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REFRACTORY CONCRETE, SPECIFICATION FOR

DESIGN ENGINEERING DIRECTORATE

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Approved:

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JOHN F. KENNEDY SPACE CENTER, NASA

TABLE OF CONTENTS

Section	Title	Sheet
1.0	SCOPE	1
2.0	APPLICABLE DOCUMENTS	1
2.1	Governmental	1
2.1.1	Standards	1
2.2	Non-Governmental	1
3.0	REQUIREMENTS	2
3.1	Qualification	2
3.2	Materials	2
3.3	Properties	2
3.3.1	Fineness Modulus	2
3.3.2	Strength	2
3.4	Stability	2
3.5	Rocket Engine Exhaust Resistance	2
3.6	Workability	2
3.7	Weathering	2
4.0	QUALITY ASSURANCE PROVISIONS	2
4.1	Responsibility	2
4.2	Product Qualification Requirements	3
4.3	Qualification Tests	3
4.3.1	Test Sample	3
4.3.1.1	Reinforcement	3
4.3.1.2	Cover for Reinforcement	3
4.3.1.3	Surface Finish	3
4.3.1.4	Rocket Engine Exhaust Exposure	3
4.3.2	Fineness Modulus	3
4.3.3	Strength	3
4.4	Certificate of Conformance	3
4.5	Test Reports	3
5.0	PREPARATION FOR DELIVERY	3
5.1	Packaging	3
5.2	Packing	3
5.3	Palletization	4
5.4	Marking	4
5.5	Mixing and Application Instructions	4

TABLE OF CONTENTS (cont)

Section	Title	Sheet
6.0	NOTES	4
6.1	Intended Use	4
6.2	Ordering Data	4

JOHN F. KENNEDY SPACE CENTER, NASA

REFRACTORY CONCRETE,

SPECIFICATION FOR

This specification has been approved by the Design Engineering Directorate of the John F. Kennedy Space Center (KSC) and is mandatory for use by KSC and associated contractors.

1.0 SCOPE

This specification covers requirements for refractory concrete used for the heat and blast protection of flame deflectors, and other areas of a launch facility.

2.0 APPLICABLE DOCUMENTS

The publications of the issue in effect on the date of issuance of invitation for bids form a part of this specification and, where referred to thereafter by basic designation only, are applicable to the extent indicated by the references thereto. In the event of difference between this specification or its accompanying drawings and the referenced specification, this specification and its accompanying drawings shall govern to the extent of such difference.

2.1 Governmental.

2.1.1 Standards.

Military

MIL-STD-129	Marking for Shipment and Storage

(Copies of standards required by the contractor in connection with specific procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer.)

2.2 Non-Governmental.

American Society for Testing and Materials (ASTM)

C 33	Concrete Aggregates
C 39	Compressive Strength of Cylindrical Concrete Specimens

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race St., Philadelphia, Pennsylvania, 19103.)

3.0 REQUIREMENTS

3.1 Qualification. The refractory concrete furnished under this specification shall be a product that has been tested and has passed the qualification tests specified in 4.3, and has been listed or approved for listing on the approved products list.

3.2 Materials. The fine aggregate shall be hard, dense, durable, clean, sharp, and well graded.

3.3 Properties.

3.3.1 Fineness Modulus. When tested in accordance with 4.3.2, the fineness modulus shall be between 3.75 and 2.75.

3.3.2 Strength. When tested in accordance with 4.3.3, refractory concrete shall develop a compressive strength of 4500 psi (minimum) at 7 days and 90 percent of the 7-day strength within 24 hours. If desired to develop improved properties, use of randomly dispersed steel wire fibers shall be permitted provided steel fibers do not segregate and clog nozzles.

3.4 Stability. When maintained in the original unopened bag for a period of 1 year, the material shall meet the requirements of this specification.

3.5 Rocket Engine Exhaust Resistance. Test samples installed at designated areas of the launch facility and then subject to rocket engine exhaust, shall not crack, spall, or erode more than 1/8 inch when tested in accordance with 4.3.1.4. Heat flux will be up to 3300 Btu/ft^2-sec; time of exposure will be approximately 10 seconds.

