



**Cementitious
Grouts**

MASTERFLOW® 928

High-precision, nonshrink natural aggregate grout with extended working time

Description

MASTERFLOW® 928 grout is a high-precision, nonshrink natural aggregate grout with extended working time. It is ideally suited for grouting machines or plates requiring precision load-bearing support. This specially formulated precision grout can be placed at a variety of consistencies – from fluid to damp-pack – over a wide temperature range, 45 to 90°F (7 to 32°C). MASTERFLOW® 928 grout meets the requirements of ASTM C 1107 and the Army Corp of Engineers' CRD C 621, Grades B and C.

Features/Benefits

- Meets ASTM C 1107 and CRD C 621, Grades B and C, requirements at a fluid consistency over a temperature range of 45 to 90°F (7 to 32°C) over a 30-minute working time
- Can be mixed at a wide range of consistencies to ensure proper placement under a variety of application conditions
- Extended working time to ensure sufficient time for placement
- Hardens free of bleeding, segregation, or settlement shrinkage
- Contains high-quality, well-graded quartz aggregate for optimum strength and workability
- Sulfate resistant
- Freeze/thaw resistant

Where to Use MASTERFLOW® 928

Precision nonshrink grouting of:

- Machinery and equipment, baseplates, and soleplates
- Precast wall panels, beams and columns, curtain walls, concrete systems, and other structural and nonstructural building members
- Grouting anchor bolts, reinforcing bars, and dowel rods
- Repairing concrete, including grouting voids and rock pockets
- Applications requiring high one-day and later-age compressive strengths
- Applications requiring nonshrink grout to achieve maximum bearing for optimum load transfer
- Applications requiring grout to be pumped
- Marine applications
- Freeze/thaw environments

Important: Read This First

ChemRex® does not warrant the performance of this product unless the instructions of this document and other related ChemRex® documents are adhered to in all respects.

How to Apply MASTERFLOW® 928

Pre-Planning

ChemRex® recommends that the user request the services of the local representative for a pre-job conference to plan the installation.

Surface Preparation

- 1 Steel and concrete surfaces must be free of dirt, oil, grease or other contaminants, and substrate must be fully cured (28 days).
- 2 All surfaces should be roughened to remove laitance and expose sound concrete.
- 3 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) 3/8 in. (10 mm).
- 4 Concrete surfaces should be rough and saturated (ponded) with clean water for 24 hours just prior to grouting.
- 5 All free standing water must be removed from the foundation and bolt holes prior to grouting.
- 6 Bolt holes must be grouted before the major portion of grout is placed.
- 7 Shade the foundation from summer sunlight 24 hours before and 24 hours after grouting.

Forming

- 1 Forms should be liquid tight and non-absorbent. Seal forms with grout, putty or caulking compound.
 - 2 Moderately sized equipment should utilize a head form sloped at 45° to enhance the grout placement. A moveable head box may be a way to provide additional head at minimum cost.
 - 3 Side and end forms should be a minimum 1 in. (25 mm) horizontally away from the object grouted to permit expulsion of air and any remaining saturation water as the grout is placed.
- Note:** A minimum of 2 in. (51 mm) is required at the area where the grout is to be placed.
- 4 Sufficient bracing is required to prevent the grout from leaking.
 - 5 Large non-supporting grout areas should be eliminated wherever possible.
 - 6 Forms should extend a minimum of 1 in. higher than the bottom of the equipment being grouted.
 - 7 Expansion joints may be necessary for both indoor and outdoor installation. Consult your local field representative for suggestions and recommendations.

Temperature

1 For precision grouting, store and mix grout to produce the desired mixed grout temperature. If bagged material is hot use cold water, if bagged material is cold use warm water, in order to achieve a mixed product temperature as close to 70° (21°C) as possible.

Recommended Temperature Guidelines for Precision Grouting (degrees F)

	Minimum	Preferred	Maximum
Foundation and plates	45°	50° - 80°	90°
Mixing water	45°	50° - 80°	90°
Grout at mixed & placed temp.	45°	50° - 90°	90°

2 If temperature extremes are anticipated, or if special placement procedures are planned, contact your local ChemRex® representative for assistance.

3 When grouting at minimum temperatures, care must be taken to see that foundation, plate and grout temperatures do not fall below 45°F (7°C) until after final set; and that the grout is protected from freezing (32°F or 0°C) until it has reached 4,000 psi (27.6 MPa) compressive strength.

Mixing

(Use potable water only.)

For aggregate extension guidelines, see Guide to Cementitious Grouting (page A-10 in the Appendix)

1 Place estimated water into the mixer, then slowly add the dry grout. For a fluid consistency, start with 9 lb. (4 kg) (1.1 gallon [4.2L]) per 55 lb. bag.

2 The water demand will depend on mixing efficiency, material, and ambient temperature conditions. Adjust the water to achieve the desired flow. Recommended flow is 25 to 30 seconds using the ASTM C 940 Flow Cone method. Use the minimum amount of water required to achieve the necessary placement consistency. Before placing grout below 45°F (7°C) and above 90°F (32°C) consult your ChemRex® representative.

