MASTER® BUILDERS SOLUTIONS

Application Guide

Cementitious Grouts

MasterFlux

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GENERAL

This application guide applies to the MB Solutions Australia Pty Ltd, cementitious grout ranges, known as MasterFlux brand family (formerly MasterFlux or BluCem). This application guide shall be read in conjunction with all project specifications (including drawings) -by others- and the current material Technical Data Sheets (TDS) and Safety Data Sheets (SDS).

Products Info

Renamed Brand	Formerly as	Size (kg)	Water ratio L per 20kg bag	Min-max thickness mm	Yield
MasterFlux 700	MasterFlow 700	20	Dry: 2.1 Plastic: 3.0 Flowable: 3.6	10-100	10.5
MasterFlux UW 788	MasterFlow 788	20	3.6	10-100	11
MasterFlux 810	MasterFlow 810	20	3.6	10-100	11
MasterFlux 870	MasterFlow 870	20	3.3-3.4	10-100	10.8
MasterFlux 880	BluCem HE 80	20	4.0 - 5.0	10-100	11.2-12.2
MasterFlux 881	BluCem HE 80AG	20	2.0-2.4	10-100	9.5-9.9
MasterFlux 200	BluCem HS 200	20	6.0 - 7.2	10-100	12.2-13.4
MasterFlux 201	BluCem HS 200A	210 (10kg+200 kg GPC)	128.0 litres @ 30% water (63L) 135.0 litres @ 33% water (69L) 140.0 litres @ 36% water (76L) 144 litres per 38% water (80L)		
MasterFlux HST 4600	MasterFlow 4600	20	2.3-2.4	20-150	8.7
MasterFlux HST 120	BluCem HS 120	20	2.0-2.4	10-100	9.8
MasterFlux 5460RMX	BluCem LH60RMX	Wet mix per m^3 delivered to site in the back of concrete trucks ($1-6m^3$ per truck)		20-250	$1-6m^3$ ($1m^3$:100bags)
MasterFlux 200RMX	BluCem HS200RMX			10-100	$1-6m^3$ ($1m^3$:83bags)
MasterFlux 80RMX	BluCem HS80RMX			10-100	$1-6m^3$ ($1m^3$:91bags)
MasterFlux HST 120RMX	BluCem HS120RMX			10-100	$1-6m^3$ ($1m^3$:100bags)
MasterFlux EA 55RMX	BluCem EA55RMX			10-100	$1-6m^3$ ($1m^3$:100bags)

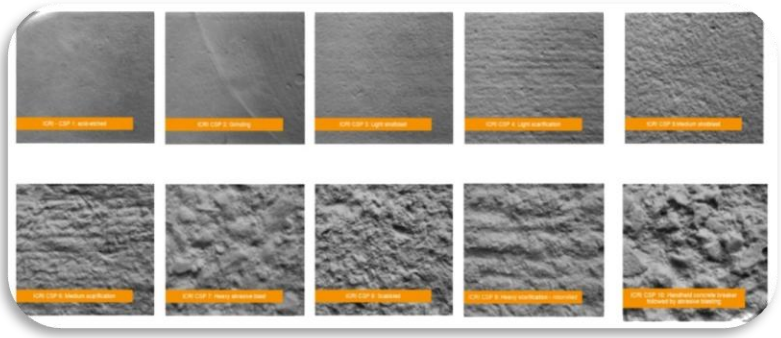
Application Requirements

- **Training:** All work shall be carried out by adequately trained and skilled applicators/installers, under appropriate supervision.
- **Safety:** Always ensure the appropriate use of adequate PPE (gloves, goggles, long sleeves etc) and comply with all other safety related requirements when applying Master Builders Solutions materials.
- **Quality Systems:** The applicator shall operate under a fully compliant quality system, to ensure the on-site quality of applied material. The applicator shall keep fully documented work records for all works undertaken.
- **Quality Control:** If after application and/or testing, any applied material is deemed as unsatisfactory by the specifying consulting engineer and/or MB Solutions Australia Ltd, it may need to be rectified at the applicator's cost.
- **Storage:** Grout components shall be stored between 10°C and 30°C. Note the restrictions on hot and cold weather grouting sections.
- **Application Procedure:** The most important step of a precision grouting should be Preparation and Preplanning on:
    - Materials, Skills required, Tools & equipment, Access, Trials
    - Surface preparation
    - Plate preparation
    - Forming
    - Saturation (cementitious only)
    - Temperature control
    - Flow test
    - Mixing
    - Placing
    - Curing

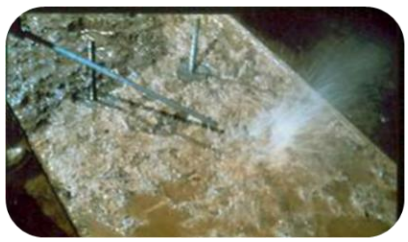
APPLICATION- PREPARATION

Foundation Preparation

- The foundation surface must be free of all laitance and unsound material and thoroughly cleaned and cured. Covering the surface simplifies cleaning before grouting and reduces costs.
- The grout foundation should be roughened as specified. Roughen the grout foundation as specified. Recommended profiles: CSP 3: 2-5mm (minimum); CSP 5: 3-10mm (maximum).



- 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, handheld, pistol grip pneumatic hammers with chisel point heads are recommended for roughening to remove laitance and loose material to ensure a good bond.
- Large paving breakers fitted 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 bolt holes, 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.

Saturated Surface Dry (SSD)


- 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.

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 backboard (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 MasterFinish 222), a good wax based curing compound (such as MasterKure CC 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.

