

GEORGIA-PACIFIC CORPORATION  
BESTWALL GYPSUM DIVISION

R&D REPORT FOR FIRST 6 MONTHS OF 1965

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## FOREWORD

This report covers the activities of the Research Department for the six months ending June 30, 1965. One organizational change was made during this period: Mr. R. F. Martin was hired as a research chemist from several candidates interviewed. This addition will help us resume some long-term projects which have been delayed because of insufficient manpower. Another reason for adding to the department is to obtain qualified young men with good potential and train them, with a view toward greater research effort in the future.

The 1965 research budget is \$170,000, and \$60,000 of this amount is slated for fire and sound testing. To date a total of \$90,213 has been spent.

A record of the past six months' market performance of products developed through research is shown on page 2. Some of the efforts cannot be evaluated directly in terms of sales or profits. An example is the seven fire ratings attained during this period. This gives Georgia-Pacific just about every rating that our competitors have, and several which our competitors do not have. Some measure of the value of this work may be shown by the 52.1% increase in 1/2" Firestop sales, and 23.6% increase in 5/8" Firestop sales for the first 6 months of this year as compared to the same period last year.

Some significant cost reduction programs have recently been completed. A formula revision of the four basic joint system items will save 10¢ to 17¢ per bag. This will offset increased costs and save about \$108,000 per year, based on the first half 1965 sales of these four products.

The transition to a finer filament glass fiber has just been completed. Some plants have reduced their usage of glass fiber in regular (not Firestop) wallboard by 25%, and other plants have made a 50% reduction. A 25% reduction at all plants would save about \$83,000 per year, as estimated from 1964 wallboard production figures.

On page 3 is the distribution showing how the research dollars were spent for the six months' period.

The bulk of this report is devoted to the progress of the individual projects. This section is categorized into those projects which were completed during the past six months; those which should be completed shortly; and those which have either just been started or which will require quite a bit more time to complete.

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1965 SIX MONTHS' MARKET PERFORMANCE OF  
NEW PRODUCTS

| <u>PRODUCT</u>         | <u>SALES VOLUME</u>                        | <u>LIST SALES</u> | <u>ESTIMATED<br/>GROSS PROFIT</u> |
|------------------------|--------------------------------------------|-------------------|-----------------------------------|
| Firestop 120 Tile      | 312,000 sq. ft.                            | \$ 43,289         | \$ 10,361                         |
| Grabit Adhesive        | 54 tons                                    | 8,888             | 3,157                             |
| One Day Joint Compound | 221 tons                                   | 39,227            | 8,062                             |
| Dens-Cote Plaster      | 1,033 tons                                 | 62,197            | 6,586                             |
| Dens-Cote Base (all)   | 5,763 M. sq. ft.                           | 255,456           | 80,797                            |
| Dens-Cote Tape         | 9,227 rolls                                | 8,895             | 3,439                             |
| Ready Mix Joint Comp.  | 17,654 - 5 gal.pails<br>3,685 - 1 gal.pail | 85,647            | 11,133                            |
| Tile Backer Board      | 813,300 sq. ft.                            | 62,776            | 20,523                            |
| Tile Backer Tape       | 209 rolls                                  | 1,434             | 786                               |
| Model Densite          | 18.3 tons                                  | 852               | 283                               |
| Tooling Densite        | 1.7 tons                                   | 108               | 26                                |
| High Expansion Densite | 0.1 tons                                   | 5                 | -                                 |
| Bestex A, B, and C     | 3530 bags                                  | 13,551            | 1,373                             |
| Tru-Grain Wallboard    | 286,000 sq. ft.                            | 17,992            | 747                               |
| Vinyl Joint Compound   | 115 tons                                   | <u>20,700</u>     | <u>6,060</u>                      |
|                        |                                            | \$621,017         | 153,333                           |

PATENT INFORMATION

Patents Issued - None

Patent Applications being Prepared - High Expansion formula with outstanding resistance to ageing.

Patent Applications Filed

Dens-Cote Plaster

Dens-Cote Base

Patent Applications Previously Submitted - Processing of Synthetic Gypsum - Second rejection by patent office being considered.

Grabit Adhesive - First rejection by patent office answered.

One Day Joint Compound - No action.

## PROJECTS COMPLETED

### 1. NEW TYPE OF GLASS FIBER - R&D #131

Objective: Evaluate Owens Corning fine filament 636 glass fiber for use in our wallboard products.

Investigation: It was previously reported that reduced amounts of 636 glass fiber were being tried in our regular wallboard products. These plant trials with reduced quantities of fiber were successfully completed during the past six months.

