THE
MASONRY
PEOPLE

KING

Mixing Strength
With Satisfaction

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MASONRY PRODUCTS DIVISION

King Packaged Materials Company has been producing dry-mix, cementitious products from North American plants since 1963. All three KING plants are registered to the international quality standards of ISO 9001:2008. Through these plants, KING has been able to provide quality mortars, grouts and other masonry products to projects throughout North America.

KING mortars and grouts have proven themselves time and time again, on a wide variety of projects including many specialized applications. KING 1-1-6, KING Block and other grouts have been used in the construction of hospitals, schools, wastewater treatment plants, and more! KING has been able to satisfy customer needs, as well as offer a full range of mortar and stone, masonry restoration products for historic building applications.

KING's ability to adapt its products to meet specific project requirements is a key component of its success. Coloured mixes can be custom-designed, in-house, to satisfy the architectural requirements of any project.

Various packaging options allow for completely pre-blended products, in packages as small as 30 KG or as large as 1500 KG. Bulk silos are also available in two size (2000 KG and 4500 KG capacity) for any project utilizing KING's bulk bag mortars or grouts.

KING's technical support team is always available to provide technical assistance, whether before, during or after the project.

www.king-masonry.com

BINDER CONTENTS

This binder, with its array of helpful information, was prepared to help clients choose the most suitable mortar and grout for specific projects. Product recommendations are provided, based on intended use. The binder, however, does not include product Technical Data Sheets. Since these are updated on a regular basis, we have opted to upload the latest versions to our website.

It is important to note that the binder's contents pertain to new buildings or construction projects. For information about masonry restoration work, please refer to our HERITAGE BUILDING SOLUTIONS binder.

Please also note that King Packaged Materials Company is pleased to participate in your project, by submitting its recommendations. However, the recommendations made are of a general nature and King Packaged Materials Company cannot be held responsible for the implementation of these recommendations. The full and sole responsibility in this regard rests with the professional in charge of the project.

To ensure you are referring to the most recent binder version, please visit our website.

www.king-masonry.com

RECOMMENDATIONS

CLAY BRICK FACING

MAIN FEATURES

- **Outdoor application**
- **Aboveground application**
- **Exposure to rainwater**

Installation of masonry elements demands the use of a mortar that is weaker in terms of compressive strength than the masonry unit itself. The mortar used must also conform with the light movements of the facing without deforming. Last, the mortar selected must be more permeable to water vapour than the masonry units to be installed.

Installation of any exterior facing is particularly important, since the facing is the first defence against water infiltration. One of the roles of mortar is to effectively manage rainwater flowing over the facing. Since our Canadian climate involves numerous freezing and thawing cycles, it is important that minimal water remain in the facing when the first freezing cycles occur.

To this end, mortars containing lime have long proven effectiveness. Furthermore, Canadian standard CSA A 179-14 indicates that a mortar rich in lime *will likely resist water penetration better and reduce cracking* (CSA A 179-14, pg. 44).

TIP

Clay brick units often have a high absorption rate. This is one more reason to use a lime mortar. The lime particle, by its sheet form, has the characteristic of retaining water in the mortar mixture. By keeping the water longer in the mortar, it ensures a good hydration of the cement particles that make up the binder.

RECOMMENDATION

TYPE OF MORTAR RECOMMENDED: TYPE N

» Mortar recommended outdoors: **KING 1-1-6**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

BRICK OR STONE CONCRETE FACING

MAIN FEATURES

- **Outdoor exposure**
- **Aboveground exposure**
- **Rainwater exposure**

Installation of masonry elements demands use of a mortar that is weaker in terms of compressive strength than the masonry unit itself. The mortar used must also conform to the light movements of the facing without deforming. Last, the mortar selected must be more permeable to water vapour than the masonry units to be installed.

Installation of any exterior facing is particularly important, since the facing is the first defence against water infiltration. One of the roles of mortar is to effectively manage rainwater flowing over the facing. Since our Canadian climate involves numerous freezing and thawing cycles, it is important that minimal water remain in the facing when the first freezing cycles occur.

To this end, mortars containing lime have long proven effectiveness. Furthermore, Canadian standard CSA A 179-14 indicates that a mortar rich in lime *will likely resist water penetration better and reduce cracking* (CSA A 179-14, pg. 44).

