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Non-Metallic
Non-Shrink Grouting

MasterFlow[®] 4316

Ultra high-strength, hybrid performance, high-precision grout

PACKAGING

50 lb (22.7 kg) polyethylene-lined bags

YIELD

One 50 lb (22.7 kg) bag of Masterflow 4316 grout mixed with approximately 6 lbs. (2.7 kg) or 0.72 gallons (2.72 L) of water provides approximately 0.39 ft³ (0.011 m³) of grout.

Note: The water requirement may vary due to mixing efficiency, temperature, and other variables.

STORAGE

Store in unopened bags in cool, clean, dry conditions.

SHELF LIFE

8 months when properly stored

VOC CONTENT

0 g/L less water and exempt solvents

DESCRIPTION

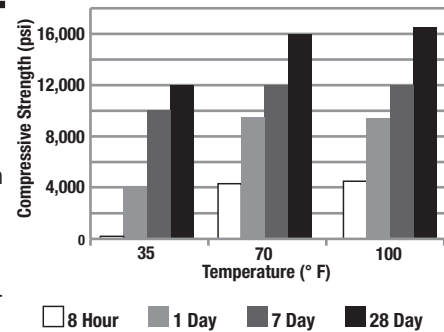
MasterFlow 4316 is a unique grout that provides high early and ultimate compressive strengths over a wide variety of application and service temperatures. The superior performance of MasterFlow 4316 lies in its novel hydraulic binder with premium mineral aggregates which, when mixed with water, produces a flowable and pumpable grout that can be installed in temperatures ranging from 35 to 100 °F (2 to 38 °C).

PRODUCT HIGHLIGHTS

- Meets the requirements of ASTM C1107 at recommended consistencies.
- High early strength with low creep for rapid turnaround—up to 4,300 psi at 8 hours
- Excellent effective bearing area (95%) for even load distribution
- Extremely dense material with proven fatigue resistance—durable
- DNV Fatigue Resistance Tested – 20 years of in-service life for wind turbine grouting applications
- Outstanding shrinkage, impact and vibration resistance
- Ability to be placed in hot weather – up to 100 °F
- Ability to place in cold weather (35 °F / 2 °C)
- Exceptional temperature resistance—up to 1000 °F (538 °C)
- Homogeneous, flowable and pumpable
- Application advantage—one component, easy mixing, placement and cleanup
- Positive expansion when tested according to ASTM C 1090
- Freeze/thaw stable
- Coefficient of thermal expansion equivalent to concrete
- 16,000 psi ultimate strength

SUBSTRATES

- Concrete



APPLICATIONS

- Grouting of equipment, such as compressors and generators, pump bases and drive motors, tank bases, conveyors, foundations, etc.
- In cold weather, when tenting and/or heating are impractical
- Where high early and ultimate compressive strengths are required
- Where high service temperatures are present
- Where a non-shrink grout is required for optimum load transfer
- Applications requiring a pumpable grout
- Grouting anchor bolts, rebar and dowel rods