Conclusion: A 25% reduction in the glass fiber content was made in the wallboard formulas of those plants where no paper fiber is being used in the core. A 50% reduction in glass fiber content has been made in those plants which use paper fiber. The savings previously estimated for a company-wide reduction of 25% was 83,000 per year. With some plants reducing their fiber content by 50%, the savings will obviously be greater.

### 2. JOINT SYSTEM TEXTURE - R&D 261

Objective: To develop a complete line of texture products suitable for spray application.

Investigation: Three different products had been undergoing field performance evaluation for the past year. The products being field tested were: Bestex A, which is a non-aggregated texture for spray or hand application; Bestex B, which is a lightly aggregated texture for giving a sand type finish; Bestex C, which is heavily aggregated to give a coarse or simulated acoustic appearance; and Bestex D, which is also a coarse texture with rust inhibiting qualities for direct application to concrete slab ceilings.

Conclusion: After successful field experience, Bestex A, B, and C have been released and added to our line of Joint System materials. Trials of Bestex D were not as favorable, and further work will be necessary, if Sales still feels that this product is required.

### 3. SYNTHETIC GYPSUM - R&D #221

Objective: To further prove that it is possible to use synthetic gypsum in the manufacture of gypsum wallboard, and to establish what equipment and operating conditions are desirable or necessary in this process.

Investigation: A one-week run was conducted at the New Orleans plant, in which about 500 tons of synthetic gypsum were purchased from Coastal Chemical Corporation at Pascagoula, Miss. and converted into the manufacture of wallboard. The synthetic was neutralized, dried, calcined, and tube milled prior to being transferred to the board stucco bin. Variations in the amount and type neutralizer used and variations in calcination temperatures were tried. In the board making process, the grind of the synthetic transferred to the mixer was varied by means

of a hammermill. The amount and type of accelerator used was also varied. The machine speed used was 40 fpm and was subsequently increased to 60 fpm. The slower machine speed was to enable the synthetic gypsum to fully hydrate, since past experience has shown that synthetic gypsum hydrates at a slower rate than natural gypsum.

Conclusion:

1. It was confirmed that the hydration of the synthetic gypsum proceeds at a slower rate than with natural gypsum. The hydration appeared to be improved by using a lower temperature for calcination. The longer hydration time required means that a longer belt section prior to the dryer would be necessary to maintain normal manufacturing speeds.
2. Highly tubed stucco did not perform satisfactorily on the board machine; however, a small amount of tubing is highly desirable.
3. It appears to be necessary to use aluminum sulfate to provide sufficiently quick hydration, even at the reduced machine speed. A ratio of 60% ground block and 40% aluminum sulfate appeared to be optimum.
4. It appears to be desirable to include a hammermill in the system to provide a fine grind stucco.
5. The board manufactured was satisfactory in every respect. Approximately 100,000 sq. ft. of this wallboard has now been shipped, without any comment whatsoever from the field.

4. PROTEIN JOINT COMPOUND FORMULATIONS - R&D #275

Objective: To make revisions or improvements where necessary or advisable in our Joint System formulations.

Investigation: The work on this project was intensified when the price of casein began to rise sharply last December. At that time, it was 19¢ a pound, and the present price is 38¢ per pound. We were already evaluating a new alkali system which permitted less casein to be required. This alkali system is a combination of soda ash and borax. The alkalies are not new, but we have never been able to use them previously, because the water retention agent we were using was not compatible with borax. We have just recently begun to use a water retention agent called Natrosol which is compatible with borax. The reduction in the amount of casein and the use of borax, which has some preservative properties, has enabled us to use a milder preservative in lesser quantities. This has resulted in some economies in preservative usage, in addition to the savings in casein.

Conclusion: This work was intensified as soon as the price situation regarding casein began to get out of hand. The Lab work was concluded, and a comprehensive field testing program was commenced. Field trials were held in Cleveland, Rochester,

Kansas City, Wilmington, Philadelphia, Denver, Chicago, and Houston. In every case, the results were favorable. As of April 1, Akron was converted to the new formulas. On May 1, Acme also made the transition. Based on a casein price of 38¢ per pound, the per bag savings varies from 10¢ to 17¢, depending on the product and whether the manufacturing point is Acme or Akron.

5. TWO-HOUR FIRE RATED INCOMBUSTIBLE FLOOR & CEILING - R&D #279

Objective: Test a concrete and bar joist floor & ceiling construction protected by 1/2" Firestop to gain a 2-hour rating.

