INTERNATIONAL CHEM-CRETE CORPORATION

GUIDE TO CEMENTITIOUS GROUTING

A Guide to the Proper Preparation, Placement and Protection of Cement-Based, Non-Shrink Grouts

From the Manufacturer of Chem Grout 982

GUIDE TO CEMENTITIOUS GROUTING

SURFACE PREPARATION

1. The Surface shall be free of grease, dirt, oil, or other contaminants.
2. All surfaces should be roughened to remove laitance and expose sound concrete.
3. Concrete surfaces should be chipped with a chisel point hammer to a roughness of ± 3/8" (10mm).
4. Roughen and saturate the surface with clean water for 24 hours prior to grouting.
5. All free standing water must be removed from the foundation and any holes prior to applying the grout.
6. Before the major portion of the grout is applied, bolt holes must be grouted first.
7. The foundation should be protected (shaded) from sunlight 24 hours before and after grouting.

FORMING

1. All forms should be liquid-tight and non-absorbent. Forms can be sealed with caulking compound, grout, or putty.
2. To enhance the grout placement, moderately sized equipment should use a head box sloped at 45°.
3. To permit expulsion of air and any remaining saturation water as grout is applied, side and end forms should be a minimum of 1" (2.5 cm) horizontally away from the object being grouted. A clearance of 4 to 5" (10 to 12.7 cm) is recommended at the point where the grout is to be placed; however, a minimum of 2" (5 cm) is required.
4. So that the grout does not leak from the form, sufficient bracing is required.
5. Non-supporting, large areas should be eliminated wherever possible.
6. Extend forms a minimum of 1" (2.5 cm) higher than the bottom of the equipment being grouted.
7. Indoor and outdoor installations may require expansion joints. Consult an International Chem-Crete local representative for suggestions and recommendations.

TEMPERATURES

To standardize the grouting procedure, temperatures of the foundation, plates, mixing water and grout should be as follows:

	MIN.	PREFERRED	MAX.
FOUNDATION AND PLATES	45° (7°C)	50 TO 80° (10 TO 27°C)	90° (32°C)
MIXING WATER	45° (7°C)	50 TO 80° (10 TO 27°C)	90° (32°C)
GROUT AT MIXED AND PLACED TEMPERATURE	45° (7°C)	50 TO 80° (10 TO 27°C)	90° (32°C)

When grouting at minimum temperatures, be sure foundation, plate, and grout temperatures do not fall below the minimum until after final set. Protect grout from freezing until 4000 psi compressive strength is reached.

MIXING
(Use drinkable water only)

1. Place measured amount of water into mortar mixer and slowly add the dry grout.
2. Water demand will depend on the efficiency of mixing, material, and ambient temperature conditions. Make adjustments to achieve the desired flow.
3. It is best to mix moderate size batches of grout in one or more clean mortar mixers. Large batches of grout may be efficiently, effectively, and economically mixed in ready-mix trucks.
4. After all material and water is in the mixer, mix grout a minimum of 5 minutes.
5. Do not mix more grout than can be applied within the working time of the grout.
6. A wheelbarrow, bucket or pump can be used to transport the product to the equipment to be grouted. It is important to keep the distance for the grout to be transported at a minimum.
7. Do not retemper grout after it stiffens.

PLACING AND CURING

1. To prevent entrapment of air or water beneath the equipment, grout should always be placed from one side.
2. Once application is completed, trim the surfaces with a trowel, cover the exposed grout with clean, wet rags and maintain this moisture for 5 to 6 hours.
3. Before you remove the grout forms or cut back excessive grout, test grout. it should offer stiff resistance to penetration using a pointed mason's trowel, for example.
4. Use a curing agent, such as International Chem-Crete's CHEM-CURE 10, immediately after the wet rags are removed to further minimize the potential moisture within the grout.
5. Do **NOT** vibrate grout. To aid in the movement of the grout, steel straps can be inserted under the plate.

RECOMMENDATIONS FOR HOT WEATHER GROUTING

High temperatures accelerate stiffening and require grout application in short periods of time. The use of cold materials and cool foundation and base plates are preferred practices for hot weather grouting as this extends the length of time the grout is workable. This will not affect the non-shrink and strength characteristics of the grout.

Use a many of the following practices as possible for best results when applying grout in hot weather:

HOT WEATHER RECOMMENDED TEMPERATURE GUIDELINES

	Maximum	Preferred
Foundation & Plates:	90° (32°C)	70-80° (21-27°C)
Mixing Water:	90° (32°C)	70-80° (21-27°C)
Grout at Mixed and Placed Temperature:	90° (32°C)	70-80° (21-27°C)

1. Store the grout in as cool a place as possible, but at the minimum in the shade. Be sure to remove the plastic wrap from the pallet to help cool the grout unless it is likely to be exposed to wet conditions.
2. Be sure to thoroughly saturate the concrete base for a full 24 hours before grouting. Wind and heat cause rapid evaporation, and the concrete base should be wet down liberally and frequently in order to prevent drying. Sunshades and wind breakers will help maintain the moisture.
3. Both the base plate and the concrete base should be kept cool while saturating by covering both with wet cloth or burlap, and keeping it wet.

   Keep the temperature of the “mixed grout” under 70° (21°C). A preferred temperature would be between 50-55°F (10-13°C). The term “mixed grout” refers to the temperature of the grout immediately after mixing. A good

rule of thumb is to have the “mixed grout” temperature as much under 70° F. as the base plate and foundation are above 70° F.

The minimum “mixed grout” temperature is 45°F. (7°C). A word of caution, this minimum should only be used when the temperature of the base plate and concrete foundation are measured, not estimated, and are found to be suitably warm.