Technical Data

Test Data

PROPERTY	TEST METHOD REQUIREMENT				TEST METHOD
	35 °F (2 °C)	72 °F (22 °C)	100 °F (38 °C)		
Compressive strengths, psi (MPa)					ASTM C 109
8 hours	none	–	4,300 (30)	–	
12 hours	none	–	6,500 (44.8)	–	
1 day	1,000 (7)	4,100 (28.3)	min. 8,000 (55.2)	min. 8,000 (55.2)	
3 days	2,500 (17)	8,700 (60)	10,900 (75.2)	10,600 (73.1)	
7 days	3,500 (24)	10,000(68.9)	min. 12,000 (82.7)	min. 12,000 (82.7)	
28 days	5,000 (34)	11,900 (82)	16,000 (110.3)	17,000 (117.2)	
Early Height Change, %	< 4	0.4	0.7	0.9	ASTM C 827
Hardened Expansion, %	Max + 0.3	0.09	0.08	0.05	ASTM C 1090 (CRD C621)
Setting Time, min					ASTM C 191
Initial	–	180	180	150	
Final	–	220	210	180	
Consistency, flow test, in (mm)	–	10.5 (260)	10 (250)	9 (225)	2x4" cylinder
Mixed Density, lb/ft ³ (kg/m ³)	–	145 (2,323)	142 (2,275)	142 (2,275)	ASTM C 185
Impact Resistance, Mass Loss, %	–	–	43	–	LA Rattler, 2,000 Cycles
Fatigue	–	–	No deterioration after 2,000,000 cycles	–	DNV-OS-C502-458 Loaded at 7,639 psi (52.7 MPa) at 5hz cycle rate
Freeze/Thaw			Greater than 95% durability factor		ASTM C 666
Slant Shear Bond, psi					ASTM C 882 – Slant Shear Bond Strength
3 days			3,300*		
7 days			3,400*		
28 days			3,500*		
Chloride Permeability @ 28 days			very low (< 500 coulombs)		ASTM C 1202 Rapid Chloride Permeability
Effective Bearing Area			High - Greater than 95%		ASTM C 1339
Compressive Creep			Creep Coefficient 0.08** (strain/initial elastic strain)		ASTM C 512
Creep Strain, in/in			1 Year (600 psi @ 140 °F) 2.3 x 10 ⁻³		ASTM C 1181
Thermal Conductivity, W/mK			2.1 @ 28 days		ASTM C 518
Coefficient of Thermal Expansion, in/in °F			5.7 x 10 ⁻⁶		ASTM C 531
*breaks in concrete base					
** Creep Coefficient of concrete ranges between 2-3					
Mix ratio 12% water by weight or powder 6 lb (0.72 gal, 92 fl. oz) water per 50 lb powder (120 g water / kg powder)					
Test results are averages obtained under laboratory conditions. Expect reasonable variations.					

HOW TO APPLY

SURFACE PREPARATION

1. Steel surfaces must be free of dirt, oil, grease, or other contaminants.
2. Cure the foundation until design strength of the concrete is achieved and foundation is dry. Use the recommended procedure according to ACI 351.1R, Grouting Between Foundations and Bases for Support of Equipment and Machinery. In lieu of mechanical surface preparation, MasterFinish EA 48 Deep surface retarder may be used on freshly placed concrete. Remove surface retarder after 24 hours by use of pressure washing to achieve an exposed aggregate finish. After pressure washing, regular curing practices should continue until design strength is reached.
3. The surface to be grouted must be clean, SSD, strong, and roughened to a CSP of 5–10 following ICRI Guideline 310.2 to permit proper bond.
4. When dynamic, shear or tensile forces are anticipated, concrete surfaces should be chipped with a “chisel-point” hammer, to a roughness of (plus or minus) $\frac{3}{8}$ " (10 mm). Verify the absence of bruising following ICRI Guideline 310.2.
5. Concrete surfaces should be saturated (ponded) with clean water for 8 hours or more depending on site conditions, prior to grouting.
6. All freestanding water must be removed from the foundation and bolt holes immediately before grouting.
7. Anchor bolt holes must be grouted and sufficiently set before the major portion of the grout is placed.
8. Shade the foundation from sunlight 24 hours before and 24 hours after grouting.

FORMING

1. Forms should be constructed to include a 1" chamfer strip at the top of the forms, be watertight, and non-absorbent. Seal forms with putty, sealant, caulk or polyurethane foam. Use sufficient bracing to prevent the grout from leaking or moving.
2. Moderate to large sized equipment and narrow placement applications should utilize a head box to create additional pressure and to enhance the grout placement.
3. Side and end forms should be a minimum 1" (25 mm) distant horizontally from the equipment to be grouted to permit expulsion of

air and any remaining saturation water as the grout is placed.

4. Leave a minimum of 2" between the bearing plate and the form to allow for ease of placement.
5. Eliminate large, non-supported grout areas wherever possible.
6. Extend forms a minimum of 1" (25 mm) higher than the bottom of the equipment being grouted.
7. Expansion joints may be necessary. Consult your local Master Builders Solutions field representative for suggestions and recommendations.

