Reinforced Masonry Pier Construction

**Purpose:** To provide an alternative to piles in V Zones and A Zones in coastal areas where soil properties and other site conditions indicate that piers are an acceptable alternative to the usually recommended pile foundation. Examples of appropriate conditions for the use of piers are where rock is at or near the surface or where the potential for erosion and scour is low.

**Key Issues**

- The footing must be designed for the soil conditions present. Pier foundations are generally not recommended in V Zones or in A Zones in coastal areas.

- The connection between the pier and its footing must be properly designed and constructed to resist separation of the pier from the footing and overturning due to lateral (flood, wind, debris) forces.

- The top of the footing must be below the anticipated erosion and scour depth.

- The piers must be reinforced with steel and fully grouted.

- The connection to the floor beam at the top of the pier must be through use of properly sized and detailed metal connectors.

- Special attention must be given to the application of mortar and the tooling of all the joints in order to help resist water intrusion into the pier core, where the steel can be corroded.

- Special attention must be given to corrosion protection of joint reinforcement, accessories, anchors, and reinforcement bars. Joint reinforcement that is exposed to weather or the earth shall be stainless steel, hot dipped galvanized, or epoxy coated. Wall ties, plates, bars, anchors, and inserts exposed to earth or weather shall also be stainless steel, hot dipped galvanized, or epoxy coated. Reinforcement bars shall be protected by proper use of masonry cover.

**Figure 1.** In coastal areas, masonry pier foundations are not recommended in V Zones with erodible soils, or in A Zones subject to waves and erosion — use pile foundations in these areas.
Piers vs. Piles

Pier foundations are most appropriate in areas where:

- Erosion and scour potential are low.
- Flood depths and lateral forces are low.
- Soil can help resist overturning of pier.

The combination of high winds and moist (sometimes salt-laden) air can have a damaging effect on masonry construction by forcing moisture into even the smallest of cracks or openings in the masonry joints. The entry of moisture into reinforced masonry construction can lead to corrosion of the steel reinforcement bars and subsequent cracking and spalling of the masonry. Moisture resistance is highly influenced by the quality of the materials and the quality of the masonry construction at the site.

Good Masonry Practice

If a masonry pier is determined to be an appropriate foundation for a building, there are some practices that should be followed during construction of the piers.

- Masonry units and packaged mortar and grout materials should be stored off the ground and covered.
- Masonry work in progress must be well protected from exposure to weather.
- Connectors should be selected that are appropriate for masonry to wood connection. It is important to maintain a sufficient load path from the building into the ground. The connectors and fasteners should be a corrosion-resistant material or have corrosion protection at least equivalent to that provided by coatings in accordance with the 2009 IRC. Connectors should be properly embedded or attached to the pier. Wood in contact with masonry pier should be naturally durable or preservative-treated. Figure 3 illustrates the importance of maintaining a proper load path between the pier and the building’s beams.
- Properly sized steel reinforcing bars should be installed throughout the masonry piers. Piers should be fully grouted and steel reinforcing bars should not be left exposed to weather for excessive amounts of time prior to installation. Lap splices should be properly located and of sufficient length to meet the standard masonry industry details and requirements to sufficiently carry the loads imposed on the structure.
- Consider incorporating grade beams into the foundation in order to achieve greater structural stability in the pier system.
- If the design of the pier system or any details are unclear, contact a structural engineer or appropriate design professional to clarify the foundation details.

Pros and Cons of Grade Beams

Grade beams are horizontal structural members cast against the ground or “grade.” Grade beams can be a useful foundation method in areas with limited potential for erosion and scour. The type of force resisted by grade beams varies by application, but can range from continuous vertical and horizontal loads to axial loads. The grade beams used in this example are used primarily for axial loads generated by stability demands of the piers. The grade beams should be placed below the elevation of anticipated eroded grade so that there is no effect on scour and erosion of the supporting soils.

The pros of using grade beams with pier foundations are that they:

- Provide vertical and lateral support.
- Are less prone to rotation and overturning.
- Transfer loads imposed on the elevated home and foundation to the ground below.

Figure 2. Pier breakage (Long Beach, Mississippi)
Some cons of using grade beams with pier foundations are that they:

- Are susceptible to erosion and scour if too shallow
- Can become obstructions during flood events and can increase scour

**Figure 3. Failure of pier-to-beam connections due to wave and flood forces acting on the elevated building (Long Beach, Mississippi)**

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**Additional Resources**


