TT-I-178e
December 1, 1972
SUPERSEDING
MIL-I-3170A
April 23, 1964

FEDERAL SPECIFICATION

INK, DUPLICATING, LITHOGRAPHIC PROCESS KIT

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 lithographic inks and separately packaged drier, varnish (binder), and reducer (extender).

1.2 Classification. The inks shall be of the following colors, as specified (see 3.2.1, 6.2, and 6.5):

Red, Number 1
Yellow, Number 2
Blue, Number 4 - (Process B)
Blue, Number 5
Purple, Number 6
Red, Number 7 - (Process C)
Black, Number 8 - (Process D)
White, Number 9 - (Transparent)
White, Number 10 - (Opaque)
Green, Number 11
Green Brown, Number 12
Red Brown, Number 13

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.

Federal Specifications:

TT-T-775 - Tung Oil, Raw (China Wood) (For Use in Organic Coating).
UU-P-265 - Paper, Book.
PPP-C-96 - Cans, Metal, 26 Gage and Lighter.
PPP-T-60 - Tape: Packaging, Waterproof.

Federal Standards:

Fed. Std. No. 123 - Marking for Domestic Shipment (Civil Agencies).
Fed. Test Method Std. No. 141 - Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing.
Fed. Test Method Std. No. 191 - Textile Test Methods.

(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, D.C. 20402.)

(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, Washington, D.C. Atlanta, Chicago, Kansas City, MO., Fort Worth, 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 Standards 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 a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials

ASTM D1535-62 - Method of Specifying Color by the Munsell System.

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

Graphic Arts Technical Foundation:

GATF Bulletin No. 805 - How to Make and Run Better Zinc Surfaced Plates
GATF Bulletin No. 807 - How to Make and Run Better Aluminum Surfaced Plates

(Application for copies should be addressed to the Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, PA 15213.)

National Printing Ink Research Institute Test Methods:

C-2 - Cobalt Analysis.
C-3 - Manganese Analysis.
C-4 - Lead Analysis.
C-6 - Acid Number Determination.
D-1 - Grind Determination, Fineness of.
D-2 - Specific Gravity Determination.
D-3 - Viscosity Determination.
D-6 - Kauri-Butanol Number, Determination.
E-2 - Tinting Strength, Relative, Determination of.

(Application for copies should be addressed to the National Printing Ink Research Institute, Lehigh University, Bethlehem, PA.)

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Association, Inc., Tariff Order Section, 1616 P Street, N.W., Washington, D.C. 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.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Materials. The supplier is given wide range in the selection of materials and processes of manufacture, provided that the ink produced meets the requirements of this specification.

3.2 Inks.

3.2.1 Name, color, and pigmentation. Name, color, and pigmentation of the inks shall be as specified in table I.

TABLE I

Name	Color name (see 6.2)	Pigmentation
Red, Number 1	Moderate Reddish Orange	Fire Red Toner.
Yellow, Number 2	Strong Greenish Yellow	Red Shade Hansa.
Blue, Number 4 (Process B)	Strong Blue	Cyan Peacock Blue.
Blue, Number 5	Vivid Blue	Milori Blue.
Purple, Number 6	Strong Violet	Alkali Blue - Extra Red.
Red, Number 7 (Process C)	Strong Purplish Red	Bronzeless Rubine Red.
Black, Number 8 (Process D)	Black	Carbon Black (Plus Toners).
White, Number 9	Transparent White	Alumina Hydrate.
White, Number 10	Opaque White	Rutile Titanium Dioxide.
Green, Number 11	Green	Phthalc Blue, Benzadine Yellow.
Green Brown, Number 12	Green Brown	Rubine Red, Phthalo Blue, Benzadine Yellow.
Red Brown, Number 13	Red Brown	Red Lake, Rubine Red, Carbon Black.

3.2.2 Color matching. The color of the test ink shall match the standard color of the dry color prints (see 6.4 and 6.4.1) when printed in accordance with 4.4.1.1.1. A deviation from the standard color is acceptable, provided that the test ink color does not exceed the printed color deviation for each color specified in table II. The white inks, No. 9 and No. 10, shall meet the requirements of table II and shall be tested as specified in 4.4.1.1.2.

