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S U M M A R Y

Facts and Figures

This is our first semi-annual report since we moved into our new Tigard Research headquarters. Since this is the year end, we will include some annual figures in addition to the six months figures. The sales and profits generated from new products in 1967 reached all time highs of \$3,307,524 and \$875,769. This growth since 1962 is shown on the charts on pages 3 and 4. The 1967 figures represent 4.1% of the Gypsum Division sales and 4.6% of the Division profits. Firestop sales escalated to 30,604 M sq ft of 1/2" and 81,792 M sq ft of 5/8" which are increases of 26.1% and 19.0% respectively over 1966 figures. We feel that improvements in the products and new fire and sound ratings have been a factor in this growth. In addition, it is estimated that reduced weight limits for Firestop have saved approximately \$62,303 in 1967.

\$200,961 was budgeted for Research in 1967. Our R & D expenses were actually \$174,232 for the year. We have budgeted \$221,000 for Research in 1968. Our expected distribution of budgeted expenditures in 1968 are shown on the graph on page 8.

New Products

The only new product released in the last six months was a vermiculite aggregate texture which will be called Bestex D. The major research activity has been the continuation of projects which were started in 1967 or earlier. The molded grainboard pilot plant is complete and some encouraging trial runs were made. Our option to develop this process has been extended for another six months. The wallboard radiant heating panel is now at the stage where we will be seeking Underwriters approval and at the same time field testing will be started. Another new product is a specially formulated 3/16" thick wallboard which we are proposing to use as a core material in wood paneling. Earlier experiments were conducted at the Savannah plant but the current investigation will be done in cooperation with the Eugene Division.

Improved Products

Hard End wallboard may be one of the most significant improvements in gypsum wallboard in recent years. Very shortly an installation will be made in the Acme wallboard line. From this method we can evaluate the method of manufacturing hard end wallboard and also see what the reaction in the field will be. The Denscal operation is currently underway and replacements of Denscal for Densite are being made to take advantage of the lower cost of Denscal. The estimated savings per ton of Densite replaced by Denscal is \$11.00. Other product improvements being investigated are the replacement of limestone with gypsum in Joint System, the search for a lower cost emulsion for water proof sheathing and the development of a hard edge wallboard.

Sales Service

Some new fire and sound ratings have been developed. The most important were the one hour fire rating and 45 STC sound rating for 1/4" gypsum sound deadening board and 1/2" Firestop over wood studs. The fire test program concluded on a disappointing note when we fell short of our objectives in the last three tests. Laboratory testing is underway, using our pilot furnaces, to seek further improvements in the Firestop formula in order to gain the ratings which have eluded us and also to seek lower raw material costs for Firestop.