TIP

Concrete brick units often have a low absorption rate. Therefore in order to reflect this characteristic, it is not uncommon for the mason to adjust the required amount of water.

RECOMMENDATIONS

TYPE OF MORTAR RECOMMENDED:

- **Mortar requiring not much constraint: TYPE N**
  - Mortar recommended outdoors: **KING 1-1-6**
  - Mortar recommended indoors: **KING 1-1-6** or **MasonGo 100**
- **Mortar requiring medium to high constraint: TYPE S**
  - Mortar recommended outdoors: **KING 2-1-9**
  - Mortar recommended indoors: **KING 2-1-9** or **KING Block**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

LIMESTONE FACING

MAIN FEATURES

- **Outdoor exposure**
- **Aboveground exposure**
- **Exposure to rainwater**

Installation of masonry elements demands use of a mortar that is weaker in terms of compressive strength than the masonry unit itself. The mortar used must also conform to the light movements of the facing without deforming. Last, the mortar selected must be more permeable to water vapour than the masonry units to be installed.

Installation of any exterior facing is particularly important, since the facing is the first defence against water infiltration. One of the roles of mortar is to effectively manage rainwater flowing over the facing. Since our Canadian climate involves numerous freezing and thawing cycles, it is important that minimal water remain in the facing when the first freezing cycles occur.

To this end, mortars containing lime have long proven effectiveness. Furthermore, Canadian standard CSA A 179-14 indicates that a mortar rich in lime *will likely resist water penetration better and reduce cracking* (CSA A 179-14, pg. 44).

TIP

Limestone units often have a medium absorption rate. Outdoors, lime-based mortars are very useful in managing rainwater.

RECOMMENDATIONS

TYPE OF MORTAR RECOMMENDED: TYPE N

» Mortar recommended outdoors: **KING 1-1-6**

» Mortar recommended indoors: **KING 1-1-6** or **MasonGo 100**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

GRANITE STONE FACING

MAIN FEATURES

- **Outdoor exposure**
- **Aboveground exposure**
- **Exposure to rainwater**
- **Masonry unit with a low absorption rate**

Installation of any exterior facing is particularly important, since the facing is the first defence against water infiltration. One of the roles of mortar is to effectively manage rainwater flowing over the facing. Since our Canadian climate involves numerous freezing and thawing cycles, it is important that minimal water remain in the facing when the first freezing cycles occur.

To this end, mortars containing lime have long proven effectiveness. Furthermore, Canadian standard CSA A 179-14 indicates that a mortar rich in lime *will likely resist water penetration better and reduce cracking* (CSA A 179-14, pg. 44).

TIP

Granite stones have a very low absorption rate. So, the absorption of water contained in the mortar per masonry unit, which is required to ensure optimal adherence between the mortar and the masonry unit, is reduced.

Outdoors, lime mortars will be of great help in managing rainwater. But with granite, this is not enough. We also recommend application of a slurry before installing granite elements. To find out more about the slurry, see the document on page **T5** or visit: **www.king-masonry.com**

RECOMMENDATIONS

TYPE OF MORTAT RECOMMENDED: TYPE S

» Mortar recommended outdoors: **KING 2-1-9**

» Mortar recommended indoors: **KING 2-1-9** or **KING Block**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

SANDSTONE FACING

MAIN FEATURES

- **Outdoor exposure**
- **Aboveground exposure**
- **Rainwater exposure**
- **Masonry unit with a high absorption rate**

Installation of masonry elements demands use of a mortar that is weaker in terms of compressive strength than the masonry unit itself. The mortar used must also conform with the light movements of the facing without deforming. Last, the mortar selected must be more permeable to water vapour than the masonry units to be installed.

Installation of any exterior facing is particularly important, since the facing is the first defence against water infiltration. One of the roles of mortar is to effectively manage rainwater flowing over the facing. Since our Canadian climate involves numerous freezing and thawing cycles, it is important that minimal water remain in the facing when the first freezing cycles occur.

To this end, mortars containing lime have long proven effectiveness. Furthermore, Canadian standard CSA A 179-14 indicates that a mortar rich in lime *will likely resist water penetration better and reduce cracking* (CSA A 179-14, pg. 44).

