

# STEEL FOUNDERS' SOCIETY OF AMERICA

## *Tentative Specification for*

# MOLDABLE EXOTHERMIC PAD MATERIALS

SFSA Designation: 3 OT-65

Issued: 1965

This Tentative Specification has been approved by the Society's Specifications Committee and reviewed by the material producers. The Tentative Specification shall be in effect for two (2) years and, if not revised in that time, it shall be advanced to Standard. Suggestions for revisions should be addressed to the Steel Founders' Society at 606 Terminal Tower, Cleveland, Ohio **44113**.

### 1. Scope

1.1 This specification covers all exothermic materials which are molded to shape and rammed in place against the pattern to extend the feeding range in steel castings.

### 2. Acknowledgment

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

### 3. Identification

3.1 Containers for exothermic moldable materials shall be plainly marked "Exothermic Moldable Material" or by vendor's trade name.

3.2 The name of the manufacturer and batch number shall be legibly marked on each container.

### 4. Quality

4.1 The material shall be of uniform color and free from foreign materials.

### 5. Sample Preparation

5.1 The number of containers to be sampled by the consumer for routine testing shall depend on the number of containers in a shipment.

5.1.1 When the shipment consists of 10 containers or less, the number of containers sampled at random shall be not less than 2 and preferably 4.

5.1.2 When the shipment consists of more than 10 containers, the number of containers to be sampled at random shall be not less than 4 containers and preferably 30 percent of the total number in the shipment or a maximum of 10 containers (see Note 1).

5.2 The composite sample shall not weigh less than 40 pounds or greater than 200 pounds and shall be obtained by taking approximately equal weights from each random selected container in the sample lot.

5.2.1 The composite sample shall be reduced by quartering until a minimum 20-pound sample is obtained.

5.2.2 An alternate method for reducing the gross sample is by the use of a sample splitter, such as

described in the AFS "Foundry Sand Handbook," Seventh Edition, Section III.

5.3 Identification of the sample shall indicate material, trade name, manufacturer, batch number, source of shipment and date shipment was received.

5.4 In case of a dispute between manufacturer and purchaser, the number of units to be sampled shall be according to ASTM C322, Procedure C.

**NOTE 1.-Fractional units** shall be converted to the nearest whole number, e.g., **4.4 containers=4 containers, 4.6 containers= 5 containers.**

### 6. Technical Requirements

6.1 Contaminators in the Exothermic Pad Material.

6.1.1 Boron . . . . .less than 0.005 percent

6.1.2 Lead . . . . .less than 0.050 percent

6.1.3 Magnesium . . . . .less than 0.100 percent

6.1.4 Tin . . . . .less than 0.120 percent

6.1.5 Zinc . . . . .less than 0.150 percent

6.2 Exothermic Pad Requirements for Casting Sound Plate.

6.2.1 By the use of a tapered exothermic pad of prescribed dimension, a 1x5x15-inch carbon steel plate, cast horizontally, shall conform to Class 1 of ASTM E-7 1-52 in respect to internal soundness.

6.3 Bend Test.

6.3.1 The degree of bend in a normalized carbon steel plate (0.25 percent  $\pm$  0.03 percent carbon) shall be equal to or greater than 70 degrees. The bend portion of the bar shall not contain more than 3 cracks, none of which shall be over  $\frac{1}{8}$  inch long in any direction. Figure 1 illustrates how measurement of degrees ("bend) is taken (see Note 2 ).

6.3.2 In the event the degree of bend is less than 70 degrees, a machined bend bar from a standard keel block poured in the same heat and similarly heat treated shall be bend tested and meet 120 degrees bend.

6.3.2.1 Failure of the machined bend bar to meet the 120-degree requirement permits the retesting for degree of bend with a test plate cast in another heat.

**NOTE 2.-**If the fractured surface of the bend bar indicates a visual flaw in the steel, such as sand and/or slag inclusions, porosity and/or gas holes, etc., a retest shall be permitted.

## 6.4 Contaminators in the Steel Casting.

6.4.1 The maximum pickup (see Note 3) in aluminum, boron and silicon 0.025 inch below the test casting-exothermic pad interface shall conform to the following limitations:

- 6.4.1.1 Aluminum .....0.10 percent
- 6.4.1.2 Silicon ..... 0.80 percent
- 6.4.1.3 Boron .....none

**NOTE 3**.-Pickup refers to the percentage of contaminators in excess of the base composition of the test plate.

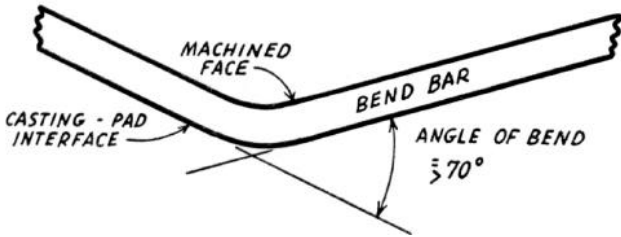


Figure 1-Sketch illustrating measurement of angle of bend.

## 7. Acceptance Tests

### 7.1 Contaminators in Exothermic Pad Materials.

7.1.1 The manufacturer, upon request, shall furnish within ten days to the purchaser a certified representative analysis of the contaminators as indicated in 6.1.