APPLICATION- MIXING

Temperature Control

- The "as mixed" temperature is the temperature of the grout immediately after mixing.
- When mixing and placing cementitious grouts, it important is to mix and place the product in as short a time as possible, while maintaining the "as mixed" temperature between 10 – 30°C.
- 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.
- Ideally the time from bag opening to product placement should be 10 minutes at the desired "as mixed" temperature of 21°C.
- Proper organisation of equipment and crew is key to ensuring this. The purpose of this application guide is to offer advice and assistance in the grouting process.
- Controlling the temperature of the "as mixed" grout will result in consistent Grout flows and working times and results in higher compressive strengths.
- 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.
- In high temperatures > 30°C or cold temperatures <10°C; the below special precautions recommended:

Hot Weather Grouting (Above 30°C)

- The only method of extending the working time that may be used with Master Builders Solutions grouts is through the use of cold materials and cool foundation and base plates. Recommendations:
- Store the bags of grout in as cool a place as practicable, but at least in the shade.
- Give extra attention to saturating the concrete base for 24 hours or more.
- 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.
- 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.
- 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.
- 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 than 7°C can be damaging to the grout.
- If the mixer is warm, cool it by charging the mixer with chilled water will help reduce heating of the grout.
- 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 from 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.
- Use screens to shade the area being grouted.
- 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 eg no more than 5 bags.
2. Provide increased mixing capacity so the grout can be poured faster and continuously or pumped.

Cold Weather Grouting (Below 10°C)

- 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.
- For MasterFlux 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 settle and bleed water 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.

- 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 difficult and can be 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.
- There are three important factors, which must be considered for successful cold weather grouting:

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.
- Optimum storage temperatures for precision grouting in cold weather are over 7°C.
- 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 hotter than 27°C.
- 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.
- 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.

Foundation and Equipment Temperature:

- 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.
- 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).

Ambient (Curing) Temperature:

- 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 28MPa.
- 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.
- Curing procedures to retain water for long-term strength gain and other properties are important, even in cool, moist conditions.

Mixing Position

- 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 secondary containers, consider elevating these mixers 300 – 600mm so that they may more easily be discharged into these secondary containers.
- For Construction grouts, Jiffy or Spiral or Helical mixers can be used.
- For precision grouts, Birdscage, Spider Grout stirrer recommended.

- 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.

- An adequate potable water supply should be located adjacent to the mixer.
- Grout that has been mixed for a long time and has lost workability and reached a consistency that is not placeable should be discarded.
- Consistency of the grout should be checked initially and periodically thereafter to see that it meets specifications. Please see the section "onsite QA" for details on this.

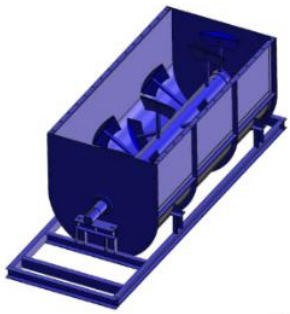
Single Bag Mixing

- Small volumes of grout can be most efficiently mixed using hand held Festo style mixers. These mixers have variable speed settings. For fluid grouts a speed of around 300 rpm is ideal.
- Add 80% of 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 2-3 minutes at 300 rpm ensuring the mixing blade is kept below the surface of the grout to prevent air entrapment.

- Faster speeds and long mixing time may introduce excess air without increasing the mixing efficiency.
- Slowly add the remaining of water (as specified for each product) based on the flow consistency requirements.
- For areas that require more than one bag; one method would be to have a number of mixing buckets available and to mix two to three bags so as to have a supply of grout to enable semi continuous pours. The sequence would be, mix bag and allow it to sit, mix bag two, and allow it to sit mix bag three and allow it to sit. Mix bucket one for 20 seconds, mix bucket 2 for 20 seconds mix bucket 3 for 20 seconds and begin mixing bag 4 and begin applying the grout under the baseplate.
- This should allow for a semi continuous operation and ensure that the grout does not lose energy during the pouring operation.

Multi Bag Mixing

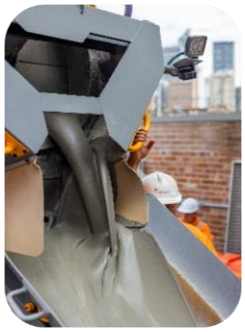
- Pan mixers (eg a SOROTO) or ribbon paddle-type mixers are most often used for mixing grout and are the best choice for larger volumes.
- Add approximately 80% of the required mixing water, then add the bags using care to flow each bag slowly into the mix (rather than dump the entire bag contents as 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.
- A flow check is the best way to ensure that the mixing time is correct. Please see the section "onsite QA" for details on this.



- "Ribbon 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.
- Add approximately 70% of the required mixing water, then add 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.
- A flow check is the best way to ensure that the mixing time is correct. Please see the section "onsite QA" for details on this.

RMX Mixing

- No mixing procedure in situ.
- Pre-mixing RMX grouts in concrete agitators at batch plants being delivered to site as ready to use wet mix.



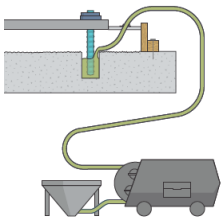
Summary of Basic Principles- Mixing

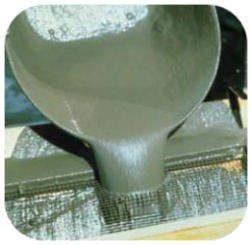
- Wet out the mixing container with water.
- Place the mixing water in the mixer first, then add the dry grout rapidly in a steady stream.
- Do not let large clumps drop in at one time.
- The best retarder for Master Builders Solutions MasterFlux grouts is to lower the "as mixed" grout temperature. This is usually accomplished through the use of cold or iced mixing water or cool storage of the dry grout material. Do not add ice directly to the mix.
- Aim for an" as mixed" temperature of 15 - 21°C.
- Aim for work time of less than 10 minutes from starting to mix to placement.
- Master Builders Solutions MasterFlux 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).
- Do not use grout from damaged bags.
- Mix with potable water only.
- Do not mix by hand.
- Ready mixed grouts come as wet mixed.

