

# MIL-R-9299C

3 Dec 1968

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SUPERSEDING

MIL-R-9299B(ASG)

30 July 1964

## MILITARY SPECIFICATION

### RESIN, PHENOLIC, LAMINATING

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope - This specification presents requirements for two grades of resin used in fabricating plastic laminates for structural parts and other applications.

1.2 Classification - The resin shall be furnished in the following grades, as specified (see 6.2):

Grade A - Normal properties

Grade B - Improved properties

#### 2. APPLICABLE DOCUMENTS

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

#### SPECIFICATIONS

##### Federal

O-A-548	Antifreeze, Ethylene Glycol, Inhibited
TT-I-735	Isopropyl Alcohol
TT-S-735	Standard Test Fluids, Hydrocarbon
PPP-C-96	Cans, Metal, 28 Gage and Lighter
PPP-D-705	Drum: Metal Shipping, Steel (Over 12 and Under 55 Gallon)

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PPP-D-729	Drums, Metal 55-Gallon (for Shipment of Non-corrosive Material)
PPP-P-704	Pails, Shipping, Steel (1 through 12 Gallon)

Military

MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft and Ordnance
MIL-C-9084	Cloth, Glass, Finished, for Polyester Resin Laminates

## STANDARDS

Federal

Fed. Test Method Std. No. 406	Plastics: Methods of Testing
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Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-147	Palletized Unit Loads (40 In. X 48 In., 4-Way Partial and 4-Way Pallets)

(Copies of specifications, standards, drawings, and publications required by suppliers 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 otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply:

Uniform Classification Committee

## Uniform Freight Classification Rules

(Application for copies of the above publication should be addressed to the Uniform Classification Committee, 202 Chicago Union Station, Chicago, Ill. 60606.)

Code of Federal Regulations

49 CFR 171-178      Department of Transportation (DOT) Regulations  
for the Transportation of Explosives and Other  
Dangerous Articles by Land and Water

(The Department of Transportation Regulations are a part of the Code of Federal Regulations (latest cumulative pocket supplement) available from the Superintendent of Documents, Government Printing Office, Washington, D. C., 20402. Orders for the above publication should cite "Code of Federal Regulations, 49 CFR 171-178.")

Manufacturing Chemists Association, Inc.

Manual L-1      Guide to Precautionary Labeling of Hazardous  
Chemicals (Sixth Edition - 1961)

(Application for copies should be addressed to the Manufacturing Chemists Association, Universal Building, 1825 Connecticut Avenue, Washington, D. C., 20009.)

## 3. REQUIREMENTS

3.1      Preproduction - Unless otherwise specified, prior to production, a sample shall be tested to determine compliance with the requirements of this specification.

3.2      Materials - The materials used in the manufacture of the resin shall be as specified herein. The resin shall be of the phenolic or modified phenolic thermosetting laminating type. The component materials of the resin shall be such that the cured resin shall not be corrosive to metals.

3.3      Form - The resin shall be in a form suitable for impregnating, or may be already impregnated on glass fabric (dry lay-up). Unless otherwise specified, prepreg shall be made using glass fabric No. 181.

3.3.1      Code number - The manufacturer shall designate each resin composition by a code number which shall be used to identify the resin. The code number may include trade name, if desired. The manufacturer's code number shall appear on the instruction sheet and on the label of the resin container and on the dry lay-up material. Any changes in the components or manufacturing procedures shall necessitate the assignment of a new code number. For dry lay-up materials, those materials using the same resin but having different properties under 3.5 as a result of different impregnating conditions, shall have different designations and shall be submitted independently for acceptance as different materials. The designation shall consist of the resin code number with a suffix indicating impregnating conditions.



(c) Solids content (average and tolerance).

(d) Flow (average and tolerance).

