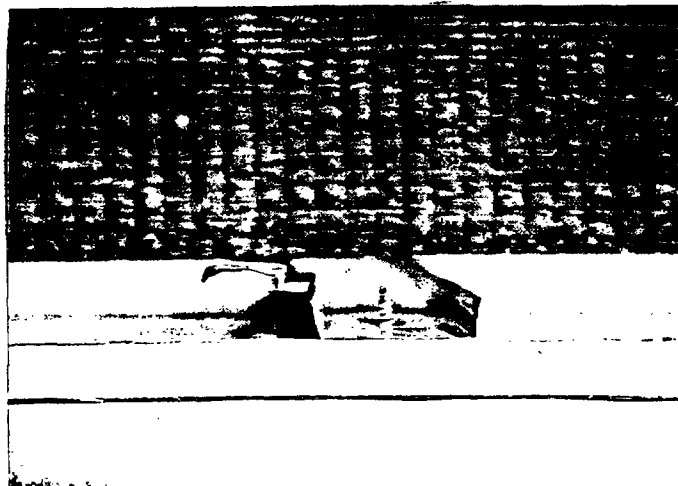
B. SALES AIDS

1. One Hour Wood Floor & Ceiling - R & D 256

Objective: To develop a one hour rating for a wood floor construction with 1/2" Firestop as the underside (ceiling) protection.

Investigation: The initial attempt to develop this rating resulted in a failure at 48 minutes. Sales still indicated a strong desire to achieve the one hour. A furring channel or resilient channel attachment was proposed as a possible way of achieving the one hour with 1/2" Firestop. Based on exploratory fire testing and the improved sound rating possible, a revised construction using the resilient channel was selected and a second test was conducted at Underwriters' Laboratories.

Result: The one hour was passed using the 1/2" Firestop over resilient channels. A cross sectional photograph of the assembly shows the construction tested. This rating gives us an extremely competitive construction to promote, where both fire and sound insulation are desired. This gives Bestwall another first, since no one else has a one hour rated wood floor with 1/2" Firestop. Data on sound insulation properties is being developed.



2. New Use for Grabit - R & D 244

Objective: To explore the possibility of Grabit being used to adhere gypsum wallboard to polystyrene exterior insulation board.

Investigation: Several small installations were constructed at the Laboratory, and it was found that Grabit would bond to polystyrene insulation. A recommended procedure calling for

## PROJECTS COMPLETED

3/8" x 5/8" ribbons to be applied on 1" centers was specified. A large test was conducted in Omaha, Nebraska, on a high-rise building and observed in the various stages and over a period of six months. All reports from this job were very favorable, and the finished installation was regarded as completely satisfactory.

Result: On the basis of the satisfactory performance on the high-rise job in Omaha, Grabit was approved for use in applying wallboard to polystyrene insulation. This is a system we can promote where good insulation is required and is another outlet for Grabit.

### 3. Predecorated Gypsum Wallboard - R & D 215

Objective: To develop a flame spread rating or lower than 50 and preferably below 25.

Investigation: At our request, a number of adhesive suppliers submitted samples of fire retardant adhesives for laminating vinyl film to gypsum wallboard. It was found that making the adhesive fire retardant would be easier and cheaper than rendering the vinyl film fire retardant. A Borden adhesive was selected as offering the best fire retardant properties, while performing reasonably well on our laminator at Fort Dodge. A number of boards were laminated, using the Borden adhesive and tested in the tunnel at Underwriters' Laboratories. A flame spread rating of 35 was attained.

Result: This rating allows us to use Eternawall in most places. A flame spread of 25 is required for an incombustible rating and unlimited usage. It is possible that further work will be done to try to get the incombustible rating.

The adhesive is not entirely satisfactory from plant operation standpoint, and further improvement by the adhesive manufacturer is in process.

## C. IMPROVED PRODUCTS & PROCESSES

### 1. Owens Corning Projects - R & D 210

Objective: To approve 799 binder (Muzzy Mix) glass fiber for use in regular wallboard. This fiber offers better reinforcing value per pound of fiber used.

Investigation: The 799 glass fiber proved difficult to cut, probably due to the finer diameter filaments. As a result of these cutting problems, our entire cutter operation was scrutinized. This was resolved by improvements in our cutters. Faster cutterhead speed, relocation of the holddown roll, and replaceable razor blades all improved the cutter operation.

