Review of the Fellowship Program

Introduction

The Asbestos Textile Institute was formally established on November 16, 1944 and included in the Constitution as adopted on that date are certain provisions with reference to the Institute's interests in research and the establishment of a Fellowship.

Article II, titled Purposes, sets forth, in part, as follows:

"The purposes of the Institute shall be:

1. .....

2. To lawfully promote the following activities:

   (a) The development of standards through research, practical tests, and other available means, the application of which by individual manufacturers, will insure a proper measure of quality in each of the Industry's products.

   (b) The development through research and other means of new uses and markets for the Industry's products, resulting in an increased consumption and a grading up of the Industry's products through the sale of better quality asbestos textile materials.

3. To lawfully promote and foster such Industry policies and programs as will tend:

   (a) To cultivate the good will of engineers, distributors, manufacturers, and the consuming public, and to improve their acceptance of the Industry's products.

   (b) To develop a more creative selling by the Industry's salesmen, and to instill among such salesmen an attitude of courageous aggressiveness in combating attacks upon the Industry, its Members, and its products.

   (c) To promote Industry welfare through cooperative research, improved manufacturing, selling and distribution methods.

   (d) To cooperate in maintaining open, free, unrestrained and equitable competition in a manner consistent with the laws of the United States."

Recognizing the important part that research can play in the development of an industrial organization, whether it be an individual company or an association of companies such as is represented by the Institute, the founders of the Institute specifically provided that such an activity should be one of the essential functions of the association. Realizing also, that many individual firms conduct research in their own interest and that advancements through these endeavors are essential to their individual growth, they were nevertheless aware of the necessity for industry-wide development which could serve to enhance individual security.

It was envisioned that the purpose and function of research, as an Institute activity, would in no way encroach upon the individual company's research and development programs but would rather serve to compliment such work through an industry-wide approach to problems of common interest. During recent years, glass and certain organic fibers have made inroads in applications where asbestos was formally used. In some cases, the newer products serve to a better advantage than do asbestos textiles, however, in many cases the newer products have found application simply through the performance of a service which the older line of asbestos textiles were not designed or intended to meet but which could possibly be met if asbestos textiles were improved in construction and composition to meet the specific requirements. A general up-grading in composition and quality would do much toward promoting increased usage of asbestos textiles, however, such a move on the part of one or two individual companies might not effectively serve to achieve the desired end. The entire industry must develop as a unit and be in a position to engage in a unified effort to combat the invasion of substitute materials.

During the course of this presentation, an effort will be made to set forth the steps which have been taken by the Institute in an effort to carry out the original conceptions of the research activities of the Institute, and by the Fellow in an endeavor to conduct the research in accordance with the directions received from time to time from the Institute.

Historical

The Technical Committee of the Asbestos Textile Institute came into being at the General meeting of the Institute held in Philadelphia, Pa., on July 25, 1945. At this meeting the action taken relative to the Technical Committee is set forth in Paragraph 7 of the Minutes of that meeting, as follows:

> "It was moved by Mr. Muehleck and seconded by Mr. Gatke that a Technical Committee be appointed. The motion passed unanimously. All members of the Institute are invited to appoint representatives to serve on the committee, with alternates

and/or technical advisors if desired. It was decided that the responsibilities of this Technical Committee should include: standardization, product research and development, consideration of standard nomenclature, finding new end uses for asbestos textiles, experimentation on combinations of asbestos with other fibrous materials, consideration of membership in the American Standards Association, possible selection of research facilities, consideration of a textile fellowship in some University, etc.

Members present were asked to name their representatives for this Technical Committee, and the following are the appointments to date:

ASBESTOS TEXTILE COMPANY	A. E. Berngen
JOHNS-MANVILLE CORP.	H. Coss J. Tucker (alternate)
PHILADELPHIA ASBESTOS CO.	A. J. Scanlan J. G. Tyson, Jr. (alternate) J. W. Weber (Technical advisor)
RAYBESTOS-MANHATTAN, INC.	J. M. Weaver
SOUTHERN ASBESTOS CO.	J. D. McCluer
UNION ASBESTOS & RUBBER CO.	Robert E. Cryor"

This action was preceeded by consideration of the subject at the meeting of the Board of Governors which was held in Philadelphia on June 15, 1945 where it was moved by Mr. Marshall, seconded by Mr. Teubner and unanimously agreed that action should be taken in the establishment of a Technical Committee.

On September 25, 1945 the Technical Committee held its first meeting in Philadelphia, with ten members representing seven member companies being present. At this meeting, one of the discussions concerned the establishment of a fellowship by the Institute and the following motion was unanimously agreed upon:

> "We should appoint a subcommittee to investigate possible institutions for establishment of a fellowship. This investigation should include possible locations, annual cost of the fellowship and type of work to be considered."

The subcommittee appointed was as follows:

"Mr. Frederick
Mr. Coss
Mr. Weaver"

On November 16, 1945, the subcommittee met in Philadelphia and the minutes of that meeting follow:

"The meeting was called to order by the Chairman, Mr. Frederick at 10:30 A.M. and the following is a summary of the points covered in the discussion:

A. The question as to whether or not a fellowship in a college or textile institute was needed at the present time indicated a common agreement that it does not seem advisable to establish a fellowship until a definite program of research has been outlined. It was further commented that a fellowship could best be expected to carry on a long range experimentation or development program which they felt was not a pressing need.

B. It was agreed that gathering factual information suitable for use in the promotion program was in order. It was felt that the services of a professional testing laboratory could do a quicker job of supplying useful information for use by the Sales Promotion Committee. Such organization as the U. S. Testing Laboratories, Pittsburgh Laboratory and Electrical Testing Laboratories were mentioned as possibilities in this program.

C. After some discussion, Mr. Coss suggested that the Committee members analyze Fiberglas advertising, promotive literature, catalogs, data sheets and publicity with a view to determining the type of factual information that this competitor has been using to promote their products. This analysis would provide the basis for a questionnaire which is to be prepared by the Committee members. The purpose of the questionnaire is to facilitate the gathering of pertinent information from Institute member companies in order that a practical program of testing could be outlined and then discussed with one of the testing laboratories. Until such time as a program is laid out in at least outline form, there is no reason to approach these laboratories as to possible cost, time etc."

On March 11, 1946 the subcommittee again met in Philadelphia and Minutes of that meeting contain two sections relative to the establishment of the Fellowship. They are as follows:

> "2. The question of a fellowship as discussed at the last meeting was brought up again. At the last meeting it was generally agreed that the desired testing could best be handled by some commercial Testing Laboratory. In the interim, however, because of several points of experience mentioned by Mr. Coss, this decision was reversed and it was agreed by all present that a fellowship of the proper size and with the proper facilities should be able to do the job better than one of the commercial testing laboratories. The feeling was that the needs were for a creative job rather than a routine testing service.
>
> 3. The following courses of action were agreed upon:
>
> (a) Mr. Coss was to get information on the possibilities, tentative costs, etc. from the Ceramic Dept. of Rutgers, North Carolina State University and Georgia Institute of Technology.
>
> (b) Mr. Frederick was to obtain similar information from the Mellon Institute.
>
> (c) Mr. Weaver was to get in touch with the Bureau of Standards to determine what pertinent and useful information was in their files with a view to making use of it in case a fellowship were established."

On June 14, 1946 the Technical Committee met in Philadelphia, Pa. and during that meeting the problems related to the establishment of a fellowship were again reviewed. The section of the Minutes of that meeting devoted to these considerations are as follows:

> "The afternoon session was devoted to discussion of fellowship facilities. Mr. Frederick, Chairman of the Fellowship Subcommittee reported as follows:
>
> 11/16/45 - At the first meeting of the subcommittee the members analyzed competitive data and submitted a report which was presented on 4/11/46.
>
> 3/26/46 - Rutgers.
> Met with Dr. Koenig of Dept. of Ceramics and discussed facilities for comparative studies on glass, asbestos, and other flameproof materials.

4/4/46 - Mellon Institute
Subcommittee met Dr. Weidlein at the Chemists Club in N.Y.C. The Institute is tied up with Naval Programme at present. Dr. Weidlein spoke of a slight possibility for a vacancy in July of this year but probably not until 1947. He thought that Armour Institute, Battelle Memorial Institute, Georgia Tech. and N. Carolina State would be "loaded up" at the present time.

5/9/46 - U. of Pennsylvania
Subcommittee met Deans Arnold and Goff of the Towne Scientific School. They had no definite offers to make as there is a matter of policy to be determined whether a programme of industrial research will be initiated. Subcommittee reported that it "looked like space but no facilities were available."

Penn. State College.
Mr. Coss talked with Dr. Henry at Buffalo. Dr. Henry thought Penn State well equipped. After some correspondence, the picture became confused. Mr. Frederick then wrote to Dr. Whitmore explaining the proposition. To date he had received no answer.

The members present then proposed the following opinion;-

In order to expedite the fellowship, we recommend that a fellowship be authorized and established at Rutgers due to personnel, spirit and facilities available."

