The Chemical Company

BASF CONSTRUCTION CHEMICALS AUSTRALIA and NEW ZEALAND

APPLICATION GUIDE for MASTERFLOW® CEMENTITIOUS PRECISION GROUTS

Masterflow® 830
Masterflow® 830DP
Masterflow® 870
Masterflow® 880

IMPORTANT: READ THIS FIRST

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

1. FOUNDATION PREPARATION

The foundation surface must be free of all laitance and unsound material and thoroughly cleaned and cured. Keeping the surface covered will make the later job of cleaning the surface prior to grouting much easier and less costly.

The grout foundation should be roughened as specified. The concrete surface may be uniformly roughened before it has set by the use of a nail rake in one direction only. Use of a bull float, darby, broom, or wood float finish, or scratching at random with a garden rake or trowel is NOT recommended.

After the concrete hardens, hand held, pistol grip pneumatic hammers with chisel point heads are recommended for roughening to remove laitance and loose material to ensure a good bond. Use of large paving breakers equipped with bush hammers, spade or chisel bits, are NOT recommended. Where grout will extend horizontally out beyond the edge of the plate or object grouted, the foundation must also be prepared below these areas to help assure bond.

Before setting structural elements or machinery, all of the areas of the foundation, which will be in contact with the grout, including anchor boltholes, must be thoroughly cleaned. Remove any oil, grease, and curing membrane. One method of cleaning a concrete surface is the use of compressed air and water. Continue cleaning until water runs clear.

Foundation surface and bolt holes must be saturated for a minimum time of 4 hours, preferably overnight or 24 hours. This should be concluded immediately prior to grouting.

Just before mixing and placing is started, all free ”standing” water must be removed from any anchor bolt holes and foundation surfaces over which grout is to be placed. This most often is accomplished with compressed air and/or blotting with dry absorbent rags.

Any rust, oil or grease on the bedplate being grouted must be removed. Air relief holes must be provided where necessary. Eliminate sources of vibration (which can cause settlement and bleeding) until grout hardens.

2. FORMING

Forms should be watertight and strong enough to withstand the hydraulic pressure of plastic, flowable or fluid grout, without leaking. When flowing the grout into place, all forms should extend vertically at least 25mm above the underside of the bedplate surface to help ensure complete filling of the space to be grouted and prevent overflowing. The side forms should not be tight against the plate, but should be erected 25 to 50mm horizontally away from the plate so that air being displaced is not trapped below the plate.

The vertical form on the exit side (opposite the placing side) should be extended 50 to 100mm away from the plate so that straps or other placing aids can be inserted to assist movement of the grout should that become necessary.

HEADER BOX - The form on the placing side should be extended 50 to 100mm horizontally from the plate at the foundation and be slanted upward at an approximate 45 degree angle so that grout can be poured on it with a minimum of turbulence (and entrapment of air bubbles) while directing it smoothly on its way under the plate. A blackboard (splash board) form should be built on top of the plate and at the plate edge, opposite the slanted headboard, to prevent spillage of grout and provide containment of the “head” of grout as it is being placed.

For many applications, such as turbines and generators, or other base plates of lengthy dimensions, it is not prudent to build high, pouring “head” forms for these base plate lengths. In lieu of this, low forms, sufficiently high to contain the grout and at least 25mm above the bottom elevation of the plate to be grouted may be used. However, as a sloped pouring form is desirable, a portable “head box” which can be moved along the length of the plate as the grouting proceeds may be used. This portable “head box” serves well in helping to place the grout and saves a lot on forming costs. The box with a sloped pouring surface should rest in part on the form, floor and/or base plate and this method serves just as well, and often better than a long sloped form, as the thrust of the grout flow is better controlled.

Forms should be caulked to prevent leakage. Forming materials, such as wood, which absorb water, should be coated with water resistant oil (form oil), a form release agent (such as Rheofinish FR222), a good curing compound (such as Masterkure 100WB) or plastic coating. These coatings prevent loss of water from the grout and act as bond breakers so that smooth grout surfaces result after form removal and the forms are protected for reuse. The points to caulk are the interfaces between the form and rough foundation surface where grout might leak out during its placement or before setting. Material used for caulking between the form and concrete surface may be a stiff consistency of sand-cement mixture or stiff consistency of the grout to be used. Vertical joints in the forms should be caulked if large cracks are evident. The use of duct tape applied on the inside of the form, at corners, is useful for this.

