



Formerly



brand products

SECTION 03540

CEMENTITIOUS UNDERLAYMENTS AND TOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cementitious underlayments scheduled under finish flooring.
- B. Cementitious toppings for traffic bearing surface with applied surface treatments as scheduled.

1.2 RELATED SECTIONS

- A. Section 03300 – Cast In-Place Concrete.
- B. Section 06100 – Rough Carpentry.

1.3 REFERENCES

- A. ACI 201.1R Guide for Making a Conditions Survey of Concrete in Service.
- B. ACI 224.1R93 Causes and Repair of Cracks in Concrete Structure.
- C. American National Standard Specifications for the Installation of Ceramic Tile.
- D. ASTM C 78 – Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
- E. ASTM C 109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch (50-mm) Cube Specimens).
- F. ASTM C 190 – Method of Test for Tensile Strength of Hydraulic Cement Mortars.
- G. ASTM C 191 – Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
- H. ASTM C 348 – Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
- I. ASTM C 382 – Specification for Mineral Fiber Blanket and Felt Insulation (Industrial Type) for Elevated Temperatures.
- J. ASTM C 469 – Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.

- K. ASTM C 580 - Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
- L. ASTM D 4259 - Abrading Concrete.
- M. ICRI 03732 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
- N. RFCI (Resilient Floor Covering Institute) MRP - Addressing Moisture Related Problems Relevant to Resilient Floor Coverings Installed Over Concrete.
- O. NOFMA (National Oak Flooring Institute) - Installing Hardwood Flooring.
- P. TCA (Tile Council of North America) - Handbook for Ceramic Tile Installation.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Manufacturer's printed installation instructions for each product.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm specializing in manufacture of cementitious underlayments and toppings, with minimum 10 years experience.
- B. Installer Qualifications: Firm specializing in installation of cementitious underlayments and toppings, with minimum 5 years documented experience with projects of similar scope, design, and materials.
- C. Mock-Up: Provide a mock-up of each type of installation for approval of quality of workmanship.
- D. Pre-Installation Meeting: At least three weeks prior to commencing underlayments and toppings work conduct a meeting at the project site to discuss contract requirements and job conditions; require the attendance of installers, representative of installation materials manufacturer, and installers of related materials; notify Architect in advance of meeting.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.
- B. Store materials subject to damage by freezing or overheating.
- C. Deliver and store materials on site at least 24 hours before work begins.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Proceed with underlayments and toppings Work after surface defects have been repaired and projections through substrate have been completed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Bonsal / ProSpec, Bonsal American, 8201 Arrowridge Blvd., Charlotte, NC 28273. ASD. Tel: 704.525.1621. Tel: 800.334.0784. Fax: 704.529.5261. Web: <http://www.prospec.com>. **Technical Contact Person: Peter Golter, PE**
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.
- D. Obtain products from a single manufacturer.

2.2 SELF LEVELING CEMENTITIOUS UNDERLAYMENTS

- A. Product: Level Set Deep Pour 3 Underlayment as manufactured by Bonsal / ProSpec.
 1. Application: Feather edge to 3 inch (76 mm). For placements greater in depth than 3 inch (76 mm) preblend or broadcast 15 lb (7 kg) of 3/8 inch (10 mm) clean, dry coarse aggregate to each 50 lb (22.7 kg) bag.
 2. Working Time at 70 degrees F (21 degrees C): 25 to 35 minutes.
 3. Set Time – ASTM C 191 at 70 degrees F (21 degrees C): Initial set approx. 80 minutes, final set approx. 2 hours.
 4. Compressive Strength ASTM C 109: 1 day = >1,600 psi (11.0 MPa), 7 days = > 2,100 psi (14.5 MPa), 28 days = >3,500 psi (34.5 MPa).
 5. Wet Density: 120 lbs./ft³ (1922 kg/m³).
 6. Accepts tile/stone installations in 3 to 4 hours and moisture-sensitive floor coverings in 36 to 48 hours.
- B. Product: Level Set 100 Underlayment as manufactured by Bonsal / ProSpec.
 1. Application: Feather edge to 1 inch (25 mm). For placements greater in depth than 1 inch (25 mm) preblend or broadcast 15 lb (7 kg) of 3/8 inch (10 mm) clean, dry coarse aggregate to each 50 lb (22.7 kg) bag.
 2. Working Time at 70 degrees F (21 degrees C): 30 minutes.
 3. Set Time – ASTM C 191 at 70 degrees F (21 degrees C): Initial set 1 to 1.5 hours, final set 2 to 3 hours.
 4. Compressive Strength ASTM C 109: 1 day - 1,500 psi (10.3 MPa), 7 days - 3,800 psi (26.2 MPa), 28 days - 5,000 psi (34.5 MPa).
 5. Flexural Strength ASTM C 348: 28 days - >900 psi (6.2 MPa).
 6. Flexural Strength ASTM C 580: 7 days - 1,500 psi (10.3 MPa), 28 days - 1,800 psi (12.4 MPa).
 7. Tensile Strength ASTM C 190: 28 days - >600 psi (4.1 MPa).
 8. Wet Density: 128 lbs./ft³ (2050 kg/m³).
 9. Modulus of Elasticity ASTM C 469: 28 days - 1.8 x 10⁻⁶.
 10. Accepts tile/stone installations in 24 hours and moisture-sensitive floor coverings in 72 hours.

