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**STANDARDIZING  
 NOTICE**

34-14-13D

**SUBJECT COATING COILED FILAMENTS - By  
 Machine Process**

SUPERSEDES DATA

Supersedes former 13-8-28

This process is used in the coating of all types of heaters which are sufficiently rigid to stand upright in clips. The schedules are not binding. They are intended primarily as guides to indicate the approximate conditions under which coiled filaments of various wire sizes should normally be coated. The ultimate manner of applying the coating on coils must depend on experience and good judgment of operator.

In general, coiled filaments should be coated by applying the coating as wet as possible without running, to minimize the time required for the operation. However, the coating should not be applied so fast that the required coated coil weight is obtained in less than 36 revolutions of machine, as poor distribution of coating may result if fewer passes than required for 3 complete coverings are applied. Furthermore, if spray material is applied too wet, defective assemblies may result due to loose coating near bottom ends of coils. Coating preparation 13C-46-9 after application on coils has a medium rough finish. For any given air pressure the fluidity of spray is principally dependent on the gun opening (turns on fluid needle). Due to wear on fluid needles and fluid tips, different guns may require different openings to produce spray streams of the same fluidity.

**1. HEATER COIL COATING SCHEDULES**

Coating Preparation - - - 13C-46-9 or as specified on heater.  
 Type Spray- - - - - Medium wet  
 Rotor R.P.M.- - - - - 8

Air pressure on gun (lb./sq. in.)	<u>Guns 1 &amp; 3</u>	<u>Gun 2</u>
2-3 mil Dowmo wire	10-15	10-15
4-8 mil Dowmo & H wire	20-30	20-30
Less than 2 mil size (tungsten & Dowmo wire)	2-1/2 - 5	2-1/2 - 5
Distance of gun to coils (inches)	3-5	4-6
Nozzle setting (dial)	5-8	15-20

Note: Gun #2 is aimed at point where application of spray material is needed most to make coating uniform.

**2. COATING PROCEDURE**

Note 1. Very flexible coils must not be sprayed in a clamping fixture which holds 2 clips side by side in pairs, due to high shrinkage resulting from tangling of coils in the 2 clips.

Note 2. Prior to racking, a few coils should have been inspected for coil length, leg length, paired turns, uneven spacing, square shoulders of legs, twisted or wide legs, etc. This inspection must occur at the start of each coil winding operation and at the start of new bundle of wire. A mm scale is preferable to a standard coil chart. Operators must check all coils which appear to be out of size limits.

A. The process begins with the assumption that the coils, at the coil winding machine, have been placed in grooved racks (Equipment item 10B1a).

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## 2. COATING PROCEDURE (Cont'd)

### A. (Cont'd)

Before clamping clips onto legs, operator should shift coil legs by means of the clip jaw into horizontal position to avoid pinching them together.

- I Inspect for defective coils at this point. Using a modified lc-1 pick-up clip from rack 20 coils per clip by the legs, clamping over the length which is not to be sprayed. Extreme care must be exercised in this operation as the length of legs covered has an important bearing on the relationship between coil weight and diameter.

- B. Check coils for uniformity of leg positions and reject coils on which legs cannot be rearranged properly. Also reject defective coils. Do not use tweezers on bodies of coils.

Note: Buff coil holding clips as often as necessary to maintain good quality. Good practice requires a minimum cleaning of twice a day. Clips in which coils with very short coated leg lengths (1/2 to 1 mm) are sprayed should be cleaned each time after use. An excess of spray material on clips tends to shield coils along line of legs and may affect bottom turns as well as exposed leg length. Particles of coating may for example break from clips and deposit onto the coils. Other conditions permitting, coating should not be allowed to accumulate on clips to a thickness in excess of .015-.020". Buff metal sides of clips with wire brush and use bristle brush to clean rubber along edges of jaws, brushing crosswise to prevent damage or excessive wear on rubber. For best results rubber inserts must be kept flush with top edges of clips.

- C. Load all heads on rotor with clips or with fixtures holding clips while machine is not running. Seat cross pins of clip posts or center plates of spray fixtures in slots across heads.
- D. Roll bottle of coating preparation at least 3/4 hour, or longer if necessary, immediately before the preparation is used,\*\*and at Harrison check viscosity as described in section 7A. About 2 hrs. of mixing may be sufficient if the coating preparation has been allowed to settle for more than 48 hrs.
- E. Spraying of coiled filaments may be started at any time regardless of the positions of spray guns due to previous stopping of the machine. Operators must occasionally check performance of gun or guns within reach.
- F. When spraying operation is nearly complete, as determined by experience, operator should weigh a coil occasionally to determine completion of process. Weight of coils must fall within the limits set up.
- G. After completion of spraying operation, allow coating to dry in air if necessary, empty coils out of clips, pinch or roll coils to break apart turns, casually inspect coils for chipped coating.



