INCH-POUND

MIL-DTL-53039B
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SUPERSEDING
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DETAIL SPECIFICATION

COATING, ALIPHATIC POLYURETHANE, SINGLE COMPONENT, CHEMICAL AGENT RESISTANT

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

1. SCOPE

1.1 Scope. This specification covers single component, chemical agent resistant, aliphatic polyurethane coating for use as a finish coat on military combat equipment. The coating is lead and hexavalent chromium free and has a maximum of 420 grams/liter (3.5 pounds/gallon) volatile organic compounds for type I and a maximum of 180 grams/liter (1.5 pounds/gallon) volatile organic compounds with zero volatile hazardous air pollutants for type II.

1.2 Classification.

1.2.1 Type. The coatings are of the following types, as specified (see 6.2):

Type I - Maximum of 420 grams/liter (3.5 pounds/gallon) volatile organic compounds.
Type II – Maximum of 180 grams/liter (1.5 pounds/gallon) volatile organic compounds with zero volatile hazardous air pollutants.

1.2.2 Color. The coating colors are as follows:

Aircraft Black, 37038	Black, 37030	Green 383, 34094
Aircraft Gray, 36300	Brown 383, 30051	Interior Aircraft Black, 37031
Aircraft Green, 34031	Dark Green, 34082	Interior Aircraft Gray, 36231
Aircraft Insignia Blue, 35044	Dark Sandstone, 33510	Olive Drab, 34088
Aircraft Red, 31136	Earth Yellow, 33245	Sand, 33303
Aircraft White, 37875	Field Drab, 33105	Tan 686A, 33446
Aircraft Yellow, 33538		

Comments, suggestions, or questions on this document should be addressed to: Director, U.S. Army Research Laboratory, Weapons and Materials Research Directorate, Materials Applications Branch, Specifications and Standards Office, Attn: AMSRD-ARL-WM-MC, Aberdeen Proving Ground, MD 21005-5069 or emailed to rsquilla@arl.army.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil/.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 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 are those cited in the solicitation or contract.

FEDERAL SPECIFICATIONS

TT-B-1325	-	Beads (Glass Spheres) Retro-Reflective.

FEDERAL STANDARDS

FED-STD-141	-	Paint, Varnish, Lacquer and Related Materials: Methods Of Inspection, Sampling and Testing.
FED-STD-595	-	Colors Used in Government Procurement.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-12468	-	Decontaminating Agent, STB
MIL-P-53022	-	Primer, Epoxy Coating, Corrosion Inhibiting, Lead & Chromate Free.
MIL-P-53030	-	Primer Coating, Epoxy, Water Reducible, Lead and Chromate Free.

(Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or http://assist.daps.dla.mil/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 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 of these documents are those cited in the solicitation or contract.

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Promulgated Method 311 – HAPS in Paints and Coatings.

(Copies of this document are available online at www.epa.gov/ttnemc01/ or from the Superintendent of Documents, U.S. Government Printing Office, North Capitol & "H" Streets, N.W., Washington, DC 20402-0002.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

ASTM D476	- Standard Classification for Dry Pigmentary Titanium Dioxide Products. (DoD adopted)
ASTM D522	- Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings. (DoD adopted)
ASTM D523	- Standard Test Method for Specular Gloss. (DoD adopted)
ASTM D562	- Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer. (DoD adopted)
ASTM D1210	- Standard Test Method for Fineness of Dispersion of Pigment – Vehicle Systems by Hegman-Type Gage. (DoD adopted)
ASTM D1849	- Standard Test Method for Package Stability of Paint. (DoD adopted)
ASTM D2369	- Standard Test Method for Volatile Content of Coatings. (DoD adopted)
ASTM D2805	- Standard Test Method for Hiding Power of Paints by Reflectometry. (DoD adopted)
ASTM D3335	- Standard Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy. (DoD adopted)
ASTM D3359	- Standard Test Methods for Measuring Adhesion by Tape Test.
ASTM D3363	- Film Hardness By Pencil Test. (DoD adopted)
ASTM D3723	- Standard Test Method for Pigment Content of Water-Emulsion Paints by Low-Temperature Ashing.

ASTM D3960	- Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings. (DoD adopted)
ASTM D4214	- Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films. (DoD adopted)
ASTM E308	- Standard Practice for Computing the Colors of Objects by Using the CIE System. (DoD adopted)
ASTM G90	- Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight.
ASTM G154	- Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.

(Copies of these documents are available from www.astm.org or ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959.)

2.4 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 coatings furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list (QPL) before contract award (see 4.2 and 6.4). Any change in the formulation of a qualified product shall necessitate its being qualified again. The material supplied under contract shall be identical, within manufacturing tolerances, to the products receiving qualification.

3.2 Materials. The materials used in the coatings shall be as specified herein. Materials not specified shall be selected by the contractor and shall be subject to all provisions of this specification.

3.3 Color and spectral reflectance. The camouflage colors listed in table I shall impart to the substrate the required spectral reflectance properties in the visible (380-700 nanometers) and near infrared (700-900 nanometers) spectrums. Some camouflage colors shall have numerical requirements and some shall have visual matches for chromaticity as listed in table I. The color chips used for visual matches are available from the address provided below. The colors of the camouflage system shall fall within 2.0 National Bureau of Standards (NBS) units under Standard Illuminant C of the values listed in table I. Figures 3 through 10 shall be used as approximate guidelines for the appropriate color. The color Dark Green, 34082 and Green 383, 34094 shall meet the spectral reflectance limits specified in table III and plotted in figure 11. Aircraft Green, 34031, Interior Aircraft Black, 37031, Aircraft Gray, 36300, and Dark Sandstone, 33510 shall visually match color chips furnished by U.S. Army Research Laboratory,

ATTN: AMSRD-ARL-WM-MC, Building 4600, Deer Creek Loop, Aberdeen Proving Ground, MD 21005-5069, and these colors shall meet the infrared reflectance requirements of table I when tested as in 4.6.13. All other colors listed in 1.2.2 shall visually match the appropriate chip from FED-STD-595.

TABLE I. Color and reflectance requirements.

Color	Brightness (Y)	Chromaticity X	Chromaticity Y	Infrared 1/ Min.	Infrared 1/ Max.	Allowable 2/ Ratio
Dark Green, 34082	0.071 – 0.091	0.339	0.390	-	60.0	5.2
Green 383, 34094	0.063 – 0.083	0.328	0.365	-	60.0	5.2
Field Drab, 33105	0.093 – 0.117	0.390	0.383	25.0	35.0	-
Earth Yellow, 33245	0.228 – 0.263	0.420	0.395	30.0	40.0	-
Sand, 33303	0.284 – 0.323	0.360	0.366	55.0	65.0	-
Brown 383, 30051	0.060 – 0.080	0.357	0.342	8.0	20.0	-
Black, 37030	0.030 – 0.041	0.310	0.315	0.0	15.0	-
Tan 686A, 33446	0.360 – 0.400	0.368	0.364	62.0	72.0	-
Aircraft Green, 34031	VM[3]	VM[3]		-	7.0	-
Interior Aircraft Black, 37031	VM[3]	VM[3]		-	7.0	-
Aircraft Gray, 36300	VM[3]	VM[3]		-	15.0	-
Dark Sandstone, 33510	VM[3]	VM[3]		-	45.0	-

1/ See table II or 4.6.13.
2/ The ratio are calculated by dividing the average infrared reflectance by the average red region reflectance.
3/ Visual Match(es) (VM) as stated in 3.3 are to be used for Aircraft Green, 34031, Interior Aircraft Black, 37031, Aircraft Gray, 36300, and Dark Sandstone, 33510.

TABLE II. Selected wavelengths for determining red and infrared values from reflectance data.

Red Region [1] (Nanometers)	Infrared Region [2] (Nanometers)
620.0	720.0
630.0	740.0
640.0	760.0
640.0	770.0
650.0	780.0
650.0	800.0
650.0	810.0
660.0	830.0
660.0	840.0
660.0	860.0

1/ The red value is the average reflectance for the ten wavelengths listed.
2/ The infrared value is the average reflectance for the ten wavelengths listed.

TABLE III. Spectral reflectance limits for Dark Green, 34082 and Green 383, 34094.

Wavelength Nanometers	% Reflectance Max.	Min.	Wavelength Nanometers	% Reflectance Max.	Min.
600	10.2	-	760	59.5	40.0
610	9.8	-	770	61.5	42.0
620	9.8	-	780	-	42.0
630	9.8	-	790	-	42.0
640	9.5	-	800	-	42.0
650	9.5	-	810	-	42.0
660	10.0	-	820	-	42.0
670	10.5	4.0	830	-	42.0
680	13.0	5.8	840	-	42.0
690	21.5	8.5	850	-	42.0
700	28.0	11.0	860	-	42.0
710	35.8	15.0	870	-	42.0
720	41.0	19.0	880	-	42.0
730	48.5	25.0	890	-	42.0
740	51.8	30.0	900	-	42.0
750	56.0	36.3			

3.4 Composition. The material shall be furnished as a single package, and shall consist of an aliphatic polyisocyanate prepolymer combined with volatile solvents, pigments, extenders and additives.

3.4.1 Pigment. The pigments listed in table IV, or any combination thereof, shall make up the primary hiding pigmentation for the colors specified. Iron oxides used as hiding pigments shall be of synthetic origins. The titanium dioxide shall be a rutile, chalk resistant type conforming to ASTM D476, type III or IV. If other tinting pigments are used to match the spectral characteristics, these additional pigments must have good color stability. No lead or hexavalent chromium pigments shall be used. Flattening agents shall not exceed the amounts specified in table VI based on the manufacturer's statement of composition. Glass beads for Interior Aircraft Black, 37031 shall conform to TT-B-1325, type I, grade B and shall conform to the amount specified in table VI.

3.4.2 Nonvolatile vehicle. The nonvolatile vehicle shall be a hydroxyl terminated prepolymer reacted with an aliphatic polyisocyanate. The IR spectrum of the partially cured resin shall show the presence of aliphatic polyisocyanates (for example, figure 1 and figure 2) and shall contain no aromatic polyisocyanates when determined as stated in 4.6.7.

TABLE IV. Pigmentation.

Dark Green, 34082 Green 383, 34094	Acid insoluble green pigment predominately composed of cobalt, zinc, and chromium oxides with other oxides permitted, carbazole dioxazine violet, iron oxides, chromium oxide, light stable organic yellow and orange, zinc/magnesium ferrite or other mixed metal oxides.
Field Drab, 33105 Brown 383, 30051 Earth Yellow, 33245 Sand, 33303 Tan 686A, 33446 Dark Sandstone, 33510	Chromium oxide, titanium dioxide, carbon black, carbazole dioxazine violet, iron oxides, zinc/magnesium ferrite or other mixed metal oxides.
Aircraft Green, 34031 Olive Drab, 34088	Iron oxides, carbon black, zinc/magnesium ferrites, titanium dioxide, chromium oxide or other mixed metal oxides.
Black, 37030 Aircraft Black, 37038 Interior Aircraft Black, 37031	Carbon black, iron oxides.
Aircraft White, 37875	Titanium dioxide.
Aircraft Red, 31136	Titanium dioxide, light stable organic red.
Aircraft Gray, 36300 Interior Aircraft Gray, 36231	Titanium dioxide, carbon black, iron oxides.
Aircraft Insignia Blue, 35044	Copper phthalocyanine blue, carbon or lampblack, black iron oxide, titanium dioxide.

