MINUTES of the Meeting of the Technical Committee held Sept. 14, 1951, at the Warwick Hotel, Philadelphia, Pa.

IN ATTENDANCE:

J. M. Weaver, Chairman
RAYBESTOS-MANHATTAN, INC.

KEASBEY & MATTISON CO.
C. R. Frederick
C. R. Hutchcroft

JOHNS-MANVILLE CORP.
J. L. Tucker

AMERICAN ASBESTOS TEXTILE CORP.
E. C. Cutler

SOUTHERN ASBESTOS CO.
J. D. McCluer

RUTGERS UNIVERSITY
M. C. Shaw

1. The Chairman called the meeting to order and asked the Secretary to read the Minutes of the last meeting held June 7, 1951. There being no additions to the Minutes as read they were unanimously approved.

2. The first subject presented for discussion concerned specifications for thickness of asbestos cloths. No action covering such specifications have as yet been officially considered by this committee, however, due to some apparent inconsistencies in published data in this regard, it was felt that a review of this subject was now in order. Following a discussion covering the information at hand it was agreed that more complete data would be necessary for study before action and possible recommendations could be considered. It was therefore moved by C. R. Frederick that "each member company shall prepare and have ready for the next meeting a complete tabulation of all, or as many cloths as possible, as they come from the loom and after calendering." This motion was seconded by E. C. Cutler and unanimously approved.

3. The next item on the agenda was a report by the Fellow concerning the status of the Fellowship report on the Abradoflex that has been in preparation for publication in the A.S.T.M. Bulletin. The Fellow reported that the article has been rewritten in accordance with the instructions of the Technical Committee and is now in the hands of the Editor of the Bulletin for review.

4. The next subject to come before the meeting concerned specifications for braided tubing. The Secretary submitted a tabulation of all of the construction data on braided tubing as received from 1) Johns-Manville Corp., 2) Southern Asbestos Co., 3) Raybestos-Manhattan, Inc., 4) Keasbey & Mattison Co. Following a discussion of the tabulation it was agreed that each member would thoroughly review all of the data and confer with the manufacturing department of his company to ascertain their views on the subject. The subject will be considered again at the next meeting of this committee with a view toward establishing specifications for these materials.

Also included in this discussion was a review of the methods used for determining weight, length and wall thickness of braided tubing. The Fellow submitted a proposed method for making these determinations and the discussion which followed, covering this proposal, indicated that there was a wide range of views regarding this subject. It was agreed therefore that 1) each member would report at the next meeting regarding his company's recommended method for making these determinations and 2) the Secretary will obtain 25 yards each of three different sizes of braided tubing and will submit 3 yards of each to each member company for the determination of weight, length and wall thickness by their recommended practice, the results to be reported at the next meeting.

5. The next subject on the agenda concerned aluminum foil clad asbestos cloth. The Fellow reported that arrangements have been completed with Shellmar Products Co., Mt. Vernon, Ohio to process a 12 yard sample of Commercial Grade cloth in accordance with present ideas concerning such a construction. To date, there has been no report from this convertor and it was agreed that further consideration should be deferred until this information becomes available.

6. The next subject for discussion concerned the request for information received from A. Wayne Bitner, Pennsylvania State College, in regard to the use of asbestos textiles in the construction of portable fireproof substations for coal mines. In view of the critically short supply of asbestos textiles for established essential uses it was unanimously agreed that in the interest of national defense it would be impractical to consider such applications at this time.

7. The final discussion of the meeting concerned Federal Specification MIL-C-10316 (ORD) dated May 24, 1950--Asbestos Textiles for Transportation Equipment. There appeared to be some very apparent errors in these specifications and it was agreed that the Chairman should investigate this matter in more detail in preparation for a further discussion of the subject at the next meeting of this Committee.

8. There being no further business to come before this session, it was unanimously agreed that the meeting be adjourned.

Myril C. Shaw,
Secretary

HEAT AGING TESTS FOR ASBESTOS TEXTILES

INTRODUCTION

The so-called "Heat Aging Tests" as presented in the Specifications of A.S.T.M., the Navy Department and Westinghouse Electric Manufacturing Corp., have been found to be inadequate as test methods for evaluating the thermal degradation characteristics of asbestos textiles. In Fellowship Reports No. 11 and No. 12 we endeavored to point out the reasons for some of the inconsistencies in results which may be obtained, chiefly as a result of variations in the interpretations of the techniques which are to be followed in conducting such tests. Among other things, it was established that the prescribed time duration of 5 minutes for such tests is in the range of extreme criticalness as regards the degradation of the organic portion of such textiles and it was recommended that a longer period be observed to overcome the possible errors introduced by this factor.

At a meeting of the Technical Committee held on November 30, 1949, a further discussion of this matter was pursued and representatives of Keasbey & Mattison Co., and Johns-Manville Corp. reported upon work carried out in their respective laboratories in connection with this test. Keasbey & Mattison Co. summarized their work as follows:

"The tensile strength before heating or air dry gave us an average tensile of 75.1 pounds, range 85 pounds to 62 pounds and standard deviation of 4.87 pounds for the 35 specimens tested. The old method of heat treatment (five minutes) before tensile testing gave us an average of 43.2 pounds, range 62 pounds to 31 pounds, standard deviation 6.72 pounds, for the 35 specimens tested. Tentative Method "B", using a ladder-like frame holder and heating the specimens for twenty minutes before testing gave us an average tensile of 32.8 pounds, range 49 pounds to 24 pounds, standard deviation 5.57 pounds for the 35 specimens tested. Tentative Method "C", using a wire screen holder and heating the specimens for twenty minutes, gave us an average tensile of 31 pounds, range 44 pounds to 27 pounds, standard deviation of 3.75 pounds for the 35 specimens tested.

There is little or no significant difference between the average tensile of the two tentative methods, but there is a great difference between either tentative method and the old five minute method of heat treatment. There is a drop in tensile of 25 per cent to 30 percent between the five minute method and the two tentative methods. The standard deviation of the tentative method using the wire screen holder was much lower than the other tentative method, so this indicates that the wire screen holder method is the better of the two tentative methods.

The tentative method using the wire screen holder was definitely the best of the methods studied during this experiment. The samples were much easier to prepare, the range and the standard deviation were smaller. It is recommended that further tests be made on like cloths and other types and grades of cloth using this method of heat treatment."

Johns-Manville Corp. representatives reported a finding which heretofore had apparently gone unrecognized but appears to be quite significant. In their work it was found impossible to maintain a constant temperature of 300°C during the course of a test and the extent of deviation was so great as to present an intolerable variation in results. The possible reasons for this temperature variation were discussed by the Committee and it was suggested that a check of this condition be made in the furnaces of the several laboratories in an effort to establish more information in this connection.

In light of all of the facts at hand following the last meeting of the Technical Committee, the Fellow again approached the problem with a view toward (1) checking the findings of the various laboratories as reported to date and (2) developing a skeleton form around which a suitable set of specifications for the subject test might be drawn.

It has been obvious from the outset that the method of deploying the samples while under test is quite important and unless this part of the procedure is carefully standardized it may contribute markedly to the attainment of inconsistent results. This consideration motivated one of our most recent developments and in a later section of this report a simple device for mounting the test specimens is described.

The question of the most suitable type of furnace and controlling mechanism wherein such tests are to be carried out is important not only from the standpoint of providing suitable standard conditions for the test but also from the standpoint of economic practicability. It will probably be quite difficult, if indeed possible, to prescribe a standard furnace set up and hope to have everyone rigidly adhere to these specifications. It would be more advisable, if possible, to prescribe limits of temperature and atmosphere control which must be maintained; permitting each operator to develop his own method and technique within his available equipment, whereby the above prescribed conditions may be met. With this thought in mind, we have made several exploratory runs in our furnace and have developed a set of conditions which we feel might serve to provide the basis for a reasonably reproduceable specification.

EXPERIMENTAL WORK

Specimen Holder

The proper method of deploying the samples within the furnace during the heat aging test has received a considerable amount of attention from all who have been confronted with this test. The most desirable method is, of course, the most convenient method and the degree of convenience is usually different for each operator. Therefore, there are probably as many methods of handling this problem as there are technicians conducting the test. It has been established that variations in the methods employed may contribute to erroneous results and in view of this fact, some standardization of this step must be effected if such inconsistencies are to be reduced.

To this end we have constructed and used in all of the work included in this report a frame which is simple in design, light in weight, easily handled and quickly loaded and unloaded. Drawings of this frame are shown in Figures 1 & 2. It is constructed of 3/32" drill rod bent and welded into the shape as shown. A front section, consisting of an L-shaped piece of galvanized iron with four 1/8" holes is so disposed to accommodate the four extending pins and it serves as a support for the front part of the frame. In assembling the unit, a jig is used which punches four holes in the five cloth specimens to be tested, the holes being at the corners 3/4" from the ends in the 6" direction and 1/2" from the sides in the 4" direction. The cloths so punched are slipped onto the rods and are spaced 9/16" apart with ceramic spacers separating each cloth from the adjacent one. Dummy cloths are placed in the first and seventh positions and cloths under test are placed in the remaining positions. The entire unit may be easily slipped into and removed from any suitable furnace muffle.

The cost of the materials for such a frame is around 50 cents and the labor involved is not too extensive. Therefore, if the Technical Committee should approve of such a unit and the Institute will underwrite the expense involved, we will be glad to supply such frames to everyone interested in conducting these tests. Such a procedure might well serva as an initial step in the standardization of the test technique.

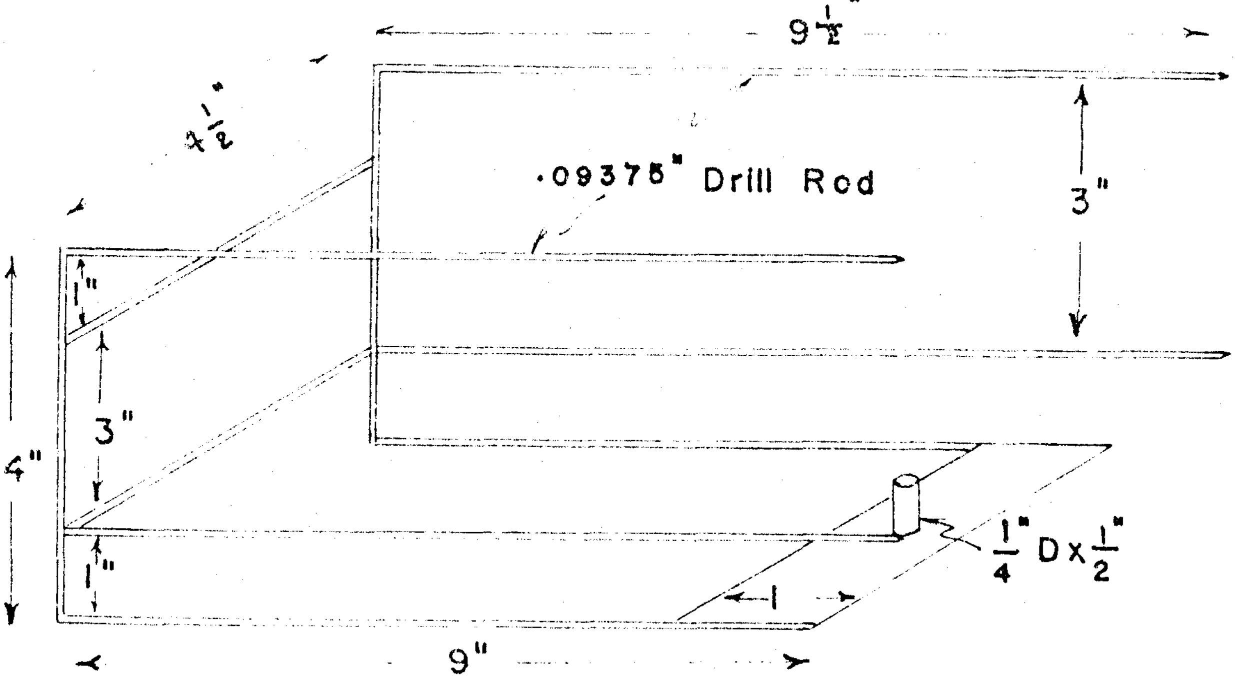
Investigation of Furnace Conditions

In light of the reported findings of the Johns-Manville Corp. representatives regarding temperature variations within a furnace during heat aging tests, it was deemed advisable to investigate this characteristic in our furnace. The pertinent data covering our furnace is as follows:

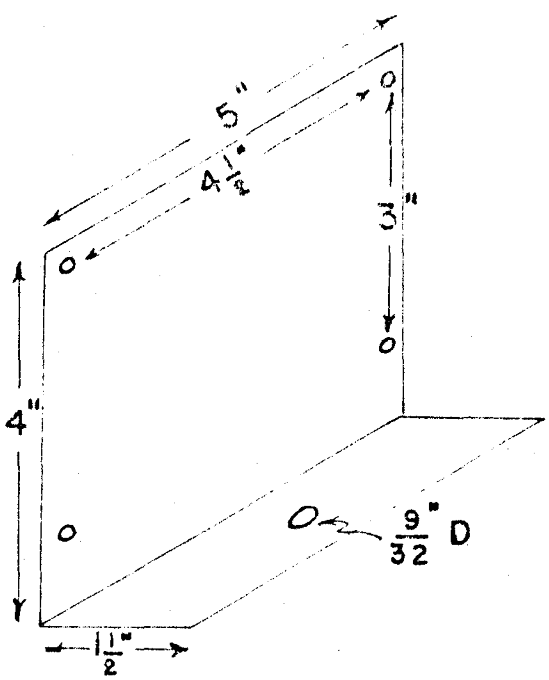
Thermo Electric Co.
Dubuque, Iowa, U.S.A.
Temco Electric Furnace
Volts-115 AC Amps-22
Model-OFES   Serial No. 519

Dimensions--
Outside--Height--24"
Width---18"
Depths--14½"
Muffle---Height-- 5"
Width--- 6"
Depth---10"

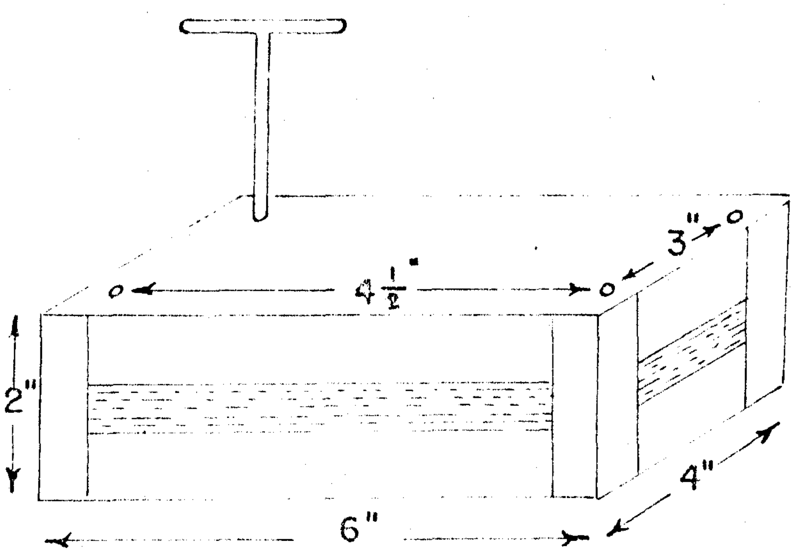
The temperature measurements are made through the use of a base metal (chromel-alumel) thermocouple which extends 2½" through the rear of the muffle, 3" from each side and 1" from the top.



SPECIMEN SUPPORTING FRAME

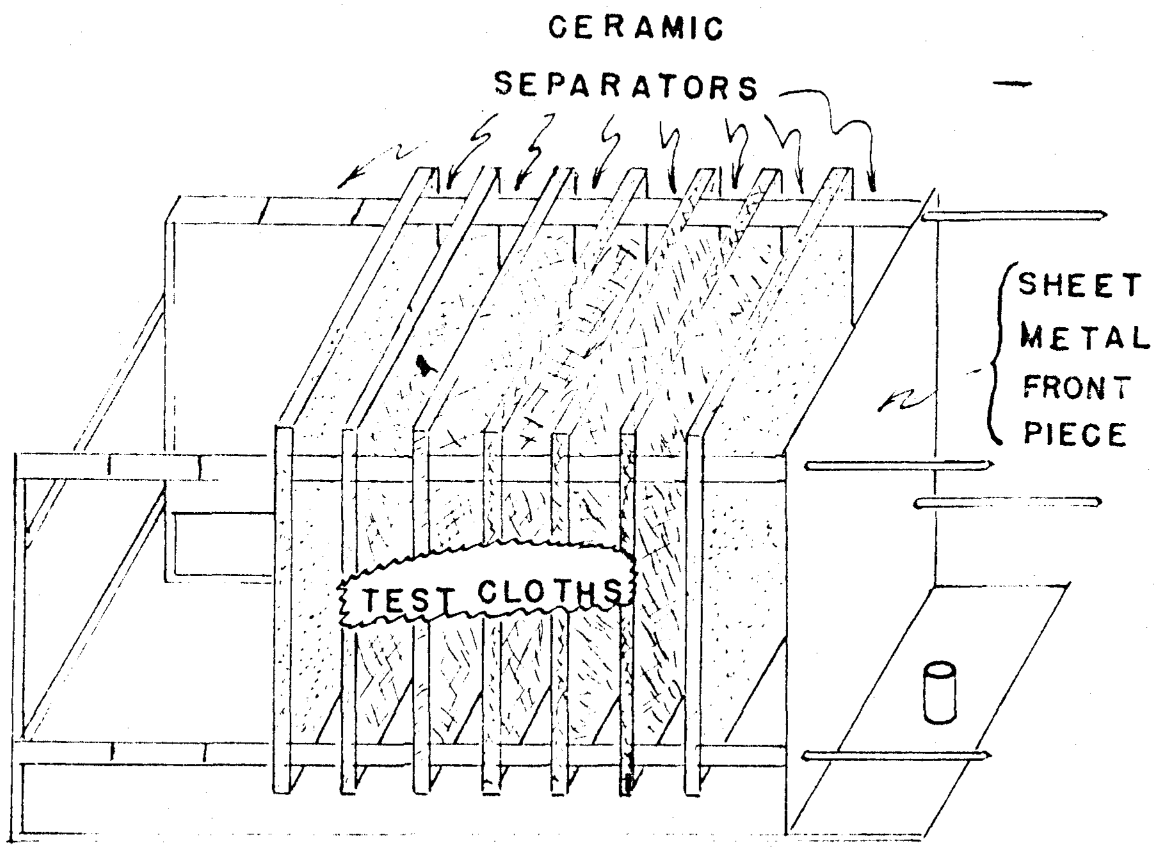


FRAME FRONT PIECE



SPECIMEN HOLE JIG

FIGURE I



SUPPORTING FRAME ASSEMBLY

FIGURE 2

Past experience with this furnace has shown that at least one hour is required to attain constant temperature conditions at 300°C. That is, after one hour and with a setting of 15% on the Temcontrol, the heat input is equal to the heat loss and a constant temperature of 300°C can be maintained indefinitely within the muffle. It was on this basis that all work previously reported, in connection with the heat aging test, was conducted. However, no observations were made at that time in reference to the temperature variations during the test.

It is logical to assume that the introduction of an object at atmospheric temperature into the chamber of a warm furnace would tend to reduce the chamber temperature to an extent dependent upon the mass and temperature of the object. Likewise, it may be expected that, providing the object is inert at the temperatures under consideration, equilibrium will again be attained after a period of time sufficient to permit the object to become thermally stabilized and after this period relatively constant temperatures may be maintained.

However, in the tests here being conducted a set of conditions prevail which do not fulfill the above conditions and the resulting disturbance is so marked that some recognition of its existance should be considered in the development of the most satisfactory test procedure for the subject test.

(a) Effect of organic combustion. In this work, we are introducing into our furnace at 300°C., asbestos cloths plus the necessary supporting frame, at some temperature around 25°C. This introduction causes an immediate temperature drop within the muffle due to 1) loss of heat through the open door at the time of introduction, 2) the absorption of heat by the cooler additions, and 3) the absorption of heat in the endothermic drying operation. Figure #3 presents two curves which illustrates the extent of temperature variations which were encountered during two tests on typical Underwriters cloths. Both tests were started with the furnace temperature stabilized at 300°C, however, in the case of curve #1 the furnace control was maintained throughout the test at a setting of 15% which under normal conditions would maintain a constant temperature of 300°C indefinitely. In the case of curve #2 the power was shut off at the beginning of the test period and remained off throughout the test. The initial rate of cooling within the muffle is quite rapid on both cases and continues for about one minute with a temperature drop of 50°C. After one minute the temperature within the muffle begins to rise and, in the test with the power on, the rise continues for ten minutes reaching a maximum temperature of approximately 325°C. After this point there is a gradual decline in temperature until at approximately the 50 minute mark equilibrium is established at 300°C. However, in the test wherein the power was not utilized the initial loss and point of regain are the same as in the first curve but the ensuing rate of temperature rise is less steep and much less extensive, with a maximum temperature of 275°C being realized at the 6 minute mark, constancy is maintained for an additional five minute and then a decline to 225°C is reached in approximately 30 minutes. The apparent reason for the noticeable increase in temperature after