On June 19, 1946, the Asbestos Textile Institute met in General meeting in Philadelphia and on this occasion gave further consideration to the establishment of a Fellowship. The Technical Committee report presented by Mr. Weaver reviewed the work of the subcommittee in its endeavor to find a suitable location where a fellowship might be established as well as a man for the position. In concluding this section of the report, Mr. Weaver states

"Your Technical Committee voted in favor of establishing an asbestos fellowship at Rutgers College, and to consider Dr. Myril C. Shaw for the position it will create".

In consideration of the full report, action was taken in the General meeting and the Minutes set forth this action as follows:

"Mr. Weaver, Chairman of the Technical Committee, presented a report on recent activities of his Committee. It was the recommendation of the Technical Committee that the Institute establish a Fellowship at Rutgers College, and to consider Dr. Myril C. Shaw as head of the activity. Mr. Fabel moved that we appropriate a sum of $15,000. a year, for two years, to set up an Asbestos

Fellowship as recommended by the Technical Committee. This motion was seconded and passed by all companies present.

It was understood that this Fellowship would operate under the Technical Committee who would be responsible for its supervision and guidance. Furthermore, the record of the man recommended in the Technical Committee report to head this Fellowship, Dr. Myril C. Shaw, met with the approval of the group, but the full responsibility for selecting a man to head the Fellowship was assigned to the Technical Committee."

The final step in establishing the fellowship was taken at the General meeting of the Institute which was held in Philadelphia on October 3, 1946. The section of the Minutes of this meeting related to these considerations are as follows:

"Mr. Weaver, Chairman of the Technical Committee, presented a report on recent activities of his Committee regarding the establishment of A Fellowship Program at Rutgers University (copy attached). A discussion on the aims and purposes of the Fellowship followed, and Mr. Gatke stated his acceptance of the Program outlined by the Technical Committee. Since we now have 100% acceptance of the Fellowship program as outlined and approved at the June 19, 1946 General meeting, the Chairman of the Technical Committee and the Institute Manager were instructed to take the necessary steps to employ Dr. Myril C. Shaw and to establish the Fellowship at Rutgers.

Mr. Wakem moved that the Manager contact, WEST, FLINT & CO. to have them calculate the assessment of each member company for this Fellowship--this assessment to be based on 1945 production figures. Motion seconded by Mr. Marshall, approved unanimously.

Mr. Weaver then read the proposed working agreement as presented by Dr. Shaw to the Technical Committee. It was suggested that this working agreement be cleared with the legal departments of Cadwalader, Wickersham & Taft and when approved by them, should be distributed to all member companies. After the working agreement has been finally approved, the President was authorized to complete the contract with Dr. Shaw--this contract to be dated October 1, 1946.

The Manager was then requested to contact Dr. Shaw and arrange for him to meet with the Technical Committee."

PURPOSES OF A FELLOWSHIP
ON ASBESTOS RESEARCH
AT RUTGERS UNIVERSITY

"I wish to present on behalf of your Technical Committee a brief resume of the reasons for recommending that a fellowship on asbestos research be instated at Rutgers University.

The agenda that was handed to the Technical Committee for action at its organization meeting included a fellowship for the study of asbestos. A subcommittee was appointed to the task of considering a fellowship, the scope of such fellowship, investigation of institutions where a fellowship could be established, facilities of such institutions to do the kind of research applicable to asbestos textiles, yearly cost, etc. The subcommittee held its first meeting and discussed the undertaking, with the negative result that no benefit could be seen that might not be obtained from a commercial testing laboratory. However, we are all conscious of the competition of glass fiber and it was decided to study the reasons set forth in advertisements of Owens-Corning Fiberglas Corp. to promote the use of glass textiles in fields where asbestos had had the call.

At the second meeting the sub-committee discussed its study and developed the fact that the asbestos textile industry does not have certain facts on the properties and performance of its products, facts established under the authority of recognized institutions and published in responsible engineering reports. Such information could be developed by a fellowship if established at a suitable institution. Among the topics considered and which have been mentioned for investigation are:-

a. Heat resistance of asbestos textiles when applied where high temperatures are in contact with only one side of the textile material.

b. Life tests to determine, the useful period of various grades at elevated temperatures, as might be disclosed by continuous application to hot surfaces for periods of 30, 60 and 90 days.

c. Flexural strength, a property of very low value in fiberglas.

d. Safe working temperatures for which various grades of textiles may be recommended under authority of engineering tests.

e. Rodent resistance. It is known that rats will go thru concrete, thru aluminum, and into magnesia pipe covering, but it is hoped that asbestos cloth is a barrier.

Other long-range projects have occurred to the Sub-committee such as

(1) a study to determine accurately the constituents of various types of asbestos;
(2) to find out why there is considerable variation in the analyzed percentages of water of crystallization in different lots of fiber, and what effect this has on performance of the asbestos;
(3) a study of the opening of asbestos so as to separate fibers without injury, and
(4) to determine the maximum degree of fiberizing and methods or technique of taking advantage of the greater strength possible of attainment in twisting together very finely divided fibers.

Confidently expecting that those members who were not present at the General Meeting held June 19, 1946, would concur in the unanimous action of that meeting, I proceeded to have Dr. Shaw visit members of the Institute and notified Rutgers University. Subsequently I received from Dr. John H. Koenig, Director, Dept. of Ceramics, a tentative agreement covering the proposed fellowship, which is hereby made part of this report.

The cost breakdown on a one-year basis is as follows:

Salary of Research Specialist------	$6,000.00
Equipment, supplies, etc.----------	750.00
University overhead----------	750.00
	$7,500.00

Dr. Myril C. Shaw visited Raybestos-Manhattan, Inc. at Manheim and made a very favorable impression. He also visited other members of the Institute but deferred seeing all plants until later.

It may be in order to mention that as an industry we have been prodded by the continual flow of advertised applications of fiberglas to a realization of how little we have that can be used to foster the use of asbestos.

MS 003527

The Fiberglas Corporation spent freely and the reward has been many fold. We all know of the large staff of research and development engineers that has worked for several years in accumulating the information that supports fiberglas in its manifold applications.

The 9th Annual Report on Industrial Research Progress at Armour Research Foundation of Illinois Institute of Technology lists glass fibers as one of the 41 projects that were completed in 1945.

Bearing in mind that to foster the use of asbestos it becomes essential to give it publicity, what better way can be suggested than a fellowship that would in itself be an item of publicity? and that facts developed by it would be news for publication in Engineering Journals.

It has been suggested that I present at this meeting a tentative program. I feel that the topics already set forth are a tentative program. Your Technical Committee will be glad to receive suggestions to enlarge or modify the scope of the work."

J. M. Weaver, Chairman
Technical Committee

INDUSTRIAL RESEARCH AGREEMENT
between
THE TRUSTEES OF RUTGERS UNIVERSITY IN
NEW JERSEY
and the
ASBESTOS TEXTILE INSTITUTE

Preamble: For the purpose of promoting useful knowledge, the Trustees of Rutgers University in New Brunswick, New Jersey, hereafter described as the University and Asbestos Textile Institute, an organization having a place of business at 12 South Twelfth Street, Philadelphia, Pa., hereafter described as the Donor, hereby enter into the following agreement.

Title: The project to be established under this agreement shall be known as the Asbestos Textile Institute Fellowship.

Purpose: The object of this work is to conduct research to foster the proper utilization of asbestos textiles and extend their use.

University's
Responsibility: The University agrees:

1. To furnish such land, buildings, laboratories and equipment as may be available for the work to be performed.

2. To designate the director of the Department of Ceramics as its agent in the administration and supervision of the project.

3. That the research specialist selected to carry on the work shall be acceptable to the Donor and shall have the necessary qualifications to conduct the work.

4. To furnish the Donor with reports of progress made under this project at intervals of two months.

5. To furnish the Donor with a full and complete report of the work done and results attained under this project at the expiration of this agreement.

Donor's
Responsibility: The Donor agrees:

1. To contribute for the support of this project the sum of $7500.00 payable on October 1, 1946, to Rutgers University.

2. To designate the Technical Committee of the Asbestos Textile Institute, J. M. Weaver, Chairman, as their agent and representative for consultation.

Mutual Undertakings: It is mutually agreed:

1. That the work shall be carried on under the supervision of the director of the Department of Ceramics.

2. That no publication shall be made of the results attained under this project during the life of this agreement or after submittal of the final report, except by mutual consent.

3. That the Donor shall be entitled to all patent rights that may arise from this research project.

Life of Agreement: This agreement will become effective October 1, 1946, and shall remain in force and effect for a period of one year from that time.

This agreement may be renewed by mutual consent upon its expiration. Such renewal may be effected by an exchange of letters, or, if necessary, by the execution of a supplementary agreement.

In witness whereof, the respective parties hereto have caused this instrument to be executed as of the first day of September, 1946.