Investigation: National Gypsum Company was the first to obtain this rating with their Super-X 1/2" Fireshield board. Subsequently, USG also obtained a rating with their Type C Firecode wallboard. Last October, we made an attempt to achieve the rating with our regular 1/2" Firestop, but we were unsuccessful. It was obvious that a special board with improved performance would be required, in order to pass the test. The installation of our pilot furnace was completed in December 1964 and, by January 1965, it was operational. A long series of exploratory tests were conducted in the pilot furnace, so we could determine what was needed to achieve this rating. The exploratory tests brought out the following facts:

1. A new type of glass fiber from Owens Corning, designated 636, was found to perform better than the 710 or 799 glass fiber formerly used.

2. Firestop from Wilmington was found to perform better than Firestop from Fort Dodge.

3. 1/2" Firestop from Wilmington, with either 799 or 636 glass fiber types, was found to outperform samples of National's Super X and USG's Type C boards obtained in the field.

A special run of 1/2" Firestop using 636 glass fiber was conducted at the Wilmington plant, and this board was rechecked in the Lab. The results were again favorable, and the full scale test at Underwriter's was arranged.

Conclusion: On May 11, the test was passed giving us the 2-hour rating. At the same time, a lower weight limit for 1/2" and 5/8" Firestop was established. The minimum for 1/2" Firestop was reduced from 2000 to 1930 lbs/M., and the minimum for 5/8" Firestop was reduced from 2525 to 2415 lbs/M. This is based on our using 636 glass fiber, which we intend to do.

6. ONE HOUR FIRE RATED WOOD FLOOR & CEILING WITH 1/2" FIRESTOP - R&D #287

Objective: To test a wood joisted floor, protected by 1/2" Firestop on the underside at Underwriters' Laboratories, in order to gain a one hour fire rating.

## PROJECTS NEARING COMPLETION

### 1. DRY VINYL JOINT COMPOUND - R&D #211

Objective: To develop joint system products with vinyl or other synthetic resin binders.

Investigation: A joint compound consisting of polyvinyl alcohol and spray dried polyvinyl acetate as the binders, and Natrosol as the water retention agent was formulated and tested extensively here in the Laboratory. On the basis of favorable lab results, a field test was conducted in Hartford, Conn. This customer was selected because of his interest in a vinyl joint compound. The material was followed through all phases of the joint treatment, and then examined again after it had been decorated; Results in all cases were satisfactory to us and to the customer. On this basis, he was shipped another truckload. After this second truckload was used, another investigation was made, and it was found that the bond of the vinyl joint compound to the tape was not quite as good as it should be. This was traced to a problem with the USG tape that they were using. Since the vinyl compound bonded satisfactorily to Bestwall tape, they began to use our tape and continued to place orders for the vinyl product. Subsequent laboratory investigations indicated that a plasticizer, such as Dibutyl Phthalate would add significantly to the bond under humid conditions, regardless of what tape might be used. This change was put into effect on the third truckload, and another inspection was made after it had been used. In the meantime, the new plasticized formula was tried in several areas around Philadelphia, Wilmington, Washington, D. C., and Baltimore. All of the trials except the one in Wilmington drew favorable comments on the workability and performance of the material. After these tests, it was decided to release the product in the Wilmington Sales District, so that it would be exposed to wider market coverage. At the same time, additional trials will be held in other parts of the country.

There is very little difference in the economics between the dry vinyl joint compound and our regular casein joint compound. If the products are priced the same, there appears to be sufficient advantages to the dry vinyl joint compound to induce customers to request it in preference to the casein products.

### 2. READY MIX JOINT COMPOUND - R&D #211

Objective: To improve the quality and cost structure of Ready Mix Joint Compound.

Investigation: Quite a number of problems developed with Ready Mix after it was initially introduced. Some of these problems were viscosity control, inadequate humid bond, insufficient resistance to cracking, and unsatisfactory workability. Quite a lot of additional work has been done in cooperation with the plants, and some formula revisions have been made. It is felt that all of these problems are under control at the present time, based on recent market reactions. Further work is being done

toward a reduced formula cost. Successful initial field tests were conducted on the latter in the St. Louis market, and we will continue to furnish St. Louis to gain further experience with this lower cost formula.

Also under investigation are lower cost containers. The Purchasing Department has contacted several manufacturers of containers, to see if we can get a cheaper container than the metal pail presently used. We are searching in two directions: First, to obtain some sort of corrugated package which could be used in conjunction with Ames Tools. For this use the package must be sufficiently rigid, in order to transfer the material from the container by means of a pump. The second type of package under consideration is a waterproof bag which would be strong enough to contain the product in loading and shipping. If bags of this kind can be developed, they should be quite inexpensive.

A small amount of time was provided to give technical assistance to the Engineering Department in their design of a Ready Mix plant for Acme.

### 3. DENS-COTE TAPE - R&D #219

Objective: To develop sources for Dens-Cote tape and to prepare a raw material specification for this product.