APPLICATION- PLACING GROUTS

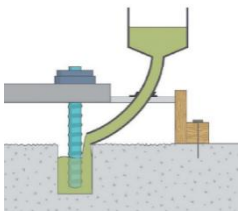
Methods of Placement

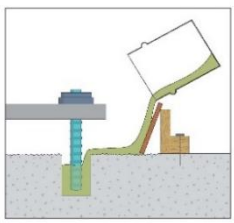
- Grout should be placed as quickly as possible after it has been properly mixed and discharged. Ideally less than 10 minutes from bag opening to placement.
- Grouts may be poured at a fluid or flowable consistency.
- They may also be pumped.

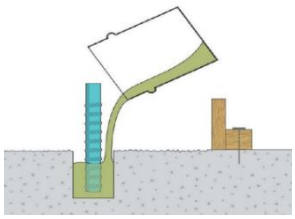




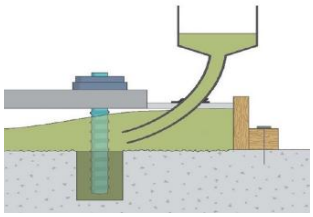
- The method of placement will depend on the size of the object grouted, its shape, available access to accomplish the grouting, clearances, obstacle around which the grout must be placed and environmental temperatures.
- All anchor bolthole grouting should be completed prior to placing the major grouting above, although the foundation may be grouted immediately following the bolthole grouting.
- Sloping board might be used to direct grout to bolt holes if plate is in place.
- Bolt holes can also be filled using a tremie to direct the grout if the underside of the plate is congested.



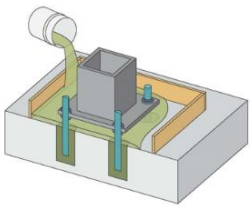


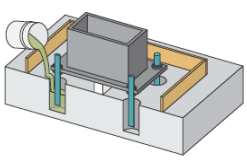


- The tremie can also be used to direct the grout to difficult places to get to.

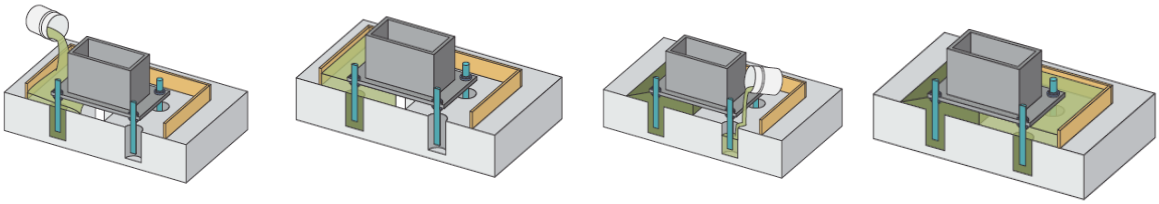


- Placement of grout should be across the shortest dimension of the equipment or base plate involved whenever possible.

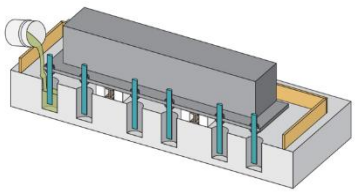


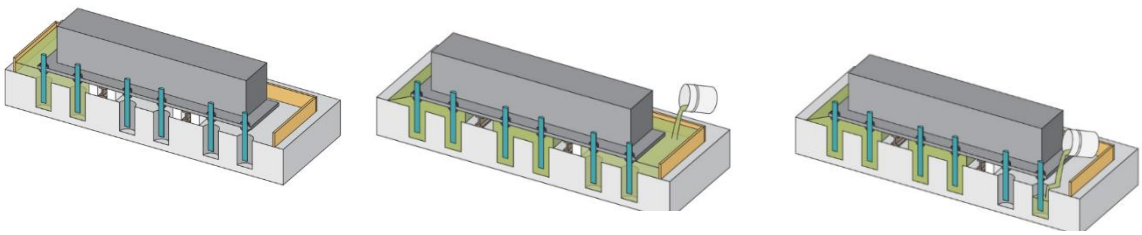


- With Large Baseplates or complex and congested areas to be grouted it may be necessary to divide the areas to be grouted into a number of sections. A size ratio of 1:1 or 1:2 has been found to work well (for example 2m wide and 2m deep or 2 m wide and 4 meters deep.
- Temporary formwork to divide the sections will be necessary and ensure that they will not be stuck to the grout.



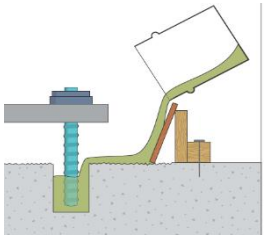
- Grouting bolt holes for multi sectioned machine base with multiple sections of temporary formwork.
- Repeat the process for various sections



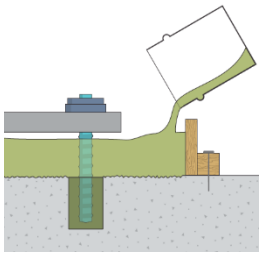


- Fabric hoses filled with water have been found to be effective as has timber formwork that can be removed. Make sure that all free water from the surface of the foundation and anchor boltholes has been removed just prior to grouting them.
- Flow distance of more than 3 metres can be expected using flow troughs, at normal thickness.
- 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.
- 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



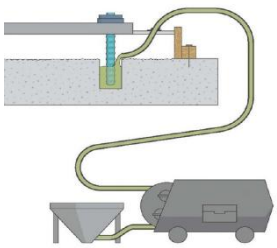
- Grout should not be placed indiscriminately at separate locations along one side as this prevents tracing the actual movement and progress of the grout and can result in large pockets or voids being trapped between such placing points, nor should grout be poured towards the centre from opposite sides, 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.



