APPENDIX 4

to

PROCESS INSTRUCTION 3426-818

COPPER PLATING

SPECIAL PROCESS

Process Instruction
3426-818
January 21, 1988

COPPER PLATING

Ref: (a) MIL-C-14550B; AMENDMENT 3; COPPER PLATING (Electrodeposited)

SCOPE

This appendix establishes a procedure to copper plate and conforms to the requirements of reference (a) intended for such uses as build-up and undercoating for other metals, carburizing shield or for brazing operations, and to prevent basis metal migration into tin layer in soldering operations. Because of the wide range of parts processed, deviations from this procedure may have to be made. Any deviations to be made on any nuclear work must have Code 134 and Code 2300 approval. An Inspection/ Verification sheet will be used for processing of any nuclear work, upon Code 2300 request.

.1 Method.

.1.1 Pre-Plating Requirements.

.1.1.1 Receive and Examine part(s) for obvious visual defects. Return unsuitable or defective part(s) to customer, specifing reason for rejection. If measurement of thickness is required, measure thickness and record preplating dimensions.

.1.1.2 Calculate Time for plating. As applicable.

	Factor	Current density
COPPER	0.088	0.21

FORMULA :

$$\text{TIME, hours} = \frac{\text{Thickness} * 1000 * \text{Factor}}{\text{Current density}}$$

.1.1.3 Mask. As required.

.1.1.4 Wire/Rack according to their size to support the items physically and electrically.

.1.2 Pre-cleaning before plating.

.1.2.1 Degrease.

.1.2.2 Strip Paint.
a. Rinse

.1.2.3 Hot Alkaline Cleaner.
a. Rinse.

.1.2.4 Hydrochloric Acid.
a. Rinse.

.1.2.5 Brite Dip. As necessary per visual inspection.
a. Rinse.

.1.2.6 Copper strip. If necessary.
a. Rinse.

.1.2.7 Vaporhone and/or Sandblast.
a. Rinse.

.1.2.8 A) If Copper or Copper base alloys, Brass, Bronze, or Steel.
a. Continue with step .1.3.

B) If Stainless Steel, Copper-Nickel or Nickel-Copper
a. Acid Nickel Strike for 1 to 4 minutes.
b. Rinse.

.1.3 Copper Strike or Copper Plate.
a. Rinse.

.1.3.2 Hot Rinse.

.1.3.3 Air Blow Dry. With Compressed air.

.1.3.4 V Inspect Deposit. The copper plating shall be smooth, fine grained, adherent, free from blisters, pits, scale, nodules, porosity, indications of burning, excessive edge build-up and other defects which are detrimental to the utility, form, fit or funtion of the part. If measurement of thickness is required, measure thickness and record post-plating dimensions.

.1.3.5 If any visual defects detected. Continue with step .1.2.6.

.1.3.6 Unwire / Unrack part(s).

.1.3.7 Prepare Part(s) for shipment to customer. Attach proper documents, i.e., copy of Instructions and Sketch Card, AWRs, or other documents, and material Route Tag, and ship to customer.

APPENDIX 5

to

PROCESS INSTRUCTION 3426-818

NICKEL PLATING

SPECIAL PROCESS

Process Instruction
3426-818
March 24, 1987

NICKEL PLATING

Ref: (a) QQ-N-290A, NICKEL PLATING (Electrodeposited) dated 12 Nov 1971

SCOPE

This appendix establishes a procedure to Nickel plate and conforms to the requirements of reference (a) for Class 1. Class 1 , corrosion protective plating, is used to protect against corrosive attack, or is used as an undercoat for chromium. This process is not suitable for Class 2 plating. Parts may be of steel, stainless steel or copper and copper alloys. Because of the wide range of parts processed, deviations from this procedure may have to be made. Any deviations to be made on any nuclear work must have Code 134 and Code 2300 approval. An Inspection/ Verification sheet will be used for processing of any nuclear work, upon Code 2300 request.

.1 Method.

.1.1 Pre-Plating Requirements.

.1.1.1 Receive and Examine part(s) for obvious visual defects. Return unsuitable or defective part(s) to customer, specifing reason for rejection. If measurement of thickness is required, measure thickness and record pre-plating dimensions.

.1.1.2 Calculate Time for plating. As applicable.

	Factor	Current density
A) COPPER	0.088	0.21
B) NICKEL	0.139	0.25

FORMULA :

$$\text{TIME, hours} = \frac{\text{Thickness} * 1000 * \text{Factor}}{\text{Current density}}$$

.1.1.3 Mask. As required.

.1.1.4 Wire/Rack according to their size to support the items physically and electrically.

.1.2 Pre-cleaning before polishing and/ or plating.

.1.2.1 Strip Paint. As necessary.

.1.2.2 Rinse.

.1.2.3 Hot Alkaline Cleaner.

.1.2.4 Rinse.

.1.2.5 If Nickel Plating is present. Remove old nickel plating in Nickel Strip, using reverse current.
a. Visual inspection as necessary until all nickel is removed.
b. Rinse.

.1.2.6 Hydrochloric Acid. To remove rust and scale.

.1.2.7 Rinse.

.1.2.8 Brite Dip. As necessary per visual inspection.

.1.2.9 Rinse.

.1.2.10 Vaporhone and/or Sandblast. As necessary.
a. Rinse.

.1.2.11 If Buffing and/or Polishing is Not Required. Continue with step .1.2.22.

.1.2.12 Hot rinse.

.1.2.13 Air Blow Dry. With compressed air.

.1.2.14 Unwire/Unrack part(s).
a. Mask. As necessary.

.1.2.15 Buff and/ or Polish.

.1.2.16 Rewire/ Rerack part(s).

.1.2.17 Vapor Degrease. If necessary.

.1.2.18 Electrocleaner solution. Clean off buffing and polishing compounds using swabs and cleaning brushes, may require pumicing to clean part(s).

.1.2.19 Rinse.

.1.2.20 Sour Acid Dip. For 10 to 30 seconds.

.1.2.21 Rinse.

.1.2.22

A) If Copper or Copper base alloys, Brass, Bronze.
a. Continue with step .1.2.24.

B) If Steel.
a. Continue with step .1.2.23.

C) If Stainless Steel, Copper-Nickel or Nickel-Copper
a. Acid Nickel Strike. For 1 to 4 minutes until part(s) are covered.
b. Rinse.
c. continue with step .1.2.24.

.1.2.23 Copper Plate. If necessary.
- a. Rinse.
- b. Hot Rinse.
- c. Air blow dry. With compressed air.
- d. Unwire/Unrack part(s).
- e. Buff Copper. To bright finish.
- f. Rewire/ Rerack part(s).
- g. Vapor Degrease. If necessary.
- h. Electrocleaner solution.
- i. Rinse.
- j. Sour Acid Dip. For 10 to 30 seconds.
- k. Rinse.

.1.2.24 Copper Strike. (Flash).
- a. Rinse.
- b. Sour Acid Dip. For 10 to 30 seconds.
- c. Rinse.

.1.3 Bright Nickel Plate or Dull Nickel plate as required.
- a. Check solution temperature.

.1.3.1 Rinse.

.1.3.2 Hot Rinse.

.1.3.3 Air Blow Dry. With Compressed air.

.1.3.4 V Inspect Deposit. Inspect for blisters, pits, cracks, nodules, indication of burning, flaking, discoloration or peeling. If measurement of thickness is required, measure thickness and record post-plating dimensions, to verify proper thickness.

.1.3.5 If any visual defects detected. Continue with step .1.2.5.

.1.3.6 Unwire / Unrack part(s).

.1.3.7 Prepare Part(s) for shipment to customer. Attach proper documents, i.e., copy of Instructions and Sketch Card, AWRs, or other documents, and material Route Tag, and ship to customer.

APPENDIX 6

to

PROCESS INSTRUCTION 3426-818

CADMIUM PLATING

SPECIAL PROCESS

Process Instruction
3426-818
January 21, 1988

CADMIUM PLATING

Ref: (a) QQ-P-416 E, Amendment 1, PLATING CADMIUM, (Electrodeposited)

SCOPE

This appendix establishes a procedure to Cadmium plate and conforms to the requirements of reference (a) for Class 1, Class 2 and Class 3. Cadmium plating shall be of the following types, Type I, and Type II. This procedure does not apply to Type III plating. Unless otherwise specified in the request, the cadmium plating shall be type II. The prime purpose of chromate finishes (type II) on electrodeposited cadimum platings is to retard or prevent the formation of white corrosion products on surfaces exposed to stagnant water, high humidity atmospheres, salt water, marine atmospheres or cyclic condensation and drying. Some types of chromate have proven satisfactory as a base for paints. Parts may be of steel, stainless steel or copper and copper alloys. Because of the wide range of parts processed, deviations from this procedure may have to be made. Any deviations to be made on any nuclear work must have Code 134 and Code 2300 approval. An Inspection/ Verification sheet will be used for processing of any nuclear work, upon Code 2300 request.

.1 Method.

.1.1 Pre-Plating Requirements.

.1.1.1 Receive and Examine part(s) for obvious visual defects. Return unsuitable or defective part(s) to customer, specifing reason for rejection. If measurement of thickness is required, measure thickness and record pre-plating dimensions.

.1.1.2 Calculate Time for plating. As applicable.

	Factor	Current density
CADMIUM	0.07	2.5

FORMULA :

$$\text{TIME, hours} = \frac{\text{Thickness} * 1000 * \text{Factor}}{\text{Current density}}$$

.1.1.3 Mask. As required.

.1.1.4 Wire/Rack according to their size to support the items physically and electrically.

.1.2 Pre-cleaning before plating.

.1.2.1 Degrease.

.1.2.2 Strip Paint. As necessary.
a. Rinse.

.1.2.3 Hot Alkaline Cleaner.
a. Rinse.

.1.2.4 Hydrochloric Acid.
a. Rinse.

.1.2.5 Brite Dip. As necessary per visual inspection.
a. Rinse.

.1.2.6 Vaporhone and/or Sandblast. As necessary.
a. Rinse.

.1.2.7 A) If Copper or Copper base alloys, Brass, Bronze or Steel.
a. Continue with step .1.3.

B) If Stainless Steel, Copper-Nickel or Nickel-Copper
a. Acid Nickel Strike for 1 to 4 minutes.
b. Rinse.

.1.3 Cadmium Plate. As required.
a. Rinse.

.1.3.2 Nitric Acid. 1% solution.
a. Rinse.

.1.3.4 If Type II plating is required.
a. Chromate Conversion until finish is satisfactory.
b. Rinse.

.1.3.4 Hot Rinse.

.1.3.5 Air Blow Dry. With Compressed air.

.1.3.6 V Inspect Deposit. The cadmium plating shall be smooth, fine grained, adherent, uniform in appearance, free from blisters, pits, nodules, indication of burning and other defects. If measurement of thickness is required, measure thickness and record post-plating dimensions.

.1.3.7 If any visual defects detected. Continue with step .1.2.2.

.1.3.8 Unwire / Unrack part(s).