TABLE II. Color formula and color tolerance (see 6.4)

Base ink	Allowed deviation
Red, Number 1	See 4.4.1.1.1, 6.4, and 6.4.1
Yellow, Number 2	See 4.4.1.1.1, 6.4, and 6.4.1
Blue, Number 4	See 4.4.1.1.1, 6.4, and 6.4.1
Blue, Number 5	See 4.4.1.1.1, 6.4, and 6.4.1
Purple, Number 6	See 4.4.1.1.1, 6.4, and 6.4.1
Red, Number 7	See 4.4.1.1.1, 6.4, and 6.4.1
Black, Number 8	See 4.4.1.1.1, 6.4, and 6.4.1
White, Number 9	See 4.4.1.1.2
White, Number 10	See 4.4.1.1.2
Green, Number 11	See 4.4.1.1.1, 6.4, and 6.4.1
Green Brown, Number 12	See 4.4.1.1.1, 6.4, and 6.4.1
Red Brown, Number 13	See 4.4.1.1.1, 6.4, and 6.4.1

3.2.2.1 Tinting strength. The color of the test ink plus bleaching white shall match the standard wet sample (see 6.4 and 6.4.1) plus bleaching white within 10 percent when tested as specified in 4.4.1.1.4.

3.2.3 Drier. Inks shall be free of drier metals when tested as specified in 4.4.1.2.

3.2.4 Pigments. The pigments used in the ink shall be insoluble in water and dilute acids (see table VI).

3.2.5 Vehicles. The wetting properties of the vehicles used shall thoroughly protect the pigments against chemical action and bleeding. They shall dry rapidly and thoroughly with the addition of the drier. Vehicles shall not incorporate wetting agents that will detrimentally affect the working properties of the ink by inducing excessive emulsification of fountain solution on the press (see table VI).

3.2.6 Specific gravity. The specific gravity of each base ink shall be as indicated in table III when tested as specified in 4.4.1.3.

TABLE III. Specific gravity of base inks

Base ink	Specific gravity
Red, Number 1	1.12 ± 0.11
Yellow, Number 2	1.15 ± 0.12
Blue, Number 4	1.17 ± 0.12
Blue, Number 5	1.23 ± 0.12
Purple, Number 6	1.23 ± 0.12
Red, Number 7	1.22 ± 0.12
Black, Number 8	1.15 ± 0.12
White, Number 9	1.30 ± 0.13
White, Number 10	1.98 ± 0.20
Green, Number 11	1.14 ± 0.15
Green Brown, Number 12	1.20 ± 0.15
Red Brown, Number 13	1.18 ± 0.15

3.2.7 Lightfastness. There shall be no difference between simultaneously exposed drawdowns of the test and standard inks when tested as specified in 4.4.1.4.

3.2.8 Grind. The grindometer reading of the test ink shall be no greater than that specified in table IV when tested as specified in 4.4.1.5.

3.2.9 Toxic misting. The inks shall not fly off the press rollers in such a way as to contaminate the air or other areas around the press when tested as specified in 4.3.2.

TABLE IV. Grindometer reading

Base ink	4 Scratch	10 Scratch
Red, Number 1	2.0	1.0
Yellow, Number 2	2.0	1.0
Blue, Number 4	2.0	1.0
Blue, Number 5	5.0	1.0
Purple, Number 6	5.0	1.0
Red, Number 7	5.0	1.0
Black, Number 8	4.0	1.0
White, Number 9	6.0	3.0
White, Number 10	6.0	3.0
Green, Number 11	4.0	1.0
Green Brown, Number 12	4.0	1.0
Red Brown, Number 13	4.0	1.0

3.3 Drier, Number 11.

3.3.1 Metal content. The metal content of the drier shall be 3.0 ± 0.2 percent when tested as specified in 4.4.2.1. Cobalt shall comprise 20-25 percent of the metal and manganese the balance.

3.3.2 Viscosity. The viscosity of the drier shall be between 60 and 120 stokes at 25°C. when tested as specified in 4.4.2.

3.3.3 Drying time for prints. Prints of the base ink with drier added in specified proportions (see table V, column a) shall dry within 8 hours when tested as specified in 4.4.2.3.

3.4 Lithographic varnish (binder), Number 12. Unless otherwise specified (see 3.5 and 6.2), lithographic varnish Number 12 shall be furnished.

