

REPORT OF THE TECHNICAL COMMITTEE
of the
ASBESTOS TEXTILE INSTITUTE

Hotel Bismarck, Chicago, Ill.

April 7, 1948

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Mr. President, Members, Guests:

At a meeting of the Institute held in New Brunswick, N. J. on Dec. 5, 1947, the Technical Committee was authorized to formulate a system by which indicative style numbers could be assigned to asbestos cloths; also, that asbestos cloths which are in common production as staple fabrics be compiled in a list to show a range of weights from 1 to 3 pounds per square yard.

The Technical Committee met at the Engineers' Club in Philadelphia, on Jan. 30, 1948, to work on these assignments.

A numbering system based upon letters to indicate the type of cloth, preceded by numbers to give the weight in ounces, and followed by numbers which show the cut of yarn used in weaving, makes up 5-place combination numbers, which have been adopted, subject to approval by the Institute.

The letter P	indicates	plain, non-metallic cloth
M	"	wire-inserted cloth
H	"	herringbone weave
T	"	plain twill
BT	"	broken twill

A sheet entitled "PLAIN, NON-METALLIC ASBESTOS CLOTH, attached to and made a part of this report, has been distributed to you. The table on this sheet is self-explanatory, but with reference to the style numbers it will be noted, for example, that the first number, 16P18, stands for a 16-ounce plain cloth woven with 18-cut yarn. Observe the open-mesh cloth, sixth from the top, woven in 9 x 9 construction with 1020 yarn. Its weight is 1.50 pounds per square yard. Since 1.50 pounds equals 24 ounces, the style number is 24P10.

Attention is called to the tolerances, which are those given in ASTM Spec. D-677 for Asbestos Cloth.

Memorandum No. 113 dated July 24, 1947, sent to all member companies by the Institute's Manager, was attached to copies of correspondence between the War Dept., Corps of Engineers, Utilities Branch of the Engineering Division, and Mr. McKinney. The correspondence was opened by Mr. Felix A. Peckham, who advised that a Federal Specification was to be prepared for use by all Government Agencies in connection with the procurement of asbestos cloth, strands and tape. The new specification was to be similar to Navy Dept. Specification 32C11d.

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JM - 83

MT-001996

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Your Technical Committee was assigned the task of representing the asbestos textile industry in formulating the new specifications and several meetings were held in putting together a draft of specifications for consideration by the committee headed by Mr. Peckham. His Committee adopted the principal modifications proposed by the Technical Committee and prepared a draft to be passed on by the Federal Specification Board at a meeting scheduled for April 5, 1948.

A letter was addressed to each member of the Institute by Mr. Peckham inviting a representative to attend the meeting. I also wrote the members of the Technical Committee requesting that they attend to support our request:

- (1) that the specifications stipulate nominal weights per square yard instead of minimum weights.
- (2) that a tolerance of $\pm 7\%$ in weight be stipulated.
- (3) that 1 strand $\frac{1}{2}$ in the warp and 1 strand $\frac{1}{2}$ in the filling be tolerated.
- (4) that the word "cotton" be replaced by "organic fiber".
- (5) that Federal Specification CCC-T-191a, General Specifications and Test Methods for Textiles, be applicable, as these Federal Specifications give various ASTM testing procedures that are desirable.
- (6) that class numbers be assigned to the various kinds of cloth called for under Types A, B and D, so that requests for bids will stipulate exactly the cloth on which to bid.
- (7) that stipulated tensile strengths be in accordance with recommendations of the Technical Committee, which strengths were determined by compiling information from producers and setting figures low enough to pass under the conditions that now exist under present supplies of asbestos fiber.

ASBESTOS TEXTILE INSTITUTE'S FELLOWSHIP WORK

The Chairman of the Technical Committee has kept in close touch with Dr. Myril C. Shaw by 'phone and by visiting at Rutgers Ceramic Dept. Laboratory. Dr. Shaw's report will cover his progress in the work of the Fellowship.