### 7.2 Test Procedure for Determining Feeding Ability of Exothermic Pad Material.

7.2.1 Cast horizontally a steel plate with pad as shown in Figure 2.

7.2.1.1 Foundry practice for test shall be according to drawing shown in Figure 2.

7.2.1.2 Test plate shall be cast in 0.22-0.28 percent carbon steel,

7.2.1.3 Pouring temperature of the steel shall be not less than 2850 degrees F.

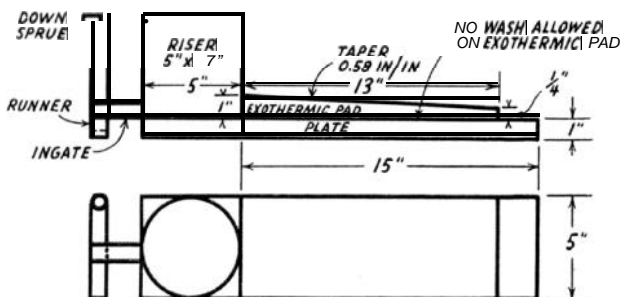


Figure 2—Sketch of test plate with exothermic pad giving dimensions of plate, exothermic pad, and riser. Gate location indicated.

7.2.2 Pressure blast plate, remove gate and riser, and then normalize 1600 degrees F.

7.2.3 Place film adjacent to plate-pad interface, radiograph test plate to a quality level of a 2-2T (ASTM-EY4) for internal shrinkage (see Note 4).

**NOTE 4**.-Further checking of the exothermic material not required if test plate does not conform to Class 1 of ASTM E-71-52 in respect to Internal soundness.

### 7.3 Performing the Bend Test.

#### 7.3.1 Preparation of bend specimen.

7.3.1.1 Remove bend bar specimen from plate as illustrated in Figure 3. It shall be machined (see 7.3.1.2) to 1 by 1/4 inch in section with corners rounded to a radius not over 1/16 inch.

7.3.1.2 No machining or grinding will be permitted on casting-plate interface of the bend specimen.

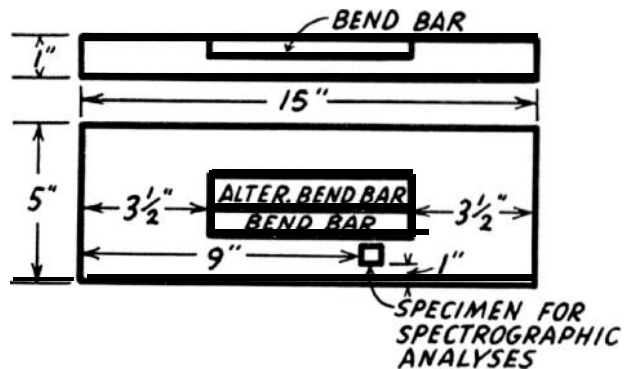


Figure 3-Sketch showing location of bend bar specimen and location of specimen for spectrographic analyses.

#### 7.3.2 Test procedure.

7.3.2.1 The bend test specimen shall stand being bent cold through an angle of 70 degrees.

7.3.2.2 The bend shall be made around a pin 1 inch in diameter with the unmachined pad-casting interface being on the outside of the bend (the side of the bend specimen experiencing tensile forces).

7.3.2.3 The bend test shall be conducted in accordance with ASTM A-370, Methods and Definitions.

### 7.4 Determining Pickup of Contaminators (Al, Si and B) in Test Plate.

7.4.1 Analytical procedures shall be limited to spectrographic methods.

7.4.2 Specimen for spectrographic analysis shall be taken approximately 9 inches from the riser end of the plate and 1 inch from either edge of the plate.

7.4.3 Spectrographic tests shall be made 0.025 inch below the plate-exothermic pad interface.

7.4.4 Preparation of casting surface for spectrographic analysis shall be by machining (see Note 5).

7.4.5 Spectrographic test for base composition (Al, Si and B) shall be made from the side opposite the exothermic pad. Use the spectrographic specimen from Item 7.4.2.

7.4.6 Referee Procedure.

7.4.6.1 Surface preparation for spectrographic analysis for contaminants shall be by either electropolishing or by a milling operation.

**Note 5.-Surface preparation for spectrographic analysis by grinding is permitted provided the ground surface is cleaned with 11 hydrochloric acid to remove any aluminum or silicon contaminants. Grinding is permitted without hydrochloric acid cleaning provided a silicon carbide belt is used for aluminum sparking and an aluminum oxide belt is used for silicon sparking.**

## 8. Number of Tests

8.1 One test plate shall be made for each shipment under test.

8.2 One bend test shall be made for each shipment under test.

8.3 If any bend specimen shows defective machining or develops a visual flaw, it may be discarded and another specimen substituted.

## 9. Retest

9.1 If the result of the bend test does not conform to the requirements specified, another test plate may be cast.

## 10. Rejection

10.1 Any rejection based on tests made in accordance with Section 7 which does not conform to the requirements in Section 6 shall be reported to the manufacturer within two weeks by the purchaser.

10.2 Materials which do not conform to the requirements of this specification will be subject to rejection by the purchaser.