3 Moderate size batches of grout are best mixed in one or more clean mortar mixers.

Note: Large batches of grout may be effectively, economically and most efficiently mixed in ready-mix trucks utilizing 3,300 lb. (1,500 kg) bulk bags.

4 Mix grout a minimum of 5 minutes after all material and water is in the mixer. Use mechanical mixer only.

5 Do not mix more grout than can be placed in approximately 30 minutes.

6 Transport by wheelbarrow, buckets or pump to the equipment to be grouted. Every measure should be taken to minimize transportation distance.

7 Do not retemper grout by adding water and remixing after it stiffens.

Placing and Curing

1 Grout should always be placed from only one side of the equipment to prevent entrapment of air or water beneath the equipment. MASTERFLOW® 928 grout should be placed in a continuous pour. Discard grout that becomes unworkable. Make sure that the grout fills the entire space to be grouted and remains in contact with plate throughout the grouting process.

2 Immediately after placement, trim the surfaces with a trowel and cover the exposed grout with clean wet rags and maintain this moisture for 5 to 6 hours.

3 The grout should offer stiff resistance to penetration, with a pointed masons trowel, prior to removing the grout forms or cutting back excessive grout.

4 Immediately after placement, wet cure MASTERFLOW® 928 grout by covering all exposed grout with clean, damp rags (not burlap). Keep moist until grout surface is ready to be finished or until final set. Following the removal of the damp rags, immediately coat with a recommended curing compound compliant with ASTM C 309.

5 Do not vibrate grout. Steel straps inserted under the plate may be used to aid in movement of the grout.

6 Consult your ChemRex® representative before placing more than 6 in. (152 mm) in depth per lift.

Curing

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

Jobsite Testing

If strength tests must be made at the jobsite, use 2 in. (51 mm) CUBE molds per ASTM C 942. DO NOT use cylinder molds. Testing should be controlled on the basis of the desired placing consistency rather than strictly on the water content. Consult with your local ChemRex® representative for special procedures required when mixing and casting compressive strength tests of fluid, nonshrink grout.

Pre-job Conference and Job Service

Conferences prior to the installation of equipment, sole plates or rail mounts should be held as early as practical. Such conferences are important to review the above recommendations (for a given grouting project) to ensure a placement of highest quality and lowest in-place cost.

For Best Performance

- The ambient and initial material temperature of the grout should be in the range of 45 to 90°F (7 to 32°C) for both mixing and placing. Ideally the amount of mixing water used should be that which is necessary to achieve a 25- to 30-second flow per ASTM C 939 (CRD C 611). For placement outside of 45 to 90 °F (7 to 32°C), contact your local ChemRex® representative.
- For pours greater than 6 in. (152 mm) deep, consult your local ChemRex® representative for special precautions and installation procedures.
- For precision applications, requiring a fluid consistency (25 to 30 second flow per ASTM C 939/CRD C 611) with extended working time over a temperature range of 45 to 90°F (7 to 32°C) and dynamic load bearing support, use EMBECO® 885 grout.
- When the grout will be in contact with steel which is or will be stressed in tension over 80,000 psi (550 MPa), use MASTERFLOW® 816 cable grout or MASTERFLOW® 1205.
- MASTERFLOW® 928 is not intended for use as floor toppings, or in large areas of exposed shoulders around baseplates. Where grout is exposed for shoulders, occasional hairline cracks may occur. Cracks may also occur near sharp corners of the baseplate and at anchor bolts. These superficial cracks are usually caused by temperature and moisture changes which affect the exposed shoulder grout at a faster rate than the grout beneath the baseplate. These cracks do not affect the structural, nonshrink or vertical support provided by the grout if the foundation preparation, placing and curing procedures are properly carried out.
- The minimum placement depth is 1" (25 mm).

- Make certain the most current version of this data guide is being used; call Customer Service (1-800-433-9517) to verify the most current version.
- Proper application is the responsibility of the user. Field visits by ChemRex® personnel are for the purpose of making technical recommendations only and are not for supervising or providing quality control on the jobsite.

Technical Data

Compliances

- Meets ASTM C 1107 and CRD 621, Grade B and C requirements at a fluid consistency over a temperature range of 40 to 90°F (4 to 32°C).

Typical Compressive Strengths (ASTM C 109, ASTM C 942, Modified)

	Consistency					
	Plastic ¹		Flowable ²		Fluid ³	
	psi	MPa	psi	MPa	psi	MPa
1 day	4,500	31	4,000	28	3,500	24
3 days	6,000	41	5,000	34	4,500	31
14 days	7,500	52	6,700	46	6,500	45
28 days	9,000	62	8,000	55	7,500	52

Volume Change (ASTM C 1090)*

	% Change	Requirement per ASTM C 1107, %
1 day	>0	0.0 - 0.30
3 days	0.04	0.0 - 0.30
14 days	0.05	0.0 - 0.30
28 days	0.06	0.0 - 0.30

Setting Time (ASTM C 191)

	Consistency		
	Plastic ¹	Flowable ²	Fluid ³
Initial Set (Hr.:Min.)	2:30	3:00	4:30
Final Set (Hr.:Min.)	4:00	5:00	6:00