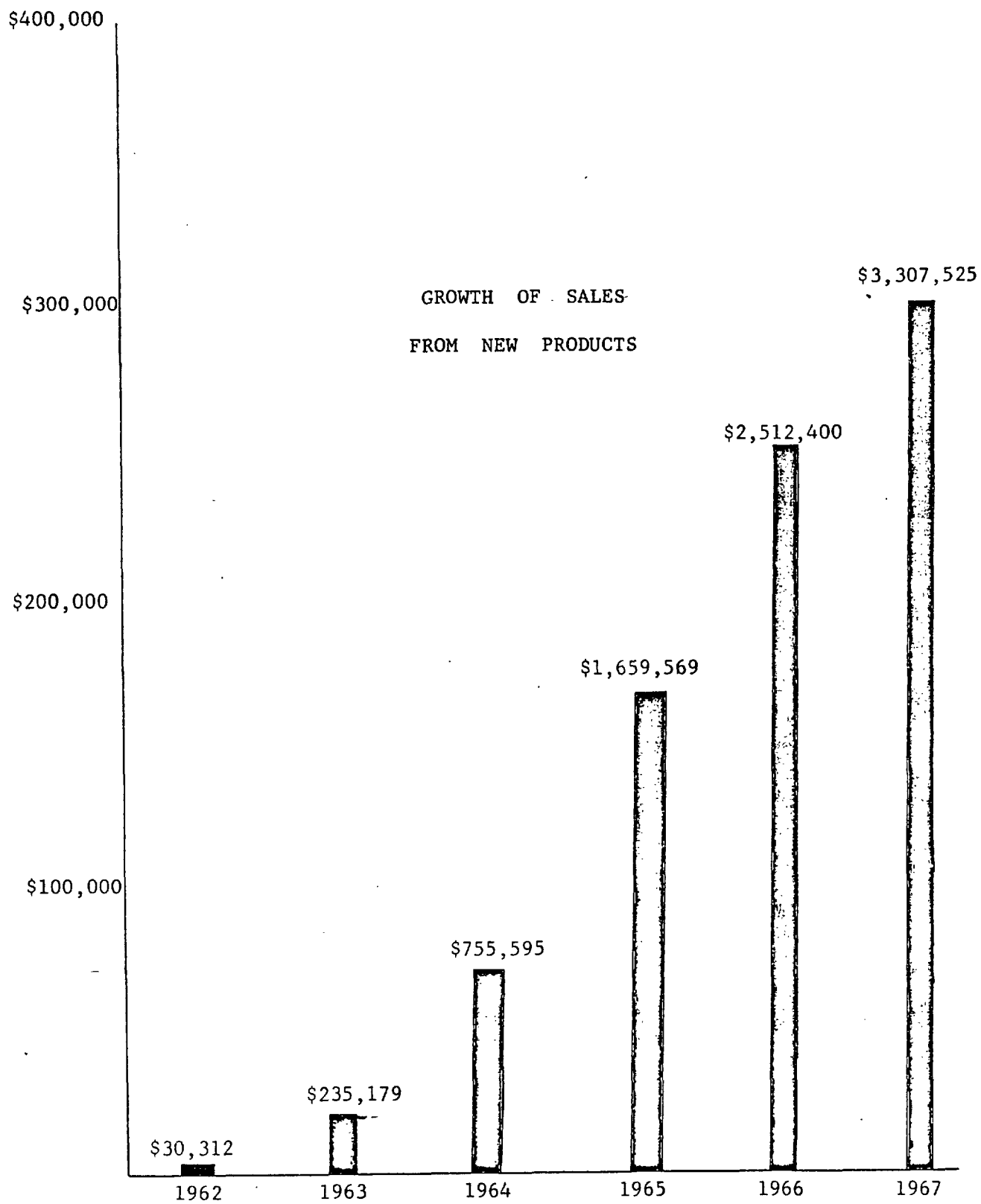
Patents

In August of 1967 a patent application was filed for the innovation which has permitted us to manufacture lighter weight Firestop. Our patent counsel was advised by the patent office that the major claims for Dens-Cote base patent application will be allowed so we expect a patent to issue in the near future. We have resumed the investigation of National Gypsum's infringement of our Firestop patent. Fresh evidence from new analyses of the National Gypsum products have been submitted to patent counsel. It is now a matter of deciding whether the patent is strong enough to support a suit against National.