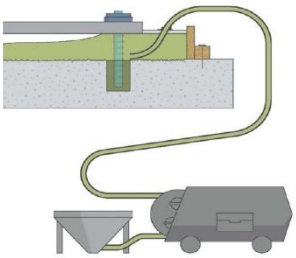
- DO NOT use chains are for this purpose, as they tend to entrap air bubbles each time the links pass down into the grout.
- DO NOT vibrate as this may lead to segregation of the grout.
- Grouting structural or machinery plates that do not have a flat underside, or that are too large to pour, call for 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 (eg a suitable pump is a Putzmeister SP 11) 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. These large volumes are best pumped (eg a Putzmeister SP 11). Grout mixes develop considerable heat quickly in a large batch. Usually chilled (0°C) water is used in these applications, to maintain lower as-mixed temperatures during placing. See section on Hot Weather Grouting.

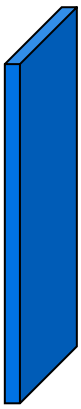


Shoulders

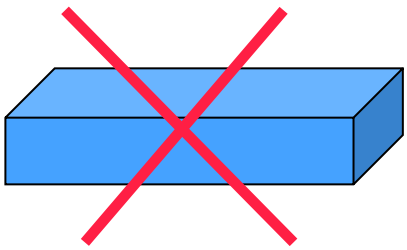
- Master Builders Solutions discourages wide shoulders of grout and recommend that these shoulders have minimal horizontal dimension. Master Builders Solutions recommend chamfering shoulders to 45 degrees, from bottom of the base plate to the substrate.

Grout Thickness

- The reason for the thickness limits on grouts is to control the exotherm. This is essentially a limit on mass of material.
- It is important to note that this limit applies to shapes other than under a plate. ie a grout bed of 100mm thick by 1.5 long and 500mm wide is the same volume as a bolt pocket of 1.5mm deep by 500mm long and 100mm wide.



- However, there is a need to limit the overall mass and thickness so the total volume needs to kept in mind in the example above there is 75 Liters of grout and it would not be acceptable to apply the grout in one pour to 200mm thick and 750mm by 500mm.
- Thus we need to think about both volume and dimensions and this is reason we have a range of grouts to cope with the needs of the market place and to keep in mind the limitations of the materials.



- The volume of grout to be placed can cause a number of problems:
  - Inability to mix and place the grout so that the first material placed is still fluid when the last material is placed.
  - The need for special mixing facilities (high shear mixers for large volumes).
  - The creation of an exotherm that results in cracking or other effects on the grout.
- Cementitious grouts are thixotropic. This means that the flowability reduces as the grout loses energy but if the energy is put back in the flow can be returned.
- This is the reason that grout needs to be poured continuously as the grout if left to sit under the forms loses its flowability quickly.
- If the pour is stop start, you can create voids under the plate as the grout has not melded well enough.
- Thus, in large pours steel straps are used to re-liquify the grout if grouting stops momentarily and are used to ensure that voids don't form around hold down bolts etc.

Pumping

- Master Builders Solutions 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 (ID) pump hose is preferred.
- 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.
- 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 connections between lengths of pipe should not reduce the internal diameter of the pipe and avoid where possible lips and ledges in the pipes.
- 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 : 50mm (Inside Diameter)
- When pumping grout the need for adequate mixing equipment to keep the mixer and grout lines filled throughout the complete placement cannot be over emphasised.
- 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 chilled water. If delays occur agitate and recirculate 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; 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.
- MasterFlux 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 grout).

APPLICATION- MASTERFLUX GROUTS

MasterFlux 700- General Purpose Grout

- MasterFlux 700 can be placed as dry pack to flowable consistency.
- Actual amount of water will depend on the desired consistency for the job and temperature (both ambient and grout).
- For any given consistency more water will be required at high temperatures and less at low temperatures. As a guide 20kg of grout mixed at 20°C requires the following amount of water to achieve the consistency indicated:

Consistency	Litres per 20kg
Dry (damp) packed	2.1
Plastic	3.0
Flowable	3.6

- A 20kg bag of MasterFlux 700 mixed with 3 litres of water yields approximately 10.5 litres.

Mixing

- For large quantities use a paddle type mortar mixer.
- For smaller quantities mix in a 20-25 litre pail using a heavy-duty electric drill (e.g. Festo) fitted with a helical paddle (Jiffy).
- When using a mortar mixer add approximately 70% of the required mixing water before adding any MasterFlux 700.
- Add only as much water as necessary to provide required consistency. Too much water may adversely affect expansion characteristics and strength development. Mix until grout appears homogeneous, about 2 minutes.
- When using a helical mixer add all the required water before adding any MasterFlux 700. Mix for 1-2 minutes.

Placing

- Place grout within 30 minutes of mixing. Place grout by hand and ram (damp-pack) or rod into place (plastic).
- MasterFlux 700 may be placed at a flowable consistency by pouring from one side only into a formed area using a suitable header box. Avoid entrapping air.
- To facilitate grout movement, gently strap or rod the grout during pouring. 10mm minimum thickness is recommended.

MasterFlux WR 788- Under Water Grout

- MasterFlux 788 is recommended for repairing structures under water and in tidal zone by grouting.
- The yield from 20kg MasterFlux 788 mixed with 3.6L water at flowable consistency is 11 L.

