

# STEEL FOUNDERS' SOCIETY OF AMERICA

## *Standard Specification for*

# FORSTERITE AND/OR OLIVINE AGGREGATE AND FLOUR

SFSA DESIGNATION: 15-81

REVISED: I98 1

This Standard Specification has been approved by the Society's Specifications Committee and reviewed by the material producers. The preceding Tentative Specification 15T-62 has been revised and advanced to Standard Specification 15-81. Suggestions for revisions should be addressed to the Steel Founders' Society, 2061 1/2 Center Ridge Road, Rocky River, Ohio 44116

### 1. Scope

1.1 This specification covers forsterite and/or olivine for use as either a molding or a core sand in the production of steel castings.

### 2. Acknowledgment

2.1 When specified, a vendor shall indicate this specification number in all quotations when acknowledging purchase orders.

### 3. Quality

3.1 The material shall be free from low melting impurities and other detrimental materials as specified in Section 5.

### 4. Sample Preparation

4.1 Bagged material.

4.1.1 The number of bags to be sampled by the consumer for a routine check of the technical requirements shall be a minimum of 5 bags taken at random to make a 10-pound composite sample.

4.1.2 The sample so taken shall be representative of the aggregate of the bags selected.

4.1.3 Sample reduction shall be by quartering until a 2.5-pound laboratory sample is secured.

4.1.3.1 An alternate method for reducing the gross sample is by the use of a sample splitter which is described in the AFS "Mold and Core Test Handbook", First Edition, Section 2, p. 7.

4.1.4 Identification of sample shall indicate material, producer, supplier, source of shipment, and date shipment was received.

4.1.5 In case of a dispute between supplier and purchaser, the number of bags to be sampled shall be according to ASTM C 322-77a.

4.1.5.1 The number of samples shall depend on the number of units in a shipment. When a shipment consists of 100 bags or less, the number of bags sampled at random shall be preferably 10 bags but not less than 5. When the shipment is greater than 100 and less than 500, the number of bags sampled shall be not less than 15.

4.2 Carload shipments.

4.2.1 A composite sample shall be obtained by taking equally sized samples from the stream at equally timed intervals during the entire unloading process.

4.2.2 The individual samples shall cut the entire stream.

4.2.3 Sample reduction for the laboratory sample shall be according to 4.1.3.

### 5. Technical Requirements

5.1 Chemical composition.

5.1.1 The mineral compound  $2\text{MgO}\cdot\text{SiO}_2$  ( $\text{Mg}_2\text{SiO}_4$ ) shall be not less than 85 percent. The combination of the compound minerals  $2\text{FeO}\cdot\text{SiO}_2$  ( $\text{Fe}_2\text{SiO}_4$ ) +  $2\text{MgO}\cdot\text{SiO}_2$  ( $\text{Mg}_2\text{SiO}_4$ ) shall be not less than 95 percent.

5.1.2 The vendor, upon request, shall furnish to the purchaser (foundry) a certified representative chemical analysis within 10 days of shipment.

5.2 Calcining loss (loss on ignition) shall not exceed the following maximum levels:

AFS Grain Size	Loss on Ignition-%	
	Washington	North Carolina
120 and coarser	1.1	1.35
120 and finer	1.5	1.5

5.3 Screen analyses.

5.3.1 Screen analyses shall be made on a 100 or 250-gram sample of forsterite and/or olivine.

5.3.2 The sizes of the screens shall be in accordance with the National Bureau of Standards series as given in ASTM E 1 I-70.

5.3.3 The U.S. Standard sieve numbers to be used in the screen analysis shall be as follows:

5.3.3.1 For forsterite and/or olivine aggregate.

Screen No.	Diameter in Inches
20	0.033 1
30	0.0232
40	0.0165
50	0.0117
70	0.0083
-100	0.0059
140	0.004 1
200	0.0029
270	0.002 1

5.3.2 For forsterite and/or olivine flour.

Screen No.	Diameter in Inches
140	0.0041
200	0.0029

5.3.4 Classification of forsterite and/or olivine aggregate.

5.3.4.1 Six grades of aggregate are recommended, SFSA Nos. S-35, S-60, S-70, S-90, S-120, and S-180. The recommended classification for each grade is given in Table I.

**TABLE I-SCREEN CLASSIFICATION RANGES FOR VARIOUS SFSA GRADES OF FORSTERITE AND/OR OLIVINE AGGREGATE**

Screen Number	Fraction-Percent					
	s-35	S-60	s-70	s-90	s-120	S-180
20	100P(1)	100P	—	—	—	—
30	—	—	100P	—	—	—
40	—	—	—	100P	—	—
50	—	—	—	—	100P	—
70	—	90min.R(2)	—	—	—	—
100	—	—	—	—	—	100P
200	—	95min.R	95min.R	75min.R	75min.R	—
270	—	—	—	—	—	75min.R

(1) P Passed  
(2) R Retained

5.3.4.2 Two grades of flour are recommended, SFSA Nos. F-200 and F-325. The recommended classification for each grade is given in Table II.