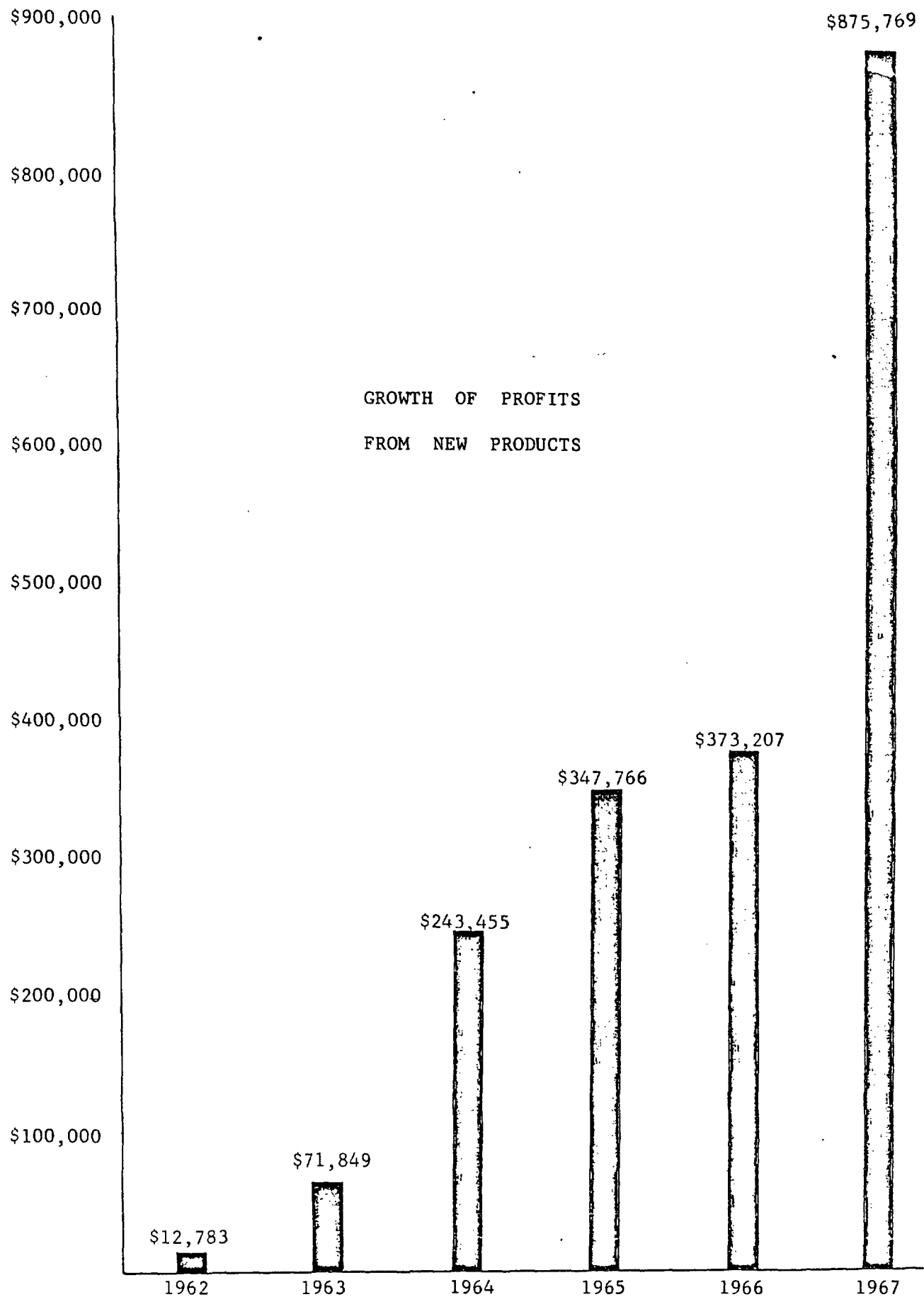
The Future

Next year should bring the molded grainboard, the radiant heating panels and the hard end wallboard to a conclusion. If they are successful, we will be furnishing technical assistance to manufacturing and sales to help launch these products. There will probably be many ramifications of these products to be pursued. A very comprehensive investigation into our Firestop formula is also planned. In addition, there will undoubtedly be some completely new developments plugged into our program in 1968.

The rebuilding of our research organization will continue into 1968. The current research group consists of George Green and Ray Hinkel who came with us from Paoli; Don Klus, who transferred to Tigard from our Grand Rapids plant; and the new men, Kelly Stalker and Mike Robinson. The training of the new men will be done simultaneous with the pursuit of our research objectives. Our objectives for 1968 offer more opportunity for us to contribute to the profits of the company than ever before. We will be doing everything possible to make the most of this opportunity.



SGP 0015038



M SQ. FT.

80,000

70,000

60,000

50,000

40,000

30,000

20,000

10,000

5/8" FIRESTOP

SALES GROWTH OF FIRESTOP

1/2" FIRESTOP

1964

1965

1966

1967

SGP 0015040

12 MONTHS 1967 MARKET PERFORMANCE OF NEW PRODUCTS

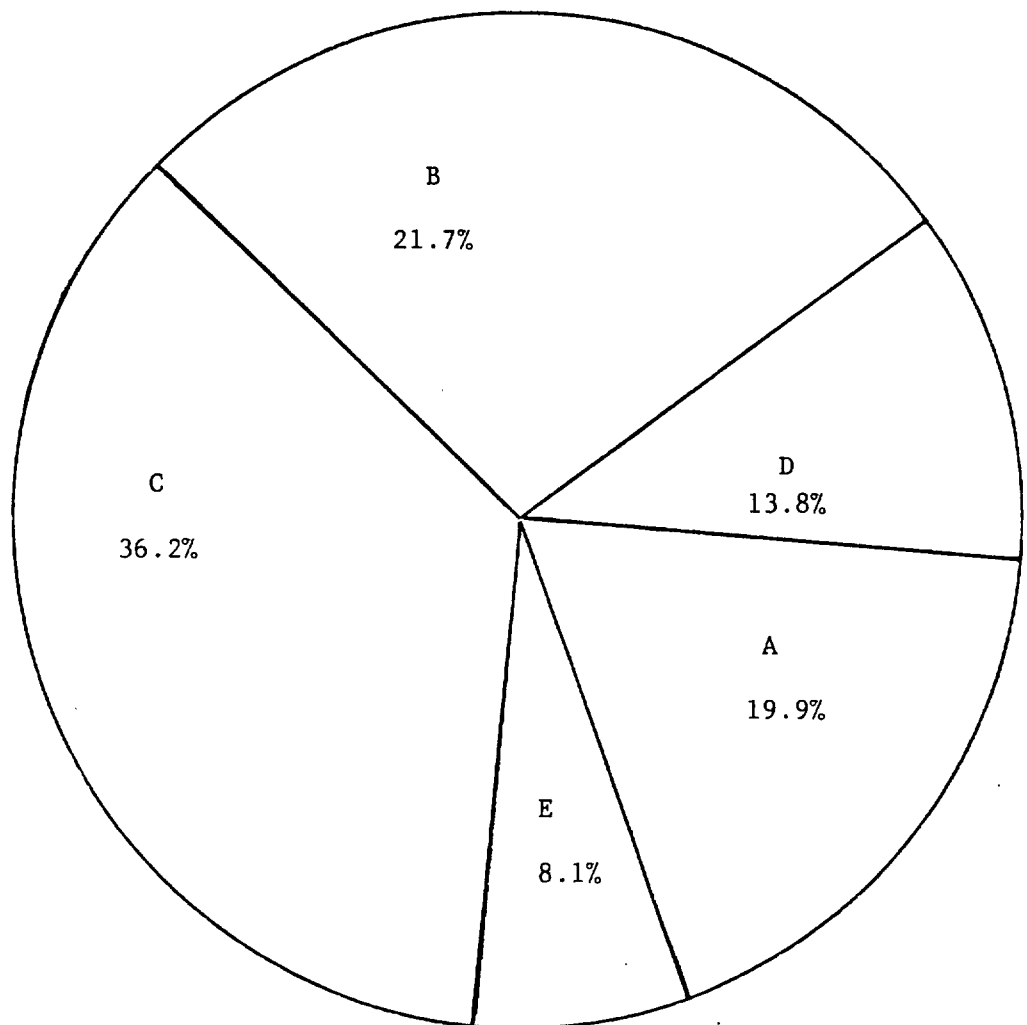
<u>Product</u>	<u>Sales Volume</u>	<u>List Sales</u>	<u>Gross Operating Profit</u>
Dens-Cote Base (all)	18,106.6	\$801,372.60	\$272,235.77
Tile Backer Board (all)	4,824.7	409,567.83	197,884.02
Gypsum Sound Deadening Board	764.0	30,168.65	9,617.16
One Day Joint Compound	292.9	50,168.98	11,210.74
Ready Mix	6,782.0	837,517.99	127,674.46
Triple Duty	4,885.0	735,909.21	172,559.93
Grabit Adhesive	74.4	11,073.37	4,207.96
Bestex A Texture	1,043.3	170,678.85	28,072.27
Bestex B Texture	41.0	8,115.44	72.46
Bestex C Texture	222.7	42,805.84	(2,083.65)
Bestex D Texture	1.0	165.00	9.35
Dens-Cote Plaster (all)	3,043.9	185,353.80	45,584.34
Dens-Cote Tape	1.2	18,099.07	5,332.58
Model Densite	.1	2.20	.33
Ram Process Plaster	37.3	6,050.22	3,380.30
Dnescal PR	.5	35.20	11.40
Denscal HP	0.	0.	0.
Tooling Plaster	0.	0.	0.
High Expansion Plaster	0.	<u>0.</u>	<u>0.</u>
 TOTALS		 \$3,307,524.00	 \$875,769.00