TABLE I

Lengthwise mechanical and physical properties of Grade A and B  
glass fabric base plastic laminates with test methods 1/

Fed. Std. No. 406, Test Method No. (Except as noted)	Property	Requirements and values <u>2/</u>	
		Grade A	Grade B
Under standard conditions			
1031	Flexural, flatwise, psi: Ultimate strength Initial modulus of elasticity	50,000 3.0 x 10 <sup>6</sup>	73,000 3.5 x 10 <sup>6</sup>
1011	Ultimate tensile strength, psi	40,000	46,000
1021	Ultimate compressive strength edgewise, psi	35,000	58,000
2021	Flammability, inches per minute	1.0 (max)	1.0 (max)
7031	Water absorption, 24 hours im- mersion, percent change in weight	+1.25 (max)	+1.25 (max)
4.7.1.2 5011 or 5012 7061	Barcol hardness Specific gravity <u>3/</u> Resin content, percent <u>3/</u>	55	55
Wet conditions (see 4.3.2)			
1031	Flexural, flatwise, psi: Ultimate strength Initial modulus of elasticity	45,000 2.50 x 10 <sup>6</sup>	70,000 3.0 x 10 <sup>6</sup>
1011	Ultimate tensile strength, psi	38,000	44,000
1021	Ultimate compressive strength, edgewise, psi	30,000	53,000

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TABLE I (Continued)

Fed. Std. No. 406, Test Method No. (Except as noted)	Property	Requirements and values <u>2/</u>	
		Grade A	Grade B
Tested at 160° F after exposure to 160° F for 1/2 hour			
1031 and 4.3.3.1	Flexural, flatwise, psi: Ultimate strength	50,000	69,000
	Initial modulus of elasticity	3.0 x 10 <sup>6</sup>	3.3 x 10 <sup>6</sup>
After immersion in chemical fluids <u>4/</u>			
4.3.4	Fluid conforming to MIL-H-5606:		
7011	Percent change in weight (increase or decrease)	2.0 (max)	0.2 (max)
7011	Percent change in thickness (increase or decrease)	0.2 (max)	0.2 (max)
1031	Ultimate flexural strength, psi	45,000 (min)	70,000 (min)
4.3.4	Fluid conforming to TT-I-735		
7011	Percent change in weight (increase or decrease)	2.0 (max)	0.2 (max)
7011	Percent change in thickness (increase or decrease)	0.1 (max)	0.1 (max)
1031	Ultimate flexural strength, psi	45,000 (min)	70,000 (min)
4.3.4	Fluid conforming to O-A-548:		
7011	Percent change in weight (increase or decrease)	2.0 (max)	0.2 (max)
7011	Percent change in thickness (increase or decrease)	0.1 (max)	0.1 (max)
1031	Ultimate flexural strength, psi	45,000 (min)	70,000 (min)

TABLE I (Continued)

Fed. Std. No. 406, Test Method No. (Except as noted)	Property	Requirements and values <u>2/</u>	
		Grade A	Grade B
4.3.4	Fluid conforming to TT-S-735 (type III):		
7011	Percent change in weight (increase or decrease)	2.0 (max)	0.2 (max)
7011	Percent change thickness (increase or decrease)	0.2 (max)	0.2 (max)
1031	Ultimate flexural strength, psi	45,000 (min)	70,000 (min)

1/ Lengthwise direction of test specimens is parallel to warp direction of glass fabric.

2/ Unless otherwise specified, all values are minimum for the average of five specimens.

3/ The specific gravity and resin content by weight shall be noted for the panels tested.

4/ The samples shall show no cracking, crazing, delamination, or any other visible deterioration after exposure or immersion cycle.

TABLE II

Lengthwise mechanical properties of Grade A and B laminates at elevated temperatures

Fed. Std. No. 406, Test Method No. (Except as noted)	Property	Requirements and values <u>1/</u>	
		Grade A	Grade B
Tested at 500° F after 1/2 hour exposure to 500° F			
1031 and 4.3.3.2	Flexural, flatwise, psi:		
	Ultimate strength	40,000	52,000
	Initial modulus of elasticity	3.0 x 10 <sup>6</sup>	3.1 x 10 <sup>6</sup>
1021 and 4.3.3.2	Ultimate compressive strength, edgewise, psi	30,000	32,000

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TABLE II (Continued)

Fed. Std. No. 406, Test Method No. (Except as noted)	Property	Requirements and values <u>1/</u>	
		Grade A	Grade B
1011 and 4.3.3.2	Ultimate tensile strength, psi	30,000	39,000
Tested at 500° after 100 hours exposure at 500° F			
1031 and 4.3.3.2	Flexural, flatwise, psi:		
	Ultimate strength	20,000	45,000
	Initial modulus of elasticity	2.5 x 10 <sup>6</sup>	2.9 x 10 <sup>6</sup>

1/ Unless otherwise specified, all values are minimum for the average of five specimens.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may utilize 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 supplies and services conform to prescribed requirements.