Note: Chromium oxides exclude the use of hexavalent chromium.

3.4.3 Volatile organic compounds (VOC). Volatile content shall consist of non-photochemical reactive solvents and not contain any volatile hazardous air pollutants for type II coatings as defined in EPA method 311 as specified in 4.6.8.

3.5 Quantitative requirements. The coating shall conform to the quantitative requirements of table V when tested as specified in 4.6.

3.5.1 Specific quantitative requirements. Each color shall conform to its specific requirement in table VI when tested as specified in 4.6.1.1. Total solids, pigment solids and vehicle solids are calculated as percent by weight. Extender pigment is percent by weight of pigment.

3.6 Qualitative requirements.

3.6.1 Condition in container. When tested as specified in 4.6.14, the coating shall be free from grit, seeds, skins, abnormal thickening or livering in a freshly opened container and shall show no more pigment settling or caking than can be easily and completely reincorporated to a smooth homogeneous state.

TABLE V. Coating requirements.

Characteristic	Min.	Max.
Pigment, hexavalent chromium	Absent	
Lead content, percent of total solids		.05
Viscosity (Krebs-Stormer, K.U.)	55	80
Fineness of grind (hegman scale)		
All camouflage colors and Dark Sandstone, 33510	2	-
Interior Aircraft Black, 37031	-	0
Aircraft Green, 34031	0	2
Other colors	4	-
Hiding power (contrast ratio)		
Aircraft Red, 31136	.94	-
Aircraft White, 37875	.92	-
Other colors	.98	-
Drying time		
Set to touch, minutes	5	30
Dry hard, hours	-	3
Dry through, hours	-	4
Specular gloss for Dark Sandstone, 33510 and Sand, 33303, Earth Yellow, 33245 and Tan 686A, 33446		
60 degree	-	1.6
85 degree	-	4.0
Other camouflage colors		
60 degree	-	1.0
85 degree	-	3.5
Aircraft Green, 34031 and Interior Aircraft Black, 37031		
60 degree	-	0.6
85 degree	-	1.0
Aircraft Black, 37038		
60 degree		3.0
85 degree		8.0
Other colors		
60 degree	-	3.0
85 degree	-	8.0

3.6.2 Storage stability.

3.6.2.1 Accelerated storage stability. After testing as in 4.6.15.1, the coating shall meet all the requirements of the specification and have a maximum viscosity of 90 KU. There shall be no curdling or hard dry caking and any sedimentation shall easily mix back into a smooth homogeneous state.

TABLE VI. Specific quantitative requirements.

Color	Percent Total Weight Solids (Min.)	Percent Vehicle Solids (Min.)	Percent Total Pigment (Min.)	Percent Flattening Agents (Max.)
Dark Green, 34082	55	17	28	60
Green 383, 34094	55	17	28	60
Brown 383, 30051	55	17	25	70
Tan 686A, 33446	55	17	26	70
Black, 37030	48	17	20	75
Aircraft Green, 34031	55	17	28	70
Sand, 33303	55	17	26	70
Field Drab, 33105	55	17	28	70
Olive Drab, 34088	55	17	28	70
Dark Sandstone, 33510	55	17	28	70
Aircraft White, 37875	55	17	28	70
Aircraft Red, 31136	55	17	28	70
Aircraft Black, 37038	48	17	20	85
Aircraft Gray, 36300	55	17	28	70
Aircraft Insignia Blue, 35044	55	17	28	70
Interior Aircraft Gray, 36231	55	17	28	70
Interior Aircraft Black, 37031	55	17	28	70 1/
Earth Yellow, 33245	55	17	29	67

1/ 19-20 percent of total pigment are glass beads.

3.6.2.2 Full container storage stability. The liquid coating, stored in the full quart can, shall show no skinning, livering, curdling, hard dry caking nor tough gummy sediment when tested as specified in 4.6.15.2. It shall remix readily to a smooth homogeneous state, shall have a maximum viscosity of 90 KU, and shall meet all other requirements of this specification.

3.6.3 Spraying properties. When tested as specified in 4.6.16, the coating shall spray satisfactorily in all respects and shall show no running, sagging, or streaking. The coating shall not spray dry and the dried film shall show no dusting, mottling, color separation or other film irregularities or defects and shall present a smooth (except Aircraft Green, 34031 and Interior Aircraft Black, 37031) lusterless, seedless finish.

3.6.4 Brushing properties. When tested as specified in 4.6.17, the coating shall brush satisfactorily and shall dry to a smooth, uniform film, free from seeds, runs, sags, or streaks. The dried film shall show no discernible brush marks.

3.6.5 Flexibility. A film of the coating tested as specified in 4.6.18 shall withstand bending without cracking or flaking.

3.6.6 Recoatability. When tested as specified in 4.6.19, recoating of a dried film shall produce no lifting, softening, or other film irregularity.

3.6.7 Adhesion. The assessment of the adhesion of the coating film shall be determined by its ability to not peel from the substrate when tested in accordance with ASTM D3359 as specified in 4.6.20. The resultant test rating shall be classified as scale 4B or better.

3.6.8 Water resistance. When tested as specified in 4.6.21, a film of the coating shall show no blistering or wrinkling and no more than a slight whitening or softening immediately upon removal from the water. Film softening shall not exceed a 2 pencil hardness difference (see ASTM D3363) from an unexposed film with identical cure history prior to water exposure. After 2 hours air drying, the portion of the panel that was immersed shall be almost indistinguishable with regard to adhesion, hardness, color, and gloss from an unexposed film with identical cure history prior to water exposure.

3.6.9 Hydrocarbon resistance. When tested as specified in 4.6.22, a film of the coating shall show no blistering or wrinkling when examined immediately after removal from the hydrocarbon test fluid. When examined 2 hours after removal, there shall be no excessive softening, whitening, or dulling. Film softening shall not exceed a 2 pencil hardness difference (see ASTM D3363) from an unexposed film with identical cure history prior to water exposure. After 24 hours drying, the portion of the panel which was immersed shall be almost indistinguishable with regard to hardness, adhesion, and general appearance from a panel prepared at the same time but not immersed and shall have no more than a 0.5 gloss unit increase over the original 60 and 85 degree gloss values.

3.6.10 Acid resistance. For Dark Green, 34082 and Green 383, 34094, a film of the coating tested as specified in 4.6.23 shall have no blistering and show no change from the original color.

3.6.11 Accelerated weathering. Samples of aircraft colors and Olive Drab, 34088 tested as specified in 4.6.24 for 800 hours shall show no cracking, chalking, or loss of adhesion, and shall meet the color, 60 and 85 degree gloss requirements of the specification. Camouflage colors tested as specified in 4.6.24 for 800 hours shall show no cracking, chalking, loss of adhesion, or increase in the 60 and 85 degree glosses to exceed maximum values in table V, and the color change shall be less than 2.5 NBS units. In addition, the camouflage colors after accelerated weathering shall remain within 2.5 NBS units of the chromaticity specified in table I at the mean of the allowable brightness range. The infrared reflectance and allowable ratio shall remain within those limits originally specified.

3.6.12 Super Tropical Bleach (STB) resistance. When tested as specified in 4.6.25, a film of the coating shall show no blistering, wrinkling, or film softening when examined immediately after washing with water. Film softening shall not exceed a 2 pencil hardness difference (see ASTM D3363) from an unexposed film with identical cure history prior to Super Tropical Bleach exposure. After drying, there shall be a maximum color change of 2.5 NBS units when comparing a portion of the untested panel to that of the tested area. The Super Tropical Bleach (STB) composition shall be in accordance with MIL-DTL-12468.

3.6.13 Chemical agent resistance. A film of the coating tested as specified in 4.6.26 shall desorb a maximum of 180 micrograms of agent HD, a vesicant agent, and 40 micrograms of agent GD, a toxic nerve agent.

3.6.14 Weather resistance. Films of the coating tested as specified in 4.6.27 shall show no checking, cracking, or appreciable film deterioration. There shall be no more than light chalking (see ASTM D4214). The color shall not exceed 2.5 Delta E units at 280 MJ/m^2 of total UV irradiance for silica flattened coatings. The color shall not exceed 2.5 Delta E units at 560 MJ/m^2 of total UV irradiance for polymeric flattened coatings. Note: 280 MJ/m^2 is the approximate equivalence of one year of total UV irradiance in southern Florida.

3.7 User instruction marking and precaution sheet. All containers shall include the VOC content in grams per liter of coating and a printed precaution sheet with the following information:

PRECAUTION: The Surgeon General requires airline respirators to be used unless air sampling shows exposure to be below standards. Then, either chemical cartridge respirators or airline respirators are required. Avoid contact with skin and eyes. Use with adequate ventilation. For other safety recommendations, refer to the Material Safety Data Sheet. Keep containers closed.

3.8 Toxicity clearance. All new chemicals and materials being added to the Army supply system shall have a toxicity clearance. A toxicity clearance involves a toxicological evaluation of materials prior to introduction into the Army supply system. The Army program manager shall be responsible for identifying technically feasible materials and requesting a toxicity clearance for use of that material within their program (see 6.4.1.2).

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).
b. Extension of qualification inspection (see 4.3).
c. Conformance inspection (see 4.4)

4.2 Qualification inspection. Qualification shall be conducted by the Qualifying activity (see 6.4). The qualification test sample shall consist of four quarts of the paint. The samples shall be legibly identified (see 6.4.1.1). Qualification inspection shall consist of tests for all requirements in section 3 and examination for user instruction marking (see 3.7). The results of each test shall be compared with the applicable requirement in section 3. Failure to conform to any requirement shall be counted as a defect, and paint represented by the sample test shall not be approved for inclusion on the qualified products list (QPL) under this specification.

4.3 Extension of qualification inspection. Qualification inspection (see 4.2) shall be performed on the colors listed in the left column of table VII. These colors shall be approved for inclusion on the qualified products list (QPL) under this specification in order to qualify their respective colors listed in the right column to an extension test program. The extension test program shall test for color, infrared reflectance, accelerated weathering (only for Aircraft Yellow, 33538 and Red, 31136), 60 and 85 degree gloss, STB resistance, acid resistance, accelerated storage stability, chemical agent resistance, and viscosity. Colors in the right column shall be listed on the qualified products list (QPL) if they satisfy the requirements of the extension test program. The qualification test sample shall consist of a one quart sample of the paint. The sample and the necessary paperwork (see 6.4.1.1) shall be sent to the Qualifying activity (see 6.4).

TABLE VII. Qualification and extension colors.

Color Qualified	Additional colors to which approval is extended
Green 383, 34094 Field Drab, 33105 Tan 686A, 33446 Brown 383, 30051 Black, 37030 Olive Drab, 34088 Aircraft Gray, 36300 Interior Aircraft Black, 37031 Aircraft White, 37875	Dark Green, 34082 Earth Yellow, 33245, Dark Sandstone, 33510 Sand, 33303 - Aircraft Black, 37038 Aircraft Green, 34031 Interior Aircraft Gray, 36231 - Aircraft Red, 31136, Aircraft Insignia Blue, 35044, Aircraft Yellow, 33538

4.4 Conformance inspection. The contracting officer shall require that an appropriate sprayed sample from each production lot (see 6.6) be forwarded to the U.S. Army Research Laboratory, ATTN: AMSRD-ARL-WM-MC (Coatings Team), Building 4600, Deer Creek Loop, Aberdeen Proving Ground, MD 21005-5069. Conformance inspection shall consist of testing spectral reflectance characteristics to include color, STB resistance, and gloss at 60 and 85 degrees. There shall be no failures (see 6.5).