3.4.1 Composition. The varnish shall be a regular bodied linseed lithographic varnish (see table VI).

3.4.2 Acid number. The acid number shall be in the range of 10 to 16 when tested as specified in 4.4.3.1.

3.4.3 Viscosity. The viscosity shall be within the range of 50-75 stokes at 25°C. when tested as specified in 4.4.3.2.

3.5 Water resistant lithographic varnish (tinder), Number 13. Water resistant lithographic varnish Number 13 shall be furnished in place of lithographic varnish Number 12 only when specified in contract or order (see 6.2).

3.5.1 Oil composition. The varnish shall have a 40 gallon oil length. The varnish shall contain not less than 20 gallons of raw tung oil conforming to TT-T-775. The balance of the oil shall be #00 pale linseed lithographic varnish (see table VI).

3.5.2 Resin. The varnish shall contain 100 percent pure phenolic resin and, when tested as specified in 4.4.4.1, the results shall show the presence of phenolic resins.

3.5.3 Viscosity. The viscosity of the varnish shall be in the range of 300 to 500 stokes at 25°C. when tested as specified in 4.4.4.2.

3.5.4 Rosin identification. The varnish shall give negative results when tested for rosin as specified in 4.4.4.3.

3.6 Reducer, Number 14.

3.6.1 Distillation range. The reducer shall be a petroleum distillate. The reducer shall have not more than 5 percent distilling at 515°F. and below and not less than 95 percent distilling at 590°F. or below when tested as specified in 4.4.5.1.

3.6.2 Kauri-Butanol value. The Kauri-Butanol (KB) value of the reducer shall be less than 28 when tested as specified in 4.4.5.2.

3.7 Printing.

3.7.1 Performance. The ink, when mixed in accordance with table V, shall produce a fine 133 line highlight dot and a clean, open 133 line shadow dot when tested as specified in 4.4.6 through 4.4.6.1.3.

TABLE V. Press formulations

Base ink	Formulations	(a) Sheet-fed	(c) Wet-fed
Red, Number 1	Red, Number 1	4.90 parts	4.50 parts
	Drier, Number 11	0.10 parts	0.10 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15 parts
		5.00 parts	5.00 parts
Yellow, Number 2	Yellow, Number 2	4.85 parts	4.45 parts
	Drier, Number 11	0.15 parts	0.15 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15
		5.00 parts	5.00 parts
Blue, Number 4	Blue, Number 4	4.90 parts	4.50 parts
	Drier, Number 11	0.10 parts	0.10 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15 parts
		5.00 parts	5.00 parts
Blue, Number 5	Blue, Number 5	4.90 parts	4.50 parts
	Drier, Number 11	0.10 parts	0.10 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15 parts
		5.00 parts	5.00 parts

TABLE V. Press Formulations (con.)

Base ink	Formulations	(a) Sheet-fed	(b) Web-fed
Purple, Number 6	Purple, Number 6	4.85 parts	4.45 parts
	Drier, Number 11	0.15 parts	0.15 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15 parts
		5.00 parts	5.00 parts
Red, Number 7	Red, Number 7	4.90 parts	4.50 parts
	Drier, Number 11	0.10 parts	0.10 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15 parts
		5.00 parts	5.00 parts
Black, Number 8	Black, Number 8	4.80 parts	4.40 parts
	Drier, Number 11	0.20 parts	0.20 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15 parts
		5.00 parts	5.00 parts
White, Number 9	White, Number 9	4.75 parts	4.35 parts
	Red, Number 1	0.10 parts	0.10 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15 parts
		5.00 parts	5.00 parts
White, Number 10	White, Number 10	4.80 parts	4.40 parts
	Red, Number 1	0.10 parts	0.10 parts
	Drier, Number 11	0.10 parts	0.10 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15 parts
		5.00 parts	5.00 parts
Green, Number 11	Green, Number 11	4.90 parts	4.50 parts
	Drier, Number 11	0.10 parts	0.10 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15 parts
		5.00 parts	5.00 parts
Green Brown Number 12	Green Brown, Number 12	4.90 parts	4.50 parts
	Drier, Number 11	0.10 parts	0.10 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15 parts
		5.00 parts	5.00 parts
Red Brown, Number 13	Red Brown, Number 13	4.90 parts	4.50 parts
	Drier, Number 11	0.10 parts	0.10 parts
	Varnish, Number 12 (or 13)		0.25 parts
	Reducer, Number 14		0.15 parts
		5.00 parts	5.00 parts

3.7.2 Drying time for prints. The prints shall dry within 8 hours when tested as specified in 4.4.6.2.

3.7.3 Examination of the press. There shall be evidence of excessive emulsification of ink on the press, dried skin in the fountain, slur on the plate due to ink, chalking after drying due to a slow drying agent, mottling due to unevenly distributed driers, scumming due to greasy or soupy ink or piling due to incorrect varnish either while printing or when the press is stopped for 45 minutes (see 4.4.6.3).