After caulking the foundation, the area within the forms to be grouted should be cleaned and flooded with water to see if there are any leaks in the formwork or between the form and foundation.

3. MIXING GROUT

Mortar mixers, paddle-type mixers and rotary concrete mixers are most often used for mixing grout. However, concrete mixers are the least efficient of these in terms of speed and thoroughness of mixing. Occasionally, for large volume jobs, which must be placed quickly, transit mix trucks are used. On the other hand, small volumes of grout can be most efficiently mixed using hand held Festo style mixers.

Mortar mixers, concrete mixers and ready mix truck mixers will generally not produce lump-free grout and generally the larger the mixer the less efficient will be the mixing. A few lumps, however, will not harm the grout in place nor the overall placing result, but these may be removed to prevent blocking, or obstructing the grout placement by the use of screens placed in the head form if lumps must be removed. These screens may be made from expanded metal or iron grating with suitable size openings.

"Paddle" type or mortar mixers have horizontal shafts equipped with blades (or paddles), which revolve within a stationary drum. These mixers are capable of mixing grout to most any consistency.

Revolving drum mixers such as small concrete mixers can be used for grout of flowable or fluid consistency. Introduction of bagged materials on the sides of the drum during successive batches is difficult to remove. If is found helpful to load this type mixer while it is rotating by pouring the dry grout into the mixer from pails rather than from the bag in which it was shipped. Vertical shaft mixers of large capacity are used for grouts of flowable and fluid consistencies, but they are not readily available.

Mixers should be located as close as possible to the object being grouted to minimise transporting time, equipment, and labour. If mortar or paddle-type mixers are to be emptied into wheelbarrow, consider elevating these mixers 300 – 600mm so that they may more easily be discharged into the wheelbarrows.

An adequate potable water supply should be located adjacent to the mixer.

The size of the batches mixed should be compatible with the volume of the space being filled, and the speed with which the grout can be mixed, discharged, transported and placed. Do not mix more grout at one time than can be placed in ten minutes. However, lower mixed grout temperatures will extend the working time. Also, during short job delays, the grout may be agitated in the mixer to keep it workable. Do not add additional water to maintain the desired consistency. Grout that has been mixed for a long time and has lost workability and reached a consistency that is not placable should be discarded rather than retempered and used.

Grout flow and working time can be effectively controlled by the use of temperature controls. See the Hot Weather and Cold Weather Grouting sections of this Application Guide for more details.

Consistency of the grout should be checked initially, and periodically thereafter to see that it meets specifications.

BASIC PRINCIPLES

A. Wet out the mixing container with water. Place the mixing water in the mixer first, then add the dry grout rapidly in a steady stream. Do not let large clumps drop in at one time.
B. The best retarder for non-catalysed grouts is a lower "as mixed" grout temperature. This is usually accomplished through the use of cold or iced mixing water or cool storage of the dry grout material.
C. BASF grouts are supplied in a ready to use form requiring only the addition of water. Do not add any other dry materials (sand, cement etc).
D. Do not use grout from damaged bags.
E. Mix with potable water only.
F. Do not mix by hand.

SMALL SIZE BATCHES

Small batches are those in which one or two bags are mixed at one time with a drill-mixer (eg Festo) and grout stirrer in a 20 to 25-litre pail.

Add all the required water to the mixing pail. Slowly and uniformly add the grout into the water over 30 seconds while mixing. Do not “dump” the grout into the mixer. This may cause lumping, which will be hard to break down. Mix for 1-2 minutes at 300-400rpm ensuring the mixing blade is kept below the surface of the grout to prevent air entrapment. Excessive mixing will entrap air, reducing flow and strength.

MEDIUM-SIZE BATCHES

A medium-size batch is one prepared in a power driven mixer, using from 1 to 20 bags per batch. The most widely used equipment is the common horizontal-shaft, paddle-type mortar mixer. Other useable mixers are revolving drum concrete mixers and vertical-shaft, paddle mixers.

A. Mortar Mixers: add approximately 70% of the required mixing water, then cut into the bags using care to flow each bag slowly into the mix (rather than dump the entire bag contents as a mass) with the mixer running. Mix for 3 minutes to break up any lumps. Slowly add the remaining water. Mix until grout appears homogeneous, about 4-5 minutes in total.

   Lumps in the grout as poured are not desirable, but a few small ones, if wet through, can be tolerated. A better procedure is to pour the grout through a 10mm or 13mm screen and waste the lumps.