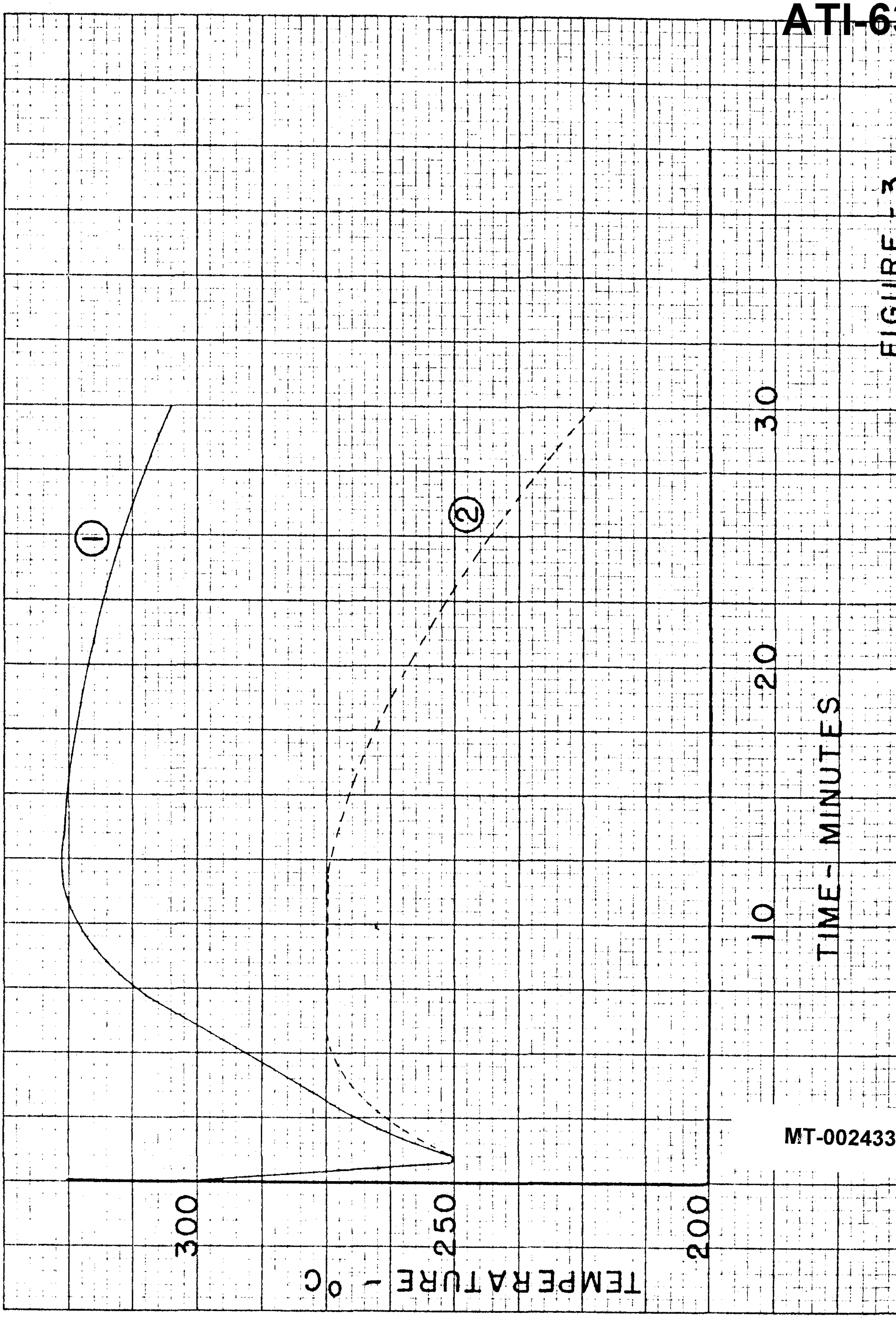


FIGURE - 3

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the initial loss rests in the fact that after one minute the organic portion of the cloths begins to burn with the rate and extent of ignition increasing for approximately eight minutes. During this period the temperature within the muffle increases markedly as a result of this ignition. After the organic portion has been eliminated through combustion the inherent heating characteristic of the furnace are again exerted and constancy of muffle temperatures may be controlled through the proper furnace adjustments. However, during the period when the combustion of the organic materials is progressing, temperature control and constancy maintenance through furnace controlling mechanisms is difficult and is variably dependent upon the amount and type of organic materials being handled.

(b) Effect of procedural disturbances. In addition to the disturbance incited by the combustion of the organic portions of the cloths under test, certain procedural manipulations may also contribute to the unrest and in Figure 4 a set of curves are presented which show the time-temperature relationship within our furnace under three sets of conditions, illustrating the extent to which various operational disturbances influence temperature stability. These tests were conducted with no power input during the period of test. In the case of curve A the door of an empty furnace, which had been stabilized at 300°C, was opened for exactly 5 seconds and then the door was immediately closed. Curve B illustrates the extent of disturbance resulting from the insertion of the empty cloth frame into the muffle. Curve C shows the temperature changes resulting from the introduction of the cloth frame properly and fully assembled. It will be observed that the immediate effect of opening the furnace door for 5 seconds (the time necessary to load the furnace) is a 5° drop in temperature and this is realized in 15 seconds. By the time 30 seconds have elapsed the original temperature has nearly been regained. The introduction of the empty frame has no tendency to effect these first results however after 1½ minutes the heat absorption by the frame does begin to influence the muffle temperature and the rate of temperature drop becomes more rapid. However, the introduction of the loaded frame into the furnace markedly changes the character of the resulting time-temperature curve with a progressive drop in temperature for the first minute to the extent of 50°C. After this point, the combustion of the organic materials incites a temperature rise for approximately seven minutes with an increase of approximately 35°C and this temperature is maintained for an additional four minutes before a permanent decline is evidenced.

(c) Cloth temperature vs furnace temperature. In an effort to determine the extent of temperature development during the combustion of the organic portion of these cloths a series of tests were carried out with a thermocouple in contact with the middle or number 3 test cloth in a fully assembled test frame. Curves in Figure 5 show the results of one of these tests. In this test the temperature of the furnace was measured in the usual manner with a thermocouple extending through the rear of the furnace and a second thermocouple was inserted through the 3/8" peep hole in the door and extending on through 1/4" holes in the first two test cloths so that the thermocouple junction contacted the third or

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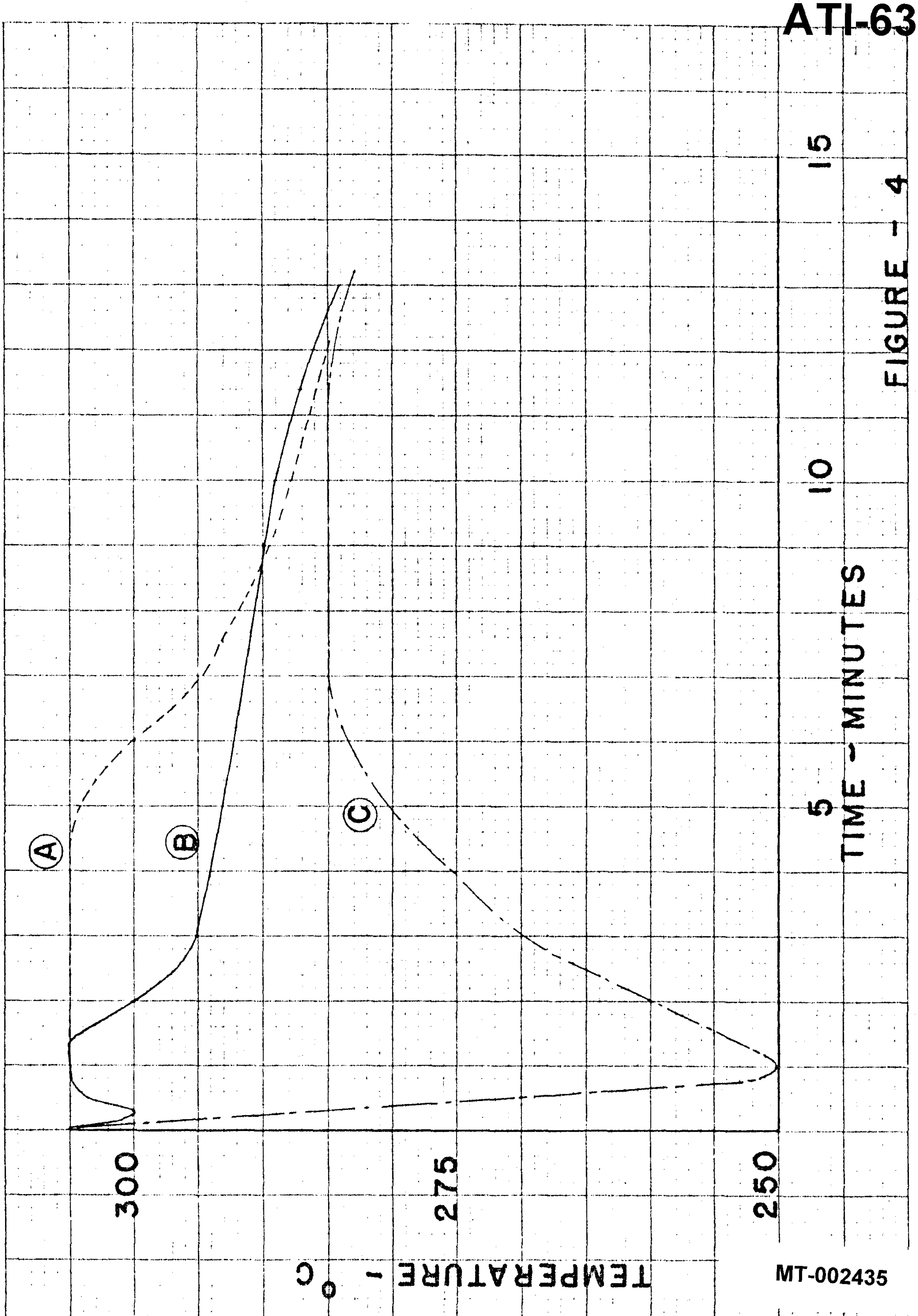

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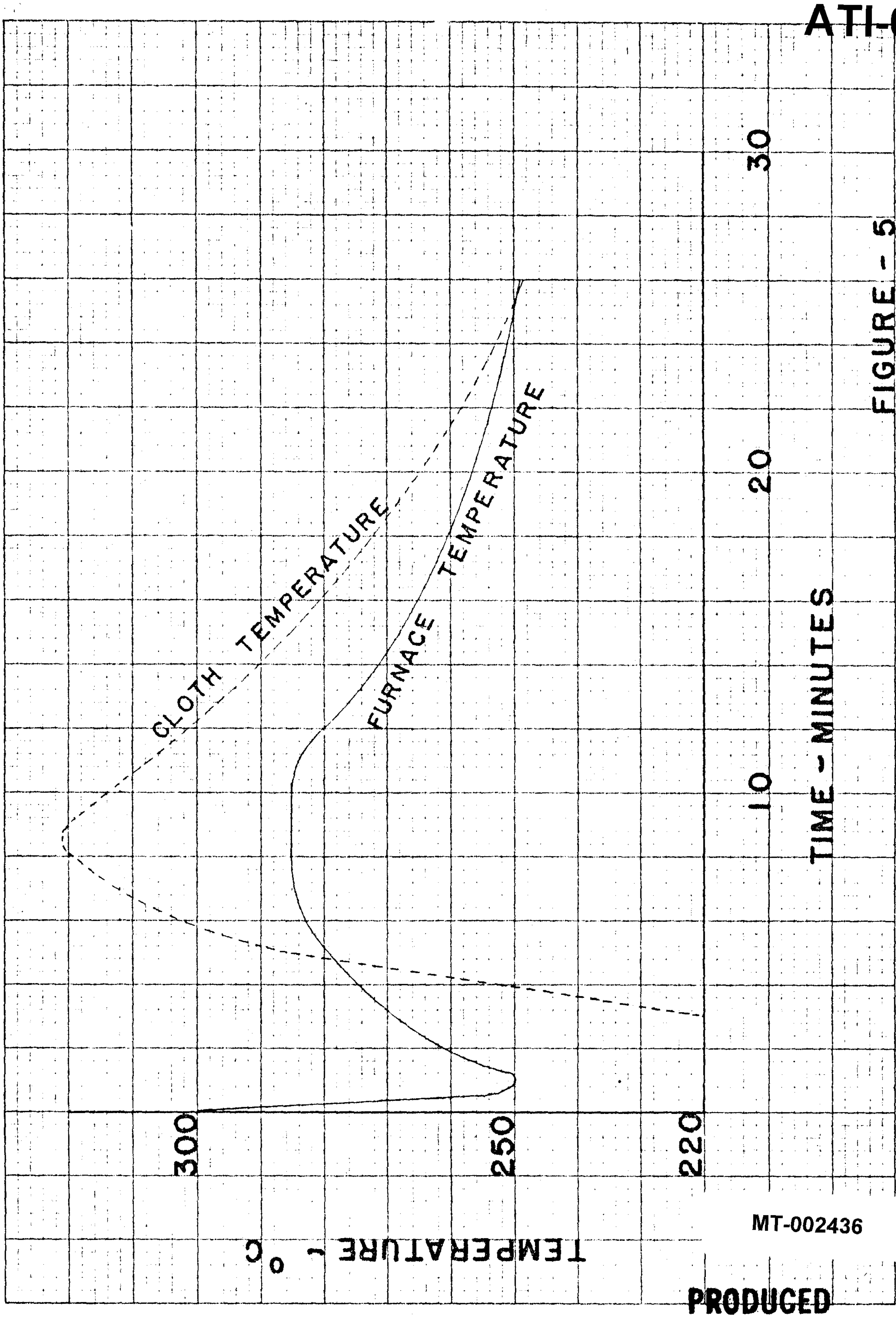

CLOTH TEMPERATURE
FURNACE TEMPERATURE
TIME - MINUTES
10
20
30
TEMPERATURE - °C
300
250
220

FIGURE - 5

middle test specimen. The power was off for the duration of this test. It can be seen that the cloth temperature increases rapidly for the first 8 minutes and then begins to decrease in temperature at a moderate rate. The furnace temperature also increases for the first seven minutes and then attains constancy for a 5 minute period before a decline is noted. Both the cloth and furnace decrease in temperature from this point and approach equality in about 25 minutes.

