SUBJECT: BULB WASHING BY HAND - CATHODE-RAY Process Specification

This specification covers the Salvage Section (Cathode-Ray Tube Factory) processes for removing the screen and graphite coating from bulbs of salvaged tubes.

SCHEDULE NO. 1
(For All-Glass Bulbs)

MAY 1955

1. EQUIPMENT
   a. Two-position wash sink.
   b. Four-position, high pressure, warm air dryer.
   c. Bottle brush.
   d. Slide wire operated hinged brush holder with three No. 2561 wheel brushes mounted at the end so that their diameter is at right angles to the supporting rod.
   e. Chemical safety goggles.
   f. Rubber gloves.
   g. Plastic armlets.
   h. Plastic apron.
   i. 1/8" drill.

2. MATERIALS
   H7 Hydrofluoric acid, *10-12% solution
   -- Warm tap water, 43°-49°C. (110°-120°F.).

HYDROFLUORIC ACID SAFETY PRECAUTIONS: See 33-2-7A.

3. PROCEDURE

a. Open door of sink number 1.
b. Remove bulb from water rinse position and inspect.
c. Place washed bulb on dryer. (In the case of metal cone bulbs, place in transfer tray and continue washing as specified in Sched.#2.)
d. Remove bulb from acid wash and place on water rinse.
e. Remove bulb from storage rack and place on acid wash.
f. Close door.
g. Repeat same procedure (a-f) on sink number 2.

CAUTIONS:

(1) Never close the doors unless there is a bulb in the acid wash position.
(2) Never impede the operation of the control lever on the acid wash by tying or in any other way.

The optimum time schedule for acid washing is as follows:

(1) Types nine inches or more in diameter -*60 seconds
(2) All other types - - - - - - - - - - - - - - 20 seconds.

In some cases after washing a metal cone bulb some graphite coating may remain on the metalledge at the cone to neck splice. It is very important that this coating be completely removed. The brush described in item d under equipment should be used for this. This operation should take place between operations d & e. The bulb should be rinsed and inspected again after this operation.

(Cont'd on page 2)

Formerly part of Page 2

3. PROCEDURE (Cont'd)

CAUTIONS: (Cont'd)

Other coating remaining on the side of glass bulbs may be removed either with a bottle brush or by repeating entire washing operation.

→ * 4. MAINTENANCE PROCEDURE

a. The acid drum is to be emptied and flushed three times per week as follows:
Sunday night - 3rd shift
Tuesday night - 2nd shift
Thursday night - 1st shift
The drum is to be charged as follows:
32 liters of tap water (fill to within 6" from top of drum).
Add 10 liters of H7 Hydrofluoric acid.

b. The aspirator system should be cleaned each time the acid drum is cleaned. The piping should be cleaned and inspected and the jet reamed with 1/8" drill to remove any foreign particles.

→ ** 5. LOG

The acid concentration should be checked at the start of each shift and recorded in the log.

** End of Schedule #1

BULB WASHING BY HAND - CATHODE-RAY

SUBJECT: Process Specification

SCHEDULE NO. 2
(For Metal Cone Bulbs)

1. EQUIPMENT
   a. Bulb rotator, equipped with air chuck.
   b. Brush holder for two typewriter brushes.
   c. Acid wash sink.
   d. Tap water rinse position.
   e. Measuring spoon.
   f. Typewriter brushes, No. 52 (handles removed).

2. MATERIALS
   ---- Tap water, 38°-49°C. (100°-120°F.)
   ---- Detergent MXP (A634).
   H7 Hydrofluoric acid, 5% solution

DETERGENT MXP SAFETY PRECAUTIONS: See 33-2-8A.
HYDROFLUORIC ACID SAFETY PRECAUTIONS: See 33-2-7A.

3. PROCEDURE

   a. Acid wash as specified in Sched. No. 1.
   b. Immediately after acid wash and subsequent water rinse, place bulb in the rotator being careful to see that the chuck is locked.

