



TECHNICAL BULLETINS - Value Engineering Considerations

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The information within this and all our bulletins has been provided as a guideline and based upon statistical data and prior uses. We always suggest that you consult with your engineer, architect or contractor for the best design and use of cast stone for your project. Our design team is always available to answer any of your questions. We do not accept any liability from damages resulting from your interpretation of the data contained within.

The following are front-end engineering considerations for the manufacturing of cast stone material. They are provided for general purposes, and as suggestions, and precautions that we feel are important; they are for use as a guideline to assist you. Please keep in mind that this information is not all inclusive. We suggest that you also review the individual bulletins made available to you on our website or consult the Cast Stone Institute website for additional information.

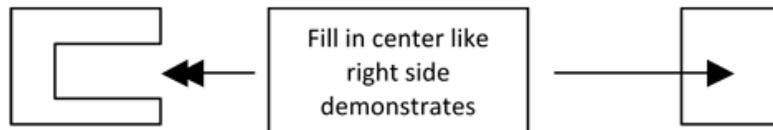
Preliminary considerations must be examined during the planning and design stages of any project. Technical, Care and Maintenance, and Design Tip Bulletins have been created to give a broad recommendation for the following considerations. If you have questions regarding any topic related to the construction, application, installation, and care of cast stone after reviewing these bulletins, it is highly recommended that you contact the Espinoza Cast Stone, Inc., design team for recommendations. Considerations include:

- Shapes and dimensions of cast stone material.
- How cast stone molds will be constructed to insure tamped edge is not visible.
- How cast stone is positioned for curing.
- Application of the cast stone.
- Environmental conditions of structure -- weather, temperature, and moisture.
- Allowances for movement.
- Sealants, mortars, and joints.
- Anchoring & Reinforcement Systems, including anchors insets in the cast stone.
- Lifting inserts for large pieces.
- Inspection of material upon delivery.
- Storage of material before installation.
- Cleaning and Water Repellents.

Shapes and dimensions of cast stone material play an important part in manufacturing, shipping, installation, and application. To understand the importance of the shapes and sizes designed, it is important to understand the manufacturing process. Cast stone is made using the vibrant dry-tamp method. It is a mixture of three parts sand to one part cement with additives and possible colorants. Water is added to make it wet enough to stick together, similar to making a sand castle. The mixture is tamped into molds using small air hammers. Once tamped the material is turned over and released from the mold onto a curing rack. The material is then inspected, finished, steam cured, re-inspected, allowed to further cure and is then palletized ready for shipment. Cast stone pieces are separated by styrofoam for their protection during shipment and secured on the pallet. We prefer that shipments go out on air ride flatbeds and covered as there is less chance of damage from multiple movements and transfers between trucks and forklifts.

Keep in mind that "L" and "U" shaped material can be manufactured although alternative considerations should be explored for a couple of reasons.

Although cast stone is not designed to be load bearing, it is a heavy material and the weight of the upper pieces has a contributing factor on the lower pieces based upon installation techniques and anchoring systems. The "U" shaped pieces that have an



The molds are designed to tamp the face of the stone at the base with the larger portion, as possible, at the top of the mold for tamping purposes. Once the piece has been properly tamped, the team flips the mold upside down and releases the top and sides. The tamped side is now facing down on the curing boards. This tamped side is also the side that is secured to the building and not visible. The face of the stone is now facing up. Once the curing system is initiated, the moisture has a greater chance of being received by the face of the stone.

Cast stone is architecturally designed decorative stone that is not designed to be load bearing. Cast stone is excellent for enhancing windows and doors with beautiful surrounds. Products like trims, banding, jack arches, keystones, medallions, columns, and balustrade systems are excellent uses for cast stone. Wall coping, parapet coping, pier caps, and finials that are designed to fit upon newel piers, wall supports, mailbox housings, and more, are all excellent ways to add the special contrast and finishing touch to any project.

One must consider the anchoring and support system for the cast stone material as there must be a proper support beneath the stone. Edging on the stone should not stick out farther than the support unless it is at least one inch wide and cannot be easily damaged should it be hit. The bulletins contained within can address the individual nuances of cast stone material.

Architects and designers should take into consideration the environment that the cast stone will be used in. Weather conditions play an important role on when the material should be installed, patched, and sealed. Cast stone should not be installed in freezing conditions or when a freeze is expected within 24 hours of installation. Extra precautions should be taken when installing cast stone material in extremely hot areas. Starting in the early hours, working in the shade and keeping the cast stone and mortar, grout, or caulking moist throughout the day, is important to prevent 'quick' drying and shrinkage of the materials used. Areas with excess moisture should have proper runoff and be properly sealed to protect the cast stone from constant standing water such as found in and around planter boxes.