- C. Product: Level Set 200 Underlayment as manufactured by Bonsal / ProSpec.
1. Application: Feather edge to 1-1/2 inches (38 mm) without extension with aggregate, and up to 5 inches (127 mm) extended with aggregate.
 2. Working Time at 70 degrees F (21 degrees C): 25 to 35 minutes.
 3. Set Time –ASTM C 191 at 70 degrees F (21 degrees C): Initial set 80 minutes, final set 120 minutes.
 4. Compressive Strength ASTM C 109 (air cured): 4 hours – >1,000 psi (6.9 MPa), 1 day - >3,000 psi (20.7 MPa), 7 days - >3,600 psi (24.8 MPa), 28 days - >5,000 psi (34.5 MPa).
 5. Flexural Strength ASTM C 348: 28 days - 1,050 psi (7.2 MPa).
 6. Tensile Strength ASTM C 190: 28 days - 525 psi (3.6 MPa).
 7. Wet Density: 120 lbs./ft³ (1,922 kg/m³).
 8. Accepts tile/stone installations in 4 hours and moisture-sensitive floor coverings in 16 hours.
- D. Product: Level Set 300 Underlayment as manufactured by Bonsal / ProSpec.
1. Application: Feather edge to 1-1/2 inches (38 mm) without extension with aggregate, and up to 5 inches (127 mm) extended with aggregate.
 2. Wet Density: 120 lb./ft³ (1,922 kg/m³).
 3. Working Time at 70 degrees F (21 degrees C): 25 to 35 minutes.
 4. Set Time – ASTM C 191 at 70 degrees F (21 degrees C): Initial set 80 minutes, final set 120 minutes.
 5. Compressive Strength ASTM C 109 (air cured): 4 hours – >1,500 psi (10.3 MPa), 1 day - >3,500 psi (20.7 MPa), 7 days - >4,500 psi (24.2 MPa), 28 days - >5,500 psi (35.9 MPa).
 6. Flexural Strength ASTM C 348: 28 days - >1,100 psi (7.6 MPa).
 7. Tensile Strength ASTM C 190: 28 days - 570 psi (4.0 MPa).
 8. Accepts tile/stone installations in 4 hours and moisture-sensitive floor coverings in 16 hours.
- E. Product: Level Set LW-60 Underlayment as manufactured by Bonsal / ProSpec.
1. Application: Feather edge to 2 inches (52 mm) per lift.
 2. Wet Density: 60 lb./ft³ (961 kg/m³).
 3. Working Time at 70 degrees F (21 degrees C): 30 minutes.
 4. Set Time –ASTM C 191 at 70 degrees F (21 degrees C): Initial set 80 minutes, final set 120 minutes.
 5. Compressive Strength ASTM C 109: 4 hours – 1,000 psi (6.9 MPa), 1 day - 2,000 psi (13.8 MPa), 7 days - 3,000 psi (20.7 MPa), 28 days - 4,000 psi (27.6 MPa).
 6. Accepts tile/stone installations in 4 hours and moisture-sensitive floor coverings in 16 hours.

This product is only for above grade, interior use covering dry substrates. It is not a vapor barrier and should not be exposed to moisture. Compatibility of the floor covering installation over a gypsum substrate is to be determined by the floor covering manufacturer. Always insure the application suitability of the Level Set G for intended use by installing enough test areas, encompassing adhesives and the finished floor. Product: Level Set G Underlayment as manufactured by Bonsal / ProSpec.

1. Application: From a 1/8 inch to 2 inches (3 to 51 mm) without extension, and up to 5 inches (127 mm) extended with aggregate.
2. Working Time at 70 degrees F (21 degrees C): 30 minutes.
3. Set Time – Temperature 70 degrees F (21 degrees C) ASTM C 191: Initial set 90 minutes, final set 120 minutes.
4. Compressive Strength ASTM C 109: 4 hours – 1,000 psi (6.9 MPa), 1 day - 2,000 psi (13.8 MPa), 7 days - 3,000 psi (20.7 MPa), 28 days - 4,500 psi (31.0 MPa).