B. Concrete Drum Mixers: To batch the dry grout into the revolving opening of the smaller-sized drum mixers, it is necessary and safer to first empty the bags into steel pails or cans, then pour slowly from the can into the throat of the rotating mixer. Have enough cans to hold an entire batch before starting.

   The larger concrete drum mixers are normally skip loaded. Here it is a simple matter to empty all of the bags for a batch into the skip and raise it to slide the dry grout into the mixer slowly.

C. Vertical Shaft (Paddle) Mixers: These mixers stir grout in a cylindrical tank with vertical shaft to which pairs of horizontal fins are attached. Batch capacities range from 140 to 300 litres of mixed grout.

   They are made to prepare very fluid water/cement or water/cement/sand grouts. In normal usage, when sand is employed, it is added after the cement so that the slurry will have enough “body” to hold the sand in suspension. Because with Masterflow grouts, all dry materials are added at one time, there will be a tendency for the metallic aggregate (if present) and some of the sand to settle in the dead space between the lowest set of the mixing blades and the bottom of the tank. This space should not be more than 25mm, but usually nearer to 50mm. Have the blades

lowered, if possible, or add rubber sweeps that will nearly touch the bottom. If neither of these things can be done, mix a 2 or 3 bag batch, preferably using a drill mixer, to fill this dead space. Waste what will run out without disturbing that which has settled to form a new higher bottom, then go ahead with full batches – part or all of the mixing water first, then dry grout. Mix for 2 to 3 minutes after the last of the grout or water has been added at a maximum RPM that will not splash the grout excessively.

D. High Speed Shear Mixers: High-speed shear mixers should be avoided with all BASF grouts as they tend to adversely affect the cementitious systems of BASF grouts due to their high speed (1200 to 1600 RPM), which quickly heats up the grout.

LARGE VOLUME BATCHES

When the job requires the pouring of a large volume of grout in a single placement of 0.4 to 4m^3 per batch, concrete mixers (ready-mix trucks; skip loaded, revolving drum mixers; turbine mixers: etc.) will have to be use for preparing the grout. Because large volumes of grout tend to warm up rapidly and thicken, it is essential that the following procedure be rigorously observed.

A. Take whatever means necessary to produce a grout temperature under 16°C after mixing. This includes the following:

   i. Use cold mixing water on ice and cold water as required.

   ii. Make arrangements for batching the dry grout into the mixer in less than five minutes. If the mixer is a ready-mix truck, all the bags of grout for a given batch must be emptied in advance into a skip or clean, dry concrete bucket set on a platform above the truck or that can be lifted by crane to the throat of the mixer.

   iii. Put part or all of the mixing water and ice, if used, in the mixer first. Then, with the mixer running at full concrete mixing speed, add the dry grout rapidly, then remaining water, if any, in 3 to 5 minutes. Mix for 3 to 5 minutes and pour.

B. Prearrange for rapid and efficient transporting and pouring of the grout so that all of the mix is in place in 10 to 15 minutes after mixing. Either pour directly into head box or have 4 or more wheelbarrows or buggies so that placing is continuous.

Alternative Procedure: Where the dry grout cannot be batched rapidly into the water already in the mixer – as, for example, where there is not headroom for a crane to lift a bucket over the inlet of a ready-mix truck, precede as follows:

A. Place all of the dry grout into the drum first, after MAKING SURE THERE IS NO WATER IN THE DRUM.

B. With the drum stopped, add all of the iced mixing water in 3 to 5 minutes – no longer. Pumping the ice water from an adjacent tank through an accurate water meter best does this. Generally, the tank on a ready-mix truck will not hold enough water and

the discharge of it is too slow. Also, there will not be time for refills and it is difficult to add ice to it.

C. Mix for 3 to 5 minutes at full concrete mixing speed and pour. The mix may contain some lumps, but they will either have to be accepted or strained out by pouring through a 25mm screen. Mixing for a longer period to reduce lumps also reduces handling time – the longer a large volume of grout is held as a mass in the mixer, the faster it warms up and thickens.

SPECIAL APPLICATIONS

It is possible to bulk out Masterflow 830 and Masterflow 870 with clean, dry, silt free 10mm pea gravel when sections to be grouted are in excess of 100mm. The pea gravel can be added at 40% weight/weight (8kg/20kg) bag of Masterflow 830 or Masterflow 870. Approximate water demand for this mixture is 2.8-3.0 litres/20kg bag of grout; however it is advised that the mixture be trialled first to reach the required consistency. This mixture is not to be used for precision grouting applications. Alternatively, Masterflow 830DP can be used for pours up to 500mm thick.