Flexural Strength (ASTM C 78)*

	psi	MPa
3 days	1,000	6.9
7 days	1,050	7.2
28 days	1,150	7.9

Modulus of Elasticity (ASTM C 469, Modified)*

	psi	MPa
3 days	2.82 x 10 ⁶	1.94 x 10 ⁴
7 days	3.02 x 10 ⁶	2.08 x 10 ⁴
28 days	3.24 x 10 ⁶	2.23 x 10 ⁴

Coefficient of Thermal Expansion (ASTM C 531)*

6.5 x 10⁻⁶ in./in./°F (11.7 x 10⁻⁶ mm/mm/°C)

Split Tensile and Tensile Strength (ASTM C 496 and ASTM C 190)*

	Split Tensile		Tensile	
	psi	MPa	psi	MPa
3 days	575	4.0	490	3.4
7 days	630	4.3	500	3.4
28 days	675	4.7	500	3.4

¹100-125% flow on flow table per ASTM C 230

²125-145% flow on flow table per ASTM C 230

³25 to 30 seconds through flow cone per ASTM C 939

*Test conducted at a fluid consistency

Test results are averages obtained under laboratory conditions. Reasonable variations can be expected.

Ultimate Tensile Strength and Bond Stress from ASTM E 488 Tests*

Diameter, inch	Depth, inch	Tensile Strength, lb.	Bond Stress, psi
5/8	4	23,500	2,991
3/4	5	30,900	2,623
1	6.75	65,500	3,090

*Average of 5 tests in f'_c ≥ 4000 psi concrete using 125 ksi threaded rod in 2 inch diameter, damp, core-drilled holes.

Notes:

1. Grout was mixed to a fluid consistency.
2. Recommended design stress = 2,275 psi.
3. Refer to the "Adhesive and Grouted Fastener Capacity Design Guidelines" for more detailed information.
4. Tensile tests with headed fasteners were governed by concrete failure.

Punching Shear Strength (ChemRex® Method)* 3 in. x 3 in. x 11 in (76 mm x 76 mm x 279 mm) beam

	psi	MPa
3 days	2,200	15.2
7 days	2,260	15.6
28 days	2,650	18.3

Resistance to Rapid Freezing and Thawing (ASTM C 666, Procedure A)

300 Cycles RDF 99%

*Test conducted at a fluid consistency

Note: The data shown is based on controlled laboratory results. Reasonable variations from the above results can be expected. Field and laboratory tests should be controlled on the basis of desired placement consistency rather than strictly on the water content.

Order Information

Packaging

MASTERFLOW® 928

- 55 lb. (25 kg) moisture-resistant bags
- 3,300 lb. (1,500 kg) bulk bags

Shelf Life

- Shelf life is 12 months when stored in original, unopened containers under normal conditions.

Coverage

- One 55 lb. (25 kg) bag of MASTERFLOW® 928 grout mixed with approximately 10.5 lb. (4.8 kg) or 1.26 gallon (4.8 L) of water yields approximately 0.50 ft.³ (0.014 m³) of grout.

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

Caution

MASTERFLOW® 928 GROUT

Risks

Eye irritant. Skin irritant. Causes burns. Lung irritant. May cause delayed lung injury.

Precautions

KEEP OUT OF THE REACH OF CHILDREN. Avoid contact with eyes. Wear suitable protective eyewear. Avoid prolonged or repeated contact with skin. Wear suitable gloves. Wear suitable protective clothing. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. Wash soiled clothing before reuse.

First Aid

Wash exposed skin with soap and water. Flush eyes with large quantities of water. If breathing is difficult, move person to fresh air.

Waste Disposal Method

This product when discarded or disposed of, is not listed as a hazardous waste in federal regulations. Dispose of in a landfill in accordance with local regulations.

For additional information on personal protective equipment, first aid, and emergency procedures, refer to the product Material Safety Data Sheet (MSDS) on the job site or contact the company at the address or phone numbers given below.

Proposition 65

This product contains materials listed by the state of California as known to cause cancer, birth defects, or reproductive harm.

VOC Content

This product contains 0 g/L or 0 lbs./gallon.

For medical emergencies only, call ChemTrec (1/800/424-9300).

Limited Warranty Notice

Every reasonable effort is made to apply ChemRex® exacting standards both in the manufacture of our products and in the information which we issue concerning these products and their use. We warrant our products to be of good quality and will replace or, at our election, refund the purchase price of any products proved defective. Satisfactory results depend not only upon quality products, but also upon many factors beyond our control. Therefore, except for such replacement or refund, CHEMREX® MAKES NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, RESPECTING ITS PRODUCTS, and CHEMREX® shall have no other liability with respect thereto. Any claim regarding product defect must be received in writing within one (1) year from the date of shipment. No claim will be considered without such written notice or after the specified time interval. User shall determine the suitability of the products for the intended use and assume all risks and liability in connection therewith. Any authorized change in the printed recommendations concerning the use of our products must bear the signature of the ChemRex® Technical Manager.



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