Mixing

- Mechanical mixing is necessary. For a large batch use an approved grout mixer and for a small batch (up to two bags at a time), use a heavy-duty slow speed (approx. 600 rpm) drill fitted with a grout stirrer.
- It is important to ensure that the mixing capacity is adequate for grouting continuously to completion as interruptions in grout placing may result in air pockets and cause blockages in the placing pipe.
- Place approximately 80% of the water in the mixer. Keeping the mixer running, add MasterFlux 788 slowly. Mix for at least 3-4 minutes until a lump free mix is obtained.
- Add the remaining water while continuing to mix until the desired consistency is achieved. Sieve the grout so it is free from lumps.
- Place the mixed grout within 30 minutes after mixing.

Placing

- Introduce a flexible pipe of minimum 50 mm diameter and fitted with a funnel at the top into the formwork under water. Ensure that the mouth of the pipe is about 50 mm above the bottom of the form. Place the grout slowly and continuously into the funnel (above water).
- Place at least 20% more grout than the estimated requirement.
- Where situation demands, use a double diaphragm air operated slurry pump to pump the grout directly into the funnel.
- A hand operated pump or manual placing can also be employed.
- Note: The pump is required only to convey the grout from the mixing site to the placing site and not to build up pressure. It is advisable to get a diver inspect the grouted area periodically for any leaks during and immediately after grouting.

MasterFlux 810- Mid strength non-shrink precision grout

MasterFlux 870- High strength non-shrink precision grout

- MasterFlux 810 and 870 can be hand applied as plastic consistency or flowable form and pour. MasterFlux 810 is not suitable for situations requiring a dry pack grout unlike MasterFlux 870 which can be used as dry pack grout.
- Actual water demand will depend on consistency required and temperature (both ambient and grout).
- A 20kg bag of MasterFlux 810 mixed with 3.6 litres of water at flowable consistency yields approximately 11 litres. approximately 2.46 litres for plastic
- A 20 kg MasterFlux 870 with 3.3-3.4 litres at flowable consistency yields 10.8L. When mixing with 2.6-2.7L forms a plastic consistency and 10.4L yielding.

Mixing

- MasterFlux 810 and 870 can be mixed to either a plastic or flowable consistency.
- Water addition may be affected by temperature conditions on site. Trials are recommended to determine the correct water requirement.
- Do not use water at a temperature or volume that causes the grout to bleed or segregate.

Placing

- Place grout within 30 minutes of mixing. Place grout by hand and ram (damp-pack) or rod into place (plastic) or placed at a flowable consistency by pouring from one side only into a formed area using a suitable header box.
- Avoid entrapping air.

MasterFlux 880 and MasterFlux 881- Precision Ultra rapid strength gained Grout/Micro Concrete

- MasterFlux 880/881 are both flowable grouts which may be poured or pumped into place.
- MasterFlux 881, with the addition of special fine aggregate allows the product to be batch mixed in agitators for large volume applications.
- One 20kg bag of MasterFlux 880 mixed with 4.0L water yields approximately 11.2L.
- One 20kg bag of MasterFlux 881 mixed with 2.0L water yields approximately 9.5L.

Mixing

- Measure and place 80% of the specified volume of potable water to the high shear mixing vessel. Start mixer and slowly add MasterFlux 880/881 powder.
- Following addition of all powder, mix for 1 - 2 minutes or until uniform consistency then add final 20% of potable water.
- More or less water may be added within the ratio limits specified on this data sheet. Do not mix more material than can be placed in 20 minutes.
- The mix water's temperature should be kept as low as possible to prevent the grout from hydrating too rapidly.
- As with the water temperature, the higher the air temperature the more quickly the grout hydrates and sets. Master Builders Solutions specify mixing times and set times at an ambient temperature of 20°C.
- Once the grout has been mixed you need an effective pumping method to deliver it to the area of application.
- MasterFlux 881 is a micro- concrete and therefore best mixed using tumble style agitators. It is also best to pour or pump shorter distances using concrete pumps.
- Various models of batch mixers and continuous mixers are available for use, all with varying specifications. It is important to match your application's specifics with the capabilities of the mixer and pump. Master Builders Solutions are able to recommend the right mixer for your project.

Placement

- Prior to pumping grout, rinse the mixer and charge the pump hopper with sufficient water to flush and cool the pump and all grout lines thoroughly.

- Check to ensure that all lines and hoses are clear and unobstructed. Once grout is mixed, it is important to keep it agitated continuously prior to pumping. If the grout is allowed to sit then it will 'gel' and may become more difficult to pump, or otherwise set earlier than expected.
- Once the site is ready for grout placement, commence pumping. It is important to pump continuously and avoid the formation of cold joints.
- When pouring MasterFlux 881, reduce exposed surface areas to ensure maximum confinement during expansion phase of initial set. Consult Master Builders Solutions for further information about aggregate addition for large volume pours.
- Following completion, dispose of excess production material in consideration of the environment. Carefully wash out mixer tanks and agitators into the pump hopper and pump the resulting washout material through the grout hoses to a suitable disposal site. Drain any water out of the lines and hoses. Clean down the machinery and surrounding areas.

Application Temperatures

- The mix water's temperature should be kept as low as possible to prevent the grout from hydrating too rapidly.
- As with the water temperature, the higher the air temperature the more quickly the grout hydrates and sets. Master Builders Solutions specify mixing times and set times at an ambient temperature of 20°C. These times vary with temperature fluctuations, and adjustments will be required to compensate for this. Exposing the pumping hoses to the sun on a hot day accelerates the product's set time. In some cases, it may be necessary to cool the material, the mix water, or even the hose itself during the process and pre-planning the storage of all materials to keep the temperature as low as possible.
- High-shear mixing can add 1 to 2°C per minute of mixing. In order to minimise this effect, add all ingredients to the mixer as quickly as possible and minimise prolonged batch-mixing procedures.
- It is estimated that every 10°C increase in temperature will halve the product set time. Likewise, every 10°C reduction will double the set time. These set time variances may have detrimental consequences for the final set product and Master Builders Solutions should be consulted where extreme temperatures are anticipated.
- MasterFlux 880 may be poured or pumped into place. Do not exceed the maximum application thicknesses specified in the data sheet for any wet layer.
- When pouring MasterFlux 880, reduce exposed surface areas to ensure maximum confinement during expansion phase of initial set.