6 MONTHS 1967 MARKET PERFORMANCE OF NEW PRODUCTS

<u>Product</u>	<u>Sales Volume</u>	<u>List Sales</u>	<u>Gross Operating Prof</u>
Dens-Cote Base (all)	10,452.3	\$468,296.17	\$169,231.36
Tile Backer Board (all)	2,694.7	232,895.11	113,571.94
Gypsum Sound Deadening Board	438.6	15,317.34	4,872.29
One Day Joint Compound	180.1	25,468.63	5,590.25
Ready Mix	3,632.4	427,326.03	63,066.03
Triple Duty	2,692.7	388,806.70	84,917.45
Grabit Adhesive	45.1	5,362.79	1,915.58
Bestex A Texture	616.2	101,691.66	18,215.63
Bestex B Texture	24.8	4,933.60	63.52
Bestex C Texture	121.2	22,560.45	1,241.59
Bestex D Texture	1.0	165.00	9.35
Dens-Cote Plaster (all)	1,370.3	83,743.11	21,304.96
Dens-Cote Tape	1.1	11,117.65	3,716.43
Model Densite	.1	2.20	.33
Ram Process Plaster	58.3	3,894.27	2,397.30
Denscal PR	.5	35.20	11.40
Denscal HP	0.	0.	0.
Tooling Plaster	0.	0.	0.
High Expansion Plaster	0.	<u>0.</u>	<u>0.</u>
 TOTALS		 \$1,791,526.00	 \$481,125.00

1968 R&D BUDGET OF PROJECT EXPENDITURES

- A - Product and Process Improvement
- B - Sales Service
- C - New Product Development
- D - Fundamental Research and General Testing
- E - Other