(d) <u>Constant temperature control</u>. Since the specifications, as presently written, established 300°C as the temperature at which this test is to be carried out the next phase of this investigation was devoted to the determination of ways and means of satisfying this requirement.

It is apparent from the preceeding discussions that during the first 5 to 7 minutes of these tests temperature changes occur which are, for the most part, beyond control by furnace adjustments or manipulation. However, since the temperature changes cover a range below 300°C the resultant effect on the cloth peoperties is not particularly deleterious. Therefore, it was felt that the early period effects should be permitted to run their normal course without interference or control. Following this period, the necessary controls may be applied to establish and maintain a constant temperature for some prescribed period of time.

Figure 6 shows a series of representative time-temperature curves for full scale tests under varying conditions of initial temperature and control. In these tests the assembled frame with five test cloths and two shielding cloths was subjected to the treatment. Curves 1 and 2 represent treatments started at 300°C, with #1 having a 15% power input throughout the test and #2 having no power input during the test. Curve #3 represents a treatment with a starting temperature of 325°C and with no power input during the test. Curve #4 represents a treatment with a starting temperature of 310°C, with no power input during the test. Curve #5 represents the end product of this phase of the work and shows the characteristic curve of a treatment started at 305°C, with no power on for the first 10 minutes but with 15% power input after the ten minute mark. It will be noted that this last curve shows constant temperature maintenance after the seven minute mark.

Also included with these curves are tensile strength values (in parenthesis) for the cloths tested after a 30 minute duration. It will be observed that the highest strength values were obtained in the test started at 300°C and run throughout without additional heat. The next highest value was obtained by the technique which maintains a constant temperature of 300°C throughout the final stages of the test. The lowest values were obtained for those cloths subjected to the highest initial and subsequently higher regain temperatures even though no power input was used at any time during the tests.

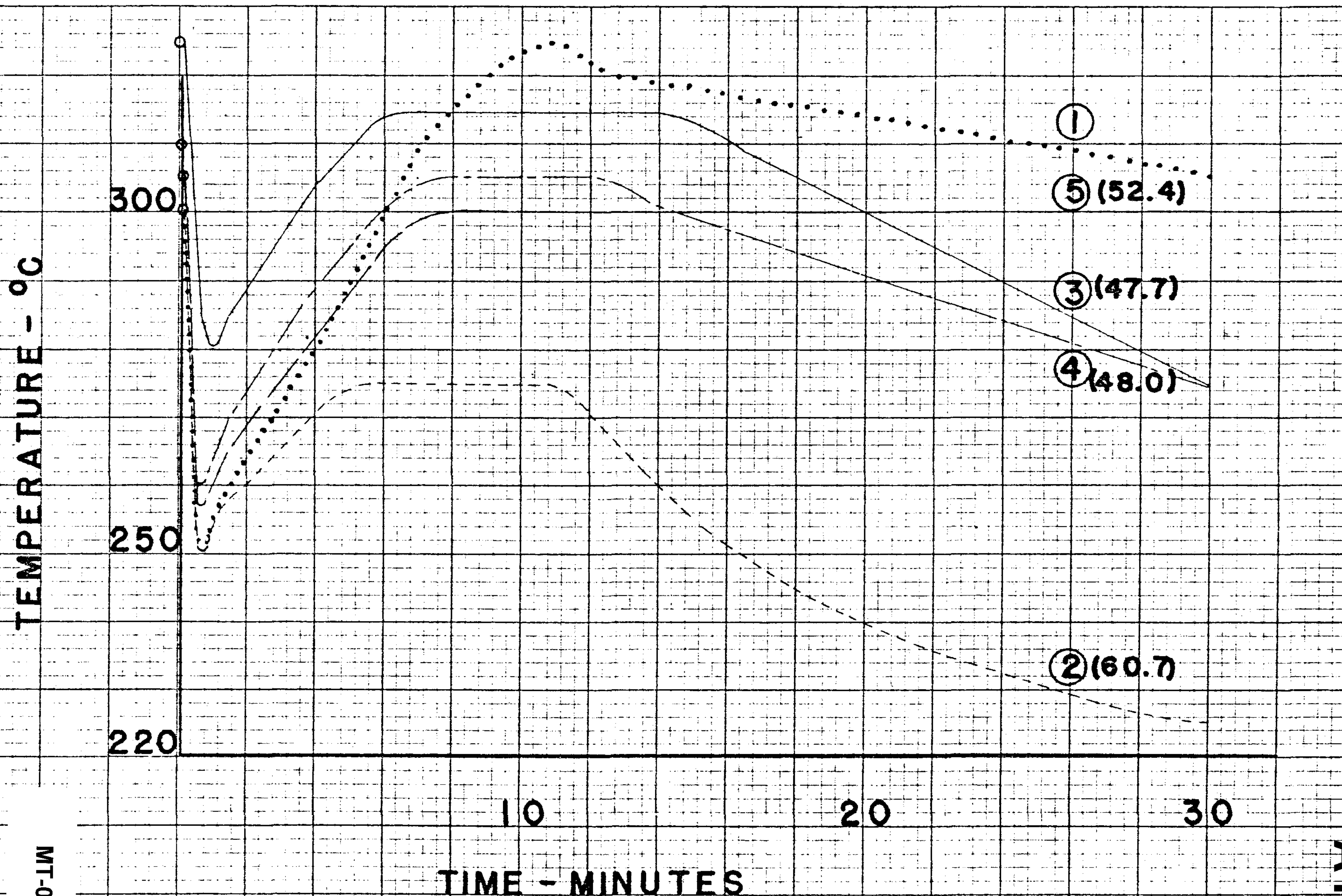

TEMPERATURE - °C
300
250
220
10
20
30
TIME - MINUTES
1
5 (52.4)
3 (47.7)
4 (48.0)
2 (60.7)

FIGURE - 6

SUMMARY

As a result of the tests conducted in the work here reported still further evidence is available upon which to base a condemnation of the time-temperature relationship prescribed in the subject specifications. It is quite possible that furnaces having different internal and external dimensions and possessing different electrical characteristics than the one here used will yield results somewhat different than those reported in this work. However, if the starting temperature and temperatures of final stabilization are duplicated the results should be well within tolerable limits. It does not seem likely that under any set of conditions the early period degradation characteristics of the asbestos textiles will be markedly altered. During this early period which continues from the start to approximately the seven minute mark, the ignition and combustion of the organic portion of the cloth markedly contributes to the temperature attainments with the muffle. This contribution is a function of the type and amount of organic material present. In light of this observation, therefore, it is quite understandable why extensive variations in results may be found when such tests are concluded after a five minute duration, as prescribed in the specifications.

On the basis of our findings we have developed a technique which might well serve as a starting point for the establishment of a test procedure that could be adapted to the subject specifications. The procedural steps are as follows:

1. Stabilize furnace temperature at 305°C. (Our furnace requires at least one hour of operation before constant temperature control is possible. Each furnace will have its own characteristics in this respect).

2. Test five specimens of cloth 6"x4" mounted in an approved manner.

3. In loading the furnace the door shall not be opened for more than 5 seconds.

4. Turn off current immediately after placing test specimens in furnace at the start of the test.

5. If the time of duration for the test is longer than 10 minutes turn power on at 15% at the 11 minute mark.

When the above procedure is followed the time-temperature characteristics as shown by curve #5 in Figure 5 will be obtained. The early period reactions are permitted to proceed as they will and temperature stabilization at 300°C is effected and maintained after seven minutes for the duration of the test.

Using the procedure outlined above, tests were conducted on three samples of cloth which were constructed in accordance with Westinghouse Specification 2060 L (1). The results of these tests are included in the curves shown in Figure 7. It will be observed that