The Committee reports progress in the development of a high grade fabric for safety clothing to be used under extra hazardous conditions. There has been submitted to the Committee information on conditions that are encountered, which must be studied in considering the construction and properties of suitable fabrics.

Mr. McKinney has copied and sent to the Members of the Institute a letter from the American Optical Company which expresses interest in the outcome of this undertaking. That manufacturer of safety clothing acknowledges the need for specially made asbestos cloth for extra hazardous conditions.

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JM - 83**

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Referring again to the list of cloths compiled by the Committee, we recommend that this receive consideration and that each member's representative be authorized to present at the next meeting of the Technical Committee any suggested changes, additions or deletions - Note the omission of a 2-pound cloth - Cloth of this weight is produced by several manufacturers, but judging from catalog data each manufacturer produces a different cloth. Consideration of the differences by the Technical Committee may bring about standardization in a cloth of this weight, if the Committee's members are authorized to get together in writing an industry standard.

Respectfully submitted,

J. M. Weaver, Chairman
Technical Committee

Manheim, Penna.
March 29, 1948

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PRODUCED
JM - 83

MS 002594

NOTE: This specification prepared by the Heat Insulating Materials Committee has not been approved and is subject to further revision.

FEDERAL STANDARD STOCK CATALOG

Section IV

May 25, 1948

(Part 5)

PROPOSED FEDERAL SPECIFICATION

FOR

CLOTH, YARN, THREAD, AND TAPE; ASBESTOS

(Approval paragraph to be inserted in final draft submitted for approval).

A. APPLICABLE SPECIFICATIONS

A-1. The following Federal Specification, of the issue in effect on date of invitation for bids, shall form a part of this specification:

CCC-T-191 - Textiles; General Specifications, Test Methods.

B. TYPES, CLASSES, AND WIDTHS

B-1. Types and classes. - Asbestos materials covered by this specification shall be furnished in the following types and classes, as specified in the invitation for bids: (See par. I-2.)

Cloth:

Type I. - 20 percent organic fiber (maximum), blue stripe

Class A. - Plain weave, regular weight.

Class B. - Plain weave, lightweight.

Class C. - Twill weave.

Class D. - Broken twill weave.

Type II. - 10 percent organic fiber (maximum), red stripe.

Class A. - Plain weave.

Class B. - Twill weave.

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Type III. - 5 percent organic fiber, (maximum), wire insertion, no stripe.

Type IV. - 5 percent organic fiber (maximum), green stripe.

Class A. - Plain weave, regular weight.

Class B. - Plain weave, lightweight.

Class C. - Twill weave.

PRODUCED
JM - 83

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Cloth, Yarn, Thread, and Tape; Asbestos - 2 -

Yarn:

Type V. - Yarn and wire.

Thread:

Type VI. - Sewing thread without wire.

Tape:

Type VII. - Plain weave.

B-2. Widths. - Asbestos cloth and tape shall be furnished in the widths specified in the invitation for bids. (See par. I-3.)

C. MATERIAL AND WORKMANSHIP

C-1. Material. - Asbestos cloth, yarn, thread, and tape shall be made of good quality long fiber asbestos yarn of uniform size. They shall contain no rubber or other filling material, except organic fiber.

C-2. Workmanship. - Asbestos cloth, yarn, thread, and tape shall be reasonably free from nap, broken and uneven threads, and knots.

D. GENERAL REQUIREMENTS

D-1. Asbestos. - The dry asbestos fiber shall contain not less than 12 percent by weight of chemically combined water.

D-2. Tolerance in width. - A tolerance of plus or minus 1/2 inch will be permitted in the specified width of cloth or tape.

