

PPP-C-843D  
 July 22, 1977  
 SUPERSEDING  
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FEDERAL SPECIFICATION  
 CUSHIONING MATERIAL, CELLULOSIC

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers cushioning material in rolls, sheets, multifold units, cut shapes and forms for packaging purposes.

1.2 Classification.

1.2.1 Types and classes. The cushioning material shall be one of each of the following types and classes, as specified (see 6.2):

Types:

- I - Water absorbent.
- II - Water resistant.

Classes:

- A - Low tensile strength, filler material.
- B - High tensile strength, wrapping material.
- C - Very high tensile strength, low dusting, filler & wrapping material.

1.2.2 Style (see 3.2).

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Federal Specifications:

- UU-P-268 - Paper, Kraft, Untreated, Wrapping.
- MOM-A-260 - Adhesive, Water-Resistant, (For Sealing Waterproof Paper).
- PPP-B-636 - Boxes, Shipping, Fiberboard.
- PPP-B-640 - Boxes, Fiberboard, Corrugated, Triple-Wall.
- PPP-B-1055 - Barrier Material, Waterproofed, Flexible.

Federal Standard:

- Fed. Std. No. 123 - Marking for Shipment (Civil Agencies).

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

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(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Philadelphia, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Houston, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

MIL-STD-129 - Marking for Shipment and Storage.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., Traffic Department, 1616 P Street, N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

3. REQUIREMENTS

3.1 Material. The cushioning material shall be composed of any cellulosic material that will provide a product complying with the requirements of this specification.

3.1.1 Recovered material fiber. The material offered shall contain not less than 70 percent of recovered materials. Recovered materials are defined as material which has been collected or recovered from solid waste. Solid waste is defined as any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges.

3.2 Style. The cushioning material shall be furnished in roll, sheet, multifold unit, cut shape or form, as specified (see 6.2). Cushioning material shall be plain, longitudinally compressed, perforated, or longitudinally compressed and perforated style, as specified (see 6.2). The perforations of the cushioning material shall be as specified (see 3.2.1).

3.2.1 Perforations of the cushioning material are defined as follows: For plain (uncompressed) material, perforations are a linear series of holes in the material to permit tearing off of a premeasured length of material. For longitudinally compressed, perforations are cut out areas leaving one inch linkages along the width to permit the tearing off of a premeasured length of material.

3.3 Absorbent capacity. The absorbent capacity of the material shall be as required in 3.3.1 or 3.3.2, as applicable, when tested in accordance with 4.4.1.

3.3.1 Type I. Type I, class A or B material shall absorb not less than fourteen times its weight of water.

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3.3.2 Type II. Type II, class A, B, or C material shall absorb not more than three times its weight of water.

3.4 Compression set. The material shall have a compression set of not more than 40 percent when tested in accordance with 4.4.2.

3.5 Dimensions. The length, width, and thickness of the material shall be specified (see 6.2), and shall be within the tolerances specified below when tested in accordance with 4.4.3. The dimensions and tolerances for the cut shapes and forms shall be specified. Unless otherwise specified (see 6.2), the longitudinally compressed material dimensions shall be determined in the compressed state and expanded state and so identified.

3.5.1 Length. The length shall be determined by 4.4.3.1.

3.5.1.1 Sheet. The length of individual sheets shall be within 5 percent or 1/2-inch (whichever is the larger) of the length specified.

3.5.1.2 Rolls. The completely unrolled length of a roll shall be not less than 95 percent of the specified length, measured to the closest 1/2 inch.

3.5.2 Width.

3.5.2.1 Sheet or roll. The width of the sheet or roll shall be as specified with a tolerance of plus or minus 3 percent or 1/4 inch, whichever is larger. The width shall be determined by 4.4.3.2. Each ply must measure out to the full width dimension specified.

3.5.3 Thickness.

3.5.3.1 The thickness of the material shall be not less than 95 percent of the thickness specified and as determined by 4.4.3.3.

3.6 Expansion. The longitudinally compressed material (see 3.2) shall have the capability of expansion (decompression) to not less than 4.8 times its length without rupture of the plies, when tested in accordance with 4.4.4.

3.7 Pliability. The surface of the material shall show no cracks or separations, when tested in accordance with 4.4.5.

3.8 Strain. The strain limits of the material shall be not less than 50.0 nor more than 75.0 percent when tested in accordance with 4.4.6.

