MINUTES of the Asbestos Textile Institute held June 4 thru June 7, 1956 in New York; Thetford Mines and Asbestos, P. Q., Canada

IN ATTENDANCE:

F. J. Wakem, President
JOHNS-MANVILLE CORP.

ASBESTOS CORPORATION, LTD.
I. C. Campbell
G. F. Jenkins
P. E. LeClerc
J. A. Marcotte

BELL ASBESTOS MINES, LTD.
Geo. Smith
H. A. Smith
F. P. Smith

CASSIAR ASBESTOS CORP., LTD.
J. D. Christian
T. T. Tigert

JOHNSON'S COMPANY, LTD.
A. S. Johnson
W. J. Johnson
Carl Bindman
Geo. Robinson

JOHNS-MANVILLE CORP. OF CANADA
J. C. Kelleher

JOHNS-MANVILLE CORP.
E. A. Schuman
W. Atkinson
W. S. Hough

KEASBEY & MATTISON CO.
R. L. Lans
A. E. Whitfield

RAYBESTOS-MANHATTAN, INC.
M. S. Maier
J. A. Brown
R. B. Smith
M. W. Oliver
S. R. Zimmerman, Jr.
G. W. Marshall, Jr.

SOUTHERN ASBESTOS CO.
J. T. Griffis
Geo. Griswold
J. D. McCluer

ASBESTOS TEXTILE INSTITUTE
M. C. Shaw

GUESTS:

Frank Gatke
Dr. Paul Cartier
Maurice LaChance

The second quarterly meeting of the Asbestos Textile Institute was held jointly in New York City on June 4th and in Thetford Mines and Asbestos, P. Q., Canada from June 5th through June 7.

The meetings in New York on June 4th were devoted to committee discussions by the Air Hygiene, Sales Promotion and Technical Committee and the minutes of these several meetings are herewith attached.

On June 5, a group of fifteen members of the Institute journeyed to Thetford Mines by rail, being delayed some eight hours on arrival due to track washouts, however, the reception tendered by our Canadian members and friends effectively served to ease the tensions of many shattered nerves.

The group toured the asbestos mines and mills in the Thetford area on July 6, and everyone was greatly pleased and impressed to see the many advances the several mines in this area have made to provide an adequate supply of asbestos fibers of the desired quality.

During the evening of July 6, the group met for a dinner meeting at the Balmoral Hotel, Thetford Mines. The meeting was presided over by President Wakem who addressed the meeting briefly and expressed the appreciation of the touring members for the well planned program of activities arranged by the hosts. Mr. Wakem concluded his remarks with the observation that through such visitations and the sharing of ideas of mutual interest through the activities of the Institute the entire industry can and will advance and will be better able to serve the ever growing needs for asbestos textile products by the industrys of tomorrow.

Following the opening remarks by the President, the Chairman of the Technical Committee, Mr. H. W. Oliver; Chairman of the Sales Promotion Committee, Mr. J. T. Griffis; member of the Air Hygiene Committee, Mr. R. B. Smith; and the Fellow, Dr. M. C. Shaw briefly addressed the meeting, describing the activities of each of the groups and setting forth the plans for anticipated future activities.

The concluding portion of the meeting was devoted to brief addresses by members representing and mining industry who served as hosts for the tour. Among those who spoke were Mr. Geo. Smith, President Q.A.M.A., Mr. J. A. Marcotte and Mr. Carl Bindman.

The meeting adjourned in a spirit of mutual understanding and appreciation between the two segments of asbestos industry here represented.

On June 7, the group motored from Thetford Mines to Asbestos where the mining and milling operations of Canadian Johns-Manville Corp. are located. A tour of the new Jeffry Mill and underground mine revealed still further the great strides that have been made by the asbestos mining industry in their effort to provide adequate supplies of quality asbestos fibers for all consumers. At noon on this day luncheon was served to all members of the touring party by Johns-Manville Corp. and at the close of the luncheon Mr. Kelleher and several of his associates of Johns-Manville briefly discussed the various operations donducted at this plant.

Following the inspection tour at Asbestos the group left by car for Richmond, there to entrain for the return trip to the United States.

Myril C. Shaw,
Secretary
ASBESTOS TEXTILE INSTITUTE

Ambler, Pa.
May 29, 1956

Mr. J. G. Schoepf, Treasurer
Asbestos Textile Institute

Dear Mr. Schoepf:

In compliance with your request, examination was made of the books and records of the Asbestos Textile Institute under Dr. M. C. Shaw's supervision on Monday, May 28, 1956. The audit covers the period from March 3, 1956 to May 28, 1956 inclusive.

The Balance Sheet of the Asbestos Textile Institute at May 28, 1956 is set forth below:

ASSETS

Total Cash in Bank (Schedule A)	$ 26,695.01
Total Cash on Hand	57.28
Postage on Hand	.57
* Furniture & Equipment (nominal value)	1.00
	$ 26,753.86

LIABILITIES

Social Security & Withholding Taxes	$ 13.63
Net Worth	26,740.23
	$ 26,753.86

* Other Asset items not included in above classification are shown in Schedule B.

The latest statement received from the depository (Chase-Manhattan Bank of New York) in which all funds of the Institute are kept, shows a balance of $27,913.84 on April 27, 1956. The Petty Cash Fund totalling $100.00 includes $57.28 in cash and $42.72 in vouchers. This fund was verified by actual count.

Schedule A: Showing a reconciliation of the Bank Balance at May 28, 1956:

Bank Balance per Latest Statement, April 27, 1956 $ 27,913.84

Less: Checks Drawn Subsequent to

Check No.	Date	Payee	Amount	
1090	4/30/56	M. C. Shaw	$ 901.55	
1091	4/30/56	Pennsylvania Company	193.44	
1092	5/14/56	Petty Cash	88.86	
1093	5/17/56	Phila. Textile Institute	18.65	
1094	5/25/56	A. Pomerantz	16.33	1,218.83

BALANCE ON HAND IN BANK, MAY 28, 1956 26,695.01

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Checks numbered 1060 to 1072 inclusive, which were outstanding at the last audit were examined and found to be in order. Bank deposits during this period totalled $14,312.59 and were credited to General Fund.

A reimbursement transfer in the amount of $270.24 was made from the General Fund to the Petty Cash Fund.

Schedule B; Other Assets of Asbestos Textile Institute:

ITEM	QUANTITY	DESCRIPTION	DATE ACQUIRED	PURCHASE COST
(a)	7	Visual Aid Display Cases	January 1950	$ 3,414.32
(b)	1	Suter Tensile Tester	August 1947	726.00
(c)	1	Heat Aging Furnace	April 1951	849.98
(d)	1	Bausch & Lomb Triple Purpose Micro-Projector	May 1954	94.00
(e)	1	Brabender Moisture Tester	September 1954	765.00
(f)	1	Federal Thickness Gage	January 1947	50.50
(g)	1	Mapes Magnetic Analyser	April 1954	100.00
(h)	1	Scott Twist Tester	December 1947	126.50
(i)	1	Abradoflex	December 1947	500.00
(j)	Office Furniture & Equipment:			
	4	Steel Work Benches	September 1954	
	1	Steel Flat Top Desk	"	
	1	Steel Table	"	
	1	Swivel Chair	"	
	1	Straight Chair	"	
	1	4 Drawer Steel Legal File	"	
	2	Steel Storage Cabinets	"	
	5	Steel Book Case Units	"	
	1	Wall Costumer	"	
	1	Waste Basket	"	757.50
(k)	1	Temco Muffle-oven & Control	October 1954	161.00
(l)	1	Cenco Balance	October 1954	32.25
(m)	1	Electric Stopclock	October 1954	50.00
(n)	1	Abradoflex	January 1956	1,175.00
			TOTAL	$ 8,802.05