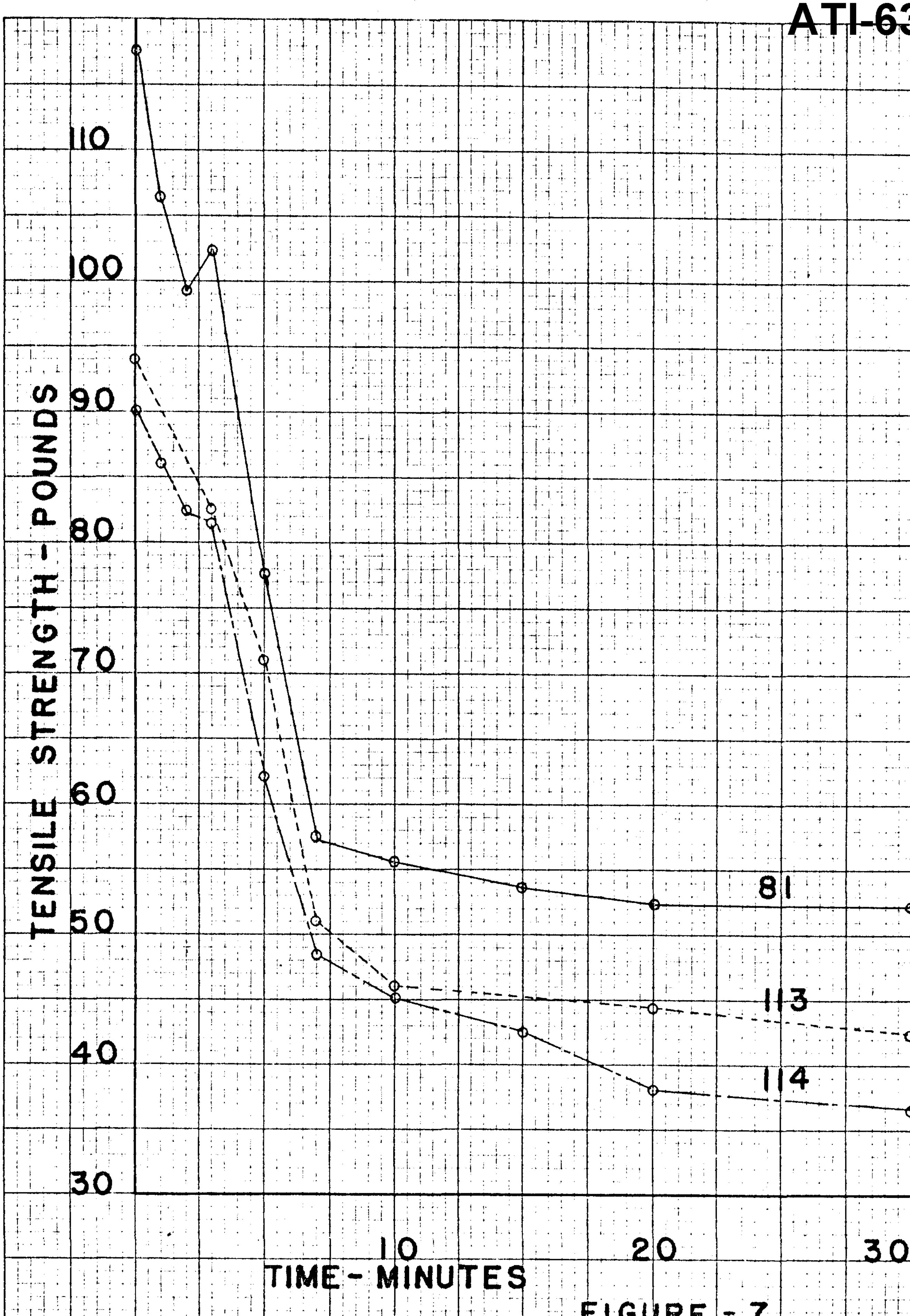

TENSILE STRENGTH - POUNDS
110
100
90
80
70
60
50
40
30
81
113
114
10
20
30
TIME - MINUTES

FIGURE - 7

in all cases the rate of loss in tensile strength is extremely rapid during the first seven minutes and after this time the rate is markedly diminished. From these results it would seem advisable to conduct such tests for a minimum time of fifteen minutes with a twenty minute test period probably being the most desirable.

CONCLUSIONS

In the work here reported the three main points of interest covered include:

1. The development of a simple supporting frame for holding test samples during heat aging tests. The sample holding frame presented is simple in design and manipulation and effectively disposes the test samples so that they do not contact each other during the course of the test. In addition, the cloths are so located with respect to each other and so positioned within the muffle that uniform temperature distribution throughout the test specimens is assured.

2. The establishment of the reasons for and effect of temperature disturbing influences encountered furing heat aging tests. The ignition and combustion of the organic portions of asbestos textiles markedly contribute to the temperature development within the furnace wherein such cloths are being tested. The extent and rate of such disturbances are a function of (1) the temperature at which such tests are started, (2) the amount and nature of the organic materials present and (3) the extent of ventilation and subsequent removal of the gaseous products of combustion.

During the early stages of these disturbances there is little, if any, possibility of controlling the rate or extent of temperature rise through furnace control or manipulation, however the initial starting temperature may well serve to define the maximum attainments resulting from these reactions. In addition, if the products of combustion are eliminated or permitted to escape as rapidly as they are formed, the effects resulting from the further reduction or cracking of these by-products will be reduced.

3. The definition of time-temperature limits for heat aging tests. On the basis of this work we have been able to establish, for our own equipment, a test procedure which (1) is reproduceable in character, (2) does not exceed a furnace temperature of 300°C at any time, and (3) yields tensile strength values that show no variations which can be attributed to positioning in the furnace.

From these observations it may be concluded that a satisfactory heat aging test can be established only after there is a complete understanding regarding the thermal excitations necessary to cause the degradation of the organic portions of asbestos textiles and, in addition, there is an appreciation of the reactions which may result from such destruction. If it is intended that the actual cloth temperatures are not to exceed 300°C it will be necessary to start such tests at temperatures low enough to retard the rate and extent of ignition so that the maximum will not be exceeded. However, if the 300°C temperature is to be that of the furnace interior a rate such as we have established will meet the necessary requirements and the actual cloth temperatures will attain a maximum temperature considerably in excess of that of the furnace. The procedure that we have here proposed would appear to satisfactorily meet the general requirements of the test as it is faguely presented in the subject specifications. However, if a completely satisfactory test method is to be developed there must be an understanding between the consumers and producers of such cloths with regard to the purpose of the test and the relationship of the conditions of test to actual service conditions.

Respectfully submitted,

MYRIL C. SHAW

weaving Institute Standard cloths for test purposes, conforming with specifications that had been prepared on the assumption that adequate supplies of Rhodesian fiber would be available. The Technical Committee has reviewed the matter and recommends that Projects 1, 2, 3, 4 and 5 adopted at the jointmeeting of the Board of Governors and the Technical Committee held July 27, 1950, be continued under modified procedure as follows:-

Projects 1 and 2 shall continue as already authorized. Projects 2, 4 and 5 shall proceed by selecting cloths which are represented in the stock now in the Fellow's laboratory, comprising Commercial, Underwriters, AA, AAA and AAAA grades, that have been supplied by member companies. The cloths so selected shall be those upon which the Fellow has information pertaining to the details of construction, which information shall be included in the reports of the Fellow.

The projects have been restated in the minutes of the Technical Committee meeting held March 19, 1951, included as supplemental to this report.

Item III.

Three new projects have been proposed.

Item III-A -Submitted by J. D. McCluer
Southern Asbestos Co.

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.

In the discussion of this proposal questions were raised on what chrysotile sources shall be included? The various Thetford Mines fibers are similar but not identical from the King, Bell and Johnson mine. Black Lake fiber is harsher and is somewhat different in harshness from Vimy Ridge fiber. Ontario chrysotile is quite different from the various quebec chrysotiles - and all differ from the chrysotile found in Southern Rhodesia, which produces a number of types. Several types are prospectively available from the Transvaal. Then there are the different types of Arizona chrysotile. California may become a producer of chrysotile comparable with both Canadian harsh and Canadian soft. The field of choice is very wide, and to be even moderately instructive this proposed project would require a considerable outlay of money. It was agreed that quotations covering the cost of evaluations should be obtained before proceeding with an outline of the work, and that the industrial value of the investigations be given careful consideration by members of the Institute.

Item III-B - Submitted by H. T. Coss
Johns-Manville Corp.

Review the methods for determining magnetic iron content of chrysotile.

Experience has disclosed the unreliability of the General Electric Magnetic Analyzer, in that different ratings are obtained on the same specimen, dependent upon whether the magnetic particles are well dispersed or concentrated. The Technical Committee believes it is advisable to review the whole subject and to explore new approaches for making such determinations. It was suggested that consultation with specialists on the Rutgers faculty might lead to new methods of attacking the problem.

Item III-C -Submitted by C. R. Frederick
Keasbey & Mattison Co.

Investigate acid degradation tests for asbestos textiles. Some specifications, specifically one by Consolidated Edison, Chicago, rely upon results of such testing. An investigation by the Fellowship may enlighten the membership regarding the value of the test method and results so obtained.

Item IV.

Upon conclusion of the discussion of the fellowship activity the Technical Committee adopted a motion which is now placed before the Institute for consideration as follows:-

"The fellowship program as revised at the Technical Committee meeting held March 19, 1951, be recommended by the Chairman for acceptance at the next general meeting of the Institute, and that new projects, if approved by the Institute, be given consideration by the Fellow at the earliest possible date.

Item V.

A letter that acknowledges the work of the Asbestos Textile Institute on specification matters pertaining to asbestos products is here quoted:

DEPARTMENT OF NATIONAL DEFENSE
Electronic Standards Sub-Committee

Ottawa, Ontario
12 December 1950

Asbestos Textile Institute,
Raybestos-Manhattan, Inc.
Manheim, Pennsylvania.

Attention: Mr. Jesse Weaver

Re: MIL-I-3053

Dear Sir:

"United States Military Specification MIL-I-3053 has been proposed for adoption by the Canadian Military. The Canadian Johns-Manville Company has proposed certain changes in the requirements on which we would like the opinion of those more imtimately connected with asbestos products before deciding upon a course of action. We know that the Asbestos Textile Institute was very prominent in the preparation of this specification and therefore your opinion would be valued. Incidentally we do realize that MIL-I-3053 is under the direct control of the Armed Services Electro Standards Agency, and propose to discuss these points with them as well.

"<u>Table V</u> - The minimum asbestos content would be reduced from 90 to 82 percent. We understand from Canadian-Johns-Manville that the Institute is also interested in having this change made.

"<u>Table VII-Paragraph 3.6.4.3: Breaking Strength</u>

(a) "As received" breaking strengths are acceptable.

(b) Johns-Manville cannot accept the oven-aging tests of 5 minutes at 300°C. The results obtained from the tensile strengths after heating tests are so variable that it is impossible for any two individuals to obtain duplicate results on the same material.

"We wish to point out that if it is imperative that we are to accept orders with this test included, the customer should be required to give us minute details of the tests and a description of the apparatus used. By minute details we mean a description of the method of insertion, temperature range, time range, position of samples, number of samples tested at same time, size of sample, rack for holding samples, etc.

"We understand that you are investigating this test at the present time with a view to recommending necessary changes.

"Table IX - (a) Nominal Inside Diameter - A tolerance of ± 1/64 is needed for inside diameters of 1/16" to 3/16" inclusive.

(b) Nominal Wall thickness - A tolerance of ± 1/64 should shave been specified for wall thickness.

"We feel that these tolerances are too broad and would like to see the specification values maintained.

"Any information you can give us on the above points would be appreciated."

Yours very truly,

V. E. TANT, Chairman
Specifications Panel.

Copies of Mr. Tant's letter were sent to several member companies whose representatives had participated in the work of the Technical Committee in collaborating with our Armed Services Electronic Agency in formulating Specification MIL-I-3053. Replies were received from

Southern Asbestos Company and Keasbey & Mattison Co. Copies of their letters were sent with my letter to the Department of National Defense of Canada. Our letters were acknowledged under date of 29 January 1951, as follows:

Dear Mr. Weaver:

> Thank you very much for your letters of the 22 January, 1951, and 18 December 1950, with attached comments from Keasbey & Mattison Company and Southern Asbestos Company. These letters have provided very much useful information on the points in doubt, and your cooperation in this matter is very much appreciated. In view of the unanimity of opinion of industry on these points we are making changes in MIL-I-3053 as industry has suggested. However, we would still appreciate receiving copies of the replies from other members of the Asbestos Textile Institute which you refer to in the last paragraph of your letter of January 22.

Yours Very truly,

V. E. TANT, Chairman
Specifications Panel

Item VI.

On the subject of ATI standard asbestos cloths, Mr. C. R. Frederick, Keasbey & Mattison Co., has called attention to small discrepancies in thicknesses published by A.S.T.M. and The A.T.I. thicknesses, amounting to 0.003 inch in one cloth and to 0.005 inch for two other cloths. The discussion resulted in requesting the Fellow to compile data resulting from his study of cloths furnished for fellowship work and to present it at the next meeting of the Technical Committee.

Item VII.

The Navy's specification for asbestos insulation on electrical cables, No. 15Cli of 1 Feb. 1947, was superseded by

Specification MIL-C-915 (ships) 15 Nov. 1949. Under Section 3.11.9.2, Asbestos Electrical Insulating walls, the last sentence reads: "Asbestos for this application shall conform to either class 2 or class 4 of Specification 18-I-29". A member of the Institute telephoned me for an opinion on whether the intent of the stipulation is that the asbestos industry is permitted to use either class of asbestos in supplying roving or lap for primary insulation or whether the cable manufacturer may stipulate one or the other class of asbestos. The Technical Committee voted to authorize the Secretary of The Institute to write to the Bureau of Ships for clarification of the matter.