TIP

Generally, sandstones have a high absorption rate. Outdoors, lime mortars are of great help in managing rainwater.

RECOMMENDATIONS

TYPE OF MORTAR RECOMMENDED: TYPE N

» Recommended mortar outdoors: **KING 1-1-6**

» Recommended mortar indoors: **KING 1-1-6** or **MasonGo 100**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

SILICO-CALCAREOUS FACING

MAIN FEATURES

- **Outdoor exposure**
- **Aboveground exposure**
- **Rainwater exposure**
- **Masonry unit with a medium to high absorption rate**

Installation of masonry elements demands use of a mortar that is weaker in terms of compressive strength than the masonry unit itself. The mortar used must also conform to the light movements of the facing without deforming. Last, the mortar selected must be more permeable to water vapour than the masonry units to be installed.

Installation of any exterior facing is particularly important, since the facing is the first defence against water infiltration. One of the roles of mortar is to effectively manage rainwater flowing over the facing. Since our Canadian climate involves numerous freezing and thawing cycles, it is important that minimal water remain in the facing when the first freezing cycles occur.

To this end, mortars containing lime have long proven effectiveness. Furthermore, Canadian standard CSA A 179-14 indicates that a mortar rich in lime *will likely resist water penetration better and reduce cracking* (CSA A 179-14, pg. 44).

TIP

Generally, silico-calcareous stones have a high absorption rate. Outdoors, lime mortars are of great help in managing rainwater.

RECOMMENDATIONS

TYPE OF MORTAR RECOMMENDED: TYPE N

» Mortar recommended outdoors: **KING 1-1-6**

» Mortar recommended indoors: **KING 1-1-6** or **MasonGo 100**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

CONCRETE BLOCKS INDOORS

MAIN FEATURES

- **No exposure to rainwater**
- **Walls can be load-bearing or non-load-bearing**

The type of mortar to be used for installing concrete blocks indoors depends on the type of application. Since there will be no rainwater to manage, lime mortars are not necessary.

RECOMMENDATIONS

A » Load-bearing wall requiring high compressive strength:
TYPE S MORTAR

» Mortar recommended: **KING Block** or **KING 2-1-9**

B » Load-bearing wall that does not require high compressive strength:
TYPE N MORTAR

» Mortar recommended: **MasonGo 100** or **KING 1-1-6**

C » Non-load-bearing wall:
TYPE N MORTAR

» Mortar recommended: **MasonGo 100** or **KING 1-1-6**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

CONCRETE BLOCK GROUT

MAIN FEATURES

- **Very fluid**
- **Without segregation and excessive bleeding**

Grouts are very fluid products. The high fluidity allows the grout to penetrate the cavities of the concrete blocks throughout the building, despite the presence of rebar and/or other elements resulting from the architectural details. To this end, mortar should never be used to replace grout.

Nowadays, grouts are of the expansive type. During the fluid phase, the grout will expand, which will compensate for the generally observed shrinkage occurring with the use of Portland Cement products, and will also guarantee a superior adhesion.

The resistance of the selected grout will depends on the type of use. Following this rule, King Packaged Materials Company recommends for users to always consult with a structural Engineer before selecting a grout resistance.

TIP

Since hydrated lime develops compressive strength once in contact with air, the use of non-hydraulic lime in the grout composition is not recommended.

RECOMMENDATIONS

TYPE OF GROUT RECOMMENDED:

- **Low** compressive strength: **KING E-15**
- **Medium** compressive strength: **KING E-20**
- **High** compressive strength: **KING E-25** or **KING E-30**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

CULTURED BRICK AND STONE

MAIN FEATURES

- **Units fixed individually using mortar**

Given the excessive number of potential variables, installing cultured brick and stone fixed with mortar is no longer detailed in Canadian standards.

Although in many cases conventional Type N or Type S Mortars can be used, King Packaged Materials Company recommends using a polymer-modified mortar for this type of application.

RECOMMENDATION

» **Mortar recommended:** indoors or outdoors: **MasonBond 400**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

EXTERIOR CHIMNEY

MAIN FEATURES

- **Outdoor application**
- **Aboveground application**
- **Exposure to rainwater**
- **High degree of saturation**

The elements that make up an exterior chimney are subject to a high level of saturation. For this type of application, Canadian standard CSA A 179-14 recommends using a Type S Mortar.