Yours very truly,

S. C. Gehman, Auditor

ASBESTOS TEXTILE INSTITUTE
Treasurer's Report
May 28, 1956

Balance in Various Funds - March 2, 1956:			
Fellowship Fund		$ 10,981.43	
General Fund		5,051.98	
Petty Cash Fund		90.33	$ 16,123.74
Receipts:			
Assessments:			
Fellowship Fund		$ 9,007.59	
General Fund		5,250.00	
Testing Charges (General Fund)		52.00	
Handbook Sales (General Fund)		3.00	$ 14,312.59
Transfers:			
To Petty Cash (From General Fund)		$ 270.24	$ 270.24
			$ 30,706.57
Disbursements:			
Fellowship Fund:			
Fellowship Salary	$ 1,700.77	$ 1,700.77	
General Fund:			
Secretary's Salary	$ 534.25		
Secretary's Travel	25.24		
Stenographic Expense	79.00		
Meeting Expense	398.83		
Legal Expense	501.98		
Auditing Expense	3.00		
Visual Aid Expense	55.36		
Petty Cash Transfer	270.24		
Misc. Office Expense	82.32	$ 1,950.22	
Petty Cash Fund:			
Laboratory Assistance	$ 241.50		
Laboratory Supplies	7.87		
Misc. Office Expense	53.92	$ 303.29	$ 3,954.28
Balance on Hand - May 28, 1956:			$ 26,752.29

Balance in Various Funds - May 28, 1956

Fellowship Fund	$ 18,288.25	
General Fund	8,406.76	
Petty Cash	57.28	$ 26,752.29

Respectfully submitted,

J. G. Schoepf, Treasurer

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MINUTES OF THE ASBESTOS TEXTILE INSTITUTE

AIR HYGIENE COMMITTEE MEETING

June 4, 1956

IN ATTENDANCE WERE:

D. R. Holmes
Ralph Smith, General Asbestos
Dr. Kenneth Smith, Johns-Manville
Mr. George Griswold, Southern Asbestos

MORNING SESSION

#1

The first item on the agenda was the discussion of Asbestosis and Cancer in relation to the Taylor case at Lancaster, Pa., in which a state referee decided the case in favor of the employee on the basis of finding an Asbestosis-Cancer relationship. This decision was made by the referee on the basis of writings by Dr. Hueper of the National Institute of Health, Bethesda, Maryland.

It is Dr. Kenneth Smith's opinion that most medical men consider that a normal X-Ray pattern must be shown in order to establish an Asbestosis-Cancer relationship.

Prior to this meeting a memorandum was received from Industrial Hygiene Foundation entitled PROPOSED EPIDEMIOLOGICAL STUDY OF LUNG CANCER IN ASBESTOS WORKERS FOR THE ASBESTOS TEXTILE INSTITUTE.

There are two questions raised in reference to this memorandum -

1. Whether there is a relation between Cancer and Asbestosis, and

2. Whether a relationship exists between Lung Cancer and considerable exposure to asbestos fibres and dust.

There are about 2,000 workers in this industry whose employment records could be a basis for such a survey. During the weeks of April 23rd and May 7th, visits were made to seven plants of the Asbestos Textile Institute. Conferences were held with representatives of management from each plant. The purpose of this visit was to determine the extent of availability of medical records and employment records in a period of time covered by them. Each plant was questioned regarding the number of known cases of Asbestosis and Lung Cancer, if any.

The I.H.F. advises that there are at least 1,800 asbestos textile workers employed under observable conditions for periods sufficiently long to get a total of no less than 15,000 person-years. They also advise that this should be an adequate basis on which to predict with 90% accuracy, providing the plant incidence is actually higher than that in the general population.

It is anticipated that the field work for such a study would consume approximately six months. An analysis of the data and any necessary review in preparation of the report an additional six months. On this basis, cost of the study is estimated at $17,500.00 including travel and out-of-pocket expenses. The cost of the initial fact finding survey was $864.00. This was slightly less than the $1,000.00 estimated. It was the desire of the committee that a copy of this memorandum from the I.H.F. be sent to each member of the Air Hygiene Committee along with a letter urging that each member of the committee impress the importance of this program to the Officers of his Company. This has already been done.

I had a long discussion with Dr. Kenneth Smith in reference to this program covering the relationship of Asbestosis to Cancer. It is his opinion that it is of primary importance that this program be adopted as soon as possible, so that the I.H.F. could publish the results of this survey along with the results from a survey undertaken by them for the Quebec mining association.

On May 11, 1956, a letter was received by the Chairman from a Dr. Kenneth M. Lynch, President, of the Medical College of South Carolina. Dr. Lynch is doing some work in relation to the effect of Asbestos dust on laboratory animals exposed for prolonged periods in dusting chambers. He is primarily interested in enlisting the aid of the Asbestos Industry in this effort, which for the past eight years has been and is presently being supported by the National Cancer Institute of the U. S. Public Health Service. This letter was discussed at the meeting with Dr. Kenneth Smith, who has worked along with Dr. Lynch for many years.

Dr. Lynch is also doing work for another member of the Institute and has been doing so for some time. Dr. Lynch is performing this work in an effort to clarify the relation of Asbestosis and Cancer of the Lung.

It was the opinion of the committee that the Chairman should write Dr. Lynch and thank him for his interest in Industry and its problems, however, advising him that we have other programs being instigated at this time and cannot, therefore, enter into any programs for the support of his work.

#2

We had a discussion on the Spencer Stock Conditioner. We all agreed that this type of conditioner is probably the best on the market and that it was to operate on small percentages of oil - less than 1½%, providing the humidity is under control, as Stock will ordinarily not run with more than 50% relative humidity.

John Weber now has a heavy type bag loader in operation and is very well satisfied with it. It is practically dust free.

The next discussion was in reference to the amount of dust in asbestos fibres received from the mines. However, at a later date we should receive some figures on these dust percentages and at that time we hope to take the subject up with the mines.

We next talked on the Wheelobrater Dust Collection system. Ralph Smith and George Griswold related their experiences in the installation and operation of this type unit. As we have said before, the Industry now has several Wheelobrater collectors in operation and to our knowledge all are operating in a satisfactory manner. This type of unit is comparatively maintenance free.

Our next discussion concerned compensation as it is handled in several states. This discussion was informative to each one of us as it gives an opportunity to compare one state system against the other.

AGENDA FOR THE NEXT MEETING

#1 - Continuing the discussion of the memorandum from the I.H.F. on Asbestosis and Cancer.

2 - Continuing the discussion of spraying fibres with oil with a view toward the elimination of dust at the source.

3 - Report on general improvements and elimination of dust by whatever means.

D. R. Holmes, Chairman
Air Hygiene Committee
Asbestos Textile Institute

150 years at the present rate of consumption. The total industry payroll accounts for some 6,000 employees earning about $25,000,000 a year.

"As a result of the visit, members of the Asbestos Textile Institute felt assured that there were ample reserves of asbestos fibre to meet not only their needs but the needs of other asbestos consuming industries.

"Some of the prime users of asbestos textile products include all branches of the Armed Services, the shipbuilding, automotive, aircraft, electrical reinforced plastics and many other industries."

Following the meeting on June 4th in New York City and at the mines during that week, your committee got together again in Philadelphia, at the Warwick Hotel, on June 18th, with Mr. Beck and Mr. Taylor, of the Art Guild of Philadelphia, who are preparing the display for us, and it was at that time that we went over all of the material, samples, etc., that we had collected, in an effort to come up with final plans for this display. All previous plans had been outlines, or sketches, to give us an idea of what we were trying to arrive at.

Your Chairman is particularly grateful to each of the members of the committee for the prompt and sincere cooperation and efforts in gathering the necessary data, samples, etc., to make this an exceptionally outstanding display.

Out plans are to meet again with Mr. Beck and Mr. Taylor, of the Art Guild of Philadelphia, on July 9th to have a look at their latest outlay of the plans, and we are hopeful that the display can be completed in time to have it available for members to see at our next meeting.

