METRIC

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MILITARY SPECIFICATION

FLUX, SOLDERING, LIQUID (ROSIN BASE)

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

1. SCOPE

1.1 Scope. This specification covers rosin-base liquid fluxes used in the preparation of solder joints for electrical/electronic circuits (see 6.1 to 6.1.4, inclusive).

1.2 Classification. Flux covered by this specification shall be of the following types, as specified:

Type R - Rosin base (see 3.2.1.1). This is equivalent to flux type R of QQ-S-571.
Type RMA - Mildly activated rosin base (see 3.2.1.2). This is equivalent to flux type RMA of QQ-S-571.
Type RA - Activated rosin base (see 3.2.1.3). This type is equivalent to flux type RA of QQ-S-571.

2. APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

AMSC N/A FSC 3439

SPECIFICATIONS

FEDERAL

QQ-S-571 - Solder; Tin Alloy, Tin-Lead Alloy, and Lead Alloy.
PPP-C-2020 - Chemicals, Liquid, Dry and Paste; Packaging Of.

MILITARY

MIL-P-116 - Preservation, Methods Of.

STANDARDS

FEDERAL

FED-STD-313 - Material Safety Data Sheets, Preparation and the submission of.

MILITARY

MIL-STD-129 - Marking for Shipment and Storage.
MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
MIL-STD-45662 - Calibration Systems Requirements.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DoD SD-6 - Provisions Governing Qualification.

(Application for copies should be addressed to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 36 - Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar.

ASTM D 465 - Acid Number of Rosin, Test Methods for.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

THE INSTITUTE FOR INTERCONNECTING AND PACKAGING ELECTRONIC CIRCUITS (IPC)

IPC-B-25 - IPC Multipurpose Test Board.
IPC-TM-650 - Test Methods Manual.

(Application for copies should be addressed to the Institute for Interconnecting and Packaging Electronic Circuits, 7380 Lincoln Ave, Lincolnwood, IL 60646.)

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

EIA-571 - Statistical Process Control Systems.

(Application for copies should be addressed to the Electronic Industries Association, Engineering Department, 1722 Eye Street, NW, Washington, DC 20006.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The flux furnished under this specification shall be a product which is qualified per this specification, SD-6 and listed on the applicable qualified products list (QPL) at the time set for opening of bids (see 4.5 and 6.3). Any change in the formulation of a qualified product will necessitate its requalification. The material supplied under contract shall be identical, within manufacturing tolerance, to the product receiving qualification.

3.2 Material.

3.2.1 Composition.

3.2.1.1 Type R. The flux shall be composed of gum rosin, wood rosin or tall oil rosin having a minimum acid value of 130 dissolved in, or plasticized by, a nonhalogenated solvent. No additional additives are permitted. Modified natural rosins meeting requirements of this specification are acceptable. Manufacturers of flux shall maintain records indicating the acid value of all rosin used to formulate their products in compliance with this specification. To determine the acid number of rosin use ASTM D 465 (see 4.3).

3.2.1.2 Type RMA. The flux shall be composed of gum rosin, wood rosin or tall oil rosin having a minimum acid number of 130 dissolved in, or plasticized by a nonhalogenated solvent. Modified natural rosins meeting requirements of this specification are acceptable. Additives introduced for the purpose of improving the fluxing action shall be such as to provide a flux meeting the requirements of this specification (see 4.3). Manufacturers of flux shall maintain records indicating the acid value of all rosin used to formulate their products in compliance with this specification. To determine the acid number of rosin use ASTM D 465 (see 4.3).

3.2.1.3 Type RA. The flux shall be composed of gum rosin, wood rosin or tall oil rosin having a minimum acid number of 130 dissolved in, or plasticized by a nonhalogenated solvent. Modified natural rosins meeting requirements of this specification are acceptable. Additives introduced for the purpose of improving the fluxing action shall be such as to provide a flux meeting the requirements of this specification (see 4.3). Manufacturers of flux shall maintain records indicating the acid value of all rosin used to formulate their products in compliance with this specification. To determine the acid number of rosin use ASTM D 465 (see 4.3).

3.2.2 Nonvolatile content. The flux manufacturer shall certify that a minimum of 51.0% of the nonvolatile content is rosin. For an optional test method to verify certification, see 4.7.6 and 6.1.4.1.