Furthermore, installation of any exterior facing is particularly important, since the facing is the first defence against water infiltration. One of the roles of mortar is to effectively manage rainwater flowing over the facing. Since our Canadian climate involves numerous freezing and thawing cycles, it is important that minimal water remain in the facing when the first freezing cycles occur. To help the facing manage rainwater, we recommend using a lime mortar.

Mortars containing lime have long proven effectiveness. Furthermore, Canadian standard CSA A 179-14 indicates that a mortar rich in lime *will likely resist water penetration better and reduce cracking.* (CSA A 179-14, pg. 44).

RECOMMENDATION

TYPE OF MORTAR RECOMMENDED: TYPE S

» Mortar recommended: **KING 2-1-9**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

INTERIOR CHIMNEY

MAIN FEATURES

- **No exposure to rainwater**

Construction of an interior chimney is no different from other types of interior masonry. Since the elements will not be in contact with rainwater, lime mortars can be used, but are not necessary.

TIP

Since it takes less energy to manufacture lime than Portland Cement, it is always preferred from an environmental standpoint, to use a lime mortar.

RECOMMENDATIONS

TYPE OF MORTAR RECOMMENDED: TYPE N

» Mortar recommended: **KING 1-1-6** or **MasonGo 100**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

CONCRETE BLOCK FOUNDATIONS

MAIN FEATURES:

- **Outdoor exposure**
- **Underground exposure**
- **High degree of saturation**

Concrete block elements, which make up a buried foundation wall, are generally exposed to a high level of saturation. For this type of application, standard CSA A 179-14 recommends using a Type S Mortar, at a minimum.

RECOMMENDATIONS

TYPE OF MORTAR RECOMMENDED: TYPE S

» Mortar recommended: **KING 2-1-9** or **KING Block**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

NATURAL STONE FOUNDATIONS

MAIN FEATURES

- **Outdoor exposure**
- **Underground exposure**
- **High degree of saturation**

The natural stone elements that make up a buried foundation wall are generally exposed to a high level of saturation. For this type of application, standard CSA A 179-14 recommends using a Type S Mortar, at a minimum.

RECOMMENDATIONS

TYPE OF MORTAR RECOMMENDED: TYPE S

» Mortar recommended: **KING 2-1-9** or **KING Block**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

PARAPET

MAIN FEATURES

- **Outdoor application**
- **Aboveground application**
- **Rainwater exposure**
- **High level of saturation**

Elements that compose an outdoor parapet are subject to a high level of saturation since the front, back and top are exposed to the elements. For this type of application, Canadian Standard CSA A 179-14 recommends the use of a Type S Mortar.

Installation of any exterior facing is particularly important, since the facing is the first defence against water infiltration. One of the roles of mortar is to effectively manage rainwater flowing over the facing. Since our Canadian climate involves numerous freezing and thawing cycles, it is important that minimal water remain in the facing when the first freezing cycles occur. To help the facing mange rainwater, we recommend the use of a lime-based mortar.

Mortars containing lime have long proven effectiveness. Furthermore, Canadian standard CSA A 179-14 indicates that a mortar rich in lime *will likely resist water penetration better and reduce cracking* (CSA A 179-14, pg. 44).

RECOMMENDATIONS

TYPE OF MORTAR RECOMMENDED FOR THE CONSTRUCTION: TYPE S

A » Without any joints between the masonry unit on top: **KING 2-1-9**

B » If masonry units are used as coping: **Reconstec MF**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

MORTAR FOR ISOLATION JOINTS

MAIN FEATURES

- **Outdoor exposure**
- **Aboveground exposure**
- **Exposure to rainwater**
- **Flexibility**

Isolation joints are commonly used in modern building construction in order to prevent masonry facings from cracking. Isolation joints allow walls to expand or contract in multiple directions. To allow this expansion or contraction, caulking joints are generally applied. Unfortunately, these joints are not particularly attractive.

To improve the aesthetics of isolation joints, King Packaged Materials Company offers a polyurethane mortar. This mortar looks like a masonry joint; it is flexible, resistant to UV rays and resistant to de-icing salt.