I wish at this time to say that while J. A. Bettes, Oliver Bowles and I were lunching with Mr. G. M. VanLear, Bureau of Ships engineer on cable construction several days after the Technical Committee meeting, I asked whether the sentence means that class 4 asbestos is always permitted even though the specification allows a choice of class 2 or 4, and his answer was that class 4 is satisfactory. All manufacturers will realize the necessity for this. Nature has provided class 2 asbestos in small quantity.

MIL-I-3053, which superseded 171-29, reads in Section

6.1 Intended Use and

6.1.1 Class 2 - "This class is intended only for special applications where the asbestos is of primary importance, as in electrical insulation used on magnet wire, and in paper tape, sleeving, or cloth used primarily as a dielectric."

Returning to MIL-C-915 (Ships) 3.11.9.2 it reads:-

> "Asbestos electrical insulating walls shall consist of plain or reinforced asbestos applied either in treated or untreated form. The asbestos shall be suitably applied and compressed about the conductor

so as to provide a dense felted wall of circular cross sections, in which the conductor is well centered. Such insulating walls are normally to be employed in combination with walls of insulating material of high dielectric strength, such as synthetic resin or varnished cambric."

It is clear from the detailed remarks that the Bureau of Ships has explained why class 4 asbestos is acceptable, specifically because there is another insulating wall of high dielectric strength. The asbestos withstands high operating temperature and protects the higher dielectric materials of less heat resistance in electrical cable for shipboard use.

Item VIII.

Your Technical Committee was directed at the general meeting held December 14, 1950 to formulate specifications for braided rubing or sleeving. This work is underway. Specifications now in use by three members have been supplied for a study of the problem. Other companies are to supply specifications and the data are to be assembled in comparative form by the Fellow for action of the Technical Committee at its next meeting.

Respectfully submitted,

Jesse M. Weaver
Chairman,
Technical Committee

Metallic Foil Clad Asbestos Textiles

Introduction

One of the projects presently under investigation by the Fellow concerns the development of an asbestos textile suitable for covering pipe insulations for high temperature applications. A number of considerations must be taken into account in the establishment of the most suitable and serviceable cloths for this application. First, the cloth must have sufficient quality to withstand the high temperature service conditions to which it will be subjected; second, the overall cost of installations of this nature is high and asbestos cloth coverings so used must be held to a low figure and be a relatively small part of the whole cost if they are to receive due consideration for such applications; third, since the cost of asbestos cloths are generally directly proportional to the grade of construction, the lower grade cloths will necessarily come closer to satisfying the cost requirements than the more expensive, high grade cloths. With these conditions in mind, our considerations have been directed toward an approach which would permit the utilization of a commercial grade cloth.

It is understood that the pipe covering service may be such that pipe temperatures in excess of 1000°F. may be encountered and further, under these conditions, pipe expansions may cause wide cracks to open in the insulation material which would expose the cloth coverings to temperatures above 500°F. Theorectically, the thermal expansion factor for a steel pipe, typical of one used in installations such as those with which we are concerned, is in the neighborhood of 12×10^{-6} per degree F over the range from 68° to 1300°. Using this figure, it can be calculated that a 100' length of pipe carried to 1000°F will expand 14.5". Further, if 33 three foot sections of insulations are applied to this pipe and, providing the expansion is uniformly distributed, the space between the sections will be .423" at 1000°F.

Temperatures of 500°F, for relatively short periods of time of exposure, will badly char Commercial Grade asbestos textiles and noticibly degrade Underwriters cloths. Generally accepted temperature limits for these cloths are: Commercial, 400°F and Underwriters, 450°F. It is obvious, therefore, that these cloths, as such, would be undesirable under the conditions specified within the problem here under consideration.

On December 26, 1950 a new approach to this problem was initiated and there are indications that perhaps a Commercial grade cloth may be so conditioned that it will withstand service conditions at temperatures considerably in excess of 500°F with only slight degradation. The principle under consideration is that of reflective insulation. The effectiveness of a bright metallic surface for retarding heat transfer has been well known for many years and the principle has been utilized extensively in low and relatively low temperature insulations. The U.S. Air Corp. in developing a fire fighting suit for high temperature exposures utilized this principle to achieve a desired serviceability. The metallics are usually in the form of foils although heavier sheets are occassionally utilized.

The relative effectiveness of several such metals is set forth in the following table where e = a = 1-r; e is the emissivity or the ratio of heat radiated by a body to that of a black body under the same conditions; a is the absorptivity, or ratio of radiant heat absorbed by a body to that of a black body under similar conditions; and r is the reflectivity, or the ratio of radiant heat reflected by a body to that of a black body under similar conditions.

TABLE I

	°F.	Total Normal Emmisivity
Aluminum, polished	100	0.03-0.05
	500	0.04
	1000	0.06
Aluminum; foil	100	0.05
Aluminum, oxidized at 1110°F	100	0.11
	500	0.12
	1000	0.18
Chromium polished	100	0.06
	300	0.06
Gold, polished	100	0.02
	500	0.02
	1000	0.03
	2000	0.03
Lead, polished	100	0.06
	500	0.08
Nickel, polished	500	0.07
	1000	0.10
Platinum, polished	500	0.07
	1000	0.10
	2000	0.18
Silver, polished	100	0.02
	500	0.02
	1000	0.03
Tin, polished	200	0.05
Aluminum paint	100	0.27-0.69
Asbestos Cloth	200	0.90
Asbestos Paper	200	0.93
Glass polished	100	0.90

It will be observed that all of the polished metals have very low emissivity values compared to asbestos cloth or paper or polished glass. Polished aluminum has a value of 0.03-0.06, compared to 0.90 for asbestos cloth, giving a ratio of 15 to 1 in favor of the aluminum. Most other metals are arrayed in the same neighborhood as aluminum.

Experimental work

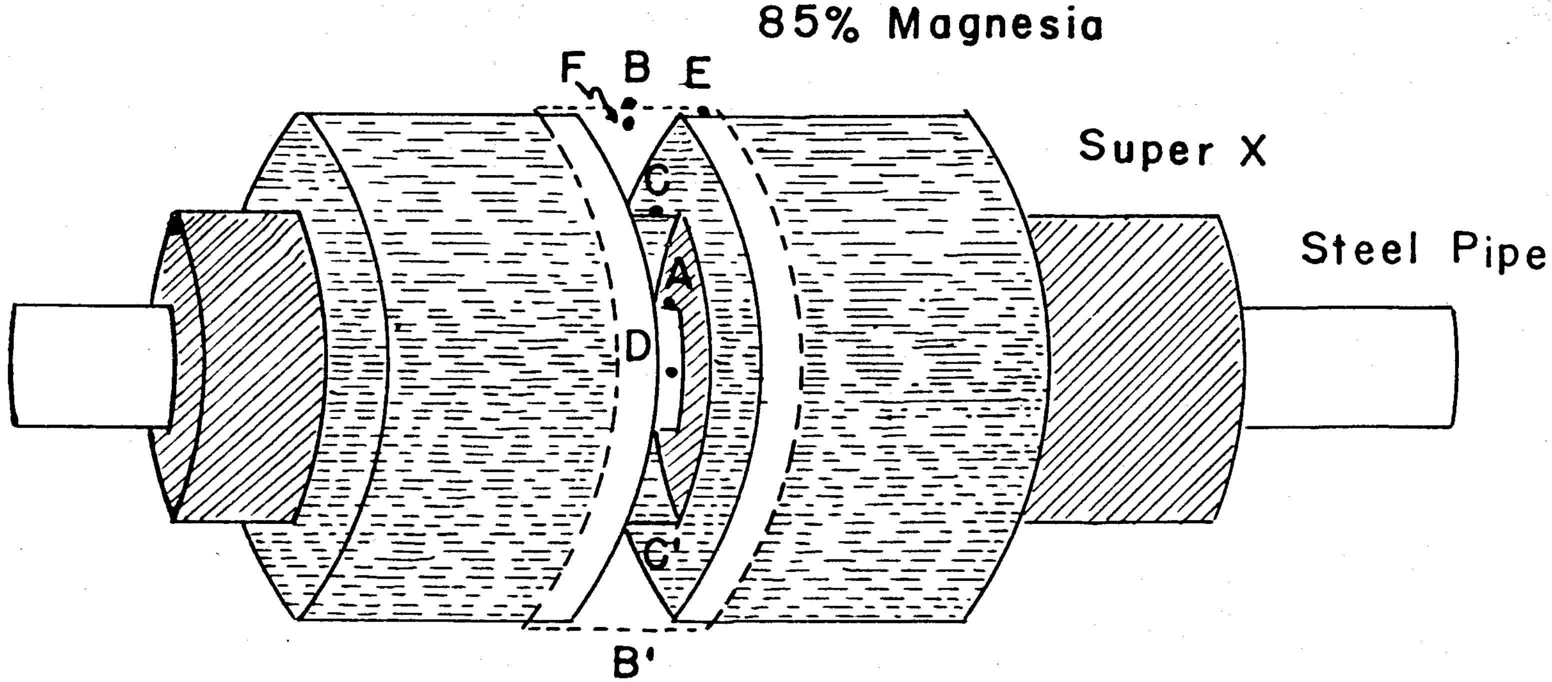
With this information at hand, our investigation was directed to a study of the possibilities of ulilizing some of these metal foils in conjunction with asbestos textiles in an effort to protect the asbestos cloths under the service conditions with which we are now confronted. Our first efforts were projected through the use of a tin foil 0.0015" thick, cemented to a 2.25 commercial grade asbestos cloth.

The results of this work were very encouraging and warranted further investigation of the possibilities. However, it was felt that tin foil was not the most suitable metal due to its weight, having a bulk mass of approximately 450# per cu. ft. Aluminum foil was next procured and has been the basis for our work since that date. The aluminum foil has a thickness of .001" and weighs 4.15 gms or 1.46 ounces per square yard. The bulk weight of the aluminum foil is approximately 1/3 that of the tin foil. The application of this foil by cementation with a thin coating of Arabol cement or sodium silicate adds approximately 7.5% in weight to a 2.25 pound commercial grade cloth or approximately 3 ounces more per yard making a total weight of 2.40 pounds per square yard.

In pursuance of this investigation a number of preliminary experiments were run in an effort to establish certain fundamental characteristics. Two test procedures were adopted and the different techniques involved permitted a wide range of evaluations.

Pipe Covering Test.

The first test method utilized the pipe covering test unit which has been in operation in our laboratory for the past eight



Steel Pipe - $2\frac{1}{2}$" ID x $2\frac{13}{16}$" OD x 30" L

Super X - $2\frac{7}{8}$" ID x $6\frac{3}{4}$" OD - 10" per section

85% Magnesia - $7\frac{3}{4}$" ID x $10\frac{3}{4}$" OD - 6" per section

Heating Coil - Hevi Duty, Type 78 S - 24" x 600 watts.

Thermocouple Junctions - A, B, C, D, E, F.

FIGURE I

months. The illustration in Figure 1 shows the full construction utilized in some of the tests. Other tests were conducted, however, wherein the layer of 85% magnesia was not used and the cloth coverings were applied directly over the Super X insulations, 2" from the direct heat of the actual pipe. The illustration shows a vertical space between the two insulation covering sections and the width of this space was varied so that the effects of such variations might be ascertained.