3.2.3 Resistivity of water extract. When the flux is tested as specified in 4.7.2, the mean of the specific resistivities of the water extracts shall be at least 100,000 ohm-centimeters (ohm-cm) for type R and type RMA flux, and 50,000 ohm-cm for type RA flux.

3.2.4 Halide content (applicable to Types R, RMA and RA). Halides of interest are chlorides (Cl), bromides (Br) and fluorides (F). In order to control these within acceptable limits, and prevent possible corrosive effects, testing for Cl, Br, and F shall be performed per 3.2.4.1, 3.2.4.2 and 3.2.4.3.

3.2.4.1 Silver chromate paper test. When the flux is tested, there shall be no significant reaction to halides present by a color change of the paper to off-white or yellow white (see 4.7.3.1).

The silver chromate paper test is required for all fluxes. Additional testing is required if the flux fails the silver chromate paper test (see 3.2.4.3). A flux cannot fail for Halide content based solely upon the failure of the silver chromate paper test. Type RA flux will normally fail this test, serving as an indicator that it is classified/labeled correctly Type R flux fails if the silver chromate test is positive.

3.2.4.2 Tests for Fluorides. A qualitative test is required for all fluxes. Type R flux must test negative to pass when tested as in 4.7.3.2. Flux testing positive shall be tested quantitatively to determine the concentration of fluoride present (see 4.7.3.2).

3.2.4.3 Halide ion testing for combined Chloride (Cl) and Bromide (Br) content. If a flux fails the silver chromate paper test, see 3.2.4.1 and 4.7.3.1, a quantitative test for the chloride and bromide ions shall be performed (see 4.7.3.3). The following limits for either one or a combination of these ions shall apply:

For RMA - 0.040 Milliequivalents per gram (meq/g) of solids
For RA - 0.284 Milliequivalents per gram (meq/g) of solids

If fluoride is found, see 3.2.4.2 and 4.7.3.2, its concentration, expressed in meq/g solids, shall be added to the concentration of the chloride and/or bromide ion(s), expressed in meq/g, if also present. Any single ion or combination of the ions of fluoride, chloride and/or bromide shall not exceed the above limits.

3.3 Flux reliability.

3.3.1 Effect on copper mirror (applicable to Type R and Type RMA). When tested as specified in 4.7.3.4, the flux fails this test if there is any complete removal of the copper film, as evidenced by the white background showing through. Discoloration of the copper due to a superficial reaction or only a partial reduction of the thickness of the copper film shall not be cause for failure.

3.3.2 Surface insulation resistance. When tested as specified in 4.7.4, the insulation resistance of all test specimens shall be not less than 100 megohms at 96 and 168 hours under conditions of 85 + 2°C and 85% relative humidity. Specimens shall have a minimum 500 megohms resistance two hours after completion of testing. Failed specimens shall be retested using new test patterns. Testing of specimens 24 to 72 hours after removal from chamber shall indicate resistance equal to or exceeding pre-test values.

3.3.3 Solder spread factor. When tested as specified in 4.7.5, the solder spread factor test results shall be expressed in square millimeters (mm^2).

The following are minimum requirements for the Solder spread Test Method in 4.7.5:

Flux Type	Area in mm^2
RMA	90
RA	100

3.3.4 Solids Content Process Control Test (see 4.7.6). There is no specific requirement regarding solids content; however 51.0% of the minimum nonvolatile content shall be rosin (see 3.2.2).

3.4 Safety and Health Requirements. Fluxes formulated per this specification shall contain only nonhalogenated solvents. These might possibly include an alcohol (see 3.2.1.1 thru 3.2.1.3). The solvent acts as a vehicle for the solids, and, if present, various additives and/or activators.

It is mandatory that flux be used only in well ventilated areas well away from any possible sources of ignition such as open flames, sparks or anything that might produce an electrostatic discharge.

Applicable local and federal regulations concerning hazardous materials shall be reviewed and invoked to ensure safety of all personnel possibly exposed to any flux, associated solvents, additives, gases, vapors or smoke particles resulting from its use.

3.5 Environmental Protection. Solvents (s) used in flux, all resultant, gases, smoke particles, evaporant or leakage produced by or from flux during its use and/or storage shall be considered as hazardous material. This is also true of flux and/or associated vapors or solvents subject to waste disposal. Certain chemicals have been identified in the Occupational Safety and Health Act (OSHA) as cancer-producing substances (carcinogens). Before using or disposing of any materials which might contain these chemicals, they shall be evaluated in accordance with the CFR, Title 29, Chapter XVII, Part 1910.