.1.3.9 Prepare Part(s) for shipment to customer. Attach proper documents, i.e., copy of Instructions and Sketch Card, AWRs, or other documents, and material Route Tag, and ship to customer.

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APPENDIX 7

to

PROCESS INSTRUCTION 3426-818

DECORATIVE CHROME PLATING

SPECIAL PROCESS

Process Instruction
3426-818
March 24, 1987

DECORATIVE CHROME PLATING

Ref: (a) QQ-C-320B, Chromium Plating (Electrodeposited) dated 17 June 1974

SCOPE

This appendix establishes a procedure to chromium plate as a decorative finish and conforms to the requirements of reference (a), Class 1, type I or type II. Parts are plated with decorative chromium to provide a pleasing appearance. Parts may be of iron, steel, copper and copper-base alloys. Because of the wide range of parts processed, deviations from this procedure may have to be made. However, any deviations to be made on any nuclear work must have Code 134 and Code 2300 approval. An Inspection/ Verification sheet will be used for processing of any nuclear work upon Code 2300 request.

.1 Method.

.1.1 Pre-Plating Requirements.

.1.1.1 Receive and Examine part(s) for obvious visual defects. Return unsuitable or defective part(s) to customer, specifing reason for rejection. If measurement of thickness is required, measure thickness and record pre-plating dimensions.

.1.1.2 Calculate Time for plating. As applicable.

	Factor	Current density
A) COPPER	0.088	0.21
B) NICKEL	0.139	0.25
C) CHROMIUM	2.57	2.50

FORMULA :

$$\text{TIME, hours} = \frac{\text{Thickness} * 1000 * \text{Factor}}{\text{Current density}}$$

.1.1.3 Mask. As required.

.1.1.4 Wire/Rack according to their size to support the items physically and electrically.

.1.2 Pre-cleaning before polishing and/ or plating.

.1.2.1 Strip Paint. As necessary.

.1.2.2 Rinse.

.1.2.3 Hot Alkaline Cleaner.

.1.2.4 Rinse.

.1.2.5 If Nickel Plating is present. Remove old nickel plating in Nickel Strip, using reverse current.
a. Visual inspection as necessary until all nickel is removed.
b. Rinse.

.1.2.6 Hydrochloric Acid. To remove rust and scale.

.1.2.7 Rinse.

.1.2.8 Brite Dip. As necessary per visual inspection.

.1.2.9 Rinse.

.1.2.10 Vaporhone and/or Sandblast. As necessary.
a) Rinse.

.1.2.11 If Buffing and/or Polishing is Not Required. Continue with step .1.2.22.

.1.2.12 Hot rinse.

.1.2.13 Air Blow Dry. With compressed air.

.1.2.14 Unwire/Unrack part(s).

.1.2.15 Buff and/ or Polish.

.1.2.16 Rewire/ Rerack part(s).
a) Mask. As necessary.

.1.2.17 Vapor Degrease. If necessary.

.1.2.18 Electrocleaner solution. Clean off buffing and polishing compounds using swabs and cleaning brushes, may require pumicing to clean part(s).

.1.2.19 Rinse.

.1.2.20 Sour Acid Dip. For 10 to 30 seconds.

.1.2.21 Rinse.

.1.2.22

A) If Copper or Copper base alloys, Brass, Bronze.
e. Continue with step .1.2.24.

B) If Steel.
a. Continue with step .1.2.23.

C) If Stainless Steel, Copper-Nickel or Nickel-Copper
a. Acid Nickel Strike. For 1 to 4 minutes until part(s) are covered.
b. Rinse.

.1.2.23 Copper Plate. If necessary.

a. Rinse.
b. Hot Rinse.
c. Air blow dry. With compressed air.
d. Unwire/Unrack part(s).
e. Buff Copper. To bright finish.
f. Rewire/ Rerack part(s).
g. Vapor Degreaser. If necessary.
h. Electro Cleaner solution.
i. Rinse.
j. Sour Acid Dip. For 10 to 30 seconds.
k. Rinse.

.1.2.24 Copper Strike. (Flash).

a. Rinse.
b. Sour Acid Dip. For 10 to 30 seconds.
c. Rinse.

.1.2.25 Bright Nickel Plate or Dull Nickel plate as required.

a. Rinse.
b. Inspect Deposit. Inspect for blisters, pits, cracks, nodules, indication of burning, flaking or peeling.

NOTE: Do not allow Nickel plated part(s) to air dry, Chrome plate as soon as possible.

c. If any visual defects detected. Rewire and/or Rerack if necessary. Repeat process starting at step .1.2.5.

.1.3 Chromium Plate. For 2 to 4 minutes.

a. Check solution temperature.

NOTE: Current shall be off when immersing the part(s) but rectifier should be turned on as soon as possible. Apply total current to part(s) slowly after immersing in plating solution. Solution should be dummied prior to being used for production plating using 250 ASF for 10 minutes to 1 hour. Anodes left in the plating solution lose their effectiveness because of Lead Chromate build-ups on the surface of inactive anodes. Anodes should be periodically removed from the tank and cleaned in a lead anode cleaning solution.

.1.3.1 Rinse.

.1.3.2 Hot Rinse.

.1.3.3 Air Blow Dry. With Compressed air.

.1.3.4 V Inspect Deposit. Inspect for blisters, pits, cracks, nodules, indication of burning, flaking, discoloration or peeling. If measurement of thickness is required, measure thickness and record post-plating dimensions, to verify proper thickness.

.1.3.5 If any visual defects detected. Continue with step .1.2.3.

.1.3.6 Unwire / Unrack part(s).

.1.3.7 Prepare Part(s) for shipment to customer. Attach proper documents, i.e., copy of Instructions and Sketch Card, AWRs, or other documents, and material Route Tag, and ship to customer.

APPENDIX 8

to

PROCESS INSTRUCTION 3426-818

SILVER PLATING

SPECIAL PROCESS

Process Instruction
3426-818
April 6, 1987

SILVER PLATING

Ref: (a) QQ-S-365 D, SILVER PLATING (Electrodeposited)

SCOPE

This appendix establishes a procedure to Silver plate and conforms to the requirements of reference (a) for Type I, Grade B. Parts may be of steel, stainless steel or copper and copper alloys. Because of the wide range of parts processed, deviations from this procedure may have to be made. Any deviations to be made on any nuclear work must have Code 134 and Code 2300 approval. An Inspection/ Verification sheet will be used for processing of any nuclear work, upon Code 2300 request.

.1 Method.

.1.1 Pre-Plating Requirements.

.1.1.1 Receive and Examine part(s) for obvious visual defects. Return unsuitable or defective part(s) to customer, specifing reason for rejection. If measurement of thickness is required, measure thickness and record preplating dimensions.

.1.1.2 Calculate Time for plating. As applicable.

	Factor	Current density
A) COPPER	0.088	0.21
B) SILVER	0.043	0.18

FORMULA :

$$\text{TIME, hours} = \frac{\text{Thickness} * 1000 * \text{Factor}}{\text{Current density}}$$

.1.1.3 Degrease. As necessary.

.1.1.4 Mask. As required.

.1.1.5 Wire/Rack according to their size to support the items physically and electrically.

.1.2 Pre-cleaning before plating.

.1.2.1 Degrease. As necessary.

.1.2.2 Strip Paint. As necessary.
a. Rinse

.1.2.3 Hot Alkaline Cleaner.

.1.2.4 Rinse.

.1.2.5 Hydrochloric Acid. To remove rust and scale.
a. Rinse.

.1.2.6 Brite Dip. As necessary per visual inspection.
a. Rinse.

.1.2.7 If silver strip is necessary.
a. Hot rinse.
b. Air blow dry.
c. Mask as necessary.
d. Silver strip.
e. Rinse.

.1.2.8 Vaporhone and/or Sandblast. As necessary.
a. Rinse.

.1.2.9 A) If Copper or Copper base alloys, Brass, Bronze, or Steel.
a. Continue with step .1.2.10.

B) If Stainless Steel, Copper-Nickel or Nickel-Copper
a. Acid Nickel Strike. For 1 to 4 minutes until part(s) are covered.
b. Rinse.

.1.2.10 Copper Strike or Copper Plate. As necessary to ensure full coverage of all base metal.
a. Rinse.

.1.2.11 Silver Strike. At 4 to 6 volts until proper coverage of silver over copper.

.1.3 Silver plate. As required.

.1.3.1 Rinse.

.1.3.2 Hot Rinse.

.1.3.3 Air Blow Dry. With Compressed air.

.1.3.4 V Inspect Deposit. The silver plating shall be smooth, fine grained, adherent, free from visible blisters, pits, nodules, porosity, indications of burning, excessive edge build-up and other defects. If measure of thickness is required, measure thickness and record post-plating dimensions.

.1.3.5 If any visual defects detected. Continue with step .1.2.7.

.1.3.6 Unwire / Unrack part(s).

.1.3.7 Prepare Part(s) for shipment to customer. Attach proper documents, i.e., copy of Instructions and Sketch Card, AWRs, or other documents, and material Route Tag, and ship to customer.

APPENDIX 10

to

PROCESS INSTRUCTION 3426-818

LEAD PLATING

SPECIAL PROCESS

Process Instruction
3426-818
January 21, 1988

LEAD PLATING

Ref: (a) MIL-L-13808B, LEAD PLATING, ELECTRODEPOSITED

SCOPE

This appendix establishes a procedure to lead plate and conforms to the requirements of reference (a), for Type I and Type II, classes 1, 2, and 3. Because of the wide range of parts processed, deviations from this procedure may have to be made. Any deviations to be made on any nuclear work must have Code 134 and Code 2300 approval. An Inspection/ Verification sheet will be used for processing of any nuclear work, upon Code 2300 request.

.1 Method.

.1.1 Pre-plating Requirements.

.1.1.1 Receive and Examine part(s) for obvious visual defects. Return unsuitable or defective part(s) to customer, specifing reason for rejection. If measurement of thickness is required, measure thickness and record pre-plating dimensions.

.1.1.2 Calculate time for plating.

	Factor	Current density
A. LEAD	0.049	0.10
B. TIN	0.077	0.14
C. COPPER	0.088	0.21

FORMULA :

$$\text{TIME , hours} = \frac{\text{Thickness} * 1000 * \text{Factor}}{\text{Current density}}$$

.1.1.3 Mask. As required.

.1.1.4 Wire/Rack according to their size to support the items physically and electrically.

.1.2 Pre-cleaning before plating

.1.2.1 Degrease.

.1.2.2 Strip Paint.
a. Rinse.

.1.2.3 Hot Alkaline Cleaner.
a. Rinse.

.1.2.4 If tin or lead are present.
a. Wire brush or Lead strip as necessary.
b. Rinse.
c. continue with step .1.2.7 .

.1.2.5 Hydrochloric acid.
a. Rinse.

.1.2.6 Brite Dip. As necessary per visual inspection.
a. Rinse.

.1.2.7 Vaporhone.
a. Rinse.

.1.2.8 A. If lead over lead is required.
a. Tin plate.
b. Rinse.

B. If lead over new part(s) is required.
a. Copper plate. In accordance with reference (a), type and class.
b. Rinse.

.1.3 Lead plate.
a. Rinse.