4.5 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in FED-STD-141, section 9, routine and referee testing conditions. A dry film thickness of 0.002 ± 0.0002 inches (0.0508 ± 0.00508 mm) shall be used whenever film thickness is requested in any test, unless otherwise required by the test.

4.6 Test methods.

4.6.1 Test conditions. Except as otherwise specified herein, the routine testing condition shall be conducted in accordance with FED-STD-141, section 9, the appropriate ASTM method, or specific conditions cited herein.

4.6.1.1 Test procedures. The following tests (see table VIII) shall be conducted in accordance with FED-STD-141, the appropriate ASTM method, or specific procedures cited herein. The right is reserved to make any additional tests deemed necessary to determine that the coating meets the requirements of this specification.

Table VIII. Index.

Item	Government Documents	ASTM Method	Test Paragraph	Requirement Paragraph or Table
Color and spectral reflectance	-	E308	4.6.2	3.3
Total and vehicle solids	-	D2369	4.6.3	Table VI
Pigment analysis	-	D3723	4.6.4	3.4.1, Tables IV and VI
Titanium dioxide	-	D476, type III or IV	-	3.4.1
Hexavalent chromium	-	-	4.6.5	Table V
Lead content	-	D3335	4.6.6	Table V
Nonvolatile vehicle	-	-	4.6.7	3.4.2
Volatile organic compounds	EPA Method 311	D3960	4.6.8	3.4.3
Viscosity, Krebs-Stormer	-	D562	-	Table V
Hiding-power (contrast ratio)	-	D2805	4.6.9	Table V
Fineness of grind	-	D1210	4.6.10	Table V
Drying time	-	-	4.6.11	Table V
Specular gloss	-	D523	4.6.12	Table V
Infrared reflectance Camouflage colors Other colors	 - -	 E308 E308	 4.6.13 4.6.13	 Table I, II, III 3.3
Condition in container	FED-STD-141	-	4.6.14	3.6.1
Accelerated storage stability	-	-	4.6.15.1	3.6.2.1
Full container storage stability	-	D1849	4.6.15.2	3.6.2.2
Spraying properties	-	-	4.6.16	3.6.3
Brushing properties	-	-	4.6.17	3.6.4
Flexibility	-	D522	4.6.18	3.6.5
Recoatability	-	-	4.6.19	3.6.6
Adhesion	-	D3359	4.6.20	3.6.7
Water resistance	-	-	4.6.21	3.6.8
Hydrocarbon resistance	-	-	4.6.22	3.6.9
Acid resistance	-	-	4.6.23	3.6.10
Accelerated weathering	-	G154	4.6.24	3.6.11
STB resistance	-	-	4.6.25	3.6.12
Chemical agent resistance	-	-	4.6.26	3.6.13
Weather resistance	-	D4214	4.6.27	3.6.14

4.6.1.2 Test panels. Unless otherwise specified, metal panels used for test purposes shall be of two types:

a. Steel, cold rolled, 0.032 inches (0.8128 mm) thick. Zinc phosphate, B-952 or equivalent.
b. Steel, tinplated, 0.010 inches (0.254 mm) thick.

4.6.2 Color and spectral reflectance. Prepare two sprayed samples of the coating on a black and white hiding chart o a dry film thickness of 0.002 ± 0.0002 inches (0.0508 ± 0.00508 mm). Dry for a minimum of 48 hours according to the test conditions in 4.6.1. Determine the color and infrared reflectance from the spectral curves using the recording spectrophotometer method in accordance with ASTM E308. Measurements shall be made over the black portion of the hiding chart. For aircraft colors, compare the color as specified in 3.3. Visually match the other colors listed in 1.2.2 to the appropriate color chip from FED-STD-595 for compliance with 3.3 and table I. Spectral reflectance is outlined in table III.

4.6.3 Total and vehicle solids. Determine the total solids (nonvolatile matter) of the coating in accordance with ASTM D2369. Check for compliance with Table VI. Additionally, centrifuge approximately 10 ml of the whole paint on a high-speed centrifuge in excess of 15,000 rpm for 30 minutes or until separation is complete. Determine the vehicle solids (nonvolatile matter) of the supernatant liquid in accordance with ASTM D2369. Check for compliance with Table VI.

4.6.4 Pigment analysis. Determine the pigment content of the coating in accordance with ASTM D3723. The pigment generated by this method shall be used for the screening tests of the coating's heavy metal content as listed below.

4.6.5 Hexavalent chromium. Determine the presence or absence of hexavalent chromium by either of the following chemical reagent screening techniques.

(a) Weigh approximately 250 mg of pigment into a small glass test tube. Add 5 ml of 25 percent aqueous KOH and shake vigorously for 1-2 minutes. Decant a one ml aliquot into a plastic micro-centrifuge tube and centrifuge for five (5) minutes at 17000 rpm - balancing the centrifuge with a tube containing one ml of the KOH solution. The resulting supernatant liquid shall be nearly colorless. Use the tube containing the KOH solution as a reference. A distinct yellow color indicates the presence of hexavalent chromium and therefore shall constitute failure of the test requirement.

(b) Weigh approximately 50 mg of pigment into a small glass test tube. Add 5ml of 10 percent aqueous H_2SO_4 and shake vigorously for 1-2 minutes. Decant a one ml aliquot into a plastic micro-centrifuge tube and centrifuge for five (5) minutes at 17,000 rpm, balancing the centrifuge with a second tube containing one ml of the H_2SO_4 solution. The solution in the second tube shall act as the test "blank". Immerse a chromate ion (CrO_4^{2-}) test strip into the supernatant from each tube. Shake off the excess liquid and after approximately one minute compare the color change in the reaction zone of the strips to the color scale (concentration levels) provided by the manufacturer. The appearance of a purple/violet color from the "sample" strip is indicative of hexavalent chrome and therefore shall constitute failure of the test requirement. If a color change is apparent from the "blank" strip rerun the test using fresh, chromium-free reagents. The appearance of a pronounced color change is indicative of hexavalent chrome and therefore shall constitute failure of the test requirement.

4.6.6 Lead content. Determine the presence or absence of lead by weighing 50 mg of pigment into a small glass test tube. Add 5 ml of dilute HNO_3 and shake vigorously for 1-2 minutes. Decant a one ml aliquot into a plastic micro centrifuge tube and centrifuge for five (5) minutes at 17,000 rpm, balancing the centrifuge with a second tube containing one ml of the dilute HNO_3 solution. The solution in the second tube shall act as the test "blank". Immerse a lead ion test strip into the supernatant from each tube. Shake off the excess liquid and after approximately one minute compare the color change in the reaction zone of the strips to the color scale (concentration levels) provided by the manufacturer. If a color change is apparent from the "blank" strip rerun the test using fresh, lead-free reagents. Confirmation of the exact lead concentration in the coating's solids can be quantified using ASTM D3335. Nonconformance to the table V requirements shall constitute failure of this test.

4.6.7 Nonvolatile vehicle. Centrifuge a 1:1 mixture of methyl isobutyl ketone and paint at 12,000 rpm for 10 minutes. Evaporate a film of the vehicle on a sodium chloride plate at 105 °C (221 °F) for 5 minutes. Scan the infrared spectrum from 2.5 to 15 micrometers. Check for compliance with 3.4.2.

4.6.8 Solvent analysis for volatile organic compounds (VOC) determination. Determine the VOC content in accordance with ASTM D3960. Check for compliance with 3.4.3.

4.6.9 Hiding power (contrast ratio). Using a sprayed sample from the color determination (see 4.6.2), determine the reflectance using the daylight reflectance factor of ASTM D2805 over the black and white portion of the card and record the values as R_B/R_W and check for compliance with table V.

4.6.10 Fineness of grind. Determine fineness of grind in accordance with ASTM D1210. Check for compliance with table V.

4.6.11 Drying time. Spray the mixed coating to a dry film thickness of 0.002 ± 0.0002 inches (0.0508 ± 0.00508 mm) and determine the drying under ambient conditions as described in table V. Check for compliance with table V.

4.6.12 Specular gloss. Spray the mixed coating to a dry film thickness of 0.002 ± 0.0002 inches (0.0508 ± 0.00508 mm). Test for 60-degree gloss and 85-degree gloss (sheen) as specified in table V of this specification and check for compliance with table V.

4.6.13 Infrared reflectance (for Aircraft Green, 34031, Aircraft Gray, 36300, Interior Aircraft Black, 37031, and Dark Sandstone, 33510). Determine the infrared reflectance on the black portion of the sprayed sample in 4.6.2. For Aircraft Green, 34031 and Interior Aircraft Black, 37031 determine the infrared reflectance value at 870 nanometers. Determine the infrared reflectance for Aircraft Gray, 36300 and Dark Sandstone, 33510 at 1500 nanometers. In all evaluations, use a spectrophotometer which is capable of measuring the total diffuse reflectance in accordance with ASTM E308. Check for compliance with table I.

4.6.14 Condition in container. Determine package condition in accordance with method 3011 of FED-STD-141 and observe for compliance with 3.6.1. On qualification testing, determine pigment settling by proceeding as specified in FED-STD-141, method 3011, but do not stir. Reseal and then agitate the can for 3 minutes on a paint shaker. On reexamination of the contents, the disclosure of any gel bodies or undispersed pigment indicates unsatisfactory settling properties.

4.6.15 Storage stability.

4.6.15.1 Accelerated storage stability. Fill an epoxy lined pint container with the coating and determine the viscosity in accordance with ASTM D562. Tightly seal the container and place sample in a preheated oven for 7 days at 60 ± 1 °C (140 ± 1.8 °F). Allow to cool to room temperature and examine the contents. Check for compliance with 3.6.2.1.

4.6.15.2 Full container storage stability. Allow 2 quarts of liquid coating to stand undisturbed for 6 and 12 months respectively in accordance with ASTM D1849. Examine the contents for skinning. Reseal and agitate the can for 5 minutes on a paint shaker. Reexamine and evaluate for pigment settling as specified in 4.6.14. Determine viscosity and other applicable tests for compliance with 3.6.2.2.

4.6.16 Spraying properties. If reduction is necessary for spray application, reduce with thinner suggested by manufacturer, not to exceed VOC limits where applicable. Spray the coating on a solvent cleaned steel panel to a dry film thickness between 0.002 ± 0.0002 inches (0.0508 ± 0.00508 mm) and observe the spraying properties for compliance with 3.6.3.

4.6.17 Brushing properties. Apply the coating using a 2-1/2 inch brush to a panel prepared as in 4.6.26.1. The packaged coating may be reduced as in 4.6.16 if needed. Check for compliance with 3.6.4.

4.6.18 Flexibility. Determine flexibility in accordance with ASTM D522, method B using a ¼ inch mandrel. Spray the coating on a steel panel, tinplated 0.010 inches (0.254 mm) thick. Air dry for 168 hours. Bend the coated panels according to ASTM D522, method B. Examine the coating for cracks over the area of the bend for compliance with 3.6.5.