3.7.4 Drying on nonporous surfaces. There shall be no evidence of ink drying on the press either during printing or when the press is stopped for 45 minutes (see 4.4.6.3).

3.8 Accelerated storage test. The inks shall show no signs of damage, including gelling, livering, skinning or changes in viscosity or consistency when tested as specified in 4.4.7.

3.9 Workmanship. The finished product shall be uniform and homogeneous, contain no lumps or dirt, and shall conform to the quality of product established by this specification.

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 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 Inspection. Sampling for inspection shall be performed in accordance with MIL-STD-105, except where otherwise indicated hereinafter.

4.2 Component and material inspection. In accordance with 4.1 above, components and materials shall be inspected and tested in accordance with all the requirements of referenced specifications, drawings, and standards unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase documents.

4.2.1 Certificate of compliance. Where certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification.

4.3 Inspection of the end item.

4.3.1 Examination of the end item. The end item shall be examined for the defects in applicable subparagraphs below and at the inspection levels and acceptable quality levels (AQLs) set forth in 4.3.1.5. Random samples shall be drawn from each lot of end items of the same size and color for examination of visual, net contents, and preparation for delivery defects. The lot sizes, for purposes of determining sample sizes in accordance with MIL-STD-105, shall be expressed in units of filled primary containers of 5 pounds of ink of the same color, 1 pound each of drier, reducer and varnish for the examination in 4.3.1.1, 4.3.1.2, 4.3.1.3, and in units of shipping containers for the examination under 4.3.1.4.

4.3.1.1 Examination of the primary container. The sample unit for this examination shall be one filled primary container.

Examine	Defect
Construction	Not type and class specified (see 5.1).
Closure	Not type specified; imperfect.
Exterior coating	Not as specified.
Workmanship	Dented, abraded, dirty, split, punctured; any other defect affecting serviceability; and seepage of contents.
Markings	Name, color and pigmentation of inks missing, incomplete, incorrect, or not as specified (see 3.2.1 and 5.3.3).

4.3.1.2 Examination of contents of the primary container. The sample unit for this examination shall be the contents of one filled primary container.

Examine	Defect
Form and workmanship	Not uniform, not homogenous, contains lumps; presence of foreign material.

4.3.1.3 Examination of filled containers for net contents. The sample unit for this examination shall be one filled primary container each of ink and modifier. The quality of the lot shall be unacceptable if the average net weight of contents is less than specified or indicated for all sample units examined.

4.3.1.4 Examination of preparation for delivery requirements. An examination shall be made to determine that the packaging, packing and marking complies with the section 5 requirements. The sample unit shall be one shipping container, fully packed, selected just prior to the closing operation. Closed shipping containers shall be examined for closure defects. The lot size shall be the number of shipping containers in the end item inspection lot.

Examine	Defect
Marking (exterior and interior)	Incorrect; incomplete, illegible; omitted; of improper size, location, sequence, or method of application.
Materials	Any nonconforming component; component missing or damaged.
Workmanship	Inadequate application of components: such as incomplete closure of container flaps, loose strapping, improper taping or inadequate stapling. Bulged or distorted containers.
Contents	Number per container is more or less than required.

4.3.1.5 Inspection levels and acceptable quality levels (AQLs) for examinations. The inspection levels, for determining the sample size, and the acceptable quality levels (AQLs), expressed in defects per one hundred units, shall be as follows:

Examination paragraph	Inspection levels	AQLs
4.3.1.1	I	2.5
4.3.1.2	I	2.5
4.3.1.3	S-2	
4.3.1.4	S-2	2.5

4.3.2 Testing of the end item. The end item shall be tested for the characteristics specified in section 3 in accordance with test methods specified in table VI. The lot, for test purposes, shall be the number of containers filled with drier, varnish, reducer and ink of the same color submitted for inspection at one time. The sample unit shall be 1 pound each of drier, varnish, reducer and ink of the same color. The sample size for tests shall be as indicated below. The lot shall be unacceptable if there is any failure of any sample unit to meet any characteristic applicable to the sample unit.