.1.3.1 V Inspect Deposit. The lead plating shall be smooth, fine grained, adherent, continuous, free from visible blisters, pits, nodules, excessive build-up, staining and other defects. If measurement of thickness is required, measure thickness and record post-plating dimensions.

.1.3.2 If any visual defects detected. Continue with step .1.2.4

.1.3.3 Unwire / Unrack part(s).

.1.3.4 Prepare Part(s) for shipment to customer. Attach proper documents, i.e., copy of Instructions and Sketch Card, AWRs, or other documents, and Material Route Tag, and ship to customer.

APPENDIX 11

to

PROCESS INSTRUCTION 3426-818

CLEANING

SPECIAL PROCESS

CLEANING

SCOPE

This appendix establishes a procedure for cleaning and surface treatment. Prior to application of surface treatments and coatings, cleaning materials and processes which have no damaging effect on the metal, including freedom from pits, intragranular attack and significant etching. Because of the wide range of parts processed, deviations from this procedure may have to be made. Any deviations to be made on any nuclear work must have Code 134 and Code 2300 approval. An Inspection/ Verification sheet will be used for processing of any nuclear work, upon Code 2300 request.

.1 Method.

.1.1 Receive and Examine part(s) for obvious visual defects. Return unsuitable or defective part(s) to customer, specifing reason fo rejection.

.1.2 Wire/Rack according to their size to support the items physically and electrically.

.1.3 Degrease.

.1.4 Strip Paint. As necessary.
a. Rinse.

.1.5 Hot Alkaline Cleaner.
a. Rinse.

.1.6 Hydrochloric acid.
a. Rinse.

.1.7 Sandblast or Vaporhone

.1.8 Bright Dip.
a. Rinse.

.1.9 Cyanide Solution.

.1.10 Hot Rinse.

.1.11 Blow Dry.

.1.12 Inspect part(s). All part(s) shall be completely free of corrosion products, scale, paint, grease, oil, flux and other foreign materials including other metals, and shall be given th specified treatment as soon as practicable after cleaning.

.1.13 If any visual defects detected. Continue with step .1.1.

.1.14 Unwire / Unrack part(s).

.1.15 Prepare Part(s) for shipment to customer. Attach proper documents, i.e., copy of Instructions and Sketch Card, AWRs, or other documents, and material Route Tag, and ship to customer.

APPENDIX 12

to

PROCESS INSTRUCTION 3426-818

PASSIVATION

SPECIAL PROCESS

Process Instruction
3426-818
April 27, 1987

PASSIVATION

Ref: (a) QQ-P-35B, PASSIVATION TREATMENTS FOR CORROSION-RESISTING STEEL

SCOPE

This appendix establishes a procedure for passivation treatment and conforms to the requirements of reference (a) for Type I, II, III or VI. This appendix is not applicable to high sulfur and selenium material(s). Passivation treatments are intended to improve corrosion resistance of parts made of austentic, ferritic, and martensitic steels of 300 or 400 series and precipitation hardening steels. Because of the wide range of parts processed, deviations from this procedure may have to be made. Any deviations to be made on any nuclear work must have Code 134 and Code 2300 approval. An Inspection/ Verification sheet will be used for processing of any nuclear work, upon Code 2300 request.

.1 Method.

.1.1 Pre-treatment Requirements.

.1.1.1 Receive and Examine part(s) for obvious visual defects. Retur unsuitable or defective part(s) to customer, specifing reason rejection.

.1.1.2 Wire/Rack according to their size to support the items physically and electrically.

.1.2 Pre-cleaning before treatment

.1.2.1 Degrease.

.1.2.2 Strip Paint. As necessary.
a. Rinse.

.1.2.3 Hot Alkaline Cleaner.
a. Rinse.

.1.2.4 Hydrochloric Acid.
a. Rinse.

.1.3 Passivation solution. For 10 - 30 minutes minimum as require for base metal.

.1.3.1 Rinse.

.1.3.2 Hot Rinse.

.1.3.3 Blow Dry.

.1.3.4 V Inspect Deposit. The passivated part(s) shall exibit a clean surface and shall show no etching, pitting or frosting when examined. A slight discoloration will be allowed.

.1.3.5 If any visual defects detected. Continue with step .1.2.1.

.1.3.6 Unwire / Unrack part(s).

.1.3.7 Prepare Part(s) for shipment to customer. Attach proper documents, i.e., copy of Instructions and Sketch Card, AWRs, other documents, and material Route Tag, and ship to customer

APPENDIX 10

to

PROCESS INSTRUCTION 3426-818

SOLUTION PREPARATION

SPECIAL PROCESS

Process Instruction
3426-818
May 2, 1988

SOLUTION PREPARATION

SCOPE

WARNING

Nearly all solutions utilized in strippings, preparation, and plating operations are in some way harmful to the individual. Many solutions are highly corrosive while many of the components in them possess an accumulation characteristic which surfaces after repeated exposure over a considerable period of time. This may be evidenced in the form of nausea, respiratory infection, skin rashes, etc. after only slight additional exposures to the offensive substances. Therefore, every precaution must be taken to minimize the exposure with these solutions. Protective equipment such as aprons, boots, gloves, goggles, respirators, etc. must be worn where necessary. Adequate and continuous ventilation must be provided.

Chemical solutions are used for surface preparation, treatment, and deposition of metal must be carefully controlled to obtain quality end items. The following information provides instructions for the preparation of those solutions. The actual analysis schedule should be stabilize by the Laboratory supervisor and/or project engineer, taking in consideration the volume of solution, general workload and history of the solution. In any event, testing is to be frequent enough to ensure that the process solutions are mentioned within recommended limits and near optimum condition. Testing frequency as specified is to serve as a guide and is not mandatory.

Process Instruction
3426-818
May 2, 1988

PLATING SOLUTIONS IN ELECTROPLATING FACILITY

SOLUTION	CHEMISTRY	RECOMMENDED RANGE, g/L	Page NO. MIXING PROCEDURE
1) ANODIZING volume : 125 gal 473 L	CHROMIC ACID SULFURIC ACID SODIUM CHLORIDE	50 - 100 0.3 MAX 0.2 MAX	11
3) CADMIUM CYANIDE volume : 600 gal 2271 L	CADMIUM CADMIUM OXIDE TOTAL SODIUM CYANIDE SODIUM HYDROXIDE SODIUM CARBONATE	18 - 22 N/A 90 - 112 8 - 23 26 - 60	10
4) CHROME TANK (T4) volume : 688 gal 2604 L	CHROMIC ACID SULFURIC ACID BARIUM CARBONATE RATIO, CrO3/H2SO4	225 - 270 1.2 - 1.5 (1) N/A 85 - 115	11
5) CHROME TANK (T5) volume : 1275 gal 4826 L	CHROMIC ACID SULFURIC ACID BARIUM CARBONATE RATIO, CrO3/H2SO4	225 - 270 1.2 - 1.5 (1) N/A 85 - 115	11
6) CHROMATE CONVERSION volume : 100 gal 379 L	SODIUM DICHROMATE pH	5 - 21 1.2 - 1.8	12
7) COPPER CYANIDE volume : 1022 gal 3870 L	COPPER CYANIDE FREE SODIUM CYANIDE POTASSIUM HYDROXIDE TOTAL SODIUM CYANIDE	55 - 95 40 MAX 20 - 60 70 - 120	13

(1) mL/L (2) % by volume

PLATING SOLUTIONS IN ELECTROPLATING FACILITY

SOLUTION	CHEMISTRY	RECOMMENDED RANGE, g/L	MIXING PROCEDURE
8) DECORATIVE CHROME (T6)	CHROMIC ACID	225 - 270	
volume : 290 gal	SULFURIC ACID	1.2 - 1.5 (1)	11
1098 L	BARIUM CARBONATE	N/A	
	RATIO, CrO3/H2SO4	85 - 115	
9) NICKEL BRIGHT	NICKEL SULFATE	225 - 375	
volume : 360 gal	NICKEL CHLORIDE	60 - 135	
1362 L	BORIC ACID	41 - 50	9
	pH	3.5 - 4.5	
	BRIGHTENER # 4	0.8 - 1.5 (2)	
	BRIGHTENER #63	2 - 4 (2)	
	MAGNUN S	0.1 - 0.4 (2)	
10) NICKEL STRIKE	NICKEL CHLORIDE	225 - 375	14
volume : 190 gal	HYDROCHLORIC ACID	120 - 130 (1)	
719 L			
11) SILVER CYANIDE	SILVER	22 - 40	
volume : 440 gal	SILVER CYANIDE	N/A	15
1665 L	TOTAL POTASSIUM CYAN	35 - 50	
	POTASSIUM CARBONATE	15 - 150	
12) SILVER STRIKE	SILVER CYANIDE	2 - 6	16
volume : 233 gal	POTASSIUM CYANIDE	15 - 45	
882 L			
13) TIN	SODIUM STANNATE	95 - 120	
volume : 337 gal	SODIUM HYDROXIDE	7 - 15	17
1275 L			

(1) mL/L (2) % by volume

PLATING SOLUTIONS IN ELECTROPLATING FACILITY

SOLUTION	CHEMISTRY	RECOMMENDED RANGE, g/L	MIXING PROCEDURE
B)LEAD volume :			

643/643

(1) mL/L (2) % by volume

Process Instruction
3426-818
May 2, 1988

PREPARATION OF BASIS METALS SOLUTIONS IN ELECTROPLATING FACILITY

SOLUTION	CHEMISTRY	RECOMMENDED RANGE, g/L	MIXING PROCEDURE
1)BRIGHT DIP (cleaner) volume : 99 gal 375 L	NITRIC ACID SULFURIC ACID	50 (2) 50 (2)	2d
2)BRIGHT DIP (cadmium) volume :	NITRIC ACID SULFURIC ACID	50 (2) 50 (2)	2d
3)BRIGHT DIP (silver) volume :	NITRIC ACID SULFURIC ACID	50 (2) 50 (2)	2d
4)CADMIUM ALKALINE volume : 292 gal 1105 L			19
5)CADMIUM BRIGHTENER volume :			
6)CADMIUM HYDROCHLORIC volume : 426 gal 1612 L			
7)CADMIUM PAINT STRIP volume :			22
8)CHROME STRIP volume :			
9)COPPER ALKALINE volume : 1028 gal 3891 L	ELECTRO CLEANER stk # 6850-00-2854314 Note: Soak, Anodic or Cathodic 4 - 6 volts.	59 - 75	18

(1) mL/L (2) % by volume

PREPARATION OF BASIS METALS SOLUTIONS IN ELECTROPLATING FACILITY

SOLUTION	CHEMISTRY	RECOMMENDED RANGE, g/L	MIXING PROCEDURE
10)HYDROCHLORIC ACID volume : 832 gal 3149 L	HYDROCHLORIC ACID	50 (2)	20
11)METHYLENE CHLORIDE (cleaner) volume : 1021 gal 3865 L			22
12)NICKEL STRIP	SULFURIC ACID Note : at 6 volts	20 - 80 (2)	20
13)PAINT STRIP (cadmium)	EPOXY STRIPPER stk # 6850-LL-C905570		22
14)SODIUM CYANIDE volume : 509 gal 1927 L			23
15)SODIUM HYDROXIDE volume : 1347 gal 5098 L	SODIUM HYDROXIDE	44 - 134	19
16)SOUR ACID DIP	HYDROCHLORIC ACID SULFURIC ACID	25 (2) 10 (2)	24

(1) mL/L (2) % by volume

19 - ALKALINE — OK
20 - DILUTE ACIDS — OK
24 - MIXED ACIDS — OK
22 - STRIP
23 - CYANIDE

MIXING PROCEDURES

Process Instruction
3426-818
May 2, 1988

CADMIUM CYANIDE

1) Clean an spare tank of approximately the same volume.