4. PLACING GROUT

Grout should be placed as quickly as possible after it has been properly mixed and discharged. Grouts may be poured at a fluid or flowable consistency. The may also be pumped. The method of placement will depend on the size of the object grouted, its shape, available access to accomplish the grouting, clearances, obstacle around which the grout must be placed and environmental temperatures.

Placement of grout should be across the shortest dimension of the equipment or base plate involved whenever possible. Make sure that all free water from the surface of the foundation and anchor boltholes has been removed just prior to grouting them. All anchor bolthole grouting should be completed prior to placing the major grouting above, although the foundation may be grouted immediately following the bolthole grouting.

Recommended grout thickness for **Masterflow 830, Masterflow 870 and Masterflow 880** is 25-50mm, with a minimum of 10mm. Flow distance of more than 3 metres can be expected using flow troughs, at normal thickness. Where grout thickness exceeds 100mm, special procedures may be necessary to restrict temperature rise. However, general practice for placing fluid grout is to have a 50mm vertical clearance between base plate and foundation form flat plates, having few obstructions beneath, with up to 1.2 metre of horizontal placing dimension. Roughly chipped foundations will require additional clearance, and for placements of grout with more than 1.2m horizontal flow, an additional 25mm clearance should be added for each 1.2m travel. These are minimum requirements to which additions should be made allowing for anticipated difficulty of placement. Recommended grout thickness for **Masterflow 830DP** is 50-500mm.

If using a grout of plastic consistency, these clearances should be increased slightly, and may be decreased slightly if a pump is used. It is better to have greater clearance than required than to have too little.

When grouts are poured, placing should start at one end (on the slanted or head box) and continue there until the grout rises above the bottom of the bedplate on the exit side. The pouring point is then moved slowly along the slanted head form on the pouring side as soon as grout continues to come up on the opposite side, to ensure that air is being displaced rather than trapped. Grout should not be placed indiscriminately at separate locations along one side as this prevents tracing the actual movement and progress of the grout and can result in large pockets or voids being trapped between such placing points, nor should grout be poured towards the centre from opposite sides, for the same reason.

Before starting the grout placement, steel packing straps 20 – 25mm wide can be introduced below the plates and worked slowly back and forth to encourage the flow of grout around obstacles and to exit side. DO NOT use chains are for this purpose, as they tend to entrap air bubbles each time the links pass down into the grout. DO NOT vibrate as this may lead to segregation of the grout.

Grouting structural or machinery plates that do not have a flat underside, or that are too large to pour, call for a variety of special placing and forming techniques too numerous to cover all applications.. For instance, inverted “cake pan” plates or those with stiffeners may have to be poured from the top through holes and the corners in each section drilled with small holes to permit displaced air to escape, permitting the grout to rise and make contact with the bottom of a plate during placing. This is occasionally done in 2 or 3 separate placements with delays of from 15 minutes to several days between placements.

Extremely large plates, or equipment under which the grout must travel more than 3 – 4 metres horizontally, may have to be poured through grout holes in the top of the plates to shorten the travel distance, or pumped, using special forming and pipe entry holes in order to fill the space completely. In these cases, one should trace the movement of the grout and move the pumping hose to prevent buckling due to hydraulic pressure.

Large plates or cavities requiring a cubic metre or more must be placed quickly and continuously. This volume is often pumped, and a ready mix concrete truck or several large mortar mixes used for bulk mixing, provided they can be brought close to the space being grouted for efficient and continuous discharge. Grout mixes develop considerable heat quickly in a large batch. Usually ice water or shaved ice and chilled (0°C) water are employed when truck mixers are used to maintain lower as-mixed temperatures during placing. See section on Hot Weather Grouting.

Grouting products generally do not make good floor toppings as they are too rich in cementitious material and are designed for use below base plates. For this reason BASF discourages wide shoulders of grout and recommend that these shoulders have minimal horizontal dimension. Where wide shoulders or topping of large areas of the foundation are anticipated, use a mortar designed for such applications (eg. Barra Mortar).