Recommended:
College of Engineering

_____
Dean

_____
Director
Department of Ceramics

Approved:
The Trustees of Rutgers University
in New Jersey

By_____
President of the University

Asbestos Textile Institute

By_____
(Name and Title)

(Agreement with Dr. Shaw supplemental to the Industrial Research Agreement between the Trustees of Rutgers University and the Asbestos Textile Institute)

INDUSTRIAL RESEARCH AGREEMENT

AGREEMENT entered into this day of October, 1946, between MYRIL C. SHAW, herein after referred to as Research Specialist, and ASBESTOS TEXTILE INSTITUTE, a non-incorporated trade association having its principal office in the City of Philadelphia, hereinafter referred to as the Institute.

In consideration of a substantial contribution to be made by the Institute to Rutgers University for the support of a project known as the Asbestos Textile Institute Fellowship to conduct research to foster the proper utilization of asbestos textiles and extend their use and the employment of the Research Specialist by Rutgers University to administer the project, it is hereby agreed:

1. The Institute will contribute Seven thousand five hundred dollars ($7,500) to the support of said project.

2. The Research Specialist will promptly and fully disclose to the Institute any and all inventions received, discovered or made by him while engaged on said project whether solely or jointly with others and directly or indirectly relating to the utilization of asbestos textiles or an extension of their use and that he will not at any time without the Institute's consent disclose such inventions to any person, firm or corporation other than the Institute;

He will fully cooperate with the Institute in securing letters patent for said inventions everywhere upon the Institute's request so to do and at its expense;

He will and does hereby assign to the Institute or its nominee all of such inventions, all applications for letters patent filed thereon and all letters patent which may issue thereon;

He will execute all proper papers and documents and perform all other lawful acts which the Institute deems necessary to enable it to secure patent protection on such inventions and more full vest the Institute with title therein and thereto in any and all countries.

IN WITNESS WHEREOF,, this agreement has been duly executed and delivered this day of October, 1946.

_____
Research Specialist

ASBESTOS TEXTILE INSTITUTE

By_____
President

_____
Secretary

Fellowship Projects

Immediately following the establishment of the Fellowship at Rutgers University the Technical Committee initiated discussions related to the establishment of a project list for the Fellowship. The Committee met on November 15, 1946, and at that time reviewed a list of thirty prospective projects for inclusion in this work. From this list, twelve specific projects were selected to constitute the first Fellowship program. This program was submitted to the Institute in General Meeting on December 12, 1946 and unanimously adopted. The program was as follows:

Program I

Group I.

1. Determine abrasion resistance of various types of weave in asbestos garment cloths.
2. Determine comparative abrasion resistance of the standard grades of plain weave cloth weighing 2.50 pounds per square yard.
3. Determine flexural strength of various grades, weights and weave constructions of asbestos cloths.
4. Determine tensile strengths of various grades, weights and weave constructions of asbestos cloths:
   a) by the grab method
   b) by the strip method
5. Determine at what temperature test specimens should be held in a drying oven and for how many hours, to attain constant weight. There is good reason to believe that the long established practice of drying for one hour at 110°C (230°F.) does not disperse all of the absorbed water.
6. Tests of various grades and weights of asbestos cloth applied upon a hot surface for 30, 60 and 90 days at temperatures of 400°F., 450°F., 500°F., and higher.
7. Safe working temperatures for which various grades and types of asbestos cloth should be recommended.
8. Make tests to determine the grade and weight of asbestos cloth to be recommended for a) Fire blankets, b) Welding curtains, c) Theater curtains, d) Draperies, e) Asbestos gloves and mittens; hoods and helmets; coats and coveralls.

Group II.

1. A study of the chemical and physical properties of asbestos in its various types to inform the Research Specialist on the fundamentals of the Fellowship work.

2. Develop a simple procedure for classifying fiber as to staple lengths, to obtain more accurate descriptions than are obtained by the Quebec Shaker Screen Test.

Group III.

1. Compile for 8-cut, 10-cut, 12-cut, 14-cut, 16-cut, 18-cut, 20-cut, 22-cut, 24-cut, 28-cut yarns, a table giving diameters, turns per inch and tensile strengths for various grades. The object is to establish standards for the asbestos industry.

Group IV.

1. Develop a method to determine the magnetic rating of chrysotile fiber in terms that will evaluate the fibers' electrical properties.

On July 15, 1949 the Technical Committee again considered the work of the Fellowship and, at this time, amended the program as follows:

Program II

I) It was recommended that the work and results of the following investigations be written up as progressive and complete reports. These reports are to be presented to the Technical Committee and the News Release Committee of the Institute for editing prior to publication and for authorization of publication:

1-a.) Determine the comparative abrasive resistance of various grades, weights and weave constructions of asbestos cloths.

1-b.) Determine the comparative flexural strength of various grades, weights and weave constructions of asbestos cloths.

2. Determine the comparative strengths of various grades, weights and weave constructions of asbestos cloth by
   a) The grab method
   b) The strip method

3. Determine the time-temperature relationship which, with reasonable laboratory facilities will result in a sample of cloth attaining constant weight.

4. Investigate methods of determining the fire or flaming resistance of the several grades of asbestos cloth.

II). It was further recommended that the following projects be actively pursued by the Fellow:

1. Expose various grades and weights of asbestos cloths under controlled conditions for such periods of time as are found necessary to hot surface temperatures of 400 degrees F., 450 degrees F., and higher as desired. Determine some critical property such as tensile strength before and after exposure.

2. Determine the applicability of asbestos textile products for electrical purposes which can be ultimately applied to the unwoven fibers.

3. Develop a procedure for classifying asbestos fibre as to length which will be more accurate than the Quebec Standard Testing Machine.

4. Accumulate data on physical and chemical properties of asbestos (primarily the chrysotile of commerce) in order to determine many of its fundamental properties. Such a study to include:

   (a) X-ray analysis, with a view toward identifying certain fibre; toward determining the crystal lattice; toward determining its atomic structure; and toward determining the molecular size and shape.

   (b) Thermal analyses, with a view toward assisting in determining physical, chemical and thermal properties.

   (c) Chemical analysis.
   Test chrysotile for sodium chloride and other contamination.

   (d) Fibre strength.

   (e) Potential fibre sub-division

   (f) Stiffness or harshness if fibre.

   (g) Electrical properties of fibre.

   (h) Method of determining sub-division of fibre, say for example by surface area.

5. Determine if variations in types of chrysotile asbestos bear any relation to the performance--
   (1) Dielectric strength
   (2) Resistivity in megohm
   (3) Thermal conduction
   (4) Acid Resistance
   (5) Adhesion to resins
   (6) Permeability to saturating compounds
   (7) Ease and extent of fiberization

6. Investigate the time-temperature relationship on tensile strength of asbestos fabrics.

7. Attempt to keep informed of developments in safety clothing.

8. Keep advised on developments for synthesizing asbestos from serpentine or other raw materials.

This action was submitted for approval at the General Meeting of the Institute held on September 16, 1949 and unanimous approval was received.

On July 27, 1950 a special meeting was called to reconsider the Fellowship program. Those members who were in attendance to discuss this work represented members of the Board of Governors and of the Technical Committee. Concluding these discussions, the following project list was approved.

Program III

1. Continue the work on the heat aging test for asbestos textiles so that satisfactory specifications may be concluded with Westinghouse Manufacturing Co. and the Federal Agencies. It was unanimously agreed that the necessary funds, not in excess of $1000, would be provided from the General Fund of the Institute to purchase a furnace for these tests after such a furnace had received the unanimous approval of the membership.

2. Gather information and publicize the use of asbestos textiles for pipe covering purposes. Develop a suitable cloth for such purposes.

3. Determine the temperature resistance of five standard grades of asbestos cloth.

4. Make a comparison of asbestos textiles with glass-asbestos combinations, glass and duck with respect to:

   a) Abrasion resistance before and after resination.

   b) Conformity and slippage.

   c) Heat and moisture degradation.

   d) Mildew and soil aging test.

   e) Alkaline resistance.

5. Compare fire and flame resistance of asbestos textiles with glass and glass-asbestos combinations.

On March 19, 1951, the Fellowship program was again reviewed by the Technical Committee and it was agreed that the program adopted July 27, 1950 should be continued and three additional projects should be added for consideration following the completion of the work on the first five subjects listed on the previous schedule.

A. Obtain up-to-date chemical, X-ray and spectrographic analyses of chrysotile. Such analyses to include the determinations for: MgO, SiO_2, Al_2O_3, FeO, Fe_2O_3, CaO, Na_2O, K_2O, H_2O, CO_2, and Ignition Loss.

B. Review the methods for determining magnetic iron content of asbestos. In view of the apparent unreliability of present methods of making these determinations it was felt advisable to review the whole subject and explore new approaches for making such determinations.

C. Investigate the acid degradation tests for asbestos textiles. Some specifications, specifically one by Consolidated Edison, rely upon the results of such a test and it was felt that an investigation of the subject by the Fellowship would serve to enlighten the membership regarding the value of results so obtained.

Thus, it will be observed that the burden of formulating the research programs has, for the most part, been carried by the Technical Committee of the Institute, however, on one occasion, July 27, 1951, the Technical Committee met with the Board of Governors for the purpose of reviewing and reformulating the work to be engaged in by the Fellow. In all instances, however, the actions of the Technical Committee were in the form of recommendations which were presented to General Meetings of the Institute and on all occasions these recommendations were approved.