2) Fill two-thirds with distilled water.

3) Raise temperature to about 90°F.

4) Slowly add the Sodium Cyanide while slowly agitating solution.

5) Slowly add the Sodium Hydroxide while slowly agitating solution.

6) Carefully add the Cadmium Oxide while stirring.

7) After all salts have been dissolved, add 1.5 to 2 pounds per 100 gal solution of purification grade Zinc dust, and stir thoroughly for half hour.

8) Let stand for about 4 hours, then filter into the plating tank, leaving about 5% of the solution and sediment at the bottom of the tank.

9) Fill to operating level.

10) Install approximately one anode per linear foot of bar. (Use anodes conforming to specification QQ-A-671)

11) Electrolyze at 1/4 to 1/2 volt for 24 to 48 hours period.

12) Add the required addition agent if required, and plate first at 10 Amp/ft^2 for a day or two to normalize the solution.

13) Use continuous filtration.

NOTE: Sodium Carbonate and Sodium Hydroxide concentrations will raise due chemical reactions within the solution therefore make-up additions should l held to a minimum. Ratio of NaCN/Cd metal [(3-5)/1] ideal 3.75 $\pm$ .4 . If the solution is to be idle for an extended period of time, the anodes shou be removed from the solution.

Process Instruction
3426-818
May 2, 1988

CHROMIC ACID

1) Fill tank half-full of distilled water.

2) Slowly add the Chromic Acid flakes or liquid while slowly agitating solution.

3) Fill tank near operating level with distilled water.

4) Carefully add Sulfuric Acid slowly and cautiously while agitating solution.

5) Fill to operating level with distilled water.

6) Heat to temperature.

7) Solution should be dummie prior to being used for production plating using 250 Amp/ft^2 for 24 hours.

8) Use continuous agitation (mechanical agitation is recommended).

NOTE: Current to be on when immersing part. Apply total current to part immediately after immersing in plating solution. For proper functioning of the anode, it must be properly positioned in relation to the work and have continuous and uniform film of lead peroxide on the entire surface. The function of the anode is not only to conduct current but to oxidize Trivalent Chromium back to Hexavalent Chromium. An anode to cathode area ratio of 2 to 1 will effectively oxidize and balance the concentration of Trivalent Chromium near the optimum operating limits. Insoluble Antimoniac-Lead (92 - 94 % Pb, 6 - 8 Sb) and Lead-Tin (93% Pb, 7% Sn) are used for anode. Anodes left in the plating solutions lose their effectiveness because of Lead Chromate build-up on the surface. Therefore the anodes should be periodically removed from the tank and cleaned in a solution of 1 pound Sodium Hydroxide and 1 pound Rochelle Salts or 2 pounds of MIL-C-14460 per gallon of solution operated at room temperature.

Process Instruction
3426-818
May 2, 1988

CHROMATE CONVERSION

1) Fill tank with distilled water.

2) Slowly add with agitation the required quantity of Oxychro 754.

3) Mix solution and adjust to desired level with distilled water after all powder is dissolved.

4) No anodes required immersion tank solution.

Process Instruction
3426-818
May 2, 1988

COPPER

1) Fill tank one-half full with distilled water.

2) Heat to 120 - 140 °F.

3) Add the Sodium Cyanide slowly and cautiously while agitating solution.

4) Add the Copper Cyanide slowly and cautiously continuing agitation.

5) Add the Sodium Carbonate slowly, continue agitation.

6) Add the Sodium Hydroxide slowly, continue agitation.

7) Fill tank to operating level with distilled water.

8) Heat to 120 to 135 °F.

9) Use anodes conforming to specification QQ-S-673.

8) Use continuous filtration.

NOTE : Free cyanide content promote good corrosion and contributes to electrical and conductivity. However, high Free Cyanide reduces cathode efficiency and causes dull deposits. Sodium Hydroxide improves anode corrosion, electrical conductivity, and throwing power, and regulates the p of the solution.

Process Instruction
3426-818
May 2, 1988

NICKEL STRIKE

1) Fill tank two-thirds full of distilled water.

2) Add the Nickel Chloride slowly and cautiously while agitating solution.

3) Add the Hydrochloric Acid slowly and cautiously continuing agitation.

4) Use anode conforming to specification QQ-S-677.

5) Fill tank to operating level with distilled water.

6) Mix thoroughly.

Process Instruction
3426-818
May 2, 1988

SILVER CYANIDE

1) Fill tank one-half full with distilled water.

2) Add the Potassium Cyanide slowly and cautiously while agitating solution.

3) Add the Silver Cyanide slowly and cautiously continuing solution agitation.

4) Add the Potassium Carbonate cautiously continuing agitation.

5) Add the Potassium Hydroxide cautiously.

6) Fill tank to operating level with distilled water.

7) Mix thoroughly.

8) Use continuous filtration.

NOTE: Anode to cathode area should be maintained at 1 to 1 ratio. The solution operates at a cathode efficiency of 100 %. therefore, when Silver anodes are used, the bath is somewhat self-regulating except for the loss c chemicals by solution drag-out. This loss of solution can be minimized by rinsing the parts over the plating tank upon withdrawal from the solution.

Process Instruction
3426-818
May 2, 1988

SILVER STRIKE

1) Fill tank two-thirds full of distilled water.

2) Add the Potassium Cyanide slowly and cautiously while agitating solution.

3) Add the Silver Cyanide slowly and cautiously continuing agitation.

4) Fill tank to operating level with distilled water.

5) Mix thoroughly.

6) Use continuous filtration.

Process Instruction
3426-818
May 2, 1988

TIN

1) Fill tank one-half full with distilled water.

2) Heat to 140 to 150 °F.

3) Add the Sodium Stannate slowly while slowly agitating solution.

4) Add the Sodium Hydroxide slowly, continue agitation.

5) Fill tank to operating level with distilled water.

6) Heat to 160 - 180 °F.

7) Do not stir solution during plating operation.

NOTE: Anode to cathode area should be maintained at 1 to 1 ratio.

Process Instruction
3426-818
May 2, 1988

ALKALINE CLEANER

1) Fill tank two-thirds full of tap water.

2) Add chemicals slowly while agitating solution.

3) Fill tank to operating level with tap water.

4) Heat to 125 to 135 °F.

5) Use continuous agitation.

Process Instruction
3426-818
May 2, 1988

~~50 % Hydrochloric Acid~~ DILUTE ACID

1) Fill tank 40 % of tap water.

2) Add slowly and cautiously the ~~Hydrochloric~~ Acid to the tank.

3) Slowly and cautiously add fill tank to operating level.

Process Instruction
3426-818
May 2, 1988

MIXED ACIDS

~~25:10 Hydrochloric Acid:Sulfuric Acid~~

1) Fill tank one-half full of tap water.

2) Add slowly and cautiously the Sulfuric Acid while stirring solution.

3) Add the ~~Hydrochloric Acid~~ Acid (HYDROCHLORIC OR NITRIC) slowly and cautiously while stirring solution

4) Slowly and cautiously add fill tank to operating level.

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

SODIUM CHLORIDE FOR SHOP 51 ONLY

APPLICABLE TANKS :
ANODIZE

APPLICABLE STANDARD :

51- 16

ANALYTICAL PROCEDURE :

1. PREPARE 3 STANDARDS REPRESENTING 0 g/L, 0.1 g/L and 0.2 g/L

   a. PIPET 0.6 mL OF 51-16 SOLUTION TO EACH OF THREE CLEAN 150 mL BEAKERS.

   b. ADD NOTHING TO BEAKER NO. 1, ADD 0.6 mL OF NaCl STD TO BEAKER NO. 2 AND ADD 1.2 mL OF NaCl STD TO BEAKER NO 3.
   (THESE WILL REPRESENT 0, 0.1 AND 0.2 g/L, RESPECTIVELY)

2. PIPET 1 mL SAMPLE INTO A 150 mL BEAKER.

3. ADD 3 mL OF ETHANOL AND 4 mL 1:4 SULFURIC ACID TO ALL 4 BEAKERS.

4. STIR WELL UNTIL ALL CHROME IS REDUCED, (ie, THE COLOR TURNS TO GREEN), (APPROXIMATELY 3 MINUTES).

5. DILUTE TO 100 mL WITH D. I. WATER.

6. ADD 0.3 N SILVER NITRATE SOLUTION TO ALL BEAKERS AND COMPARE THE SAMPLE WITH THE STANDARDS IN TURBIDITY KIT.

7. REPORT g/L.

INFORMATION :
1 mL NaCl STD. = 100 ppm OF Cl or 0.1 mg/mL = 0.1 g/L
0.061 mg of Cl

FOR : 0.1 g/L NaCl STD. - USE 0.61 mL OF Cl STD.

0.2 g/L NaCl STD. - USE 1.21 mL OF Cl STD.

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

SILVER FOR SHOP 51 ONLY

APPLICABLE TANK :
SILVER CYANIDE, SILVER CYANIDE STRIKE

APPLICABLE STANDARD :
51-9 .

ANALYTICAL PROCEDURE :

1. PIPET 5 mL OF SAMPLE IN A 250 mL ERLENMEYER.
2. WORKING UNDER AN OPERATING HOOD, CAREFULLY ADD 10 mL OF CONCENTRATED SULFURIC ACID, THEN 5 mL OF CONCENTRATED NITRIC ACID AND SWIRL TO MIX.
3. HEAT UNTIL HEAVY, WHITE FUMES OF SULFURIC ACID HAVE BEEN PRESENT FOR A MINUTE OR TWO.
4. COOL.
5. ADD A FEW mL OF FERRIC AMMONIUM SULFATE (INDICATOR) SOLUTION AND 50 mL OF D.I. WATER.
6. TITRATE WITH STANDARD 0.1 N POTASSIUM THIOCYANATE.

CALCULATION :

$$\text{SILVER, g/L} = (\text{ml} \times \text{Norm.})_{\text{THIO.}} \times 2.63 / 0.1335$$

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

OXYCHRO 754 FOR SHOP 51 ONLY

APPLICABLE TANK :
CHROMATE CONVERSION

APPLICABLE STANDARD :
51-8 .

