

# STEEL FOUNDERS' SOCIETY OF AMERICA

## *Tentative Specification for*

# **PREFORMED EXOTHERMIC AND INSULATING SLEEVES**

**SFSA Designation: 41T-81**

ISSUED: 1981

This Tentative Specification has been approved by the Society's Specifications Committee. 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 Cast Metals Federation Building, 20611 Center Ridge Road, Rocky River, Ohio 44116.

### **1. Scope**

1.1 This specification covers all exothermic and insulating sleeves which are preformed by the manufacturer and are placed in the riser mold cavity to retard the solidification time of the riser and thus promote feeding.

1.2 The dimensions of the largest cube, in inches, which the sleeve will feed to a specified soundness will be the performance rating of the preformed riser shape.

### **2. Acknowledgement**

2.1 When specified, the vendor shall indicate this specification number (latest revision) in all quotations and when acknowledging purchase orders.

### **3. Identification**

3.1 Containers for preformed sleeves shall be plainly marked with the dimensions of the preformed sleeves, the vendor's trade name, and the number of pieces.

**3.2** The actual name of the manufacturer and the batch number, lot number or date of manufacture shall be legibly marked on each container.

3.3 If asbestos is not used in the manufacturing process of the sleeves, the container shall be clearly marked "Asbestos Free." If asbestos is used in the manufacturing process, the container shall be marked "Contains Asbestos."

3.4 Safety labeling shall be in accordance with applicable regulations.

### **4. Quality**

4.1 The preformed riser sleeves shall be of substantially uniform color within the batch shipment, and free from foreign materials.

4.2 The height, internal dimensions, and minimum wall thickness of the preformed sleeve shall conform to the normal dimensions and tolerances given by the manufacturer.

### **5. Packaging**

5.1 Each container shall be marked as outlined in the requirements of Section 3.

5.2 Packaging shall be adequate to reasonably insure against mechanical damage to the preformed riser sleeves during shipment and handling.

### **6. Sample Preparation by the Foundry**

6.1 One or more preformed sleeves of each size in the shipment may be selected at random.

6.2 Identification of the samples shall include the trade name, manufacturer, batch number, source of shipment, date the shipment was received, the nominal sleeve dimensions and the performance rating defined in Section 1.

### **7. Testing Procedure by the Foundry**

7.1 Mold a cube of the largest size which the manufacturer states can be fed by the preformed riser sleeve. See Figure 1.

7.2 Fill the riser cavity to the height recommended by the manufacturer of the preformed sleeve within the time specified by Figure 2.

7.2.1 The pouring temperature of the steel shall be  $2900^{\circ}\text{F} \pm 30^{\circ}\text{F}$  (see Note 1).

7.3 After the mold is poured, the surface of the metal in the riser shall be immediately covered to a depth recommended by the manufacturer of the preformed sleeve with a riser topping compound which is acceptable to the sleeve manufacturer. Since this test is intended to evaluate the sleeve, metal producing toppings are not recommended for this test.

7.4 Shakeout the cube casting and allow it to cool to approximately room temperature.

7.5 Measure the dimensions of the test cube with calipers. No dimension of the test cube may exceed the corresponding dimension of the test cube pattern when measured with standard calipers.

7.6 Remove the riser. The suggested method is sawing.

7.7 Section the cube through the central axis and examine the sectioned casting for a pipe into the casting or the presence of internal shrinkage. The suggested method is sawing.

7.8 As an alternate method, the test cube may be radiographed.

## 8. Procedure for Determining Pick-up of Contaminating Elements in Steel Castings

8.1 Analytical procedures shall be limited to spectrographic methods except carbon and sulfur which may be determined by wet chemical methods.

8.2 The specimens for analysis shall be taken at the locations shown in Figure 3.

8.3 Spectrographic tests shall be made 0.025 inch or more below the casting-riser or sleeve-casting interface.

8.4 Preparation of the casting surface for spectrographic analysis shall be by machining (see Note 2).

### 8.5 Referee Procedure for Spectrographic Analysis

8.5.1 Surface preparation of the specimen for spectrographic analysis shall be limited to either electro-polishing or milling.