Respectfully submitted,

J. T. Griffis, Chairman

The Technical Committee held its Second Quarter Meeting on June 4th, at the Hotel New Yorker, New York, New York. There were four member companies represented with six members present.

IN ATTENDANCE:

Raybestos-Manhattan, Inc.
H. W. Oliver, Chairman
M. S. Maier

Keasbey & Mattison Company
R. L. Lanz

Philadelphia Textile Institute
M. C. Shaw

Johns-Manville Corporation
J. L. Tucker
Ed Beale

Southern Asbestos Company
J. D. McCluer

Since all members had received a copy of the minutes of the previous meeting, it was moved by Mr. Tucker and seconded by Dr. Maier that the reading of the minutes be dispensed with at this time.

It was recommended by the chairman that the Technical Committee send a proposal to the Board of Governors stating that the Asbestos Textile Institute award a plaque or scroll to Mr. C. R. Frederick, of Keasbey & Mattison Company, in recognition of his many years of service and contributions to the Institute. It was moved by Mr. J. L. Tucker, seconded by Mr. McCluer, and unanimously approved by all members present this action be taken. It was further recommended in the proposal that President Walken extend an invitation to Mr. C. R. Frederick to attend our next meeting so that the presentation could be made to him at the General Meeting. This would be done if Dr. Shaw could get the scroll in time for our next quarterly meeting in September.

Mr. R. L. Lanz rendered the report of the Sub-Committee on Asbestos Tapes. There was no change in the status of the specification on industrial tapes. This is complete with the exception of after heating tensiles. There will be no action on this until a standard method for testing after heat tensiles of cloth and tapes can be adopted. The action taken to date on industrial tapes is covered in Table I, attached.

During the past quarter, Mr. Lanz submitted a form to each member company to fill out on electrical tapes for the following gauges: .010", .015", .020", .025", and .030". The data submitted on these forms was discussed in detail, however, several large variations were found in total number of ends on the various widths. This was no doubt due to the different style yarns used by the individual companies. As a result of this, it was agreed that we would attempt to standardize on the 1" width of each thickness tape and continue our work from that point. Mr. Lanz will send out forms requesting constructions and yarns to be used in manufacture of 1" tape. He will then use a formula presented by the chairman and compute a nominal ft/lb., showing permissable range of yarns that may be used with reported constructions (total ends and picks/inch). We will then be able to re-evaluate our individual constructions and yarns to see if any change must be made to stay within tolerances. It was tentatively agreed that on 1" tapes the standard total number of ends and picks/inch would be as follows:

THICKNESS, INCHES:

	.010"	.015"	.020"	.025"	.030"
No. Ends 1" Width	31	33	28	32	33
Picks/inch, All Widths	17	15	13	12	11

FORMULA MENTIONED ABOVE IS AS FOLLOWS:

$$\frac{(1.10 \div 3) \times \text{Total Number Ends}}{\text{yds/lb. (Warp Yarn)}} = \text{Wt/100'} \quad \text{Warp}$$

$$\frac{(1.10 \div 3) \times \text{Picks/inch} \times \text{Width}}{\text{yds/lb. (Filling Yarn)}} = \frac{\text{Wt/100'}}{\text{Wt/100'}} \quad \begin{matrix}\text{Filling} \\ \text{Tape}\end{matrix}$$

The above formula is for non-metallic tape, no binders. In the case of binder warp, it is figured separate from ground warp and approximately 60% contraction factor is used on binder warp instead of 10% as is used on ground warp. This formula is to be used only as a guide and is not guaranteed to be 100% accurate.

Brief discussion took place on tolerances in regards to total number of ends, picks/inch, gauge, etc. Since there were different values reported, there will be another discussion on this prior to writing them into A.S.T.M. specification to be recommended at a later date. This concluded the report of the Sub-Committee on Asbestos Tapes, both Industrial and Electrical.

Since there was no activity in the Sub-Committee on Braided Tubing during the last quarter, there was nothing to report, however, a brief discussion took place on the type of gauge to be used in measuring thickness. Mr. Tucker suggested the Cady gauge and it was requested that he send to each member company a detailed description of this gauge and where it could be purchased. It was agreed that even though we may not agree on a specific instrument, that we should set a standard as to the size of the anvil and the amount of weight to be applied. If we can standardize on this, then the Cady gauge, or its equivalent, could be written into the specification on methods of testing braided asbestos tubing. This subject will be on our agenda for the next meeting for further discussion.

Mr. Cutler, Chairman of the Sub-Committee on Asbestos Cloth, was not present. There was no activity within the committee on this subject during the last quarter as we were awaiting results from Dr. Shaw on dynamic testing of asbestos cloths. Our aim in regards to cloth is to standardize on a heat aging method for testing asbestos cloths. We are not in position to make a recommendation at this time due to further work to be conducted by Dr. Shaw. There was a joint meeting with the Sales Promotion Committee in the afternoon at which time Dr. Shaw discussed this subject as a part of his Fellowship Report #37. In the place of dynamic testing, it is now termed "The Elevated Temperature Serviceability of Asbestos Textiles under Constant Stress". Dr. Shaw feels there is additional work to be done whereby cloths may be tested around 2,000°F. for short periods. He is to write and request necessary samples from each member company so that tests can be made on current cloths. This subject is covered in detail in Dr. Shaw's Fellowship Report, therefore, nothing further will be reported here, however, each member company is to carefully digest the data reported by Dr. Shaw in the Fellowship Report as pertains to this subject and will send to him their comments and recommendations. Dr. Shaw presented pictures of testing equipment used so that everyone would have a much better idea of his undertakings in continuing his work on soaking heat studies and shock tests at higher temperatures. A new oven must be constructed in order to reach the high temperatures for shock testing. This will be worked on during the third quarter.

The next topic on the agenda was that of U. S. Government Specifications. In accordance with the request of the Technical Committee at the March meeting, Dr. Shaw contacted the Detroit Arsenal to find out what had happened to our proposed revision of Mil-C-10316, made in 1954. Mr. G. O. Newcomb, Ordnance Tank-Automotive Command, replied on 12 April 1956, as follows:

"Gentlemen:

Since the proposed revision to Specification Mil-C-10316 elicited considerable comment when coordinated with other agencies in the Department of Defense, it was never issued.

These comments are presently being incorporated into a further revised draft which, it is hoped, will be issued without further delay. Six (6) copies of this revised draft will be forwarded to your organization when it is submitted to Washington for issue."

(Signed) G. O. Newcomb
Assistant"

During the past quarter, each member company was to study Mil-I-3053A, dated August 3, 1951, covering Insulation, Electrical, Asbestos Fiber, Treated and Untreated. Special emphasis was to be given to that part dealing with Di-Electric strength. In checking our records it was found that a proposed revision was submitted in 1954. This proposed revision included a deletion of those parts pertaining to Di-Electric strength. Dr. Shaw has been instructed to write appropriate Government agency to determine the status of the proposed revision. Dr. Shaw will also state that we do not approve of Par. 4.5.4.2 on Magnetic Iron Content when required. Since we are not prepared to make a concrete recommendation at the present time, action will be withheld until further consideration is given this subject. Report to be made at next meeting of our committee. This concluded action on U. S. Government Specifications.

It was moved by Mr. J. D. McCluer and seconded by J. L. Tucker, that Dr. Shaw's project list be expanded to include better ways of determining dust in asbestos fiber, better methods of evaluating asbestos fiber, also, use of mild acid to remove impurities prior to making Water of Crystallization determination on asbestos fiber. Since expensive equipment would be required to carry on some of the above activities, it was recommended that the above be presented to the Board of Governors for appropriate action.

It was recommended by Mr. J. L. Tucker that Dr. Shaw's project list be further expanded to include "Development of Metal Detector", for use on asbestos yarns, rovings, etc. Since Raybestos-Manhattan's representative was opposed to such a project for the Secretary, and, stated they would not participate in this project, it will be presented to the Board of Governors for proper disposition.