4.6.19 Recoatability. Prepare two steel panels pretreated as specified in 4.6.1.2 and apply epoxy primer conforming to MIL-P-53022 or MIL-P-53030 to a dry film thickness between 0.0012 ± 0.0003 inches (0.03048 ± 0.00762 mm). Air dry both panels 2 hours. Mix the coating as specified in 4.6.16 and spray to a dry film thickness of 0.002 ± 0.0002 inches (0.0508 ± 0.00508 mm). Apply a second coat of paint to one of the above panels after 2 hours (air dry) and a second coat to the other after air drying for 24 hours. Air dry both panels 24 hours. Examine for lifting, softening, and evidence of other film irregularity for compliance with 3.6.6.

4.6.20 Adhesion. Prepare a steel panel pretreated and primed as specified in 4.6.1.2 and mix the coating as specified in 4.6.16. Spray the coating to a dry film thickness of 0.002 ± 0.0002 inches (0.0508 ± 0.00508 mm) and air dry for 168 hours. Perform adhesion testing as specified in ASTM D3359, method B, and examine for compliance with 3.6.7.

4.6.21 Water resistance. Prepare a steel panel pretreated and primed as specified in 4.6.19 and mix the coating as specified in 4.6.16. Spray the coating to a dry film thickness of 0.002 ± 0.0002 inches (0.0508 ± 0.00508 mm) and air dry for 168 hours. Coat all exposed unpainted metal surfaces with wax or suitable protective coating and immerse in deionized water at 25 ± 1 °C (77 ± 2 °F) for 168 hours. Panels shall be immersed at a minimum depth of 50%. At the end of the test period, remove and examine for compliance with 3.6.8.

4.6.22 Hydrocarbon resistance. Prepare a film of the coating as specified in 4.6.21. Air dry the specimen for 168 hours and then immerse for 168 hours in a hydrocarbon fluid conforming to

JP8 at 25 ± 1 °C (77 ± 2 °F). Panels shall be immersed at a minimum depth of 50%. At the end of the test period, remove and examine for compliance with 3.6.9.

4.6.23 Acid resistance (only for Green 383, 34094 and Dark Green 34082). Using the film prepared and dried as specified in 4.6.21, place a 3 to 5 ml spot of a 10 percent by volume acetic acid solution on the surface of the coating. Cover the film with an appropriate size watch glass and allow to stand for 1 hour. Rinse with water thoroughly, allow to dry, and examine the film for blistering and color change for compliance with 3.6.10.

4.6.24 Accelerated weathering. Spray four panels as specified in 4.6.21 and air dry for 168 hours. Three panels are to be tested and one retained as a control. Determine the color and infrared reflectance as in 4.6.2 and measure the 60 and 85 degree gloss. Expose three panels for 800 hours to accelerated weathering in accordance with ASTM G154 using a UV 340A light source. Measure the 60 and 85 degree gloss and determine the color and infrared reflectance of the exposed film. Examine the panel for chalking by rubbing with a piece of velvet or cheese cloth. Check for compliance with 3.6.11.

4.6.25 Super Tropical Bleach (STB) resistance. Spray one 4 by 12 inch panel as specified in 4.6.21. Air dry the panel a minimum of 168 hours. Scribe a 1 inch diameter wax ring using a china marker on the painted surface of the panel. Place approximately 1 ml of STB agent on the panel surface. Do not cover. Allow to stand 30 minutes then thoroughly wash with water. An STB slurry mix of 40 parts STB and 60 parts water by weight shall be used. Examine for compliance with 3.6.12.

4.6.26 Chemical agent resistance.

4.6.26.1 Panel preparation. Spray eight steel panels pretreated as specified in 4.6.1.2 and primed conforming to MIL-P-53022 or MIL-P-53030 with coupons to be circular discs with a 2.4 inch (61 mm) diameter for the chemical agent testing to a dry film thickness between 0.001 ± 0.0001 inches (0.0254 ± 0.00254 mm). Air dry 2 hours and spray the coating to be tested to a dry film thickness between 0.002 ± 0.0002 inches (0.0508 ± 0.00508 mm). Air dry the panels for 7 days.

4.6.26.2 Test conditions. Because the desorption rate of agents from paint is temperature dependent, all agent tests shall be conducted at 25 °C (77 °F). Extremely toxic materials are used in this testing. Agent HD, a vesicant agent, is also a known carcinogen. Agent GD is a toxic nerve agent, exposure to which is difficult to treat. Consequently, all work shall be performed in an approved fume hood, and appropriate measures to protect individuals at risk of exposure must be taken.

4.6.26.3 Test apparatus. The test apparatus used for both HD and GD testing consist of a temperature controlled Plexiglas box (approximately 0.5 m x 0.5 m x 1 m) containing five separate test cells. Four of these cells are used to test sample CARC panels; the fifth is used to test a control panel, all five tests to be run simultaneously. The test cells are machined from aluminum and consist of two parts that are clamped together to hold the test panels in place. Maintain a gastight seal. Agent desorbed from the test panels is entrained by dry nitrogen that passes through a temperature-humidity-flow controller, with final temperature controlled by a proportional temperature controller. The nitrogen passes through an external chamber fitted with a bleed valve before entering the test cells. Determine the agent recovered in micrograms for compliance with 3.6.12.

4.6.26.4 Test procedure. Place a 5 cm^2 circular template on the area of the test panel to be contaminated with agent. Use a grease pencil to mark a circle around the template; the grease mark serves to keep the agent from spreading out of the designated area. Place 50 microliters of agent HD or GD on the test area. Place a glass cover slip (microscope slide) over the test area to minimize evaporation of the agent. After 30 minutes remove the cover slip, rinse the agent from the panel with isopropanol and allow to air dry for approximately 45 seconds. Place the panel in the test cell, which has been maintained at 25 °C (77 °F), with the coated area positioned such that the nitrogen stream shall pass across the contaminated area. Nitrogen is used instead of air to eliminate the possibility of reaction of the desorbed agent over the time of the test, which is 22 hours. Pass the nitrogen through an impinger containing the appropriate solvent, n-decane for HD and iso-octane (2, 2, 4-trimethylpentane) for GD. The flow of nitrogen shall be maintained at 0.252 grams/min across each sample. Terminate the test at the end of 22 hours.

4.6.26.5 Analysis. Transfer the contents of each impinger to a 25 ml volumetric flask. Rinse the impinger twice with the same solvent and add the rinse to the flask. Bring the volume up to the mark with solvent and mix well. Transfer a 1 ml portion to a GC vial for analysis. Perform the analysis on a Finnigan-MAT GQC ion-trap mass spectrometer equipped with a 25 m MS-5 capillary column, using helium as the carrier gas. Standardize the mass spectrometer by serial dilutions of an agent solution in the appropriate solvent, analyzed in the same conditions. The instrument conditions are as follows: introduce the samples from an AST 2000 autosampler, volume of 1 microliter, onto the GC column in splitless mode; injector temperature of 280 °C (536 °F). Temperature program the column from an initial temperature of 50 °C to 120 °C (122 °F to 248 °F) at a rate of 10°/min; followed by an increase of 25 °C/min (77 °F/min) to a final temperature of 200 °C (392 °F). Acquire mass spectra in electron impact mode over the mass range of 50-150 for HD and 50-200 for GD. Under these conditions, HD has a retention time of 8.15 minutes. Integrate the peak areas of the relevant portion of the reconstructed ion chromatograms for the ion at m/z 109. Under the cited conditions GD elutes as a pair of completely resolved diastereomeric enantiomers with retention times of 9.56 and 10.04 minutes. Integrate the peak areas of the relevant portion of the reconstructed ion chromatograms for the ion at m/z 99. Construct the standard response curve for HD and GD using the integrated area on the y axis and concentration (µg/ml) on the x axis. Use the linear regression analysis function of an Excel spreadsheet, which shall calculate the slope, intercept, and correlation coefficient of the standard response curve. The slope and intercept of the standard response curve are used to calculate concentration of agent HD or GD in the impinger solutions. Calculate the total amount of agent (in micrograms) that outgassed from the CARC panel by multiplying the concentration of agent in the impinger solution (micrograms per milliliter read from the standard curve) by the volume of the impinger solution (25 ml).

4.6.27 Weather resistance. Prepare five 3 by 6 inch steel panels as in 4.6.1.2. Air dry the panels a minimum of 7 days. The chemical agent resistant coating that is flattened with polymeric materials shall be placed outdoors, for the equivalent of 560 MJ/m^2 of total UV irradiance, in an accelerated outdoor exposure according to ASTM G90. The chemical agent resistant coating that is flattened with siliceous materials shall be placed outdoors for the equivalent of 280 MJ/m^2 of total UV irradiance, in an accelerated outdoor exposure according to ASTM G90. At 70 MJ/m^2 intervals examine the panels for compliance with 3.6.14. Determine chalking according to ASTM D4214. Wash the panels with a warm soap solution using a soft sponge or cloth, rinse, dry and examine for color change at each interval. The exposure racks shall be angled at a latitude of 33° 23’ North and 112° 35’ West.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. This single component polyurethane coating is intended to provide surfaces that are easily and effectively decontaminated after exposure to liquid chemical agents. It may be used in areas where the maximum VOC level, 3.5 lbs/gallon or less, is regulated. It is applied over epoxy primers (MIL-PRF-23377, MIL-P-53022, MIL-P-53030, or MIL-PRF-85582) depending on the application and substrate. For adequate camouflage properties, it is necessary to apply the coatings to a minimum dry film thickness of 0.002 ± 0.0002 inches (0.0508 ± 0.00508 mm).

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Type and color of coating (see 1.2).
c. If a toxicity clearance is required (see 3.8).
d. If qualification samples are required and where to send them (see 4.2 and 6.4).
e. If extension of qualification samples are required and where to send them (see 4.3 and 6.4).
f. If conformance samples are required and where to send them (see 4.4).
g. Packaging requirements (see 5.1).
h. Whether material safety data sheets (MSDS) are required with each shipment (see 6.4.1).
i. Quantity and kit size identification (see 6.7.1)

6.3 Basis of purchase. The coating covered by this specification should be purchased by volume, the unit being one U.S. liquid gallon of 231 cubic inches at 20 °C (68 °F).

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL-53039, whether or not such products have actually been so listed by that date. The attention of contractors is called to this requirement and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Samples for qualified products list (QPL) testing (see 4.2) and for the extension testing program (see 4.3) should be submitted to the U.S. Army Research Laboratory, ATTN: AMSRD-ARL-WM-MC (W. Lum), Building 4600, Deer Creek Loop, Aberdeen Proving Ground, MD 21005-5069.

6.4.1 Material safety data sheets (MSDS). The contracting activity should be provided a material safety data sheet at the time of contract award. The MSDS should be provided in accordance with OSHA section 1910.1200, 29 CFR Chapter XVII and found as part of FED-STD-313. OSHA section 1910.1200 requires reporting threshold criteria for known or suspected human carcinogens on MSDS 0.1 percent or greater, and 1 percent or greater for other health hazards. The MSDS should be included with each unit of issue of material covered by the specification, when specified (see 6.2). Contracting officers will identify those activities requiring copies of completed material safety data sheets prepared in accordance with FED-STD-313. The pertinent Government mailing addresses for submission of data are listed in FED-STD-313.