4.2 Classification of inspections - The inspection of the resin shall be classified as:

- (a) Preproduction inspection (4.4)
- (b) Quality conformance inspection (4.5)

#### 4.3 Test conditions -

4.3.1 Atmospheric conditions - Atmospheric conditions surrounding tests shall be 70° to 80° F and 30 to 60 percent relative humidity. If it is found that these conditions affect the test results significantly, then tests shall be conducted under

standard conditions. Standard conditions shall be  $73.4^{\circ} \pm 2^{\circ}$  F and  $50 \pm 4$  percent relative humidity. Specimens shall be tested after being exposed for 4 days to this temperature and humidity.

4.3.2 Wet conditions - Wet conditions shall be 2 hours immersion in boiling, distilled water. The specimens shall be cooled in water. The tests shall be made wet immediately after removal of the specimen from the water. In case of any question as to the validity of the test results, wet conditions shall be 30 days soaking in distilled water at room temperature, tested wet immediately after removal of the specimen from the water. Results determined under these conditions shall be final.

4.3.3 Exposure at elevated temperatures -

4.3.3.1 Exposure at  $160^{\circ}$  F - Specimens shall be exposed for 1/2 hour at a temperature of  $160^{\circ} \pm 2^{\circ}$  F in the test chamber previously heated to the temperature of test and tested immediately at the same temperature.

4.3.3.2 Exposure at  $500^{\circ}$  F - The procedure for exposure for 1/2 hour or 100 hours and test shall be the same as in 4.3.3.1, except that the exposure and test temperature shall be  $500^{\circ} \pm 3^{\circ}$  F.

4.3.4 Immersion in chemical fluids - Specimens shall be conditioned in accordance with Method 7011 of Federal Test Method Standard No. 406 (except that the immersion period shall be 24 hours and the specimens shall be 4 inches instead of 3) and tested in accordance with 4.7.1.1 and Method 1031 of Federal Test Method Standard No. 406 immediately after immersion in the fluids specified in Table I.

4.4 Preproduction inspection. -

4.4.1 Sample - For each code number of resin or dry lay-up, the sample shall consist of 1 gallon of resin (not required for dry lay-up) or sufficient impregnated fabric to fabricate a 2 by 2 foot by 1/8-inch thick laminate. Two copies of the instruction sheet specified in 3.6 shall be furnished with the sample.

4.4.1.1 Fabrication of laminate for test purposes - A glass fabric base plastic laminate panel shall be fabricated in the form of a flat sheet employing a parallel lay-up, using the resin to be tested and 12 plies of 181 glass fabric finished in accordance with MIL-C-9084. The laminate shall be fully cured in accordance with the resin manufacturer's instruction sheet. The laminate shall be essentially void-free and representative of the best workmanship and shall have a resin content by weight which will produce laminates with optimum properties. Specimens from this panel shall be tested to determine conformance with 3.5. Five specimens shall be used for each test.

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4.4.2 Identification - Preproduction test specimens shall be forwarded to the activity responsible for testing, as specified in the contract or order (see 6.2), plainly identified by securely attached durable tags marked with the following information:

Sample for preproduction inspection  
 Resin, or dry lay-up, Grade \_\_\_\_\_  
 Manufacturer's name  
 Manufacturer's designation and code number  
 Submitted by (name) (date) for testing in accordance with  
 MIL-R-9299C under authorization (reference letter of author-  
 ization).

4.4.3 Inspections - The preproduction inspection of resin (or dry lay-up) shall consist of the examination and tests specified under 4.6 and 4.7.

4.5 Quality conformance inspections -

4.5.1 Lot size - All material offered for delivery at one time shall be considered a lot for the purpose of quality conformance inspection.

4.5.2 Sampling for material conformance - Two quarts of resin or sufficient dry lay-up material to fabricate a 1 by 2 foot by 1/8-inch thick laminate shall be selected at random from each lot and shall be subjected to the tests specified in 4.7.2 and 4.7.3 for the resin and in accordance with 3.6.2 for the dry lay-up.

4.5.3 Sampling for filled container conformance - A random sample of filled resin containers shall be selected from each lot in accordance with MIL-STD-105, inspection level I, acceptable quality level of 2.5 percent defective and shall be subjected to the examination specified in 4.6.2. Any container in the sample having one or more defects, or which is under required fill, shall be cause for rejection, and if the number of defective containers in any sample exceeds the acceptance number for the appropriate sampling plan of MIL-STD-105, the lot represented by the sample shall be rejected.