3.9 Tensile strength. The tensile strength of the material shall be as specified in 3.9.1, 3.9.2, or 3.9.3 as applicable, when tested in accordance with 4.4.7.

3.9.1 Types I and II, class A. All class A material shall have an average tensile strength of not less than 0.25 pounds per square inch in the weakest direction.

3.9.2 Types I and II, class B. All class B material shall have an average tensile strength of not less than 1.50 pounds per square inch in the weakest direction.

3.9.3 Type II, class C. All class C material shall have an average tensile strength of 10 pounds per square inch minimum in the weakest direction.

3.10 Dustiness. Type II, class C material shall be tested in accordance with 4.4.8. The number of particles, 1 micron and larger in size, shall not exceed 100 (20 million particles per cubic foot).

3.11 Workmanship. The cushioning material shall be clean and free from defects which might affect serviceability.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

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4.1.1 Certification of recovered material. The contractor shall certify in writing to the contracting officer or his representative that the materials offered to the government comply with the content of recovered materials specified in 3.1.1. Unless maximum percent is set provided the physical characteristics meet the specification requirements.

4.2 Sampling for inspection. Sampling for inspection shall be performed in accordance with MIL-STD-105, except where otherwise indicated herein. For the purposes of sampling, an inspection lot shall consist of all material of the same type, class, style, and construction submitted for inspection at the same time. Unless otherwise specified, the inspection level shall be S-2 and the AQL shall be 4.0.

4.3 Examination of end item. The end item shall be examined in accordance with the following classification of defects. Random samples shall be drawn from each lot of end items of the same type, class, and style for examination of visual, dimensions, and preparation for delivery requirement. The lot size for the purposes of determining the sample size in accordance with MIL-STD-105, shall be expressed in sheets, rolls or units (as applicable) identical to the specified sample unit for examination under 4.3.1, and units of shipping containers for examination under 4.3.2. Unless otherwise specified, the sampling for the examination shall be performed with inspection level S-2 with an AQL of 4.0 expressed in terms of percent defective.

4.3.1 Examination of the end item for defects in appearance and workmanship.

TABLE I. Examination of end item	
Examine	Defects
Construction	Not compressed, when specified. Not perforated, when specified.
Form	Not roll, when specified. Not sheet, when specified. Not form specified.
Cut shapes and forms	Not in accordance with specified drawings (see 6.2).
Workmanship	Not clean cut. Serviceability defects.

4.3.2 Examination of preparation for delivery. An examination shall be made to determine whether packaging, packing, and marking comply with the requirements of section 5. Defects shall be scored as specified in table IV. The sample unit shall be one container fully prepared for delivery. The lot shall be the number of containers offered for inspection at one time. The inspection level shall be S-2 with an AQL of 4.0 expressed in terms of percent defective.

TABLE II. Examination of preparation for delivery	
Examine	Defects
Contents	Not as specified.
Container	Not as specified.
Markings	Omitted; incorrect; illegible; improper size, location, sequence, or method of application.
Materials	Component missing or damaged.
Workmanship	Bulging or distortion of containers.

4.4 Tests. Unless otherwise indicated, the tests on the longitudinally compressed material shall be performed after the material has been expanded. Unless otherwise indicated, the tests shall be performed at and the samples conditioned to standard conditions of  $73^{\circ} \pm 3.5^{\circ}\text{F}$ . and  $50 \pm 2$  percent relative humidity. Sampling for the tests in table III shall be performed with inspection level S-2 with an AQL of 6.5 expressed in terms of percent defective. Samples drawn in 4.3 shall be used for these tests.

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TABLE III.

Requirement	Conformance paragraph	Test paragraph	No. of determinations per sample
Absorbent capacity	3.3	4.4.1	1
Compression set	3.4	4.4.2	1
Dimensions			
Sheet length	3.5.1.1	4.4.3.1	1
Roll length	3.5.1.2	4.4.3.1	1
Sheet width	3.5.2.1	4.4.3.2.1	1
Roll width	3.5.2.1	4.4.3.2.2	4
Thickness	3.5.3.1	4.4.3.3	1
Expansion	3.6	4.4.4	1
Strain	3.8	4.4.6	1
Tensile strength	3.9	4.4.7	1
Dustiness	3.10	4.4.8	1
Pliability	3.7	4.4.5	2

