

TECHNICAL BULLETIN

SikaGrout®

Recommendations for Cold Weather Grouting

COMMON CONCERNS FOR COLD WEATHER CEMENTITIOUS GROUTING:

Grouting, whether in a precision application (i.e. sole plate, skid frame, or turbine base installation) or a general construction application (i.e. rock anchors, anchor bolts, or pipe rack bases), can be greatly impacted by the temperature of the ambient air, surrounding surfaces, or anything that object the grouting material comes into contact with. Ensuring that all surfaces, substrates, mixing/application equipment, mixing components (grouting material, aggregates, and water) are maintained at or above minimum temperatures can help ensure adequate strength gain, placement/handling properties, and final product performance.

COLD WEATHER RECOMMENDED TEMPERATURE GUIDELINES

| | Min | Preferred |
|-------------------------|--------------|--------------------------|
| Foundation & plates | 45 °F (7 °C) | 50 (10 °C)–70 °F (21 °C) |
| Mixing Water | 45 °F (7 °C) | 50 (10 °C)–70 °F (21 °C) |
| Grout, mixed and placed | 45 °F (7 °C) | 50 (10 °C)–70 °F (21 °C) |

The above indicates the minimum recommended temperatures for the grout after it has been mixed, at lower temperatures the initial set may be delayed and deter form stripping. Retarded set due to low temperatures can be detrimental, allowing settlement or bleeding.

1. Mixed grout temperature:

Temperature of the mixed and placed grout is affected by the temperature of the dry, packaged grout, the temperature of the mixing water, the amount of the grout being mixed, the ambient temperature, the temperature of concrete substrate and the equipment or member being grouted.

- a.) The optimum storage temperature for the packaged grout is 60-75 °F (15-24 °C).
- b.) Mixers and pumps should be warmed prior to use, if this is done with hot water rinsing, all rinse water must be discharged before grouting operations begin.
- c.) Warm the mixing water as necessary to provide mixed grout in the recommended temperature range. Do not use mix water in excess of 90 °F (32 °C).
- d.) Cooler temperatures will require less mix water to achieve the desired fluidity/flow of the grout. Ultimate strengths achieved may be higher with cooler temperature. Initial set and early age strengths will be lower at cooler temperatures.
- e.) Water demand will vary with temperature; never mix the grout to a consistency that produces bleeding or segregation.
- f.) Following directions in the product literature for proper mixing time.

- g.) Mixing methods: Precision grouts utilize sophisticated chemistry requiring proper mixing. Use mixing methods as recommended in the product literature. Do not mix by hand, or with a wheel barrow and shovel. Use of mechanical/forced action mixers or Low Speed (400-600 RPM)/torque drills produce the best results.

2. Foundation and equipment temperatures:

- a.) Measure the temperatures of the baseplate and the concrete foundation with a surface thermometer.
- b.) If the temperatures of the baseplate or foundation are below the minimum recommended, warm to 45 °F (7 °C). Heating large baseplates and foundations is best done with radiant heat (such as infrared) as it will penetrate solids. Success has also been reported by enclosing of the equipment, baseplates, and foundation to be grouted inside a plastic covered frame and utilizing space heaters. Small enclosures and equipment may be heated using electric light bulbs. Do not use open fires, coal or gas fired heaters unless they are fully vented outside the enclosure. The grout cavity may be filled with warm water using a recirculating heater or immersion heater. This will also assure the concrete is saturated when grout is placed. All water must be removed from the cavity prior to grout placement. In very cold weather or when grouting large equipment and foundations, allow adequate time to accomplish the warming process. This may take in excess of 24 - 48 hours prior to grouting, depending on the job site conditions.

3. Curing temperature

- a.) Freshly placed grout must be protected from freezing. From the time of placement, the in-place grout temperature must be maintained at or above 45 °F (7 °C) until the grout has reached 1 000 psi (7 MPa). It must then be protected from freezing until a minimum compressive strength of 4000 psi (27 MPa) has been reached. Once this strength is achieved the temperature of the grout, equipment, and foundation should slowly be allowed to equilibrate with ambient conditions. This should be done over a 24 - 48 hour period to reduce the potential for damage from thermal shock.
- b.) Cold/cool temperatures retard early strength gain. Early strengths may be accelerated by warm moist curing. Use caution as this heat must be uniformly applied to avoid thermal shock damage.
- c.) Curing is critical for long-term strength gain. Refer to the most current published product data. Contact Sika Construction Systems Technical Support for additional information.

4. Moisture Retention-Curing

- a.) Because the rate of hydration within the grout is retarded at low temperatures, moisture retention/curing time should be extended when grout temperatures are below 50 °F (10 °C). Premature drying negatively affects the properties of the in-place grout.
- b.) Keep the exposed grout surfaces covered with clean, wet cloth/rags for 24 hours or more at temperatures below 50 °F (10 °C). The cloth/rags need to be kept continuously moist during this period. Covering the wet cloth with plastic sheeting will aid in retaining moisture.
- c.) Immediately after removal of the moist cloth/rags, immediately after removal of the moist cloth/rags, apply a Sika curing compound that meets the moisture retention requirements of ASTM C 1315.

Note: Consider SikaGrout 4316 if the ambient temperature is cold and heating is not an option.

HEALTH , SAFETY AND ENVIRONMENTAL

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