There being no further business, it was moved by Dr. Maier and seconded by Mr. Tucker that we adjourn.

082247 Respectfully submitted,
M. W. Oliver, Chairman

September 7, 1955

TABLE I

ATI Standard Industrial Asbestos Tapes (No Wire Inserted). For Ft/Lb. on sizes 1/32", 1/16", 1/8", 3/16" and 1/4" Tapes, see Asbestos Textile Institute Handbook of Asbestos Textiles, Page #52.

Tolerances: Ft/Lb. - All sizes ± 10%
Width: For 1/32 and 1/16 Thicknesses
1" and under ± 1/32"
Over 1" ± 1/16"
For 1/8", 3/16" and 1/4" Thicknesses.
All widths ± 1/16"
Thickness: 1/32" ± .003"
1/16" ± .005"
1/8", 3/16" and 1/4" + .010", - .005"

Method of Sampling - According to following Table:

No. Rolls Tape in Lot	No. Rolls to be samples
8 and under	2
9 to 15	3
16 to 40	4
41 to 65	5
66 and over	6

Methods of Testing:

Weighing: Smooth by hand on a flat surface, cut 36" linear inches, weigh and calculate to Ft/Lb. (For referee method only, condition tape to Standard conditions of 70°F and 50% Rel. Hum. prior to weighing).

Width: Use Standard steel scale and while tape is flat, smooth and without tension, measure in five different places and average.

Thickness: Use dead weight micrometer with foot not less than 3/8" diameter. Make 10 measurements and average.

Tensile: On tape 1" wide and less, take the full width tensile using jaws more than 1" wide and record the tensile as Lbs/Full width. On tape over 1" wide, use the Grab Method employing jaws 1" wide and record the tensile as Lbs/1" width. Tensiles are to be taken on specimen "As Received" and also "After Heated at 300°C - 30 minutes". Heated samples should be atmosphere conditioned 30 minutes prior to breaking.

Table I (Continued)

CONSTRUCTIONS:

Sizes	Warp	Fill	Warp Ends per inch (Includes Binder Ends)	Total Picks per Inch	Tolerances Warp Ends per Inch	Picks per Inch	Tensile Strength Before Heating Lbs/1" Width Comm.	Und.
1/32"	1010	1410	28	11	± 2 per 1" of width	± 1	80	85
1/16"	1030	1020	18	8	± 2 per 1" of width	± 1	150	170
1/8"	1030	1020	34	12	± 2 per 1" of width	± 2	250	275
3/16"	1040	1040	33	12	± 2 per 1" of width	± 2	350	375
1/4"	1040	1040	45	18	± 2 per 1" of width	± 3	None Reported	

ASTM Designation of Grades

Grade	Asbestos Content
Commercial Grade	75% to 80% Excl.
Underwriters Grade	80% to 85% "
Grade A	85% to 90% "
Grade AA	90% to 95% "
Grade AAA	95% to 99% "
Grade AAAA	95% to 100% "

08224

FELLOWSHIP REPORT

MYRIL C. SHAW

RESEARCH FELLOW

ASBESTOS TEXTILE INSTITUTE

PHILADELPHIA TEXTILE INSTITUTE

PHILADELPHIA, PA.

REPORT #37

June 4, 1956

THE ELEVATED TEMPERATURE SERVICEABILITY
OF
ASBESTOS TEXTILES UNDER CONSTANT STRESS

Introduction

Asbestos textiles are frequently placed in service under the combined conditions of elevated temperature and load or stress. The ability of these materials to resist destruction as a result of a constant or intermittant application of a load or stress may often serve as the prime factor in determining its suitability for a given service. Curtains, draperies and temporary or movable partitions wherein the materials are supported at the top and permitted to hang more or less free from that support, are examples of such services. Under these conditions the stress may be the result of the weight of the cloth itself or may consist of a combination of the cloth weight plus a roller or other super structure which may be attached to the bottom of such a curtain. Tapes and cloths used as lagging materials may be tightly wrapped or applied over a pipe or cable and with an increase in temperature the expansion of the pipe or cable may be greater than that of the tape or cloth, putting a stress on the lagging material. There are innumerable other applications in which, at some stage in the performance of a service, asbestos textiles are called upon to resist destruction due to stress while serving as a non-combustible protection medium.

The industry has for many years accepted an arbitrary range of temperature limits of serviceability for the various grades of asbestos textiles available, as follows:

Commercial Grade	— Up to 400°F
Underwriters Grade	— " " 450°F
Grade A	— " " 550°F
Grade AA	— " " 600°F
Grade AAA	— " " 750°F
Grade AAAA	— " " 900°F

This system of grading is based solely upon asbestos content and does not take into account such important factors as cloth construction and design or stress bearing characteristics.

Yarn construction and cloth constructions are very closely related and the grades of fiber or the lengths of asbestos fibers used will exert some influence upon the resultant elevated temperature serviceability characteristics. For example, a 36P10 cloth may contain fibers which are predominately of 3R quality, however, when a cloth bearing the construction of 17P24 is required the asbestos fiber quality may need some improvement in grade and fiber length if the requisite 24 cut yarns are to be produced for incorporation in this latter cloth. Such improvements in fiber quality usually reflect improvements in several properties including elevated temperature serviceability.

In an effort to determine the relative elevated temperature characteristics of a group of asbestos textiles designed to meet specific applications, some consumers have directed attention to so-called heat-aging tests as a means of evaluation. In such tests the textiles are subjected to a predetermined heat treatment, some at 200°F, others at 572°F and some at higher temperatures for periods of time ranging from 30 minutes to several hours and following such treatments are tested to determine the loss in tensile strength resulting from the heat treatments. Such heat aging tests do serve a useful purpose in that the results usually reflect to some degree the fiber quality which was used in the cloth construction and on the basis of comparative tests a consumer may be able to establish which of several cloths so tested exhibit the characteristics which will best serve the intended application. However, it is doubtful that the results of such tests provide simulative service data of universal significance since the time cycle of test is much shorter than most service applications. Further, the stress is applied after the sample has been permitted to cool to room temperature following the heat treatment while in service the stress would undoubtedly be active during the heating up period as well as the cooling period. The selection of arbitrary temperatures and periods of duration for these tests limits the data resulting therefrom to specific areas of serviceability which in most cases will not serve to define either the maximum or minimum parameters of serviceability.

In an effort to overcome some of the indicated short comings of heat aging tests as they are currently conducted it was felt that a study wherein asbestos textiles subjected to live loads continuously at elevated temperatures might provide data that could be interpreted in terms that would serve to define the ranges of elevated temperature serviceability as a function of the tensile strength properties at these temperatures. The work covered in this report represents the initial undertaking in this investigation and, although the data covers only a relatively few cloths and tapes and cannot therefore be considered with any degree of finality, it does provide some interesting relationships which serve to indicate the trends that may be expected in the more extensive study being pursued.

Testing Equipment

The equipment used in this investigation was designed and built specifically for this study. The main unit of the equipment set-up is the electric furnace wherein the samples under test are subjected to elevated temperatures. The furnace has over-all outside dimensions, 24" long by 14" wide by 10" deep and inside dimensions, 15" long x 5" wide x 5" deep. The heating elements, consisting of two coils of nichrome wire, each rated at 1000 watts at 110V and each being capable of separate control, are embedded in the two side walls of the furnace. The furnace is constructed with a one-inch wide slit running length-wise along the center of both the top and bottom sections of the furnace so that the samples of cloth under test may be supported above and outside of the furnace, passed through the furnace and extend six inches below the bottom of the furnace, at which point loads may be attached to bottom of the sample.

The furnace was constructed on wheels so that it could be moved along a track-way. The purpose of the movable feature was to provide the possibility of carrying out shock tests wherein the furnace might be first heated to a given temperature without test samples and upon the attainment of that temperature be moved in place over the test specimens, under a given load. In this manner heat shock or instantaneous heating tests are to be conducted.