ANALYTICAL PROCEDURE :

1. PIPET 5 mL OF SAMPLE INTO A 250 mL ERLENMEYER FLASK AND ADD APPROXIMATELY 100 mL D.I. WATER.
2. ADD 2 GRAMS OF AMMONIUM BIFLUORIDE.
3. ADD 15 mL CONCENTRATED HYDROCHLORIC ACID.
4. ADD 10 mL OF 10 PERCENT POTASSIUM IODIDE SOLUTION.
5. ADD 3 mL OF 2 PERCENT STARCH SOLUTION.
6. TITRATE WITH 0.1 N THIOSULFATE TO A LIGHT OR CLEAR (WHITE) ENDPOINT.

CALCULATION :

$$\text{OXYCHRO 754, g/L} = (\text{ml} \times \text{Norm.})_{\text{THIO.}} \times 1.48 / 0.1335$$

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

NICKEL FOR SHOP 51

APPLICABLE TANKS :
NICKEL STRIKE

APPLICABLE STANDARD :
51-4

ANALYTICAL PROCEDURE :

1. TARE A PLATINUM ELECTRODE.

2. TAKE A 10 mL SAMPLE INTO A 250 mL BEAKER.

3. ADD 15 mL CONCENTRATED AMMONIUM HYDROXIDE.

4. ADD ENOUGH D.I. WATER TO COVER THE ELECTRODE.

5. PLATE AT 1 AMPERE UNTIL COMPLETION.

CALCULATION :

Nickel, g/L = (elect. wt.) X 100 X 237.556 / 58.71

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

NICKEL FOR SHOP 51

APPLICABLE TANKS :
NICKEL STRIKE

APPLICABLE STANDARD :
N/A

ANALYTICAL PROCEDURE :

1. TARE A PLATINUM ELECTRODE.

2. TAKE A 10 mL SAMPLE INTO A 250 mL BEAKER.

3. ADD 15 mL CONCENTRATED AMMONIUM HYDROXIDE.

4. ADD ENOUGH D.I. WATER TO COVER THE ELECTRODE.

5. PLATE AT 1 AMPERE UNTIL COMPLETION.

CALCULATION :

Nickel, g/L = (elect. wt.) X 100 X 237.556 / 58.71

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

HYDROXIDE FOR SHOP 51 ONLY

APPLICABLE TANKS :
CADMIUM CYANIDE, COPPER CYANIDE, TIN

APPLICABLE STANDARD :
51-13.

ANALYTICAL PROCEDURE :

1. PIPET 5 mL OF COPPER OR 10 mL OF CADMIUM OR 10 OF TIN SAMPLE INTO A 150 mL BEAKER.

2. DILUTE TO 80 mL WITH D.I. WATER.

3. UNDER AN OPERATING HOOD, TITRATE WITH 0.1 N SULFURIC ACID TO pH 11.1 USING pH METER AND MAGNETIC STIRRER SET UP.

NOTE : ACID MUST BE ADDED DROPWISE TO AVOID DECOMPOSITION OF CYANIDE.

CALCULATION :

$$\text{HYDROX., g/L} = \frac{(\text{N} \times \text{mL})_{\text{SULF. ACID}} \times 0.0561 \times 1000}{5}$$

STANDARD USE 10 mL Sample.

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

HYDROCHLORIC ACID FOR SHOP 51 ONLY

APPLICABLE TANKS :
NICKEL STRIKE

APPLICABLE STANDARD :
51-23.

ANALYTICAL PROCEDURE :

1. PIPET 1 mL OF SAMPLE INTO A 250 mL ERLENMEYER.
2. ADD 2 DROPS OF METHYL ORANGE INDICATOR, DILUTE TO 50 mL WITH D.I. WATER. (IF YELLOW CONTINUE WITH STEP 4.)
3. IF NOT YELLOW ADD 0.5 N SODIUM HYDROXIDE UNTIL CHANGE TO YELLOW.
4. ADD APPROXIMATELY 1 mL OF 10 % POTASSIUM DICHROMATE (HALF DROPPER).
5. TITRATE WITH 0.1 N SILVER NITRATE TO FAINT REDISH ENDPOINT.

CALCULATION :

$$\text{HYDROC., ppm} = (\text{N} \times \text{mL})_{\text{SILV.}} \times 35450$$

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

FREE CYANIDE SHOP 51 ONLY

APPLICABLE TANKS :
SILVER CYANIDE, SILVER CYANIDE STRIKE, CADMIUM CYANIDE
COPPER CYANIDE

APPLICABLE STANDARD :
51-10.

ANALYTICAL PROCEDURE :

1. PIPET 5 mL SAMPLE INTO A 250 mL ERLENMEYER.

2. ADD ABOUT 0.5 GRAMS OF POTASSIUM IODIDE CRYSTLAS (2 SCOOPS).

NOTE : FOR CADMIUM CYANIDE SOLUTION ADD 15 mL OF CONCENTRATED AMMONIUM HYDROXIDE, UNDER AN OPERATING HOOD.

3. ADD 50 mL OF DISTILLED WATER.

4. MIX, THEN TITRATE WITH STANDARD 0.1 N SILVER NITRATE TO A FAINT WHITE TURBIDITY.

CALCULATION :

$$\text{SILVER, g/L} = (\text{ml} \times \text{Norm.})_{\text{SILV.}} \times 3.48 / 0.1335$$

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

COPPER FOR SHOP 51 ONLY

APPLICABLE TANKS :
COPPER CYANIDE

APPLICABLE STANDARD :
51-14.

ANALYTICAL PROCEDURE :

1. TARE A PLATINUM ELECTRODE.

2. TAKE 10 mL OF SAMPLE INTO A 250 mL BEAKER

3. ADD 10 mL 1:1 SULFURIC ACID AND 1 mL OF CONCENTRATED NITRIC ACID WHILE IN AN OPERATING HOOD.

4. HEAT UNTIL THE SULFURIC ACID FUMES.

   A. IF IT WON'T GO INTO SOLUTION :

      a. ADD APPROXIMATELY 10 mL MORE OF 1:1 SULFURIC ACID
      b. ADD 5 mL CONCENTRATED NITRIC TO WASH DOWN THE SIDES (WILL GET RID OF ORGANICS)
      c. HEAT AGAIN UNTIL ORGANICS ARE IN SOLUTION

5. ADD APPROXIMATELY 150 mL OF D.I. WATER AND 10 mL 1:1 NITRIC ACID. (IF NOT CLEAR BLUE, HEAT UNTIL CLEAR)

6. PLATE ON A TARED PLATINUM ELECTRODE AT 2 AMPS UNTIL COMPLETION.

CALCULATION :

COPPER, g/L = (wt. of ppt.) X 100

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

COPPER FOR SHOP 51 ONLY

APPLICABLE TANKS :
COPPER CYANIDE

APPLICABLE STANDARD :
51-14.

ANALYTICAL PROCEDURE :

1. TARE A PLATINUM ELECTRODE.

2. TAKE 10 mL OF SAMPLE INTO A 250 mL BEAKER

3. ADD 10 mL 1:1 SULFURIC ACID AND 1 mL OF CONCENTRATED NITRIC ACID WHILE IN AN OPERATING HOOD.

4. HEAT UNTIL THE SULFURIC ACID FUMES.

5. ADD APPROXIMATELY 150 mL OF D.I. WATER AND 10 mL 1:1 NITRIC ACID. (IF NOT CLEAR BLUE, HEAT UNTIL CLEAR)

6. PLATE ON A TARED PLATINUM ELECTRODE AT 2 AMPS UNTIL COMPLETION.

CALCULATION :

% COPPER, g/L = (wt. of ppt.) X 100

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

CHROMIC ACID FOR SHOP 51 ONLY

APPLICABLE TANKS :
NUMBER : 4, 5, 6 AND ANODIZING

APPLICABLE STANDARD :
51-1 .

ANALYTICAL PROCEDURE :

1. TAKE A 10 mL. ALIQUOT OF SAMPLE AND DILUTE TO 100 mL VOLUMETRIC.
2. TAKE 5 mL. ALIQUOT OF SAMPLE AND PUT INTO A 250 mL. ERLENMEYER.
3. ADD 10 mL. OF 1:1 SULFURIC ACID
4. ADD 75 mL. OF D.I. WATER.
5. ADD ONE SCOOP (aprox. 1 gr.) OF POTASSIUM IODIDE (KI).
   (JUST BEFORE TITRATING.)
6. TITRATE 0.1 N SODIUM THIOSULFATE UNTIL THE BROWN COLOR TURNS A LIGHTER BROWN.
7. ADD STARCH AND TITRATE TO SHARP ENDPOINT OF BLACK TO LIGHT OPAQUE BLUE. (Cr^{+3})

CALCULATION :

CHROMIC ACID, g/L = $(ml \times Norm.)_{THIO.} \times 66.7865$

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

CARBONATE FOR SHOP 51 ONLY

APPLICABLE TANKS :
SILVER CYANIDE, CADMIUM CYANIDE

APPLICABLE STANDARD :
51-11.

ANALYTICAL PROCEDURE :

1. PIPET 5 mL OF SAMPLE INTO A 250 mL BEAKER.
2. ADD ABOUT 30 mL OF DISTILLED WATER, THEN ADD 10 mL OF 10 % BARIUM CHLORIDE SOLUTION AND MIX.
3. VACCUM FILTER THE SOLUTION THROUGH A GOOCH CRUCIBLE WITH A FIBER GLASS PAD.
4. RINSE THE BEAKER WITH SMALL AMOUNT OF WATER, ADDING THE RINSE WATER FROM THE BEAKER TO THE CRUCIBLE AND RINSING THE CRUCIBLE.
5. TRANSFER THE CONTENTS OF THE CRUCIBLE (INCLUDING THE GLASS PAD) TO A 250 mL ERLENMEYER.
6. ADD A FEW DROPS OF METHYL ORANGE INDICATOR AND PIPET IN A KNOWN EXCESS OF STANDARD 1.0 N HYDROCHLORIC ACID. (ABOUT 10 mL SHOULD SERVE)
7. DISSOLVE THE PRECIPITATE.
8. TITRATE THE EXCESS ACID USING STANDARD 0.5 N SODIUM HYDROXIDE.

CALCULATION :

FREE SOSIUM CYANIDE, g/L = (meq used in the rxn) X 1.42 / 0.1335

FREE POTASSIUM CYANIDE, g/L = (meq used in the rxn) X 1.85 / 0.1335

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

CADMIUM FOR SHOP 51 ONLY

APPLICABLE TANKS :
CADMIUM CYANIDE

APPLICABLE STANDARD :
51-12.

ANALYTICAL PROCEDURE :

NOTE : DO THIS PROCEDURE AFTER COPPER AND USE THE COPPER PLATED ELECTRODE

1. PIPET 10 mL OF SAMPLE INTO A 250 mL BEAKER.

2. ADD ABOUT 150 mL OF DISTILLED WATER.

3. MIX AND PLATE ON TARED COPPER PLATED PLATINUM ELECTRODE AT 1 AMP. (ABOUT 6 VOLTS) UNTIL ALL CADMIUM IS REMOVED (ABOUT 2 HOURS). RAISE THE LIQUID LEVEL AFTER EACH HALF HOUR TO DETERMINE COMPLETION.