4.6 Examinations -

4.6.1 Packaging, packing, and marking - Preparation for delivery shall be inspected for conformance to Section 5.

4.6.2 Examination of filled containers - Each unit sample selected as specified in 4.5.3 shall be visually examined for defects in accordance with MIL-STD-105 or Table III.

TABLE III

Classification of defects in accordance with MIL-STD-105

Categories	Defects
Critical: 1	None defined.
Major: 101	Type not as specified, (oblong, square or round).
102	Gauge of steel not within requirements.
103	Size (capacity) not as specified.
104	Container not coated or coating nonconforming, (internal and external, as applicable).
105	Means of closure not as required; closure (cover) leaks, (container inverted); gasket, when applicable, missing, damaged or nonconforming.
106	Seam improperly formed, soldered or welded.
107	Seam leaks.
108	Not the required volume (fill).
109	Marking (as to content) not as specified, missing or illegible.
Minor: 201	Not free from dents, scratches, burrs or sharp exposed edges.
202	Evidence of rust or corrosion.
203	Bails improperly attached or missing (when applicable).
204	Diameter of bail wire less than allowable minimum (when applicable).
205	Bail wire hand grip missing, nonconforming, not wood or metal as required (when applicable).

#### 4.7 Tests -

4.7.1 Mechanical and physical properties - The mechanical and physical properties of the laminate shall be determined in accordance with the methods specified in Table I and Table II, and as follows.

4.7.1.1 Change in weight, thickness, and flexural strength after immersion in chemical fluids - At least five samples of the laminates, approximately 1 inch by 4 inches, shall be weighed to the nearest milligram and measured for thickness at the center to the nearest 0.0001 inch. The samples shall then be immersed in the fluid as specified in Table I for 24 hours at  $73.4 \pm 2^\circ$  F. After removal from the fluid, the samples shall be wiped free of surface fluid and immediately weighed and the thickness measured as above. A separate set of specimens shall be used for chemical resistance tests in each of the four specified fluids and, immediately after the measurements are

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completed, the flexural strength shall be determined in accordance with Method 1031 of Federal Test Method Standard No. 406. The flexural strength shall be based on the dimensions of the specimen before immersion. The percent increase or decrease in weight and thickness and the flexural strength shall be reported, as well as any perceptible softening, delamination, or other deterioration.

4.7.1.2 Barcol hardness - The Barcol hardness of the laminate shall be obtained on each specimen by direct reading on a Barcol impressor. Size of the laminate specimen shall be in accordance with Method 1081 of Federal Test Method Standard No. 406.

4.7.2 Specific gravity - Specific gravity of the liquid resin shall be determined by weighing a specific volume of the resin to the nearest 0.001 gram and dividing by the volume in cubic centimeters.

4.7.3 Viscosity - Viscosity of the liquid resin shall be determined by a calibrated McMichael viscosimeter, or equivalent. The test procedure shall be submitted by the manufacturer.

4.7.4 Volatile content (dry lay-up), (see 3.6.2) - The test method shall be determined by the manufacturer.

4.7.5 Solids content (dry lay-up), (see 3.6.2) - The test method shall be determined by the manufacturer.

4.7.6 Flow of pre-impregnated material (dry lay-up) - The flow of pre-impregnated material shall be determined in the following manner: Four 4-inch squares shall be cut from the impregnated fabric material. These specimens shall be weighed. Specimens of 4 plies shall be wrapped in cellophane and placed between platens of the flow meters before being pressed into a laminate under conditions specified by the manufacturer. After removing the specimen from the flow meter the cellophane, as well as all the flash resin that has flowed from the laminate, shall be removed from the 4 edges. The specimen shall then be re-weighed. This weight shall be subtracted from the original weight, divided by the original weight, and multiplied by 100 to obtain the flow (see 3.6.2).

4.8 Rejection criteria - Failure of any lot sample to fully meet the requirements herein shall reject the lot represented. Disposition of inspection lots found unacceptable under initial conformance inspection shall be in accordance with MIL-STD-105.

## 5. PREPARATION FOR DELIVERY

5.1 Packaging - Packaging shall be level A or C, as specified (see 6.2).

5.1.1 Level A - The resin shall be furnished in 1-gallon cans, 5-gallon pails, 16- or 55-gallon drums, as specified (see 6.2).