All plants except Wilmington are presently using 799 glass fiber. A replaceable razor blade cutter is ordered for Wilmington, and this should permit them to be able to use the 799 fiber. During the time the cutter operation was being studied, two significant changes in the wallboard operation occurred. These were:

1. The elimination of paper fiber from the board core.
2. The reduction in standard board weight at several plants.

A reduction in the amount of glass fiber was originally intended when the 799 glass fiber was approved. However, in view of these other recent changes, it is felt unwise to consider a reduction in the amount of glass fiber at this time.

The development of better types of glass fiber which permits more complete defilamentization of the strands was a significant factor in the program for deletion of paper fiber from wallboard core. This change has made possible large savings in processing wallboard & lath products.

2. To Evaluate Methods of Grinding Molding & Industrial Plasters - R & D 250

Objective: To find a method to overcome dusting and mixing problems of industrial plasters from Wilmington, and therefore make these products more acceptable to the trade.

Investigation: Based on some initial testing which looked favorable, an Entoleter (impact type grinder) was purchased and installed. The Entoleter gave the plaster the desired properties but did not remove the fine gritty material. It was found necessary to use the Entoleter in combination with an air-separator to remove the gritty material.

Result: The resultant molding and pottery plasters produced by the air-separator and Entoleter grinding has been found to be completely acceptable by all the customers who have tried it thus far.

3. Water Repellent Treatment for Sheathing Paper - R & D 203

Objective: To find a repellent which will apply easier and offer better repellency.

Investigation: Three more candidates were tried during the past six months. One promising repellent was given a full scale trial on a run of sheathing paper. The paper showed satisfactory repellency, but when it was made into board, the repellency was almost completely lost. After two years' effort and no satisfactory progress and no fresh ideas, there does not appear to be any justification for further work. The project therefore is being inactivated.

OTHER

1. Accumulation of Fire & Sound Test Data - R & D 219

Objective: To collect and categorize all available fire and sound test data from the various constructions.

Investigation: This information was gathered from competitive literature, Sweets Catalogue, Underwriters' reports and various trade organizations' literature. It was then sorted, put onto cards, and filed in categories according to type construction the materials used, and the fire rating developed. Where available, sound ratings were also included.

Result: A card file has been prepared containing fire and sound ratings for numerous constructions which have been tested. This file will be kept up to date and provides a quick reference for this information. It will chiefly be used in planning our own tests.

1. JOINT SYSTEM SPRAY TEXTURES - R & D 261

Objective: To develop pre-aggregated textures for addition to our line of Joint System products. Another objective is to eliminate the necessity for a primer over surfaces where One Day Joint Compound is used prior to texture applications. Three new products and one improved product are our goal. The new products are:

1. Simulated Acoustic Texture
2. Sand Finish Texture
3. Masonry Spray Texture

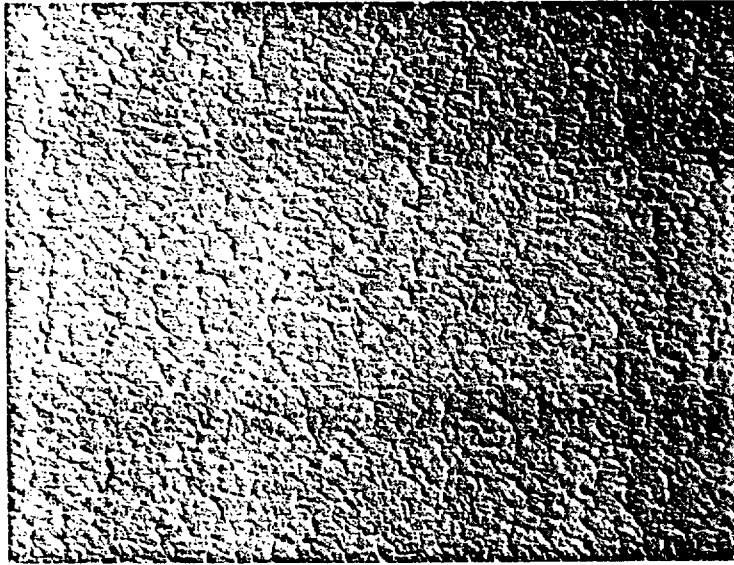
Our standard texture is to be improved so that it will hide One Day Joint Compound and Topping Compound and can be hand or spray applied.