CALCULATION :

CADMIUM, g/L = (ELECTRODE WEIGHT) X 13.35 / 0.1335

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

BRIGHTENER NO. 63 FOR SHOP 51 ONLY

APPLICABLE TANK :
BRIGHT NICKEL

APPLICABLE STANDARD :
51-7 .

ANALYTICAL PROCEDURE :

1. PIPET 50 mL INTO A 150 mL SEPARATORY FUNNEL.
(50 mL OF D.I. WATER INTO ANOTHER SEPARATORY FUNNEL AS A BLANK)

2. ADD 35 mL OF ETHYL ACETATE.

3. ADD 1 mL OF CONCENTRATED HYDROCHLORIC ACID.

4. ADD 5 DROPS OF BROMCRESOL PURPLE INDICATOR.

5. STOPPER AND SHAKE FOR 1 MINUTE.

6. ALLOW THE LAYERS TO SEPARATE AND DRAWN OFF THE LOWER AQUEOUS LAYER.

7. RINSE THE SIDES OF THE SEPARATORY FUNNEL WITH 10 mL OF D.I. WATER, CAREFUL DIRECT THE STREAM OF WATER AGAINST THE SIDES OF THE FUNNEL AND NOT TO THE SURFACE OF THE ETHYL ACETATE LAYER.

8. DO NOT SHAKE OR STIR. DRAW OFF THE WATER.

9. REPEAT STEP 7 AND 8.

10. ALLOW TO STAND A FEW MINUTES TO BE SURE ALL THE WATER HAS SETTLED TO THE BOTTOM, THEN DRAW OFF ANY REMAINING WATER.

11. TRANSFER THE ETHYL ACETATE LAYER TO A DRY 300 mL FLASK.

12. ADD 20 mL OF METHYL ALCOHOL.

13. TITRATE THE SOLUTION WITH 0.1 N SODIUM HYDROXIDE FROM YELLOW, THROUGH GREEN, TO A DEFINITE BLUE ENDPOINT.

CALCULATION :

$$\text{B. no. 63, \%} = (\text{ml} \times \text{Norm.})_{\text{SOD.}} \times 25.468164$$

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

BRIGHTENER NO. 4 FOR SHOP 51 ONLY

APPLICABLE TANK :
BRIGHT NICKEL

APPLICABLE STANDARD :
51-6 .

ANALYTICAL PROCEDURE :

1. PIPET 10 mL OF SOLUTION INTO A 300 mL ERLENMEYER, (10 mL OF D.I. WATER INTO ANOTHER ERLENMEYER TO BE RUN AS A BLANK FOR THE INDICATOR)

2. ADD 25 mL OF MERCURIC CHLORIDE SOLUTION.

3. ADD 1 mL OF BRIGTENER NO. 4 INDICATOR SOLUTION.

4. DILUTE TO 125 mL WITH D.I. WATER BOTH ERLENMEYERS AND MIX THROROUGHLY.

5. TITRATE THE SOLUTIONS WITH STANDARDIZED BROMATE SOLUTION UNTIL THE DARK RED COLOR BECOMES CLEAR AND DISTINCTLY GREEN, THE SOLUTION SHOULD BE AGITATED AND THE BROMATE TITRANT ADDED SLOWLY AS THE YELLOW ENDPOINT IS APROACHED. (6 - 8 mL)

CALCULATION :

$$\text{B. no. 4, g/L} = (\text{ml} \times \text{Norm.})_{\text{BROM.}} \times 20.074906$$

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

TIN FOR SHOP 51 AND SHOP 52

APPLICABLE TANKS :
TIN, TIN / LEAD

APPLICABLE STANDARD :
51-16, SHOP 51.
51-18, SHOP 52.

ANALYTICAL PROCEDURE :

1. DO NOT SHAKE THE SAMPLE. ALLOW THE SUSPENDED MATTER TO SETTLE OUT BEFORE GRABBING THE SAMPLE.

2. PIPET 5 mL OF CLEAR SAMPLE FROM SHOP 51 OR PIPET 10 mL OF CLEAR SAMPLE FROM SHOP 52 INTO A 250 mL VOLUMETRIC FLASK, MAKE UP TO VOLUME WITH D.I. WATER.

3. RUN THE DV PROGRAM ON THE ICP, USING THE FOLLOWING PARAMETERS :

NUMBER OF INTEGRATIONS	: 4
WAVELENGTH	: 1899.8
ATTENUATION	: 14
PRE-FLUSH, INT.	: 10,1
SNOUT	: CLOSED

CALCULATION :

$$\text{TIN, g/l} = (\text{SAMPLE NET INT} / \text{STD NET INT}) \times 112.35$$

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

SULFURIC ACID FOR SHOP 52 ONLY

APPLICABLE TANKS :
ACID COPPER

APPLICABLE STANDARD :
51-22.

ANALYTICAL PROCEDURE :

1. PIPET 5 mL SAMPLE INTO A 250 mL ERLENMEYER.
2. ADD 150 mL OF D.I. WATER AND 5 DROPS OF 0.2 % METHYL ORANGE SOLUTION.
3. TITRATE WITH STANDARD 0.5 N SODIUM HYDROXIDE SOLUTION UNTIL THE COLOR CHANGES FROM VIOLET TO PALE GREEN.

CALCULATION :

SULFURIC ACID, g/L = (NORM. X mL)SODIUM HYDROX. X 1.31 / .1335

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

SPECIFIC GRAVITY FOR SHOP 52 ONLY

APPLICABLE TANKS :
GOLD CYANIDE

APPLICABLE STANDARD :
51-21

ANALYTICAL PROCEDURE :

1. MEASURE THE SPECIFIC GRAVITY AT ROOM TEMPERATURE . NO TEMPERATURE CORRECTION REQUIRED. SPECIFIC GRAVITY AROUND 1.13.

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

pH FOR SHOP 51 AND SHOP 52

APPLICABLE TANKS :
BRIGHT NICKEL, CHROMATE CONVERSION, GOLD CYANIDE

APPLICABLE STANDARD :
51-5, SHOP 51
51-21, SHOP 52

ANALYTICAL PROCEDURE :

1. STANDARDIZE METER USING BUFFER 7 (1ST) AND BUFFER 4 (2ND) AT ROOM TEMPERATURE.

2. USE TEMPERATURE COMPENSATION DIAL. AS LONG AS THE TEMPERATURE RANGE FALLS WITH IN 20 - 30 DEGREE CENTIGRATE. NO CORRECTION IS REQUIRED.

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

NICKEL SULFATE FOR SHOP 51 AND SHOP 52

APPLICABLE TANKS :
BRIGHT NICKEL, ACID NICKEL

APPLICABLE STANDARD :
51-4 .

ANALYTICAL PROCEDURE :

1. TARE GOOCH CRUCIBLE WITH GLASS PAD OR PAPER PULP.
2. PIPET 1 mL OF SAMPLE INTO A 250 mL BEAKER.
3. ADD 5 mL ACETIC ACID.
4. DILUTE TO 100 mL WITH D.I. WATER.
5. HEAT TO NEAR BOILING. (5 OR 4 ON HOT PLATE)
6. ADD CAREFULLY 20 mL OF 10 % BARIUM CHLORIDE SOLUTION, HEAT AT LOW HEAT FOR ONE HOUR.
7. FILTER THRU A TARED GOOCH CRUCIBLE.
8. WASH WITH SOME AMOUNTS OF HOT WATER.
9. DRY AT 105 ^{o}C FOR APPROXIMATELY ONE HOUR.
10. PLACE IN DESICATOR TO COOL AND REWEIGH.

CALCULATION :

Ni. SULF., g/L = (wt. of ppt.) X 1126.2172

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

NICKEL CHLORIDE FOR SHOP 51 AND SHOP 52

APPLICABLE TANKS :
BRIGHT NICKEL, NICKEL STRIKE

APPLICABLE STANDARD :
51-3 .

ANALYTICAL PROCEDURE :

1. PIPET 1 mL OF SAMPLE INTO A 250 mL ERLENMEYER.

2. ADD 2 DROPS OF METHYL ORANGE, DILUTE TO 50 mL.
   a. IF SOLUTION IS NOT YELLOW ADD 0.5 N SODIUM HYDROXIDE.

3. ADD APPROXIMATELY 1 mL POTASSIUM DICHROMATE (HALF A DROPPER)

4. TITRATE WITH 0.1 N SILVER NITRATE TO FAINT ORANGE (REDISH) ENDPOINT.

CALCULATION :

$$\text{NICKEL CHLOR., g/L} = (\text{ml} \times \text{Norm.})_{\text{SILV.}} \times 118.8764$$

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

LEAD FOR SHOP 52 ONLY

APPLICABLE TANKS :
TIN/LEAD

APPLICABLE STANDARD :
51-18

ANALYTICAL PROCEDURE :

1. PIPET 1.0 mL. SAMPLE INTO A 250 mL. ERLENMEYER.
2. ADD 50 mL. D.I. WATER.
3. ADD 1 mL. 30 % HYDROGEN PEROXIDE SOLUTION.
4. SWIRL TO MIX.
5. SLOWLY ADD 10 mL. AMMONIUM BUFFER, WITH SWIRLING.
6. ADD 5 mL. 20 % TRIETHANOLAMINE SOLUTION, SWIRL.
7. PIPET 25 mL. 0.05M EDTA SOLUTION INTO THE SOLUTION AND MIX.
8. LET THE SOLUTION STAND FOR 5 MINUTES.
9. ADD ABOUT 0.1 gram ERIOCHROME BLACK 'T' SALT (1:100).
10. TITRATE WITH 0.05M ZINC SOLUTION UNTIL SOLUTION TURNS FROM A BLUE TO A WINE RED COLOR.

CALCULATION :

LEAD, g/L = [(mL X M) EDTA - (mL X M) ZINC] X 207.2

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

GOLD FOR SHOP 52 ONLY

APPLICABLE TANKS :
GOLD CYANIDE

APPLICABLE STANDARD :
51-20.

ANALYTICAL PROCEDURE :

1. DO NOT SHAKE THE SAMPLE. ALLOW THE SUSPENDED MATTER TO SETTLE OUT BEFORE GRABBING THE SAMPLE.

2. PIPET 10 mL OF CLEAR SAMPLE INTO A 250 mL VOLUMETRIC FLASK, MAKE UP TO VOLUME WITH D.I. WATER.

3. RUN THE DV PROGRAM ON THE ICP, USING THE FOLLOWING PARAMETERS :

NUMBER OF INTEGRATIONS	: 5
WAVELENGTH	: 2427.95
ATTENUATION	: 4
PRE-FLUSH, INT.	: 30,1
SNOUT	: CLOSED

CALCULATION :

GOLD, g/l = (SAMPLE NET INT / STD NET INT) X 3.3 X 2.5

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

FLUOBORIC ACID SHOP 52 ONLY

APPLICABLE TANKS :
TIN/LEAD

APPLICABLE STANDARD :
51-18

ANALYTICAL PROCEDURE :

1. PIPET 5 mL SAMPLE INTO A 250 mL ERLENMEYER.

2. ADD 25 mL D.I. WATER.
(DO NOT ADD ANY ADDITIONAL WATER TO THE TEST SOLUTION)

3. TITRATE WITH 0.5N SODIUM HYDROXIDE TO A SLIGHTLY TURBID ENDPOINT
(USE A DARK BACKGROUND TO SEE ENDPOINT).

CALCULATION :

FLUOBORIC ACID, g/L = (mL X N) SODIUM HYDROXIDE X 87.81 / 5

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

COPPER FOR SHOP 52 ONLY

APPLICABLE TANKS :
COPPER ACID

APPLICABLE STANDARD :
51-15.