MasterFlux 880- In Slab Stabilisation applications

Mixing

- Mixing details as above

Grout Injection

- For injection equipment: to prevent grout extrusion or backup during injection, the injection equipment must include a grout packer that is capable of sealing the hole.
- There are two common grout packers but any device may be used subject to approval by Master Builders Solutions that can hold the injection nozzle in place and adequately seal the hole.
- The injection equipment should include either a return hose from the packer to the grout tank or reverse switch to stop grout injection.
- The authorised contractor must drill several holes through the slab in a grid pattern, which has been agreed prior with Master Builders Solutions, Client and Engineers.
- The grid pattern will vary depending upon the pavement and associated voids under the pavements.
- A 1 -2m grid is a common pattern for slab stabilisation, the pattern shall be established to allow grout flows from one hole to another or to the nearest joint.
- The contractor may elect to increase the spacing if the grout flows easily between the holes. If the grout does not flow easily, the contractor may elect to reduce the spacing. This must be done in consultation with the client.
- Each project is unique, and trials are necessary at the start of a project to help determine the appropriate hole pattern. Also, some flexibility in the specification to allow the contractor to change the hole pattern for changing project conditions should be made.
- In most cases injection should start at the centre holes and work out towards the shoulders.
- When pumping holes near the edge of the pavement the contractor must use care to avoid raising the shoulder.
- The grout injection should start at low pumping rate and pressure. Grout injection pressure should usually be in the range of 2.5bar – 4 bar with a maximum pressure of 7 bar. Initially a short pressure surge may be necessary to clear debris from the grout hole and voids. This initial surge can be as high as 14bar for 2-3seconds. If the pressure doesn't drop after three seconds there is likely some other problem, such as blockage or no voids.
- Pumping should cease when any of the following occur:
    - The slab begins to rise
    - The grout no longer pumps at maximum pressure
    - Grout begins to flow up adjacent holes or joints

- When the grout is displacing water from under the slab, pumping should continue until undiluted grout flows from the same area.
- After completing grout injection, the contractor should remove the packer and plug the hole with an approved grout or mortar.
- Traffic can resume a minimum of 1 hour after the completion of grouting.

MasterFlux 200 , MasterFlux 201and MasterFlux 200RMX - PT Cable Grout

- MasterFlux 200 may be poured or pumped into place.
- MasterFlux 201 is a powder additive which requires the addition of cement powder and water to form a pumpable cementitious grout.

Mixing

- MasterFlux 200:
    - Measure and place approximately 90% of the desired water into the approved mixing vessel. Start mixer and slowly add the powder.
    - Mix at high speed for a further 3 - 4 minutes to adequately dissolve the grout and achieve flowable consistency.
    - Additional water can be added to a total volume not exceeding the total allowable limit
- MasterFlux 201:
    - Measure and place approximately 90% of the desired water into the approved mixing vessel. Start mixer and slowly add 50% cement powder.
    - Add MasterFlux 201 Powder and mix for approximately 1 minute. Slowly add the remaining 50% of cement and 10% water.
    - Additional water can be added to a total volume not exceeding the total allowable limit. Mix for a further 3 - 4 minutes to adequately dissolve the MasterFlux 201 additive and achieve flowable consistency.
- MasterFlux 200RMX:
    - No mixing procedure in situ.
    - Pre-mixing grout in concrete agitators at batch plants being delivered to site as ready to use wet mix.

Placement

- Once the grout has been mixed you need an effective pumping method to deliver it to the area of application. Various models of batch mixers and continuous mixers are available for use, all with varying specifications. It is important to match your application's specifics with the capabilities of the mixer and pump.
- Prior to pumping grout, rinse the mixer and charge the pump hopper with sufficient water to flush and cool the pump and all grout lines thoroughly. Check to ensure that all lines and hoses are clear and unobstructed.
- Once grout is mixed, it is important to keep it agitated continuously prior to pumping. Although, this product has a long pot life, if the grout is allowed to sit then it will 'gel' and may become more difficult to pump.
- Once the site is ready for grout placement, commence pumping. It is important to pump continuously and avoid the formation of cold joints.
- Following completion, dispose of excess production material in consideration of the environment. Carefully wash out mixer tanks and agitators into the pump hopper and pump the resulting washout material through the grout hoses to a suitable disposal site. Drain any water out of the lines and hoses. Clean down the machinery and surrounding areas.

Application Temperatures

- The mix water's temperature should be kept as low as possible to prevent the grout from hydrating too rapidly.
- As with the water temperature, the higher the air temperature the more quickly the grout hydrates and sets. Master Builders Solutions specify mixing times and set times at an ambient temperature of 20°C. These times vary with temperature fluctuations, and adjustments will be required to compensate for this. Exposing the pumping hoses to the sun on a hot day accelerates the product's set time.
- In some cases it may be necessary to cool the material, the mix water, or even the hose itself during the process and pre-planning the storage of all materials to keep the temperature as low as possible.
- High-shear mixing can add 1 to 2°C per minute of mixing. In order to minimise this effect, add all ingredients to the mixer as quickly as possible and minimise prolonged batch-mixing procedures.
- It is estimated that every 10°C increase in temperature will halve the product set time. Likewise every 10°C reduction will double the set time. These set time variances may have detrimental consequences for the final set product and Master Builders Solutions should be consulted where extreme temperatures are anticipated.