Lot size	Sample size
800 or less	2
801 up to and including 22,000	3
22,001 or more	5

TABLE VI

Characteristic	Specification Reference		Requirements applicable to		Number Determinations Per Unit	Results Reported as Pass or Fail	Results Reported as Numerically To Nearest
	Requirement	Test Method	Unit	Lot Aver			
Inks:						2/	
Color matching	3.2.2	4.4.1.1	X	-	1	X	
Tinting strength	3.2.2.1	4.4.1.1.4	X	-	1	X	
Drier	3.2.3	4.4.1.2	X	-	1	X	
Pigments	3.2.4	1/					
Vehicles	3.2.5	1/					
Specific gravity	3.2.6	4.4.1.3	X	-	1		0.01
Lightfastness	3.2.7	4.4.1.4	X	-	1	X	
Grind	3.2.8	4.4.1.5	X	-	1	X	
Toxic misting	3.2.9	4.4.1.6	X	-	1	X	
Accelerated storage test	3.8	4.4.7	X	-	1	X	
Drier:							
Metal content	3.3.1	4.4.2.1	X	-	1		0.1%
Viscosity	3.3.2	4.4.2.2	X	-	1		1 stoke
Drying time for prints	3.3.3	4.4.2.3	X	-	1	X	

TABLE VI (con.)

Characteristic	Specification Reference		Requirements applicable to		Number Determinations Per Unit	Results Reported as	
	Requirement	Test Method	Individ Unit	Lot Aver		Pass or Fail 2/	Numerically To Nearest
Lithographic varnish:							
Composition	3.4.1	1/					
Acid number	3.4.2	4.4.3.1	X	-	1	X	
Viscosity	3.4.3	4.4.3.2	X	-	1		1 stoke
Water resistant lithographic varnish:							
Oil composition	3.5.1	1/					
Resin:							
Presence	3.5.2	4.4.4.1	X	-	1	X	
Content, 100 percent pure phenolic resin	3.5.2	1/					
Viscosity	3.5.3	4.4.4.2	X	-	1		1 stoke
Resin identification	3.5.4	4.4.4.3	X	-	1	X	
Reducer:							
Distillation range	3.6.1	4.4.5.1	X	-	1		1%
Kauri-Butanol value	3.6.2	4.4.5.2	X	-	1		1 unit
Printing:							
Performance testing	3.7.1	4.4.6.1.1	X	-	1	X	
Drying time for prints	3.7.2	4.4.6.2	X	-	1	X	
Emulsification	3.7.3	4.4.6.3	X	-	1	X	
Drying on nonporous surface	3.7.4	4.4.6.3	X	-	1	X	

1/ Unless otherwise specified in the contract or order, a certificate of compliance shall be submitted and will be acceptable for the requirement stated.
2/ If failure is indicated, report description or numerical point of failure, as applicable.

4.4 Test procedures.

4.4.1 Inks.

4.4.1.1 Color matching.

4.4.1.1.1 Base inks. All test base inks, except White Number 9 and Number 10, shall be prepared for color matching in the following manner: A color print approximately 3 x 6 inches shall be offset printed on white offset book paper conforming to type II of UU-P-465 and allowed to dry completely. The color of the test ink shall be within the tolerance specified in table II. Test ink deviations greater than those specified shall constitute failure. Viewing conditions shall be as specified in 4.4.1.1.3.

4.4.1.1.2 Base inks, Number 9 and 10. Base ink Number 9 (Transparent White) shall be tested by drawing down a 0.004-inch film of the ink over a previously dried 0.004-inch film of Black Number 8 (see table V(a)). The test white ink shall not mask the black to a greater extent than the standard white ink. Base ink Number 10 (opaque white) shall be tested by drawing down a 0.0025-inch film of the ink (wet film thickness) over a previously dried 0.004-inch film of Black Number 8 (see table V(a)). The black shall be completely obscured by the white ink. Examination shall be made immediately after application.

4.4.1.1.3 Viewing conditions. Viewing conditions shall be as specified in ASTM D1535-62, section 5a. For viewing, films and color prints, as applicable, shall be abutted and placed on an opaque white background.

4.4.1.1.4 Tinting strength. Mix 5 grams each of bleaching white (see 6.3) with (a) 100 mg of the test ink, (b) 100 mg of the standard ink, (c) 90 mg of the standard ink and (d) 110 mg of the standard ink. Prepare 0.004-inch drawdowns of each of the above formulations. Immediately compare the test ink with the standard ink drawdowns for tinting strength. If the tinting strength of test ink (a) is greater than (d) or weaker than (c), it shall constitute failure. Viewing conditions shall be as specified in 4.4.1.1.3.