**TABLE II-SCREEN CLASSIFICATION RANGES FOR VARIOUS SFSA GRADES OF FORSTERITE AND/OR OLIVINE FLOUR**

Screen Number	Fraction F-200	Percent F-325
140	100P(1)	100P
200	10 max. R(2)	—
270	—	15 max.R

(1) P Passed  
(2) R Retained

## 5.4 Moisture.

5.4.1 The moisture content of the forsterite and/or olivine aggregate or flour shall not exceed 0.2% for S-70 and coarser, or 0.3% for S-90 and finer.

## 6. Acceptance Tests

### 6.1 Calcining loss (loss on ignition).

6.1.1 Place sample in an oven sixteen hours at 250° F (121° C) to remove free moisture.

6.1.2 Tare porcelain crucible boat (Coors 08).

6.1.3 Take sand from oven and put about 5 grams into boat, set in desiccator for 1 hour, weigh second time.

6.1.4 After second weight, place sample and boat into tube furnace (55035-A-Lindbergh) at 1750° F (954° C) for 15 minutes. Furnace is flushed before and during burning with argon.

6.1.5 Remove sample and boat from tube furnace and place in desiccator to cool for 1 hour.

6.1.6 Weigh sample and boat after cooling.

6.1.7 Calculate the loss on ignition, LOI:

$$\frac{\text{Loss in weight}}{\text{Weight of sample}} \times 100 = \% \text{LOI}$$

### 6.2 Screen analysis.

6.2.1 The screen analysis of forsterite and/or olivine aggregate shall be performed by either of two methods:

6.2.1.1 Dry method, by means of agitating an assembled series of screens and noting the weights retained on each.

6.2.1.2 Wet method, according to the ASTM Procedure C 92-76 for wet sieve analysis (Section 5).

6.2.2 The screen analysis for forsterite and/or olivine flour shall be performed by wet screening.

#### 6.2.2.1 Apparatus.

6.2.2.1.1 200-mesh Tyler sieve, 6-inch diameter.

6.2.2.1.2 4-liter beaker.

6.2.2.1.3 4-inch shallow drying pans.

#### 6.2.2.2 Procedure.

6.2.2.2.1 Transfer 100 grams of the laboratory sample to the 600-ml beaker containing about 400 ml of water, and thoroughly mix with a stirring rod. Place the 140-mesh sieve in the flared top of the 4-liter beaker, and then pour the slurried sample through the sieve. Flush any residue in the beaker onto the sieve and wash the residue on the sieve with a stream of water from a 1/2-inch diameter hose connected to the cold water tap until beaker is full. Reserve the screened slurry. The water pressure for washing the residue is adjusted by the faucet to just fill the hose and is directed on the sieve in a rotary motion.

6.2.2.2.2 Carefully flush any residue on the 140 sieve into a shallow pan, decant the excess water, dry, and weigh the residue. The weight of residue is reported as percent on the 140 mesh.

6.2.2.2.3 The reserved slurry in the 4-liter beaker is slowly poured onto the 200-mesh sieve. If the super-fine material tends to clog the sieve, slightly tap the side of the sieve. After all the material has been transferred to the screen, wash as described above until most of the superfines are washed through. Place the sieve on the 4-liter beaker and continue to wash with a rotary motion until the beaker is full. Remove the sieve, discard the washings, then continue washing the residue until the beaker is filled three times.

6.2.2.2.4 Flush the residue on the sieve into a shallow pan, decant the excess water, dry and weigh. The weight of residue is reported as percent on the 200 mesh.

6.2.2.2.5 The percent through the 200 screen is found by subtracting the percent on the 140 and 200 screens from 100.

### 6.3 Percent moisture.

6.3.1 Weigh 10.0 grams of the sample and heat to constant weight at a temperature not under 105 nor over 110 degrees C. Cool in a desiccator and weigh.

#### 6.4.2 Calculations:

$$\frac{\text{Loss in weight}}{\text{Weight of sample}} \times 100 = \text{Percent Moisture}$$

## 7. Packaged or Bagged Aggregate or Flour

7.1 The aggregate shall be bagged in such a manner as to insure that the forsterite and/or olivine is not exposed to moisture and is protected against shipping loss.

7.2 The forsterite and/or olivine shall be bagged in sacks which hold a maximum of 115 pounds or in metal or wooden barrels of 500 pounds net weight.

## 8. Rejection

8.1 Material not conforming to the specification will be subject to rejection by the foundry.