The auxiliary equipment necessary for the operation of the furnace consists of a Powerstat Variable Transformer for controlling the power input, a voltmeter to indicate the voltage input and a potentiometer equipped with a chromel-alumel thermocouple for measuring the temperature attainments.

The furnace was originally designed to operate at a maximum temperature of 1500°F, however, in actual usage the practical limit of operation was found to be 1415°F. The heating schedule is set forth in Plate I.

Test Procedure

The procedure followed in carrying out the tests in this investigation represents a departure from that pursued in most heat aging tests currently in use. Tensile strength characteristics serve in both instances as the factors of significance, however, in the normal heat aging tests grab test specimens are studied while in the work here undertaken 1" ravel-strip samples 21" long are used. The samples must be 21" in length in order that they may extend through the test furnace being supported above the furnace and extending below the furnace sufficiently to accommodate the desired loads. The segment of each specimen that is actually subjected to the heat treatment is approximately 7 inches.

The test samples are first prepared by cutting representative specimens 21" long by 1-1/2" wide, and then ravelled to a 1" width. The tensile strength of the ravelled sample is then determined using the prescribed technique for strip tests, with 2" jaws both front and back, top and bottom, on the tensile tester, with the top and bottom jaws 3" apart. The tensile strength so determined serves as the basis for stress application and is noted as the "Tensile Strength, As Received".

The load or stress to which each of the samples is subjected is based upon the "As Received" tensile strength in increments of 10%, 20%, 30% and 50% of the original strength.

In carrying out a given test, two specimens are mounted in the furnace at one time and are loaded with respective weights, determined as above noted. The furnace is then engaged and the temperature permitted to rise according to the schedule set forth on Plate I until the samples have broken as a result of the combined high temperature and load, the temperature at the time of rupture being noted.

Presentation of Results

The results of the tests conducted thus far in the investigation are tabulated in Table I and are also set forth in Plates II, III and IV.

Table I presents the specific data relating sample number, style, tensile strength, as received and, in the last four columns, the temperatures and loads at failure. In explanation of the presentation of the data in the last four columns, refer to sample T-1 and it will be observed that in the column designated 10% load the figures are presented as 920/21 which indicates that at 21 pounds load, which is 10% of the as received tensile strength for that particular sample, the tape failed at 920°F. Likewise under 20% load or 42 pounds, failure was induced at 515°F. The figure preceeding the hash mark denotes temperature of failure and the figure following the hash mark denotes applied load.

TABLE I

Sample Number	Style	Tensile Strength 1" Ravel Strip As Received (Except Tapes)	Failure Temperature °F Pounds Stress/ 1" Ravel Strip Percent Load/As Received 10	20	30	50
Commercial						
T-1	Tape 1"x.0638	209.16	920/21	515/42	440/63	375/105
T-5	1x.0675	128.00	915/13	615/26	490/39	390/64
T-22	1x.0633	113.66	705/11.3	565/22.7	495/34.0	440/57.0
T-24	1x.1404	287.00	1060/28.7	725/57.4	570/86.1	500/143.5
199	40P10	102.00	1040/10.2	515/21.4	425/31.6	400/51.0
Underwriters						
T-3	Tape 1"x.1415	261	970/26	685/52	585/78	490/130
T-7	1x.0728	198	1145/20	975/40	675/60	440/99
T-9	1x.0824	178	680/18	605/36	555/54	410/89
T-11	1x.0321	100	1065/10	915/20	470/30	415/50
T-13	1x.090	209	1175/21	990/42	895/63	455/104
T-15	1x.1688	317		1045/64	935/95	585/158
T-30	1x.0633	99.2	1440/9.9	985/19.8	575/29.7	450/49.6
243	17P24	60.0	1110/6.0	950/12.0	865/18.0	645/30
271	17P26	55.33	1090/5.5	920/11.0	600/16.6	410/27.6
250	24P10	50	975/5.0	780/10.0	475/15.0	420/25
S-1	26P14	68.0	1090/6.8	645/13.6	615/20.4	395/34.0
244	"	55.0	1030/5.5	615/11.0	450/16.5	390/27.5
269	"	79.66	1085/7.9	985/15.8	655/23.8	515/39.8
259	36P10	99.00	1080/9.9	905/19.8	500/29.7	390/49.5
263	40P10	109.0	1145/10.9	980/21.8	500/32.7	435/54.5
240	"	104.0	975/10.4	625/20.8	580/31.2	385/52.0
278	"	88.33	1190/8.8	950/17.6	650/26.4	510/44.16
251	"	91.33	1205/9.1	970/18.2	565/27.3	485/45.6
Grade A						
203	36P10	90.0	1185/9.0	990/18.0	600/27.0	485/45.0
260	"	79.66	1135/8.0	975/16.0	915/24.0	440/40.0
Grade AA						
246	36P10	68.0	1410NF/6.8	1070/13.6	1030/20.4	900/34
S-2	"	96.7	1410NF/9.7	1195/19.5	1025/29.2	860/48.3
275	"	84.66	1410NF/8.4	1135/16.9	1035/25.3	930/42.3
274	29P14	80.0	1410NF/8.0	1115/16	1005/24	855/40
192	40P10	82.0	1410NF/8.2	1045/16.4	1025/24.6	900/41.0

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Sample Number	Style	Tensile Strength 1" Ravel Strip As Received (Except Tapes)	Failure Temperature °F Pounds Stress/1" Ravel Strip Percent Load/As Received 10	20	30	50
Grade AAA						
247	36P10	110.5	1410NF/11.0	1120/22.1	1055/33.15	985/55.2
257	"	73.0	1410NF/7.3	1050/14.6	975/21.9	855/36.5
272	22P16	87.0	1410NF/8.7	1410/17.4	1025/26.10	970/43.5
248	"	81.3	1410NF/8.1	1180/16.2	1095/24.3	965/40.6
280	48T12	138.33	1410NF/13.8	1410NF/27.6	1365/41.7	1085/69.1
X	48P10	195.0	1410NF/19.5	1380/39.0	1045/58.5	995/97.5

