SECTION 31 43 00.20
VOID FILLING

Basis of Design: AP Fill 420 | Revision 1 | Issued 2026-09-24

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes filling of subsurface cavities beneath concrete slabs, behind walls, and around buried structures by injection through small holes, or by free-spray into accessible cavities, of two-component structural polyurethane foam, to eliminate voids and prevent settlement.

B. Work of this Section corrects the presence of subsurface cavities. Completion is judged by complete fill of the cavity without lifting of overlying construction.

C. Raising of settled slabs and soil stabilization at depth are specified separately.

D. AP Fill 420 is a high-expansion, lightweight foam intended for filling voids, abandoned pipes, and mine shafts, and for flotation, where high expansion is required and structural loads are light.

1.2 RELATED REQUIREMENTS

A. Division 01 - Product Requirements, including controlled substitution procedures.

B. Division 01 - Quality Requirements.

C. Division 03 - Concrete, for repair of concrete surfaces, cracks, and injection holes.

D. Water and moisture intrusion control at below-grade walls bounding a filled cavity: Specified separately.

1.3 REFERENCES

A. ASTM International:

1. ASTM C273 - Standard Test Method for Shear Properties of Sandwich Core Materials.
2. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
3. ASTM D732 - Standard Test Method for Shear Strength of Plastics by Punch Tool.
4. ASTM D756 - Standard Practice for Determination of Weight and Shape Changes of Plastics Under Accelerated Service Conditions.
5. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics.
6. ASTM D1042 - Standard Test Method for Linear Dimensional Changes of Plastics.
7. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
8. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
9. ASTM D1623 - Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
10. ASTM D4878 - Standard Test Methods for Polyurethane Raw Materials: Determination of Viscosity of Polyols.
11. ASTM D6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics.
12. ASTM D7487 - Standard Practice for Polyurethane Raw Materials: Polyurethane Foam Cup Test.

1.4 PREINSTALLATION MEETINGS

A. Convene a preinstallation meeting before starting work of this Section. Review at minimum:

1. Current Technical Data Sheets and Safety Data Sheets for each product to be used.

2. Results of utility location, ground penetrating radar, and site inspection under Article 3.1.
3. Void location, boundaries, depth, and estimated volume.
4. Injection grid or free-spray method, and injection sequence.
5. The incremental injection method under Article 3.4 and the heat hazard it controls.
6. Monitoring to prevent lifting of overlying construction.
7. Material temperature, equipment heat settings, and cold-weather provisions.

1.5 ACTION SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Current Technical Data Sheet for each product and accessory to be used, including revision date.

C. Safety Data Sheet for each product and accessory to be delivered to the site.

D. Fill Plan: Drawing showing void boundaries, injection grid and spacing or free-spray areas, no-drill zones, estimated void volume, and monitoring locations.

1.6 INFORMATIONAL SUBMITTALS

A. Site Investigation Report: Results of utility location, ground penetrating radar, and site inspection.

B. Injection Record: For each hole or lift, location, quantity placed, cooling interval observed, and any movement or emergence.

C. Completion Record: Confirmation that each cavity is filled.

D. Installer Qualification: Evidence that the Installer satisfies Article 1.7.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall have completed Alchatek contractor training, or Alchatek Technical Service shall be present at the start of the work.

B. Utility Locate: Contact the applicable one-call utility locate service before drilling.

C. Cold Weather: Crew shall understand frost and permeation limits before working in cold conditions.

D. Safety Data Sheets: Personnel shall review the Safety Data Sheet for each product before handling or injecting.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in unopened original containers bearing the product name and manufacturer identification.

B. Store products between 50 and 80 deg F (10 and 26 deg C). Shelf life is 24 months in unopened containers stored within this temperature range.

C. Keep lids tightly sealed when not in use and avoid splashing water into material containers.

D. Dispose of surplus material in accordance with local regulations.

1.9 FIELD CONDITIONS

A. Material temperature shall be 60 to 90 deg F (15 to 32 deg C) at the time of injection.

B. Equipment Heat Settings: For optimal performance, set the A-side to 100 deg F (38 deg C), the B-side to 110 deg F (43 deg C), and hose heat to 105 deg F (41 deg C), or as indicated on the container tops.