5. HOT WEATHER GROUTING (above 30 degrees Celsius)

High ambient temperatures accelerate stiffening and require grout mixing and placing procedures that can only be accomplished in the short period of time the grout remains workable. The alternative is to extend the length of time the grout is workable and placable through the use of cold materials and cool foundation and base plates. This approach does

not affect the non-shrink and strength development characteristics of the grout. This is the only method of extending the working time that may be used with BASF grouts.

RECOMMENDATIONS:

1. Store the bags of grout in as cool a place as practicable, but at least in the shade.

2. Give extra attention to saturating the concrete base -- for 24 hours or more.

3. Cool the base plate while saturating the concrete base by covering both with wet burlap or cloth and keeping it wet. Shortly after the grout is poured, its temperature will change to that of the steel base plate and concrete foundation, between which the grout is poured. Keep the temperature of the grout “as mixed” under 21°C and preferably between 10°C - 13°C. The “as mixed” temperature is the temperature of the grout immediately after mixing.

Rule of Thumb: Try to have the “as mixed” temperature of the grout at least as much under 21°C as the base plate and foundation are above 21°C. For example: If the base plate and foundation are at 27°C, strive to cool the grouting material and mixing water sufficiently to obtain an “as mixed” temperature of 15°C and preferably lower.

4. Cool the Mixing Water: To lower the “as mixed” temperature of the grout, use cold water. If necessary, float ice in drums of water; employing enough drums so that when water is drawn off for mixing, the replacement water has time to cool. Insulating the drums or wrapping them with wet rags will help keep the water cold. Do not add ice directly to the grout mix, and do not use ‘dry ice’ as a cooling agent.

Where large batches of grout are to be mixed or where the packages of grout product are over 32°C, consider substituting shaved ice for some of the mixing water on a weight-for-weight basis. Generally, shaved ice can be used in place of 50 to 70% of the mixing water by weight of the mixing water. Do not use more ice than will be completely melted within the proper mixing time of the grout. Unmelted ice poured with the grout will float to the top of the grout and will melt, producing water pockets under the base plate with resulting loss of bearing. Always pour the mixed grout through a 10mm screen to remove unmelted ice, lumps and foreign material.

It is good practice to take the temperature of the initial batch to determine if more or less cooling is required. An “as mixed” temperature of less that 7°C can be damaging to the grout. Therefore, the ice must be carefully controlled in batching and mixing.

5. If the mixer is warm, cool it by charging the mixer with cold or iced water will help reduce heating of the grout.

6. If the grout is being pumped, a warm pump line can heat the grout and cause plugging. Covering the line with cloth or burlap that is kept continually wet will help cool the pump line. Also, consider using reflective insulation around the line and erecting sunshades to shield the line form the hot sun.

The pump line can be cooled by filling it with chilled water or chilled cement slurry before batching the grout. However, the chilled priming mix must be completely discharged and discarded before pumping the grout.

7. Use screens to shade the area being grouted.

8. Grout early in the morning or at night when temperatures are cooler

WHEN COOLING CANNOT BE ACCOMPLISHED: Two approaches should be considered in order to cope with rapid setting in hot weather.

1. Form the area to be grouted into smaller sections so that each section can be grouted individually.

2. Provide increased mixing capacity so the grout can be poured faster and continuously.

Controlling the temperature of the environment and grout as mixed and placed, minimises the need for extra water, provides more working time and results in higher compressive strengths.

6. COLD WEATHER GROUTING (below 10 degrees Celsius)

Cool and cold temperatures affect the properties of grout in the same manner as concrete and mortars. Cold temperatures are more critical in grouts because high strength and precision bearing support are required from a relatively small section of grout when compared to the concrete beneath and the steel above the grout.

Cold temperatures retard setting times. This increases the possibility of frozen material, retarded strength gain in production to the severity of the cold and required reductions in mixing water requirements to prevent excessive flow, bleeding and settlement of aggregate particles. Cold base plates and foundation concrete quickly draw heat from the smaller volume of grout between them and these masses control the temperature of grout.

Storing the dry grout in a warm area and/or using warm water will raise as-mixed temperature and should be considered. However, the actual temperature of the foundation, equipment and machinery should be the guiding factor as to whether grouting should take place or not with the specific grout involved. Before grouting, if there is any question, the conducting of in-place bleeding tests at low temperatures, and at the consistency required, will determine safe in-place minimum temperatures for the grout. Decisions should be made as to whether or not the temperature of the equipment or structural need be raised prior to grouting. Always favour a decision on the side of safety, as grout removal and replacement is extremely expensive.