In addition, all applicable local and federal regulations such as the Environmental Protection Agency (EPA) concerning use, storage and disposal of hazardous materials shall be invoked as prescribed.

3.6 Workmanship. The flux shall be compounded and processed to ensure that it is uniform in quality and free from deleterious material and other defects that could adversely affect shelf life, serviceability, or appearance.

4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Responsibility for compliance. Fluxes covered by this specification shall meet all requirements of sections 3 and 5. The inspection(s) defined in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any additional specific inspection requirements in the specification does not relieve any flux manufacturer of the responsibiity of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the purchase order or contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements. However, this does not authorize submission of known defective material, as indicated by test data, nor does it commit the Government to accept defective material either delivered or in transit.

4.1.2 Test equipment and inspection facilities. Test/measuring equipment and inspection facilities, of sufficient accuracy, quality and quantity to permit performance of the required inspections(s), shall be established and maintained or designated by the supplier. Establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with MIL-STD-45662.

4.2 Classification of inspections. The inspections specified herein are classified as follows:

a. Materials inspection (see 4.3).
b. Qualification inspection (see 4.5)
c. Quality conformance inspection (see 4.6)
d. Packaging Inspection (see 4.8, 5.1 and 5.2).

4.3 Materials inspection. Materials inspection shall consist of certification supported by verifying data that the materials listed in Table I, used in compounding the flux, are in accordance with the applicable referenced specifications or requirements prior to such compounding. The verifying data and certification applicable to a qualification test sample shall be made a part of the qualification test report.

TABLE I. Material inspection

MATERIAL	REQUIREMENT PARAGRAPH	APPLICABLE SPECIFICATION
Rosin	3.2.1.1	ASTM D 465
	3.2.1.2	ASTM D 465
	3.2.1.3	ASTM D 465
Solvent 1/	3.2.1.1	
	3.2.1.2	
	3.2.1.3	
Additives 2/	3.2.1.1	
	3.2.1.2	
	3.2.1.3	

1/ Verification of solvent as nonhalogenated.
2/ Verification of presence or absence of additives.

4.4 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions specified in "GENERAL REQUIREMENTS" of MIL-STD-202.

4.5 Qualification inspection (applicable to types R, RMA, and RA). Qualification inspections shall be performed at a laboratory acceptable to the Government (see 6.3) on samples produced with equipment and procedures normally used in production.

4.5.1 Sample size. A sample of 0.47 L of flux shall be furnished in a sealed container and subjected to qualification inspections.

4.5.2 Inspection routine. The sample shall be subjected to the inspections specified in Table II.

TABLE II. Qualification inspection.

EXAMINATION OR TEST	REQUIREMENT PARAGRAPH(S)	METHOD PARAGRAPH(S)
Visual examination	3.2.1.1 to 3.2.1.3, plus 3.4 and 3.7	4.7.1
Material		
Resistivity of water extract	3.2.3	4.7.2
Halide content	3.2.4	4.7.3 thru 4.7.3.3
Flux reliability		
Effect on copper mirror	3.3.1	4.7.3.4
Surface insulation resistance	3.3.2	4.7.4
Fluxing action		
Solder spread factor	3.3.3	4.7.5

4.5.3 Failure. One or more failures shall be cause for refusal to grant qualification.

4.5.4 Retention of qualification. To retain qualification, the supplier shall forward a report at 12-month intervals to the qualifying activity. The qualifying activity shall establish the initial reporting date. The report shall consist of:

a. A summary of the results of the tests performed for inspection of product for delivery, groups A and B (see 4.6.1.3 and 4.6.1.4), indicating the number of lots that have passed and the number that have failed. The test results of all reworked lots shall be identified and accounted for.

b. A summary of the results of tests performed for qualification retention inspection, group C (see 4.6.2.1), including the number and mode of failures. The summary shall include results of all qualification retention inspection tests performed and completed during the 12-month period. If the summary of the test results indicates nonconformance with specification requirements, and corrective action acceptable to the qualifying activity has not been taken, action may be taken to remove the failing product from the qualified products list. Failure to submit the report within 30 days after the end of each 12-month period may result in loss of qualification for the product. In addition to the periodic submission of inspection data, the supplier shall immediately notify the qualifying activity at any time during the 12-month period that the inspection data indicates failure of the qualified product to meet the requirements of this specification. If no production has

occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. If during two consecutive reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit representative flux to testing in accordance with the qualification inspection requirements.