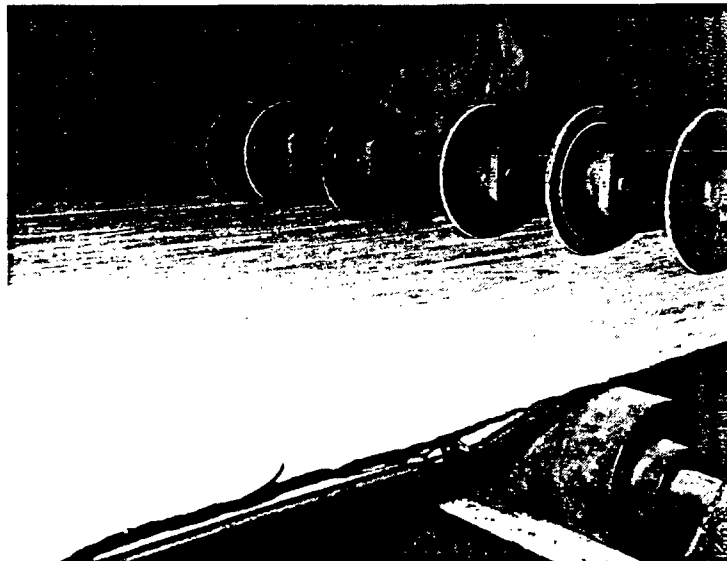
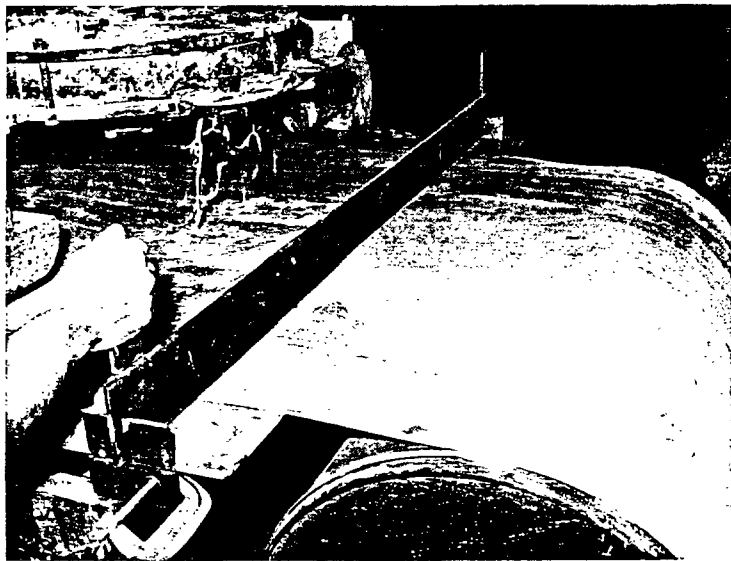
NEW PRODUCT SECTION

1. Molded Grainboard - R&D 304

The first trials of the Brunswick pilot plant were made in October. Since then there have been three experimental runs and after each, equipment revisions were made. Some short term but continuous runs have led us to be encouraged by it will require some sustained runs to make a final determination. We hope to be able to make some satisfactory trial runs of long duration (several hours) in early 1968.

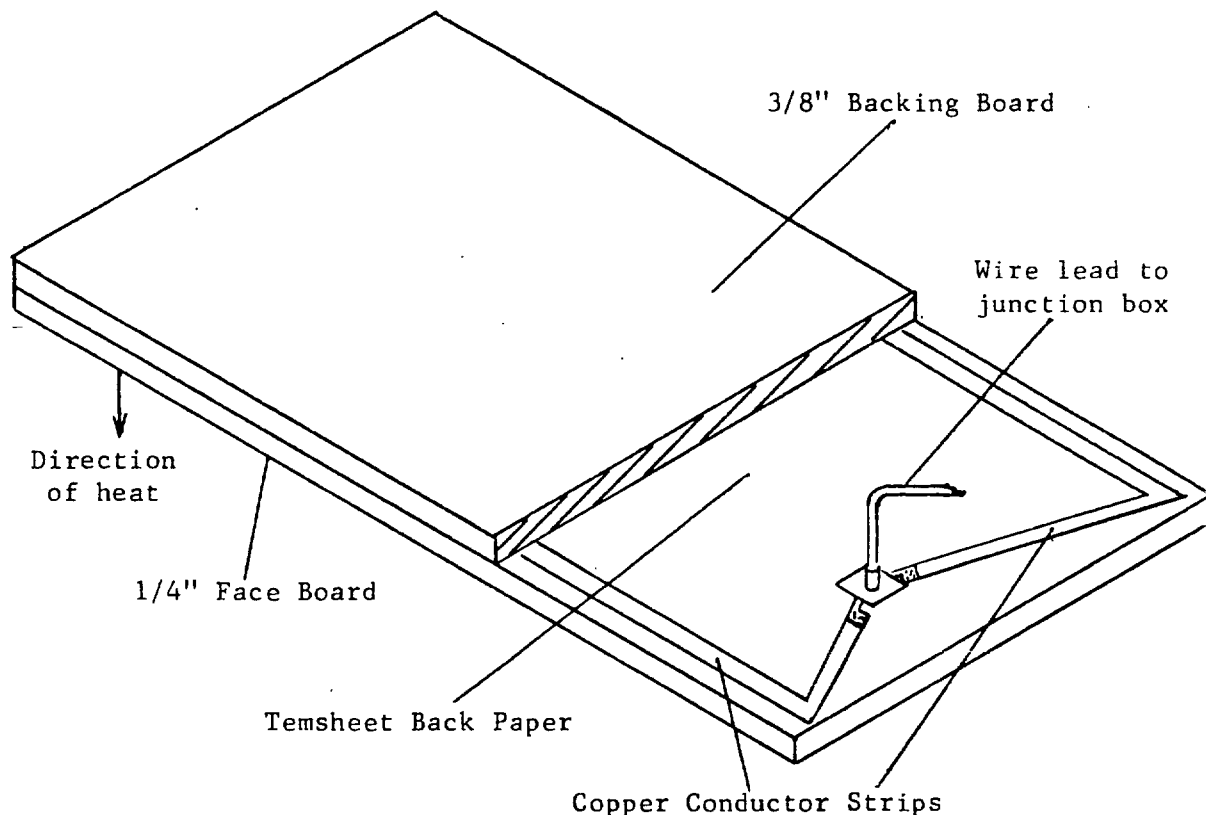
The next step will be to develop some finishing methods so that panels will be available for laboratory testing and field testing.