The execution of the several programs has been, in large measure, left to the discretion of the Fellow. The programs were usually set up with the project listings in the order of importance and preferred priority of attention. Whenever possible, this order was followed in the investigational work, however, the availability of test equipment and the time of duration for certain tests permitted the consideration of several projects having lower priority ratings.

In recent meetings during the course of discussions relative to the Fellowship work there have been expressions to the effect that much of the work undertaken by the Fellow has been more or less nonproductive in providing publicity material, since few of the projects have been reported as completed investigations. In order to clarify the position of the Fellow in this regard, an accounting of the work thus far accomplished against the work assigned may be of interest.

Investigation Reports

Abrasion Resistance.

It will be observed that the first two programs are very much the same and the projects therein listed were the chief concern of the Fellow until July 27, 1950. Projects #1, #2 and #3 of the first program and #1a and #1b of the second program were concerned with 1) the development of a machine for making abrasion tests of asbestos textiles and 2) the determinations and evaluation of the abrasion resistance and flexural strength characteristics of asbestos textiles.

It may be of interest to note that included in the report dated March 28, 1947 are photographs showing the Abradoflex machine which was in operation at that time, four and one-half months after the problem had been presented.

On March 27, 1950 a complete report was issued which covered the development of the A.T.I. Abradoflex and presented an evaluation of test work on a great many representative asbestos textiles. In the Bulletin, A.S.T.M., February 1952 another publication covering this subject was presented.

In addition to this reported work, more than one hundred individual abradoflex tests have been run for member companys of the Institute on special or unique fabrics. This additional work has afforded the Fellow an opportunity to thoroughly study the capabilities of the Abradoflex and establish its usefulness but the results of these efforts have not been reported to the Institute for general circulation.

On the basis of the reports noted above and since there has not been an expression by the Technical Committee indicating the need for further work on this subject, we have considered this work completed.

Tensile Strength

Project #4 in the first program and project #2 in the second program are concerned with tensile strength determinations on asbestos textiles. On March 27, 1950 a report was issued entitled "The Physical Properties of Asbestos Textiles" and, among other subjects, there was presented a thorough consideration of the tensile strength properties of these materials. On April 13, 1950 an additional report entitled "Tensile Strength Determination" was submitted and in this, a comparison of tensile strength determinations by the grab method and the strip method was presented. With the presentation of these two reports this work has been considered completed. However, even though these investigations covered all of the textiles available to us for this work and these cloths were fairly representative of the industry, it was the opinion of

the Technical Committee that the data presented was somewhat confidential in nature and, therefore, should not be given circulation outside of the Institute membership.

To date there has been no expression of further interest in this subject nor have we been directed to proceed with additional test work. Therefore, on the present basis, this work is considered complete.

Drying to Constant Weight.

Project #5 of the first program and project #3 of the second program refer to one step in the procedure for making asbestos content determinations. On March 27, 1950 a complete report entitled "The Asbestos Content of Asbestos Textiles" was issued and in that report specific recommendations were presented regarding the subject with which we are here concerned. On the basis of this report, this project is considered completed.

Flame Spread Tests

Project #4 in the second program is related to the investigation of methods for determining the flame spread resistance of asbestos textiles. In April, 1951, a complete report covering this subject was submitted. There has been no action taken by the Technical Committee as a whole wherein this report has been approved, however, individual members have expressed satisfaction with the presentation and Mr. G. W. Taylor, Small & Parkes Limited, expressed much interest in the work. This project is therefore considered complete and until further directions are received additional work is not contemplated.

Project #5 in the third program seeks a comparison of glass and glass-asbestos textiles with asbestos textiles as related to fire and flame resistance. However, the Technical Committee has indicated that this work, and all other work wherein asbestos-glass combination textiles are to be investigated should be held in abeyance until more is learned regarding the characteristics of asbestos-glass textiles.

Elevated Temperature Characteristics of Asbestos Textiles

Project #6 in the first program, projects #1 and #6 in the second part of the second program, and projects #1 and #3 in the third and fourth programs are all related to studies to determine the elevated temperature characteristics of asbestos textiles. This problem has been under investigation for the past several months and full reports have been issued.

Projects #7 and #8 in the first program are directly related to this work and although these projects have been discontinued for Fellowship consideration, some recommendations may be possible as a result of the findings presented in the above report.

Chemical and Physical Properties of Asbestos

Project #1 in the second part of the first program and project #4 in the second part of the second program are related to fundamental considerations of the asbestiform minerals. A considerable amount of this work has been carried out and much of it published in our early progress reports and in the report entitled "The Asbestos Content of Asbestos Textiles". However, at the joint meeting of the Board of Governors and the Technical Committee held on July 27, 1950, it was unanimously agreed that all work of a fundamental nature should be discontinued and there has, therefore, been no further work along these lines.

Classification of Asbestos Fibers

Project #2 in the second part of the first program and project #3 in the second part of the second program are related to the establishment of a method for classifying asbestos fibers as to staple length in order that more accurate descriptions may be obtained than are given by the Quebec Shaker Screen test. Work in this connection was initiated and reports #11, April 7, 1949; #13, Sept. 16, 1949; and #14, December 8, 1949 set forth discussions related to the work undertaken. However, with the establishment of program III on July 27, 1950, this project was dropped and there has been no further consideration given to this problem.

Asbestos Textiles for Pipe Covering

This project was developed and proposed at the joint meeting of the Board of Governors and Technical Committee held on July 27, 1950. As this investigation progressed Johns-Manville Corp., introduced an asbestos tape as a possible solution to this problem and the Fellow was assigned the task of determining the practicability of such applications. With the cooperation of Johns-Manville Corp. representatives we were afforded an opportunity to make a study of this material at the New York Shipbuilding Company. The complete report on this phase of this problem was presented to the Institute on June 20, 1952.

A second phase of this investigation covers the development of an aluminum clad asbestos textile for this purpose. It has since developed that such a material may be most useful in applications other than pipe covering and, recognizing the possibilities of a future for such materials, the Technical Committee placed it on the active list for Fellowship consideration at the meeting held May 6. However, at the General meeting held June 20, 1952, it was removed from the Fellowship program awaiting a report by individual members.

SUMMARY

It will be observed that complete reports have been issued to cover most of the projects which have been assigned for Fellowship work from time to time. It will also be noted that many of the projects have been discontinued due to the changing interests of the members. Many of the discontinued projects had received a considerable amount of investigation prior to the time that they were dropped and some of this information has been presented in various progress reports of the Fellow.

The work of the Technical Committee has been devoted to the consideration of technical subjects of interest to the industry and these interests are continually changing with industrial growth and changing consumer demands. The Fellow has endeavored to serve this committee in these considerations wherever possible.

Safety clothing specifications, as related to the asbestos textiles therein consumed, required attention during one period; the establishment of a standard list of asbestos textiles has been a continuing project of this committee and an effort to unify the several Federal Specifications has received attention during recent years. Early in 1950 the Heat Aging Test became an active project and many reports were presented by both the Fellow and members of the Technical Committee covering this subject.

During recent years there has been an ever increasing interest in asbestos-glass combination textiles and certain exploratory investigations in this field have engaged the services of the Fellow.

CONCLUSIONS

We have endeavored to conduct the work of the Fellowship with thoroughness and have painstakingly sought to obtain information that was accurate and, as far as possible, representative of our industry's materials. A "rate of production" schedule for a research program is a dangerous stipulation if reliability is expected, but we have endeavored to proceed as rapidly as possible and have kept the Institute periodically advised regarding the developments within the several projects of research.

Concern has been expressed regarding the inability of the Fellow to produce results having promotional value and this criticism is perhaps well founded since the programs of research have been, for the most part, designed to accumulate technical information and data which would be useful in furthering technological advancements within the asbestos textile industry as it is represented by the Institute membership.

The conversion and utilization of technical information into suitable promotional copy is a difficult task and we have perhaps been remiss in not having devoted more of our efforts in this direction. However, the work of the Technical Committee has inadvertantly dominated out work and thoughts and, for the most part our efforts have been directed to the accumulation of data and information of interest to that group. A review of the Minutes of the Technical Committee meetings over the years will reveal that the Fellow has carried out many special projects of interest to this group in connection with 1) specification considerations, 2) fiber indentification and analyses and 3) glass-asbestos combination cloth materials. Although these latter projects have not been recognized as a part of the formal program of the Fellowship work, it was felt that the interest evidenced by the Technical Committee justified the attention devoted by the Fellow.

Myril C. Shaw,
Research Fellow

INTRODUCTION

During recent months the activities of the Fellowship have been directed, in the main, to the attention of three specific problems, namely: 1) Physical Tests on asbestos textiles, 2) Westinghouse Heat-Aging Test and 3) Significance of chemically combined iron in chrysotile. In addition, the legal work in connection with the application for patent on the Abradoflex was completed on February 27th and during this period consultations with the attorney necessarily required some attention.