3 6 Workability. The refractory concrete shall be capable of being applied pneumatically or manually (trowel) to a uniform, smooth finish.

3.7 Weathering. The material shall resist degradation of thermal protection characteristics due to seacoast atmosphere exposure.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 Responsibility. Unless otherwise specified, the manufacturer is responsible for the performance of all inspection requirements specified herein. Except as otherwise specified, the manufacturer may utilize his own or any other inspection facilities and services acceptable to NASA. Inspection records of the examinations and tests shall be kept complete and available to the Government for a period of five years, unless otherwise specified in the contract or order. The Government reserves the right to perform any of the inspections set forth in the specification, where such inspections are deemed necessary, to ensure supplies and services conform to the prescribed requirements.

4.2 Product Qualification Requirements. To become a qualified product, material shall meet the requirements of Section 3 and pass the qualification tests of 4.3.1 through 4.3.3.

4.3 Qualification Tests.

4.3.1 Test Sample. A test sample shall be required in accordance with figure 1 and the following requirements.

4.3.1.1 Reinforcement. Reinforcing steel shall be Bufnel Gripsteel as manufactured by Keene Corporation, Santa Fe Springs, California or equal. Reinforcing steel shall be free from rust, scale, grease, or other coating which may reduce the bond.

4.3.1.2 Cover for Reinforcement. Minimum concrete coverage for reinforcing steel from the surface exposed to the rocket engine exhaust shall not be less than 1-1/2 inches.

4.3.1.3 Surface Finish. Surface finish shall be uniform and smooth.

4.3.1.4 Rocket Engine Exhaust Exposure. The test sample shall be installed at the designated launch site location and exposed to a rocket engine exhaust. The test sample shall be examined for conformance to 3.5. Installation and examination of the test samples shall be performed by the Government.

4.3.2 Fineness Modulus. The fineness modulus of the aggregate shall be determined in accordance with ASTM C 33.

4.3.3 Strength. The compressive strength shall be determined in accordance with ASTM C 39.

4.4 Certificate of Conformance. The manufacturer shall submit a certificate of conformance stating that the material furnished is essentially identical to the material furnished for qualification testing and complies with the requirements specified herein.

4.5 Test Reports. The manufacturer shall submit a certified laboratory report describing the tests performed in accordance with 4.3.2 and 4.3.3.

5.0 PREPARATION FOR DELIVERY

5.1 Packaging. Unless otherwise specified, material shall be furnished in bags containing 100 pounds of a premixed combination of refractory aggregate in hydraulic setting binder.

5.2 Packing. Packing shall be in a manner which will ensure arrival at the designation in satisfactory condition and be acceptable to the carrier at the lowest rate.

5.3 Palletization. When specified (see 6.2), shipping containers shall be palletized using standard wooden pallets.

5.4 Marking. In addition to any special marking required by the contract, or order, bags shall be marked in accordance with MIL-STD-129. Each bag shall display the following information.

a. Title, number, and date of this specification

b. Name of the product

c. Batch number

d. Manufacturer's name and address

e. Weight of contents

f. Date of manufacture

g. Toxic precautions

h. Necessary supplementary information to ensure safe and proper use of the material

5.5 Mixing and Application Instructions. Mixing and application instructions shall be included with each shipment.

6.0 NOTES

6.1 Intended Use. The refractory concrete is intended for use on the flame deflector and other areas of a launch complex to protect the facility from radiant heat and flame impingement effects of the rocket engine exhaust plume of a launch vehicle.