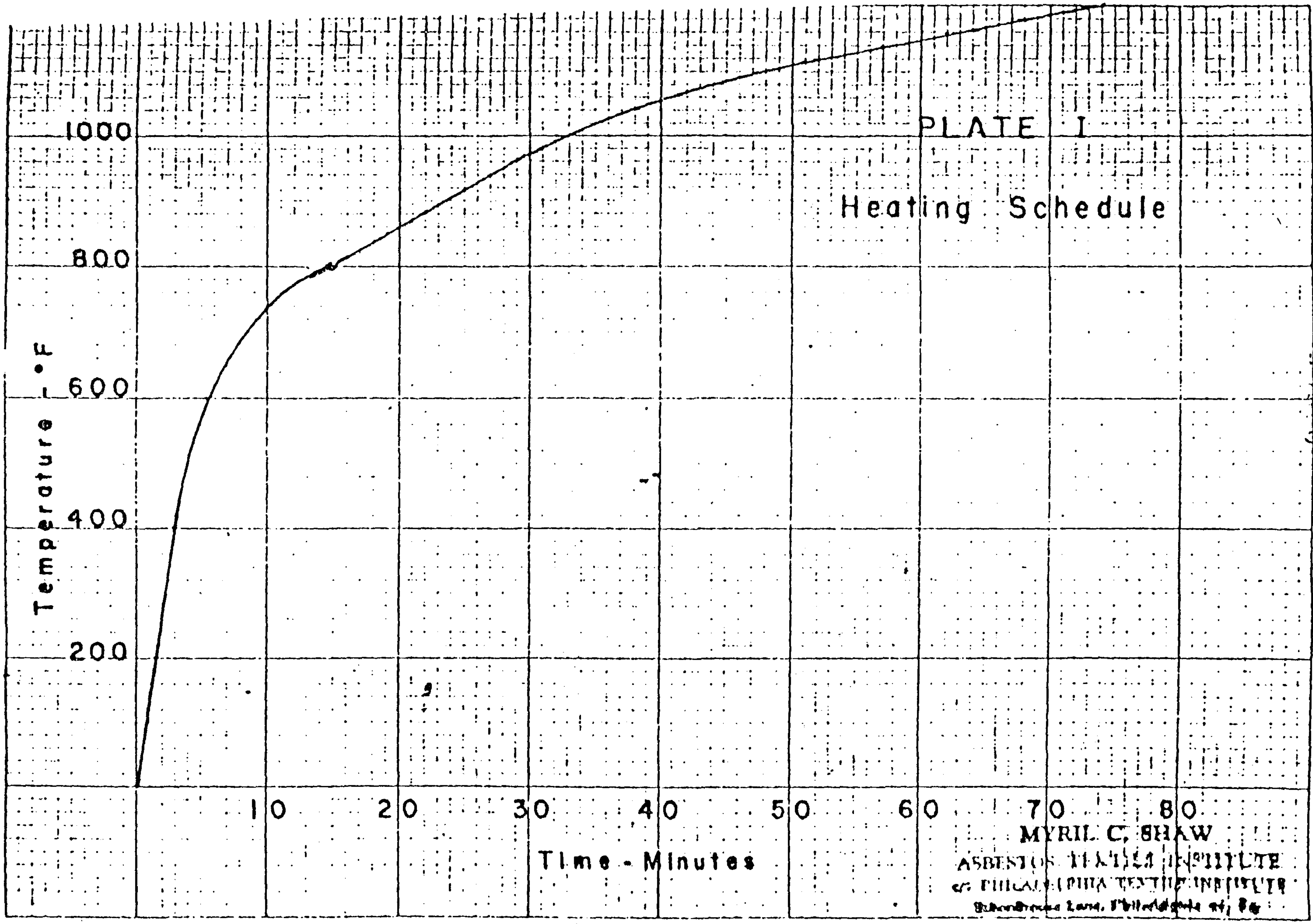
PLATE I
Heating Schedule
Temperature - °F
1000
800
600
400
200
10
20
30
40
50
60
70
80
Time - Minutes
MYRIL C. SHAW
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c/o PHILADELPHIA TEXTILE INSTITUTE
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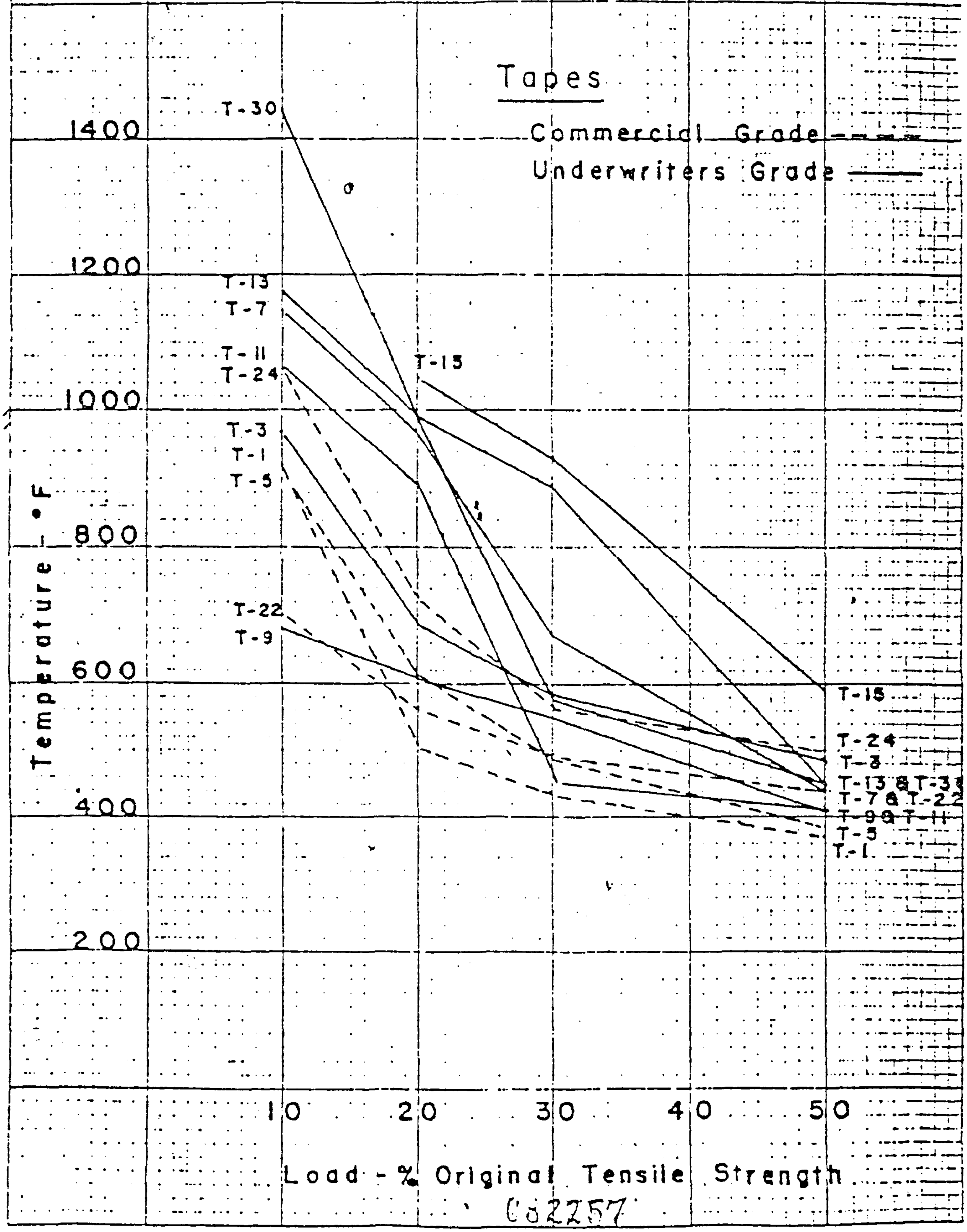
PLATE II