Investigation: All four products have been formulated and appear to give the desired finish. In addition, Laboratory tests show that all of these products will hide applications of One Day where a final coat of topping compound is used in conformance with specifications. In addition, all of these textures will be whiter than competitive products and have excellent application properties. The plain texture, in particular, has been tremendously improved to the extent that it hides as well as paint and has versatility in making a variety of textures possible from the one product.

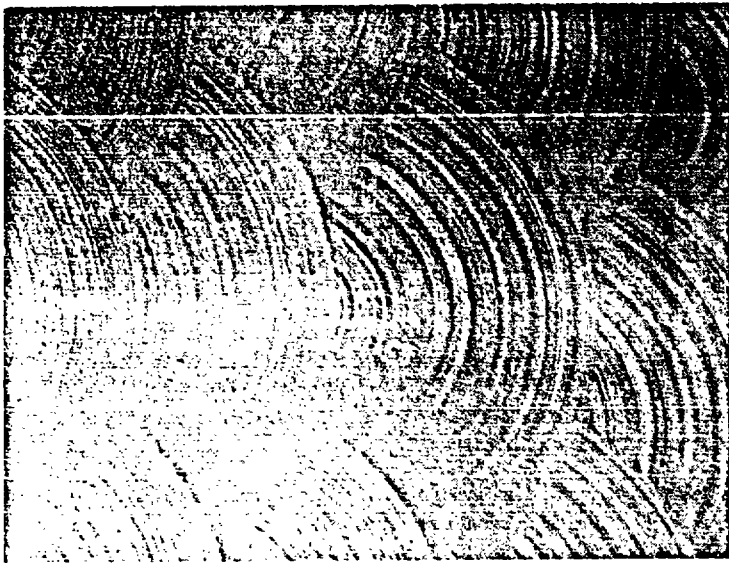
The type of surfaces possible with this texture, as well as those from the simulated acoustic and sand finish products, are shown in the attached photographs. The masonry spray texture also requires that it have rust inhibitive properties. There is no similar competitive product, so this will be a first for Bestwall, if this texture is successful in actual use.

Thus far, very few trials have been made. A number of trials which were scheduled were either postponed or cancelled during the re-organization of the Sales Department. A limited release for the plain, sand finish, and simulated acoustic textures is being considered, in order to expedite the field performance evaluation. Texture products represent only 4% of our Joint System sales, and it is felt that this figure should be as high as 10%. We believe these new textures will help bolster our Joint System sales.

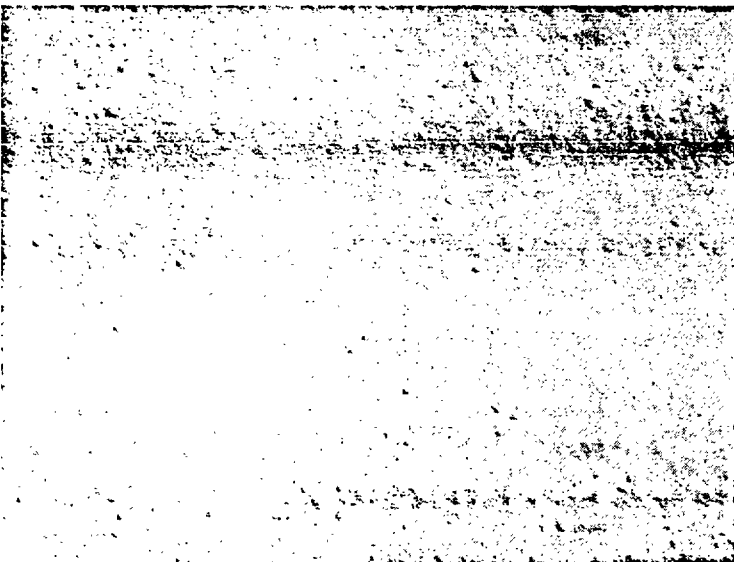
PLAIN TEXTURE (No Aggregate)



