



DESIGN TIPS – TECHNICAL BULLETIN #42 MORTARS [1 of 2]

Selection of the correct grade of mortar 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.

Mortars used in the setting of Cast Stone should meet the requirements of ASTM C270, Type N mortars. These Portland cement/lime mortars generally consist of one part cement (ASTM C150), one part lime (ASTM C207) and six parts of clean, washed masonry sand (ASTM C144). They may also contain iron oxide coloring pigments (ASTM C979).

The 1/1/6 mixture provides good bond strength with desired weather resistance and moderate compressive strength relative to the stone when cured. The lime enhances the workability of the mortar while reducing shrinkage. The practice of wetting the head and bed joints of the stone will further protect against joint shrinkage.

Although Type N mortar is the standard used in Cast Stone (as well as many natural cut stone) applications, the proportions may be varied to suit specific applications.

Proper mixing is essential to good consistency. All materials except pigments are 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. Mortars unused after 2 ½ hours should be discarded. (This time may be affected by temperature.)

Head joints in most hand set stones 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.

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 open (unmortared) for later closing with sealants.

When using a post setting pointing system, rake all stone-to-stone joints to a depth of ¾" for pointing later. It should be noted that in many cases (and specifically 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 behind and incorporated into the veneer. Stone-to-brick joints are usually struck and tooled to a slight concave. See [Technical Bulletin #44](#) on Pointing. Sponge all mortar smears from face of stone with water. Hardened, smeared mortar is difficult to remove from the surface of cast stone. Clean with a commercial masonry cleaner approved for use with cast stone or with water and a stiff fiber brush. Consult Cast Stone manufacturer first. 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 additional precautions may be taken when setting lug sills. The first 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 other approach is to shim under the lugs to bear any compressive loads. The system designer should examine the lug sill configuration and how it interfaces with the adjacent and under-supporting masonry units to insure that



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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 themselves and are set in a full bed of mortar.

The decision on whether to use mortar/pointed joints or sealant joints is a common one. All head joints at coping and joints at column covers, cornices, platforms, soffits, and in general, all stone sections with projecting profiles, exposed top joints or rigid suspension connections to the supporting structure should be "soft" sealant joints. Additionally, when piece sizes are larger than conventional masonry units (1'6" tall by 2'6" in length for vertical applications) "soft" sealant joints are generally recommended, and 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 properly sized backup rod and gun in sealant. See [Technical Bulletin #43](#) on Sealants.