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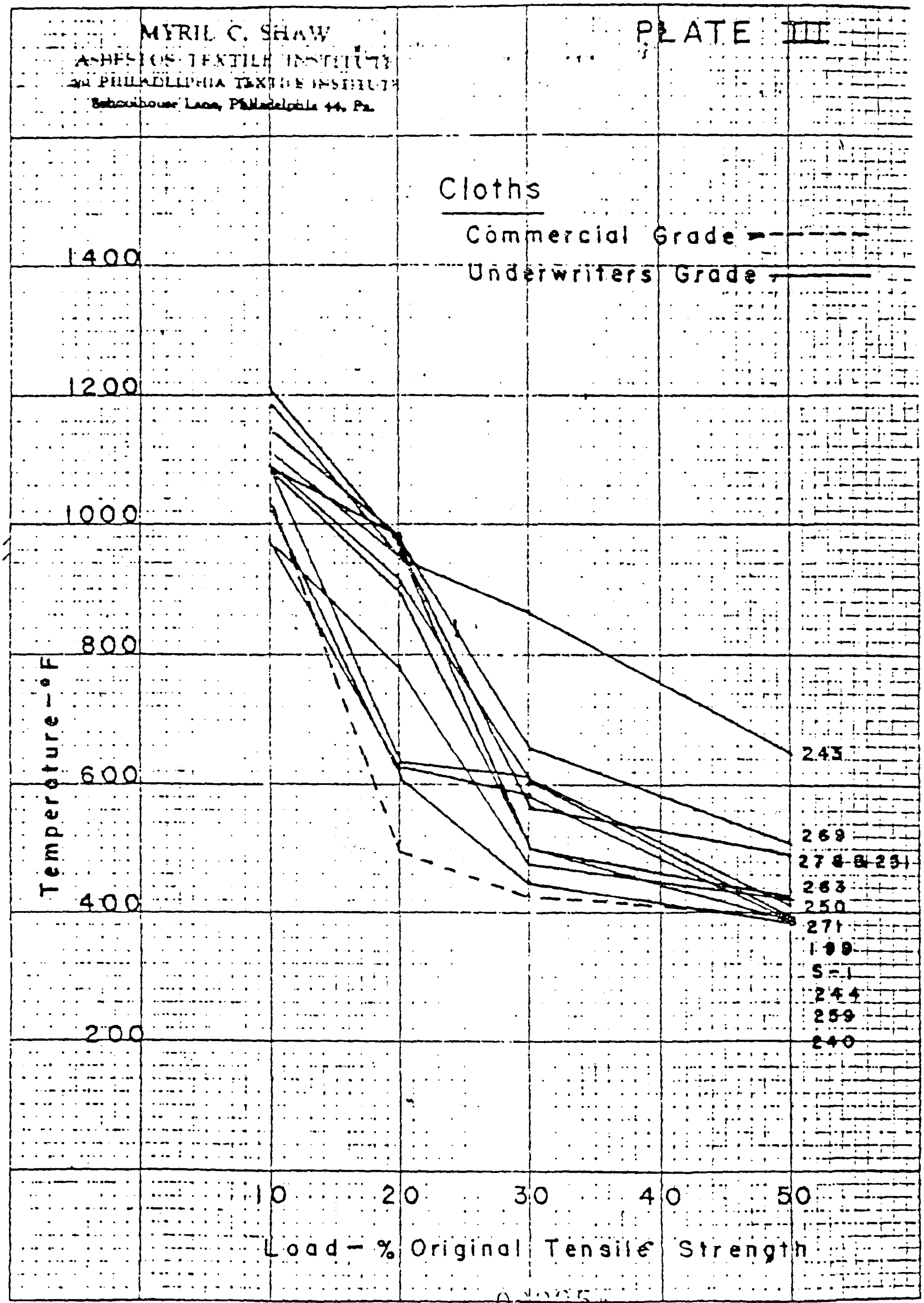

MYRIL C. SHAW
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PHILADELPHIA TEXTILE INSTITUTE
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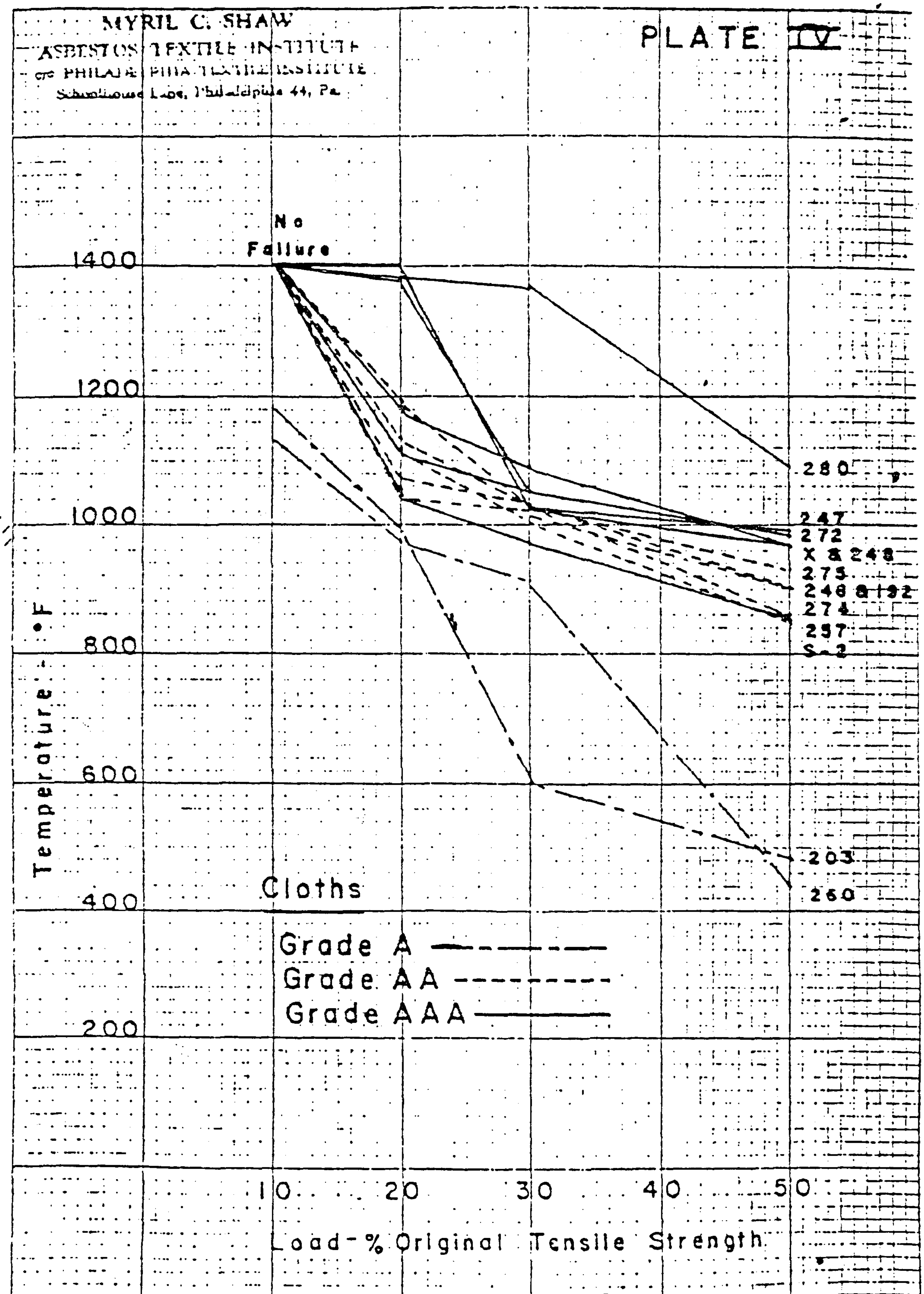
PLATE III
Cloths
Commercial Grade
Underwriters Grade
1400
1200
1000
800
600
400
200
Temperature — °F
10
20
30
40
50
Load — % Original Tensile Strength
243
269
278 & 251
263
250
271
199
S-1
244
259
240

082256



MYRIL C. SHAW
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PLATE IV
No Failure
1400
1200
1000
800
600
400
200
Temperature °F
280
247
272
X & 248
275
246 & 192
274
257
S-2
203
260
Cloths
Grade A
Grade AA
Grade AAA
10
20
30
40
50
Load - % Original Tensile Strength

In many of the higher grade cloths such as sample #246 under Grade AA it will be observed that the 10% figure reads 1410NF/6.8 which indicates that under 6.8 pounds load no failure (NF) was induced at 1410, the limit of the temperature rise.

In this investigation eleven 1" tapes were studied, four in Commercial grade and seven in Underwriters Grade, each tape being identified by the letter T placed before the sample number. The remainder of the samples here studied were cloths in the variety of styles as shown.

The graphic presentation as given in Plates II, III and IV serves to illustrate the similarity in performance of most cloths having like styles and grades.

Analysis of Results

The results of this investigation offer some rather significant points of interest regarding the ability of certain asbestos textiles to resist destruction by stress at temperatures considerably above those normally accepted as the upper limits for elevated temperature serviceability.

Before endeavoring to analyse the specific data as presented, it may be well to consider the magnitude of some of the values to be dealt with in this work. In the first place, the loading schedules established for each of the cloths and tapes here studied have been based upon the original or as received tensile strengths as determined upon samples tested in accordance with the accepted standard practice of having 3" between the jaws of the tensile tester. Under this particular test, however, the samples are subjected to tensile stress over a 19" span between the jaws. Experience gained during this work shows that the tensile strength as obtained over the longer span will be somewhat less than that obtained for the 3" span. A thorough investigation of this condition is to be undertaken, however, to date, nothing of a specific character can be given. It has been found that in some cases the tensile strengths over the longer span may be as much as 10% less than that obtained for the shorter span. It must be realized therefore that when reference is made to the 10% load or other increments as noted, the load in pounds as set forth is, in all probability, actually somewhat greater than the percentage indicated, based upon the 19" span which is used.