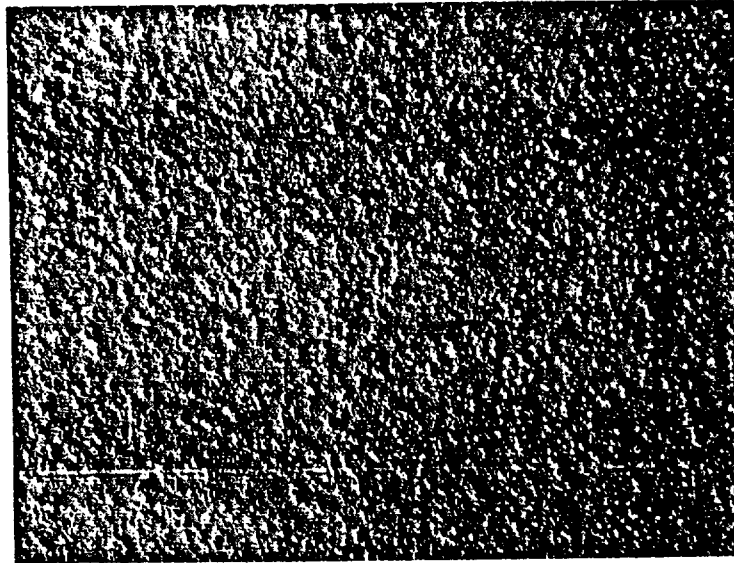
Roller Stipple Finish



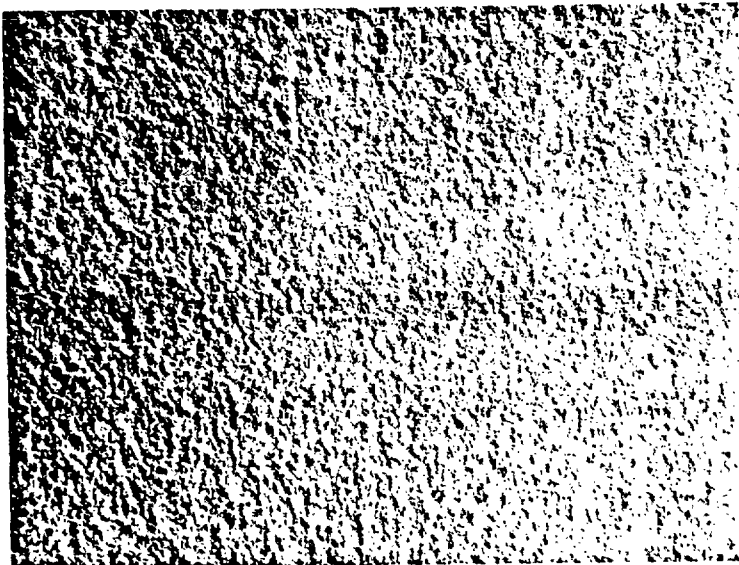
Brush Swirl Finish



Spray Orange Peel Finish



Spray Application  
Sand Finish



Spray Application  
Simulated Acoustic

PROJECTS BEARING ON THE FUTURE

2. Ready Mix Joint Compound - R & D 211

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

Investigation: A formula utilizing a dry binder was developed and field tested. The field reports were favorable. Even though the economics were not completely favorable, a small facility in Akron was approved to furnish the requirements of a large Detroit job. Unfortunately the contractor ultimately decided to use dry joint system on this job. As a result, only about 500 pails of ready mix were sold from Akron, whereas preparations had been made to furnish 3000 pails. We did not gain much from this limited experience, but it did tell us that there is very little potential for ready mix in the area served by the Akron plant.

The purpose of the dry binder as opposed to an emulsion binder was to eliminate the necessity for purchasing tanks, pumps, etc., to handle the emulsion. Other means have been found to purchase and handle emulsion which do not require the large investment for equipment formerly required. The emulsion formula offers a possible saving of 30% per pail. Costs using this formula have been worked out, and the economic picture is improved but still is not too favorable. Some of the poorest areas economically (Atlanta, Chicago, and West Coast) have the best potential market-wise, according to field surveys. On the other hand, the best areas economically (Akron and Acma) are the poorest market-wise. However, every year ready mix makes more impact on the joint system market and becomes more of a competitive factor. This competition is important insofar as joint system sales are concerned, but even more important is its influence on board sales. The future course of this project is undecided at present, but it is felt that it will be only a question of time before we are forced to meet this competition.

3. Cooperative 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 faced with 5/8" Firestop Eternawall to achieve one hour rating. Union Bag-Camp Corporation, the manufacturer of the honeycomb, is sharing in the cost of this test.

Investigation: On the second try, the fire endurance test was passed. However, two hose stream tests have failed due to inability of the fasteners to hold the board in place. The probable causes are: the small heads of the Kolorpin fasteners, and the trapping of moisture in the board core by the vinyl facing, and the limited number of fasteners. Larger headed Kolorpin fasteners have been located, but it has not yet been determined whether there is sufficient interest to make another try to pass the hose stream test. The Sales Department is to advise us of their further interest.