4.4.1.2 Drier. The presence of drier metals shall be determined by NPIRI Standard Test Methods C-2 (Cobalt), C-3 (Manganese), and C-4 (Lead). The presence of these metals in the base ink shall be cause for rejection of the lot.

4.4.1.3 Specific gravity. Specific gravity shall be determined according to NPIRI Standard Test Method D-2.

4.4.1.4 Lightfastness. Drawdowns (0.004-inch thick covering an area 2-1/2 by 3 inches) of the test and standard inks prepared according to table V, (a) (i.e. with drier added) shall be exposed for 100 hours in a Fad-o-meter in accordance with Method 5660 of Fed. Test Method Std. No. 191. The drawdowns shall be air-dried prior to exposure (see 4.4.2.3.1). After 100 hours the two exposed samples shall be compared visually. Fading of the sample ink greater than that of the standard ink shall constitute failure. (Viewing conditions shall be as specified in 4.4.1.1.3.)

4.4.1.5 Grind. The grind determination shall be made as outlined in NPIRI Standard Test Method D-1.

4.4.1.6 Toxic misting. Ink a LTF Inkometer with a standard amount of ink and allow ink to distribute for 10 seconds at medium speed. Place a clean sheet of white paper about 1 inch below the rollers and run the Inkometer for 1 minute at medium speed. Visual evidence of enough specks of ink on the paper to discolor it shall be considered as cause for rejection.

4.4.2 Drier.

4.4.2.1 Metal content of drier. Metal content of the drier shall be determined in accordance with procedures C-2 and C-3 as outlined in NPIRI Standard Test Methods.

4.4.2.2 Test for viscosity. Viscosity shall be determined by Procedure A of Method 4271 of Fed. Test Method Std. No. 141.

4.4.2.3 Laboratory test for drying time of prints. Tests for drying of prints shall be conducted as follows: Prepare a drawdown of the test and standard inks mixed with the specified amount of drier (see table V(a)) using a 0.0005-inch Bird or other suitable film film applicator. A temperature of 73.0° ± 3.5°F. and a relative humidity of 50 ± 2 percent shall be maintained during testing. The drying time of the test ink shall be within plus or minus 10 percent of the drying time noted for the standard ink.

4.4.2.3.1 Drying time. Drying time shall be defined as the time lapse between the preparation of the drawdown and when a firm finger pressure on the surface of the drawdown no longer leaves an impression.

4.4.3 Lithographic varnish, Number 12.

4.4.3.1 Determination of acid number. The acid number shall be determined in accordance with procedure C-6 of NPIRI Standard Test Methods.

4.4.3.2 Determination of viscosity. The viscosity shall be determined in accordance with Procedure A of Method 4271 of Fed. Test Method Std. No. 141.

4.4.4 Water resistant lithographic varnish, Number 13.

4.4.4.1 Qualitative test for resins. The test for phenolic resins shall be as specified in Method 5141 of Fed. Test Method Std. No. 141.

4.4.4.2 Viscosity. Viscosity shall be determined according to Procedure A of Method 4271 of Fed. Test Method Std. No. 141.

4.4.4.3 Rosin. The varnish shall give negative results with the Lieberman-Storch and Halphen-Hicks tests for rosin utilizing the procedures outlined in Methods 5031 and 5032 of Fed. Test Method Std. No. 141.

4.4.5 Reducer.

4.4.5.1 Distillation range. The procedure followed shall be as specified in Method 4301 of Fed. Test Method Std. No. 141. Temperatures shall be corrected for deviations from normal atmospheric pressure.

4.4.5.2 Kauri-Butanol value. The Kauri-Butanol value shall be determined in accordance with Method 5191 of Fed. Test Method Std. No. 141 or Procedure A-6 of NPIRI Standard Test Methods.

4.4.6 Printing. Each ink, when formulated in accordance with table V, shall be press tested on a wet-fed press as indicated hereafter. Necessary adjustment of press must be made before commencing test.