4.6 Quality conformance inspection.

4.6.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B inspection.

4.6.1.1 Inspection lot. An inspection lot shall consist of all containers of flux produced from the same batch of component materials under essentially the same conditions, and offered for inspection at one time.

4.6.1.2 Batch. As far as practicable, a batch shall consist of all flux produced by one continuous production run or by a blend of two or more continuous production runs.

4.6.1.3 Group A inspection. Group A inspection shall consist of the examination specified in Table III.

TABLE III. Group A inspection.

EXAMINATION	REQUIREMENT PARAGRAPH	METHOD PARAGRAPH
Visual	3.2.1 to 3.2.1.3, plus 3.4 and 3.6	4.7.1

4.6.1.3.1 Sampling plan. A statistical process control system shall be established in accordance with EIA-557.

4.6.1.3.2 Rejected lots. If an inspection lot is rejected, the supplier may rework it to correct the defects, or screen out containers of defectivce materials and resubmit for reinspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected.

4.6.1.4 Group B inspection. Group B inspections shall consist of the tests specified in Table IV.

TABLE IV. Group B inspections.

TEST	REQUIREMENT PARAGRAPH	METHOD PARAGRAPH(S)
Halide content	3.2.4	4.7.3 thru 4.7.3.3
Effect on copper mirror	3.3.1	4.7.3.4

4.6.1.4.1 Sampling plan. Sampling shall be in accordance with EIA-557. One hundred twenty milliliters (120 mL) of flux shall be taken from each container selected.

4.6.1.4.2 Rejected lots. If an inspection lot is rejected, the supplier may rework it to correct the defects, or screen out containers of defectivce materials and resubmit for reinspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected.

4.6.1.4.3 Disposition of samples. Samples that have been subjected to group B inspection shall not be delivered on the contract or purchase order.

4.6.2 Qualification retention inspection. Qualification retention inspection shall consist of group C inspection. Except when the inspections show noncompliance with the applicable requirements (see 4.6.2.1.4), delivery of products that have passed groups A and B shall not be delayed pending results of these qualification retention inspections.

4.6.2.1 Group C inspection. Group C inspection shall consist of the examinations and tests specified in Table V, in the order shown. Group C inspection shall be performed on samples selected from inspection lots that have passed group A and B inspection.

TABLE V. Group C inspection.

EXAMINATION OR TEST	REQUIREMENT PARAGRAPH(S)	METHOD PARAGRAPH
Materials	3.2.1.1 to 3.2.1.3	4.3
Resistivity of water extract 1/	3.2.3	4.7.2
Surface insulation resistance	3.3.2	4.7.4
Solder spread factor	3.3.3	4.7.5
Acid number	3.2.1.1 to 3.2.1.3	4.3

1/ At the discretion of the Government, this test may be waived for type R flux.

4.6.2.1.1 Sampling plan. One hundred twenty milliliters (120 mL) of the flux shall be taken from the first batch, and thereafter from one batch in every 50 batches, or once each month, whichever is less frequent.

4.6.2.1.2 Failures. If a sample does not pass any one of the group C inspections, it shall be considered to have failed.

4.6.2.1.3 Disposition of samples. Residual flux samples that have been subjected to group C inspection shall not be delivered in accordance with the contract or purchase order.

4.6.2.1.4 Noncompliance. If a flux sample fails group C inspection, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure. Corrective action shall be taken, as warranted, on the materials and process(es). Corrective action shall also be taken regarding all product units that can be corrected and that were manufactured using essentially the same material(s) and process(es) and are considered subject to the same failure evidenced by the samples tested. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity, has been taken. After corrective action has been taken, group C inspection shall be repeated on additional sample units (all tests and examinations, or the test which the original sample failed, at the option of the qualifying activity). Groups A and B inspections may be reinstitiuted; however, final acceptance and shipment shall be delayed until group C reinspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.

4.7 Methods of examination and test.

4.7.1 Visual examination. The flux shall be examined to verify that the composition, marking, and workmanship are in accordance with the applicable requirements (see 3.2.1 to 3.2.1.3 inclusive, 3.4 and 3.7). The sample containers of flux shall be examined to verify that the construction, fill and marking are in accordance with the applicable requirements, and that there is no evidence of leakage.