In connection with the project related to the chemically combined iron in chrysotile and under authorization by action taken at the last General meeting, we have engaged the services of a student assistant to expedite this particular piece of work. The employee is a senior electrical engineer who will graduate this coming June, however, it was felt that during the period of this engagement much of the fundamental and instrumentation work could be completed and the advisability of further assistance in this work could be determined. Progress in this project will be reviewed later.

REPORT OF INVESTIGATIONS

Physical Tests on Asbestos Textiles

In an effort to obtain further information relative to the degradation characteristics of asbestos textiles which contain glass fiber as compared with those which do not, the investigation here to be reported was undertaken. The Fellowship report issued at the last meeting set forth some of this data as it is related to elevated temperature performance. In an extension of this work the present investigation was undertaken in an effort to establish the degradation characteristics of representative asbestos textile materials after being subjected to 1) steam treatment, 2) water soaking and 3) acid treatment. The correlation of this data with the elevated temperature data should prove of interest.

In order that this work might have a reasonable degree of correlatability, cloths in the style of 36P10 were selected for most of these tests. However, no cloths of this style which contain glass staple are available in the grades of commercial or underwriters and, therefore, three cloths in the style 22P10G, (continuous filament glass) were selected for the underwriters grade evaluations. Also, in order that some indication as to relative serviceability of the AAAA grade cloths might be obtained, style 56T8 was included since, here again, no such cloth in style 36P10 is available.

In addition to the tests on asbestos textiles, a similar set of tests were run on a series of six samples of cotton duck which have recently been received for evaluation. From time to time, interest has been expressed in the comparability of ducks with asbestos textiles under certain conditions. Little specific information relative to this relationship is available and it may be that

this work will serve to indicate the advisability of further pursuing such an investigation.

The test conditions followed in these tests were arbitrarily selected by the investigator and do not necessarily represent any particular set of service conditions, however, it is felt that the procedures adopted do tend to indicate the relative serviceability between grades and between those cloths which do and do not contain glass.

Steam Treatment. The steam treatment consisted of subjecting the various specimens to an atmosphere of steam for a period of 48 hours. The samples used were warp-grab, tensile strength test specimens and two sets, consisting of three specimens in each set constituted one test. The specimens in test were individually suspended, one-half inch apart, on a rack which held eighteen samples at one time. The rack, holding the test specimens, was contained in a large boiler type vessel which was heated by means of an electric hot plate. A relatively constant water level was maintained in the bottom of the boiler and the temperature of the unit constantly maintained so that steam was caused to be vented through a small side port for the duration of test. In effect, all of the samples were uniformly bathed in an atmosphere of steam for the duration of the test.

Immediately upon completion of the test and while the samples were still wet, each sample was tested for tensile strength.

Water Treatment. The water treatment simply consisted of soaking the test samples in room temperature tap water for a 48 hour period. Immediately following the soaking period and while still wet, the samples were tested for tensile strength.

Acid Treatment. The acid treatment consisted of soaking the test samples in a 5% solution of hydrochloric acid for 48 hours. Immediately following the soaking period the samples were rinsed in clear water for five minutes and were then tested for tensile strength while still wet.

Heat Treatment. The heat treatment selected for use in this work, in the case of the asbestos cloths, was the 24 hour cycle at 400°F. The data used in this case was as reported in Fellowship report #23. In the case of the cotton ducks however, 400°F proved to be excessive since between 92% and 95% of the strength was lost at this temperature. Therefore, additional tests were conducted at 300°F and the results of both determinations included in this work.

RESULTS

The results of these tests are set forth in Tables 1 and 2 and in Plates 1, 2, 3 and 4. Table 1 includes the composite data for the tests on asbestos textiles and this information is graphically

presented in plates 1, 2 and 3. Table II and plate 4 present the data for the cotton duck materials.

Each plate sets forth the tensile strength data on a series of cloths, each cloth being represented by a five-section bar graph where AR represents tensile strength as received, S is tensile strength after steam treatment, W is tensile strength after water treatment, A is tensile strength after acid treatment and AH is tensile strength after heating at 400°F. The first figure below each bar graph designates the sample number, the second figure the style and the third figure the grade.

It is interesting to note in Plate 1 that the Commercial and Underwriters cloths which contain no glass exhibit qualities superior to all of the other cloths investigated, as far as resistance to destruction by the steam test, the water test and the acid test are concerned. The steam treatment on the commercial grade is but slightly more degrading than the water soaking and the Underwriters cloth likewise exhibits excellent properties in this respect, though slightly poorer than the commercial cloth. In further consideration of the Underwriters cloths shown in Plate 1, it will be seen that both steam and water actively serve to reduce the tensile strength properties of the 22P10G style cloths, with two of the three cloths showing much more destruction due to the steam than the water. The acid resistance of the 22P10G cloths is extremely poor.

Plate 2 sets forth the data for AA grade, 36P10 cloths, two of which contain no glass and four of which contain varying amounts of glass staple. It will be observed that, in general the presence of glass staple improves the resistance to destruction by steam and water and, in two of the four samples, improved acid resistance is apparent. It appears significant also, that the cloth containing the least amount of glass (7%) exhibited the best characteristics.

Plate 3 sets forth the data for five AAA grade, 36P10 cloths, and one AAAA grade, 56T8 cloth. In this series, the presence of glass staple definitely enhances resistance to destruction by steam, however, the water and acid treatments are more destructive to the glass bearing cloths than to the non-glass bearing cloths. It is also significant to note that the relative destruction by all treatments is more effective on the AAAA grade regular cloth than on the AAA grade regular 36P10 cloth.

Plate 4 sets forth data for six samples of cotton duck. The figures below each bar graph identify the separate materials on the basis of weight per square yard. In this work, the results of the steam and the water treatment are very much alike and in all cases markedly improve the tensile strength characteristics. The values for the steam treatment only are here recorded and it will be observed that increases in tensile strength of over 30% are obtained on the three lighter weight cloths. The breaking strength of the three heavier cloths, after steam treatment, exceeded the 500# limit of the testing machine and absolute results could not, therefore, be determined.

Table I

ASBESTOS TEXTILES

Cloth #	Style	Grade	Tensile Strength As Received	Steam 48 Hours	Water	Acid	After Heating 400°F 24 Hrs.
160	36P10	Comm.	141	137	139	116	26
133	36P10	Und.	150	135	142	113	44
155	22P10G	Und.	145	31	57	26	142
152	22P10G	Und.	138	43	60	23	103
159	22P10G	Und.	162	59	54	41	101
125	36P10	AA	134	107	108	62	78
134	36P10	AA	151	100	106	66	105
140	36P10GS	AA	149	143	129	88	82
171	36P10GS	AA	122	104	94	60	70
149	36P10GS	AA	123	107	96	59	64
167	36P10GS	AA	129	120	128	96	74
129	36P10	AAA	166	130	142	72	148
170	36P10GS	AAA	152	138	117	47	130
172	36P10GS	AAA	121	98	75	44	87
148	36P10GS	AAA	107	95	83	45	77
166	36P10GS	AAA	162	140	120	82	119
132	56T8	AAAA	182	112	130	63	168

Table II

DUCK

Cloth	Weight Sq. Yd. Oz.	Tensile Strength As Received	Steam (48 Hrs.)	After Heating (300°F 400°F) (24 Hrs.)	
X-1	14.3	192	262	154	10
X-2	18.0	244	327	199	10
X-3	19.8	292	393	237	16
X-4	24.0	434	over 500	378	19
X-5	27.4	480	" 500	312	18
X-6	28.0	475	" 500	346	39

