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CANADIAN GOVERNMENT SPECIFICATIONS BOARD

Code

for

METALLIZING OPERATORS' QUALIFICATION PROCEDURE

This code is cancelled since it is no longer of
significant interest to federal government agencies.



CANADA

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FOR

METALLIZING OPERATORS' QUALIFICATION PROCEDURE

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6 AUGUST 1953

ARCHIVES COPY

THIS CODE OUTLINES THE PROCEDURE TO BE FOLLOWED IN THE TESTING OF OPERATORS OF
WIRE - GAS METALLIZING GUNS USED FOR MACHINE ELEMENT AND CORROSION APPLICATION.

NATIONAL RESEARCH COUNCIL, OTTAWA, CANADA

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6 August 1953.

CANADIAN GOVERNMENT SPECIFICATIONS BOARD

CODE
forMETALLIZING OPERATORS'
QUALIFICATION PROCEDURE1. DEFINITION

This code outlines the procedure to be followed in the testing of operators of wire-gas metallizing guns used for machine element and corrosion application as specified in Para. 3.

The term "test supervisor" as used throughout this code shall refer to the person appointed to be in attendance throughout the test, to complete the Test Reports and forward them to the inspecting laboratory together with test specimens.

2. REQUIREMENTS

The requirements of a metallizing operator are as follows:

- 2.1 Knowledge of the metallizing equipment and its operation.
- 2.2 Knowledge of the metallizing process.
- 2.3 The ability to pass specific tests.

3. CLASSES OF QUALIFICATION

3.1 Testing and qualification of operators according to this code shall be governed by the following classification as applicable.

3.1.1 Class I - for machine element metallizing. Qualification for this class of metallizing requires that Tests 1, 2, 3, 4 (Questions C, D and E), and 7 must be passed.

3.1.2 Class II - for corrosion protection metallizing. Qualification for this class of metallizing requires that Tests 1, 2, 3, 4 (Questions A and B), 5, and 6 must be passed.

3.2 An operator shall be considered qualified only for the class of metallizing for which he has gained qualification according to this code.

4. KNOWLEDGE OF EQUIPMENT AND ITS OPERATION

4.1 The operator shall use metallizing equipment as covered by specification 23-GP-1.

4.2 Test No. 1 - Set Up - The operator shall be required to connect, set up, and put into operation the metallizing equipment according to the operating manual furnished with the equipment. During the setting up and operation of the equipment there are nine important points which shall be checked by the test supervisor. These are given in Test Report No. 1.

4.3 Test No. 2 - Operation - The operator shall obtain proper gun performance during the spraying of test specimens by using the guns and wire sizes listed in Table I. Spraying speeds shall be between the 80 percent and 100 percent values listed in Table I.

4.4 Test No. 3 - Flame Readjustment - With the gun operating according to Para. 4.3 and using acetylene gas, the oxygen gauge (and flowmeter if used) shall be covered and the gas ratio thrown off balance by increasing or decreasing the oxygen pressure until the wire runs out without melting. The operator shall be required to re-balance the flame without seeing the gauge readings. After the flame is re-balanced, the oxygen pressure variation from the original setting shall not exceed $\pm 1 \frac{1}{2}$ psi. gauge pressure reading for Classes 1, 2, 4 and 5 guns or ± 5 psi. gauge pressure reading for Classes 3, 6 and 7 guns.

Except for Class 5 guns, the same procedure may be followed using propane gas rather than acetylene. Permissible oxygen pressure variation shall then not exceed $\pm 1 \frac{1}{2}$ psi. for Classes 1 and 2 guns, ± 5 psi. for Class 3, 6 and 7 guns and ± 3 psi. for Class 4 guns.

5. KNOWLEDGE OF PROCESS

5.1 Test No. 4 - Preparation Methods - The operator shall answer the questions given in Test Report No. 4 by choosing the acceptable surface preparation methods for each question from the lists provided, and inserting the appropriate method numbers in the blanks following each question.

The test supervisor shall forward the answered questionnaire, Test Report No. 4, together with completed Test Reports 1, 2 and 3 to the laboratory conducting the final test.

6. SPRAYING TESTS

For the following tests, spraying speed shall be between the 80 percent and 100 percent values given in Table I.