RECOMMENDATION

» Mortar recommended: **Reconstec MF**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

GLASS BLOCKS

MAIN FEATURES

- **Indoor or outdoor exposure**
- **Possible exposure to rainwater**
- **Unit with zero absorption**

Construction using glass block masonry units demands a special type of mortar.

According to standard CSA A 371-14, the mortar required for installation of glass blocks must meet the following criteria:

Outdoor exposure: Type S, containing a waterproofing material

Indoor exposure: Type N or Type S, containing a waterproofing material

RECOMMANDATION

» Mortar recommended: **MasonGlass**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

FLAGSTONES AND PAVERS

MAIN FEATURES

- **Outdoor application**
- **Ground-level application**
- **Exposure to rainwater**
- **High degree of saturation**
- **Possible exposure to de-icing salts**

Flagstones or pavers installed on the ground, outdoors, are subject to a high level of saturation. For this type of application, Canadian standard CSA A 179-14 recommends using a Type S Mortar.

Selecting the mortar that will fix the flagstones or pavers to the ground and the mortar that will be installed around the perimeter of units, is particularly important since the flagstones and pavers may be exposed to de-icing salts.

RECOMMENDATIONS

» Mortar for fixing flagstones or pavers on a concrete slab: **MasonBond 400**

» Mortars for joints:

A » With moderate exposure to de-icing salts: **MasonBond 400** or **KING Block**

B » With high exposure to de-icing salts: **Reconstec MF**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

CONSTRUCTION OF A RETAINING WALL

MAIN FEATURES

- **Outdoor exposure**
- **Underground exposure**
- **Exposure to rainwater**
- **High level of saturation**

The elements of a retaining wall that are in contact with the ground are generally exposed to a high level of saturation. For this type of application, standard CSA A 179-14 recommends using a Type S Mortar, at a minimum.

One of the roles of mortar is to effectively manage rainwater flowing over the facing. Since our Canadian climate involves numerous freezing and thawing cycles, it is important that minimal water remain in the facing when the first freezing cycles occur.

Mortars containing lime have long proven effectiveness. Furthermore, Canadian standard CSA A 179-14 indicates that a mortar rich in lime *will likely resist water penetration better and reduce cracking* (CSA A 179-14, pg. 44).

TIP

Since it takes less energy to manufacture lime than Portland Cement, it is always preferred from an environmental standpoint to use a lime mortar.

RECOMMENDATIONS

TYPE OF MORTAR RECOMMENDED: TYPE S

» Mortar recommended: **KING 2-1-9** or **KING Block**

To obtain the full Technical Data Sheet for the recommended mortars, visit: www.king-masonry.com

INFORMATION

GUIDELINES FOR SPECIFYING MORTAR

For structural, design and aesthetic reasons, the choice of brick, block or stone is obviously very important. Remember that selecting the right mortar is also essential, as this choice will influence the structural integrity of the building, as well as its appearance.

Properly understanding the characteristics and "behaviour" of mortar rests on an understanding of its existence in two states; first as a plastic material and then as a hardened material. Mortars have, in both of these states, various characteristics that will dictate their ability to be used for various purposes. In its plastic state, mortar must be easy to manipulate and able to retain water. In its hardened state, compressive strength, adhesion and sustainability are all desired characteristics.

The characteristics that are typical of mortar in its plastic or its hardened state will vary according to the composition of the mixture.

And while the extent to which mortar can be manipulated is important, it is just as essential to select a mortar that will have the necessary physical properties once it has hardened. This choice will rest on factors such as structural requirements, the type of masonry unit being erected, the mortar's exposure to weather conditions, and the overall desired appearance of the work.

Nowadays, mortar is often comprised of masonry cement, sand and drinking water. Masonry cements often include additives such as plastifying agents, air-entraining agents or water retention agents, all of which can improve the mortar's ability to be manipulated or its sustainability. Masonry cements are increasingly being replaced by mixtures including Portland Cement and calcium hydroxide.

The latter's characteristics are preferable in terms of water retention, manipulation, adhesion and sustainability.

Sand is the basic element in mortar. Other elements are subsequently added to the mixture. The sand's colour and texture have a major influence on the finished product's appearance. Its particle or speck size influences the degree to which it can be manipulated, its sustainability (or the time it will last), as well as degree of contraction as it dries or hardens

Water quality and quantity also have an influence on the properties of mortar in both its plastic and hardened states. Cleaner water (and of better quality) leads to an improved hydration process, as well as an end product of higher quality.