4.4.1 Absorbent capacity. Weigh to 0.1 gram (i.e. to nearest 0.01 and round off tenths) a 4-1/5 inch square piece of material having a thickness of not less than 1/2-inch. This is the dry weight (Thinner material shall be stacked to at least 1/2-inch thick and stapled with weighed staples at the four corners.) Place the material on the surface of water which is maintained at 70° to 75°F. The water bath shall be sufficiently large to permit the material to submerge. After 30 seconds, remove the material with a piece of 1/2-inch mesh screen which is 6 inches square. Drain in a horizontal position for 1 minute and weigh as described above. This is the wet weight. Calculate the absorbing capacity as follows:

$$\text{absorbent capacity} = \frac{\text{number of times} - \frac{\text{wet weight} - \text{dry weight} + (\text{Staple wt. if applicable})}{\text{dry weight} + (\text{Staple wt. if applicable})}}{\text{its dry weight}}$$

4.4.2 Compression set. Place a stack of 4 ± 1/8-inch square samples of material having a minimum of 1-inch measured thickness (see 4.4.3.3) between parallel, rigid, flat plates. Compress to 50 percent of the measured thickness for two hours. Three minutes after the pressure has been removed, measure the final thickness in accordance with 4.4.3.3. Calculate as follows:

$$\text{Compression set (in percent)} = \frac{(\text{original thickness} - \text{final thickness})}{\text{original thickness}} \times 100$$

4.4.3 Dimensions. The dimensions of the material shall be measured as specified in 4.4.3.1, 4.4.3.2, and 4.4.3.3. The longitudinally compressed material dimensions shall be determined in the compressed and expanded state (see 3.5).

4.4.3.1 Length. The length of rolls or sheets shall be determined by a single measurement across the mid-width point of each sample. Rolls shall be completely unrolled for measurement. The longitudinally compressed material shall be measured for length in the compressed state and uncompressed state (see 4.4.4 expansion) and so identified.

4.4.3.2 Width. The width of the sheets and rolls shall be measured as specified in 4.4.3.2.1 and 4.4.3.2.2.

4.4.3.2.1 Sheets. The width of the individual sheet shall be determined by a single measurement across the mid-length point.

4.4.3.2.2 Rolls. The width of the unrolled roll shall be the average of four (4) measurements. The longitudinally compressed material shall be measured for width in the compressed state and the uncompressed state (expanded) and so identified.

4.4.3.3 Measured thickness. The measured thickness of the material shall be determined as follows: Place a stack of 4 ± 1/8-inch pieces of material which is at least one inch high on a level surface. If sample is 1 inch thick or greater, one sample is sufficient. Place a 6-inch square flat weight plate which weighs 0.4 ± 0.005 pounds on top of this stack. After 1-minute, measure the vertical distance (thickness) between the level surface and the weight plate at each of the four corners and record the average (final thickness). The average of the four measurements shall be the measured thickness. (Note: If more than one piece of material is used, the measured thickness shall be the final thickness divided by the number pieces.) The percent of specified thickness (as specified in the contract) shall be calculated as follows: if the measured thickness is less than specified:

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$$\text{Percent of specified thickness} = \frac{\text{[(measured thickness)]}}{\text{(specified thickness)}} \times 100$$

If measured thickness is more than specified, no additional calculation is required since the requirement is met. The longitudinally compressed material shall be tested for thickness in both the compressed state and uncompressed state and so identified.

4.4.4 Expansion. For the longitudinally compressed material, expansion shall be determined as described below: Place the sample (roll, sheet, or other unit) on a level surface, unroll or unfold and measure the entire length in the compressed state. Cut a 4 by 14-inch specimen and suspend it from a clamp having flat faces 2 by 4-inch or greater. At a distance of 10-inches (accurately measured) attach another clamp similar to one above and either add sufficient weight or pull down by hand to its maximum distance without rupture of plies. Measure accurately the expanded length of the specimen between the clamps. Calculate the expansion as follows:

$$\text{Expansion} = \frac{\text{expanded length}}{\text{compressed length}}$$

4.4.5 Pliability. Determine the thickness of a 4 ± 1/8-inch square sample of material. Wrap the sample around a cylinder which has a diameter of 3-1/4 times the thickness of the sample. The sample shall be pliable, shall easily conform to the cylinder wall, and not show any cracks or separations. The test shall be repeated with the same sample which has been rotated 90° to determine pliability in the opposite direction (i.e. Test the material in machine and cross direction).