4.7.2 Resistivity of water extract (see 3.2.3). Five (5) watch glasses and five (5) acid/alkali resistant graduated beakers shall be thoroughly cleaned by washing in hot water and detergent solution and rinsing several times with tap water followed by ay least five (5) distilled water rinses. CAUTION: All beakers shall be covered with watch glasses to protect the contents from contaminants. The beakers' dimensions shall be such that, when the conductivity cell is immersed in 50 mL of liquid contained therein, the electrodes are fully covered. Each cleaned beaker shall be filled to the 50 mL mark with distilled water. The beakers shall be immersed in a water bath maintained at 23 + 2°C. When thermal equilibrium is reached, the resistivity of the distilled water in each beaker shall be determined at this temperature with a conductivity bridge using a conductivity cell having a cell constant of approximately 0.1.

The resistivity of the distilled water in each beaker shall be at least 500,000 ohm-cm. If the resistivity of the water in any beaker is less than 500,000 ohm-cm, the complete process shall be repeated. Retain two of these beakers as controls. Add 0.100 + 0.005 mL of flux to each of the other three beakers by means of a calibrated dropper or micro syringe. The heating of all five beakers shall be started simultaneously. When the contents of each beaker comes to a boil, the boiling shall be timed for one minute. Follow this with a quick cooling of the beakers, under running tap water or by immersion in ice water, until they are cool enough to touch. The cooled, covered beakers shall then be placed in a water bath maintained at 23 ± 2°C.

When thermal equilibrium has been reached, the solution resistivity for each of the five beakers shall be determined at this temperature as follows: Thoroughly wash the conductivity cell with distilled water and immerse it in the water extract of one sample. Make an instrument reading. Thoroughly wash the conductivity cell in distilled water and continue measuring resistivities of the remaining control and water extract samples in the same manner.

The resistivity of each of the controls shall not be less than 500,000 ohm-cm. If the control value is less than 500,000 ohm-cm, it indicates that the water was contaminated with water-soluble ionized material(s) and the entire test shall be repeated. The mean of the specifiec resistivities of the flux extracts shall be calculated and recorded as resistivity of water extract.

4.7.3 Halide content.

4.7.3.1 Silver Chromate Paper Test Method for Chlorides and Bromides (see 3.2.4). Testing of type R and RMA fluxes for chlorides and bromides shall be performed in accordance with IPC-TM-650, method 2.3.33.

4.7.3.2 Tests for Fluorides (see 3.2.4 & 3.2.4.2). A qualitative spot test is employed utilizing a zirconium-alizarin purple lake that is discolored to yellow in the presence of fluorides:

Prepare a fresh zirconium-alizarin lake in three spots of a white spot plate by adding one drop each of:

1. Solution of 0.05 g of Sodium alizarin sulphonates in 50 mL of water.

2. Solution of 0.05 g of Zirconium nitrate in 50 mL of water acidified with 10 mL of Hydrochloric acid.

3. Water.

Add one drop of the solution of the flux to be tested to each of the spots. A change in color of the lake to yellow in an indication of fluoride(s).

Results of both qualitative tests, (1) Silver chromate paper and (2) Fluoride spot test, will determine which specific halides, if any, need to be further analyzed by quantitative testing (see 3.2.4.3 and 4.7.3.3).

Flux testing positive for fluoride shall be tested quantitatively using a specific ion electrode method. The procedure given by the manufacturer of the fluoride ion electrode is to be followed.

When fluorides are present in a flux, their concentration, as determined by fluoride ion electrode, shall be added to the chloride and bromide concentration as determined per para 4.7.3.3, the IPC titration method, to determine whether the flux is under the maximum allowable levels in 3.2.4.3.

4.7.3.3. Halide content Quantitative Test (see 3.2.4.3). If necessary for verification, the combined concentration of chloride and bromide shall be

determined in accordance with IPC-TM-650, method 2.3.35. Flux having more than 0.040 milliequivalents per gram (meq/g) of solids for type RMA or more than 0.284 meq/g for type RA shall be cause for rejection (see 3.2.4.3). IPC Test Method Number 2.3.35 for Halide content determination should be followed in its entirety except for Section 5.2.1.

In section 5.2.1, the formula for the calculation should be substituted by the following formula to express the result in milliequivalents per gram (meq/g) of solids:

$$\text{Halides } (Cl^- \text{ and } Br^-) \text{ as meq/g solids} = \frac{V \times N}{M \times S}$$

where:

V = the volume of silver nitrate solution (0.1N) in mL.
N = the normality of the silver nitrate solution.
M = the mass of the flux sample in grams (g).
S = the percentage of solids (non-volatile components) of the flux.