4. Hummer System - R & D 209

Objective: To develop thicker Hummer System partitions to compete with metal stud partitions.

Investigation: A screening of several thicknesses and widths of gypsum ribs revealed that a 2½" thick x 3" wide rib was optimum in size, and with 1/2" face boards gave a very satisfactory wall. These ribs are fabricated from 4 layers of 5/8" board. Fifty 2½" ribs were fabricated at Fort Dodge and shipped to Houston at the request of Sales. The trial never materialized, and the ribs apparently were lost, so another 50 ribs were fabricated at Paoli. We are awaiting a trial to be arranged for these ribs. Advantages expected from these ribs over the thinner ribs are (1) easier access for electrical fixtures and wiring; (2) improved sound properties; and (3) greater acceptance of thicker walls. The cost of the 2½" ribs has been estimated to be 3.5¢ per linear ft. by Fort Dodge. We seal conventional ribs for about 7¢ per linear ft.

5. Donn Products Cooperative Projects - R & D 259

Objective: Evaluate a clip-on stud developed by Donn Products and participate in a fire test to achieve a one hour rating.

Investigation: Several wall sections were constructed and tested for impact resistance with this new Donn metal stud. Strength-wise, the partition is quite satisfactory, being more rigid than a standard metal stud partition. The board slides into a metal flange which makes for a very fast installation. One problem is the adhesion of the joint system to the gripping flanges of the stud. Donn Products has asked for our assistance in overcoming this problem, and we agreed to provide this assistance.

The first two fire tests of the Donn stud with 5/8" Firestop failed to reach one hour. A third test which Donn Products conducted on their own with a 3-5/8" ~~deep~~ clip-on stud just barely passed the one hour. Based on tests in our Laboratory, several changes were suggested to Donn Products and eventually incorporated.

This stud, now called Grenadier System, offers considerable potential, so Donn's future development with this stud is being closely watched.

6. Fire Rated Columns - R & D 270

Objective: To develop a means of covering a steel column with wallboard to attain 2, 3 & 4 hour fire endurance ratings.

Investigation: A protective scheme has been devised consisting of 3 layers of 5/8" Firestop attached to metal studs against the flanges of the column and with tie wire around the first two layers with the objective of attaining the 3 hour rating. The test is scheduled for shortly after the first of the year. Based

## PROJECTS NEARING COMPLETION

on the results of this test, designs for other ratings will be made. At present, Bestwall has no ratings for columns, and these are needed to go along with our other systems, particularly for high-rise jobs where column protection is important.

### 7. One Hour Fire Rated Incombustible Floor & Ceiling - R & D 267

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

Investigation: This will be similar to the construction consisting of a 2½" concrete deck protected with 5/8" Firestop for which we already have a 2 hour rating. If successful, this will give us the hour rating for a less costly incombustible construction.

## PROJECTS UNDERWAY

### 1. Extrusion Method of Forming Gypsum Board Products - R & D 21

Objective: To evaluate the process as a means to manufacture gypsum board of a more consistently uniform weight and caliper.

Investigation: In December 1962, the extrusion process was tried at New Orleans with a stationary forming device. Uniform caliper was achieved, but the extrusion device was not sufficiently self-cleaning and paper breaks occurred. Another approach, also discussed in the patent '1s to form board between moving belts on short pulley centers. There has been no progress on this approach to date, because we have been unable to find a suitable type belt to use. Recently a sample of a mesh type belt was received which offers some possibility if it does not mark the board paper, and this is now under investigation.

### 2. Densite Tooling Plaster - R & D 132

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

Investigation: Most of our efforts have been directed toward developing a formula that will meet the requirements of Lockheed Aircraft. The tests had to be confirmed by an independent laboratory in order for Lockheed to accept them. This has all been done now. The tests were successfully passed and copies of Pittsburgh Testing Laboratories' report are in the hands of Sales. A trial will no doubt be arranged with Lockheed on the basis of this report. Some new information has been received regarding USG's Hydrocal B-11 formula, so further investigation will be done along these lines.

### 3. High Expansion Densite for Patterns - R & D 132

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

Investigation: A formula was developed which gave the necessary expansion but lacked satisfactory expansion control. A fresh sample of USG's high expansion has been obtained and is being used as a standard. Quite an extensive investigation is being made to find the balance of active ingredients which will offer the best expansion control. It is hoped that a satisfactory product will result from these efforts.

