

STEEL FOUNDERS' SOCIETY OF AMERICA
Tentative Specification for
**EXOTHERMIC MATERIALS FOR MOLDED
EXOTHERMIC SLEEVES**

SFSA Designation : 31T-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 made into sleeves (or shapes), placed in the riser mold cavity to retard the solidification time of the riser and thus promote feeding by atmospheric pressure.

1.2 Two grades of material are available and selection may depend on whether or not a buffer core is to be placed between the sleeve (or shapes) and the casting.

1.2.1 Grade 1 exothermic may be used without a buffer core between the exothermic sleeve (or shapes) and the casting as pickup of aluminum and silicon on casting surface is negligible.

1.2.2 Grade 2 exothermic is used generally when a buffer core is employed between the sleeve and the casting to prevent excessive pickup of aluminum and silicon at the casting surface (see Note 1).

NOTE 1.-When sleeves (or shapes) molded of Grade 2 are used without a buffer core, the casting surface adjacent to the sleeve will pick up aluminum, silicon and possibly small amounts of lead and tin.

2. Acknowledgment

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

3. Identification

3.1 Containers for exothermic materials to be molded into sleeves shall be plainly marked "Exothermic Sleeve 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 exothermic material for sleeves (or shapes) shall be of uniform color within the batch shipment 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 2).

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 2.-Fractional units shall be converted to the nearest whole number, e.g., **6.4 containers= 6 containers, while 6.6 containers= 7 containers.**

6. Technical Requirements

6.1 Contaminators in the steel casting.

6.1.1 The maximum pickup in the steel casting (see Note 3) in aluminum, silicon, boron, lead, tin and zinc 0.025 inch below the casting-sleeve interface shall conform to the following limitations:

6.1.1.1 Grade No. 1 (Tested without buffer material)

Aluminum 0.10 percent, maximum
Silicon 0.80 percent, maximum
Boron , 0.001 percent, maximum
Lead 0.003 percent, maximum
Zinc 0.003 percent, maximum
Tin 0.003 percent, maximum

6.1.1.2 Grade No. 2 (Tested without buffer core material)

Aluminum 0.5 percent, maximum
Silicon 2.00 percent, maximum

6.2 Feeding ability of riser with exothermic sleeves.

6.2.1 Feeding 5- and 10-inch cube test blocks with the aid of exothermic molded shapes when the riser diameters are 70 and 80 percent of the section, respectively (see Note 4).

6.2.1.1 Cast a 5-inch cube without a pipe or internal shrinkage with a 3½-inch diameter riser, 3½-inches high with a ½-inch thick exothermic sleeve (Grades 1 or 2).

6.2.1.2 Cast a 10-inch cube without a pipe or internal shrinkage with an 8-inch diameter riser, 6-inches high with a 1-inch thick exothermic sleeve (Grades 1 or 2). See Note 5.

NOTE 3 .-Pickup refers to the percentage of contaminants in excess of the base composition of the casting.

NOTE 4 .-These tests are designed specifically to determine whether or not the exothermic material when molded around a riser contains enough heat capacity to permit the feeding of 5- and 10-inch cubes sound with riser diameters less than the section size.

The fact that the cubes are internally sound is not to infer that any 5- or 10-inch thick section, e.g., plates, cored sections, etc., may be fed with riser diameters less than the section thickness.

It is realized that other sleeve dimensions, than required by this specification, could be employed. Nevertheless, the test results with the specified cubes will give the foundry an evaluation of the exothermic material submitted.

NOTE 5 .-If a foundry is not interested in sections equal to or greater than 10 inches, then the technical requirement of 6.2.1.2 may be waived.

7. Acceptance Tests

7.1 Procedure for Determining Pickup of Contaminators in Steel Casting-Aluminum, Boron and Silicon (see Note 3).

7.1.1 Analytical procedures shall be limited to spectrographic methods.

7.1.2 Specimen for spectrographic analysis may be taken at any location of the sleeve-casting interface (see Note 6).

7.1.3 Spectrographic tests shall be made 0.025 inch below the casting-exothermic sleeve interface.

7.1.4 Preparation of casting surface for spectrographic analysis shall be by machining (see Note 7).

7.1.5 Referee Procedure

7.1.5.1 Spectrographic methods must be used and surface preparation of the specimen for chemical analysis shall be limited to either electropolishing or by milling.

NOTE 6 .-Whenever buffer cores are used to separate the sleeve from the casting, it is not necessary to determine the pickup of contaminants.

NOTE 7 .-Surface preparation for spectrographic analysis by grinding is permitted, provided the ground surface is cleaned with 1-1 hydrochloric acid to remove aluminum or silicon contaminants from the grinding wheel. 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.

7.2 Feeding ability of riser with an exothermic sleeve.

7.2.1 Feeding a 5-inch cube.

7.2.1.1 Mold and bake sleeve 4-inches high with a 3½-inch I.D. and a 4½-inch O.D. according to the mixing procedure recommended by manufacturer.

7.2.1.2 Mold a 5-inch cube with a riser cavity 4½ inches in diameter and at least 4½-inches high with a bottom gate. Insert or ram molded sleeve in riser cavity. See Figure 1.