E. DETAIL REQUIREMENTS

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E-1. Cloth. -

E-1a. Type I and class A. - The weave of the cloth shall consist of not less than 18 $\frac{1}{2}$ strands in the warp and 9 $\frac{1}{2}$ strands in the filling per linear inch. The yarn shall be 2-ply. The cloth shall have a nominal weight of 2.25 ($\frac{1}{2}$ 7 percent) pounds per square yard. When tested for breaking strength as described in paragraph F-3a(5), the average of five breaks shall not fall below the values specified in table I.

E-1b. Type I, class B. - The weave of the cloth shall consist of not less than 19 $\frac{1}{2}$ strands in the warp and 10 $\frac{1}{2}$ strands in the filling per linear inch. The yarn shall be 2-ply. The cloth shall have a nominal weight of 1.40 ($\frac{1}{2}$ 7 percent) pounds per square yard. When tested for breaking strength as described in paragraph F-3a(5), the average of five breaks shall not fall below the values specified in table I.

E-1c. Type I, class C. - The weave of the cloth shall be one up and two down twill and shall consist of not less than 27 $\frac{1}{2}$ strands in the warp and 9 $\frac{1}{2}$ strands in the filling per linear inch. The yarn shall be 2-ply. The cloth shall have a nominal weight of 2.4 ($\frac{1}{2}$ 7 percent) pounds per square yard. When tested for breaking strength as described in paragraph F-3a(5), the average of five breaks shall not fall below the values specified in table I.

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PRODUCED
JM - 83

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MS 002596

Cloth, Yarn, Thread, and Tape; Asbestos - 3 -

E-1d. Type I, class D. - The weave of the cloth shall be one up and three down broken twill, and shall consist of not less than 30 $\frac{1}{2}$ strands in the warp and 28 $\frac{1}{2}$ strands in the filling per linear inch. The cloth shall have a nominal weight of 19 ($\frac{1}{2}$ 7 percent) ounces per square yard. When tested for breaking strength as described in paragraph F-3a(5), the average of five breaks shall not fall below the values specified in table I.

E-1e. Type II, class A. - The weave of the cloth shall consist of not less than 18 $\frac{1}{2}$ strands in the warp and 9 $\frac{1}{2}$ strands in the filling per linear inch. The yarn shall be 2-ply. The cloth shall have a nominal weight of 2.25 ($\frac{1}{2}$ 7 percent) pounds per square yard. When tested for breaking strength as described in paragraph F-3a(5), the average of five breaks shall not fall below the values specified in table I.

E-1f. Type II, class B. - The weave of the cloth shall be one up and two down and shall consist of not less than 27 $\frac{1}{2}$ strands in the warp and 9 $\frac{1}{2}$ strands in the filling per linear inch. The yarn shall be 2-ply. The cloth shall have a nominal weight of 2.4 ($\frac{1}{2}$ 7 percent) pounds per square yard. When tested for breaking strength as described in paragraph F-3a(5), the average of five breaks shall not fall below the values specified in table I.

E-1g. Type III. - The weave of the cloth shall consist of not less than 18 $\frac{1}{2}$ strands of wire-inserted yarn in the warp and 9 $\frac{1}{2}$ strands of wire-inserted yarn in the filling per linear inch. Each strand of the warp and filling shall consist of two plies of asbestos yarn and two nickel-copper-alloy wires twisted together. The wire insertion shall contain not less than 60 percent nickel, and shall be 0.008 $\frac{1}{2}$ 0.001 inch in diameter. The cloth shall have a nominal weight of 3.5 ($\frac{1}{2}$ 5 percent) pounds per square yard.

E-1h. Type IV, class A. - The weave of the cloth shall consist of not less than 18 $\frac{1}{2}$ strands in the warp and 9 $\frac{1}{2}$ strands in the filling per linear inch. The yarn shall be 2-ply. The cloth shall have a nominal weight of 2.25 ($\frac{1}{2}$ 7 percent) pounds per square yard. When tested for breaking strength as described in paragraph F-3a(5), the average of five breaks shall not fall below the values specified in table I.