Generally speaking, mortar with a high ratio of cement to sand will be more resistant to compression (often too much so), which can lead to problems in the installation of masonry units and the finishing of mortar joints. The structures erected with this type of mortar will also be highly permeable. This is due to the low adhesion between the masonry units and the mortar, which can lead to a structure's premature erosion. As a rule of thumb, mortar with a large amount of cement is more likely to contract and be increasingly rigid, with the result that it does not fare as well when there is structural movement.

Mortar that includes a greater amount of lime is easier to manipulate and has a compressive strength that is better adapted to the requirements of the structures being built. Because the lime particles are so fine, this mortar is able to better adhere to and bind with the masonry units, which renders the structure more waterproof. Moreover, lime-based mortar is more flexible and has self-healing characteristics.

From an aesthetic perspective, the success of the project rests increasingly on using mortar pre-mixed at the plant. These mixtures are highly consistent, which lowers the risk of inappropriate use on job-sites (one of the causes of colour changes in masonry joints).

At KING, we strive to offer the "best of both worlds". Our mortar is pre-mixed at the plant, and has all of the qualities desired in a good product, (i.e. malleability, low permeability, high adhesion resistance, adequate compressive strength).

To help you choose the best mortar and grout, speak with your KING Technical Representative or see our mortar and grout selection guide for new buildings. This guide, published by KING, is available at: www.king-masonry.com

COLOURED MORTAR

STANDARD COLOURS

KING mortar is offered in a wide range of attractive shades. We recommend bringing our colour chart to the job-site, to confirm that the selected colour perfectly matches the masonry unit in question. (You can, of course, also choose the desired shade from the comfort of your office!) Regardless of the approach you adopt, you are sure to find an attractive hue that will keep its shine for the life of your project. To offer you the best possible quality in terms of colour, KING relies on iron oxide pigments. All KING mortar products can be coloured, meaning we can supply a mortar that will meet all of your requirements.

CUSTOM COLOURS

If the standard colours do not meet your specific requirements, a custom colour will be the perfect solution. Just send us the masonry unit in question and we will produce a colour that matches your specifications exactly. A minimum order may be necessary in such a case, and we ask that you please allow at least two weeks for delivery. Contact your local KING Representative today!

Coloured mortar is available in small, 30 KG bags or in bulk packages of 1,500 KG.

COLOUR PLUS SYSTEM

THE RIGHT COLOUR AT THE RIGHT MOMENT!

The **COLOUR PLUS SYSTEM** is exclusive to KING*. It consist of two components – pigment and mortar – pre-measured at our plant and ready to be mixed at the construction site, ensuring perfect colour every time.

ADVANTAGES

- Economical
- Ensures a quick start on the job-site
- Eliminates loss of material
- Enables deadlines to be respected at all times
- Guarantees colour uniformity

AVAILABLE FORMATS

KING's **COLOUR PLUS SYSTEM** is available in two formats.

- **XL FORMAT** – Measured for 120 KG of mortar.
- **S FORMAT** – Measured for 30 KG of mortar (exclusively used for restoration mortars).

HOW TO USE

In a clean container, pour 75% of the total water to be added to the mixture. Add the whole bag of pigment to the water and stir for one minute. Gradually add the whole quantity of mortar. Adjust the consistency of the mixture by adding the remaining water.

*KING Color Plus System is exclusively available for KING 1-1-6 mortars and for certain restoration mortars.
Please contact a KING Representative to obtain more information.

ESTIMATING MORTAR QUANTITY

This table should serve as a guide for estimating the quantity of mortar required for your project.
It is only a guide. Actual quantities will vary depending on the size of the joint, the core and the cavity.

