MORTARS FOR CAST STONE INSTALLATION

Selecting the appropriate type of mortar for setting cast stone is perhaps the most important factor in the performance of a masonry wall. The mortar must have sufficient strength, be durable, resist rain penetration as much as possible and yet be flexible enough to accommodate slight movement within the wall assembly.

As noted in TMS 604-16, Standard Specification for Installation of Architectural Cast Stone, mortars used in the setting of cast stone should meet the requirements of ASTM C270, Type N mortars. These mortars generally consist of one part cementitious material (Portland cement and lime, or masonry or mortar cement) to three parts of clean, washed masonry sand (ASTM C144). The mortar may also contain iron oxide coloring pigments (ASTM C979) and admixtures (ASTM C1384).

The selection of a Type N mortar provides good bond strength with desired weather resistance and sufficient compressive strength relative to the cast stone when cured. Plasticizing agents, such as lime or ground limestone, enhance the workability of the mortar while reducing shrinkage. The practice of wetting the head and bed joints of the stone and tooling the mortar when thumbprint hard will further protect against joint shrinkage. Although Type N mortar is the standard used with cast stone (as well as many natural cut stone), the proportions may be varied to suit specific applications.

Proper mixing is essential to good consistency. All materials, except pigments, should be measured by volume. Sands should be placed in the spiral-blade or paddle type mixer first, followed by pigments (if required), pre-water, lime and cement, final water and 5-7 minutes of mixing time. Due to the various admixtures available for mortar, consult with the manufacturer for recommended addition rates and mix sequencing. Mortars unused after 2 ½ hours should be discarded (this time may be shorter depending on the ambient conditions).

Head joints in most hand-set cast stone may be set with the usual wet consistency mortar used in setting brick and block. Stiffer mortar must be used when setting larger stones and shims are recommended for all pieces over 300 lbs. When setting, fill all dowel holes, anchor slots and similar building stone anchor pockets completely with mortar. Non-shrink grout or anchoring cement may be specified for dowel connections. Caution should be used when the bed joint is on horizontal flashing as it will act as a bond breaker. Special anchorage may be necessary to accommodate this condition as well as in the vertical joints of the first course below a relief angle. Mechanical anchors are recommended to be installed within the first course above and below each relief angle.

Mortar systems have the ability to carry loads but cannot absorb much joint movement. For this reason, thoughtful designers often require that joints at parapets, copings and other particularly sensitive areas be left un-mortared for later filling with sealants. A mortar lock feature may be incorporated in the sides of the cast stone in order to add positive engagement of the mortar element into the cast stone unit. This helps to restrain the cast stone if the shear bond is lost between the cast stone and mortar.

When using a post-setting pointing system, all stone-to-stone joints should be raked to a depth of ¾ in. for later pointing. It should be noted that in many cases, but in particular when setting small veneer pieces, it is not practical to rake out and point all joints. In these instances, full bed setting and finishing in one operation can be used. Particular attention must be paid to the waterproofing systems incorporated into the veneer. Stone-to-brick joints are usually struck and tooled to a concave shape (See Technical Bulletin #44 on Pointing). Sponge all mortar smears from the face of the cast stone with water as hardened, mortar smears are difficult to remove from the surface of cast stone. Clean with water and a stiff fiber brush or with a commercial masonry cleaner approved for use with cast stone. Metal bristle brushes should not be used. Consult the cast stone manufacturer before performing any cleaning procedure. Direct high pressure power washers should never be used to clean cast stone. See Technical Bulletin #39 on Cleaning.

If lug sills, which extend beyond the masonry opening, are fully set in mortar, the mortar at the ends under the lugs (where the load is) may, in certain situations, compress or shrink more than the rest of the mortar (due to overburden forces), causing shear or bending stress in the sill and possibly leading to failure. One of two techniques can be used when setting lug sills. The first technique is to set only the ends of lug sills in a full bed of mortar and point the portion of the sill inside the masonry opening after the initial mortar bed has cured. The second technique is to shim under the lugs to bear any compressive loads. The designer should examine the lug sill configuration and how it interfaces with the adjacent and under-supporting masonry units to ensure that point bearing will not occur at the mid-span of the sill. Slip sills, which do not extend past the masonry opening, do not carry any load other than itself and are set in a full bed of mortar.

Designers should specify where to use mortar/pointed joints and where to use sealant joints. Typically, conventional masonry cast stone units may be set with mortar joints. Where panels are larger than conventional masonry units (1 ft. 6 in. tall by 2 ft. 6 in. in length for vertical applications), "soft" sealant joints are generally recommended. In such unique cases, a professional designer or engineer should be consulted for proper joint design and function. After setting, prime the ends of the stones (if necessary), insert a properly sized backup rod followed by application of a sealant using a caulking tool.

Selection of Joint Type for Cast Stone

Control or Expansion Joint Location	Mortar/pointed joints	Sealant joints
Most bed joints	Recommended	As needed
Head joints at coping, joints at column covers, cornices, platforms, soffits, stone with projecting profiles, exposed top joints, rigid suspension connections	Not recommended	Recommended
Units larger than 1 ft. 6 in. x 2 ft. 6 in.*	Not recommended for vertical applications	Recommended

*Proper joint design and function should be based on recommendations from an engineer or other design professional. For recommendations on sealants, please see Technical Bulletin #43.