C. Cold Weather:

1. Precondition material to 70 deg F (21 deg C). Maintain drums, lines, and hoses at the recommended temperatures, insulate hoses to prevent freezing, and protect the work area with concrete blankets.

2. Stop work when temperature falls below minus 4 deg F (minus 20 deg C). Frozen ground will cause post-thaw settlement. Resume only when conditions improve.
3. Below 50 deg F (10 deg C), extend wait times between injections and monitor material cure rates.

D. Heat Hazard: Polyurethane foam generates significant heat during cure, with internal temperatures up to 275 deg F. Improper application can cause charring, smoke, and fire. Never inject large volumes continuously at a single location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Alchatek (www.alchatek.com).

B. Substitution of products from other manufacturers is governed by the controlled substitution procedures of Division 01.

2.2 BASIS-OF-DESIGN PRODUCT

A. Basis-of-Design Product: AP Fill 420.

B. Description: Two-component, high-expansion, hydro-insensitive polyurethane foam. Unconfined density 2 lb/cu ft (32 kg/m3). Closed cell. Works in wet environments and displaces water. Bonds with soil and concrete. 90 percent of full strength in 15 minutes.

2.3 SUBSTITUTIONS

A. AP Fill 420 is the product specified for this Section.

B. A product proposed for substitution shall satisfy every requirement of Article 2.4 and shall be supported by current published technical data demonstrating compliance.

2.4 PERFORMANCE REQUIREMENTS

A. Injected material shall be closed cell in the cured state.

B. Injected material shall be hydro-insensitive, shall displace water, and shall cure in wet conditions.

C. Injected material shall bond with soil and concrete.

D. Injected material shall reach 90 percent of full strength within 15 minutes.

2.5 PRODUCT PROPERTIES

A. AP Fill 420, cured (Technical Data Sheet Rev. 1/20/2026):

1. Density, ASTM D1622: 2 +/- 0.25 lb/cu ft (32.04 +/- 4.00 kg/m3).
2. A-side specific gravity: 1.23. B-side specific gravity: 1.02.
3. Viscosity at 110 deg F, ASTM D4878: 200 cP (200 mPa-s).
4. Cream time at 105 deg F, ASTM D7487: 5 seconds. Tack free time: 36 seconds. Rise time: 38 seconds.
5. Free rise compressive strength, ASTM D1621 / D1622: 22 psi (152 kPa).
6. Free rise shear strength, ASTM C273: 11 psi (76 kPa).
7. Flexural strength, ASTM D790: 50 psi (345 kPa).
8. Shrinkage, ASTM D1042 / D756: Negligible.
9. Unconfined expansion: 35 times.
10. 90 percent of full strength: 15 minutes.

B. Confined strength by compression ratio (compressive, ASTM D1621 / D1623; shear, ASTM D732):

1. 1.5 times: Compressive 40 psi (276 kPa); shear 20 psi (138 kPa).

2. 2 times: Compressive 60 psi (414 kPa); shear 30 psi (207 kPa).
3. 3 times: Compressive 98 psi (676 kPa); shear 49 psi (338 kPa).

C. Properties will vary depending on application conditions.

2.6 ACCESSORIES

A. Injection Ports: 3/8 inch injection ports compatible with the gun in use, and injection packers for targeting specific void zones.

B. Injection Tubes: 1/2 inch steel injection tubes for deep void access.

C. Surface Protection: Alchatek Surface Guard 125.

D. Crack Sealant: SlabSeal 142.

E. Hole Patching: Hydraulic cement or concrete patch for concrete, cold patch for asphalt, epoxy for interior slabs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Locate utilities through the applicable one-call service before drilling.

B. Review site plans and project documents and confirm against field conditions: slab thickness and construction type, void location, depth, and estimated volume, reinforcing and post-tension cable locations, soil and erosion conditions, and underground utilities and drainage.

C. Investigate with ground penetrating radar to locate void boundaries and depth, reinforcing, post-tension cables, and utilities.

D. Confirm voids and verify depth and accessibility by probing. Where access permits, estimate void volume and conditions with a borescope camera.