In an effort to correlate the applied loads with some characteristic of the materials here tested in order that a basis for comparison may be more apparent, the various loads as related to the unit weight of the cloths have been tabulated and are set forth in Table II. Here it will be seen, for example, that the application of a load of 10# to a 17 ounce per square yard cloth, is equivalent to 340 times the weight of the sample. In other words, developing this data further, a load of 10# per inch applied to a sample of 17P24 cloth would be the equivalent of 360 pounds for a sample of the cloth a yard wide or 340 times the weight of a yard of such a cloth. Likewise, a 22 ounce cloth . . loaded at 50# is the equivalent to 1310 times the weight of the cloth or 1800 pounds per yard wide sample. Also, a 36 ounce cloth (36P10) loaded at 50# is an equivalent of 800 times the cloth weight or 1800 pounds for a sample one yard wide.

The full range of equivalents for loads versus cloth weights are set forth in Table II and the relationships noted serve to indicate to some degree the magnitude of the stress values with which we are here concerned.

Table II

Weight Equivalents in Terms of Cloth Weights

Load Equivalents per Cloth Weight

Loading Weight, Ounces	# 10	# 20	# 30	# 50
17	340	780	1120	
22	262	524	786	1310
24	240	480	720	
26	222	444	666	
36	160	320	480	800
40	144	288	432	720

The test data as presented in Plates II, III and IV provide an opportunity to gain a comparative impression of the characteristics of materials of like grades under the conditions of these tests. Plate II for example, covers the performance data for 1" tapes in Commercial and Underwriters Grades in a variety of thicknesses. It will be seen that, in most cases, the Commercial Grade tapes exhibit somewhat inferior properties compared with the Underwriters Grade over the range studied. Under the maximum stress of 50% of the original strength, the entire range of temperatures of failure is from 375°F to 500°F for the Commercial Grades and from 410°F to 585°F for the Underwriters Grade. Tape T-1 which is in Commercial grade loaded at 105# failed at 375°F while T-24, the heaviest of the tapes in this grade, loaded at 143.5# failed at 500°F. This latter load, incidently, is the equivalent of 1025 pounds per square inch. The Underwriters tapes, under the maximum loading, ranged from 410°F loaded at 89 pounds to 585°F loaded at 158#, the latter tape being the heaviest of the tapes in this grade. It is significant to note that under the minimum loading or stress which will be referred to hereafter as a "perceptable stress" the range of temperature over which failure was induced extended from 705°F to 1060°F for Commercial grades and from 680°F to 1440°F for Underwriters grade. On the other hand the ranges of failure at maximum or "appreciable stress" extended from 375°F to 500°F for Commercial grade and from 410°F to 585°F for Underwriters grade.

Plate III presents the performance characteristics of one Commercial and fifteen Underwriters Grade cloths under the conditions of this test. The Commercial grade cloth, 40P10, which is identified by the dotted line will be seen to exhibit somewhat inferior properties, compared with the entire group of Underwriters cloths, showing approximately 10% lower failure temperatures than the average for Underwriters grades. The selection of Underwriters grade cloths here covered ranges from 17P24 through 40P10

For this variety of cloths the performance characteristics will be seen, from the curves, to cover a rather wide range.

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In general, however, the performances of the normal Underwriters grade cloths under the conditions of this test are reasonably well grouped and the demonstration serves to indicate the characteristics which may be expected of such materials under stress at elevated temperatures. Under conditions of "Perceptable stress" (up to 10% load) the serviceability temperatures for this group of cloths ranged from 975°F on sample #250 to 1190°F for sample #278 and for conditions of "appreciable stress" (up to 50% load) the range extended from 385°F for sample #240 to 645°F for sample #243.

Plate IV sets forth the performance data for cloths in various styles and in Grades A, AA and AAA. The grade differences are noted on the graphs by the differences in the continuity of the lines as noted in the legend on the Plate. In this work, two samples of Grade A, 36P10 cloths were studied and it will be seen that the performance characteristics of the two samples are quite similar and, as a matter of fact, close study will further reveal that these cloths fall well within the range of performance for the average Underwriters grade cloths.

Cloths in Grade AA and AAA, however, exhibit elevated temperature performance characteristics which are distinctly significant and which serve to reveal the unique properties of such materials. Under the conditions of these tests and applying the "perceptable stress" of 10% load which ranged from 6.8# to 19.5# per 1" strip, there was no failure at 1410°F after heating for a period of 2 hours and 45 minutes. Under the "appreciable stress", which ranged from 34# to 48.3# for Grade AA the failures ranged from 855°F to 930°F and for Grade AAA under the "appreciable stress" ranging from 36.5# to 97.5# the range of failure was from 855°F to 1085°F. Cloth #280, 48T12 in Grade AAA, exhibited the most outstanding performance, showing no failure after 2 hours and 45 minutes, the time necessary to attain 1410°F under a load of 27.6# and under a stress of 69.1# this material remained in tact up to 1085°F.

Conclusions

The elevated temperature serviceability of an asbestos textile is dependent upon many factors aside from the cloth construction itself, and we are here particularly interested in the one related to the amount and kind of stress or physical abuse to which the material may be subjected. In order to properly service an installation it is necessary to be able to define with reasonable accurracy the several limits of serviceability so that materials capable of meeting the requirements may be properly adopted.

There are many applications which require materials that will simply resist destruction as a result of high temperature conditions and where there may be very little or no tensile stress. Under such conditions it would appear, on the basis of the preliminary work here reported, that some lower grade cloths will serve as effectively as some of a higher grade materials which might be indicated on the basis of current information. For example, most of the Underwriters grade cloths here studied exhibited reasonable strength and body retention at temperatures above 1000°F under "perceptable stress" conditions. However, under conditions here termed as "appreciable stress", failures were found to range between 400°F and 500°F.

The significance of the data thus far developed in this work would seem to indicate that under conditions requiring minimum strength properties the serviceability temperatures of all grades of asbestos textiles are well above the limits commonly recognized for such grades. As was pointed out earlier, Grades AA and AAA are extremely indestructable under minimum stress, resisting rupture at 1410°F under the conditions noted, although under the "appreciable" stress failure was induced at around 900°F for Grade AA cloths and from 850°F to 1100°F for grade AAA cloths.

In considering the work here reported it must be realized that these results were obtained under conditions of a constantly increasing temperature, with the rise continuing either until failure was achieved or the maximum capabilities of the furnace were reached. In addition, the duration of the tests were for reasonably short periods of time, in no case, exceeding 2-3/4 hours. It is reasonable to assume that subjection of these same materials under constant load and soaking at a constant temperature will bring about somewhat reduced temperatures of serviceability, however, the magnitude of this reduction can only be ascertained through further study.

Further work in this investigation will include the aforementioned soaking heat studies and instantaneous or shock tests wherein the samples under load will be instantaneously inserted into the furnace which has been previously heated to and is being held at a high temperature.

With the accumulation of the data which will be procurred from the three series of tests here to be undertaken, it should be possible to rather clearly establish and define the elevated temperature serviceability characteristics of the more universally accepted styles and grades of asbestos textiles presently available.

Acknowledgment:

With the conclusion of this academic year at the Philadelphia Textile Institute we are about to lose the services of Claude A. Kennedy, a student at the Institute, who has served as our laboratory assistant throughout this year. We would like to appreciatively acknowledge his work and assistance in developing much of the data presented in this report for without his help it would not have been possible to have advanced in this investigation to the extent here reported.