## 9. Acceptance Criteria

### 9.1 Contamination in the steel casting

9.1.1 Values for the maximum permissible pickup (see Note 3) in test casting locations defined in paragraphs 8.2 and 8.3 shall be finalized within 1 year of the issuance date of this document as a tentative specification. Elements considered will be :

Aluminum	.....	0.05 percent, maximum
Boron	.....	0.001 percent, maximum
Silicon	.....	0.30 percent, maximum
Lead	.....	0.003 percent, maximum
Zinc	.....	0.003 percent, maximum
Tin	.....	0.003 percent, maximum
Carbon	.....	0.10 percent, maximum
Sulfur	.....	0.010 percent, maximum
Phosphorus	.....	0.010 percent, maximum

9.1.2 For the purposes of establishing maximum permissible pickup values the casting manufacturer shall report analytical test results to SFSA and the respective sleeve manufacturer. Such test results shall be obtained in accordance with procedures outlined in Sections 7 and 8.

## 9.2 Internal Shrinkage and Riser Pipe

9.2.1 No riser pipe extending into the casting shall be allowed.

9.2.2 The casting shall meet Severity Level 1 of ASTM E 186, E 280, or E 446, whichever is applicable, for internal shrinkage.

## 9.3 Dimensional Stability of Sleeve and Casting

9.3.1 The metal riser shall not be larger than 1.05 times the actual sleeve diameter at the riser-casting interface, after the casting has cooled to room temperature. The actual sleeve diameter shall be within the tolerances of  $-0 + \frac{1}{4}$  in. relative to the ordered nominal sleeve diameter.

## 10. Number of Tests

10.1 One or more tests of each size of preformed sleeve in the shipment may be selected for testing.

## 11. Retests

11.1 If any test cube fails to meet the requirements of Section 9, an additional test cube of that size must be recast if requested by the sleeve manufacturer.

11.1.1 This additional test casting shall conform to the specification requirements of Section 9.

## 12. Health

### 12.1 Asbestos

12.1.1 The preformed sleeves shall comply with the applicable OSHA regulations regarding asbestos fibers present in the breathing zone of workers using the product.

### 12.2 Other

All applicable OSHA regulations shall be met by these preformed sleeves.

## 13. Rejection

13.1 Any reasons for rejection based on tests made in accordance with Sections 7 and 8 which do not conform to the requirements of Section 9 shall be reported to the manufacturer within one month from receipt of sleeves by the purchaser.

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

**NOTE 1:** Test cubes should be poured in 0.25 percent carbon ( $\pm 0.05$  carbon) steel in order to facilitate the sectioning of the steel cubes.

**NOTE 2:** Surface preparation for spectrographic analysis by grinding is permitted, provided the ground surface is cleaned with H-Hydrochloric acid to remove aluminum or silicon contaminants from the grinding wheel. Grinding is permitted without hydrochloric acid cleaning provided a silicon carbide disc or belt is used for aluminum sparking and an aluminum oxide disc or belt is used for silicon sparking.

**NOTE 3:** Pick-up refers to the percentage of contaminants in excess of the base composition of the casting.

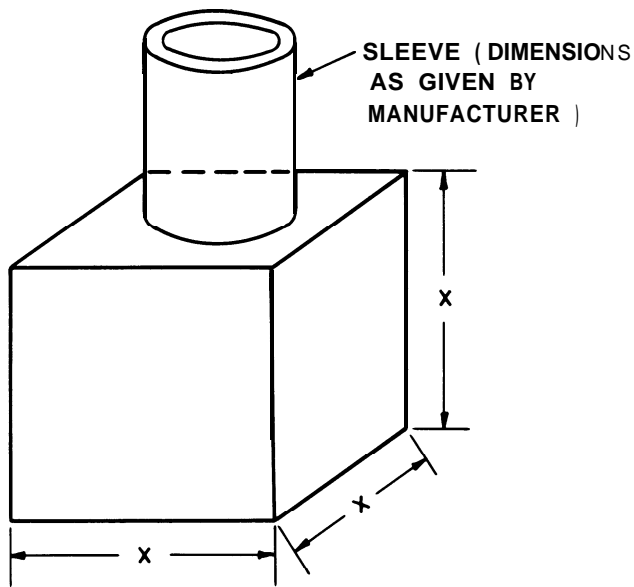


Figure 1-Illustration of Cube Casting and Sleeve configuration. Ingates to be designed in accordance with the pouring time requirements of Figure 2.