6.4.1.1 Sample identification for qualification inspection. Samples for qualified products list (QPL) testing and for the extension testing program are to be identified in a cover letter with the following information:

Manufacturer's name and product number.
Submitted by (name and date).
Specify the number of samples.
Specify the reason for submitting the samples.
Specify the specification number MIL-DTL-53039B (MR), type I or II (as applicable).
Provide a copy of the material safety data sheet (MSDS).
Provide a copy of the statement of composition.
Provide a copy of the technical data sheet.
Provide a copy of the test report.

6.4.1.2 Toxicity request. Department of the Army Regulation (AR) 40-5, Preventive Medicine, (AR) 70-1, Acquisition Policy, and Department of the Army Pamphlet 70-3, Acquisition Procedures, require a toxicity clearance. Army toxicity questions and/or a toxicity clearance request should be addressed to: Commander, US Army Center For Health Promotion And Preventive Medicine (MCHB-TS-T), 5158 Blackhawk Road, Aberdeen Proving Ground, MD 21010-5403.

6.5 Conformance rejection and retest. Failure in any conformance inspection will result in the rejection of the batch from which it was obtained. Rejected material cannot be resubmitted for acceptance without written approval from the qualification activity (see 4.4). The application for resubmission will contain all details concerning previous rejections and measures taken to correct these deficiencies.

6.6 Batch and lot formation. A batch consists of all coating material (in U.S. gallons) manufactured during one continuous operation and forming part of one contract or order for delivery. A lot consists of all coatings of the same type, composition and color, from a single uniform batch, produced and offered for delivery at one time (see 4.4). The addition of any substance to a batch shall constitute a new lot.

6.7 Part or Identifying Number (PIN). The PIN to be used for coatings acquired to this specification is created as follows:

M53039	-	X	-	XXX	-	XXXXX
Specification Identifier		Coating type designator 1 = Type I 2 = Type II		Kit size designator (see 6.7.1)		Color designator

6.7.1 Kit size designator codes. When this part numbering system is used, the kit size is to be identified as:

Kit size	Kit size designator
X pint (X liter)	0XP
X quart (X liter)	0XQ
X gallon (X liter)	0XG
50 gallon (XX liter)	50G

Note: Kit size and designator may be modified for ease of procurement and is not otherwise limited.

6.8 Detail specification. MIL-DTL-53072, Chemical Agent Resistant Coating (CARC) System Application Procedures and Quality Control Inspection, is available for application procedures and quality control inspection of this coating.

6.9 Subject term (key word) listing.

Aircraft
Camouflage
CARC
Colors
Pigment

6.10 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

CONCLUDING MATERIAL

Custodians:
Army - MR
Navy - AS
Air Force - 99

Preparing activity:
Army - MR

Project 8010-0209

Review activities:
Army - AR, AT, CR, EA, MD1, MI
Navy - CG, SH
Air Force - 11, 84

Civil agency:
GSA/FSS - 6FEE

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at http://assist.daps.dla.mil/.

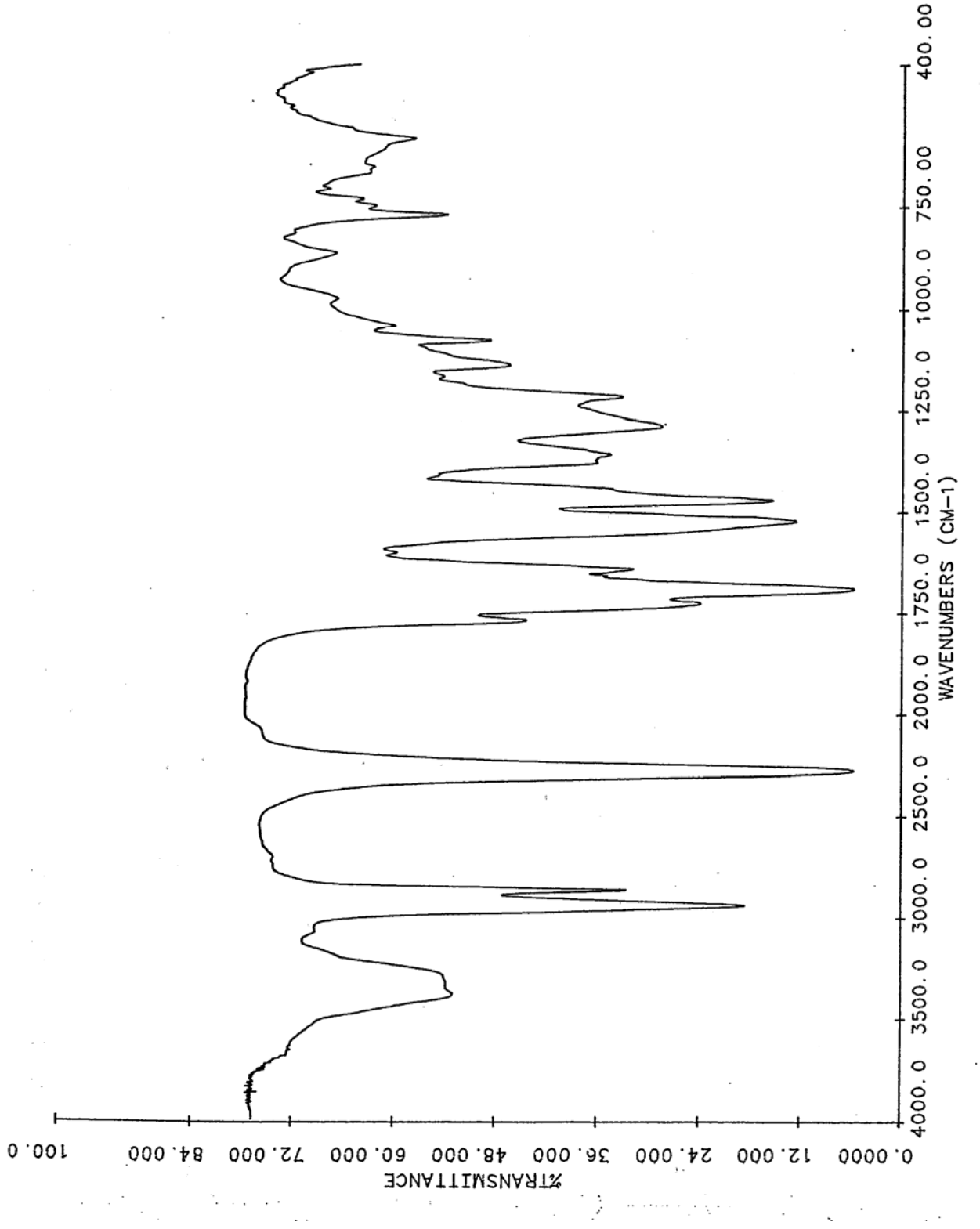


FIGURE 1. Infrared spectrum of extracted resin (prepolymer I).