ANALYTICAL PROCEDURE :

1. PIPET 5 mL SAMPLE INTO A 250 mL ERLENMEYER.

2. ADD 100 mL D.I. WATER.

3. A. IF SOLUTION IS LIGHT BLUE CONTINUE WITH STEP 4.

   B. IF NOT BLUE

   1. ADD AMMONIUM HYDROXIDE USING A DROPPER, UNTIL SOLUTION TURNS DEEP BLUE.
   2. ADD GLACIAL ACETIC ACID UNTIL SOLUTION IS LIGHT BLUE.
   3. CONTINUE WITH STEP 4.

4. ADD 2 SCOOPS OF POTASSIUM IODIDE.

5. TITRATE WITH 0.1 N SODIUM THIOSULFATE UNTIL THE SOLUTION TURNS PALE YELLOW. A CREAM COLOR, RESULTS DUE TO THE PRESENCE OF PARTICLES.

6. ADD 1 SCOOP OF STARCH AND CONTINUE TO TITRATE WITH THIOSULFATE TO A WHITE ENDPOINT.

CALCULATION :

FORMULA :

CU SULF., g/l = (NORM. X mL)THIO. X 1.7 X 3.93 / .1335

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

COBALT FOR SHOP 52 ONLY

APPLICABLE TANKS :
GOLD CYANIDE

APPLICABLE STANDARD :
51-19.

ANALYTICAL PROCEDURE :

1. DO NOT SHAKE THE SAMPLE. ALLOW THE SUSPENDED MATTER TO SETTLE OUT BEFORE GRABBING THE SAMPLE.

2. PIPET 10 mL OF CLEAR SAMPLE INTO A 250 mL VOLUMETRIC FLASK, MAKE UP TO VOLUME WITH D.I. WATER.

3. RUN THE DV PROGRAM ON THE ICP, USING THE FOLLOWING PARAMETERS :

NUMBER OF INTEGRATIONS	: 5
WAVELENGTH	: 2286.16
ATTENUATION	: 7
PRE-FLUSH, INT.	: 30,1
SNOUT	: CLOSED

CALCULATION :

COBALT, ppm = (SAMPLE NET INT / STD NET INT) X 12.5 X 25

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

CHLORIDE FOR SHOP 52 ONLY

APPLICABLE TANKS :
ACID COPPER

APPLICABLE STANDARD :
51-23.

ANALYTICAL PROCEDURE :

1. PIPET TWO 5 mL ALIQUOTS OF SAMPLE INTO A TWO 25 mL VOLUMETRIC FLASK.

2. ADD 5 mL CONCENTRATED NITRIC ACID TO EACH FLASK AND MIX.

3. ADD 10 mL ETHANOL (95%) TO EACH FLASK AND MIX.

4. A. USING AN EYE DROPPER OR A DISPENSING BURETTE ADD 1 mL OF 0.1 N SILVER NITRATE TO ONE ALIQUOT ONLY.
(NOTE: DO NOT ADD MORE THAN ONE mL)

   B. DILUTE TO VOLUME BOTH VOLUMETRICS WITH D.I. WATER AND MIX WELL. THE SECOND IS THE BLANK.

   C. ALLOW TO STAND ABOUT 15 TO 20 MINUTES.

5. READ ABSORBANCE ON A SPECTROPHOTOMETER (NO RED FILTER ON) IN HALF INCH CELLS ABOUT 440 mu AFTER SETTING THE 100 % WITH THE BLANK SAMPLE.

CALCULATION :

CHLORIDE, g/L = [(READING) - 0.0034] / 0.00653

DATE WRITTEN : _____
APPROVED BY : _____
DATE APPROVED : _____
TO BE REVIEWED: _____

BORIC ACID FOR SHOP 51 AND SHOP 52

APPLICABLE TANKS :
BRIGHT NICKEL, ACID NICKEL

APPLICABLE STANDARD :
51-5 .

ANALYTICAL PROCEDURE :

1. TAKE 5 mL OF SAMPLE INTO A 250 mL BEAKER AND ADD APPROXIMATELY 100 mL D.I. WATER.

2. PASS THE SOLUTION THRU A 30 mL CATION RESIN COLUMN TO REMOVE CATIONS AND AMMONIUM SALTS, DROPWISE.

3. RINSE THE COLUMN WITH APPROXIMATELY 180 mL OF D.I. WATER. COLLECT THE CLEAR SOLUTION USING A 500 mL ERLENMEYER, FINAL VOLUME ABOUT 300 mL.

4. ADD 2 DROPS OF METHYL RED.

5. TITRATE WITH 0.5 N SODIUM HYDROXIDE TO YELLOW ENDPOINT.

(ZERO THE BURETTE)

6. ADD 2 DROPS OF PHENOLPHTELEIN AND APPROXIMATELY 2 grams OF MANNITOL. (1 OR 2 SPATULAS)

7. TITRATE WITH 0.5 N SODIUM HYDROXIDE TO A PINK ENDPOINT WITH CONCECUTIVES ADDITIONS OF MANNITOL UNTIL THE ENDPOINT PERSIST.

CALCULATION :

$$\text{BORIC ACID, g/L} = (\text{ml} \times \text{Norm.})_{\text{SOD.}} \times 12.367041$$

SHOP 51 PROCESS INSTRUCTION

AVAILABLE TANKS

TANK LOCATION

MARE ISLAND NAVAL SHIPYARD
SAMPLING SCHEDULE FOR 1988

SHOP 51

****

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	SAMPLING
4 - 8	8 - 12	7 - 11	4 - 8	2 - 6	6 - 10	N/A
11 - 12	15 - 19	14 - 18	11 - 15	9 - 13	13 - 17	Cr SEC. (1)
18 - 22	22 - 26	21 - 25	18 - 22	16 - 20	20 - 24	Ni SEC. (2)
25 - 29	29 - 4	28 - 1	25 - 29	23 - 27	27 - 1	CN SEC. (3)
31 - 5				30 - 3		N/A

JULY	AUGUST	SEPT.	OCTOBER	NOV.	DEC.	SAMPLING
4 - 8	1 - 5	5 - 9	3 - 7	7 - 11	5 - 9	N/A
11 - 15	8 - 12	12 - 16	10 - 14	14 - 18	12 - 16	Cr SEC. (1)
18 - 22	15 - 19	19 - 23	17 - 21	21 - 25	19 - 23	Ni SEC. (2)
25 - 29	22 - 26	26 - 30	24 - 28	28 - 2	26 - 30	CN SEC. (3)
	29 - 2		31 - 4			N/A

****

SAMPLING THE LABORATORY DIVISION CODE 134.12 WILL SAMPLE THE TANKS BY SECTIONS ON THE FIRST WORKING DAY OF WEEK INDICATED ABOVE, TO BE ANALYZED. CODE 134.122 WILL REPORT THE RESULTS AND ANY CORRECTIVE ACTION TO THE SHOP. IF ANY CORRECTIVE ACTION IS REQUIRED THE SHOP WILL CONTACT THE LABORATORY DIVISION CODE 134.122 WHEN THE ACTION WAS COMPLETED.

NOTE :

(1) - CHROME SECTION TANKS : T4, T5, T6, ANODIZING, CHROMATE CONVERSION

(2) - NICKEL SECTION TANKS : BRIGHT NICKEL, NICKEL STRIKE

(3) - CYANIDE SECTION TANKS : CADMIUM, COPPER, SILVER, SILVER STRIKE, TIN

PREPARED BY : FERNANDO L. RODRIGUEZ
CODE 134.122
12/21/1987.

EXTENSION : 3405, 2357, 2314

MARE ISLAND NAVAL SHIPYARD
SAMPLING SCHEDULE FOR
SHOP 51
1987

****

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	SAMPLING
5 - 9	2 - 6	2 - 6	6 - 10	4 - 8	1 - 5	N/A
12 - 16	9 - 13	9 - 13	13 - 16	11 - 15	8 - 12	Cr SEC. (1)
19 - 23	16 - 20	16 - 20	20 - 24	18 - 22	15 - 19	Ni SEC. (2)
26 - 30	23 - 27	23 - 27	27 - 1	25 - 29	22 - 26	CN SEC. (3)
		30 - 3			29 - 3	N/A

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	SAMPLING
6 - 10	3 - 7	7 - 11	5 - 9	2 - 6	7 - 11	N/A
13 - 17	10 - 14	14 - 18	12 - 16	9 - 13	14 - 18	Cr SEC. (1)
20 - 24	17 - 21	21 - 25	19 - 23	16 - 20	21 - 25	Ni SEC. (2)
27 - 31	24 - 28	28 - 2	26 - 30	23 - 27	28 - 1	CN SEC. (3)
	31 - 4			30 - 4		N/A

SAMPLING :

THE LABORATORY DIVISION CODE 134.122 WILL SAMPLE THE TANKS BY SECTIONS ON THE FIRST WORKING DAY OF WEEK INDICATED ABOVE, TO BE ANALYZED. CODE 134.122 WILL REPORT THE RESULTS AND ANY CORRECTIVE ACTION TO THE SHOP. IF ANY CORRECTIVE ACTION IS REQUIRED THE SHOP WILL CONTACT THE LABORATORY DIVISION CODE 134.122 WHEN THE ACTION WAS COMPLETED.

NOTE : NUMBER OF TANKS

(1) - CHROME SECTION TANKS : T3, T5, T6, ANODIZING, CHROMATE CONVERSION 5
(2) - NICKEL SECTION TANKS : BRIGHT NICKEL, DULL NICKEL, NICKEL STRIKE 3
(3) - CYANIDE SECTION TANKS: CADMIUM, TIN, SILVER, SILVER STRIKE, COPPER 5

PREPARED BY : FERNANDO L. RODRIGUEZ
CODE 134.122
EXTENSION : 3405, 2357, 2314

SHOP 51 1986 SAMPLING SCHEDULE

January	February	March	April	MAy	June	Sampling
6 - 10	3 - 7	3 - 7	31 - 4	5 - 9	2 - 6	N/A
13 - 17	10 - 14	10 - 14	7 - 11	12 - 16	9 - 13	Cr Sec. (1)
20 - 24	17 - 21	17 - 21	14 - 18	19 - 23	16 - 20	Ni Sec. (2)
27 - 31	24 - 28	23 - 28	21 - 25	26 - 30	23 - 27	CN Sec. (3)
			28 - 2			N/A
July	August	September	October	November	December	Sampling
30 - 4	4 - 8	1 - 5	6 - 10	3 - 7	1 - 5	N/A
7 - 11	11 - 15	8 - 12	13 - 17	10 - 14	8 - 12	Cr Sec. (1)
14 - 18	18 -22	15 - 19	20 - 24	17 - 21	15 - 19	Ni Sec. (2)
21 - 25	25 - 29	22 - 26	27 - 31	24 - 28	22 - 26	CN Sec. (3)
28 - 1		29 - 3			29 - 2	N/A

Sampling:

The Laboratory Division Code 134.122 will sample the tanks by sections on the first day of the respective week and analyze them. Code 134.122 will report the results and any corrective action to the shop supervisor. If any corrective action is required, the shop will contact Code 134.122 when the action is completed.