### 4. Special Densite for Ram Press Process - R & D 132

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

SGP 0014869

## PROJECTS UNDERWAY

Investigation: All trials made to date have been unsatisfactory, and it was our understanding that the problem was one of too low porosity. It has since been found that the problem is insufficient surface hardness, rather than low porosity. With this information, another formula has been developed with increased surface hardness. Blue Rapids has made a batch of this new formula, and samples have been submitted to various pottery shops.

### 5. Owens Corning Projects - R & D 210

Objective: Develop constructions with good fire and sound properties with Fiberglas insulation board and gypsum board.

Investigation: Two wood stud partitions with an inner layer of Fiberglas insulation board and an outer layer of 1/2" Firestop on each side were tested at Underwriters' Laboratories for fire endurance, and both failed to make the desired one hour. This was an unexpected result. It is believed that the insulation board on the unexposed side of the partition caused such a high temperature inside the partition that all the studs burned prematurely and caused the failure under load in each case. Owens Corning financed these tests, so this information was obtained very inexpensively. We had expected to be able to promote several good fire and sound rated constructions based on the combination of Fiberglas board and gypsum board, but now it appears that we should direct our efforts to the resilient channel constructions covered in R & D #256 and R & D #271. We are still conversing with Owens Corning regarding other possibilities of their insulation board, and it is still possible that other tests will be conducted which will prove to be of value.

### 6. Synthetic Gypsum - R & D 221

Objective: To find a means of utilizing synthetic gypsum for plaster and wallboard manufacture.

Investigation: A Com-Bin feeder and Roto-Louvre dryer were installed at New Orleans for the purpose of making a thorough evaluation of synthetic gypsum. Fifty-three tons of synthetic gypsum (by-product of phosphoric acid manufacturer) were procured from Coastal Chemical Company at Pascagoula, Miss. The synthetic was dried through the Roto-Louvre at a rate of one ton per hour. The dried product was then intimately blended with calcium carbonate (precipitated chalk) by means of a hammermill. This step neutralized the acid materials present in the by-product gypsum. The synthetic gypsum was calcined in the kettle converted to continuous calcination. After calcination the stucco was tube milled to a plasticity number of 4-5. This step is necessary as the calcined product without further processing is very granular and has practically no plasticity; and for that reason, it is unsuitable for making plaster or board.

SGP 0014870

## PROJECTS UNDERWAY

A board run was made with the 40 tons of synthetic stucco produced. The heat in the first section of the kiln was shut off to provide a long period of hydration, and this required the board line to be slowed to speed of 40 feet/min. The resultant board has been tested and found to be a completely saleable product. It is possible that the amount of neutralizer can be reduced and possibly the degree of tube milling lessened, but further runs will be necessary to determine this.

### 7. Radiant Heating Panel - R & D 235

Objective: To develop a gypsum wallboard with radiant heating properties, which is heated electrically.

Investigation: This project was primarily placed on the agenda because it came to our attention that USG was working on such panels. Investigation showed that they had an exclusive license to use the methods and coatings covered by several patents held by the Chemelox Corporation.

In searching for a similar coating, work done by the Electronics Discovery Corporation came to our attention, and they were contacted. They sent us two panels which performed reasonably well, but when we sought to work out a cooperative program, their demands were such that they could not be accepted. Subsequently a more reasonable approach was suggested, and they now are willing to sell us their coating at a price which will permit us to make further exploratory tests. A gallon has been ordered but not yet received. Although USG has been working on their radiant heating board, we are unaware of release of the product, and it is concluded that serious problems have been encountered.

### 8. Strong-Scott Continuous Calciner - R & D 236

Objective: To investigate Strong-Scott Turbolizer for calcining gypsum continuously.

Investigation: This project was investigated to the point of considering the purchase of an experimental unit in July 1962. The proposition was then dropped from consideration until just recently, when it was reopened to consider a 22½ ton per hour production unit, proposed by Strong-Scott. A trial of this unit was witnessed by Lab personnel. The unit had the capacity but there is some uncertainty about its ability to calcine efficiently. The cost of installing a Strong-Scott unit is approx. the same as the cost of installing a kettle of equal capacity. It is obviously much less expensive to convert a kettle to continuous calcination than to purchase a Strong-Scott unit, so the Strong-Scott's proposition will not be accepted.