Raising the temperature of equipment requires a uniform and gradual increase in heat so as not to disturb base plate alignment. After the desired temperature is achieved, the alignment should be re-checked and adjusted if necessary.

For Masterflow grouts, 7°C is the minimum temperature of the grouts after they are mixed. Below 7°C, the grout is likely to remain in a flowable state long enough to allow settlement of the larger particle and bleeding to the surface. The consistency of the grout must also be such that it does not bleed at either as mixed or in place temperatures.

There are three important factors, which must be considered for successful cold weather grouting.

A. Mixed Grout Temperature and Consistency: the temperature of the unmixed grout in the package, the temperature of the mixing water, the size of the batch being mixed and the temperature in the mixing and working area effect the temperature of the mixed grout.

   i. Optimum storage temperatures for precision grouting in cold weather are over 7°C.

   ii. Warm the mixing water as necessary to provide mixed grout at the desired temperature, but do not mix grout warmer than necessary. Warmer mixed grout will require more mixing water for a given consistency and reduce the handling time in proportion to its temperature. Do not use mixing water over 27°C.

   iii. Less mixing water = higher strength. Early age strengths at cool temperatures are low, but cold, placed and cured grouts will be approximately as strong as normally placed grouts at 28 days and stronger at ultimate strength.

   iv. Cool and cold grouts stay fluid and flowable longer than normal temperature grouts. Hence, the working time of less fluid, cool grout will be approximately the same as more fluid, warm grout.

B. Foundation and Equipment Temperature:

   i. Accurately measure the temperature of the base plate and the concrete foundation by placing a thermometer on both surfaces. A contact thermometer performs best. If an air or immersion thermometer is used, covering it with a piece of dry insulation material or dry rags may be helpful in determining the contact surface temperature without the interference of air temperature.

   ii. If the temperature of the base plate and/or foundation is below the minimum placing temperature, bring the bedplate and foundation up to the minimum. Apply heat uniformly. Cooler in place temperatures (above the minimum) are better, unless early strength is necessary. (Heating methods should comply with equipment manufacturers and erectors instructions.)

C. Ambient (Curing) Temperature:

i. Newly placed grout must be protected from freezing. After placement, the grout must be maintained at or above minimum placing temperature until the grout has attained final set. Thereafter, the temperature must be kept above freezing until the compressive strength exceeds 28 MPa.
ii. Cold and cool temperatures retard early strength gain. Early strengths may be accelerated by warm, moist curing. If early strength is required, use heated water and maintain placed grout temperature above 20°C for 24 hours. However, this must be carefully and uniformly applied to avoid thermal shock damage.
iii. Curing procedures to retain water for long-term strength gain and other properties are important, even in cool, moist conditions.

7. PUMPING MASTERFLOW® GROUTS

BASF grouts can be pumped with the same equipment that will pump cement-sand or pea gravel mixes. Pumps should have a hopper capable of mild agitation and be fitted with a return line to allow grout to recirculate during temporary hold ups. A 50mm internal diameter pump hose is preferred, although smaller diameter hose can be used for short distances.

Whenever a large volume of grout is to be pumped, or pumping distances are over 16 metres, a 50mm or more ID grout line should be used. Minimum diameter grout lines are shown below the respective products. Occasionally, it is necessary to grout through a short length of small diameter pipe with less clearance than the outside pipe measurement. Consider the use of a rigid thin wall copper tube flattened to oval shape for such work. (Small diameter flexible rubber or plastic pipe might expand under pressure and cause the pipe to “neck down” (reduce diameter) ahead of the advancing grout and promptly plug the line.)

Keep the line from the pump to the discharge outlet as short as possible. Protect the grout pipe from heating by the sun by covering with wet burlap or cloth. Pack the grout line in ice and use iced mixing water when temperatures are extreme to retard stiffening from heat build-up and minimise line plug-ups. All reducers of line diameter from the pump outlet should be long tapers rather than abrupt reducers.

The latter creates a restriction that can cause the grout to bridge the smaller opening and plug the line. All valves should be of the quick opening gate, plug or similar types to allow unrestricted passage of the grout. (Do not use globe valves or similar types that severely restrict flow of the grout even when fully open.)

Minimum Grout Line Sizes for Power Driven Pumps – Inside Diameter:

It is always desirable to use a 50mm when pumping over 16 metres. These sizes are MINIMUM.