Below are some pictures illustrating the pilot plant equipment and some of the operations.



2. Gypsum Wallboard Radiant Heating Panel - R&D 235

For several years we have worked on radiant heating panels in general and for the past 1½ years the development has been directed to a panel with wallboard manufactured with conductive paper as the basic component. The paper, furnished by Armstrong Cork Co. and called Tensheet, is the resistance medium through which the current passes to produce heat. Some very small field trials were held to evaluate different methods of the panel fabrication and installation. We needed to have as much information as possible before approaching Underwriters for approval. One of the questions was, "Should we have a pre-laminated panel with all of the electrical connections incorporated, or should we have a system that would involve job lamination and job electrical connections?" It has been decided that the pre-laminated panel will offer less resistance from Underwriters and also permit greater separation of the drywall and electrical trades during installation. These two factors seem to outweigh the disadvantages of involvement of Georgia-Pacific in an unfamiliar fabrication and inherent packaging and shipping problems. Sufficient conductive Tensheet has been ordered from Armstrong for us to manufacture the board and fabricate the necessary full size panels for Underwriters testing as well as for some large scale field testing. The sketch below illustrates the composition of the panel.



3. 3/16" Wallboard Core For Wood Paneling-R&D 309

In the previous six month period some experiments were conducted in an attempt to determine whether thin gypsum wallboard would be a satisfactory filler for wood paneling. The objectives are to lower the costs of the paneling and to incorporate some fire resistant qualities. The first panels made at Savannah didn't give conclusive results so it was decided to make another thin wallboard but with some modifications such as increasing the thickness from 1/8" to 3/16", increasing the width from 48" to 50", increasing the length from 96" to 98", using a paper with high internal ply strength and incorporating 2.5 lbs of glass fiber/M in the board. This time we will be working with the Eugene Division so a run of the special 3/16" board was made at Lovell and shipped to Eugene in late December.

4. Firedoor Filler - R&D 295

This project was deflated when repeated efforts to make a door were unsuccessful. Each time the gypsum filler collapsed during lamination. It was found that the moisture from the glue line was permeating and weakening the filler which caused it to collapse. A waterproofing material (sodium methyl silicate) seems to offer a possible solution to the problem. Some slabs will be made with the waterproofing agent and tested in small press before making another attempt to make full size doors.

5. Road Plaster - R&D 10

At the request of sales a special gypsum road patch material has been developed. This product consists of Densite, coarse sand, and zinc stearate which is the waterproofing agent. Some patches are being applied in heavy traffic locations in order to check the permanence of this patching material. The idea is to have a road patch which could be applied and the road be opened to traffic almost immediately.

PRODUCT IMPROVEMENT SECTION

1. Reduction of Glass Fibers in Firestop - R&D 290

An attempt to reduce the amount of glass fiber in Firestop was made to realize the substantial savings that would result and also to ease manufacturing problems associated with the amount of glass we are using.

Our limited pilot testing indicated that using 1/4" instead of 1/2" glass fiber would permit a reduction of 50% in the amount of glass fiber required. Our pilot facilities were in the process of being moved so it wasn't possible to do as much testing as had been planned. It was decided to take a conservative approach and try to get U. L. approval with a 25% reduction using 1/4" glass fiber. A retest of design No. 259 - 2 hours was selected by U.L. as the criterion to establish whether the fiber content could be reduced. This is the design we have which no other manufacturer has been able to match. The test at U.L. was unsuccessful and left us without a clear reason for the failure. It was far short of the 2 hours we were seeking so it is apparent that our pilot test results misled us. As soon as the pilot test facilities are re-installed, some rechecks can be made. Several plants have purchased Finn and Fram glass cutters and they are helping to alleviate the problems in cutting the large quantity of glass fiber required in Firestop. This will not stop us from continuing to seek a means for reducing the glass fiber in Firestop.

2. Denscal Operation - R&D 308

Research assistance was provided to get the Denscal plant in full scale operation. As had previously been determined, a reheater was necessary to drive off the last traces of water and permit the manufacture of a product with a sufficiently stable setting time. The present Denscal is more stable than U.S.G. Hydrocal, judging from the Hydrocal samples we have tested.

Another phase of the Denscal investigation was to replace Densite with Denscal in our industrial product line. This substitution has taken place in pottery plaster, tooling plaster and Ram Process plaster. This substitution will lower the raw material cost of these products. The Densite in Dens-Cote has also been replaced with Denscal. This alone will save about \$2 per ton of Dens-Cote or an annual savings of \$6000 based on last years Dens-Cote sales.

