FOUNDATIONS & PIERS

Arizona
Department of Fire, Building and Life Safety

Office of Manufactured Housing
Today’s Manufactured Homes are different in many ways compared to older Mobile Homes. Some homes may be built with 2x6 walls, drywall instead of wood paneling, shingle roofs or even exterior walls with stucco.

It is more important than ever to ensure the foundation systems are capable of withstanding these extra loads and that the loads are transferred correctly to the ground.
All footings must meet these minimum requirements

- Place each footing on a surface capable of distributing equalized transfer of applied loads
- Place on firm undisturbed soil or controlled fill, free of grass and organic matter
- Calculate and use the minimum size of each footing necessary to minimize settling of the unit accounting for local soil conditions
FOOTINGS

• In freezing climates, the footing must extend below the frost line or be otherwise protected from the effects of frost heave
• Use main frame blocking installed on footings with 144 square inches of surface placed 3’6” on center, or footings with 256 square inches of surface placed at 6’ intervals to support manufactured homes manufactured on or after January 1, 1984
Pads and supports of any type cannot be split between surfaces. Pads and piers must be on 100% soil base or 100% concrete pad or footing.

Note: Existing concrete slabs, such as in mobile home parks, cannot be used to support main beam structural supports unless the manufacturer of the home approves its use and knows that there will be dissimilar foundations involved. Also the slab must be tested by an engineer and proved to hold acceptable loads.
Without written approval by the home’s manufacturer and an engineer certification, the pad may be demolished or cut out for pier placement.
Pads and piers cannot be placed on uncompacted soil. Soil cannot be loosely piled up under pads and supports.
• Required on both sides of open spans and doorways over 48 inches
• Additional piers are required with open spans over 10 feet
• Unsupported ridge-beams are included in open span spacing
• Column supports are always required
Column Pier Support when Perimeter Blocking is Required

- Maximum pier spacing is based on roof load, size or design of unit
- Both sides of open spans and doorways over 48 inches
- Unsupported ridge-beams are included in open span spacing
- Column supports are always required
Marriage/Mod Line Piers

- Perpendicular to rim joists
- Supports both floor sections
FOOTING TYPES

There are 4 types of footings that are approved by the State of Arizona and/or HUD

- Plywood pads
- Wood pads
- Hard plastic pad
- Precast concrete pad
PLYWOOD PADS

When using plywood pads

- Minimum thickness - 3/4 inch or 2 pads 5/8 inch
- Minimum of 12 inches wide
- Grade CDX APA rated sheeting exposure 1, PSI treated for ground contact
- Stack with face grain perpendicular and fasten with corrosion resistant nails or 7/16 inch wide-crown staples or screws
- Warped or curled pads with splits shall not be used
16” Plywood pad. A maximum of 2 plywood pads may be stacked, with face grain perpendicular and must be fastened together.
Cannot stack more than 2 pads
WOOD PAD

When using wood pad

- Minimum 2 inch nominal thickness
- Minimum 12 inches wide
- Treated for ground contact, conforming to the IBC 2303.1.8 or IRC R402.1.2
- Maximum 2 stacked and fasten with corrosion resistant nails or 7/16 inch wide crown staples or screws
- Cut ends must be field-treated
- Do not use any 2 inch thick piece of wood with split penetration greater than 4 inches into the end of the piece and parallel to the edges of the piece
Minimum of 12” X 20” solid pressure treated lumber
Solid lumber cannot be used in this manner to create a pier pad
Other forms of lumber use for support are not acceptable unless engineered, and on a state approved plan.
When using hard plastic pad

- Pad shall have 256 or 144 square inches of ground surface
- Pad shall withstand a minimum vertical concentrated load failure rating of 15,000 pounds when tested on very dense and coarse gravel soils.
- Pads cannot have cracks or damage
- Pads cannot be curled or bowed
- Stack up to 2 pads and only when the pad is provided with an interlocking system
Hard Plastic Pad
A maximum of 2 plastic pads can be stacked if they are of the interlocking type.
Configuration and use of plastic pads vary by manufacturer, requiring pads to be face up or face down depending on the type of pier used.
When using pre-cast concrete pad

- Use pads with 256 or 144 square inches
- Must be minimum 3 inches thick
- Stack no more than 2 pads of equal size surface
- Pads shall have a minimum of 28 days compressive strength of not less than 4000 pounds per square inch
Tapered pre-cast Concrete Pads

NOTE: Tapered pads cannot be stacked
No more than 2 concrete pads can be stacked if pads are of the same dimension.
None of this is acceptable!
Cannot stack different pads together

Cannot use two caps to perform as a pier pad
Broken pads are unacceptable
Pads that are too small for the pier are not acceptable
When using poured-in-place concrete

• Poured footings must be accompanied with a State Approved Plan provided by a Registered Engineer
• Minimum 6 inches thick
• At least a 28-day compressive strength of 3,000 lbs. psi.
• Site specific soil conditions or design load requirements may also require the use of reinforcing steel in cast-in-place concrete footings
• An open footing and rebar inspection is required prior to pouring cast-in-place concrete footings
Rebar and framing for ribbon pour
Engineered ribbon footing
Pier Location and Spacing