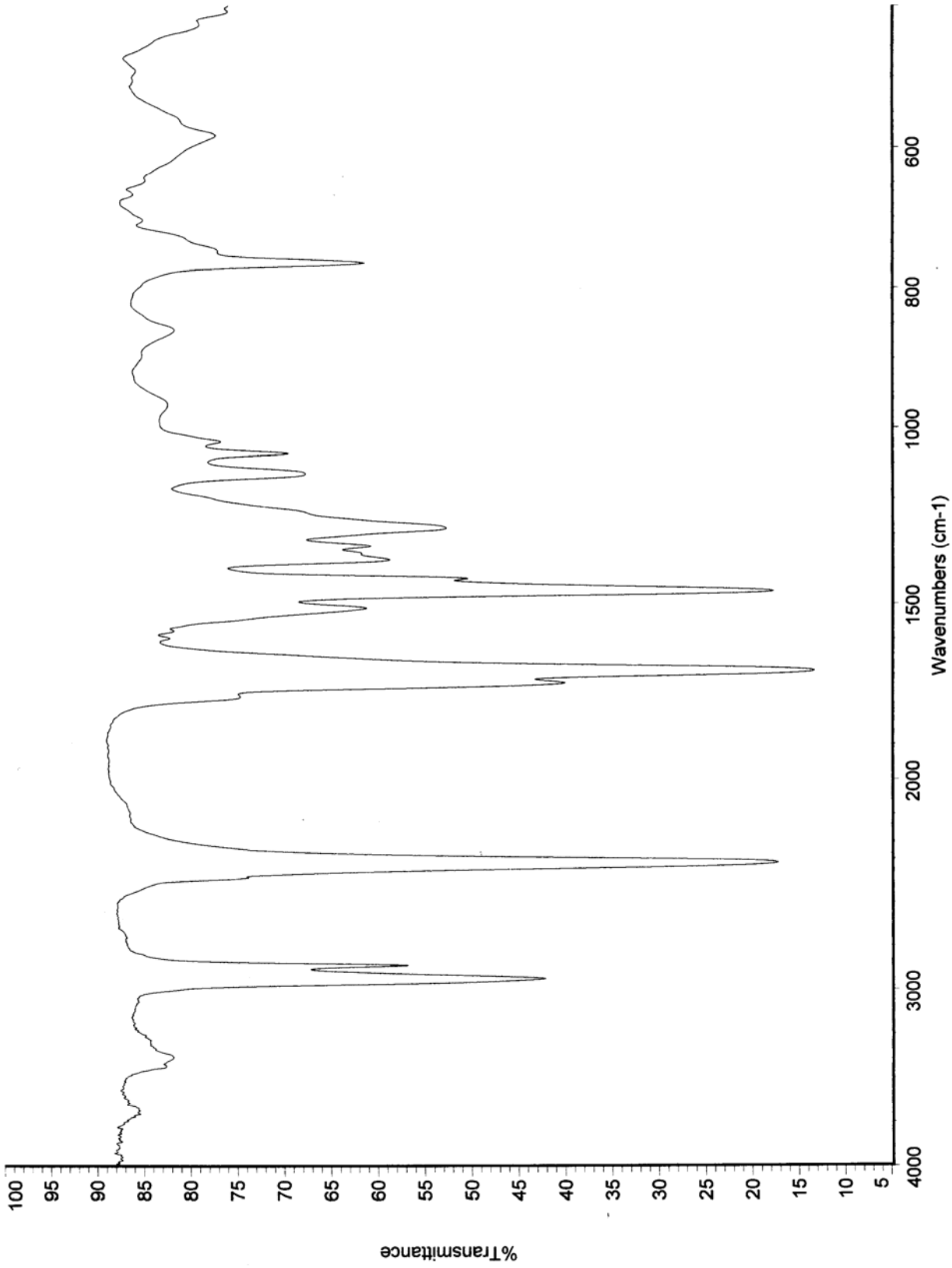
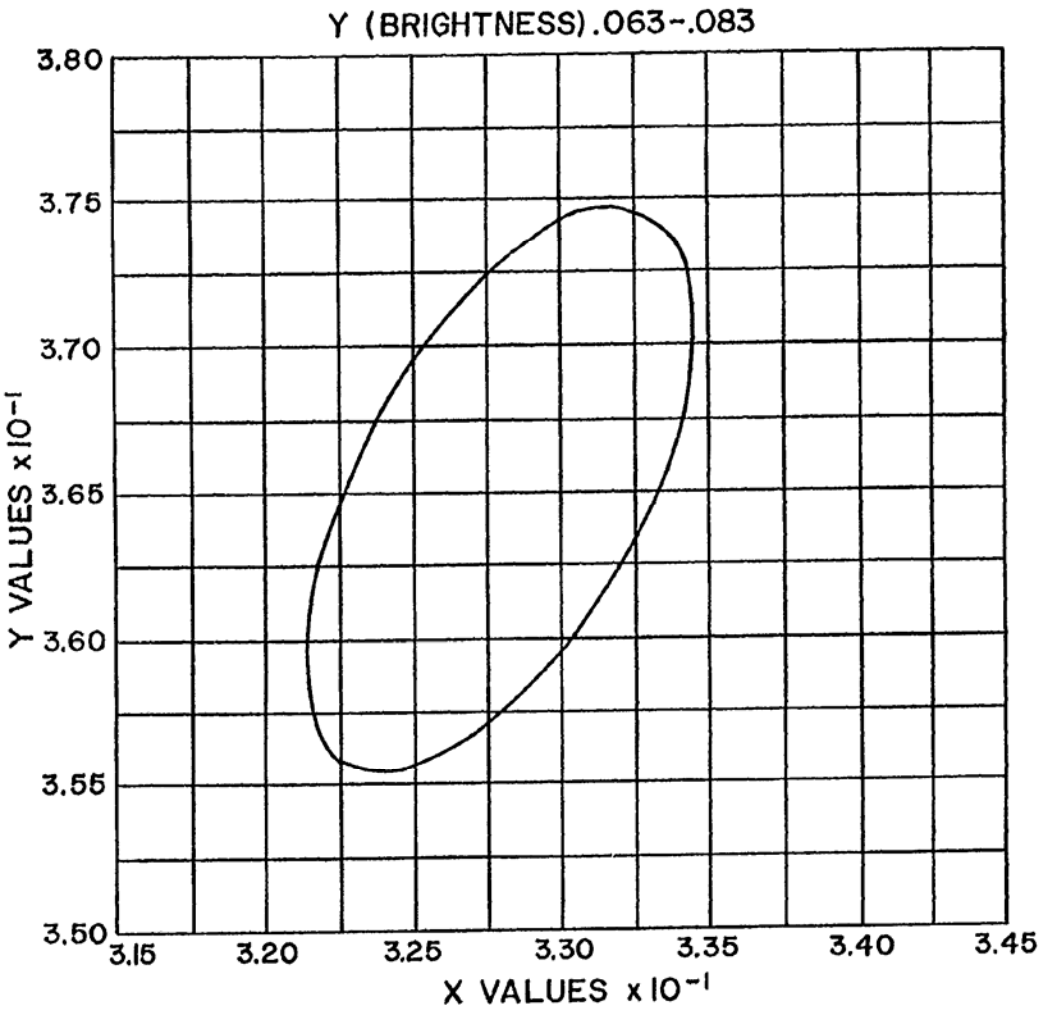
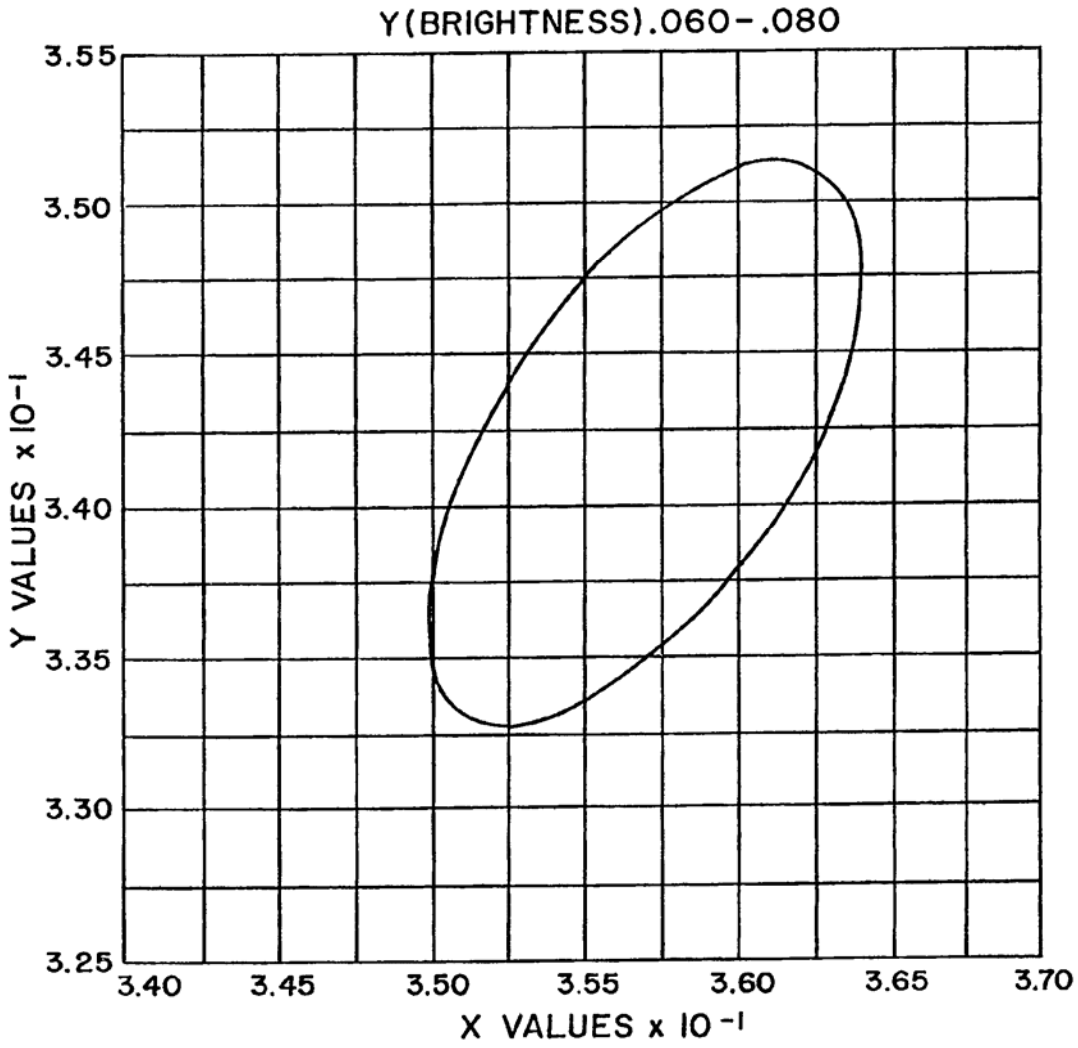


FIGURE 2. Infrared spectrum of extracted resin (prepolymer II).



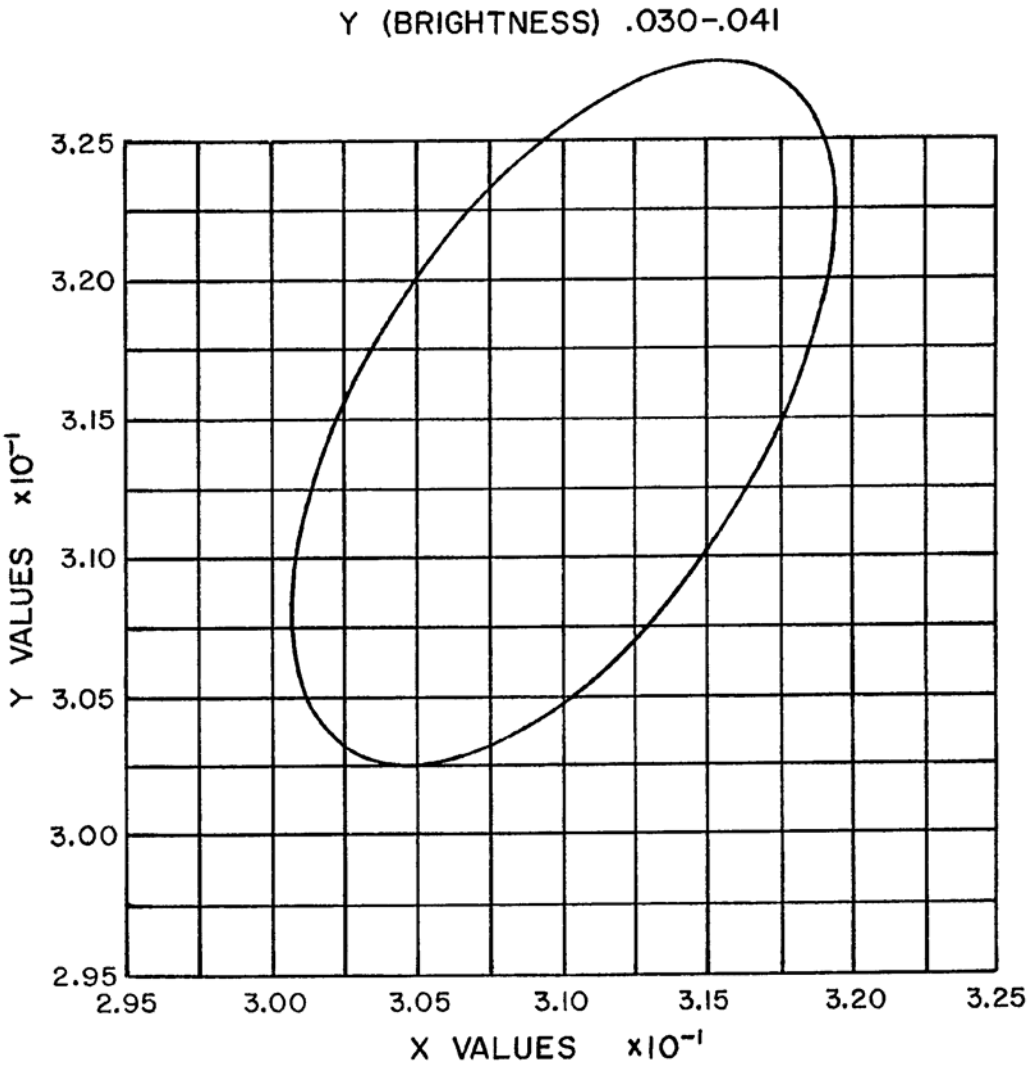
NOTE – COLOR ELLIPSE IS 2.0 NBS UNITS FROM CENTER VALUES.

FIGURE 3. Chromaticity diagram for camouflage paint, color – Green 383, 34094.