4.4.6.1 Press Testing.

4.4.6.1.1 Wet-fed press test. The ink shall be press tested as follows: The ink shall be tested on a wet-fed roll to sheet, or web-fed roll to roll, high speed, offset printing press without application of heat, operating at a wet speed of 600 feet per minute. Run a minimum of 30 minutes, using both line and 133 line halftone copy on 100 pound basis offset white book paper conforming to UU-P-465, type II. The plates used shall be bimetallic or copperized aluminum. Inspect at least one out of every 500 sheets with a nine-power magnifying glass. Any inaccuracies of copy attributable to the ink when compared with the negative of the image for accuracies shall constitute a failure.

4.4.6.2 Drying time for prints. Prints shall be dried in an atmosphere of 73.5°C ± 3.5°F. and a relative humidity of 50 ± 2 percent. Drying time shall be defined as the time lapse between the preparation of the print and when a firm finger pressure on the surface of the print no longer leaves an impression.

4.4.6.3 Ink stability during press-downtime. On completion of the printing tests the press shall be stopped and shall remain idle for 45 minutes. After 45 minutes, all components of the press shall be inspected for the characteristics specified in 3.7.3. Two hundred copies shall then be printed. Any evidence of ink drying or excessive emulsification on the form rollers or plate, or any excessive change in the size or sharpness of the printed matter when compared to the negative of the image shall constitute failure.

4.4.7 Accelerated storage tests. A container of ink, covered with a skin paper and sealed, shall be placed in a constant temperature oven maintained at 155°C ± 5°F. for a period of 4 hours. The containers shall then be removed, allowed to cool to 65° - 75°F. and examined. A sealed container of each ink shall also be placed in an environment maintained at -65°C ± 5°F. for a period of 24 hours. The container shall be removed, allowed to warm to 65° to 75°F. and examined. The ink shall be removed from the container for this examination. Any evidence of damage, including galling, livering, skinning or changes in consistency or viscosity shall constitute failure. Two samples of each ink shall be used for this test.

4.5 Inspection of preparation for delivery. An inspection shall be made to determine that the preservation, packaging, packing and marking comply with the requirements in section 5 of this specification. Defects shall be scored in accordance with table I. For examination of interior packaging the sample unit shall be one shipping container fully prepared for delivery, selected at random just prior to the closing operations. Sampling shall be in accordance with MIL-STD-105. Defects of closure listed shall be examined on shipping containers fully prepared for delivery. The lot size shall be the number of shipping container in the end item inspection lot. The inspection level shall be S-2 with an AQL of 4.0 defects per hundred units.

TABLE I. Classification of preparation for delivery defects

Examine	Defects
Markings	Omitted; incorrect; illegible; improper size, location, sequence, or method of application.
Material	Any component missing or damaged.
Workmanship	Inadequate application of components such as incomplete closure of container flaps, loose strapping, inadequate stapling, or distortion of container.
Contents	Number per container is more or less than required. Net weight exceeds requirements of the ink specification.

5. PREPARATION FOR DELIVERY

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

5.1.1 Level A.

5.1.1.1 Ink. Five pounds of ink shall be packaged in a round five-pound capacity can conforming to type VI (slip cover closure) of PPP-C-96. Exterior coating shall be plan B. The cans shall be sealed by the application of minimum one inch wide tape conforming to type III, class 1 or 2 of PPP-T-60 over the lip of the slip cover and the body of the can. A minimum tape length of 1-1/3 times the can circumference shall be used.

5.1.1.2 Drier and varnish. Drier and varnish in one pound quantities shall be packaged in round one pint capacity cans conforming to type V, class 1 or 2 of PPP-C-96. Each friction top can shall be provided with retaining clips. Exterior coating shall be plan B.

5.1.1.3 Reducer. Three-quarters of a pound of reducer shall be packaged in a one pint can conforming to type V, class 4 of PPP-C-96. Exterior coating shall be plan B.

5.1.2 Level C. Ink, drier, varnish, and reducer shall be packaged to afford adequate protection against deterioration and physical damage during shipment from the supply source to the first receiving activity. The supplier may use his standard practice when it meets these requirements.

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

5.2.1 Level A. Twelve cans of ink packaged as specified in 5.1.1.1 or 48 cans of drier, varnish, or reducer of like description only, packaged as specified in 5.1.1.2 or 5.1.1.3 as applicable, shall be packed in accordance with the applicable level A packing requirements for unpackaged cans as specified in the appendix of PPP-C-96.