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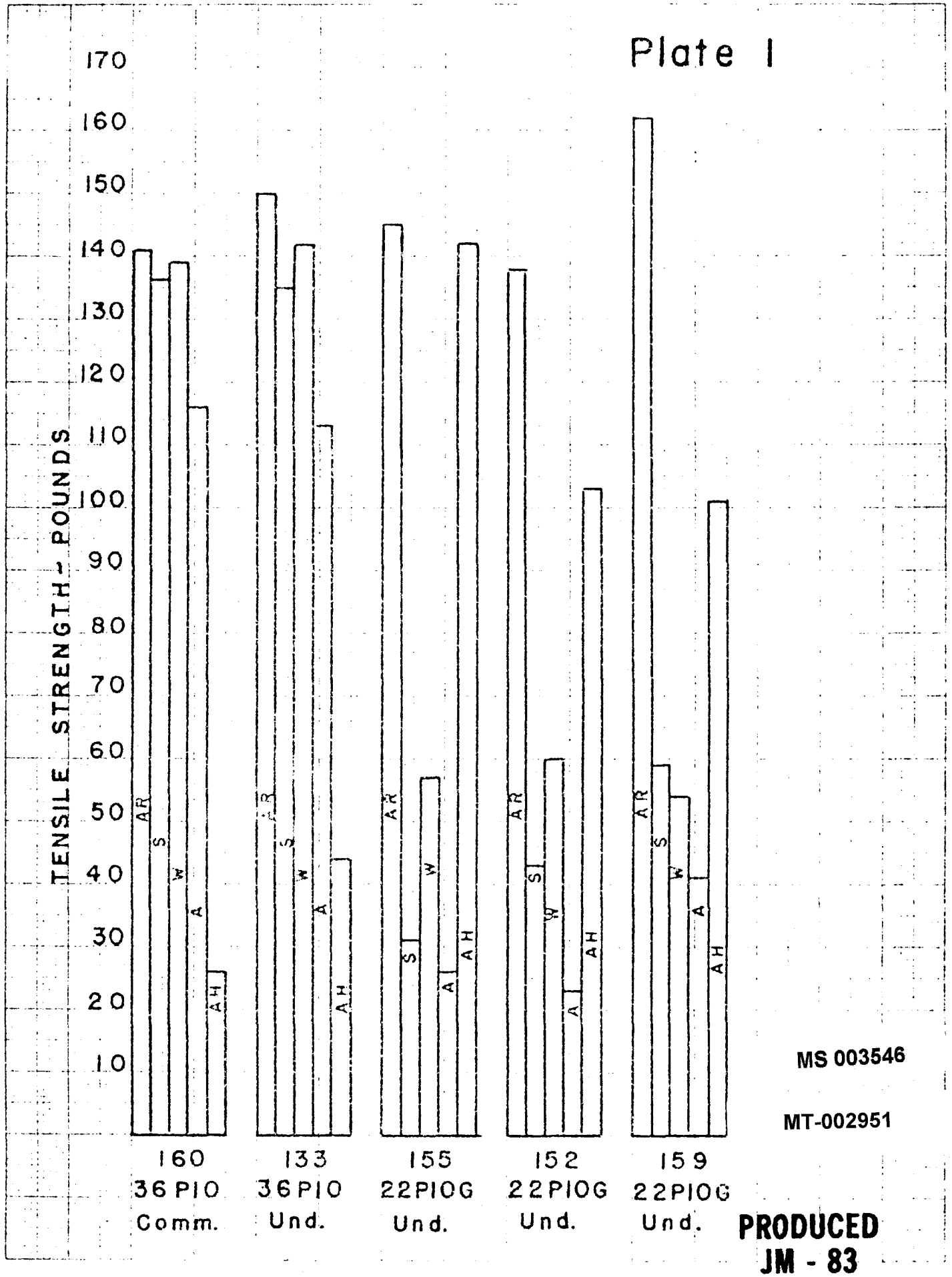
Plate I



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NEW BRUNSWICK, N.J. 08903

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Plate 2

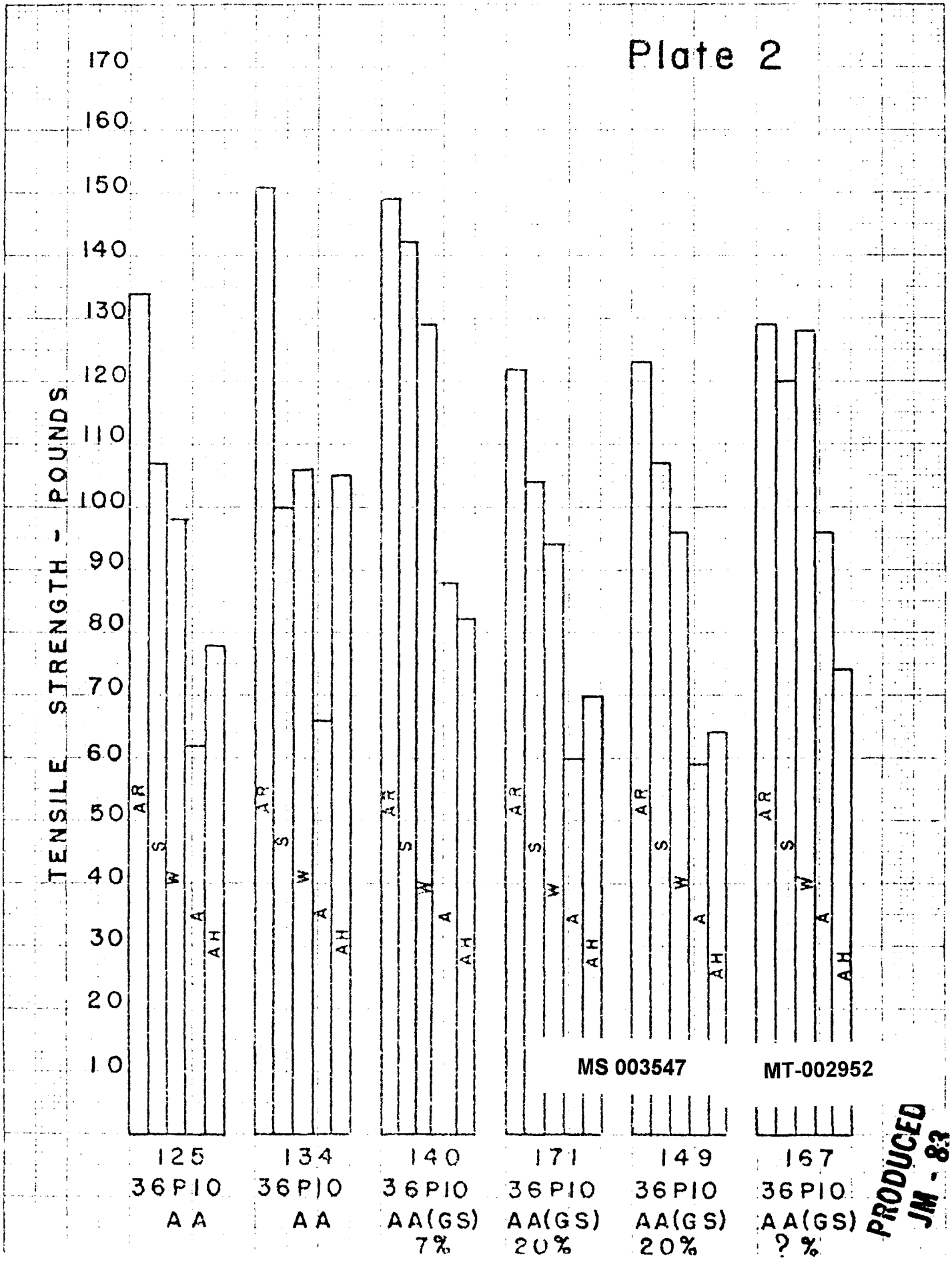

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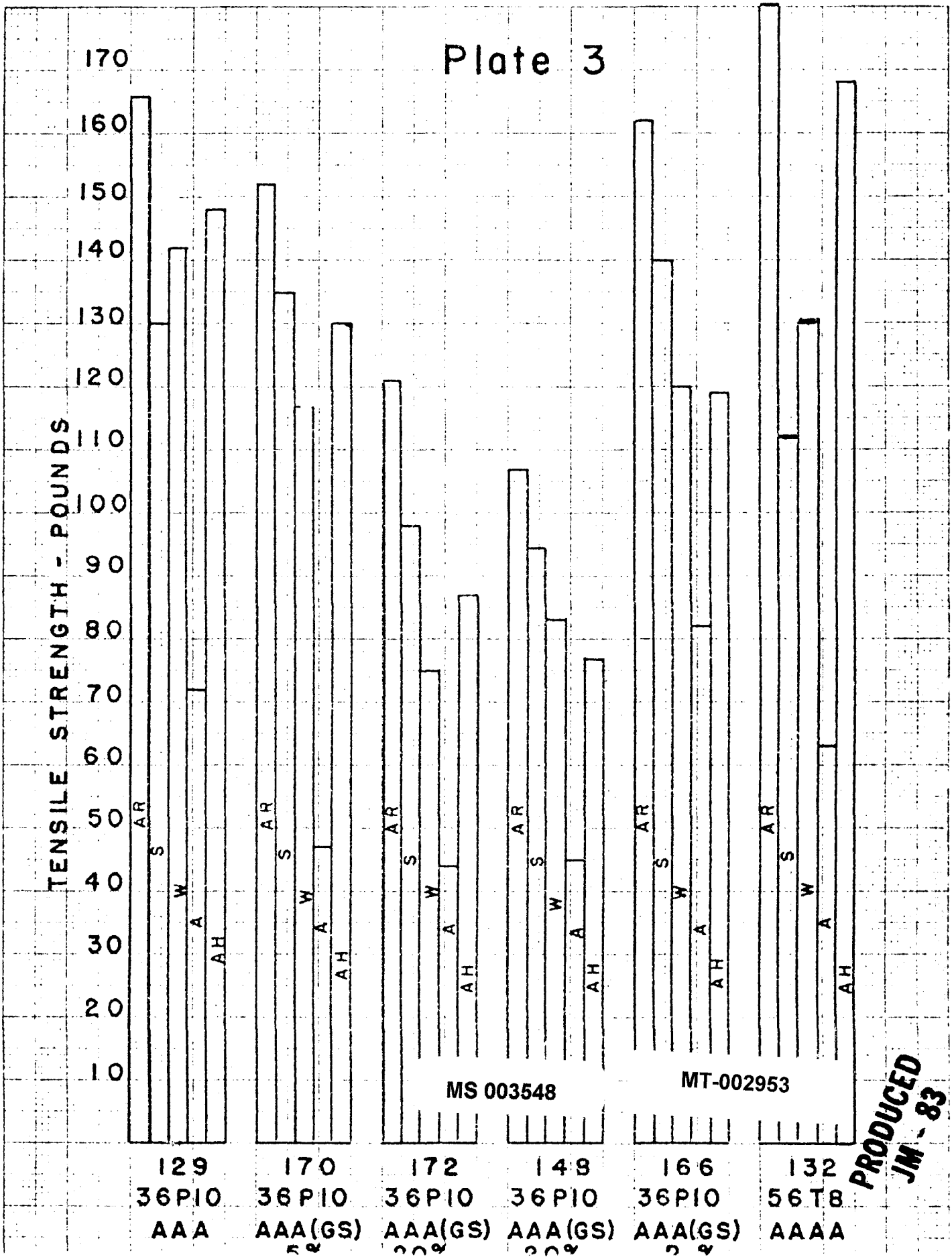
Plate 3



