INTRODUCTION

The principal purpose of mortar is to adhesively bind together the individual masonry units. It also provides protection against the penetration of air and water through the joints in a masonry assembly. Mortar also bonds the non-masonry elements of an assembly such as joint reinforcement and ties. It also compensates for minor dimensional variations in the masonry units, and provides coursing adjustment to meet required dimensions. Finally, mortar joints contribute to the architectural effect of the masonry assembly both through colour and shadow.

Mortars are supplied to the job site in three ways:

- Site mixed – the mortar is prepared on site by the mason.
- Pre-mixed wet – the mortar is commercially prepared off-site and shipped in tubs ready to use. A retarder is added to the mixture to ensure the mortar in tubs does not set up before being placed in the wall.
- Pre-mixed dry – the mortar is commercially prepared off-site and supplied in bulk bags or small bags. Water is added to the mix by the mason on site.

The supply of mortar is not typically specified, but rather determined by the mason based on site conditions.

BOND – MORTAR'S MOST IMPORTANT PROPERTY

Mortar mixes include ingredients that give it strength (i.e. cement) and those that promote workability and good bond with the masonry units. Good workability and water retentivity are essential for maximum bond. A mortar that has overly high cement content will be stronger, but may produce less bond. Conversely, a mortar with moderate cement content will not be as strong, but will have better bond strength.

- Mortar bonds masonry units together. Good bond strength will significantly contribute to a masonry wall's integrity and weather resistance.
- The compressive strength of mortar has only a small effect on the strength of the wall, but gives it durability.

A good balance of strength and bond is required. This leads to both

good structural performance and weather resistance.

Site inspection of mortar is generally not a significant concern for designers, because the bricklayer and the specifier are both looking for workable, well-proportioned mixes that ensure installation efficiency for the mason, and long-term performance for the designer.

MORTAR COLOUR

From 8-22% of the wall area is taken up with mortar (depending on the unit size), therefore the colour of the mortar can significantly alter the appearance of the wall. Natural gray mortar is the most common and generally the best choice for brick and gray block. It sets off the brick colour nicely and is the most economical. In general, if a brick mortar colour is used it matches the brick in a lighter tone. Coloured mortars are usually specified for coloured block to solidify the colour impact and to simplify cleaning after construction.

SPECIFYING MORTAR

CSA A179-04 Mortar and Grout for Unit Masonry covers raw materials, mortar types, mixing process and mortar specifications. Mortar types within CSA A179-04 are designated by the letters “S” or “N”: Type S is typically used for both structural and veneer masonry, while Type N can also be used for veneer masonry construction. There are also Type O and K mortars that have proportions that are suitable for some restoration projects. Mortar specification can be made either through the Proportion or Property method. The Proportion method is used for site-mixed mortar and is based on the respective volumes of sand and cementitious materials. The Property method is based upon compressive strength tests of mortar cubes, and is typically only used for pre-mixed mortar (also see Section 3.1 – Masonry Standards Commentary).

Typical spec:

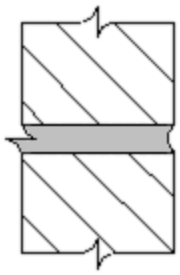
Mortar to: CSA A179-04
Type S, mortar for structural and veneer masonry
Proportion specification shall apply to field mixed mortar;
Property specification shall apply to mortar manufactured off-site

Ancient Egyptian mortars were made from burned gypsum and sand while later development in mortar technology utilized a combination of lime and sand. These mortars developed their strength slowly (through a process of carbonation). Since about 1900, Portland cement has been incorporated into mortar to provide more rapid strength development. Modern mortar is composed of either cement and lime or masonry/mortar cements, plus masonry sand, water, and possibly some admixtures.

JOINT PROFILES

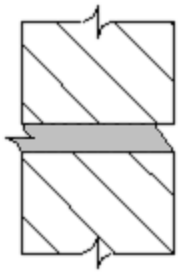
The mortar joint profile has an impact on water resistance. It also has a significant effect on appearance. Ranked by their effectiveness (highest to lowest) to resist penetration of water, common joint types are:

1. Concave Joint



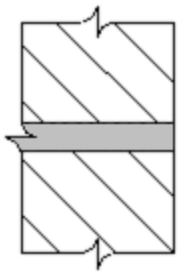
Concave tooling of the mortar joint compacts the mortar properly against the units. A dense, smooth surface is formed that sheds water effectively. This type of joint is very effective in resisting rain penetration and therefore is recommended for use in walls exposed to wind driven rain.

2. Weathered Joint



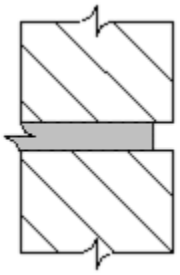
Although less effective than the concave tooled joint, the weathered or weather joint can be acceptable as a water resistant mortar joint as it is somewhat compacted and sheds the rain.

3. Flush Joint



The troweling of a flush joint forms an uncompacted joint with a possible hairline crack where the mortar is pulled away from the unit. Flush joints are not recommended as being rain resistant mortar joints and should only be used on walls that are to receive additional finishes.

4. Raked Joint



The raked joint may or may not be compacted and it provides a ledge where rain water will settle and possibly enter the wall. It is therefore not recommended as a rain resistant mortar joint and should not be used on walls exposed to weather.

Note: Because raked joints do not weather well, the use of scored block (which require the use of a raked joint) is not recommended for exposed walls.