MasterFlux HST 4600- Precision Iron Reinforced Ultra high strength Grout

- MasterFlux HST 4600 is normally placed at a flowable consistency to completely fill voids between 20mm and 150mm.

Mixing

- Measure and place 80% of the specified volume of potable water to the high shear mixing vessel. Start mixer and slowly add MasterFlux powder.
- Actual water demand will depend on consistency required and temperature (both ambient and grout). Do not use too much water, as it will cause grout to bleed or segregate.
- As a guide, the approximate quantity of water required to mix a 20kg bag of MasterFlux HST 4600 for Flowable consistency is: 2.3 - 2.4 litres which will be yield approx. 8.7L.
- Do not add sand, cement or other materials to the grout.
- Do not use water at a temperature or volume that causes the grout to bleed or segregate.

Placing

- MasterFlux HST 4600 should be placed as quickly as possible after it has been properly mixed and discharged. Ideally less than 10 minutes from bag opening to placement.
- It may be poured or also be pumped and Placement should be across the shortest dimension of the equipment or base plate involved whenever possible.
- With Large Baseplates or complex and congested areas to be grouted it may be necessary to divide the areas to be grouted into a number of sections. refer to Method of Placement of this document for more details.

MasterFlux HST 120 and MasterFlux HST 120RMX- Ultra High Strength Grout

MasterFlux 80RMX – High strength Ready Mixed Grout

- MasterFlux HST 120/RMX and MasterFlux 80RMX may be poured or pumped into place.
- A 20 kg bag of MasterFlux HST 120 with 2.0 - 2.4 litres water will yield around 9.8L.

Mixing

- MasterFlux HST 120:
  - Measure and place 80% of the specified volume of potable water to the high shear mixing vessel. Start mixer and slowly add the powder. If powder addition is too fast then large lumps will form and final mix will be slow reaching uniform consistency.
  - Following addition of all powder, mix for 1 - 2 minutes or until uniform consistency then add final 20% of potable water. More or less water may be added within the ratio limits specified in the technical datasheets of the product.
  - Do not mix more material than can be placed in 20 minutes.
- MasterFlux HST 120RMX and MasterFlux 80RMX:
  - No mixing procedure in situ.
  - Pre-mixing grout in concrete agitators at batch plants being delivered to site as ready to use wet mix.

Pumping

- Once the grout has been mixed you need an effective pumping method to deliver it to the area of application. Various models of batch mixers and continuous mixers are available for use, all with varying specifications. It is important to match your application's specifics with the capabilities of the mixer and pump.
- Prior to pumping grout, rinse the mixer and charge the pump hopper with sufficient water to flush and cool the pump and all grout lines thoroughly. Check to ensure that all lines and hoses are clear and unobstructed. Once grout is mixed, it is important to keep it agitated continuously prior to pumping.
- Once the site is ready for grout placement, commence pumping. It is important to pump continuously and avoid the formation of cold joints.
- Following completion, dispose of excess production material in consideration of the environment. Carefully wash out mixer tanks and agitators into the pump hopper and pump the resulting washout material through the grout hoses to a suitable disposal site. Drain any water out of the lines and hoses. Clean down the machinery and surrounding areas.

MasterCrete LH 5460 and MasterFlux LH 5460RMX- Deep pour flowable Ready Mixed micro concrete

Mixing

- MasterCrete LH 5460
  - Use only full bags and damaged or opened bags should not be used.
  - Add 2.4 to 2.8 litres mixing water (clean, potable water only) to a clean mixing container.
  - MasterCrete LH 5460 is best mixed with a bird cage style mixer to give a fluid consistency.
  - The mix water's temperature should be kept as low as possible to prevent the grout from hydrating too rapidly.
  - In some cases it may be necessary to cool the material or the mix water to keep the temperature as low as possible.
  - Measure and place 85% of the specified volume of potable water to the high shear mixing vessel. And add MasterCrete LH 5460 powder.
  - High-shear mixing can add 1 to 2°C per minute of mixing. To minimise this effect, add all ingredients to the mixer as quickly as possible and minimise prolonged batch-mixing procedures.
  - Following addition of all powder, mix for 1 - 2 minutes or until uniform consistency then add final 15% of potable water.
  - More or less water may be added within the ratio limits specified.
  - Note: Do not mix more material than can be placed in 30 minutes.
- MasterFlux LH 5460RMX:
  - No mixing procedure in situ.
  - Pre-mixing grout in concrete agitators at batch plants being delivered to site as ready to use wet mix.

Placement

- The minimum temperatures must be maintained during application and for at least 12 hours thereafter for optimum curing of the product.
- MasterCrete LH 5460 may be pumped or poured from the mixing bucket and trowelled onto the prepared surface.
- Do not exceed the maximum application thicknesses specified for any wet layer.
- The formwork should be watertight and sturdy. The forms should be treated with a form release agent like MasterFinish RL 211 or 222 to ensure they can be easily removed.
- When possible pre-wet the substrate before pumping or pouring the mortar into the form.
- Ensure that excess water is drained prior to filling form with mortar.
- Saturated surface dry or bonding agent should be considered where practical.

- Keep forms on until the material has reached the desired strength and cure the material after removal of forms.
- MasterCrete LH 5460 are mostly used in horizontal excavations and the surrounding concrete becomes the form.
- Move the material to the desired places with a trowel and finish off the surface profile required.
- MasterCrete LH 5460 will set relatively quickly and finishing off should be done as quickly as possible.

MasterFlux EA 55RMX - Low Thermal Resistivity Ready Mixed Grout

- MasterFlux EA 55RMX is a pumpable deep pour grout.