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3. FIRING COILS

Load all coils (other than 12V and very short coils) comprising a spray lot i.e., the coils sprayed during one run of machine, into a boat, stacking coils in three equal piles and separating the piles equidistantly from each other and from ends of boat. Each lot of 12V coils should be equally divided in two boats, as firing fewer coils per boat reduces tendency of such coils to become bowed. Very short heaters should be placed across a molybdenum strip bent up at each end, which fits lengthwise into boats. This keeps short heaters in place and prevents bowing during firing.

Unless otherwise specified on heater specification page, fire coated coils as follows:

Alundum coated coils - Fire at 1750°C ±15°, at a stoking speed of 6"/min. and in deoxidized and humidified hydrogen. (Temperature of deoxidized gas entering humidifier 55-65°C.)

For operation of humidifier refer to 34-38-34B.

4. INSPECTION

- 1. Coils are given a casual inspection for bare wires, chips, uniformity of coating, paired turns, uneven legs, long or short coated legs, crossed legs, etc. If rejects are above normal, make a 100% inspection.
- 2. Tube Factory Test for Fused Heaters - When specified on MCH heater assembly, run tube test for fused heaters. From each spray machine, remove 3 clips per hour (18 heaters per clip). Accumulate samples from each machine for each four hour period and identify. Fire as indicated above and have Tube Factory Quality Dept. run tube test. Reject or pass heaters on the basis of sampling scheme SA 0.5 A.O.Q.L. in 25-6-2. (Approx. lot size at this time is 10,000).

5. PACKING Refer to 29-0-9, p. 1MCH

6. RECLAIMING INSULATING MATERIAL

\*\* At Harrison spray coating, reclaimed as below, may be used wherever C220 (13C-46-9) material is specified,

At end of day's spraying, scrape and remove to a separate container for reclaiming all insulating material, including that in the small trays, from the hoods of both the hand and machine spray equipment. \*\*Coating reclaimed from spray booth should be only that which is moist, soft and easily removed and which will go into suspension without milling.

\*\* Roll following material in gal. bottle at 27-28 RPM over night.

Reclaimed alundum	1700 g approx
B27 Butyl acetate	700 cc
D29 Diacetone alcohol	700 cc
B110 Binder	1400 cc

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## 6. RECLAIMING INSULATING MATERIAL (Cont'd)

Sieve thru 150 and 300 mesh into 1/2 gal. proportions. Sieve openings may be kept open by tapping frame. Never force material thru sieve in such a manner as to break up lumps.

\*\* Roll following material in gal. bottle for 1/2 hr:

1/2 gal. of the above mixture  
1/2 gal. of §new C220(13C-46-9) coating

{Roll for 1 hr. before pouring 1/2 gal.

Store in fireproof container as specified in 33-1-11.

Keep preparation in a cool place and out of direct sunlight.

7. RECLAIMING COATED HEATERS BEFORE FIRING Refer to 34-14-13C.

7A. CHECKING VISCOSITY OF INSULATION COATING (With virgin or reclaimed alundum)

1. Equipment

- a. Variable Speed LV Model Brookfield Viscosimeter (44-7-2).
- b. Beaker or receptacle approximately 3" in diameter and 6" deep.
- c. #1 spindle.

2. Procedure

- a. Fill beaker to sufficient depth to cover notch on spindle when guard is in place. (Guard is for protection of spindle, and also affects the accuracy of instrument.)
- b. Immerse spindle (with guard) in solution, being sure solution covers notch on spindle. Turn speed control to obtain 30 RPM., i.e., the figure 30 faces upward.



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7A. CHECKING VISCOSITY OF INSULATION COATING (with virgin or reclaimed alundum)Contd.