6.1 Test No. 5 - The operator shall prepare and spray a single $\frac{1}{4}$ inch steel plate, approximately 4" x 6", using his own discretion as to surface preparation. He shall be required to apply a sprayed coating of brass, to one side only, not less than 0.050" thick at any point.

After spraying is completed and the specimen has cooled, all four edges shall be ground smooth. The test supervisor shall forward the specimen together with the completed Test Report No. 5 to the inspecting laboratory, and the specimen shall be visually inspected for any evidence of lifting of the coating at the edges or corners. If such evidence is apparent, the specimen shall be rejected.

6.2 Test No. 6 - The operator shall prepare and spray a $\frac{1}{4}$ -inch steel plate, approximately 4" x 6", with a uniform coating of zinc 0.008 $\pm$ 0.002" thick. The test supervisor shall forward the specimen, together with completed Test Report No. 6, to the inspecting laboratory, and there the specimen thickness shall be checked to see that it meets the tolerance requirement.

6.3 Test No. 7 - The operator shall prepare and spray 0.10 carbon steel wire on the outside of 3 steel bar specimens according to the following procedure:

The specimen steel bars, approximately 1 inch in diameter and 3 inches long as shown in Figure 1, shall be chucked in a lathe, prepared, sprayed and finished as illustrated in Figure 2. In surface preparation the operator shall select one of preparation methods 5, 7, 9, or 10, as listed in test report No. 4. Each specimen shall be prepared, sprayed, and finished separately.

The test supervisor shall forward the three finished specimens adequately identified as to surface preparation method used, to the inspecting laboratory, and there the shear strengths of the specimens shall be determined and recorded in Test Report No. 7.

TABLE I
SPRAYING SPEEDS

Guns	Wire Material	Wire Diameter	100%		80%	
			*Seconds to Spray 5'0"	Equivalent lbs.per hr.	Seconds to Spray 5'0"	Equivalent lbs.per hr.
Class 1	Steel 10C	1/8"	90	8.3	113	6.6
	1 Brass	1/8"	46	17.8	58	14.1
	1 Zinc	1/8"	22	30.8	28	24.2
Class 2	Steel 10C	1/8"	85	8.8	106	7.1
	2 Brass	1/8"	42	19.5	53	15.4
	2 Zinc	1/8"	24	28.2	30	22.6
Class 3	Steel 10C	3/16"	89	19.0	111	15.2
	3 Brass	3/16"	51	36.2	64	28.8
	3 Zinc	3/16"	34	44.8	43	36.4
Type A & B						
Class 4	Steel 10C	3/16"	90	18.8	113	15.0
	4 Brass	3/16"	50	36.9	63	29.3
	4 Zinc	3/16"	31	49.2	39	39.1
Class 5	Steel 10C	11 GA	78	5.1	98	4.1
	5 Brass	11 GA	45	9.6	56	7.7
	5 Zinc	1/8"	43	15.7	54	12.5
Class 6	Steel 10C	1/8"	63	11.9	78	9.5
	6 Brass	1/8"	35	23.4	44	18.6
	6 Zinc	1/8"	25	27.0	31	21.8
Class 7	Aluminum	3/16"	32	17.8	40	14.3
	7 Zinc	3/16"	25	61.0	31	49.2

* Note: Time required to spray 5 feet of wire is given to nearest whole second.

7. EVALUATION OF OPERATOR'S PERFORMANCE

The inspecting authority is to evaluate the operator's performance, based on the information given by the answers to questions in Test Reports 1 to 6, and on the quality of the specimens prepared for Tests No. 5, 6 and 7.

A report on this evaluation is to be submitted by the laboratory to the test supervisor or to the authority designated by the supervisor.

8. RETESTING OF OPERATORS

In the event of the operator's failure to meet the requirements of 23-GP-4, a first retest may be taken only after a month has elapsed. Should the operator also fail the first retest, a second retest may be taken only after a further six months.

Correspondence regarding this specification should be addressed to the Secretary, Canadian Government Specifications Board, National Research Council, Ottawa, Canada.