5.1.1.1 Cans - Cans shall conform to Type V, Class 2, round, of PPP-C-96. Cans shall be fabricated from tin plate having a minimum coating of 9.25 ounces per base box. Exterior plan B coating shall be used in accordance with PPP-C-96. Cans shall be provided with wire handles which shall be galvanized or protectively coated to resist corrosion.

5.1.1.2 Pails - The 5-gallon pails shall conform to Type II, Class 3 of PPP-P-704. Wire handles or bails shall be galvanized or protectively coated to resist corrosion.

5.1.1.3 Drums -

5.1.1.3.1 Sixteen-gallon drums - The 16-gallon drums shall conform to type III of PPP-D-705.

5.1.1.3.2 Fifty-five gallon drums - The 55-gallon drums shall conform to Type III or Type IV of PPP-D-729.

5.1.2 Level C - Resin shall be packaged in accordance with the contractor's commercial practice.

5.2 Packing - Packing shall be Level A, B, or C, as specified (see 6.2).

5.2.1 Level A-

5.2.1.1 Cans - Cans shall be arranged and packed for shipment in accordance with the appendix to PPP-C-96.

5.2.1.2 Pails and drums - No further packing required. When specified (see 6.2), 5-gallon pails and 16-gallon drums shall be palletized in accordance with MIL-STD-147.

5.2.2 Level B -

5.2.2.1 Cans - Cans shall be arranged and packed for shipment in accordance with the appendix to PPP-C-96.

5.2.2.2 Pails and drums - No further packing required. When specified (see 6.2), 5-gallon pails and 16-gallon drums shall be palletized in accordance with MIL-STD-147.

5.2.3 Level C - Material shall be packed in containers which will insure acceptance by common carrier and safe delivery at destination. Shipping containers

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or method of packing shall comply to the Uniform Freight Classification Rules and Regulations or other carrier regulations as applicable to the mode of transportation.

5.3 Marking for shipment - In addition to any special marking required by the contract or order or herein, interior packages, exterior shipping containers, and palletized unit loads shall be marked in accordance with MIL-STD-129. The nomenclature shall include:

RESIN, PHENOLIC, LAMINATING  
MIL-R-9299C  
Resin, Grade \_\_\_\_\_  
Batch number \_\_\_\_\_

5.3.1 Hazardous chemicals - All packaged units of hazardous chemicals shall have affixed thereto such warning labels and markings as may be required by the Department of Transportation (DOT) Regulations, 49 CFR 171-178, and the Manufacturing Chemists Association Manual L-1.

5.3.2 Warning markings - All packaged units shall be marked:

WARNING: USE WITH ADEQUATE VENTILATION - FLAMMABLE -  
The solvents contained in this compound may have flash points well below prevailing room temperatures. Do not heat by, or use near an open flame. Heat preferably by means of a steam coil or other nonflame-producing heat source.

## 6. NOTES

6.1 Intended use - Phenolic or modified phenolic laminating resin of the condensation cure type may be used in fabricating laminates for general structural parts and other applications.

6.2 Ordering data - Procurement documents should specify:

- (a) Title, number, and date of this specification.
- (b) Grade
- (c) Where the preproduction samples should be sent and the activity responsible for testing (see 4.4.2).
- (d) Type and size of container required (see 5.1.1).
- (e) Levels of packaging and packing required (see 5.1 and 5.2).
- (f) If palletization is required (see 5.2.1.2 and 5.2.2.2).
- (g) Frequency of periodic lot check testing.

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6.3 Grade A material of this specification replaces both types and classes of MIL-R-9299B(ASG). Grade B covers a new material with improved properties.

Custodians:

Army - MR

Navy - AS

Air Force - (11)

Preparing activity:

Navy - AS

Project No. 9330-0265

Review activities:

Army - MR, MI, MU

Navy - AS

Air Force - (84), (85)

User activities:

Army -

Navy -

Air Force -

Review/user information is current as of the date of this document. For future coordination of changes to this document, draft circulation should be based on the information in the current Federal Supply Classification Listing of DOD Standardization Documents.

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
INSTRUCTIONS		
This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).		
SPECIFICATION		
<b>MIL-R-9299C RESIN, PHENOLIC, LAMINATING</b>		
ORGANIZATION (Of submitter)		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO      IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED (Printed or typed name and activity)		DATE

DD FORM 1426  
1 NOV 64

REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE

C-8279

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Naval Air Engineering Center  
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