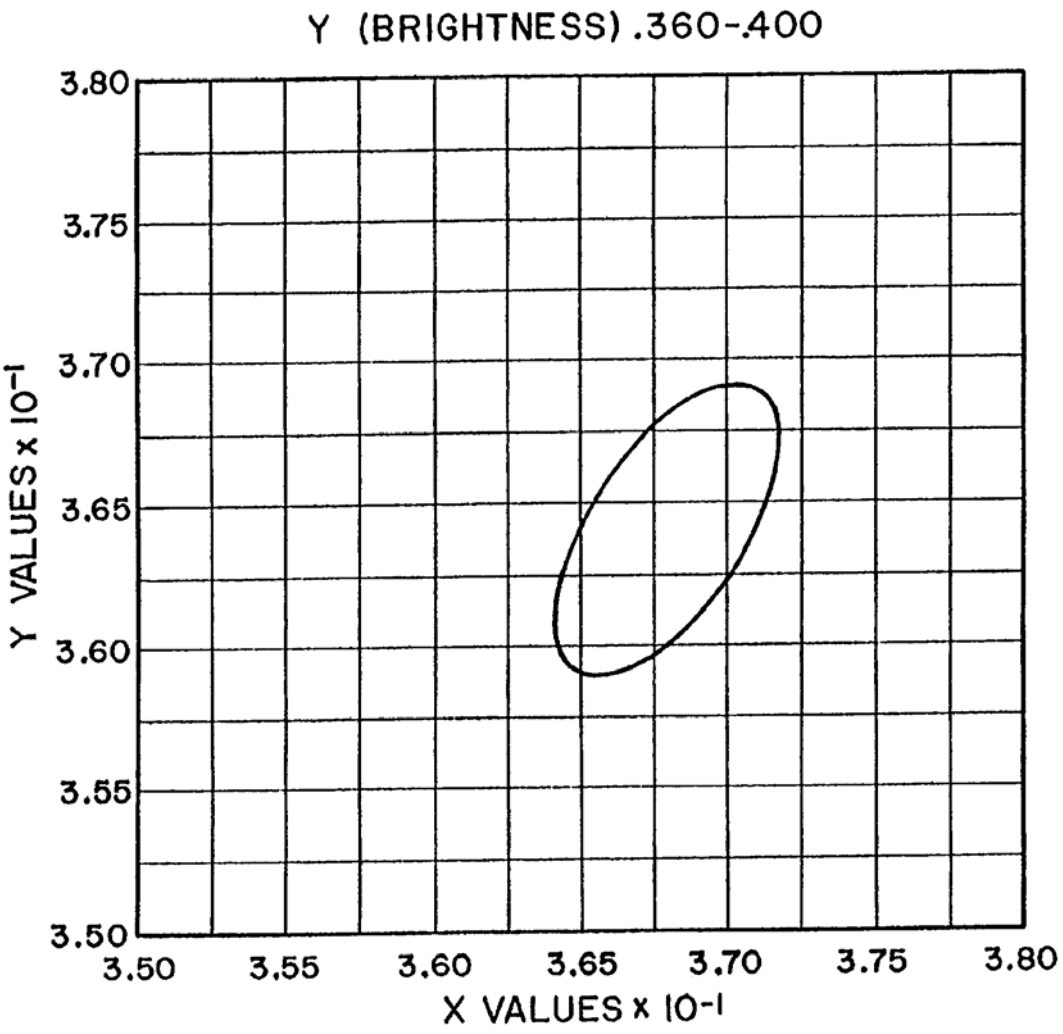
NOTE – COLOR ELLIPSE IS 2.0 NBS UNITS FROM CENTER VALUES.

FIGURE 4. Chromaticity diagram for camouflage paint, color – Brown 383, 30051.



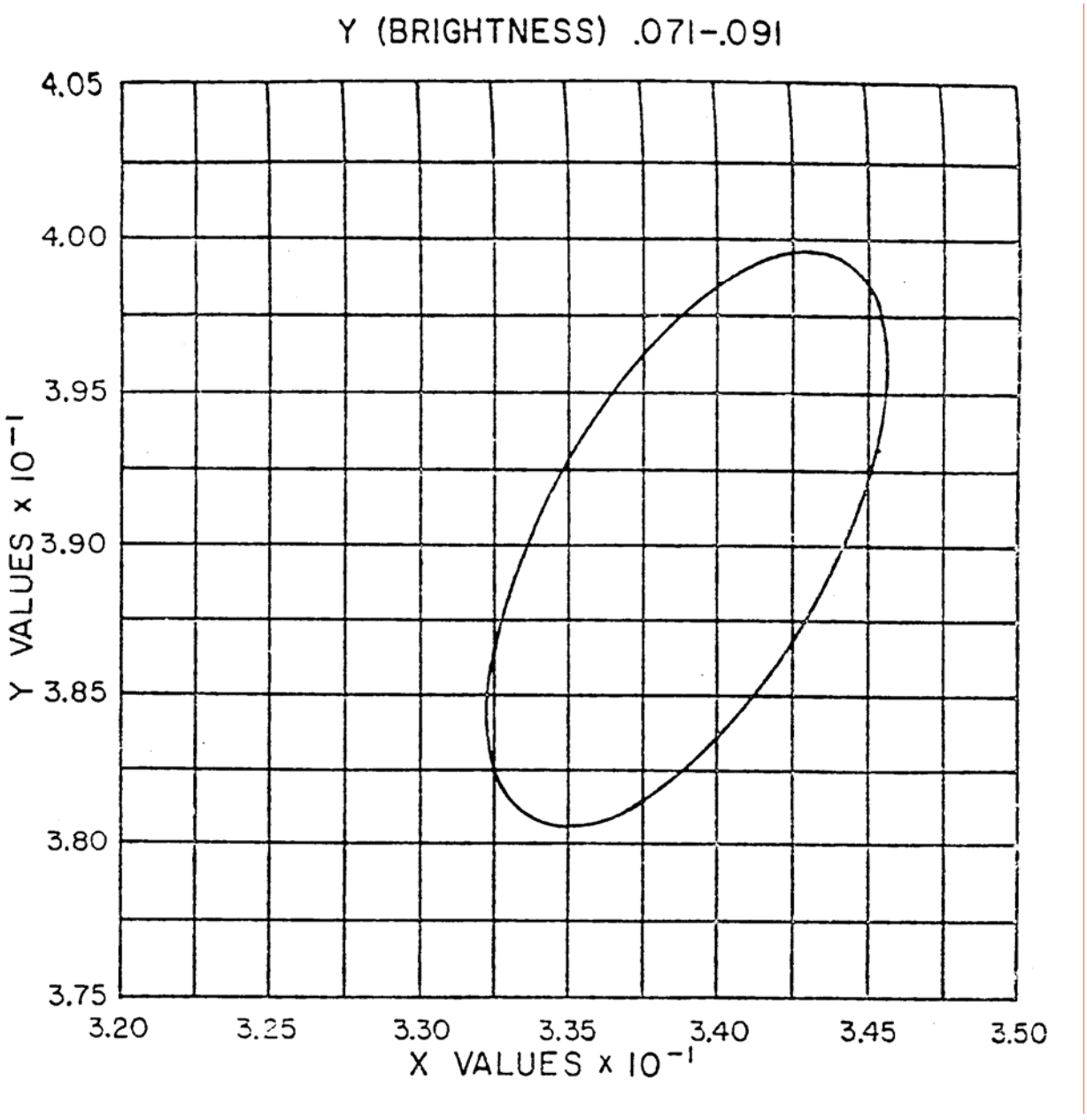
NOTE – COLOR ELLIPSE IS 2.0 NBS UNITS FROM CENTER VALUES.

FIGURE 5. Chromaticity diagram for camouflage paint, color – Black 37030.



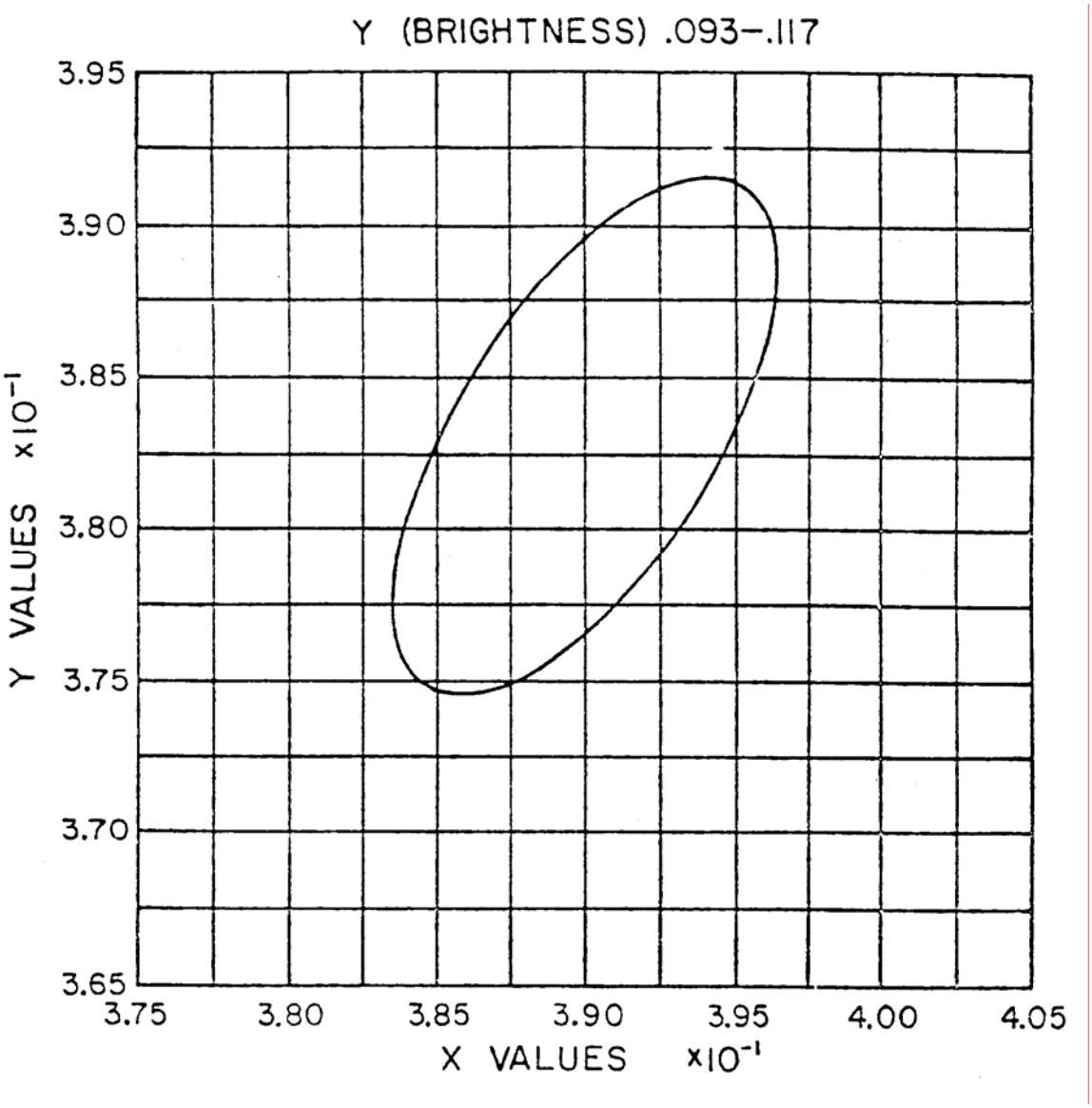
NOTE – COLOR ELLIPSE IS 2.0 NBS UNITS FROM CENTER VALUES.

FIGURE 6. Chromaticity diagram for camouflage paint, color – Tan 686A, 33446.