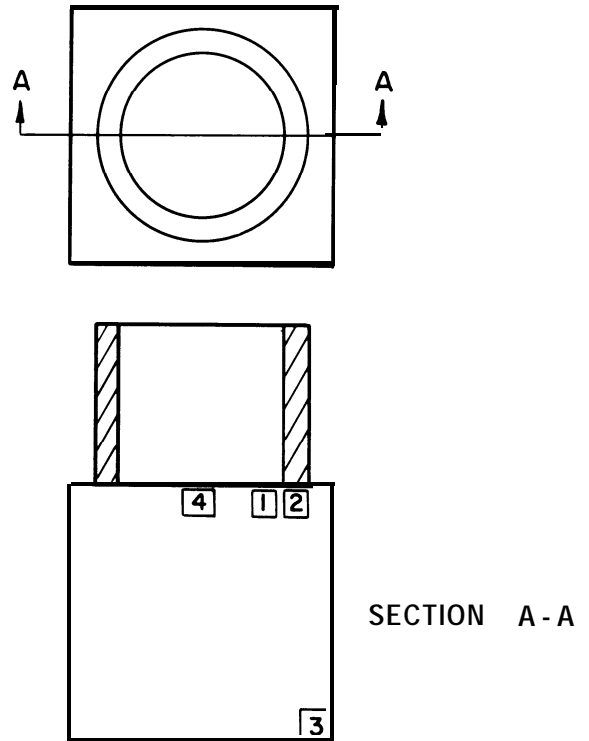


Figure 3-Locations of specimens for chemical analysis. Specimens 1, 2 and 4 shall be taken no closer than 0.025 inches from the riser-casting or sleeve-casting interface. Specimen 3 may be taken at any location at least 1 inch from the mold-metal interface. The analysis at any location shall be the average of 3 chemical determinations. Specimen 4 shall be taken directly below the vertical centerline of the riser at the riser casting interface. It is well known that segregation effects will be seen here. Also, contamination from hot toppings may occur. The chemical analysis thus determined should not be used for sleeve rejection. Rather this analysis should be made to assure the foundryman that such contamination will not appear **at** the riser-casting interface. If it does, changing the riser configuration should shift the pipe vertically and segregation and hot topping effects should be eliminated.

Please report to SFSA:

1. Base metal composition from specimen No. 3
2. Composition determined from specimens No. 1, 2, and 4
3. Cube size rating
4. Type of hot topping applied
5. If possible, the distance from the bottom of the pipe to the riser-casting interface.

This data will be useful for revisions of this specification, and in the development of standards for hot topping contamination.

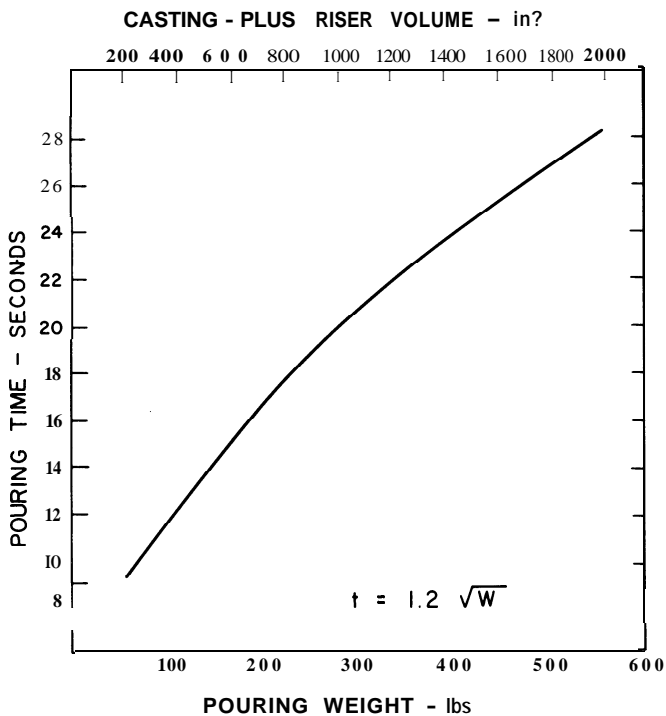


Figure 2-Pouring time, t, versus casting weight, W.