E-1i. Type IV, class B. - The weave of the cloth shall consist of not less than 19 $\frac{1}{2}$ strands in the warp and 10 $\frac{1}{2}$ strands in the filling per linear inch. The yarn shall be 2-ply. The cloth shall have a nominal weight of 1.40 ($\frac{1}{2}$ 7 percent) pounds per square yard. When tested for breaking strength as described in paragraph F-3a(5), the average of five breaks shall not fall below the values specified in table I.

E-1j. Type IV, class C. - The weave of the cloth shall be one up and two down twill, and shall consist of not less than 27 $\frac{1}{2}$ strands in the warp and 9 $\frac{1}{2}$ strands in the filling per linear inch. The yarn shall be 2-ply. The cloth shall have a nominal weight of 2.4 ($\frac{1}{2}$ 7 percent) pounds per square yard. When tested for breaking strength as described in paragraph F-3a(5), the average of five breaks shall not fall below the values specified in table I.

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JM - 83

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Cloth, Yarn, Thread, and Tape; Asbestos - 4 -

Table I.- Breaking strength of asbestos cloth, minimum,
pounds per inch width

	As Received		After heating to 200° F.	
	Warp	Filling	Warp	Filling
Type I:				
Class A - - - - -	100	45	45	30
Class B - - - - -	80	40	60	30
Class C - - - - -	125	45	90	30
Class D - - - - -	80	70	60	48
Type II:				
Class A - - - - -	100	45	80	30
Class B - - - - -	150	45	125	30
Type IV:				
Class A - - - - -	145	45	135	40
Class B - - - - -	85	40	65	35
Class C - - - - -	150	45	140	40

E-2. Yarn. -

E-2a. Type V. - Yarn and wire shall be composed of three plies of asbestos yarn and two nickel-copper-alloy wires twisted together. The yarn shall be 10-cut, and shall contain not more than 5 percent by weight of organic fiber. The wire insertion shall contain not less than 60 percent nickel and shall be 0.008 $\pm$ 0.001 inch in diameter.

E-3. Thread. -

E-3a. Type VI. - The thread shall be made from yarn not heavier than 10-cut, and shall contain not more than 23 percent by weight of organic fiber. The yarn shall be given a sewing thread finish, and shall retain its natural color. The thread shall be not over 0.045 inch in gage and not less than 450 yards per pound. The tensile strength shall be not less than 10 pounds.

E-4. Tape. -

E-4a. Type VII. - The weave of the tape shall consist of not less than 16 $\pm$ 1 strands in the warp and 8 $\pm$ 1/2 strands in the filling per linear inch. The yarn in the strands shall contain not more than 20 percent by weight of organic fiber. Each strand of the warp shall be 10-cut, 3-ply yarn, and each strand in the filling shall be 10-cut, 2-ply yarn. The tape shall have selvage edges.

F. METHODS OF SAMPLING, INSPECTION, AND TESTS

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F-1. Sampling. - Samples shall be selected by the inspector as follows:

F-1a. Cloth. - A sample strip 20 inches in length and the full width of the roll shall be taken from each lot of 1000 square yards or less, of each type and class offered for delivery.

F-1b. Yarn and thread. - A 6-ounce tube shall be supplied for each lot of 100 pounds or less, offered for delivery.

PRODUCED
JM - 83

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MS 002598

Cloth, Yarn, Thread, and Tape; Asbestos - 5 -

F-1c. Tape. - A sample 24 inches long shall be taken from each lot of 10,000 linear feet or less, offered for delivery.

F-2. Inspection. - Cloth, yarn, thread, and tape shall be inspected by the Government inspector to determine compliance with the requirements of this specification.

F-3. Tests. -F-3a. Cloth. -

F-3a(1). Preparation of sample. - Discard 4 inches of each selvage edge and cut 10 pieces 4 inches wide by 6 inches long from different parts of the sample, so that each specimen will represent different strands of warp yarn. Cut 10 specimens 4 inches wide by 6 inches long in the filling direction.