4.4.6 Strain. Place sample(s) of material to form a stack 4 ± 1/8-inch square and at least 1-inch high. If sample is 1 inch or greater, one sample is sufficient. Measure the height (measured thickness) of this stack as defined in 4.4.3.3 measured thickness (Note: For the purpose of this test, if each sample is less than 1 inch in measured thickness, the measured thickness of the stack and not the individual samples is used.) Place a 3 p.s.i. load on this stack for 15 seconds. Measure the loaded height at the four corners and record the average (compressed thickness). The strain shall be calculated as follows:

$$\text{Strain (in percent)} = \frac{\text{Measured thickness} - \text{Compressed thickness}}{\text{Measured thickness}} \times 100$$

4.4.7 Tensile strength. Prior to testing, determine the thickness of the sample of material as defined in 4.4.3.3 measured thickness. Place 4 ± 1/8-inch square sample between two clamps which are 2 inches apart. The clamps shall have flat faces, a width of at least 4 inches and shall exert uniform pressure. The tensile strength shall be determined by using a universal testing machine or by suspending one clamp to a stationary support and adding weights to the other clamps until the material breaks or tears. The test shall be repeated to provide tensile strength values for the machine direction and cross direction of the material. The tensile strength shall be calculated as follows:

$$\text{Tensile strength (pounds/sq. in) (of cross section)} = \frac{\text{weight (in pounds)}}{\text{area of cross section of sample (in square inches)}} = \frac{W}{L \times T}$$

L = 4 ± 1/8-inches  
T = measured thickness  
W = weight (in pounds)

4.4.8 Dusting. The dust test consists of placing the cushioning material in a wire basket, placing the basket in a nail, shaking the nail on a standard paint conditioner machine (mixing shaker), withdrawing the dust sample with a widget impinger apparatus, and determining the size and number of dust particles in the sample. The detailed test procedure follows.

4.4.8.1 Preparation of specimen. Approximately 12 grams of 4 by 4 specimens, conditioned at 73° ± 3.5°F. and 50 ± 2 percent relative humidity, shall be stacked and weighed to the nearest 0.0001 gram. The stack shall be placed in a 4 by 4 by 3-inch basket (see figure 1) fabricated of No. 2 mesh, 0.047-inch brass woven-wire screen (N. S. Tyler Co., or equal).

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4.4.8.2 Preparation of container. A standard 1 gallon friction cover paint pail shall be prepared in the following manner: Drill one 1/4-inch hole in the center of the cover, place a piece of analytical filter paper (Carl Schleicher & Schuell Co., No. 597, or equal) over the hole and secure the edges of the paper with cellophane tape, drill a 1/2-inch hole in the body of the can approximately 1 inch from the top, cover the hole with cellophane tape, and thoroughly clean the interior of the can. Place basket containing the specimen in the pail and tape or press cover into place.

4.4.8.3 Preparation of impinger flask and counting cell. Ten milliliter of distilled water containing 1/10 of 1 percent of nonfoaming wetting agent (Lever Brothers "Dishwasher All", or equal) shall be filtered (5 & S No. 597) into the impinger flask. A sample of the water shall be removed from the flask with a pipette and placed in a Burkert-type Neubauer ruled haemocytometer (American Optical Company's Spencer No. 1492, or equal) with cover glass in position. The number and size of particles 1 micron and larger in the center block of 9 squares of the field shall be determined (a magnification of 240 is recommended). The number of particles counted shall not exceed 15. Higher counts will require recleaning the apparatus and refiltering the water until a count less than 15 is obtained. The apparatus shall be recleaned and prepared for the test.

4.4.8.4 Agitation of the pail. The pail, containing the specimen and basket, shall be clamped in a paint conditioner machine (Miller paint mixer F3015, or equal in frequency and amplitude at vibrations) and agitated for 10 minutes, then removed and placed in an upright position.

4.4.8.5 Withdrawal of dust sample. The tape over the 1/2-inch hole in the body of the pail shall be removed and one end of a 1/4-inch clean rubber tubing approximately 12 inches long shall be inserted 1/4 inch into the hole and sealed in any suitable manner to prevent contamination from the surrounding atmosphere. The other end of the tube shall be attached to the top of the impinger flask. The impinger apparatus shall be attached to the impinger flask with a 1/4-inch clean rubber tube. The impinger pump shall be started 2 minutes after agitation is stopped and shall operate for 5 minutes at a vacuum of 12 inches of water.