MORTAR

SIZE OF BRICK	QUANTITY OF MORTAR
0.604 m^2 (6.5 /ft^2)	0.90 KG
0.455 m^2 (4.9/ft^2)	0.96 KG
0.390 m^2 (4.2/ft^2)	0.96 KG
0.279 m^2 (3.0/ft^2)	1.20 KG

SIZE OF BLOCK	QUANTITY OF MORTAR
102 mm x 102 mm x 406.4 mm (4” x 4” x 16”)	2.50 KG
152 mm x 203.2 mm x 406.4 mm (6” x 8” x 16”)	2.50 KG
203.2 mm x 203.2 mm x 406.4 mm (8” x 8” x 16”)	2.80 KG
254 mm x 203.2 mm x 406.4 mm 10” x 8” x 16”)	3.00 KG
304.8 mm x 203.2 mm x 406.4 mm (12” x 8” x 16”)	3.00 KG

GROUT

DIMENSIONS OF BLOCK	QUANTITY OF GROUT
203.2 mm (8”) block cell	6.00 KG (per cell)
254 mm (10”) block cell	6.50 KG (per cell)
304.8 mm (12”) block cell	7.00 KG (per cell)

For more options, visit www.king-masonry.com and view **“Our Services”**.

TECHNICAL DATA SHEET
SLURRY TECHNIQUE

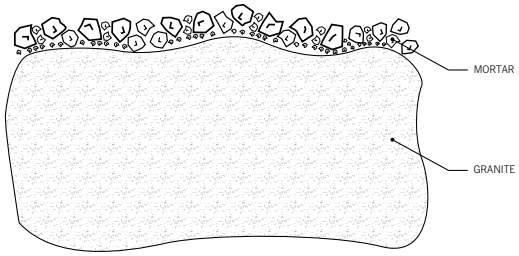
One of the key properties necessary to ensure long-lasting masonry work is the adhesion or bond between the mortar and the structural unit. This bond must reinforce the structural properties of the unit while preventing the entry of rainwater. This requires a comprehensive adhesion. If that is achieved, the wall will be sufficiently strong to stand up to surrounding conditions.*

As highlighted in the Canadian standard on mortar and grout, there must be not only adequate resistance but lasting adhesion as well.**

Adhesion or bond quality is affected by various constraints and factors. Among these is the absorption rate of masonry units. Adhesion is only possible when a masonry unit absorbs some of the water found in the mortar. The principle is simple: as it absorbs water, the masonry unit also takes in fine particles from the mixture, which have the effect of forming a solid bond. For some masonry units, the absorption rate is so low that few or no fine particles are absorbed. Masons have traditionally tended to add more water to the mix, in an effort to counter this lack of absorption by the masonry units. This has the unfortunate effect of further decreasing the mortar's ability to be manipulated, making it harder still to achieve a comprehensive and lasting adhesion.

The phenomenon is easier to understand if we imagine each sand speck in the mortar as constituting a direct link that has not been able to adequately bond with the masonry unit (Fig. 1).

Figure 1. Mortar applied directly to stone.



» *CBD-163-F, Mortiers pour maçonnerie (Masonry mortars), NRC-IRC publication, 1975.

» **CAN/CSA-A179-14, Mortar and grout for unit masonry, p.41.

GRANITE STONES

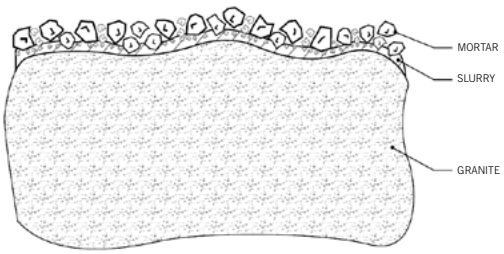
Granite stones are considered to be amongst the surfaces or walls with the lowest absorption rates. When working with a unit that has a low absorption rate, techniques must be adopted to favour the creation of a comprehensive and lasting adhesion.

The slurry technique is often used to improve adhesion and make up for the unit's original lack of absorption.

This technique calls for thinning pure Portland Cement (GU type) with water to obtain a consistency that is slightly less watery than grout. This mixture, called slurry, can be directly applied to the stones using a brush or trowel.

By applying a slurry mixture to the entire stone surface, comprehensive adhesion can be achieved. Because Portland Cement contains less air than mortar, the contact surface between the cement and stone is of greater dimension. A slurry that is at least 1/8" thick, allows the sand specks in the mortar to connect with the binding material rather than directly with the stone. This has the effect of decreasing the number of contact points between the sand and the unit (Fig. 2). The sand specks are thus tightly bonded to the slurry, which increases the resistance of the adhesion.

Figure 2. Mortar in slurry.