5.2.2 Level B. Twelve cans of ink packaged as specified in 5.1.1.1 or 48 cans of drier, varnish, or reducer of like description only, packaged as specified in 5.1.1.2 or 5.1.1.3 as applicable, shall be packed in accordance with the applicable level B packing requirements for unpackaged cans as specified in the appendix of PPP-C-96.

5.2.3 Level C. Ink, drier, varnish and reducer, packaged as specified in 5.1, shall be packed in a manner to insure carrier acceptance and safe delivery at destination at the lowest transportation rate for such supplies. Containers shall be in accordance with the Uniform Freight Classification rules or the National Motor Freight Classification rules, as applicable.

5.3 Marking. In addition to the labeling specified in 5.3.3 and any special marking required by the contract or order, all marking shall be as specified in 5.3.1 or 5.3.2 as specified (see 6.2).

5.3.1 Civil agencies. All marking shall be in accordance with Fed. Std. No. 123.

5.3.2 Military agencies. All marking shall be in accordance with MIL-STD-129.

5.3.3 Labeling. Each interior package and shipping container shall bear a label that is secured and waterproofed in accordance with the applicable requirements specified in Fed. Std. No. 123 or MIL-STD-129. The label for inks shall bear the following legend:

STORE IN COOL DRY PLACE

(Date of manufacture shall be stamped
or printed here).

NAME (see paragraph 3.2.1)
COLOR (see paragraph 3.2.1)
For sheet fed press formulations,
DRIER must be added.
For web fed press formulations,
DRIER, VARNISH (binder) and
REDUCER (extender) must be added.

The label for the drier, varnish and reducer shall bear the following legend (as applicable):

STORE IN COOL DRY PLACE
DRIER NUMBER 11 or
LITHOGRAPHIC VARNISH (binder)
NUMBER 12 or
WATER RESISTANT LITHOGRAPHIC
VARNISH (Binder) NUMBER 13
REDUCER (extender) NUMBER 14

6. NOTES

6.1 Intended use. These inks, when mixed with modifiers (drier, varnish and reducer), shall be suitable for both web and sheet-fed lithographic printing on white Bond or Offset book papers using pre-sensitized, deep-etch, bimetal or surface plates.

6.2 Ordering data. Purchasers should exercise any desired options offered herein and procurement documents should specify the following:

(a) Title, number and date of this specification.
(b) Color of ink required (see 1.2 and 3.2.1).
(c) If water resistant lithographic varnish (binder) Number 13 is required (see 3.5). Lithographic varnish No. 12 is used for normal printing; water resistant lithographic Varnish No. 13 is used when press problems such as excess emulsification or tinting of the fountain solution are encountered.
(d) Selection of the applicable levels of packaging and packing (see 5.1 and 5.2).
(e) When Level B packaging is required for Civil Agencies (see 5.1.2).

6.3 Tinting base. The tinting base as specified in 4.4.1.1.2 and bleaching white are available from The National Printing Ink Research Institute, Lehigh University, Bethlehem, Pennsylvania.

6.4 Government furnished property. Samples of the wet standard inks and standard color prints and color deviation prints may be obtained from the Commanding General, U.S. Army Natick Laboratories, Natick, MA, Attn: Chief, Chemical Products and Paper Engineering Division, C&PLSEL.

6.4.1 Color analysis to establish standard color prints. Tristimulus chromaticity values were obtained for standard color prints on G. E. Recording Spectrophotometer using Munsell Paper Matte N6 for the backing. Suggested values of these readings for each color are as follows:

Standard color	Trichromatic coefficients X	Y	Z
Red, No. 1	34.95	31.76	5.16
Yellow, No. 2	59.26	65.78	13.13
Blue, No. 4	15.63	17.47	52.69
Blue, No. 5	11.76	11.95	34.12
Purple, No. 6	12.71	9.51	36.15
Red, No. 7	22.45	12.63	9.89
Black, No. 8	6.95	6.09	7.24
Green, No. 11	19.39	29.24	28.31
Green Brown, No. 12	16.42	15.15	10.62
Red Brown, No. 13	13.51	11.55	9.67

6.5 Deletion. The Yellow, Number 3 (Process A) ink specified in MIL-I-43170A has been deleted in this specification since it is no longer required.

Custodians:

Army - GL
Navy - SA
Air Force - 84

Review activities:

Army - MD, ME

User activity:

Army - SM
Navy - MC

Preparing activity:

Army - GL

Civil Agency Interest:

GSA-FSS
TR-BEP
GPO

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein. Price 15 cents each.