MIXING

1. Condition and maintain the grout and surfaces that contact the grout between 35 to 100 °F (2 to 38 °C) for mixing, placing and curing.
2. Place estimated water (Use potable water only) into the mixer, then slowly add the grout. Start with 5.75 lbs. (2.6 kg) or 0.70 gallons (2.61 L) per 50 lb bag.
3. The water demand will depend on mixing efficiency, material, and ambient-temperature conditions. Adjust the water to achieve the desired flow. The recommended flow is an 8–10" spread using a 2" diameter x 4" height plastic tube (such as pvc pipe) on a non-porous, level surface. Use the minimum amount of water required to achieve the necessary placement consistency. Do not exceed 6.25 lbs. (2.84 kg) or 0.75 gallons (2.84 L) of water per 50 lb bag.
4. Provide one or more clean mortar mixers (stationary barrel with moving paddles) for uninterrupted placement. Do not exceed one-half the maximum capacity. Pre-wet mortar mixer, empty excess water prior to use.
5. Mix grout for at least 4 minutes and no longer than 6 after all material and water is in the mixer until a homogenous consistency is achieved. Use a mechanical mixer only.
7. Transport by wheelbarrow or buckets or pump to the equipment being grouted. Minimize the transporting distance. Do not mix more material than can be placed within the working time of the grout. If grout stiffens as it sits, remix with mechanical mixer to keep it flowable.
8. Do not retemper grout by adding additional water after it stiffens.
9. Do not add plasticizers, accelerators, retarders or other additives.

APPLICATION

1. Always place grout from only one side of the equipment to prevent air entrapment beneath the equipment. A headbox or similar device is required for a continuous pour to avoid air pockets. When pouring into the headbox, maintain at least half full of grout to ensure even flow. Discard grout that becomes unworkable. Make sure that the material fills the entire space being grouted and that it remains in contact with plate throughout the grouting process.
2. Do not vibrate grout. Use steel straps inserted under the plate to help move the grout.
3. Minimum placement thickness is 1" (25 mm). Consult your Master Builders Solutions representative before placing lifts more than 6" (152 mm) in depth.
4. Immediately after placement, trim the surfaces with a trowel and cover the exposed grout with clean wet rags (not burlap). Keep rags moist until grout surface is ready for finishing or until final set.
5. The grout should offer stiff resistance to penetration with a pointed mason's trowel before the grout forms are removed or excessive grout is cut back.
6. Proper application is the responsibility of the user. Field visits by Master Builders Solutions personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite. For guidelines on specific anchor bolt applications, contact Master Builders Solutions Technical Services.

CURING

Cure all exposed grout with an approved membrane curing compound compliant with ASTM C 309 or preferably ASTM C 1315. Apply curing compound immediately after the wet rags are removed to minimize potential moisture loss.

FOR BEST PERFORMANCE

- Contact your local representative for a pre-job conference to plan the installation.
- Large, exposed areas of grout should be avoided.
- Structural integrity of the grout is not affected by superficial, hairline cracks occasionally observed in shoulders, near base plate edges and around anchor bolts.
- Mix times closer to 5 minutes have resulted in better compressive strength development and working time.
- When grouting at minimum temperatures, see that the foundation, plate, and grout temperatures do not fall below 35 °F (2 °C) until after final set. Protect the grout from freezing (32 °F or 0 °C) until it has attained a compressive strength of 3,000 psi (21 MPa) in accordance with ASTM C 109.
- Low temperatures delay the set, increase working time and delay the strength development. High temperatures accelerate the set, decrease working time, and accelerate the strength gain. The procedures below help compensate for this. In light of this, store and mix grout to produce the desired mixed-grout temperature. If bagged material is hot, use cold water, and if bagged material is cold, use warm water to achieve a mixed-product temperature as close to 70 °F (21 °C) as possible.
- Should not be used as a floor topping
- If placing material in skid mounted applications with deep cavities, contact your local Master Builders Solutions representative
- Make certain the most current versions of product data sheet and SDS are being used; visit www.master-builders-solutions.com/en-us to verify the most current versions.
- Proper application is the responsibility of the user. Field visits by Master Builders Solutions personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite.

HEALTH, SAFETY AND ENVIRONMENTAL

Read, understand and follow all Safety Data Sheets and product label information for this product prior to use. The SDS can be obtained by visiting www.master-builders-solutions.com/en-us, e-mailing your request to mbsbscst@mbcc-group.com or calling 1(800)433-9517. Use only as directed.

IN CASE OF EMERGENCY: Call CHEMTEL +1 (800) 255-3924 or if outside the US or Canada, +1 (813) 248-0585.

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