SLURRY TECHNIQUE

- Mix Portland Cement (GU type) and water.
- Apply the resulting slurry to all surfaces that will be in contact with the mortar.
- Let the slurry dry slightly before you apply the mortar. Once the slurry has lost its shine (but is still sticky) the mortar can be applied
- Make sure the slurry does not dry completely, as this will require you to start over.

INFLUENCE OF WATER-BINDING MATERIALS RATIO ON MASONRY MORTAR

The water-binding materials ratio is the parameter with the greatest influence on the properties of cement-type materials such as masonry mortar. It is used for most of the hydraulic masonry binders, including Portland Cement, natural cement or hydraulic lime. This ratio represents the weight of the mixing water compared to the weight of the binder in a given mixture. This ratio significantly influences several factors, such as how much the mixture can be manipulated when it is freshly mixed and what properties it has after hardening (for example, compressive strength, degree of expansion/contraction, and life/sustainability of the finished work).

Mortar with hydraulic binders hardens by means of a chemical reaction (hydration) between the binder particles and water. Theoretically, around 0.25 kilogram of water per kilogram of hydraulic binder is required to ensure hydration of the particles. This represents a water-to-cement ratio of 1:4 or 0.25. Mortar mixed with a ratio of 0.25, however, will not have the degree of manipulation required to erect masonry units.

To achieve this, additional water must be added. In fact, a water-binding materials ratio in excess of 0.75 is often used in conjunction with masonry units.

In such cases, the additional water not used during the hydration of particles will evaporate and, in so doing, generate a greater porosity which will ultimately lower the mortar's compressive strength.

Inversely, a lower water-binding materials ratio will lower the porosity and bring about a higher compressive strength. This, however, will negatively influence how well the mortar can be manipulated and could affect its adhesion to the masonry unit.

To recap, the more water you add to a volume of mortar, the lower its compressive strength will be, and the less water you add, the higher this resistance will be.

LABORATORY VS. JOB-SITE

The results reported on manufacturers' Technical Data Sheets are always associated with a certain volume of water. For masonry data, this volume or quantity is directly expressed as a range. For mortar, the CAN/CSA-A179 standard stipulates that the range as measured in the laboratory should fall between 110% and 115%, but that for job-sites, this same range should be between 130% and 150%.

The discrepancy is explained by the fact that in a laboratory setting, the degree to which mortar can be manipulated need not be considered and the cubes used for tests have a 0% absorption rate. On a job-site, the extent to which mortar can be manipulated is critical and masonry unit absorption rates vary. While performing their work, masons may choose to modify the amount of water prescribed in a product's Technical Data Sheet. Possible reasons for such a change could include the masonry unit absorption rate, the ambient temperature, the wind and the masonry unit weight.

As outlined, modifying the quantity of water (or the range) will bring about a change in the mortar's compressive strength.

Bearing in mind the numerous possible variations, the CAN/CSA-A179 standard always refers to a mortar's minimum compressive strength when its acceptance is contingent on these properties.

Hence, a Type N Mortar will have a minimum compressive strength at the job-site of 3.5 MPa at 28 days, while the minimum compressive strength at the job-site of a Type S Mortar will be 8.5 MPa at 28 days.

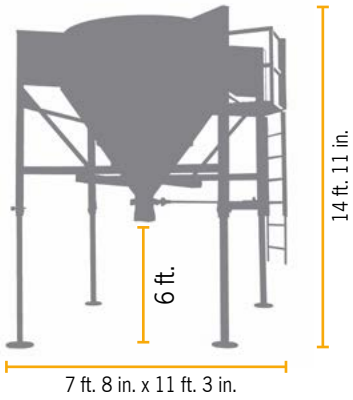
TWO KEY POINTS TO REMEMBER

- Knowing the water-binding materials ratio of the prepared mortar is essential to properly interpreting the results obtained from job-sites tests.
- The analysis of the results should also consider the absorption rate of the erected masonry units, for it has an influence on several elements, including the hardened mortar's porosity.

For additional explanations regarding the influence of the water-binding materials ratio on masonry mortars, contact your KING Technical Representative.

SPECIFICATIONS - LARGE AND SMALL SILOS

LARGE SILO	Capacity: 3 x 1500 KG bags Weight: 1670 KG



SMALL SILO	Capacity: 1-2 bags x 1500 KG Weight: 680 KG