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### 9. Volumetric Stucco Feeder for Grand Rapids - R & D 240

Objective: To purchase equipment to feed stucco volumetrically to the board machine pinmixer, in an effort to make board weights more uniform.

Investigation: The original equipment installed by Industrial Powertronics Corporation, which consisted of a pinch valve control, proved to be unsatisfactory. Present plans call for abandoning the pinch valve and replacing it with a sensing head consisting of a suspended cone inside the discharge pipe. The objective is to have the weight of the stucco impinging on the sensing head; control the speed of the stucco metering screw.

### 10. Continuous Calcination - R & D 253

Objective: To investigate a means of continuous calcination which can be accomplished merely by converting our present kettles. The aims are increased tonnage and greater fuel consumption.

Investigation: The original concept of kettle conversion involved an overflow pipe just inside the shell of the kettle which extended from near to the bottom of the kettle to near the top. An air lance at the bottom of the pipe was necessary to maintain a continuous and uniform flow. This method proved quite satisfactory, although it required a large volume of compressed air.

The next development consisted of doing away with the standpipe and instead simply cutting an opening in the kettle shell at the level of the calcining stucco and connecting it to the pipe leading to the hot pit. A shroud or hood was then installed over the outlet, which extended down into the stucco for about 18 inches. This has provided just as good quality stucco and does away with the requirement for compressed air. A further refinement of this method will be to install a baffle plate near the shroud and extending from the top of the kettle to just above the top flues. This is expected to further improve the quality of the stucco.

Blue Rapids is continuing to operate their continuous kettle, using the output for board manufacture. New Orleans has converted one kettle and had good success with its operation, but the second kettle must be converted in order to keep their dust collector in balance. Three kettles are to be converted at Wilmington at the earliest opportunity.

### 11. Inverform Paper - R & D 254

SGP 0014872

Objective: To determine whether any advantages in cost or quality can be obtained from the use of this paper.

Investigation: Fifteen tons of Inverform paper were purchased from St. Anne's Board Mill in England and tried at the Wilmington plant. Other than poor coverage of the Ivory liner, the paper ran well on the machine and provided a smoother surface than cylinder machine paper. A car of Inverform paper was purchased from Federal Paper-board Company and tried. This paper was found to be too weak for

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the machine direction to be used on 1/2" board, so it was used on 3/8" board. Again the paper ran well and provided a smooth surface. The economics of the Inverform paper are questionable, so it is not decided what further steps, if any, should be taken.

### 12. Lightweight Gypsum Wallboard - R & D 255

Objective: To find a practical means of reducing the weight of board without sacrificing its quality.

Investigation: This project has been investigated along two fronts: The manufacturing department has been pursuing the use of fine ground stucco as a means to make lightweight board, and the Lab has been experimenting with a reinforced foam. The reinforced foam permitted lightweight board of good quality to be made, but the amount of resin reinforcing required to do this was prohibitive costwise. The idea of foam reinforcing is still a good one, in our opinion, and will be explored as a means to produce gypsum casts of very low density.

A satisfactory lightweight board as low as 100 lbs/M. has been produced on occasions at the plants, but the present objective is 1925 lbs. This decrease in weight is being accomplished by grinding the board stucco finer. The grinding is being accomplished by either Raymond mills or hammermills. The weight reduction at each plant is being under careful supervision by Paoli Lab personnel. At the moment, there is evidence which indicates that the weight reduction is directly proportional to the fineness of grind. The reasons why fine grinding makes the lighter weight possible and the limits of weight reduction are not known. The investigation of the lightweight board is expected to be tied into the particle size studies being made, and perhaps this will shed some light on these unanswered questions.

### 13. Improved Sound Transmission Properties using Insulation Board and Gypsum Board - R & D 260

Objective: To evaluate constructions being promoted by the Insulation Board Institute and develop information which will assist in the promotion of Bestwall products in these constructions.

Investigation: The specifications proposed by the Insulation Board Institute (I.B.I.) have been revised to show the use of Bestwall's products (wallboard and laminating compound) and the proper type fasteners and spacings. This information has now been released by General Sales.

I.B.I. has additional fire and sound tests planned, so we should be able to benefit from these tests as well.

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### 14. Density Gauge for Controlling Stucco Feed - R & D 262

Objective: To evaluate this gauge as a means to control the speed of the stucco feed and thereby the weight of our board.

Investigation: The equipment has been ordered but has not been received.