4.7.3.4 Effect on copper mirror (see 3.3.1). Testing of fluxes for effect on copper mirror shall be performed in accordance with IPC-TM-650, Method 2.3.32.

4.7.4 Surface insulation resistance (see 3.3.2). Testing of fluxes for surface insulation resistance shall be performed in accordance with IPC-TM-650, Method 2.6.3.3. Test results shall be reported as the mean of the surface insulation resistance of three (3) comb patterns.

4.7.5 Solder spread testing (see 3.3.3). The solder spread shall be determined by means of a flux wetting/spreading test (static method) as follows:

Clean five (5) replicates of 0.254 mm thick 70/30 Brass (per ASTM B36 C26000 H02) coupons, 38.10 x 76.20 mm long, with #00 Steel wool. Using a flat strip of brass, bend the opposite ends parallel to the curve of the metal coil to stiffen and flatten the test coupon. Place one drop (0.05 mL) of flux on the test coupon. Cut a 30.16 mm length of Sn60 1.60 mm diameter Type S solid wire solder meeting the requirements of QQ-S-571. Wrap the cut length of solder around a 3.18 mm mandrel. Place the preformed solder in the center of the flux on the test coupon.

A solder pot containing at least 4kg of solder and no less than 25 mm in depth shall be maintained at 260°C. Carefully place the coupon on the surface of the solder bath for 15 seconds. Remove the coupon in a horizontal position and place on a flat surface allowing the adhered solder to solidify undisturbed. Remove all flux residue with a suitable solvent, e.i. Methylchloroform (1,1,1 Trichloroethane). Measure the solder spread area by comparing to circles (pre-drawn) with areas similar to those listed in Table VI. The mean of the spread of all five samples tested is to be reported and must meet the minimum requirement.

The minimum solder spread requirement for types RMA and RA flux is:

RMA = 90 mm^2
RA = 100 mm^2

Table VI is intended as an aid in defining areas in mm^2.

TABLE VI. Areas defined in mm^2.

RADIUS IN mm	DIAMETER in mm	AREA in mm^2
5.00	10.00	78.54
5.21	10.41	85.28
5.33	10.67	89.28
5.35	10.70	90.00*
5.49	10.99	95.03
5.64	11.28	100.00**
5.75	11.43	103.87
5.99	11.99	113.09

* - Minimum for RMA
** - Minimum for RA

4.7.6 Solids content process control test. There is no specifiec requirement for solids content; however, a suggested test for process control is in paragraph 6.1.4.1.

4.8 Packaging inspection. Packaging inspection requirements specified herein are classified as follows:

a. First Article Inspection of Packaging.

b. Quality Conformance Inspection of Packaging.

4.8.1 First Article Inspection of Packaging. Unless otherwise specified in the contract, First Article Inspection of Packaging shall be in accordance with the Unit Pack Design Validation Requirements of MIL-P-116.

4.8.2 Quality Conformance Inspection of Packaging.

4.8.2.1 Materials inspection. All materials to be used in packaging shall be inspected in accordance with the applicable material specification.

4.8.2.2 Preservation inspection. Inspection of preservation and interior markings shall be in accordance with group A and B Quality Conformance Inspection Requirements of MIL-P-116. Lot formation and sampling procedures shall be as specified therein.

4.8.2.3 Packing inspection. Inspection of packing, marking for shipment and storage shall consist of the examinations specified in Table VII,

"PACKAGING INSPECTION PROVISIONS." Lot formation shall consist of all packs made of the same materials during an identifiable period and submitted at one time for acceptance. Sampling procedures shall be in accordance with EIA-557.

TABLE VII. Packing Inspection Provisions.

No.	Characteristic	Method of Inspection
101	Intermediate container not as specified	Visual
102	Improper closure of intermediate container	Visual
103	Shipping containers not in accordance with specification	Visual
104	Excessive cube	Visual
105	Improper blocking and bracing	Visual
106	Closure not in accordance with specification	Visual
107	Weight and size exceed container limitations	Weigh and measure
108	Strapping not in accordance with specification, incorrectly applied, omitted	Visual
109	Marking omitted, incorrect, or illegible	Visual

5. PACKAGING

5.1 Packaging. Packaging shall be in accordance with PPP-C-2020, Commercial level, paragraphs 3.2.3 and 3.3.3.

5.2 Marking. Marking shall be in accordance with MIL-STD-129. In addition to any special marking required by the contract or purchase order, individual containers shall be marked with the manufacturer's name, date of manufacture, shelf life (i.e. 3 years at 25°C), code symbol, Qualification Test Report Number and type as specified in 1.2 (see (6.2).