F-3a(2). Hygroscopic moisture. - Five test specimens of approximately 5 grams each shall be weighed and then dried to constant weight at 105°-110°C. (221°-230°F.) in an electric oven, cooled in a desiccator and again weighed. The loss in weight is termed by the hygroscopic moisture. This weight divided by the weight of the sample and multiplied by 100, gives the percentage of hygroscopic moisture in the sample of cloth.

F-3a(3). Organic fiber. - Five test specimens, each weighing not less than 5 grams, and dried to constant weight at 105°-110°C (221°-230°F), shall be placed in a furnace and heated for not less than 1 hour at 800°-810°C. (1,470°-1,490°F.). After removal from the furnace, they shall be cooled in a desiccator to room temperature, and then weighed. The weight of the residue shall be divided by 0.86 to determine the original weight of the asbestos content. The weight of asbestos content shall be divided by the weight of the dried specimen and the quotient multiplied by 100 to obtain the percentage of asbestos. The average of five determinations shall be taken as the asbestos content. The percentage of organic fiber equals 100 minus the percentage of asbestos.

F-3a(4). Chemically combined water. - Certified samples of the type of asbestos carded fiber used in manufacturing the product shall be supplied to the inspector to make determinations of chemically combined water. This test shall be made on 5-gram sample of fiber. Remove the hygroscopic moisture as stipulated in paragraph F-3a(2), record the weight and ignite in an electric furnace at 800°-810°C (1,470°-1,490°F.) for 1 hour. The difference between the dried weight and the residual weight of the ignited specimen, divided by the dried weight of the specimen and multiplied by 100, gives the percentage of chemically combined water in the asbestos fiber.

F-3a(5). Breaking strength. - Breaking strength shall be determined by the grab method, as described in Federal Specification CCC-T-191. For determining the breaking strength after heating, an oven with automatic temperature control shall be used. Ten specimens 4 inches by 6 inches shall be cut, five with the 6-inch dimension parallel to the warp and five with the 6-inch dimension parallel to the filling. The specimens shall be supported on a wire screen or perforated metal plate at least 1/2 inch above the floor of the oven, and not more than five specimens shall be superimposed upon one another. The oven thermocouple shall be centrally located not more than 1/2 inch above the topmost specimen. Specimens shall be introduced into the ventilated oven with the temperature at 200°F. The specimens shall remain in the oven for 2 hours, after which they shall be removed, allowed to cool to room temperature, and tested for breaking strength as specified above.

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JM - 83

GG-27-93611

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Cloth, Yarn, Thread, and Tape; Asbestos - 6 -

F-3a(6). Cloth construction. - The number of warp yarns and number of filling yarns shall be determined as specified in Federal Specification CCC-T-191.

F-3a(7). Weight. - The weight shall be determined by method No. 1, Federal Specification CCC-T-191.

F-3b. Thread. -

F-3b(1). Breaking strength. - The breaking strength of asbestos thread shall be determined on a standard textile tension testing machine. All tests shall be made on single strands. The single strands shall be broken after conditioning the tubes or bobbins for 12 hours in a standard atmosphere having a relative humidity of 65 percent at 70°F. and the tension test shall be made under the above atmospheric conditions. A single-strand tester of proper capacity, with the lamps set 10 inches apart, and having a speed of pulling clamp of 12 $\pm$ 1/2 inches per minute, shall be used. The average of four breaks from each of ten tubes or bobbins, selected at random from each case of 300 pounds or less, shall be the average strength.

F-3c. Tape. -

F-3c(1). Hygroscopic moisture. - See paragraph F-3a(2).

F-3c(2). Organic fiber. - See paragraph F-3a(3).

F-3c(3). Chemically combined water. - See paragraph F-3a(4).