3. Hard End Wallboard - R&D 311

Increased sales pressure to make a round edge wallboard like U.S.G.'s has caused us to accelerate the "hard end" board development which we feel could counter this competitive system of U.S.G. Our method of making a hard end board is to treat the ends of the gypsum board with polyvinyl acetate resin. This reduces beading by keeping the face paper from swelling. It also

reduces end splitting of the paper and makes the end of the board harder and therefore less subject to damage in handling. It is our opinion that reducing beading at the end joints is attacking the problem where it is most prevalent. Furthermore, our method will not involve new materials or extra operations as does the U.S.G. method.

A spray system appears best for producing the hard end wallboard. The apparatus for applying the hard end treatment has been purchased, test operated in Tigard and sent to Acme, where it will be installed in their wallboard line between the end sawing and end bundling operations. Mr. Hollingsworth suggested adding a green dye to the resin treatment for identification and to use as a promotional aid. Tests are currently in progress to determine whether the green dye has any tendency to migrate through to the finished surface.

4. Lower Cost Sheathing - R&D 90

In view of the narrow profit in sheathing, an all out effort is being expended to reduce costs whenever possible. One approach was to make the edges square instead of tongue and groove. Sales, however, felt they could not sell a square edge sheathing because of the FHA requirement that the edges be tongue and groove. Reducing the weight and quality of the paper is another consideration being acted on by manufacturing. Still another potential cost reduction is to try some wax-rosin emulsions to see if they will make the core water resistant less expensively than the asphalt wax emulsion we now use. Trials are being conducted at the Akron, N. Y. plant to determine whether there are any savings to be gained from the emulsion.

5. Reduce Limestone Costs in Joint System - R&D 275

Two different limestones are used in our Acme Joint System products. One of these (Purestone) is cheaper than the other by about \$5 per ton. The more expensive limestone (Thompson Weiman marbledust) is used in the high volume products such as Topping and Triple Duty. A coarser version of Purestone was tried to make it more like the marble dust but there is still a difference in the working characteristics which we feel would adversely affect the working properties of the products. Any gain in raw material savings could easily be wiped out by a possible reduction in sales, so it is not worth the risk to make the change.

Another possibility for cost reduction is the substitution of gypsum for limestone in Joint System. While this is a more difficult objective to achieve, the potential saving is much greater than a mere limestone substitution would offer. There are two reasons why gypsum is not used as a filler in Joint System. Gypsum counteracts the alkali in the casein products and keeps the casein from going into solution. The casein must go into solution in order to provide adhesion. This would not be a problem in Triple Duty or Ready Mix since these products contain vinyl adhesives. The other problem is the inherent absorbency of gypsum. This causes the joint system

to be more absorbent than the wallboard paper and results in decoration problems. One approach is to use anhydrous gypsum. Another is to treat dihydrate gypsum with a waterproofing agent to give it the required properties. Both methods are presently under investigation.

SALES SERVICE SECTION

1. Fire Test Program

The following full scale fire tests were conducted in the last half of 1967:

- a. Design #30 - 1 hour was obtained when a wood stud partition with 1/4" Sound Deadening board and 1/2" Firestop on each side easily passed the hour test. There were no attachments of the face board into the studs except at the top and bottom. All other fastenings of the face board were to the 1/4" Sound Deadening board.
- b. The repeat of Design #259 - 2 hours to achieve lower glass fiber usage was unsuccessful.
- c. The fire test of the Dens-Cote system over metal studs using 1/2" Firestop Dens-Cote base fell short of the hour in spite of apparent good performance of the wallboard.
- d. A repeat of Design #46 also did not achieve the result desired which was for the board to remain in place for the entire test and thereby satisfy the building code requirement in San Francisco.

Now that our pilot furnaces will be available again, we will begin a comprehensive pilot fire testing program. We will be attempting to answer some of the questions posed by the unsuccessful tests and also be seeking improvements in performance and cost for our Firestop products. The only full scale test planned is a flame-spread of Eternawall with 6 mil vinyl and a new adhesive. The ultimate goal is a 25 flamespread rating.

2. Sound Test Program

A STC rating of 45 was achieved for the wood stud partition with 1/4" sound board and 1/2" Firestop. This partition along with the metal stud partition previously tested with these same board products provides information for Sales to use in promoting our new 1/4" Sound Deadening board.

3. ICBO Approval Lightweight Board

Some 1/2" board weighing 1850 and 1698 lbs/M was manufactured at Blue Rapids and shipped to an independent testing laboratory. The purpose is to convince ICBO that the lighter weight wallboard is satisfactory. ICBO's not inclined to go along with the new ASTM weights without supporting data.

4. Predecorated Panels

A ceiling panel with a grid design was prepared for purposes of

discussion at one of the Sales/R&D meetings. Sales is interested in our developing a predecorated ceiling panel as well as predecorated wall panels such as molded grainboard as a step toward elimination of joint finishing and painting. This project is in an exploratory stage at the present time.

GYPSUM ASSOCIATION - ASTM SECTION

1. Technical Committee Meeting in French Lick

The technical committee of the gypsum Association met in August. Since the light weight board issue has been resolved, U.L. Label Service is the only controversial subject. We are still alone in our stand to continue label service but thus far have restrained any action on the part of the others to drop label service.