Note : During periods when the Laboratory is involved in Steam Generator Cleaning, sampling will be limited to as required.

	NUMBER OF SAMPLES:
NOTE : (1) - CHROME TANKS : T3,T5,T6,ANODIZING,CHROMATE CONVERSION	5
(2) - NICKEL 360 gal. , NICKEL 65 gal. , NICKEL STRIKE	3
(3) - CADMIUM , TIN , SILVER , SILVER STRIKE , COPPER TANKS	5

Prepared by: Fernando L. Rodriguez C/134.122
Extention : 3405 / 2357 / 2314

SHOP 51 1985 SAMPLING SCHEDULE

January	February	March	April	MAy	June	Sampling
7 - 11	4 - 8	4 - 8	1 - 5	29 - 3	3 - 7	N/A
14 - 18	11 - 15	11 - 15	8 - 12	6 - 10	10 - 14	Cr Sec. (1)
21 - 25	18 - 22	18 - 22	15 - 19	13 - 17	17 - 21	Ni Sec. (2)
28 - 1	25-1	25 - 29	22 -26	20 - 24	24 - 28	CN Sec. (3)
				27 - 31		N/A

July	August	September	October	November	December	Sampling
1 - 5	29 - 2	2 - 6	30 - 4	4 - 8	2 - 6	N/A
8 - 12	5 - 9	9 - 13	7 - 11	11 - 15	9 - 13	Cr Sec. (1)
15 - 19	12 -16	16 - 20	14 - 18	18 - 22	16 - 20	Ni Sec. (2)
22 - 26	19 - 23	23 - 27	21 - 25	25 - 29	23 - 27	CN Sec. (3)
	26 - 30		28 - 1			N/A

Sampling:

We will sample the tanks by sections on Monday of respective weeks. The Laboratory Division Code /134 will analyze them in a 3 days period. We will report results on Wednesday afternoon anad any action by the shop should be performed on Thursday or Friday. The tanks that are decertified will be sampled the following week for addition verification, in conjuntion with the weekly samples. During periods when the Laboratory is involved in Steam Generator Cleaning, the three day analysis time cannot be met. Sampling will be therefore be limited to as required or emergency situations only.

		NUMBER OF SAMPLES:
NOTE :	(1) - CHROME TANKS : T3,T5,T6,ANODIZING,CHROMATE CONVERSION	5
	(2) - NICKEL 360 gal. , NICKEL 65 gal. , NICKEL STRIKE	3
	(3) - CADMIUM , TIN , SILVER , SILVER STRIKE , COPPER TANKS	5

Prepared by: Fernando L. Rodriguez C/134.122
Extention : 3405 / 2357 / 2314

TANKS AVAILABLE SHOP 51

TANKS AVAILABLE FOR SHOP 51 FACILITY (ELECTROPLATING SHOP)

REFER TO PROCESS INSTRUCTION 3426-818 FOR MIXING INSTRUCTIONS

SOLUTION	CHEMISTRY	RECOMMENDED RANGE, g/L	MAKE-UP pounds
1)CHROME TANK (T4)	CHROMIC ACID	225 - 270	1420
volume : 688 gal	SULFURIC ACID	1.2 - 1.5 (1)	3500 ml
2604 L	BARIUM CARBONATE	N/A	N/A
	RATIO, CrO3/H2SO4	85 - 115	N/A
2)PIT TANK (T5)	CHROMIC ACID	225 - 270	2630
volume : 1275 gal	SULFURIC ACID	1.2 - 1.5 (1)	6515 ml
4826 L	BARIUM CARBONATE	N/A	N/A
	RATIO, CrO3/H2SO4	85 - 115	N/A
3)DECORATIVE (T6)	CHROMIC ACID	225 - 270	599
volume : 290 gal	SULFURIC ACID	1.2 - 1.5 (1)	1482 ml
1098 L	BARIUM CARBONATE	N/A	N/A
	RATIO, CrO3/H2SO4	85 - 115	N/A
4)ANODIZING	CHROMIC ACID	50 - 100	78
volume : 125 gal	SULFURIC ACID	0.3 MAX	N/A
473 L	SODIUM CHLORIDE	0.2 MAX	N/A
5)CHROMATE CONVERSION	SODIUM DICHROMATE	5 - 21	11
volume : 100 gal	pH	1.2 - 1.8	N/A
379 L			
6)BRIGHT NICKEL	NICKEL SULFATE	225 - 375	900
volume : 360 gal	NICKEL CHLORIDE	60 - 135	293
1362 L	BORIC ACID	41 - 50	137
	pH	3.5 - 4.5	N/A
	BRIGHTENER # 4	0.8 - 1.5 %	4.2 gal
	BRIGHTENER #63	2 - 4 %	11 gal
	MAGNUN S	0.1 - 0.4 %	1 gal
7)ACID NICKEL	NICKEL CHLORIDE	225 - 375	475
volume : 190 gal	HYDROCHLORIC ACID	120 - 130 (1)	24 gal
719 L			
8)CADMIUM CYANIDE	CADMIUM	18 - 22	N/A
volume : 600 gal	CADMIUM OXIDE	N/A	115
2271 L	TOTAL SODIUM CYANIDE	90 - 112	505
	SODIUM HYDROXIDE	8 - 23	78
	SODIUM CARBONATE	26 - 60	N/A
9)COPPER CYANIDE	COPPER CYANIDE	55 - 95	639
volume : 1022 gal	FREE SODIUM CYANIDE	40 MAX	N/A
3870 L	POTASSIUM HYDROXIDE	20 - 60	341
	TOTAL SODIUM CYANIDE	70 - 120	810

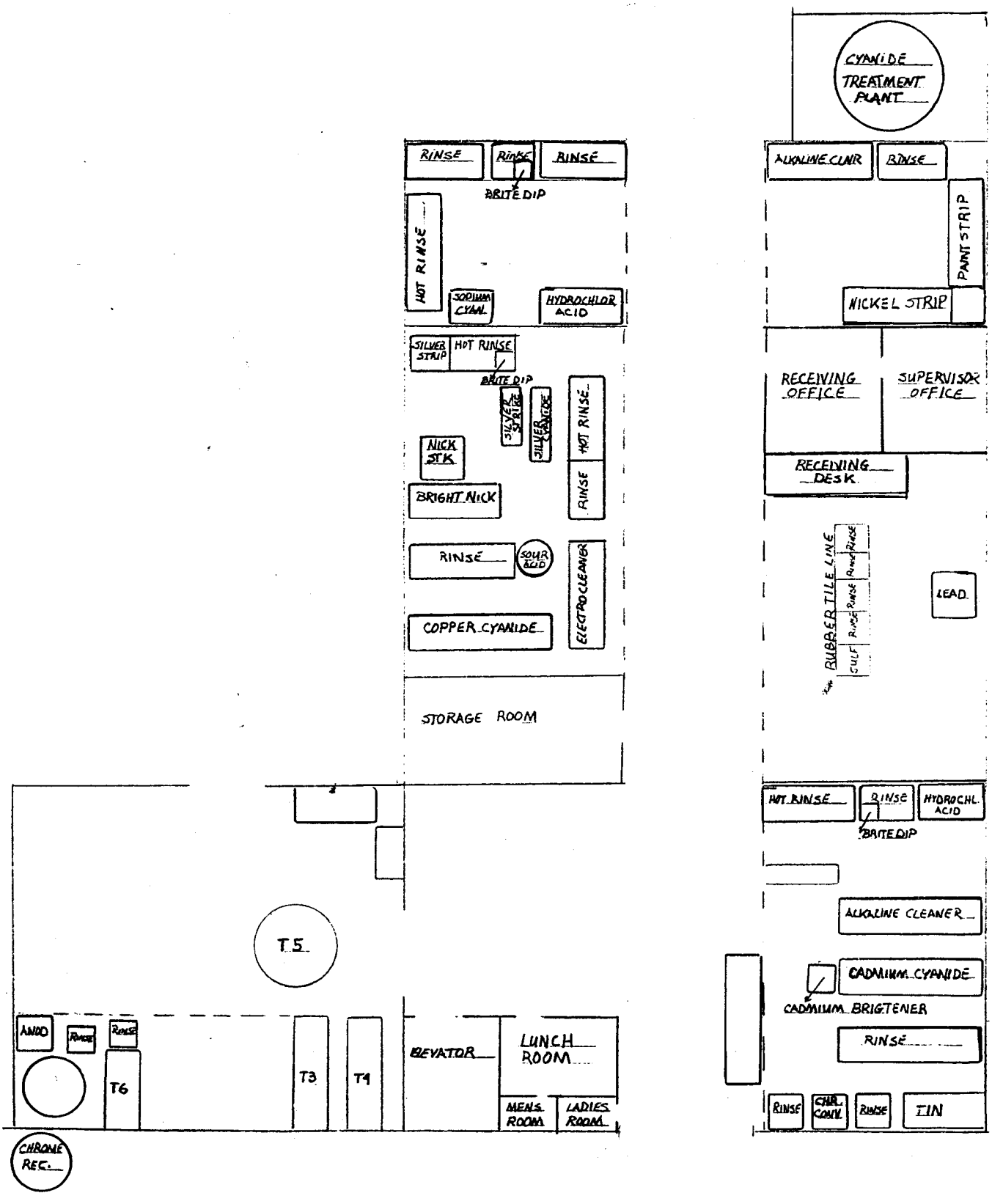
(1) mL/L

TANKS AVAILABLE FOR SHOP 51 FACILITY (ELECTROPLATING SHOP)

REFER TO PROCESS INSTRUCTION 3426-818 FOR MIXING INSTRUCTIONS

SOLUTION	CHEMISTRY	RECOMMENDED RANGE, g/L	MAKE-UP pounds
10)SILVER CYANIDE	SILVER	22 - 40	N/A
volume : 440 gal	SILVER CYANIDE	N/A	160
1665 L	TOTAL POTASSIUM CYAN	35 - 50	156
	POTASSIUM CARBONATE	15 - 150	N/A
11)SILVER STRIKE	SILVER CYANIDE	2 - 6	8
volume : 233 gal	POTASSIUM CYANIDE	15 - 45	58
882 L			
12)TIN	SODIUM STANNATE	95 - 120	302
volume : 337 gal	SODIUM HYDROXIDE	7 - 15	31
1275 L			

BUILDING 225 PLATING SHOP FACILITY



FLR 1/5/88