4. Use cold water to lower the “mixed grout” temperature. If it is necessary, float ice in containers of water using enough containers so that when the water is drawn off for mixing, the replacement water has time to cool. Using a valve or a siphon at the bottom of the container makes drawing off the coldest water easier. Water is added to the top of the container where the ice floats. Wrapping the containers with wet rags will also help to keep the water cold.

   When large batches of grout are to be mixed, or when the packages of grout are over 90°F. (32°C), try substituting shaved ice for some or all of the mixing water. Use a ratio of 1:1. Shaved ice usually can be used in place of 50 to 75% of the mixing water. Do not use more ice than will be completely melted within the proper mixing time of the grout. Ice that is unmelted will float to the top of the grout, and will melt. This produces water pockets under the base plate with a resulting loss of bearing. Always pour the mixed grout through a 3/8" (10mm) screen to remove unmelted ice, lumps, and foreign material.

   It is a good idea to test the temperature of the initial batch to determine if more, or less cooling is needed.

5. Cool a warm mixer by charging the mixer with cold or iced water. This will help reduce heating of the grout.
6. A warm pump line can heat the grout and cause plugging. Cover the line with burlap or cloth, and keep it continually wet. This will aid in cooling the pump line. Consider using sunshades and reflective insulation around the line to shield it from the hot sun. The pump line can be cooled by filling it with chilled water or chilled cement slurry before batching the grout. This priming mix must be completely discharged and discarded before pumping the grout.

IF COOLING CAN NOT BE ACCOMPLISHED

Two approaches should be considered in order to handle rapid setting in hot weather.

1. Form the area to be grouted in smaller sections in order to grout each section individually. Although this is not a widely accepted approach, it may lend itself to special types of grouting jobs.
2. Increase the mixing capacity so that the grout can be poured faster and continuously. The less the contractor can do to control temperature, the more rapidly the grout should be mixed and poured under hot weather conditions. Use additional mixing equipment, and locate the mixers so the grout can be released through a 3/8" (10mm) screen directly onto the 45° sloped form without transporting. Always provide straps positioned below the plate prior to grouting to aid in working.

GROUTING APPLICATION
COLD WEATHER CONDITIONS

The preparation and assembly of carefully aligned plates that are shimmed and bolted into place are key ingredients of precision grouting. Included in these plates are machine baseplates, column plate, and structural elements that have been aligned and supported by a total bearing, nonshrink precision grout. Anchor bolts rock anchors, nonstructural seam caulking, and filler grout applications are not considered as precision grouting.

COLD WEATHER TEMPERATURE GUIDELINES

	Minimum	Preferred
Foundation & Plates:	45° (7°C)	50-70° (10-21°C)
Mixing Water:	45° (7°C)	50-70° (10-21°C)
Grout at Mixed and Placed Temperature:	45° (7°C)	50-70° (10-21°C)

TEMPERATURE OF MIXED GROUT

The temperature of the unmixed grout, the mixing water, the mixing and working areas, and plates and substrate as well as the size of the batch being mixed, all affect the temperature of the mixed and placed grout.

1. Ideally, dry grout should be stored in cold weather at a temperature over 60°F. (16°C).
2. Warm mixers and pumps by rinsing them with hot water prior to use. Be sure to discard all warm rinse water before mixing.
3. Mixing water should not be over 90°F. (32°C).
4. Although the early-age strengths for grouts placed at cool temperatures are low, they will be as strong as grouts placed at normal temperatures at 28 days.
5. Avoid a grout consistency that produces bleeding or segregation.

TEMPERATURE OF FOUNDATION AND EQUIPMENT

1. Accurately measure the temperature of the baseplate and the concrete foundation by using a surface thermometer. If an air or immersion thermometer is used, cover it with a piece of dry insulation material or dry rags.
2. If the temperature of either the baseplate or foundation is below the minimum of 45°F. (7°C), warm the foundations by using infrared heaters. This is the most effective method as the heat penetrates solid objects.

   The use of space heaters inside plastic sheeting or plastic covered frame, which has been made around the area, is another method that can be used. Electric light bulbs can also be used to heat small enclosures. Use of coal or coke fired salamanders or open fires is not recommended unless they are fully vented to the outside. The flue gasses such as carbon monoxide are dangerous to both the workmen and the grout.

   When the weather is very cold, heat the bedplates and concrete up to the minimum well in advance of grouting.

TEMPERATURE FOR CURING

1. Be sure to protect from freezing. Once the grout is placed, it must be maintained at or above the minimum temperature until the grout has attained final set, and the temperature must be kept above freezing until the compressive strength exceeds 4000 psi.
2. You can accelerate early strengths by warm, moist curing. Be sure to carefully and uniformly apply this heat to avoid thermal shock.
3. Even in cool, moist conditions, curing procedures that retain water for long term strength gain are important. Be sure to follow the recommendations on the container.

RETENTION OF MOISTURE

1. Since the rate of hydration is slowed at low temperatures, it is important to be sure that moisture is retained within the freshly placed grout. This can be achieved when the temperature of the placed grout is below 50°F. (10°C) by placing moist, clean rags on the exposed positions of fresh grout for 24 hours or more. The rags must be kept moist during this period, and covering them with plastic is recommended.
2. For long term moisture retention and protection, use International Chem-Crete's CHEM-CURE 10 Curing Compound immediately following the removal of the moist rags and any trimming of the grout.

INTERNATIONAL CHEM-CRETE CORPORATION

800 Security Row • Richardson, Texas 75081
(972) 671-6477 • Fax (972) 238-0307
Plant (817) 447-0828 • Fax (817) 447-2343