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NEW BRUNSWICK, NEW JERSEY

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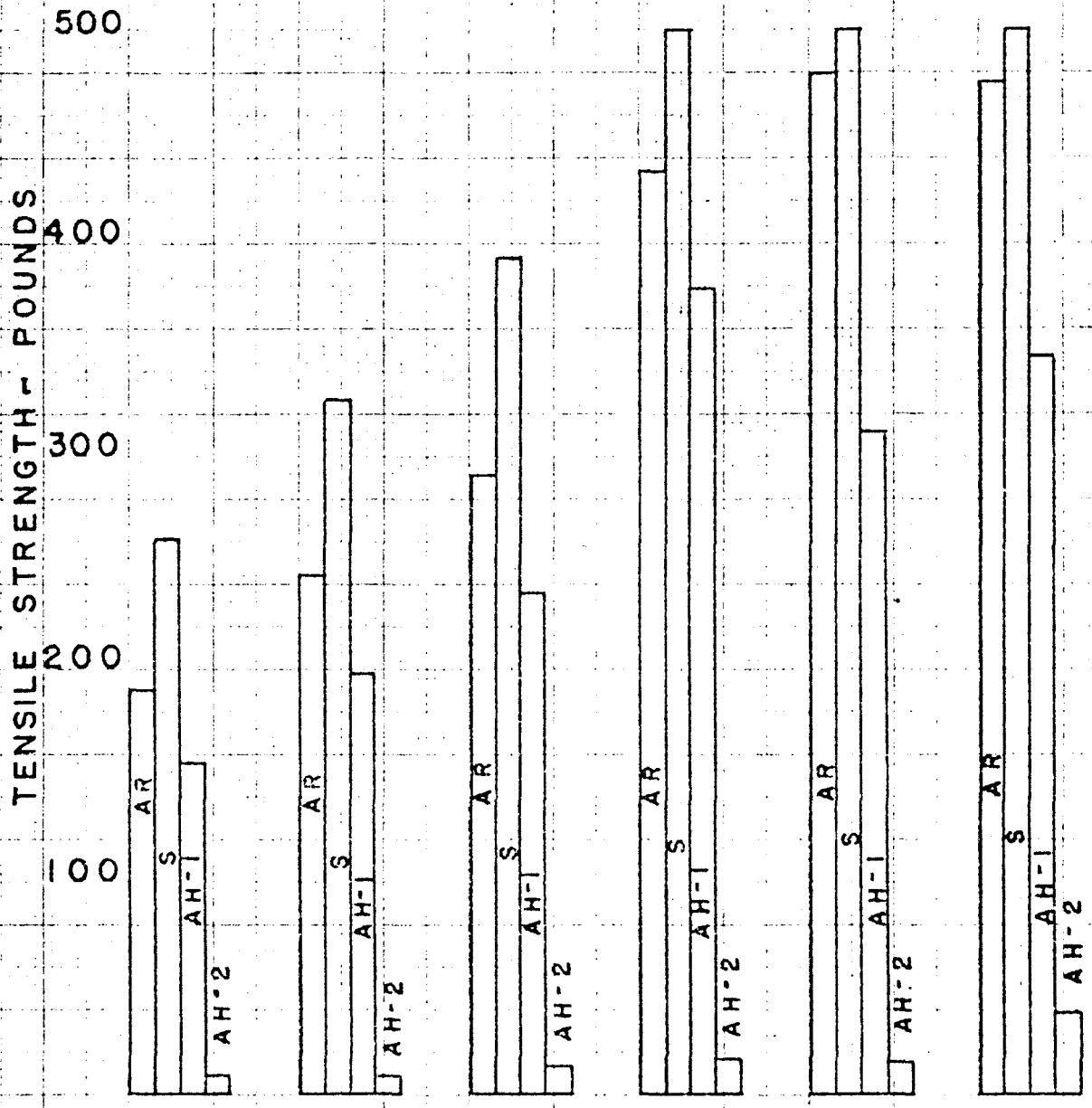
Plate 4



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DUCK

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The effect of elevated temperatures on duck varies quite markedly in the range between 300°F and 400°F. At the higher temperature destruction is nearly complete with strength retentions ranging from 4% to 8%, while at 300°F the strength retentions range from 65% to 87%.

Summary of Results. On the basis of the work here reported, several points of interest appear to be significant.

1. The destructive action of steam and water on regular asbestos textiles is a direct function of the cotton content of such fabrics. Commercial grade and Underwriters grade cloths, having relatively high cotton contents, withstand destruction by steam and water approximately 20% better than do similar cloths in grades AA and AAA.

2. The destructive action of a mild acid, such as the 5% HCl here used is apparently also a function of the cotton content of the regular fabrics since Commercial and Underwriters grade cloths retained between 30% and 40% more strength than did the AA and AAA grade cloths similarly tested.

3. The presence of continuous filament glass, such as is present in the regular 22P10G constructions, apparently does not enhance resistance to destruction by steam, water or acid to any marked degree.

4. The presence of glass staple in the Grade AA cloths here investigated, appears to improve the resistance to destruction by steam, water and acid. The improvement definitely appears to be a function of the glass fiber content with the lower glass content cloths exhibiting the superior qualities. A comparison of cloth #140 with cloths #171 and #149 in Plate 2 graphically illustrate this point.

The presence of glass staple in the Grade AAA cloths bears nearly the same relationship with respect to improvement under steam treatment, however, the water treatment proved more destructive to the glass containing cloths than to those cloths which contained no glass. The effect of acid upon this series of cloths was non-definitive in that one cloth that contained glass staple showed improved resistance, two were less resistant and one cloth behaved similarly to the cloth which contained no glass.

On the basis of the above observations, it may be concluded that 1) staple glass fiber can be utilized in asbestos textiles for purposes of improving certain physical properties and, 2) the proper amount of glass fiber necessary to effect such improvements bears a definite relationship to the cotton and chrysotile fiber content. Batches containing 5% and 7% glass fiber appear superior to those containing 20% and it will be necessary to more thoroughly

investigate the compositional relationship of the component fibers in order to obtain the most desirable combination.

5. The regular grade AAAA cloth in style 56T8 exhibits relatively inferior performance characteristics with respect to destruction by steam, water and acid to those displayed by the regular grade AAA and grade AA cloths in style 36P10.

6. The tensile strength of cotton duck is markedly improved after steam and water treatments.

Conclusions. The work here reported obviously covers only a very small group of asbestos textiles, however, it does represent the only materials that have come to our attention which contain glass fibers as batch components. It is, therefore, felt that the investigation is representative of the industry's materials in this particular style and does serve to indicate possible tendencies. The three samples of 22P10G cloths included are representative of materials supplied by three member companies of the Institute and in all cases the continuous filament glass appears to offer nothing in the way of improved characteristics, though it may be somewhat unfair to make these comparisons with 36P10 cloths of the same grade. However, the presence of glass staple fiber in the comparable cloth styles and grades AA and AAA does appear to offer some promise for improved physical properties such as those here studied and it would seem justifiable to further explore the use of glass staple where such improvements are desired.

Westinghouse Heat Aging Test.

At the last meeting of the Institute it was reported that conferences with Westinghouse officials interested in the heat aging test had been concluded and that steps were then being taken toward redrafting of Westinghouse PDS-2060-M. On January 8th the new specifications bearing number 2060-P-Tentative were received for our review and criticisms.

Immediately following the last meeting and prior to January 8, however, an investigation was initiated in our laboratory to determine the proper tensile strength figures to be set forth in accordance with the new test procedures to be carried in the revised specifications. In this work samples of 16P24 and 26P14 from two member companies were investigated. During recent weeks similar samples from a third company have been received and will be tested in the near future.