Length	8 metres	8-16 metres	Over 16 metres
Inside diameter	25mm	32mm	38mm

The need for adequate mixing equipment to keep the mixer and grout lines filled throughout the complete placement cannot be overemphasised. A slug of air entering the pump and lines usually ends up as a void in the placed grout. Mix grouts and mortars in paddle-type mixers rather than drum-type mixers. Keep mixed grout as cool as possible within product limitations using cold water and shaved ice if required and keep agitating until used by holding it in the running mixer until discharged and by agitating and recirculating mixed material in the pump hopper when not actually pumping through to the work. Hand agitation should be used to prevent material from stiffening against the pump hopper walls. Keep the grout pump line alive by giving it a shot every 3 to 5 minutes and wasting some material if necessary. Do not mix more grout than can be pumped into the work in 10 minutes or less.

Place 9mm hardware screen over the pump hopper to remove lumps of grout, ice, or other debris that may jam the pump or plug the grout line. Keep the pump hopper at least half full of grout at all times so as not to draw air into the line. (If this should be done by accident, the line must be bled). If it is not possible to draw the discharge outlet of the line back to be recirculated through the pump hopper until the air is bled, it may be necessary to bleed the line to waste to prevent the inclusion of an air void in the work. Place grout by pumping into farthest corner and gradually withdrawing hose as space fills. Take care to ensure air is not entrapped under plate.

Have the following immediately available at all times: Hose connected to a water line with good pressure and the other end connected to a pipe smaller in diameter than the grout pipe diameter and more than half the length of the grout pipe. The purpose is to quickly insert the water line into the grout pipes to quickly clean them out in the event of a breakdown. Masterflow grouts stiffen more rapidly than plain mortars or slurries. (Some grout pumping contractors prefer to “butter” the mixer, pump and grout lines with cement slurry prior to placement of grouts or mortars. This “butter” mixture is wasted until the grout has filled the line. After completion of the placement, a plain sand-cement mortar is again run through the equipment to waste as an aid to cleaning out the metallic aggregate in the non-shrink grout.)

8. CURING

All BASF cementitious products require thorough curing in order to achieve their full potential in strength and durability. Premature drying harms grouts not only the strength and durability suffer loss, but more importantly, the chemical action that reduces or eliminates drying shrinkage after hardening. Properly cured, however, these grouts provide continued bearing when normal drying does take place at later age.

Presaturation of concrete foundation prior to grouting is important to curing because the saturated condition prevents loss of water from the fresh grout. Curing is generally accomplished in two steps and these should commence immediately after the grout placement.

1. Preventing Early Moisture Loss, Plastic State:

Cover exposed, freshly placed grout with soaking wet clean rags as soon after placing as possible. Maintain this wet cover until final set and/or exposed grout is to be finished. Then follow No. 2 below. Final set can be determined as that time at which one cannot penetrate the grout with a pointed trowel.

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2. For Long-Term Curing in the Hardened State:

As soon as final set occurs, remove wet rags and trim shoulder or finish as desired. NEVER remove forms or cut back grout below underside of unit grouted BEFORE grout has hardened. Immediately thereafter, liberally apply Masterkure 402, Masterkure 404 or other BASF curing agent on all exposed grouts. Applying curing compound by brush is preferred to spraying so as to avoid waste and not spray the agent over the base plate and its supported equipment. Curing compounds are difficult to remove from intricate machinery parts and, if a sprayer is to be used, it may be advisable to recommend covering the top of the base plate and machinery with a temporary tarpaulin or plastic sheeting to protect the equipment.

In a few instances, regardless of the curing method, where exposed grout shoulders extend beyond the bedplate or connected member, or are over several metres in length as in large equipment, there is a probability of some superficial, hairline cracks appearing in the exposed grout perpendicular to the plate or member grouted. Fine hair cracks are of no structural significance and they do not detract from the quality and satisfactory results of the non-shrink, load-bearing grout, if our saturation and curing procedures listed previously are fully carried out.

Curing temperatures are critical if early loading of a base plate or machine is anticipated. For the early loading of grouts, as needed in repairs or fast installation and utilisation of rail systems or machinery, higher temperature curing is very useful.

During the long curing time required for grouts to reach strength in cold environments, it is vital that the grout does not dry out. Finally, do not remove shims or back off levelling screws until grout has attained sufficient bearing strength, which will depend on site temperatures.

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