   Caution: Do not attempt to clean bulbs with a broken or cracked neck.

   c. Straighten the bulb in the chuck so that the neck runs "true" when the bulb is rotated.
   d. Place one spoonful (1 to 1-1/2 gm) of detergent in the bulb followed by about 1/2 liter of water 38°-49°C.
   e. Place brush in the bulb, on the metal surface, near the neck to cone splice.
   f. Start chuck rotating.
   g. Move the brush slowly towards the face end of the bulb applying very light pressure on the brush. It should require six to eight seconds to move the brush from one end of the cone to the other. Three to five passes will be required to clean the cone properly, depending upon the thickness of the coating.
   h. Stop machine.
   i. Remove previous bulb from water wash, inspect and place on dryer.
   j. Remove washed bulb from rotator and place on water wash.

* Data Rearranged

3. PROCEDURE (Cont'd)

If the cone is not clean after washing in the above manner, repeat the washing procedure as described above, omitting the acid wash. If the cone is not clean after this, repeat the cleaning procedure including the acid wash. If the cone still does not appear clean, it is usually an indication that the cone has become permanently stained and may be considered clean for our purposes.

** To test if the bulb has been sufficiently cleaned, introduce about 1/2 liter of water into the bulb and swirl vigorously for about 10 seconds. Pour rinse water through clean 200 mesh strainer. Any bulb leaving the slightest residue in the strainer is unclean and the washing procedure should be repeated. One bulb per truckload should be tested in this manner.

Care should be taken to differentiate between scratches on the cone and coating. Under certain lighting conditions, scratches will appear as coating marks.

For best cleaning efficiency, the brushes should be kept in good condition. When the bristles are worn down to a length of 3/16" the brushes should be replaced.

NOTE: All bulbs shall be rewashed on automatic washing machine prior to settling, except in the case of washing machine breakdown. Wash by Sched. 2 of S.N. 34-17-4J.

** End of Schedule #2

This specification applies to the screen removal procedure for metal assemblies with screen or screen and graphite coating.

Schedule No. 3

1. EQUIPMENT:
   a. Screen blow-out machine with exhaust.
   b. High pressure air supply (90 psig)
   c. Safety goggles
   d. Sodium carbonate machine with exhaust.

2. MATERIALS: S131 Sodium Carbonate

3. PROCEDURE:

   a. Place bulb to be cleaned over the high pressure air pipe on screen blowout machine.
   b. Press pedal to release air blast until all of the phosphor screen is removed.
   c. If phosphor is not completely removed, place bulb on sodium carbonate screen removal machine.
   d. Press pedal to release abrasive. Blast until all of the screen is removed. Make sure that all of the phosphor is removed from the bulb.
   e. Place all cleaned bulbs on conveyor to bulb washer.
   f. All bulbs shall be washed on automatic washing machine prior to settling.
   g. Follow procedure for new bulbs on bulbwasher.

→ *General Revision

**End of Schedule #3

This specification applies to the hand washing procedure for cold rolled steel shells with graphite coating (For screen removal see Schedule No. 3)

SCHEDULE NO. 4
(Initially for C73514)

1. EQUIPMENT
   a. Hooded wash sink equipped with circulating pump, necessary piping, and completely enclosed shield to cover a 21" bulb assembly during graphite coating removal.
   b. Holder for bulb.
   c. Rubber gloves, apron, goggles.

2. MATERIALS

S30	Sodium Hydroxide	50 lbs.
----	Tide	2 oz.
----	Tap water	12.0 gal. (100 lbs) (13.8 gal total)

SODIUM HYDROXIDE SAFETY PRECAUTIONS: See S.N. 33-2-8A

3. PROCEDURE

   a. Spray bulb assembly with hot tap water and let stand 20 minutes.
   b. Spray for 2 minutes with NaOH Solution at 71-82°C (160-180°F.)
   c. Rinse with water for 2 minutes.
   d. Remove bulb assembly and inspect for completeness of graphite removal.
   e. If coating is not completely removed, repeat the procedure until it is.
   f. Send bulb assembly through automatic washer.

SUBJECT: BULB WASHING BY HAND - Cathode Ray Process Specification

This specification applies to the hand washing procedure for cold rolled steel shells.

