



<b>AEROSPACE MATERIAL SPECIFICATION</b>	<b>AMS5791™</b>	<b>REV. D</b>
	Issued 1986-01 Reaffirmed 2015-04 Revised 2021-05  Superseding AMS5791C	
Cobalt Alloy, Powder, Plasma Spray 56.5Co - 25.5Cr - 10.5Ni - 7.5W		

### RATIONALE

AMS5791D updates chemistry requirements (3.1), prohibits exceptions (3.5, 4.5, 5.1.3, 8.5), adds prior revisions allowance (8.4), and is the result of a Five-Year Review and update.

#### 1. SCOPE

##### 1.1 Form

This specification covers a cobalt alloy in the form of powder.

##### 1.2 Application

This product has been used typically for producing plasma spray coatings to provide surfaces resistant to wear, corrosion, and abrasion, but usage is not limited to such applications.

#### 2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent supplied herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

##### 2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

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<https://www.sae.org/standards/content/AMS5791D/>

## 2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, [www.astm.org](http://www.astm.org).

ASTM B214 Sieve Analysis of Granular Metal Powders

ASTM B215 Sampling Metal Powders

ASTM C117 Material Finer Than 75- $\mu\text{m}$  (No. 200) Sieve in Mineral Aggregates by Washing

ASTM E354 Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

## 3. TECHNICAL REQUIREMENTS

### 3.1 Composition

Powder shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM E354 or by other analytical methods acceptable to purchaser.

**Table 1 - Composition**

Element	Min	Max
Carbon	0.45	0.55
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.04
Sulfur	--	0.04
Chromium	24.50	26.50
Nickel	9.50	11.50
Tungsten	7.00	8.00
Iron	--	2.00
Cobalt	remainder	

### 3.2 Condition

Powder shall be heated by heating within the range 1750 to 1850 °F (954 to 1010 °C) in vacuum or dry hydrogen atmosphere for 2 to 4 hours to reduced surface oxides. This requirement shall be waived if powder is produced by atomizing in an inert atmosphere.

### 3.3 Properties

Powder shall conform to the following requirements:

#### 3.3.1 Particle Size Determination

Powder shall be supplied with the particle size distribution shown in Table 2. Sieve analysis shall be conducted in accordance with ASTM B214 or ASTM C117; the method of testing used shall be reported.

**Table 2 - Particle size determination**

U.S. Standard Sieve	Minimum % by Weight
Passing through No. 170 (90 $\mu\text{m}$ )	100
Passing through No. 200 (75 $\mu\text{m}$ )	95
Retained on No. 325 (45 $\mu\text{m}$ )	90

### 3.3.2 Flowability

Powder shall be visually examined for free flowing through a suitable powder feeder and spray gun. The powder stream shall allow the flow to be consistent and without excessive pulsation.

### 3.3.3 Plasma Spraying

Powder shall produce acceptable plasma spray coatings; standards for acceptance and method of test shall be as agreed upon by purchaser and producer.

### 3.4 Quality

Powder, as received by purchaser, shall be thoroughly blended, uniform in color and quality, dry, and free from foreign materials and from imperfections detrimental to its spraying qualities.

### 3.5 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.5.1.

## 4. QUALITY ASSURANCE PROVISIONS

### 4.1 Responsibility for Inspection

The producer of powder shall supply all samples for producer's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the powder conforms to specified requirements.

### 4.2 Classification of Tests

All technical requirements are acceptance tests and preproduction tests and shall be performed prior to or on the initial shipment of powder to a purchaser, on each lot, when a change in ingredients and/ or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

### 4.3 Sampling and Testing

Shall be in accordance with ASTM B215; sufficient powder shall be taken from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1 When a statistical sampling plan has been agreed upon by the purchaser and producer, sampling shall be in accordance with such plan in lieu of sampling as in 4.3 and the report of 4.5 shall state that such plan was used.

4.3.1.1 A lot shall be all powder produced in a single production run from the same batch of raw materials under the same fixed conditions and presented for producer's inspection at one time.

### 4.4 Approval

4.4.1 Sample powder shall be approved by purchaser before powder for production use is supplied, unless such approval be waived by purchaser. Results of tests on production powder shall be essentially equivalent to those on the approved sample powder.

4.4.2 Producer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production powder which are essentially the same as those used on the approved sample powder. If necessary to make any change in ingredients, in type of equipment for processing, in manufacturing or inspection procedures, producer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample powder. Production powder made by the revised procedure shall not be shipped prior to receipt of reapproval.

#### 4.5 Reports

The producer of powder shall furnish for each lot a report showing the producer's name and country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations) and the results of test for composition, the method of testing used to determine particle size, and stating that the powder conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS5791D, producer's powder designation, whether a statistical sampling plan was used, and quantity.

4.5.1 When material produced to this specification has exceptions taken to the technical requirements listed in Section 3, the report shall contain a statement "This material is certified as AMS5791D(EXC) because of the following exceptions:" and the specific exceptions shall be listed (also see 5.1.3).

#### 4.6 Resampling and Retesting

If any specimen used in the above tests fails to meet the specified requirements, disposition of the powder may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the powder represented. Results of all tests shall be reported.

### 5. PREPARATION FOR DELIVERY

#### 5.1 Identification

5.1.1 Each container shall be permanently and legibly marked with not less than the following information:

COBALT ALLOY, POWDER, PLASMA SPRAY

AMS5791D

MANUFACTURER'S IDENTIFICATION \_\_\_\_\_

LOT NUMBER \_\_\_\_\_

QUANTITY \_\_\_\_\_

5.1.2 Each exterior container shall be legibly marked with not less than the following information in such a manner that the markings will not smear or be obliterated during normal handling or use:

COBALT ALLOY, POWDER, PLASMA SPRAY

AMS5791D

MANUFACTURER'S IDENTIFICATION \_\_\_\_\_

PURCHASE ORDER NUMBER \_\_\_\_\_

LOT NUMBER \_\_\_\_\_

QUANTITY \_\_\_\_\_

5.1.3 When technical exceptions are taken (see 4.5.1), the material shall be identified with AMS5791D(EXC).

#### 5.2 Packaging

5.2.1 Powder shall be packaged in 5 pound (2.3 kg) sealed containers to protect the powder from contamination during shipment and under normal dry storage conditions. Seals used on containers shall be so designed that the seals must be destroyed in order for the container to be opened.

5.2.1.1 A lot of powder may be packaged in small quantities and delivered separately under the basic lot approval provided lot identification is maintained.

5.2.2 Individual packages or containers shall be packed in an exterior shipping container capable of protecting the powder, during shipment and storage, against damage from exposure to weather or any other normal hazard.

5.2.3 Powder shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the powder to ensure carrier acceptance and safe delivery.