5. Flexural Strength ASTM C 348: 7 days – 800 psi (5.5 MPa), 28 days - 1,500 psi (10.3 MPa).
6. Accepts tile/stone installations in 4 hours and moisture-sensitive floor coverings in 16 hours.

2.3 TROWEL GRADE CEMENTITIOUS UNDERLAYMENTS

Use over: Concrete, Embossed vinyl flooring (requires addition of ProSpec Acrylic Additive), Cementitious backerboard, Exterior grade plywood. Use under: Asphalt tile, Vinyl flooring, Carpet, Wood flooring. Delete if not required.

- A. Product: Trowel Grade Underlayment as manufactured by Bonsal / ProSpec.
 1. Application: Place the mixed material at desired thickness up to 2 inches (51 mm). For repairs greater than 2 inches (51 mm) thick, use ProSpec Acrylic Additive.
 2. Set Time – ASTM C 266 at 70 degrees F (21 degrees C): Initial set 20 to 25 minutes, final set 25 to 30 minutes.
 3. Compressive Strength ASTM C 109: 4 hours – >1,600 psi (11 MPa), 1 day - >2,000 psi (14 MPa), 7 days - >3,600 psi (25 MPa), 28 days - >5,000 psi (34 MPa).
 4. Flexural Strength ASTM C 78: 7 days – >1,500 psi (10. MPa), 28 days - >1,600 psi (11. MPa).
 5. Tensile Strength ASTM C 190: 7 days - >300 psi (2 MPa), 28 days - >500 psi (3. MPa).
 6. Shear Bond Strength ASTM C 882: 28 days - >860 psi (6 MPa).
 7. Accepts tile/stone installations in 3-4 hours and moisture-sensitive floor coverings in 16-24 hours.

Feather Edge Applications: Flash patching and skim coating; Quick installation of floor covering; Smoothing cracks, gouges, dings and ridges; Repairs nearly all types of interior subflooring such as concrete, wood terrazzo and ceramic tile. Product: Feather Edge as manufactured by Bonsal / ProSpec.

1. Application: Feather Edge can be applied from feather edge to 1/2 inch (13 mm) in one application without cracking.
2. Set Time –ASTM C 191 at 70 degrees F (21 degrees C): Initial set 25 minutes, final set 30 minutes.
3. Compressive Strength ASTM C 109: 1 day 2,100 psi (114.5 MPa), 7 days 2,800 psi (19.3 MPa), 28 days 4,700 psi (32.4 MPa).
4. Accepts tile/stone installations in .5 hours and moisture-sensitive floor coverings in 1.5 hours.
5. Note: If moisture sensitive adhesives (urethanes/epoxies) are used to adhere flooring materials, allow 16 hours curing time before covering areas prepped with Feather Edge.
6. Note: Feather Edge can be used as an embossing leveler when mixed in conjunction with Bonsal / ProSpec Acrylic Additive or B-730 Mortar Additive - two parts to one part by volume Feather Edge to Acrylic Additive or B-730 Mortar Additive.

2.4 CEMENTITIOUS TOPPING

- A. Product: Level Set Wear Topping as manufactured by Bonsal / ProSpec.
 1. Application: From 1/4 inch to 2 inches (6 to 51 mm) without extension with aggregate, and up to 5 inches (127 mm) extended.
 2. Working Time at 70 degrees F (21 degrees C): 30 minutes.
 3. Set Time –ASTM C 191 at 70 degrees F (21 degrees C): Initial set 90 minutes, final set 120 minutes.
 4. Compressive Strength ASTM C 109: 4 hours – 2,000 psi (13.8 MPa), 1 day - 3,500 psi (24.1 MPa), 7 days - 5,000 psi (34.5 MPa), 28 days - 6,000 psi (41.4 MPa).

5. Flexural Strength ASTM C 348: 7 days – 720 psi (5.0 MPa), 28 days - 1290 psi (8.9 MPa).
6. Tensile Strength ASTM C 190: 7 days – 400 psi (2.9 MPa), 28 days - 660 psi (4.6 MPa).
7. Accepts tile/stone installations in 4 hours and moisture-sensitive floor coverings in 16 hours.
8. Colors:
 - a. Gray.
 - b. White.

2.5 FLOOR PATCH

- A. Bonsal / ProSpec Floor Patch Pro:
 1. Application: Featheredge to 2 inches (51 mm) in thickness.
 2. Percentage Water: Water ratios differ for skim coat vs. thicker applications.
 3. Working Time at 70 degrees F (21 degrees C): 20 to 40 minutes.
 4. Compressive Strength ASTM C 109: 28 days - >3,500 psi (24.1 MPa).
 5. Accepts tile/stone installations in 1 to 2 hour and moisture-sensitive floor coverings in 2 to 3 hours.