F-3c(4). Tape construction. - See paragraph F-3a(6). The number of strands of warp shall be determined by counting the strands in the full width of the tape. The number of filling strands shall be determined by measuring three 5-inch lengths, taken respectively from each end and the middle of a 24-inch sample. The average of the three lengths shall be used in determining the number of filling strands per inch.

G. PACKAGING, PACKING, AND MARKING FOR SHIPMENT

G-1. Packaging. - Unless otherwise specified, commercial packages are acceptable under this specification.

G-2. Packing. - Unless otherwise specified, the subject commodity shall be packed in substantial commercial containers of the type, size, and kind commonly used for the purpose, so constructed as to insure acceptance and safe delivery by common or other carriers, at the lowest rate, to the point of delivery called for in the contract or purchase order.

G-3. Marking. - Unless otherwise specified, shipping containers shall be marked with the name of the material, the type, class, and quantity contained therein, as defined by the contract or order, the name of the contractor, and the number of the contract or order under which shipment is made.

H. REQUIREMENTS APPLICABLE TO INDIVIDUAL DEPARTMENTS

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H-1. The following departmental specifications, of the issues in effect on date of invitation for bids, and special departmental requirements, shall form a part of this specification, and shall be applicable to purchases made under this specification by the respective department.

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JM - 83

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Cloth, Yarn, Thread, and Tape; Asbestos - 7 -

H-2. Army. - (To be inserted).

H-3. Navy. - (To be inserted).

I. NOTES

I-1. Purchasers should exercise any desired options offered herein and should specify the type and class of material desired. (See pars. B-1, G-1, G-2, and G-3.)

I-2. Intended use. -

I-2a. Types I and VI are intended for use as the jacketing material over insulation where the temperature within the insulation is more than 500°F. (260°C.), except that it is not to be used on fittings and flanges, nor where it will be in contact with heated metal.

I-2b. Type II is intended for use as the inside cover on removable and replaceable covers for flanges and fittings, or for the wrapping of engine exhaust pipes, where the metal in contact is not more than 600°F. (315°C.).

I-2c. Type III is intended for the same purpose as type II where the metal in contact is more than 600°F. (315°C.).

I-2d. Type IV is intended for the same conditions as type III, but where greater flexibility is required.

I-3. Commercial sizes. -

I-3a. Cloth. - Asbestos cloth is normally available in widths of 36 inches and 40 inches. It is commonly supplied in rolls of 50 yards, and can be furnished in rolls of 25 and 100 yards. Special widths can be supplied if desired.

I-3b. Yarn and thread. - Asbestos reinforced yarn and sewing thread is normally available in 1- and 2-pound tubes.

I-3c. Tape. - Asbestos tape is normally supplied in 50-foot rolls and in widths of 1, 1-1/4, 1-1/2, 2, 2-1/2 and 3 inches. Tape can be supplied in rolls of 100 feet in 2, 2-1/2, and 3-inch widths, if desired.

I-4. It is believed that this specification adequately describes the characteristics necessary to secure the desired materials, and that normally no samples will be necessary prior to award to determine compliance with the specification. If, for any particular purpose, samples with bids are necessary, they should be specifically asked for in the invitation for bids, and the particular purpose to be served by the bid sample shall be definitely stated, the specification to apply in all other respects.

I-5. Federal specifications do not include all types, classes, sizes, etc., of the commodities indicated by the titles of the specifications, or which are commercially available, but are intended to cover the types, classes, etc., which are suitable for Federal Government requirements.

I-6. An Index of Federal Specifications may be purchased as noted in the paragraph below, price to be obtained from the Superintendent of Documents.

Cloth, Yarn, Thread, and Tape; Asbestos - 8 -

I-7. Copies of this specification and of CCC-T-191 may be obtained upon application, accompanied by postal note, money order, coupon, or cash, to the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Price _____ cents each; supplement to CCC-T-191, 10 cents.

Notice: When Government drawings, specifications, or other data, are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise, as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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JM - 83

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