4.4.8.6 Count of dust particles. The tubes shall be disconnected from the impinger flask, rubber stoppers placed in the flask openings, and the flask shaken for 30 seconds. The sample shall be withdrawn from the flask and the number and size of particles determined as specified in 4.4.8.3.

4.4.8.7 Calibration of the dust test apparatus. Prior to conducting the operations specified in 4.4.8.4 through 4.4.8.6, a blank determination of the dust count of the apparatus shall be made by following the above procedure except that the specimen required in 4.4.8.4 shall be omitted. The dust count on the blank shall be subtracted from the dust count obtained when testing cushioning specimens.

## 5. PREPARATION FOR DELIVERY

5.1 Packaging. The packaging shall be level A or commercial as specified (see 6.2).

### 5.1.1 Level A.

5.1.1.1 Rolls. Each roll of cushioning material shall be wrapped in barrier material conforming to PPP-B-1055, class C-1 or C-2(a). All folds, laps, and seams shall be sealed with water resistance adhesive conforming to MDM-A-260.

5.1.1.2 Sheets, cut shapes or forms. Sheets cut shapes or forms of one description only shall be stacked not to exceed 40 pounds. Each stack shall be wrapped and sealed as specified in 5.1.1.1.

5.1.1.3 Multi-fold units. Multi-fold units of longitudinally compressed cushioning material shall be wrapped as specified in 5.1.1.1 and packaged in a box conforming to PPP-B-636, type CF, class domestic, grade 200. Each box shall be securely closed in accordance with the appendix to PPP-B-636.

5.1.2 Commercial packaging. The cushioning material shall be preserved and packaged in unit and intermediate containers normally used in commercial practice. The quantity per unit and intermediate container shall be as specified in the contract or order. The complete package shall be designed to protect the item against damage during shipment, handling and storage.



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5.2 Packing. The packing shall be level A or commercial as specified (see 6.2).

5.2.1 Level A. Cushioning material of one description only, packaged as specified in 5.1 shall be packed in a box conforming to PPP-B-636, grade V2s or PPP-B-640, class 2. Weight of the PPP-B-636 box shall not exceed 65 pounds. Weight of the PPP-B-640 box shall not exceed 100 pounds. The box shall be closed and strapped in accordance with the appendix of applicable box specification.

5.2.2 Commercial packing. The cushioning material shall be packed in containers to insure safe delivery at destination, to provide for safe redistribution by the initial receiving activity, and shall be acceptable by common carrier under National Motor Freight Classification Rules or Uniform Freight Classification Rules. The quantity per shipping container shall be as specified in the contract or order.

5.2.3 Palletization or unitization of loads for shipment. When specified (see 6.2), cushioning material packed in accordance with 5.2.2 shall be palletized or unitized in loads suitable for handling and storage at destination, using conventional forklift equipment. Unitized loads shall meet the following minimum requirements:

- (a) Pallets, if used, may be expendable type of uniform size and of sufficient strength to permit stacking of loads to an approximate height of 15 feet.

5.3 Marking. In addition to any special marking required in the procurement document, marking of the interior packages and exterior shipping containers shall be in accordance with Fed. Std. No. 123, for civil agencies or MIL-STD-129, for military agencies, as applicable (see 6.2).

## 6. NOTES

6.1 Intended use. The material covered by this specification is intended for cushioning and for absorbent packaging for fragile containers of liquids which might break in transit. Class A and B material are not intended for use as an initial wrap to protect items from dust and chemicals.

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

- (a) Title, number, and date of this specification.
- (b) Type and class required (see 1.2).
- (c) Whether roll, sheet, multifold unit, cut shape or form, and whether plain, longitudinally compressed, perforated or longitudinally compressed and perforated style are required (see 3.2).
- (d) Length, width, and thickness (see 3.5 and 6.3) and options related to dimensions, tolerances and identifying dimensions for compressed or expanded material as required.
- (e) Selection of applicable levels of packaging and packing (see 5.1 and 5.2).
- (f) Marking document required (see 5.3).
- (g) When palletization is required (see 5.2.3).

6.3 Available widths, thicknesses and lengths. Cushioning material may be procured in rolls 2 to 105 inches in width, 35 to 1,350 feet in length for certain thicknesses ranging from 0.25 to 2.0 inches. Cushioning material may be procured in flat sheets from 3 to 60 inches in width, 10 to 72 inches long, 0.25 to 2.0 inches thick, or other sizes.



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