E. Identify drainage and water management conditions contributing to void formation and report them before work begins.

F. Identify where the cavity is directly accessible without drilling and free-spray application is appropriate.

G. Do not begin injection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Injection Grid:

1. Where the void is beneath a slab, lay out injection points 3 to 4 feet apart.
2. Keep holes 18 to 24 inches from joints and slab edges. Start at the lowest points. Avoid post-tension cables as verified by ground penetrating radar.
3. Where the void is open and accessible, no ports are required. Foam may be free-sprayed into the open space.

B. Drill injection holes through the slab with a 3/8 or 5/8 inch carbide-tipped bit to suit the gun in use. Note void depth as the bit breaks through. Clean debris from holes. Where reinforcing or post-tension cable is encountered, relocate the hole 6 to 12 inches away and mark the abandoned location.

C. Where used for large voids, drill a 1/2 inch monitoring hole and insert a borescope to monitor foam placement during injection.

D. Set dial indicators on overlying surfaces to detect unintended lifting.

E. Surface Protection: Pre-spray injection points and surrounding areas with Alchatek Surface Guard 125. Cover finished surfaces with plastic sheeting.

F. Personal Protection: Provide eye and face protection, chemical-resistant gloves, long sleeves and long pants, work boots, and safety vests. Provide respiratory protection in confined spaces.

3.3 MIXING

A. AP Fill 420 is a two-component product proportioned and mixed by the injection equipment. Do not batch mix.

B. Before injection, confirm material temperature is 60 to 90 deg F (15 to 32 deg C), heater controllers are set as specified in Article 1.9, and A-side and B-side pressures are balanced. Test the gun purge system.

3.4 INSTALLATION

A. Injection Equipment:

1. Plural-component proportioning rig with separately heated A-side and B-side and heated, temperature-controlled hoses.
2. Impingement mix gun with water or air purge, with buttonhead fitting and quick-connect coupler.
3. Pressure indication for A-side and B-side visible to the operator. Pressures shall remain balanced.

B. Grid Injection, Incremental Method:

1. Insert a port at the first grid point and inject a controlled volume. Use short shots of 3 to 5 seconds for open voids.
2. Move systematically to the next grid point and rotate through all grid points.
3. Wait 10 to 15 minutes for cooling before returning to the starting point.
4. Repeat the rotation until the void is filled.
5. Never fill an entire void from a single point or inject continuously without cooling intervals.

C. Free-Spray Application, Accessible Voids:

1. Spray a controlled layer 6 to 12 inches deep into the void.
2. Allow 10 to 15 minutes for cooling and expansion.
3. Apply the next layer and continue in lifts until the void is filled.

D. Monitor continuously for material emergence at joints and edges, machine pressures, dial indicator movement showing lifting, and smoke or excessive heat.

E. Stop injection if smoke or excessive heat appears, if dial indicators show lifting of overlying construction, or if material emerges at joints or edges.

F. Where an adjacent slab moves unintentionally, stop injection and saw cut joints to isolate the slabs before continuing.

G. Purge the gun as required by the gun in use. For water-purge guns, purge within 7 to 10 seconds of final injection or when pausing longer than 10 seconds. Where work must pause, move to a new area rather than returning to a partially completed hole.

3.5 FIELD QUALITY CONTROL

A. Confirm cavity fill by borescope, probing, or refusal at each injection point.

B. Record for each hole or lift the location, quantity placed, cooling interval, and any movement or emergence.

C. Return to Service: AP Fill 420 reaches 90 percent of full strength in 15 minutes.

3.6 CLEANING

A. Remove foam that surfaced at joints, cracks, or edges before it cures.

B. Seal cracks in the slab with SlabSeal 142.

C. Clean injection holes of debris and patch with hydraulic cement in concrete, cold patch in asphalt, or epoxy in interior slabs. Match the surrounding surface texture.

D. Remove excess foam, plastic sheeting, and empty containers from the site. Clean equipment in accordance with the proportioner manufacturer's instructions.

3.7 PROTECTION

A. Protect completed work from traffic until the return-to-service interval in Article 3.5 has elapsed.

B. Conduct a final walkthrough to confirm all holes are patched, surfaces are clean, and all equipment is accounted for.

END OF SECTION 31 43 00.20