

INCH-POUND

MIL-DTL-32537

7 October 2015

DETAIL SPECIFICATION

FLOWABLE FILL BACKFILL MATERIAL, RAPID SETTING

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the procurement requirements for flowable fill backfill material, rapid setting. The flowable fill backfill material, rapid setting may be used alone to backfill crater repairs or to backfill crater repairs before they are capped with MIL-DTL-32536 concrete capping material, rapid setting as part of the Airfield Damage Repair (ADR) program.

1.2 Classification. The flowable fill backfill material, rapid setting has the following types as specified in the contract or purchase order (see 6.2).

1.2.1 Types. The types are as follows:

Type I - 3000 lb. super sack

Type II - 50 lb. bucket

Type III - 60 lb. bag

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

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Concrete Capping Material, Rapid Setting

(Copies of these documents are available online at <https://assist.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

Comments, suggestions, or questions on this document should be addressed to DLA Troop Support - Industrial Hardware Division (ATTN: Code FHTE), 700 Robbins Avenue, Philadelphia, PA 19111-5096 or email trpsptspecspa@dlam.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

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2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C426	Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units
ASTM C1610/C1610M	Standard Test Method for Static Segregation of Self-Consolidating Concrete Using Column Technique
ASTM D4832	Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders
ASTM D6024/D6024M	Standard Test Method for Ball Drop on Controlled Low Strength Material (CLSM) to Determine Suitability for Load Application
ASTM D6951/D6951M	Standard Test Method for Use of the Dynamic Cone Penetrometer in Shallow Pavement Applications

(Copies of these documents are available from www.astm.org or the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First Article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Material. The flowable fill backfill material shall be a commercially available, preblended rapid setting backfill material that contains all constituent materials necessary for onsite production and meets the following requirements.

- a. The backfill material must only require the addition of water to produce a usable material. No liquid admixtures will be accepted.
- b. The backfill material must be compatible with citric acid for decreasing the set time in the event of an emergency.
- c. The same material must be readily available in 3,000 lb. super sacks, 50 lb. buckets and 60 lb. bags.
- d. The backfill material must be compatible with mixing in large (standard transit trucks), small mixers (vertical and horizontal) and by hand (drill and paddle).
- e. The backfill material must be compatible with volumetric mixers but cannot rely on the use of local aggregates for extension.
- f. The backfill material must be capable of producing both small and large volumes (1/2 cubic foot to 8 cubic yards).

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3.2.1 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3 Laboratory Requirements. The rapid-setting flowable fill backfill must meet the laboratory specifications listed in Table I.

TABLE I. Rapid Setting Flowable Fill Laboratory Requirements.

Test Description		Testing Specifics	Criteria
Compressive Strength	ASTM D4832	Placed using traditional (wet) method	≥ 750 psi @ 28 days
		Placed using dry method	≥ 500 psi @ 28 day
Initial Hardening	ASTM D6024/ D6024M	-	Initial Hardening: ≤ 30 min
Minimal Segregation	ASTM C1610/ C1610M	Placed using traditional (wet) method	< 5%
Linear Shrinkage	ASTM C426	Placed using traditional (wet) method	< 2%

3.4 Full Scale Aircraft Trafficking. The rapid-setting flowable fill backfill material must have the ability to perform under representative aircraft loads as a backfill material under both a MIL-DTL-32536 rapid-setting concrete cap and an asphalt cap by being subjected to following testing protocol:

- a. A minimum of 10, 10'x10'x 2' crater repairs will be conducted. 5 repairs will be concrete capped with MIL-DTL-32536 material and 5 will be asphalt capped.
- b. 14" of flowable fill backfill will be placed using the dry placement method. The flowable fill will cure for 15 min for concrete capped repairs before the rapid setting concrete is placed.
- c. 20" of flowable fill material will be placed using the traditional (wet) method for asphalt capping material repairs and the flowable fill would be allowed to cure for 30 minutes before asphalt placement. The flowable fill material would be placed using an ADR simplified volumetric mixer.
- d. MIL-DTL-32536 rapid setting concrete will be placed using an ADR simplified volumetric mixer or an ADR approved asphalt capping material will be placed and compacted.
- e. Cylindrical samples of the flowable fill material shall be obtained during wet method placement to ensure the material meets the compressive strength requirements outlined in Table I. The dry method samples shall have the California Bearing Ratio (CBR) measured using a Dynamic Cone Penetrometer (DCP) in accordance with ASTM D6951/D6951M before concrete placement and correlated to Table I compressive strength requirements.
- f. Trafficking plan – Approximately 2 hr. after completion, each crater will be trafficked to 112 passes using a fighter aircraft load cart. The 112-pass level (normal distribution) is the threshold established for expedient ADR repairs. The single-wheel load cart will be loaded to a minimum of 35,235 lb. with a 325-psi tire pressure, representative of the wheel specifications for a typical fighter aircraft. In the following days each crater will be trafficked to a total of 3,500 passes with the load cart.

3.4.1 Survey measurements. Survey measurements of each crater repair will be performed before and after trafficking. A difference in elevation of 1.25 inches or greater will be considered failure.

3.4.2 Excessive cracking due to structural failure or Foreign Object Debris (FOD) potential noted during trafficking will also cause a crater repair to be considered failed.