7.2.1.3 Fill riser cavity to within ¼ inch of top of exothermic sleeve.

7.2.1.4 After mold is poured, the surface of the metal in the riser shall be covered to a depth of ¼ inch with the loose exothermic material used to mold the sleeve.

7.2.1.5 The tapping temperature of the carbon steel must be 2950 degrees F ± 50 F degrees (see Note 8).

7.2.1.6 Shakeout 5-inch cube casting and allow it to cool to approximately room temperature.

7.2.1.7 Remove riser.

7.2.1.8 Section the 5-inch cube through the central axis by sawing and examine sectioned casting for a pipe into the casting or the presence of internal shrinkage.

7.2.1.9 Radiograph sectioned test cube for internal shrinkage (see Note 9).

7.2.2 Feeding a 10-inch cube.

7.2.2.1 Mold and bake exothermic sleeve 6-inches high with an 8-inch I.D. and a 10-inch O.D. according to the mixing procedure recommended by the manufacturer.

7.2.2.2 Mold a 10-inch cube with a riser cavity 10 inches in diameter and at least 7 inches high. Gate cube into the drag. Insert or ram molded sleeve into riser cavity. See Figure 2.

7.2.2.3 Fill riser cavity within 1 inch of top of exothermic sleeve (see Figure 2).

7.2.2.4 After mold is poured, the surface of the metal in the riser shall be covered with 1 inch of the loose exothermic material used to mold the sleeve.

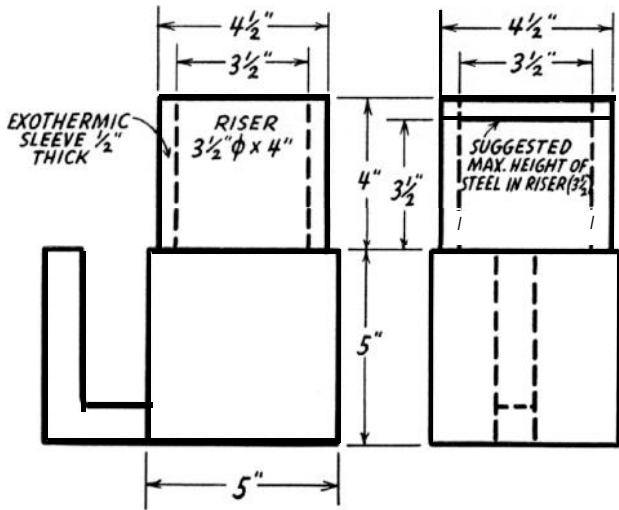


Figure 1—Drawing of 5-inch cube showing riser and exothermic sleeve dimensions.

7.2.2.5 The pouring temperature of the metal must be not less than 2850 degrees F (see Note 8).

7.2.2.6 Shakeout 10-inch cube casting and allow it to cool to approximately room temperature.

7.2.2.7 Remove riser.

7.2.2.8 Section the 10-inch cube through the central axis by sawing and then examine the sectioned casting for a pipe or the presence of internal shrinkage.

7.2.2.9 Radiograph sectioned cube for internal shrinkage (see Note 9).

NOTE 8.—Test cubes should be poured in 0.21 percent carbon (± 0.03 percent carbon) steel in order to facilitate the sectioning of the steel cubes.

NOTE 9.—Radiography as indicated in paragraphs 7.2.1.9 and 7.2.2.9 is entirely optional on the part of the foundry.

Number of Tests

8.1 For 5-inch cube test block.

8.1.1 One 5-inch cube test block for each grade in the shipment.

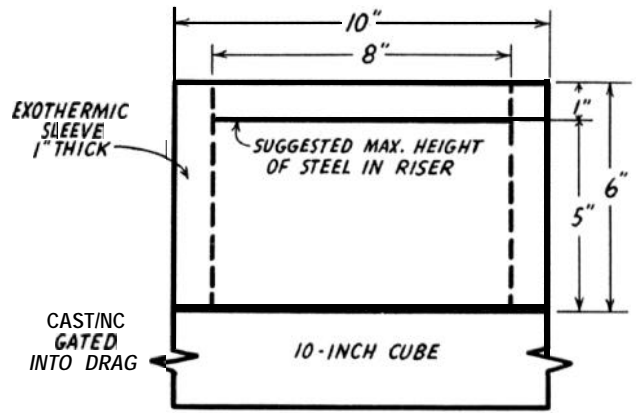


Figure 2—Sketch showing dimensions of riser and exothermic sleeve for 10-inch cube test casting.

8.2 For 10-inch cube rest block.

8.2.1 One 10-inch cube rest block for each grade in the shipment.

8.3 For contaminators.

8.3.1 One spectrograph specimen, when required, for each test casting.

9. Retest

9.1 If any test cube casting contains internal shrinkage and/or a pipe from the riser into the test casting, one additional test cube for each section thickness (5 and/or 10 inches) may be recast.

9.2 The test casting or castings shall conform to the specification requirements specified in paragraph 6.2.

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.