6.2 Ordering Data. Procurement documents should specify the following:

a. Title, number, and date of this specification

b. Number of 100-pound bags

c. Certification of Conformance (see 4.4)

d. Test Reports (see 4.5)

e. Palletization, if required (see 5.3)

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may

have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

CUSTODIAN:

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PREPARING ACTIVITY:

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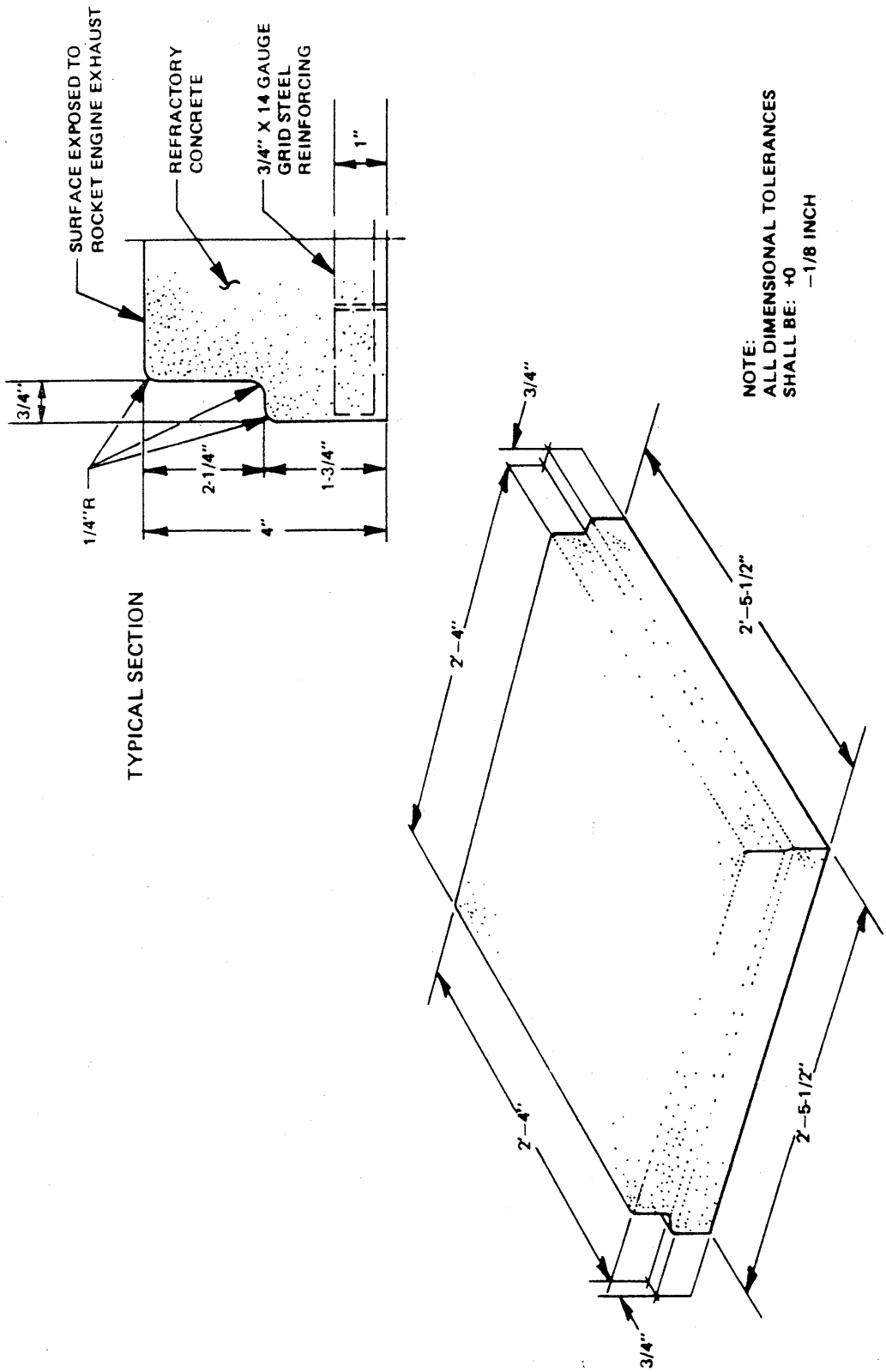

Figure 1. Test Sample Configuration