Investigation: Several tapes of different mesh sizes, and from different manufacturers, have been received. Thus far, it appears that a very fine mesh tape (18 x 14) offers greater joint strength and better resistance to cracking than the present 7 x 11 tape. Some further work remains to be done, to establish what the results will be for mesh sizes falling in between these two. A second consideration is the ease of application of the tape, and still another consideration is the cost of the tape. We are working closely with Purchasing, so that eventually some standard tape specifications can be established.

### 4. USE OF DENS-COTE OVER MASONRY SURFACES - R&D #219

Objective: To approve the use of Dens-Cote plaster over masonry wall surfaces.

Investigation: Some trial jobs were held, wherein our Texture Finish Dens-Cote was used over concrete block walls. This application proved to be quite satisfactory, and we have approved the use of texture finish Dens-Cote for this purpose. There is some concern as to whether the smooth finish can be used in this manner and, in any event, no field trials have yet been conducted. Laboratory investigations have shown that Dens-Cote for use over smooth monolithic concrete does not provide a satisfactory bond; so we will not recommend it for this purpose.

## S U M M A R Y

The major accomplishments by the Research Department during the first half of 1965 were:

1. The two hour rating for a concrete & steel floor and the one hour rating for a wood floor using 1/2" Firestop. These tests enabled the minimum weight of 1/2" Firestop to be reduced from 2000 lbs/M. to 1930 lbs/M., and 5/8" Firestop from 2525 lbs/M. to 2415 lbs/M. In addition to the promotional value of these fire rated assemblies, the lower weights will reduce the manufacturing costs and freight charges.
2. The two hour fire rating and 47 STC sound rating gained for a metal stud partition with 2 layers of 1/2" Firestop on each side. Neither National Gypsum nor USG has this rating.
3. Several fire ratings were obtained for wood stud, metal stud, and gypsum stud partitions; all of which have 50 STC or better sound transmission values. The combination of resistance to sound and fire protection makes these partitions especially attractive for apartments and other multi-family dwellings.
4. Substantial cost reductions have been and will continue to be realized from research effort in two areas: First, the amount of glass fiber used in regular wallboard has been reduced, since the new finer filament fiber has proven satisfactory. Secondly, the formula revisions for four basic products of the Joint System line will help offset what could have been an increased cost structure due to the casein shortage.
5. A successful one week plant run confirms that we can manufacture wallboard from at least one source of byproduct gypsum. Although this gives us an alternate supply of our basic raw material, at the present time there are no known sources of synthetic gypsum located close enough to our plants to make its use economically attractive.

There was one very disappointing result during the past 6 months. This was our inability to print black accent lines on the Deluxe Tru-Grain so that it could be released as planned. After repeated failures, we have had to admit defeat for the present time. This Deluxe Tru-Grain was to compete with USG's Ultra-wall and National's Fashion Grain. This unfavorable result brings out a weak point in our structure; i.e., we cannot emphasize every area of product research. In certain instances, nothing is done until a competitive situation develops, and sales pressure dictates that a concentrated effort should be made. Often the competitor has already spent several years of research on the product and has a background of experience on the subject. At this point, it can be difficult to catch up in a reasonable period of time. In some special situations, such as fire testing and joint system, we have been able to keep pace with our two largest competitors, because we have concentrated our effort in these directions. It is felt that our emphasis has been properly placed, but we must recognize that we cannot put our emphasis

in every direction; and we stand to fall behind wherever there is little or no effort. Time has been devoted to certain projects that show unusual promise, such as the acoustical tile development. If all of the time was spent catching up with competition instead of exploring new ideas, we would never have any industry firsts. We have endeavored to divide the time proportionately to approach an optimum balance of our immediate and future needs.

The progress made would not have been possible without the assistance and cooperation of the various other departments. With such combined effort, even greater progress should be possible in the future.

Tentative plans for the next 6 months shape up as follows:

1. The acoustical tile development will be continued on a high priority basis.
2. The particle size evaluation just resumed will be pursued to gain all the information desired. This work is being done primarily to gain a better understanding of our products but could be a stepping stone to some significant development in the future.
3. The development of both thincoat plaster and drywall radiant heating systems will be emphasized, in view of the increasing amount of electric heat in new construction and the interest in radiant heating.
4. Mr. Morrone has become involved in the training of new joint system quality personnel and will continue to have this responsibility until the program is complete. The development work on joint system will be handled simultaneously with the training. The evaluation of synthetic binders for these products will be stressed, in view of the high casein price.
5. Fire and sound testing will once again be an important segment of our program. Specific objectives are the cost reduction of 5/8" Firestop, development of a fire rated tile backer (water resistant) board, and one hour fire rated partitions using 1/2" instead of 5/8" Firestop.