In this work the asbestos cloth selected for test was Commercial grade, 2.25 pounds in weight, plain woven with construction 18x8 using 1020 yarns in both the warp and fill. In some cases these cloths were wrapped on the circumference of the Super X as indicated C-C' and in other cases on the circumference of the 85% magnesia insulation as indicated B-B'. In addition, tests were run wherein cloths were applied at both locations simultaneously.

The temperature measurements were made by means of chromel-alumel thermocouples, the junctions of which were located at the points indicated A, B, C, D, E, and F. Point D is located at the exact center of the pipe, inside of the heating element and is therefore very intense. Point A is located on the outer surface and top of the steel pipe and is considered the pipe temperature. Point C is on the top outside surface of the cloth wrapped on the circumference of the Super X. Point B is on the top outside surface of the cloth wrapped on the circumference of the 85% magnesia insulation. Point E is on top outside surface of the outer insulation material for any particular test depending upon whether Super X or 85% magnesia is serving that particular purpose in the test under observation. Point F is a point immediately under the test cover cloth.

Hot Plate Test.

A second test method was adopted so that somewhat more severe conditions might be simulated and in this way accelerate the rate at which data might be accumulated. In this latter method an electric hot plate with an exposed heating element was utilized and a frame was constructed so that test specimens could be placed in a horizontal position 2" above and parallel to the heating element. Figure 2. The temperature at the element surface is controllable to temperatures somewhat in excess of 1000°F and by means of a Variac control any temperature between the maximum and room temperature can be maintained for extended periods of time.

In order to establish a uniform emission of heat from the heater coil it was found necessary to place a disc of very light gauge sheet steel immediately over the heating element. The emission temperatures were then measured by means of a chromel-alumel thermocouple so placed that the junction was on this metal plate at point A on the sketch.

The test cover plate was laid upon the guard ring and was of a size to completely enclose the volume within the ring. Temperatures were read by means of a thermocouple at point B located on the top side of the test cover.

Through this arrangement it was possible to roughly determine 1) the resistance of the materials so tested to thermal degradation and 2) the ability of such materials to conserve heat as indicated by increased coil temperatures at constant power inputs and through decreased temperatures at point B.

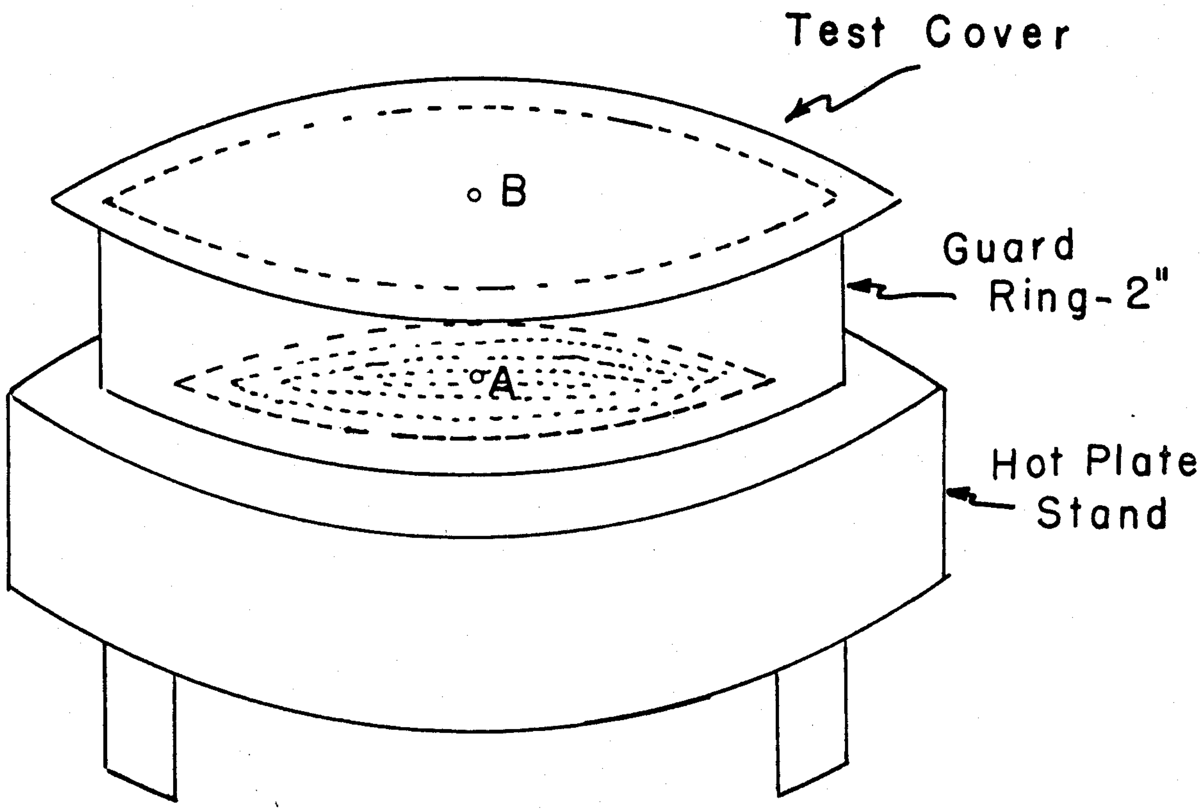


FIGURE 2

Test Results

Pipe Covering Test #1

With a 1/2" space simulating a crack between the two pipe insulation sections of Super X only, without the overlay of 85% magnesia, samples of aluminized and unaluminized cloth 2" wide were wrapped around the sections C-C to cover this space. With temperatures on the outer surface of the metal pipe of 1000°F the untreated cloths were badly charred in less than 30 minutes. On the other hand, sections of aluminized cloth maintained at pipe temperatures of 1015°F and 1165°F for 20 and 24 hours respectively showed only a very slight discoloration.

Pipe Covering Test #2

Using the same technique as described in Test #1, except with a 1" space, similar results were obtained. With outside pipe temperature of 1120°F and 1160°F for 50 and 60 hours respectively some discoloration of the cloths was produced, however, they appeared to be only slightly degraded.

Pipe Covering Test #3

Using the complete set up as shown in figure I and with a 2" space between the insulation sections a series of tests were conducted using the following wrappings: 1) Asbestos Cloth alone, 2) aluminized asbestos cloth and 3) aluminized asbestos cloth with 3/8" layer of amosite fiber between the cloth and foil. In this work the cloth strips were 4" wide.

Two series of tests were conducted, one at 6.2 amps input and a second at 7.0 amps input with the time of duration of each test being varied in accordance with the visual results apparent. The temperatures attained during each test are shown in Table III and an inspection of the cloths subjected to each test serve to illustrate the protective properties afforded by the constructions used.

It will be observed that in the cases where the aluminized cloths were used, the pipe temperatures were considerably higher, 100°F at 6.2 amps and 135°F at 7.0 amps, than with the plain cloth. The temperature immediately under the aluminized cloth were also markedly higher than those under the plain cloth wrapping. Both of these observations clearly point out the heat conservation features supplied by the aluminum foil. In the case where fibrous amosite was applied between the foil and the cloth still further improvements in the above characteristics will be noted.

Table II

		Raw 24 hours	Foiled 72 hours	Foiled Amosite filled
A	6.2 amps.	790	890	----
B		350	300	----
F		470	585	----
D		1070	1140	----
		19 hours	48 hours	10 days
A	7.0 amps	900	1035	1055
B		370	340	275
F		555	685	775
D		1230	1330	1360

Many tests of this nature were conducted in the course of this exploratory work, however, the three experiments here described set forth the essential features of the results obtained.

Hot Plate Tests

In this work the effect of reflectance upon heat conservation was markedly illustrated. Here again, many tests have been conducted, however, the results obtained in the single experiment here described serves to point out the significant features.

In order to standardize the procedure, the set up as previously described was first standardized using a cover plate of 5/8" thick carborundum plate. Under these conditions constant plate temperatures after 30 minutes were obtained. The test plates of aluminized and unaluminized cloth was then placed in position and the resulting temperatures were measured. A comparison of the values so obtained at various currents are set forth in Table III.

Table III

Amp. Input	Cover Plate	Temperature A	Temperature B	Time Minutes
4.00	Carborundum (5/8")	637	175	30
"	Aluminized Asbestos	795	160	30
"	Aluminized Duck	760	245	30
5.00	Carborundum (5/8")	720	230	30
"	Aluminized Asbestos	925	205	30
"	Aluminized Duck	935	225	30
5.40	Carborundum (5/8")	795	245	30
"	Aluminized Asbestos	1015	220	150
"	Aluminized Duck	980	235	45

Under these conditions the foil showed no indications of deterioration at any of the temperatures. The asbestos cloth with aluminum foil at the 795°F showed no discoloration, at 925°F slight browning was observed and at 1015°F a distinct browning was discernable. An additional test was conducted with 6 ounce duck samples with an aluminum foil coating and the results showed it to withstand the temperatures very nearly as well as the asbestos cloth, however, the heat loss was considerably more pronounced.

Conclusions

The results of the few tests here described and an inspection of the several specimens of cloths subjected to the tests would seem to warrant further investigation of the possibilities of the technique here described. Asbestos cloths provided with the protection of a thin film of metal may be subjected to temperatures several hundred degrees in excess of the presently recognized limits for such cloths. It is true that the foil provides the protection and foil would in many cases serve alone. However, the asbestos cloth backing provides the foil with a strong and flexible reinforcement which could well serve in many applications where the foil alone might be difficult to handle or impossible to apply. In addition, the asbestos cloth provides an insulation medium and serves to shield the hot metallic surface from direct exterior exposure which might in many cases provide an industrial hazard.

The use of the aluminum foil, in addition to protecting the asbestos cloth, provides a heat conservation medium, as is evidenced in table III. It will be observed that when the hot plate was so controlled that the plate temperature could be stabilized at 637°F using the carborundum plate, the temperature of the plate when guarded with an aluminized asbestos cloth was increased to 795°F. At higher temperatures the ratios were consistantly maintained and a 720°F with carborundum was increased to 925°F with aluminized asbestos and a 795°F temperature with carborundum was increased to 1015°F with the treated cloth.

It would seem therefore that the use of aluminum foil in conjunction with a commercial grade asbestos cloth can provide a safe insulation cloth which will effectively serve as a thermal insulator at temperatures of from 400°F to 500°F higher than the presently accepted temperatures for such materials.

Myril C. Shaw

SECRETARY'S REPORT

During the quarter just closed your Secretary has participated in the following activities in the Interest of Institute affairs.

1) Immediately following the last General Meeting a conference was arranged with Mr. M. I. Ruddock, legal counsel, for consideration of the directive as noted in the Minutes of the December meeting of the Board of Governors, paragraph 4, section 3, in reference to the redrafting of Section 6 of the By-Laws of the Institute. The proposed revision as drafted by Mr. Ruddock is herewith presented for consideration.

At this same conference the final draft of the uniform assessment notice was established and was so used by McLaren, Goode, West & Co., in the assessment notices recently issued to cover the 1951 budget.

2) McLaren, Goode, West and Co., auditors, were advised regarding the actions taken by the Institute in reference to the 1951 budget and were authorized to proceed with the issuance of the necessary assessments to satisfy this action.

3) Assistance was given our President, R. E. Cryor, in the writing of an informative article about the Asbestos Textile Institute which was published in the March issue of Asbestos.

4) During recent months, our office has been deluged with informative articles issued by the National Production Authority under the United States Department of Commerce. Approximately thirty copies of each article were received and we have endeavored to circulate this material throughout the Institute membership. We would like to know whether or not it is the desire of the membership that this service be continued. Some members have advised us to stop

mailing this material to them and other members have asked that it be continued. We would appreciate some direction in this regard.