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3.5 Live-Flight Operations. The rapid-setting flowable fill backfill material must meet the following testing protocol:

- a. A minimum of 10, 10'x10'x 2' crater repairs will be conducted. 5 repairs will be concrete capped with MIL-DTL-32536 material and 5 will be asphalt capped.
- b. 14" of flowable fill backfill will be placed using the dry placement method. The flowable fill will cure for 15 min for concrete capped repairs before the rapid setting concrete is placed.
- c. 20" of flowable fill material will be placed using the traditional (wet) method for an asphalt capping material, and the flowable fill would be allowed to cure for 30 minutes before asphalt placement. The flowable fill material would be placed using an ADR simplified volumetric mixer.
- d. MIL-DTL-32536 rapid setting concrete will be placed using an ADR simplified volumetric mixer or an ADR approved asphalt capping material will be placed and compacted.
- e. Cylindrical samples of the flowable fill material shall be obtained during wet method placement to ensure the material meets the compressive strength requirements outlined in Table I. The dry method samples shall have the California Bearing Ratio (CBR) measured using a Dynamic Cone Penetrometer (DCP) in accordance with ASTM D6951/D6951M before concrete placement and correlated to Table I compressive strength requirements.
- f. Trafficking plan – Approximately 2 hr. after completion, each crater will be trafficked to 112 passes using a fighter aircraft load cart. The 112-pass level (normal distribution) is the threshold established for expedient ADR repairs. The single-wheel load cart will be loaded to a minimum of 35,235 lb. with a 325-psi tire pressure, representative of the wheel specifications for a typical fighter aircraft. In the following days each crater will be trafficked to a total of 3,500 passes with the load cart.
- g. The following day, the craters will be subjected to live fighter and cargo aircraft operations. For cargo aircraft, these will include maximum effort landings, takeoffs, acceleration/deceleration, 180-degree turns, and taxi movements. For fighter aircraft, operations will include maximum effort landings, take offs, aborted take offs (ATOs), 180-degree turns, taxi movements, and touch-and-go operations.

3.5.1 Survey measurements. Survey measurements of each crater repair will be performed before and after trafficking. A difference in elevation of 1.25 inches or greater will be considered failure.

3.5.2 Excessive cracking due to structural failure or Foreign Object Debris (FOD) potential noted during trafficking will also cause a crater repair to be considered failed.

4. VERIFICATION

4.1 Classification of inspection. The inspection and testing of the EBS shall be classified as follows:

- a. First article inspection (see 4.2)
- b. Conformance inspection (see 4.3)

4.2 First article inspection. First article inspection shall consist of all the tests specified (see 4.5).

4.3 Conformance inspection. Conformance inspection shall include the Compressive Strength, Initial Hardening, Flow Consistency and Minimal Segregation tests in Table II.

4.4 Sampling. One package of backfill material shall be taken from each lot and used for each conformance inspection.

4.4.1 Lot Size. A lot shall consist of packages of backfill material manufactured under essentially the same conditions and submitted for inspection at one time.

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4.5 Tests.

4.5.1 Material. The contractor shall furnish certification that the material complies with the requirements specified in 3.2.

4.5.2 First article test samples. The contractor shall provide to the government 60 Type I super sacks of backfill material to perform the full scale aircraft trafficking (paragraph 4.5.4) test. The contractor shall also provide 60 Type I super sacks of backfill material to perform live-flight operations (paragraph 4.5.5) test. See paragraph 6.4 for test laboratory address.

4.5.3 First article tests. The first article tests shall include all Table II tests and paragraphs 4.5.4 and 4.5.5.

TABLE II. First Article and Conformance Laboratory Tests.

<u>Property</u>	<u>Test Method</u>	<u>Requirement</u>
Compressive Strength	ASTM D4832	Table I
Initial Hardening	ASTM D6024/D6024M	Table I
Minimal Segregation	ASTM C1610/C1610M	Table I
Linear Shrinkage	ASTM C426	Table I

4.5.4 Full Scale Aircraft Trafficking. The rapid-setting flowable fill backfill material after being subjected to the paragraph 3.4 testing protocol shall meet paragraph 3.4.1 and 3.4.2 requirements.

4.5.5 Live-Flight Operations. The rapid-setting flowable fill backfill material after being subjected to the paragraph 3.5 testing protocol shall meet paragraph 3.5.1 and 3.5.2 requirements.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Flowable fill backfill material, rapid setting covered by this specification is intended to be used alone to backfill crater repairs or to backfill crater repairs before they are capped with MIL-DTL-32536 concrete capping material, rapid setting as part of the Airfield Damage Repair (ADR) program.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number and date of this specification.
- b. If first article samples are required (see 3.1).
- c. Packaging requirements (see 5.1).

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6.3 Subject term (key word) listing.

Crater
Full scale aircraft trafficking
Live-flight operations
Super sack

6.4 First article test laboratory. First article test samples should be sent to:

U.S. Army Research and Development Center
CEERD-GS-V
3909 Halls Ferry Road
Vicksburg, MS 39180

Custodian:

Army - CE
Navy - AS
Air Force - 99

Preparing Activity:

DLA - IS

(Project 5610-2015-003)

Review Activity:

Army – AV
Navy – MC, YD

NOTE: The activities listed above were interested in this document as of the date of document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil>.