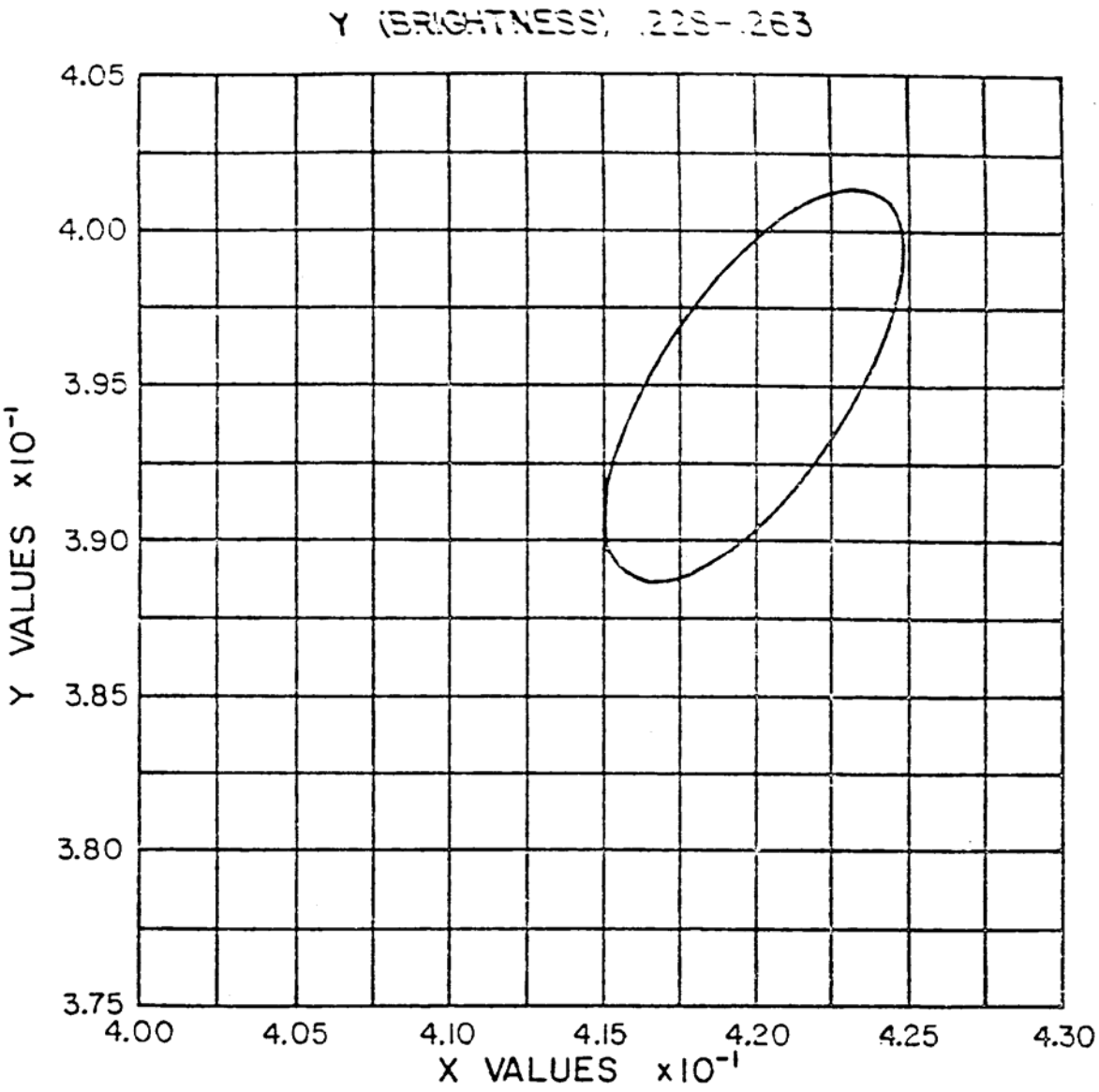
Note – Color Ellipse is 2.0 NBS Units From Center Values.

FIGURE 7. Chromaticity diagram for camouflage paint, color – Dark Green 34082.



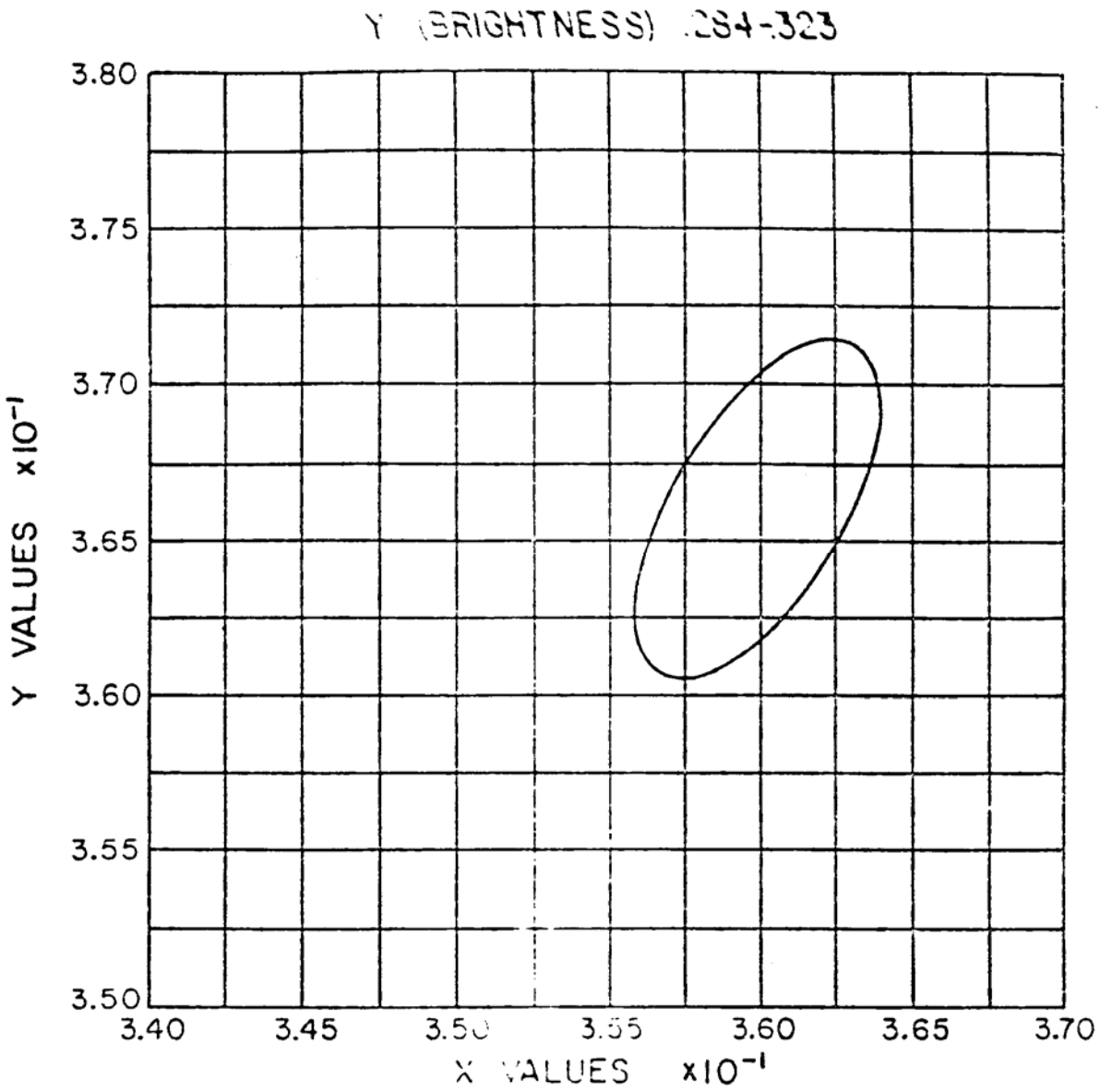
Note – Color Ellipse is 2.0 NBS Units From Center Values.

FIGURE 8. Chromaticity diagram for camouflage paint, color – Field Drab 33105.



Note – Color Ellipse is 2.0 NBS Units From Center Values.

FIGURE 9. Chromaticity diagram for camouflage paint, color – Earth Yellow 33245.



Note – Color Ellipse is 2.0 NBS Units From Center Values.

FIGURE 10. Chromaticity diagram for camouflage paint, color – Sand 33303.

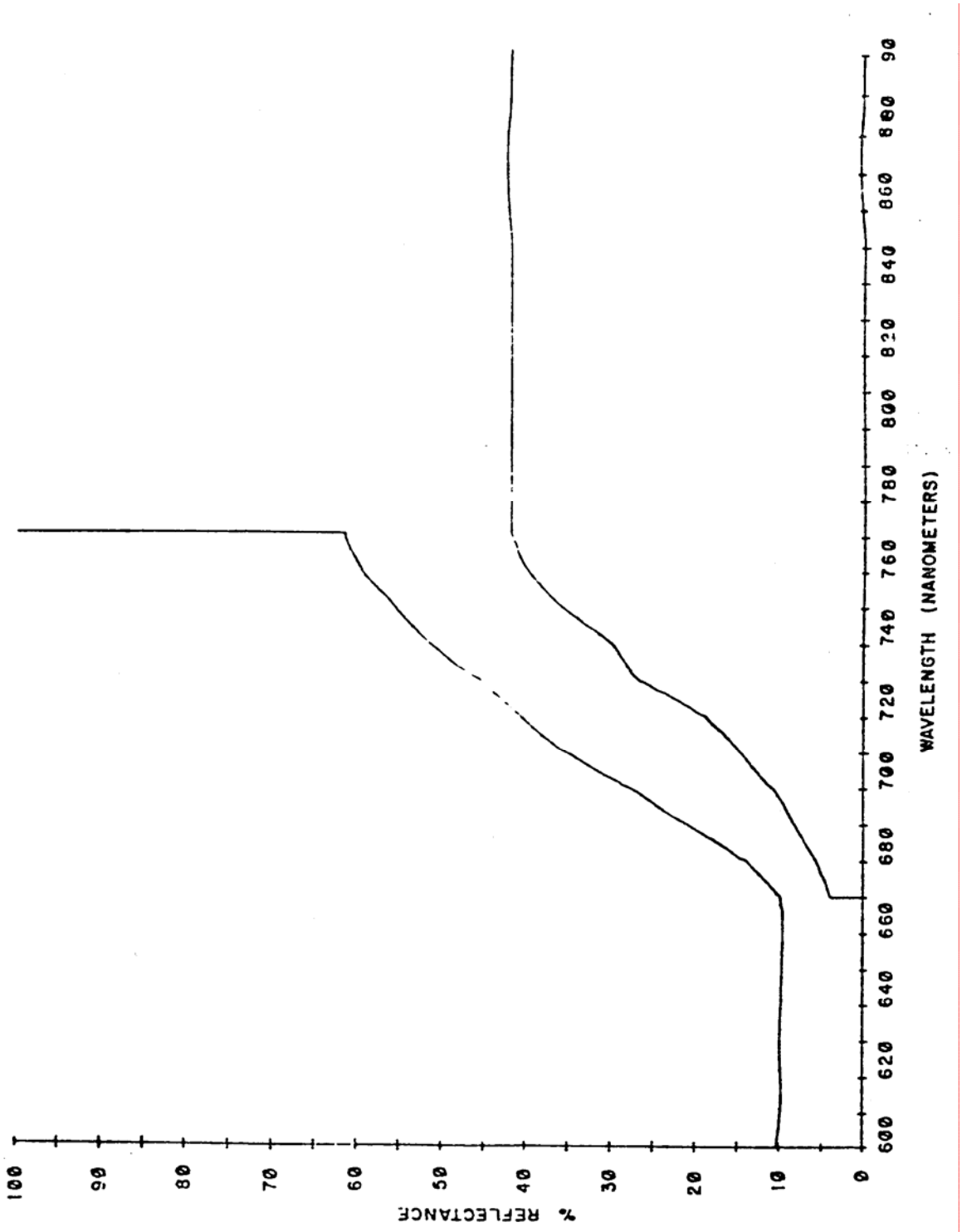


FIGURE 11. Spectral reflectance limits.