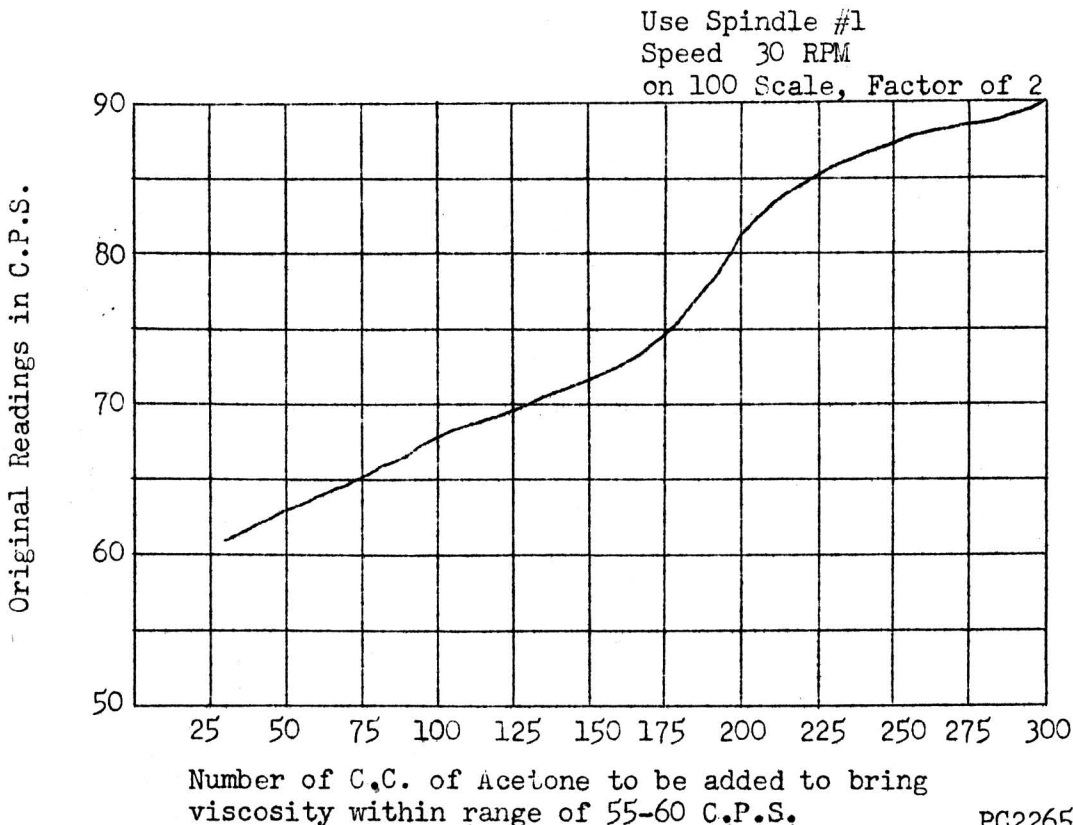
2. Procedure (Cont'd)

- c. Turn switch on and permit instrument to rotate approximately 30 seconds before locking indicator to scale. This accomplished by depressing small lever near handle of viscosimeter, and snapping off switch. By snapping starting switch on and off, red indicator can be brought into view on scale. Read value on 0-100 scale, multiply by 2 to give actual viscosity in centipoises.
- d. The viscosity must be 55-60 cps at 23°C. If the viscosity is high the addition of acetone, according to the curve below will bring it within limits. Note: If it is necessary to dilute coating without changing viscosity, use B110 binder.

3. General Precautions

- a. Always use instrument with guard.
- b. Change speed while motor running to prevent stalling of motor.
- c. Spindle has left hand thread and should be just finger tight.
- d. Always release clutch while spindle is still immersed so that pointer will float rather than snap back to zero.
- e. Clean instrument thoroughly after using with acetone or similar solvent.

CHART TO BE USED WHEN ADDITION OF ACETONE IS NECESSARY TO LOWER VISCOSITY OF 13C-46-9 COATING WITH VIRGIN OR RECLAIMED ALUNDUM.



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8. EQUIPMENT

Grooved rack	Torsion balance
Bottle rolling device	Micrometer
Furnace and boats	Microscope
Magnifying reading glass	Buffing Device
Green cardboard (or sheet bakelite)	
Trays for holding clips (1c-1 modified) and spray fixtures. (Board with holes for posts of clips & fixtures.)	

Descriptions of above items of equipment appear in 34-14-13C.

SPRAY MACHINE - With 30" (approx.) diameter rotor having 33 heads for holding posts of coil holding clips or of spray fixture designed to hold two coil holding clips. Most machines in present use are equipped with three spray guns (34-14-13C) and a hood with an opening or intake in front of each gun.

Machines with stationary guns, use four guns and rotor makes only about 4 R.P.M. The positions of spray guns with respect to the rotor are as illustrated in figs. 1 & 2, p. 3-2. Spray guns 1 and 3 are movable and gun 2 is stationary. Besides turning from side to side as indicated in fig. 1, guns 1 and 3 move up and down to permit spraying from three different levels. Coil holding clips in heads are turned 180° each revolution of rotor. Guns 1 and 3 turn from side to side (positions A & B) every two revolutions of the rotor. These guns also operate at each level during 4 revolutions of the rotor. The relation between gun and clip positions during every 4 revolutions of rotor, when guns 1 and 3 are at a particular level, is as follows:

<u>Rotor</u> <u>Revolution</u>	<u>Gun</u> <u>No.</u>	<u>Gun</u> <u>Position</u>	<u>Clip</u> <u>Position</u>	<u>Rotor</u> <u>Revolution</u>	<u>Gun</u> <u>No.</u>	<u>Gun</u> <u>Position</u>	<u>Clip</u> <u>Position</u>
1	(1	A	1	3	(1	B	1
	(2	C	1		(2	C	1
	(3	A	1		(3	B	1
2	(1	A	2	4	(1	B	2
	(2	C	2		(2	C	2
	(3	A	2		(3	B	2



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SPRAY GUN POSITIONS

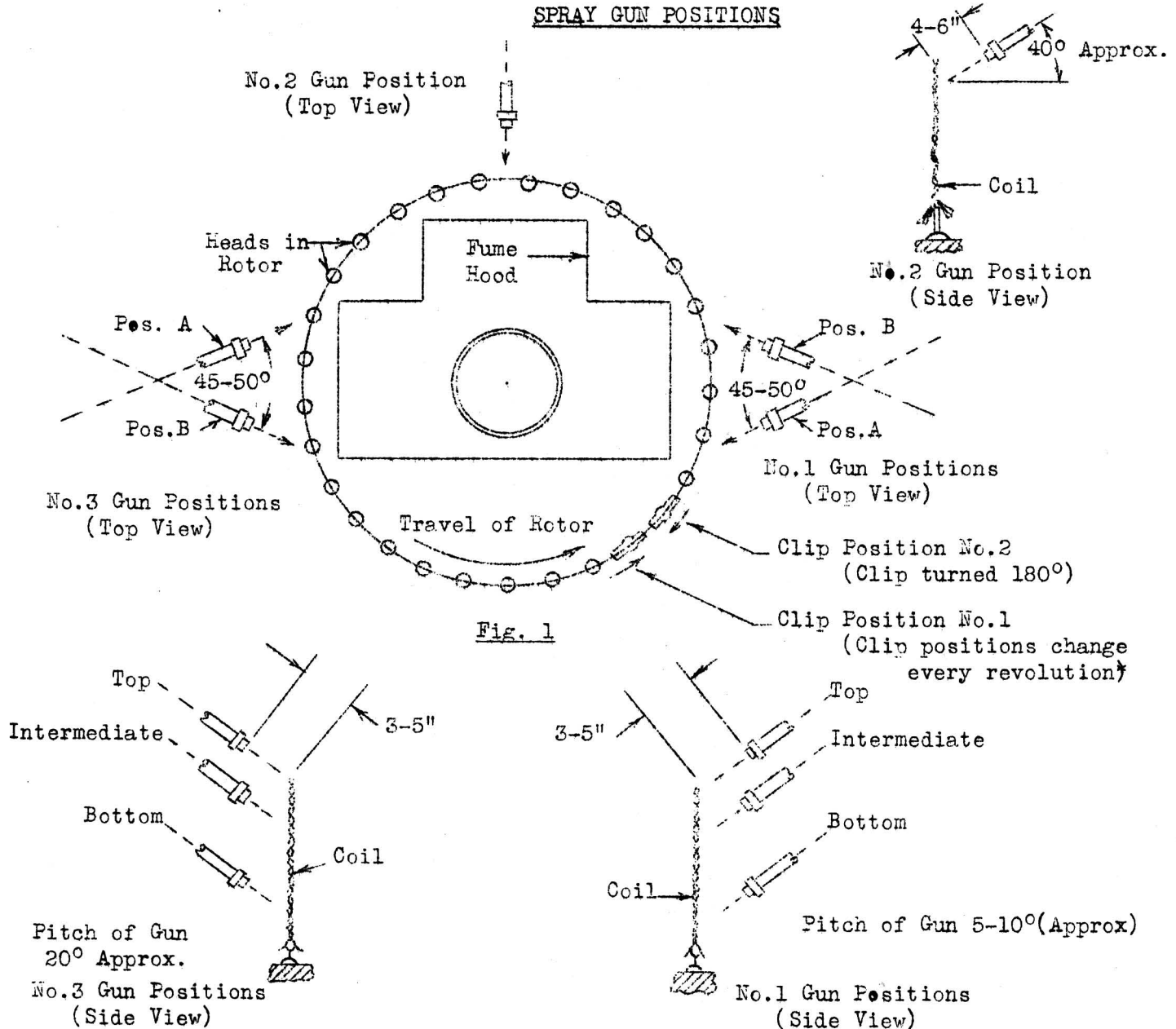


Fig. 2

No. 1 and No. 3 guns turn 45-50° from side to side, as indicated in Fig.1, every second revolution of rotor and operate at each of three levels, as shown in Fig. 2, during 4 revolutions of rotor.

No. 2 gun is stationary and may be aimed at upper half or other part of coil as desired.

STANDARDIZING SECTION  
RESEARCH & ENGINEERING DEPT.