As a result of this work, a very significant feature of the test procedure was discovered relative to the disposition of the test specimens during test. During the course of our preliminary work in this connection it had been established that the samples for test should be supported singly and in a flat position, on hardware cloth, when in the test oven. Such disposition was originally recommended to Westinghouse, however, during the course of

our conference, Mr. Atkinson felt that the cloths should be hung on a frame in accordance with their specified practice. Not having tangible evidence to argue the point, it was agreed to accept the proposal of Mr. Atkinson and such a precedure was set forth in the new tentative specifications. However, during our investigation, a comparison of the hanging method versus the flat method of sample disposition was carried out and it was found that the flat method exhibited far less sample temperature fluctuation than the hanging method and that only by the flat method could the prescribed cloth temperature limits be maintained. These variable temperature conditions were particularly pronounced on the heavier 26P14 cloth.

In light of these developments and following a study of the proposed tentative specifications, the following letter was sent to Mr. Remley setting forth our views in regard to several points.

January 22, 1953

Mr. G. A. Remley, Materials Engineer
Matl. & Std. Engrg. Dept., 7-L
Westinghouse Electric Corporation
East Pittsburgh, Pa.

Dear Mr. Remley:

I have your letter dated January 6, 1953 relative to Tentative P D Spec 2060-P, Asbestos Cloth. I note in your first paragraph reference to "asbestos glass cloths" in connection with these specifications, however, find no reference to such combination cloths in the specifications. May I assume that the word glass was inserted in error?

During the latter part of October 1952, Mr. C. R. Frederick, Keasbey & Mattison Co., and the writer called upon your Mr. Atkinson and Mr. Welshons for the purpose of correcting and clarifying the subject specification P D 2060-M. On that occasion we generally agreed upon the articles as you now have them in your Tentative PD Spec 2060-P with the exception of the tensile strength values, after heat test, as shown in section 6.1. The values you now carry are the same as those originally set forth when the test was established for a five minute duration and since we now carry the test for thirty minutes instead of five minutes, it is reasonable to expect that the tensile strength values should be reduced. This subject was thoroughly discussed during our conference; however, we, at that time, did not have specific figures to furnish and were asked to furnish this data at a later date. We now can furnish data procured during recent tests on two cloths each of the two different styles - 2060-1 and 2060-2, furnished by two A.T.I. member companies.

The values which we obtained are as follows:

	1		2	
	Warp	Fill	Warp	Fill
2060-1	29.75	28.5	24.3	22.2
2060-2	31.6	30.1	28.6	24.7

It will be observed that the values are markedly lower than those you now carry in the PD Spec 2060-P. Regarding styles 2060-3 and 2060-7, we have been unable to obtain such cloths for test and cannot, therefore, establish values for them but would imagine that these tensile strengths will also be reduced.

The values we here submit were obtained under the conditions of temperature limits as prescribed in your tentative specifications, however, the method of disposing and supporting the cloths in the oven was not followed. The reason for this departure was our inability to confine the cloth temperature, particularly style 2060-1 (the heavier material), during test within the limits prescribed by the specifications when the samples were supported as prescribed. Our original recommendation during the conference was that the cloths should be supported on a hardware cloth screen with each specimen being laid singly and flat. During our discussions, Mr. Atkinson felt that it would be better to support the samples on a frame so that the cloths hung in a vertical position with a space of not less than 3/4 inch between the separate cloths. We, therefore, agreed to this disposition, at that time, and upon our return conducted tests under these conditions. Our tests have not proven satisfactory. The cloth temperatures for 2060-1, when placed vertically with 3/4 or 1-1/8" space between cloths, reach temperatures as high as 550°C as shown on the accompanying curve. On the other hand, when the test is carried out with the cloths laid flat and singly, and with ten samples in the oven at one time, the maximum temperature reached is 308°C.

We have endeavored, by every possible means, to obtain proper conditions so that the "vertical support" technique might be used but have, as yet, found no procedure that will arrest the rapid temperature rise with the attainment of a cloth temperature over 500°C. We have varied the volume of air being circulated from the maximum to the minimum values and also the velocity of air flow from maximum to minimum, with little or no improvement. We are unable to account for the great differences in behavior between your oven and ours since the two ovens are practically identical, physically.

We attribute the difference in performance to the difference in manner in which the burning takes place due to the position difference. It is felt that cloths positioned horizontally burn more slowly and at a more uniform rate over the entire area than do cloths placed vertically where the burning naturally progresses either upwardly or in the direction induced by the circulating air. In the latter

case, there is apparently a point of maximum intensity and, with the heavier cloth, this accumulation is great enough to produce a greatly excessive cloth temperature even though for only a short duration. The excessive temperatures are sufficient to induce much greater strength losses than are obtained for the same cloths heated in a horizontal position.

We would appreciate having these findings checked in your laboratory. On the basis of these observations, we do not feel that we can agree upon the specifications in the form as now set forth in Tentative PD Spec 2060-P. Points in question are (1) Tensile strength values after heat test (paragraph 6.1) and (2) Procedure (paragraph 6.2.3).

Enclosed herewith is a copy of my original recommendations in which are included on page 2 references to test procedure. As herebefore noted, this test procedure was abandoned upon Mr. Atkinson's recommendation but on the basis of present findings I am inclined to suggest its reconsideration.

I wish to thank you for this opportunity to work with you on this task and feel certain that through such cooperative effort the desired end will eventually be achieved.

Very truly yours,
ASBESTOS TEXTILE INSTITUTE

Myril C. Shaw

It will be observed that recommendations were presented in our letter relative to the "after heating" tensile strength but that no comments were offered relative to tensile strengths "as received". The reason for this latter omission rests in the fact that the specified tensiles appear to be adequately liberal. The following table illustrates:

	Specification		Actual	
	Warp	Fill	Warp	Fill
PDS-2060-1 -- 26P14	75	70	76.4	79.6
PDS-2060-2 -- 17P24	55	50	67.7	64.8

Since making this report, no further word has been received and it must be presumed that the Westinghouse laboratories are considering the points in question.

MS 003554

Significance of Chemically Combined Iron in Chrysotile.

In outlining the program for the investigation related to the determination of the significance of chemically combined iron in chrysotile it was decided to endeavor to correlate three separate

sets of procurable data. The work to be undertaken will include chemical analyses, radiographic analyses and magnetic permiability analyses with magnetic determinations being conducted using 1) the ballistic galvanometer method and 2) the Helmholtz coil method. The asbestiform mineral fibers to be studied will include representative chrysotiles from Canada, Africa and Arizona, amosite and African crocidolite.

It is intended to first establish, through chemical analysis, the total iron content of each fiber which is normally reported as FeO and/or Fe_2O_3 even though, in most cases, some of the iron is actually present as Fe_3O_4 (magnetite) and/or as one or more of the complex iron or iron-magnesium silicates. As a second step in this phase of qualitative evaluation, an effort will be made to explore the possible values to be obtained through radiographic examinations wherein the presence of Fe_3O_4 may be visibly discerned.

The magnetic properties of the various fibers are to be investigated through two established techniques: 1) the use of ballistic galvonmeter measurements and 2) through the Helmholtz coil method. The two methods are fundamentally different and the ultimate choice of one over the other will be determined by the sensitivity required to give the desired results. The ballistic galvanometer method will permit far greater sensitivity than the Helmholtz coil method, however, much more instrumentation will be required by the first method.

To date, attention has been directed to the preparation of the necessary coils and sample holders to be used in making the ballistic galvanometer method determinations and actual test work will be initiated within the next few days.

CONCLUSIONS

During the quarter just past two relatively new projects have been undertaken by the Fellow, namely, 1) performance characteristics of asbestos textiles under service conditions other than those of elevated temperature and 2) magnetic rating determinations. The latter problem is currently under consideration by a task group within A.S.T.M., and members of the Institute have expressed the desire that this laboratory cooperate with this task group and carry on the necessary work to assist in the calrification of this problem. The work here reported is an effort in this direction. The problem related to the performance characteristics of asbestos textiles under service conditions other than those of elevated temperatures has been given a cursory investigation and the results here reported. Interest in such information has been evidenced from time to time as expressed in several of the proposed projects for Fellowship consideration. The brief report here presented may afford the members an opportunity to determine whether or not a continuation of such work or an expanded program along these lines would serve a useful purpose.

At the last General meeting a Fellowship investigation committee consisting of Mr. G. J. Harris, Mr. J. L. Tucker and the Fellow was assigned the task of reviewing the Fellowship program. In this endeavor, the Fellow prepared a report setting forth the chronological development of the Fellowship program and this work was presented to the committee to serve as a basis for their considerations. The committee met at the School of Ceramics on January 12th and, during the course of the considerations, conferred with Dr. J. H. Koenig, Head of the School of Ceramics, regarding various aspects of the Fellowship work being here conducted. The report of this committee is to be presented by the other members of this committee.

It is hoped that the work here reported is of interest to the membership and that there will be some expressions regarding the advisability of continuing along the several paths indicated. These projects are representative of problems included in the current project list, established March 1951, however, it may well be that there are more important problems that should now be engaging the attention of the Fellow and if such is the case a new project list should perhaps be considered. It is our desire to carry on work which is of the greatest interest to the Institute membership and our guides in this effort are the current project list and the individual expressions presented during the course of our meeting discussions.