SCHEDULE No. 5

Marion Only

1. EQUIPMENT:

Two position acid wash sink (model No. M886BR-7) with four vertically rotating chucks which support the bulb over the acid and water spray pipes. The acid spray operates by centrifugal pump - American Hard Rubber Co., New York - with an open end acid spray rod while the water spray uses a positive displacement pump - Robbins & Myers, Type CDQ, Frame 3L4, Form CX, using a 7.5 HP motor with 1725 RPM. The bulb mounting device is of the cage type supported from the top of the sink and driven by means of electric motors. The sink is equipped with a sliding metal door which protects the operator from acid spray, and is ventilated to prevent accumulation of fumes. The sink is also equipped with a timer and necessary switches, valves, and wiring, so that the timer controls the operation of the door, rotation of chucks, and liquid sprays. A pneumatic valve starts the automatic cycle when opened by the operator.

2. MATERIALS: A255B Hydrofluosilicic acid. 6 - 8% by weight.
- - - Tap water

3. PROCEDURE:

The operator loads the bulb to be washed over the acid spray rod, and the bulb just washed by acid over the water spray rod. Upon operating the air valve, the door is automatically closed, and the timer is started on its cycle of operation. The timer intervals are:

	Position Controlled	Start at, sec.	Stop at, sec.
(a)	Acid spray (6-8% H_2SiF6)	0	45
(b)	First tap water spray	0	7
(c)	Second tap water spray	18	25
(d)	Third tap water spray	38	44
(e)	Door closed	0	45

NOTES:

1. Acid concentration must be checked once per shift according to schedule No. 1 S.N. 34-33-66 and results recorded in log.
** 2. Sinks shall be drained, cleaned, and recharged on or just before the first and eighth shift of each week.

SCALE—

DIMENSIONS IN UNLESS OTHERWISE SHOWN DIMENSIONS SHOWN WITHOUT TOLERANCES ARE DESIGN CENTERS

5-537-7-62 PCL21463-126LG

* CHANGE
** ADDITION
*** DELETION

SUBJECT: BULB WASHING BY HAND - CATHODE-RAY
Process Specification

This specification applies to bulbs with stained face plates.

SCHEDULE NO. 6
(Initially for 27MP4)

1. EQUIPMENT
   a. Hard rubber bucket - 5 gal. capacity
   b. Plastic funnel
   c. Small electric agitator
   d. Wash sink
   e. Dryer rack
   f. Light box

2. MATERIALS
   A-609 Ammonium Bifluoride
   * W60D Deionized water

AMMONIUM BIFLUORIDE SAFETY PRECAUTIONS: See 33-2-7C
HYDROFLUORIC ACID SAFETY PRECAUTIONS: See 33-2-7A

3. PROCEDURE

a. Mixing of material
   1. The ammonium bifluoride solution is prepared by weighing 975 grams of ammonium bifluoride and placing it into the rubber bucket. 9750 cc of deionized water is added to this material.
   2. The agitator is placed on the bucket and the material stirred until the bifluoride is dissolved into the water, a period of about 10 minutes.
   3. It may be necessary to periodically agitate the bifluoride, should it settle out of solution.
   4. A new batch is to be prepared daily.

b. Washing of bulb
   1. The bulb must first be prepared for the cleaning process by washing out the screen and coating with the HF acid position at the 27 inch wash sinks.
   2. This is followed by a tapwater rinse and deionized water rinse.
   3. The bulb is then put on a dryer rack.
   4. After thorough drying of the faceplate, the bulb is light box inspected for stain prior to cleaning.

c. Cleaning of bulb
   1. The washed bulb is placed in a level position, faceplate down, and the funnel inserted into the neck.
   2. The ammonium bifluoride solution is poured from the hard rubber bucket into the bulb. It is allowed to stand in the bulb for a period of 14 to 15 minutes, and then poured back into the bucket.
   3. The bulb is then placed on the tapwater rinse position of the wash sink and allowed to remain there until the loose layer of glass is completely removed, a period of about 15 seconds.
   4. During this rinse period, the faceplate is to be wiped with a clean sponge, dampened with clean water. This is to remove any bifluoride which may have run onto the faceplate because of an overflow in pouring the bifluoride into the bulb.
   5. The bulb is then removed to the deionized water rinse position and rinsed for 75 seconds.

3. PROCEDURE (Cont'd)

c. Cleaning of bulb (Cont'd)

6. It is then removed to the drying rack, dried, and inspected at the light box to insure complete removal of stain.

7. From here it may be put back into standard processing of setting, etc.

ENGINEERING SECTION
STANDARDIZING