Mixing

- No mixing procedure in situ.
- Pre-mixing RMX grouts in concrete agitators at batch plants being delivered to site as ready to use wet mix.

Placement

- Install multiple grouting lines at the top (obvert) of the bore from the high end to ensure grouting from bottom up of the under bore if on a gradient.
- The grout lines should be installed at the following intervals to allow for easy grouting of if any grout lines get blocked. Minimum Intervals: 90%, 75%, 50% and 25% (More intervals can be added but we recommend the previous as a minimum).
- Breather tube to be placed at the top of the under bore, once consistent grout return has occurred through the breather tube stop grouting and cap off.
- It is recommended that grouting operations progress slowly and careful observation for leaks is made continuously. Grouting operations must cease immediately if a leak is observed. The leak shall be plugged with suitable plugging products.
- At the completion of grouting, the end of the breather tube shall be secured at least 1m above the conduit obvert. The breather tube shall be monitored until the grout reaches initial set for falls in grout level.
- If the grout level falls 1m, then the leak shall be identified and stopped. The breather tube shall be continuously topped up until the grout reaches initial set. Where grouting operations are not continuous, then multiple breather tubes for grout placement may be required.

CURING

- All Master Builders Solutions 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.
- Pre-saturation 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.
- A. 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 the below.
    - Final set can be determined as that time at which one cannot penetrate the grout with a pointed trowel.
- B. For Long-Term Curing in the Hardened State:
    - As soon as final set occurs, remove wet rags, formwork 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 a suitable MasterKure 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 is advisable to cover the top of the base plate and machinery with a temporary tarpaulin or plastic sheeting to protect the equipment.
- Cracks: If exposed grout shoulders extend beyond the bedplate or are over several metres in length there is a probability of some superficial, hairline cracks appearing in the exposed grout. The hairline cracks will be perpendicular to the plate or member grouted and are of no structural significance and do not compromise the integrity of the application
- 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.

ON-SITE QC

- It is good practice to do some regular checks to ensure that the grout consistency is maintained throughout the application. Here are typical QA/QC requirements requested of grouting crews records
  - Batch numbers of the grout used for each location or placement.
  - Ambient temperature
  - Relative Humidity at regular intervals (every two hours is recommended).
  - As mixed temperature of the grout. The intervals will depend on size of the mix etc but as a guide at least every second mix should be measured.
  - Flow Trough measurement
  - Water addition

GROUTS TESTING

Flow Tests

- There a number of methods used to measure flow:
  - JIS flow Cone JIS A 1123
  - ASTM Cone ASTM C 939
  - Flow trough AS 1478.2 appendix D
  - Spread ASTM C1437
- For on-site work, the simplest method is the use of a flow trough device. (1000 ml of grout used fluid consistency 38-43cm AS1478.2 app D)

- The expected flow trough measurement for each Master Builders Solutions grout is given in the individual Technical Data Sheets.

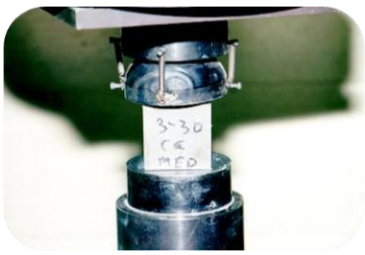
- Ring tests are meant to be comparative tests only, ie. to test one batch against another and not meant to replicate any laboratory or standard tests. Maintaining the flow within a range will ensure that application is as uniform as it can be.

Expansion Testing

- Expansion tests are performed to get show that the grout expands and does not shrink below its original dimension.
- All these tests are done on unrestrained material and measure either change in height or pressure exerted.

Cube Tests

- Collection of material for compressive strength checks:
- Please refer to AS/NZS 1478 for the method of filling storing and testing 50mm cubes. However please



note that AS/NZS 1478 is a testing standard for testing material in a laboratory with all the relevant temperature and environmental controls. It is expected that samples collected in the field may vary with testing done in a laboratory for many reasons and results should be viewed with that in mind.

OVERVIEW

Master Builders Solutions provides comprehensive construction solutions designed to enhance the performance, durability, and longevity of infrastructure projects. Our innovative range of products ensures that projects meet the highest standards of quality and reliability.
Along with innovative products, customers also receive on-site and technical support from the Master Builders Solutions team of experts. By diagnosing the underlying cause of deterioration, our specialists develop the most suitable repair strategy to prevent further damage and deliver lasting protection. Our civil infrastructure solutions are tailored to meet the specific needs of the construction industry in ANZ, delivering consistent results for a wide range of applications.

Other products application guide

- **MasterCrete**: "**Cementitious Concrete Repair Mortars**" Application Guide
- **MasterFlux ER**: "**Epoxy grouts**" Application Guide
- **MasterStrength & MasterFill ER: "Epoxy Crack Repair Systems**" Application Guide
- **MasterFill PR: "Polyurethane injection resin**" Application Guide
- **MasterStrength LAM/FIB/BAR/ANC: "CFRP structural strengthening"** Application Guide
- **MasterJoint CHR**: "**Joint sealants**" Application Guide
- **MasterJoint 910: "Hydro-swelling waterbars for construction joints"** Application Guide
- **MasterJoint 930: "FPO tape for joint waterproofing"** Application Guide
- **MasterShield AKS**: "**Chemical resistant HDPE liner**" Application Guide
- **MasterShield AC**: "**Anti-carbonation coatings**" Application Guide
- **MasterShield CI**: "**Impregnants and corrosion inhibitors**" Application Guide
- **MasterShield CP**: "**Galvanic cathodic protection systems**" Application Guide
- **MasterGeo**: "**Geotechnical Soil nails and anchors**" Application Guide

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