2.6 ACCESSORIES

- A. Primer: Bonsal / ProSpec Level Set Primer.
 1. ProSpec Level Set Primer.
- B. Primer for Non-Porous Substrates.
 1. Bonsal / ProSpec Level Set Primer Plus.
- C. Acrylic Additive:
 1. Bonsal / ProSpec Acrylic Additive.
 2. Bonsal / ProSpec B-730 Mortar Additive.
- D. Metal Lath: 2.5 lb/sq yd galvanized metal rib or self furring lathe.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive underlayments and toppings and conditions under which underlayments and toppings will be installed.
 1. Wood framed floors: Verify floor areas over which tile is to be applied to have a deflection not greater than $l/360$ of the span. Include allowance for live load and impact as well as dead load, including weight of the tile and setting bed.
- B. Do not proceed with Work until surfaces and conditions comply with requirements required by manufacturer's printed instructions.

3.2 PREPARATION

- A. Concrete Substrates:
 1. Clean area and remove unsound concrete, grease, oil, paint and any other foreign materials that will inhibit performance.
 2. Substrates shall be stable, solid and structurally sound.

3. The concrete surface shall be mechanically profiled by shot blasting, sand blasting or scarifying to achieve a CSP 3 to CSP 5 standard.
 4. After cleaning and profiling test for MVER (moisture vapor emission rate – reference ASTM F1869).
 5. Repair deep areas, holes and nonmoving cracks with ProSpec Vinyl Concrete Patcher or Floor Patch prior to application and allow curing for a minimum of 3 hours.
- B. Interior Wood Floor Substrate: Residential installations only, 3/4 inch (19 mm) minimum mortar thickness for areas up to 100 sf (9.3 sm); 1-1/4 inches (32 mm) minimum mortar thickness for areas greater than 100 sf (9.3 sm).
1. Cleavage membrane: 2.5 lb/sq yd galvanized metal lathe (minimum) nailed with 1 inch (25 mm) hot dipped galvanized ribbed roofing nails or stapled with 1 inch (25 mm) crown galvanized staples.
 2. Tape or caulk all plywood seams.
- C. Non-Porous Substrates:
1. Ceramic tile, terrazzo, quarry tile and stone shall be solid, well bonded, clean and free of bond breaking contaminants such as glazes, wax, oil and sealers.
 2. Surfaces shall be mechanically abraded until a “profile” is obtained for maximum bonding strength. Wet mop the floor removing all debris, dust and loose material prior to installing the primer. Follow installation procedures for priming using Level Set Primer Plus.

3.3 INSTALLATION

- A. Priming:
1. Two or more applications of primer may be required due to porous substrates.
 2. Test: If the primer turns clear in approximately 30 minutes, then additional coats are needed.
 3. Allow the first coat to dry before applying additional coats.
 4. Allow the primer to dry to a non-tacky film, approximately 1 to 3 hours depending on temperature and humidity before applying underlayment.
 5. Primed floor shall be covered with underlayment within 24 hours, or primer shall be reapplied.
 6. Protect primed substrate from foot traffic.
 7. Install a bond breaker where vertical surfaces meet the new topping.
- B. Underlayment Installation:
1. Temperature shall be a minimum of 40 degrees F (4 degrees C) and shall not exceed 100 degrees F (38 degrees C).
 2. Close all windows and doors to minimize air flow.
 3. Divide the areas to permit continuous placement without cold joints.
 4. To prevent ridges between batches, use a smoother tool and work a narrow dimension.
 5. For placements greater in depth where the addition of aggregate is recommended, pre-blend or broadcast 3/8 inch (10 mm) clean, dry coarse aggregate per product requirements. The addition of aggregate will inhibit the workability of the product, which will require the installation of a finish coat to obtain a smooth surface.
- C. Gypsum Floor Repair:
1. Apply the first coat of primer diluted with 3 parts water, let completely dry (minimum 3 hours) and install a second application of primer mixed 1:1 with water. Let dry, then apply Level Set G.
 2. Moisture Test: Required for moisture sensitive floor coverings.

- a. Moisture Content Test: Cover a 2 feet by 2 feet (610 mm by 610 mm) surface area with a sheet of at least 4 mil thick plastic, duct taping all edges to the Level Set G. After 24 hours, remove the plastic. If the area is darkened, additional drying time is needed. Repeat test until no darkness is present.
3. After the Level Set G is dry, a thin application of Level Set Primer diluted 1:3 with potable water is recommended. After this is completely dry, the adhesive can be applied extending its working time.

END OF SECTION