Location and spacing of piers is dependent upon dimension, live and dead loads, type of construction, soil bearing capacity, I-beam size, footings, doors, windows, columns, and interior open spans. Location and spacing requirements vary but are available in the following resources:

- Manufacturer’s Installation Instructions
- State of Arizona Statutes and Rules, R4-34-803
- 24 CFR part 3285 HUD’s Installation Standards
- Arizona Approved design provided by a registered Architect or Engineer
SUPPORT PIERS

There are 3 types of piers that are approved for use when installing a Manufactured Home, Mobile Home

• Concrete masonry unit building blocks (CMU’S)
• Metal Piers
• Concrete pier
SUPPORT PIERS

There are minimum standards that apply to all types of piers, let us talk about these first

- The bases of all piers must be equal or less in size than the foundation pad
- All piers must have a foundation pad
- Maximum load shall not to exceed 8,000 lbs
- Each support or pier must have a minimum vertical concentrated load failure rating of 15,000 lbs
SUPPORT PIERs

- Support height can be no less than 12 inches including the foundation pad, or higher to allow for flexible crossover duct to clear the soil, per instructions.
- Support height can be no greater than 36 inches without a State Approved Plan stamped by an Engineer.
- Locate supports or piers no more than 2 feet from end of main beam and no more than 6 feet on center.
- When intervals of no greater than 6 feet are not feasible because of running gear, supports shall be located as close as possible to the running gear with the remainder of the supports spaced according to the 6 and 2 foot requirements or as per manufacturer’s installation manual.
When using metal piers

- Stagger the flanges on top of piers so that every other flange is on the opposite side of the beam
- Do not use if factory applied coating is flaking, pier has more than surface rust, bent, has broken welds or damaged
- Do not adjust pier head more than 2 inches, per instructions
- Install to piers Manufactures Installation Instructions
Metal Pier

Metal pier foot cannot be extended more than 2”

Metal pier foot must alternate direction throughout length of frame
It is unacceptable to stack steel piers
CMU BLOCKS

When using CMU blocks for pier supports

• Use open or closed concrete blocks 8x8x16 inches conforming to ASTM C-90
• Stack CMU blocks perpendicular to the I-beam frame
• Use foundation pad minimum of 256 square inches
• Must be stacked with their hollow cells aligned vertically
• Single stack 8x8x16 inch blocks less than 36 inches high
• Structural loads must be evenly distributed across capped hollow block piers
• Use 2 wedges in alignment per pier support
• Cannot use decorative blocks
CMU piers with caps and wedges
Plastic pads are inverted for CMU block use
CONCRETE PIER

A concrete pier sits on the pad, but because there is no adjustable foot like a steel pier, two wedges are used to between the concrete pier and the unit.
A poured in place column can be used for support. This type of support must be designed by a Registered Engineer or Architect and the plan must be approved by the State of Arizona’s planning department.
CAPS

Hollow CMU’s used for piers must have caps to distribute structural loads

• Use concrete cap 4 x 8 x 16 inches
• Use hardwood cap 2 x 8 x 16 inches
• Use steel cap ½ x 8 x 16 inches
• Must be of the same length and width as the piers on which they rest
• When split caps are used on double stacked blocks, the caps must be installed with the long dimension across the joint in the blocks below
WEDGES AND FILLERS

Any gaps that occur during installation between the bottom of the main chassis beam and foundation support cap must be filled

- 2 - 1 ½ x 3 ½ x 6 inch shims or wedges
- No thicker than 2 inch nominal hardwood
- Wedges should be tight and the developed height shall not exceed 2 inches
- When split caps are used, 2 sets of wedges shall be used also
PERIMETER SUPPORTS

Perimeter supports must be within 12” of edge of unit. Perimeter piers may be required in the following locations. Check your Manufactures Installation Instructions for specific requirements for each home:

- Both sides of sidewall exterior doors
- Sliding glass doors
- Under porch posts
- Factory installed fireplaces and fireplace stoves
- Under jamb studs
- Multiple window openings separated only by a king stud
- At any other sidewall openings 48 inches or greater
- For roof loads 40 psf or greater consult an Engineer or Architect
Homes or buildings with a certain size, weight, or roof load require full perimeter support, not just at sidewall openings. You must reference the manufacturer’s installation instructions, the home’s data plate and markers on the home itself.

Some homes do not indicate perimeter support on the data plates. The home may come with perimeter support tabs noting where to place a support. Other homes, the installer or contractor must reference the manufacturer’s installation instructions which would note what size of home or eave types would require full home perimeter support.
Champion homes serial number has an indicator. If a “OOP” is in the serial number then it requires perimeter support throughout the home. “OOO” does not require full home perimeter supports.
Clayton/Schult data plates tell you if perimeter support is required.
Cavco homes have this stamped on the data plates to indicate the home requires full home perimeter supports.
Multiple window openings with a single stud separation
Perimeter piers at door openings
Perimeter support required throughout on some homes
Questions?
Department of Fire, Building and Life Safety
Office of Manufactured Housing

1110 West Washington, Suite 100
Phoenix, AZ 85007-2935

Phone (602) 364-1003
FAX (602) 364-1063
www.dfbls.az.gov