5.3 Compliance with transportation regulations. The fluxes covered by this specification are liquid. Most are flammable and have other hazardous characteristics (see para 3.5 and 3.6). Special precautions and regulations for transportation are applicable. Specific carrier guidelines regarding maximum volume and/or weight, special hazardous marking and documentation, unit packaging limits, and the destination shall be followed (see PPP-C-2020, paragraph 3.6).

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The fluxes covered by this specification are intended for use in the assembling of electronic circuitry and associated electrical equipment by means of tin-lead solders. For fluxing purposes, a soldered joint that functions as both a mechanical and an electrical joint (i.e., in grounding applications through a printed wiring board) is to be considered an electrical connection.

6.1.1 Type R flux. This type of flux is the purest rosin base flux obtainable.

6.1.2 Type RMA flux. This type of flux contains additives to provide a more active fluxing action than type R flux.

6.1.3 Type RA flux. CAUTION: Type RA flux usually contains corrosive materials which could adversely effect Electronic/Electrical properties of components and/or circuitry. It should only be used in the event type R or RMA have been determined to be inadequate, and only with approval from the procuring activity. Type RA flux residues should be completely removed after soldering. Appropriate tests and visual examination should be used to ensure the post-cleaning absence of residual deleterious substances.

6.1.4 Recommendations on flux use. To ensure maximum reliability and service life, only type R or RMA flux should be used to assemble or repair electronic equipment. Type RA or any flux containing polyglycol(s), water base, should not be used for these applications since their residues might cause corrosinon or electonlytic degradation of components or circuit elements (see 6.1.3).

6.1.4.1 Optional flux solids content determination (see 4.7.6). An optional means to determine the solids content of flux is IPC-TM-650, method 2.3.34.

6.2 Aquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. The applicable issue of The Department of Defense Index of Specifications

and Standards (DODISS) to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1 thru 2.2).

c. Type of flux required (see 1.2).

d. Applicable marking (see 3.4 thru 3.6).

e. Commercial preservation and packing (see 4.8 thru 5.2).

f. When first article packaging inspection test reports require Acquisition Activity approval prior to production unit packing.

g. Part or Identifying Number (PIN). The PINs to be used for items acquired to this specification are created as follows:

M	14256	X
MIL Spec	Spec No.	Type

6.3 Qualification. With respect to flux products requiring qualification, awards will be made only for products that, prior to the time set for opening bids, have been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of suppliers is called to this requirement (see 3.1). Manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification to be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the US Army Laboratory Command, Attn: SLCET-RS, Fort Monmouth, NJ 07703-5000; Information pertaining to qualification of products may be obtained from the Defense Electronics Supply Center, (DESC-EQ), 1507 Wilmington Pike, Dayton, Ohio 45444.

6.4 Ventilation. Rosin fluxes usually contain organic acids and flammable solvents, such as turpentine or alcohols. Fluxes therefore, are respiratory irritants and should be used with caution only in well-ventilated areas away from possible ignition sources such as flames or sparks. Solvents used to remove fluxes should also be considered as hazardous materials and treated in the same manner.

6.5 Subject term (key word) listing.

Flux
Rosin
Soldering

6.6 Material Safety Data Sheets. Contracting Officers will identity those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. The pertinent mailing addresses for submission of data are listed in appendix B of FED-STD-313.

6.7 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:
Army - ER
Navy - EC
Air Force - 11

Preparing activity:
Army - ER

Review Activities:

Army - MI
Navy - SH
Air Force - 84, 99
DoD - GS, IP

Project: 3439-0518

User Activities:

Navy - AS, OS, MC, YD
Air Force - 80

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NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-F-14256E	Flux, Soldering, Liquid (Rosin Base)

3a. NAME OF SUBMITTING ORGANIZATION

b. ADDRESS *(Street, City, State, ZIP Code)*

4. TYPE OF ORGANIZATION *(Mark one)*

- ☐ VENDOR
- ☐ USER
- ☐ MANUFACTURER
- ☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*