METALLIZING OPERATORS' QUALIFICATION PROCEDURE

TEST REPORT NO. 1

Did the operator perform the following:

1. Blow out compressed air outlet before connecting air filter, air regulator and air hose. Yes ☐ No ☐
2. Blow out fuel gas cylinder valve before connecting gas regulator Yes ☐ No ☐
3. Blow out oxygen cylinder valve before connecting oxygen regulator. Yes ☐ No ☐
4. Insure that regulator screws are released before opening cylinder (fuel gas and oxygen) valves. Yes ☐ No ☐
5. Blow out all three hoses (fuel gas, oxygen, air) before connecting to metallizing gun. Yes ☐ No ☐
6. Check or install proper wire nozzle etc. necessary to meet requirements of Para. 3.3 Yes ☐ No ☐
7. Set up wire reel stand, wire straightener and adjust. Yes ☐ No ☐
8. Open gun valve, set and check gas, oxygen and air pressures. Yes ☐ No ☐
9. Light metallizing gun and adjust wire speed to Para. 3.3, Table I. Yes ☐ No ☐

Note: Questions 4 and 8 must be answered in the affirmative. Of the remaining 7 questions, operator must pass at least 5.

TEST REPORT NO. 2

Was spraying satisfactory according to requirements of Para. 3.3 Yes ☐ No ☐

Give spraying speeds in number of seconds required to spray 5'0" of wire. _____

TEST REPORT NO. 3

Give original oxygen gauge reading in psi. _____

Give re-balanced flame oxygen gauge reading, psi. _____

Calculated Difference _____

METALLIZING OPERATORS' QUALIFICATION PROCEDURE

TEST REPORT NO. 4

From the surface preparation methods listed below, the operator shall select the methods applicable to each of the five questions and shall insert the appropriate method numbers in the blank provided under each question.

Preparation Methods Available

1. Sand Blasting
2. Metallic Grit Blasting
3. Aluminum Oxide Blasting
4. Threading plus Abrasive Blasting
5. Metallic Spray Bonding
6. Threading plus Metallic Spray Bonding.
7. Electric Bonding.
8. Threading plus Electric Bonding.
9. Rough Threading.
10. Threading or Grooving plus Rotary Shaft Preparation Tool.

Questions

- A. The inside diameter of a cold water storage tank to be sprayed with 0.010" of Zinc?

Methods _____

- B. A flat surface, 4" x 6", to be sprayed with 0.060" Brass?

Methods _____

- C. A 3" diameter steel shaft having a 3/8" keyway, to be sprayed with 0.050" of .10 carbon steel?

Methods _____

- D. A 2" diameter shaft having a press fit section to be built up 0.002" on the diameter?

Methods _____

- E. A 6" diameter roll neck to be built up 1/8" on radius with .80 carbon steel?

Methods _____

Note: Four of the five above questions must be answered correctly.

METALLIZING OPERATORS' QUALIFICATION PROCEDURE

TEST REPORT NO. 5.

1. Type of surface preparation used on specimen _____
2. Distance from gun nozzle to specimen during spraying _____
3. Did operator preheat specimen prior to spraying? Yes _____ No _____
4. Did operator stop spraying for periodic cooling of specimen? Yes _____ No _____
5. Give spraying speed in seconds required to spray 5'0" of wire. _____

TEST REPORT NO. 6

1. Type of surface preparation used on specimen. _____
2. Distance from gun nozzle to specimen during spraying _____

LABORATORY REPORT

TEST REPORT NO. 7

Shear Testing of Metallized Specimens

Specimen Number	Surface Preparation	Shear Strength (psi).	Minimum * Allowable Shear Strength (psi.)	Pass or Fail
1 2 3	Metallic Spray Bonding		6000**	
1 2 3	Electric Bonding		6300	
1 2 3	Rough Threading		8500	
1 2 3	Threading or Grooving plus Rotary Shaft Preparation Tool		11300	

* Note - Minimum shear strengths are based on a program of testing as summarized and analyzed in PM Test Report 9521 of the Physical Metallurgy Division, Dept. of Mines and Technical Surveys.

** Note - Wide variation in test results with the metallic spray bonding preparation method, as illustrated in PM Test Report 9521, presented difficulty in establishing a suitable minimum shear strength.