### 15. 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 and some delicate weighing equipment has been evaluated. The purpose is to improve our ability to determine the quantity of soluble anhydrite, hemi-hydrate, and dihydrate in our calcined stucco. It is hoped that this may help in devising more efficient calcination methods and more effective calcination control. The method, however, was found not to be reproducible. This was verified by the Ontario Research Foundation, consultants retained to assist in the evaluation of this new method of analysis. A modification of this method is now being tried, and thus far seems to produce more consistent results. The Ontario Research Foundation is analyzing duplicate samples to the ones analyzed here, to be certain we are on the right track. The samples being tested are from both the batch and the continuous calcination processes, so a comparison of the stuccos from these processes will be made concurrent with the evaluation of the analysis method.

The second phase of this investigation deals with the study of particle size gradation. The fineness of the stucco we use is such, that a great portion of it passes thru the finest available screen (325 mesh per inch). This means that the particle size distribution of a large part (in many cases more than half) of our stucco is unknown. Several different instruments for making fine particle analyses were considered for our purpose. It was finally decided to purchase a Coulter-Counter. This instrument has recently been received, so most of the work to-date has been devoted to becoming familiar with the equipment. Sometime ago, the British Plasterboard people told us that their fine particle size studies were giving them extremely valuable information. We expect our experience will be as favorable.

### 16. Water Resistant Wallboard - R & D 264

SGP 0014874

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

Investigation: USG's announcement of a water resistant board for bathrooms has caused us to intensify some work which had been done in a limited way. Our initial approach was to develop a wallboard core which is resistant to both warm and cold water, inasmuch as the USG product is resistant to only cold water. Many problems developed in this approach, and it was decided to follow USG's

method, since Sales had asked for this product at the earliest possible time. Several plants have been requested to make trial runs of water resistant board, by using larger quantities of asphalt-wax emulsion. This will also involve the need for a new face paper and a method of protecting cut ends or edges. A small shower stall has been erected, so that the performance of the water resistant board and the various installation methods can be observed.

17. Continuous Moisture Recorder - R & D 265

Objective: To have a continuous measure of the moisture in the board as it leaves the kiln. This should permit more efficient kiln operation.

Investigation: This equipment has been ordered.

18. Firestop 120 Ceiling with Light & Vent Openings - R & D 266

Objective: To incorporate light & vent openings while retaining the two hour rating. Another objective is to obtain the U. L. label for Firestop 120.

Investigation: The success of the test will no doubt depend upon how effective the protective covering of the light fixture is. In view of this, a light fixture has been ordered so that all of the details of the protection can be worked out at the Laboratory before the test. 5/8" Firestop will be used to form the protective encasement.

19. Wood Grain Board - R & D 268

Objective: Develop new grainboard patterns for a predecorated board competitive with USG's new Ultrawall.

Investigation: Several manufacturers of wood grain paper patterns were contacted. The best response was received from Di-Noc Arts Inc., who sent several hundred different patterns for us to see. Subsequently a representative of Di-Noc visited with us and brought some larger samples and explained the different coatings available. This paper is available plain, with an overlay of 2 mil vinyl film, and with an overlay of 4 mil vinyl film. The costs are being prepared, and several large size (4' x 8') samples have been requested so they may be displayed alongside sheets of USG Ultrawall and Masonite Corporation's grainboard products.

20. Plastic Coated Wallboard - R & D 269

SGP 0014875

Objective: Determine method and equipment necessary to produce a predecorated board similar to National Spatter-Guard.

Investigation: At our request, the Glidden Company coated some samples of our board with spatter paint, similar to National Spatter-Guard, and furnished some estimated costs. This information

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has been forwarded to Sales, with the comment that further investigation will require the purchase of equipment for coating some boards with the spatter paint. This has been classified as a low priority project, so it is possible that there is not sufficient interest to justify the expenditure for the equipment.

### SUMMARY

The highlights of the past six months have been the development of the Dens-Cote System; the development of a one hour fire rated combustible floor with 1/2" Firestop; the new texture products which have been developed to the field testing stage; and the successful trial run of board using synthetic gypsum.

Our plans for 1964 are to continue the emphasis on our fire test program to increase our competitive position in this area; to devote more effort to our industrial gypsum product line; to put a concerted effort on the search for knowledge by the calcination and particle size studies; to bolster our joint system product line by developing products necessary to meet this competition; and finally, to continue to seek other new and improved products which will assure both the short and long term success of Bestwall Gypsum Company.