5) Immediately following the last meeting the following schools were contacted in regard to the placement of our Visual Aid Displays: Rice Institute, Bradley University, Fashinn Institute, Franklin & Marshall, Massachusetts Institute of Technology and Alabama Polytecnia Institute. The first four of these schools accepted our offer and now have the displays on exhibit. The last two schools have not acknowledged our correspondence and it is assumed that they have no interest at this time. The seventh display is presently on exhibit at Rutgers and has been viewed by a large number of people who daily visit the campus either on personal business or as members of industrial or educational groups which are ever meeting at the school.

We will welcome suggestions as to new schools or institutions that may be approached as possible exhibitors.

6) A meeting of the Technical Committee of the Institute was arranged for and attended by the Secretary on March 19th at the Hotel Warwick, Philadelphia. Minutes of this meeting have been submitted to the Chairman, Mr. Weaver, and will be discussed under the Technical Committee Report.

7) The next General Meeting of the Asbestos Textile Institute is scheduled for Thursday, June 14, 1951 at the Warwick Hotel, Philadelphia, Pa.

Respectfully submitted,

Myril C. Shaw,
Secretary

RAYBESTOS-MANHATTAN, INC.

MANHEIM, PA.

June 26, 1951

Office of Quartermaster General
Research & Development Laboratories
Washington, D. C.

Attention: Mr. Russell Schwartz

Subject: Asbestos Glove Cloth

Gentlemen:

This will confirm our recent phone conversations concerning specifications for an Underwriters grade asbestos cloth for use in the manufacture of mittens. It will facilitate this discussion if you will get before you copy of Federal Specification SS-C-466 dated 15 Dec. 1949. This specification was written after careful consultation with various members of the industry, and in the writer's opinion accurately reflects the physical values of the various cloths specified.

Paragraph 3.3.2.1 describes a 2¼-lb. Underwriters grade plain weave asbestos cloth. Paragraph 3.3.5.3 gives the warp and filling tensile of the cloth. Using these accurate values as a basis for comparison, we would like to give you the following recommendations for a proper description of an Underwriters grade plain weave asbestos cloth weighing 2.5 lbs. per square yard.

	Federal Spec. SS-C-466	Suggested Glove Cloth
Grade	A	Underwriters
Class	1	
Min. Asbestos	80%	80%
Nom. Wt. Sq. Yd.	2.25 lbs.	2.50 lbs.
Texture (Nominal)		
Ends 1"	18	20
Picks 1"	9	10
Tensile*		
Warp	100	115
Filling	45	50

*Minimum Average of 5 Breaks - Grab Method
See Federal Spec. CCC-T-191 Issue A, Par. 5, Sec. VI.

Please note particularly that while paragraph 3.3.5.3 calls for a minimum tensile, the method of determining the minimum tensile, as called for in paragraph 4.3.1.5 is actually a minimum average tensile determined by the grab method. This is a much more practical value for asbestos textiles, as they are subject to a greater percentage variation in warp and filling values than you would reasonably expect to find in a cotton textile, for example.

The writer has delayed giving you these opinions in writing until I had an opportunity to bring the matter up for discussion at a meeting of the Asbestos Textile Institute. The specification above recommended is not only the recommendations of our company, but also represents the consensus of opinion of the members present at the last meeting of A.T.I.

It was also the consensus of opinion that the warp and filling tensiles called for in Navy Specification 37Mlb dated 10/2/44 is impossible of accomplishment with the quality of fibre available to us today. You will note that this specification was originally written in July 1941. During the competitive period one manufacturer would vie with another to offer the highest possible tensile. I am confident it is your present purpose to describe a glove cloth that can be procured as a standard material under current conditions.

We trust that our suggestions will be found helpful.

Yours very truly

J. A. Bettes, Jr.
Sales Manager

July 18, 1951

THE PENNSYLVANIA STATE COLLEGE

School of Mineral Industries
State College, Pennsylvania

Department of Mineral Engineering

Address: Mineral Industries Bldg.
Telephone: State College 8441

Gentlemen:

I am interested in obtaining the comparative qualities of your asbestos cloth with other fireproofing material. My particular problem deals with the design of a portable fireproof substation that will meet the requirements of the Federal code and State mining laws for use in coal mines. The different states specify varying thickness of concrete block, brick and steel. I would appreciate information on the following:

1. Fireproof and heat transfer properties of various grades or thicknesses of asbestos cloth with equivalent thicknesses of concrete block, brick and steel and other types of masonry, with any proof of the tests that might impress anyone who was skeptical as to their validity.

2. Cost and weight of different grades of cloth and physical strength.

3. Size of cloth - can itbe joined in some manner and still preserve its properties even though it may be folded for transportation from time to time.

4. Can a joining of the cloth be made temporary so that a large piece could be taken apart and joined again on assembly and still be fireproof as original.

5. The size would be in the area of 60' x 40'.

6. Will it retain physical strength and properties upon continuous folding?

Thank you for any information you may send me.

Very truly yours,

A. Wayne Bitner
Research Associate
Mining Engineering

FELLOWSHIP REPORT

Much of the Fellowship work during the past months has been directed toward those projects which have some relationship to the several specification clarification problems presently confronting the Technical Committee. Since most of the general projects listed in the program of work to be undertaken by the Fellow are in some way related to various phases of specification work, the tie-in of the two programs could be easily accomplished.

HEAT AGING TEST. The heat aging test work in cooperation with Westinghouse Manufacturing Co., is still in progress. As reported at our last meet, the Westinghouse Manufacturing Co. was supplied with a sample of cloth on August 20th, which was to be given the heat aging test by them and the results were to be reported to us so that we might check their work and proceed to cooperatively develop a suitable test procedure for such evaluations. Having heard nothing further from this company since that date, we wrote to them sometime ago inquiring as to their progress and just last week received a reply which stated that their work would be completed and the results reported to us on January 15, 1952. This being so we can but wait for this information.

The results of this work are quite important since many government agencies are incorporating a heat aging test of a sort in their specifications. As in the past, these specifications are not clear as to test procedure and the tensile strength values after such a test are meaningless unless this procedure is explicit in many details. It is the hope of the Technical Committee that after the specifications for Westinghouse have been approved by all concerned, they may serve as a basis and guide for all other specifications covering similar conditions.

ALUMINIZED CLOTH. The work on this project is, in the main, progressing as a part of the work in connection with the investigation of the "temperature limits which may be recommended for various grades of asbestos textiles."

During recent months, however, we have received correspondence from Grems Mfg. Co., Klamath Falls, Oregon, who market an aluminum paint particularly designed for construction insulation. Samples of this material as used were also received and a request was made for some of the paint so that we might apply it to some of our cloths and investigate its properties more thoroughly as they apply to our particular problem. It is our understanding that this is a rubber base paint and, if so, the thermal properties will have definite limitations, however, it would be worth while, we feel, to be able to define these limits.

Shellmar Products Co., a convertor is endeavoring to apply aluminum foil to a 12-yard sample of commercial grade cloth which was supplied by us, have not yet completed this work. They were very desirous of having a much larger piece of material to work with than we were able to furnish and in order to obtain as long a sample as possible have split the one yard wide sample so that they can make a run on a 24 yard long piece, even though it is only 18" wide.

Upon completion of this work and the receipt of the report from the convertors regarding the commercial feasibility of such an operation, the Technical Committee will be advised and the next steps decided upon.

TEMPERATURE RESISTANCE OF ASBESTOS TEXTILES. The third project listed in the program of work for the Fellowship covers the "determination of the temperature resistance of the five grades of asbestos cloths--Commercial, Underwriters, AA, AAA and AAAA". Here again is an investigation, the results of which will have specific applications in the specification field. Many specifications set forth the temperatures at which the cloths under consideration may be serviced, however, the method of temperature application is never indicated. In our work we are making these determinations by three methods of heat application 1) Radiant heat from one side, 2) Direct or contact heat from one side and 3) Submerged heat from both sides, as in the heat aging test.

Since the degradation of these materials is a function of both time and temperature over quite a range, a great many tests and much time are involved. The rate of degradation is to be determined at temperatures ranging from 100°C up to the highest possbile temperature, which in the case of low grade cloths will be chiefly dependent upon the organic content and in the higher grade cloths by the grade of fiber used in spinning the yarn. It is hoped that from this work, serviceability curves may be obtained which will define the thermal serviceability limits of the several grades of asbestos textiles as a function of time, temperature and fiber grade. Every effort will be made to have a sufficient amount of this data available for use by the Technical Committee in the review of the several specifications which are now under consideration.

In addition to testing the regular line of untreated cloths and textiles, it is our intention to include several treated cloths and cloths which have been coated with aluminum foil and the aluminum paint if cloths having the latter application can be obtained. We realize that so-called treated cloths are being manufactured by several of our members and would appreciate receiving from three to five yards of several varieties of these materials for inclusion in this work.

MISCELLANEOUS. During the past months, the Secretary circulated among the membership of the Institute a letter from Nugent and Nugent, a Washington, D. C. law firm, regarding an asbestos deposit in which that firm had an interest, located in California. Upon request, we received samples of this material from the writer and have determined the fiber to be of the variety, chrysotile. The sample received was in rock form and the veins ranged from very thin up to approximately 3/16" across. An insufficient amount of this fiber was made available to us and for this reason extensive test work could not be carried out, however, it would seem that perhaps some further investigation might be advisable in order to definitely establish the extent of the deposit and the value of the fibers, if the deposit is, as the interested parties state, quite extensive. This matter may have perhaps received this, however, since we have had no word of any action we call this matter to your attention so that no possible sources of asbestos may be overlooked.

CONCLUSIONS

In conclusion we would like to express our appreciation to all of the members of the Institute who have supported and promoted the work of the Fellowship during the past five years. We are now entering our sixth year of service and earnestly hope that each of you will feel free to avail yourselves of the facilities of our laboratory and of the School of Ceramics at any time in extending technological advancements in the asbestos textile industry. Properly and wisely handled the Fellowship can be a powerful tool in your hands and we trust that it may be our pleasure and good fortune to be afforded the opportunity of implementing this tool under your direction.

Respectfully submitted,

Myril C. Shaw

ASBESTOS TEXTILE INSTITUTE
AUDITOR'S REPORT
December 3, 1951

Balance in Various Funds - October 1, 1951

Fellowship Fund	$ 402.43	
General Fund	7,056.61	
Publicity Fund	921.74	
Petty Cash Fund	26.55	$ 8,407.33

Receipts: General Fund (Gift Fund) 222.95

Transfers: To Petty Cash (from General Fund) 33.61

$ 8,663.89

Disbursements:

Fellowship Fund: none

General Fund:

Secretary's Salary	$ 330.61		
Secretary's Travel	29.26		
Meeting Expense	408.87		
Auditing Expense	8.40		
Stenographic Expense	49.00		
Misc. Office Expense	6.30		
Petty Cash Fund Transfer	33.61		
Gift Fund	222.92	1,088.97	

Publicity Fund:

National Science Teachers' Assoc.	600.00	

Petty Cash Fund:

Misc. Office Expense	36.36	1,725.33
Balance on Hand December 3, 1951		$ 6,938.56

Balance in Various Funds - December 3, 1951

Fellowship Fund	$ 402.43	
General Fund	6,190.59	
Publicity Fund	321.74	
Petty Cash Fund	23.80	$ 6,938.56

Respectfully submitted,

S. C. Gehman