2. Fire Resistance Design Manual

The manual is undergoing revision and we have submitted a rewritten section of the manual that had been assigned to us.

3. Destructive Tests at White Plain Urban Renewal Project

Georgia-Pacific was represented on the task force which investigated the White Plains urban renewal area. Several buildings were selected for possible burn out tests. The object of such tests is to show how gypsum performs in an actual fire. The tests are to show:

- a. The effect of gypsum board if it were used as a sub-floor component.
- b. The effect of a suspended gypsum ceiling as a protection for open beam ceilings.
- c. The effect of a fire in a house where there is a roof instead of a floor assembly above the ceiling. There is some question whether the one hour rating is still valid if there is a roof over the ceiling.
- d. The effect of certain junctures in fire rated partitions. For example, the fire rating of a partition is suspect when a partition is only as high as the suspended ceiling. Conceivably, fire can spread through the ceiling and over the top of the partition.

Based on our task force investigation the Technical Committee will decide what tests to recommend and request approval from the board of directors of the Gypsum Association.

SGP 0015052

PATENT SECTION

1. Improved Firestop

A patent application for the new light weight Firestop formula was filed in August.

2. Dens-Cote Base

Some affidavits were prepared for the continuation of the patent application on the combination of pinholes and wetting agent as a surfacing for plaster bases. We understand that the examiner is inclined to allow our claims. If so, a patent covering this product will be forthcoming. It is difficult to assess the significance since we do not know how many other companies are currently using this method or how many companies we could license if this were our desire. Samples of competitive plaster bases are being requested.

3. Infringement of Firestop Patent

The subject of National Gypsum Co.'s infringement of our Firestop patent was raised again. We have nine companies under license and it seems unfair to them if we permit the National Gypsum Company to infringe. New evidence of infringement in the way of analysis results have been submitted to Synnestvedt and Lechner, our Philadelphia patent counsel. They have been asked to advise us if our patent is sufficiently strong to stand up if we sue. Our objective is to receive royalty payments from National for the remaining 6 years of the patent.

4. Radiant Heating Panel

There appears to be no patentable feature here. Armstrong has an application on the process for manufacturing the paper. We have gotten a 3 year exclusive purchase agreement from Armstrong extended to 5 years, so this will provide some degree of protection for us.

5. Hard End Wallboard

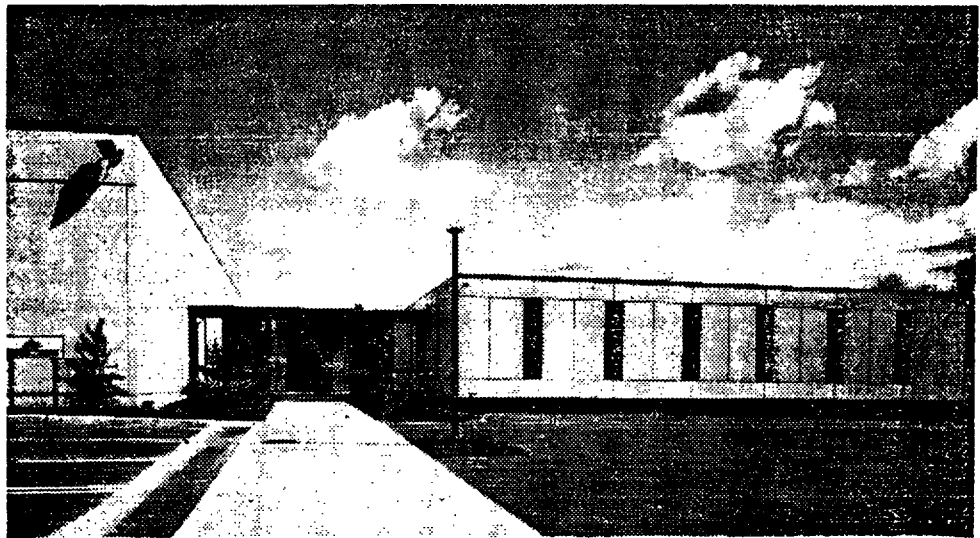
A patent search has not turned up any prior art. The next step is to determine whether there is a basis for a patent application.

6. Patent Policy

As a result of some questions which came up when the company change took place, John Synnestvedt of Synnestvedt & Lechner in Philadelphia suggested that a company policy be adopted and submitted a rough draft for our consideration. A discussion was held between Messrs. Wilson, Breuer, Pound, Stephanson and Lehnert and a revised draft of the patent policy was put together. This will be prepared in final form by Mr. Breuer and submitted to management for approval.

SGP 0015053

RESEARCH FOR PROFIT



JUST COMPLETED in Tigard, is Georgia-Pacific's new gypsum research laboratory, making that Portland suburb one of the nation's gypsum "capitals." New product development, quality control and manufacturing improvements are part of the lab's

work. Manager of research and development is C. W. (Bill) Lehnert, and technical director is John B. Moss. Portland architect L. C. Gilham designed the two-building facility. Builder was P&C Construction Co of Portland.