Architects and designers must make allowances for movement. One must be aware of the types of masonry material being used on their project as well as the environmental conditions that it will endure. Concrete does shrink and expand. Moisture allows it to expand. Drying throughout the years will show some shrinkage over time. The joints and mortar used when installing the cast stone material is important. Consideration of the adjoining masonry material—brick, stucco, and masonry---must also be taken into consideration as they have their idiosyncrasies based upon the material used to manufacture them.

The design team should make themselves aware of the various sealants and mortar joints that should, or should not be used with cast stone. There are several sealants available, and our bulletins covers the specifications of each.

Architects must consider the anchoring system and reinforcements used when applying any masonry material. The advantage that cast stone has over natural stone is the ability to contain integral reinforcement for added strength. Again, keep in mind that cast stone is not designed to be load bearing, and yet its distinct advantage is the ability to combine high compressive strength with tensile strength of reinforcing bars to provide safety and support, as well as the prevention of cracking.

Although some reinforcement issues were covered in the first section on shapes and sizes of pieces, it is important to consider the behind the scenes support system to anchor the masonry materials securely and safely to the building or structure itself.

Additionally, it is important to consider how material will be joined together. Dowel holes are usually called for in the design so material can be pieced together properly. Column shafts usually have dowel holes in the upper and lower sections so they can fit together properly, aligning perfectly, among themselves as well as with the caps and bases. Placing dowel holes in banding and coping allows masons to easily join the pieces while aligning them properly, and holding them in place as they are installed.

Both lifting considerations as well as anchoring consideration must be examined. When one is anchoring a heavy piece of cast stone material, it is important to consider both how it will be anchored, as well as how it will be lifted into place. When dealing with large pieces it is important to design the individual pieces with both anchors for support, as well as lifting inserts so the piece can be properly hoisted and put into place while the team is securing the permanent anchoring system. It is a humbling and exhausting event when one must install a large piece and one of the two, anchor or lifting, systems has not been considered.

Inspection of material upon delivery is a must. Once the material has arrived at the job site, it must be accounted for. If there are any discrepancies or damaged pieces, they must be reported to the manufacturing plant within 72 hours. New pieces can be made and sent out to the job site immediately so there is no hold up in the installation process.

A set of setting plans should be on-site so the mason, or contractor can ensure that all the pieces to his 'new puzzle' are accounted for and properly fit. Laying out window and door surrounds on the ground will ensure the profiles are consistent and the pieces fit together properly, thus preventing disappointing results after the cast stone has been installed.

Some of the longer and repetitious pieces, such as trim, banding and coping, may be manufactured in two to four feet sections so field cutting is properly done to fit the material around the project as necessary. Confirming that the left and right returns and corners have been accounted for before cutting the longer pieces, helps prevent a shortage of material at the end.

Proper storage of the cast stone materials is important. Once accounted for, cast stone must be properly stored for its protection. If taken out off the pallets, place the cast stone on non-staining, substantially supportive material, off the ground. Cast stone should be properly covered to protected from sand, dust, moisture, oils, etc., and out of the course of the main traffic.

Cleaning of cast stone is done when all the material is installed and can be cleaned simultaneously. Using any acid based cleaning solution can draw out additional chemicals that can change the texture and coloring of the stone, thus, testing the cleaner on an inconspicuous spot would be advantageous.

Keep in mind that the stone curing times may differ, different materials may be shipped on different dates, inclement changes in weather, and storage all affect the drying times. Color variations may be more apparent at different times than others. If you have done any patching, the wet stone will be darker than the dryer stone. The colors will even out over time, which can take a couple of months.

When cleaning the materials, you will want to monitor the drainage of the acid based cleaners so they do not puddle and collect in any one area. Proper drainage must be considered when cleaning the cast stone. Protection of the windows, wood and any other ornamental items may need to be considered as well.

Water Repellent should only be applied after the final inspection has taken place, and all materials have been approved. Siloxanes, silanes, or a blend of both is the most recommended forms of water repellents used for weatherproofing cast stone material. Weather, moisture, vapor transmission, adequate ventilation, timing, and temperature all play an important part in the process and all must be considered before application. Verify that all patching, touchup, repair, and cleaning has been completed before taking on the task of the final water repellent application.