FOUNDATIONS & PIERS

Arizona
Department of Fire, Building and Life Safety

Office of Manufactured Housing

OVERVIEW

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

FOOTINGS

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**

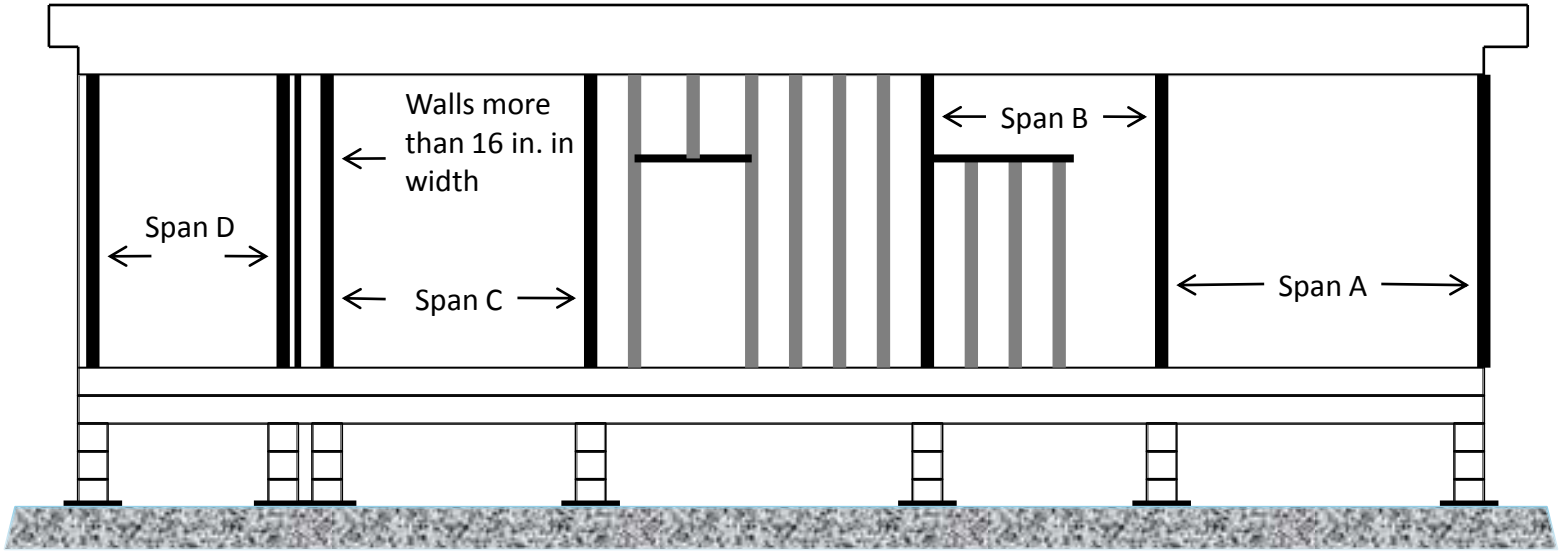
Pads and supports of any type cannot be split between surfaces. Pads and piers must be on 100% soil base or 100% concrete pad or footing.

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 it's 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

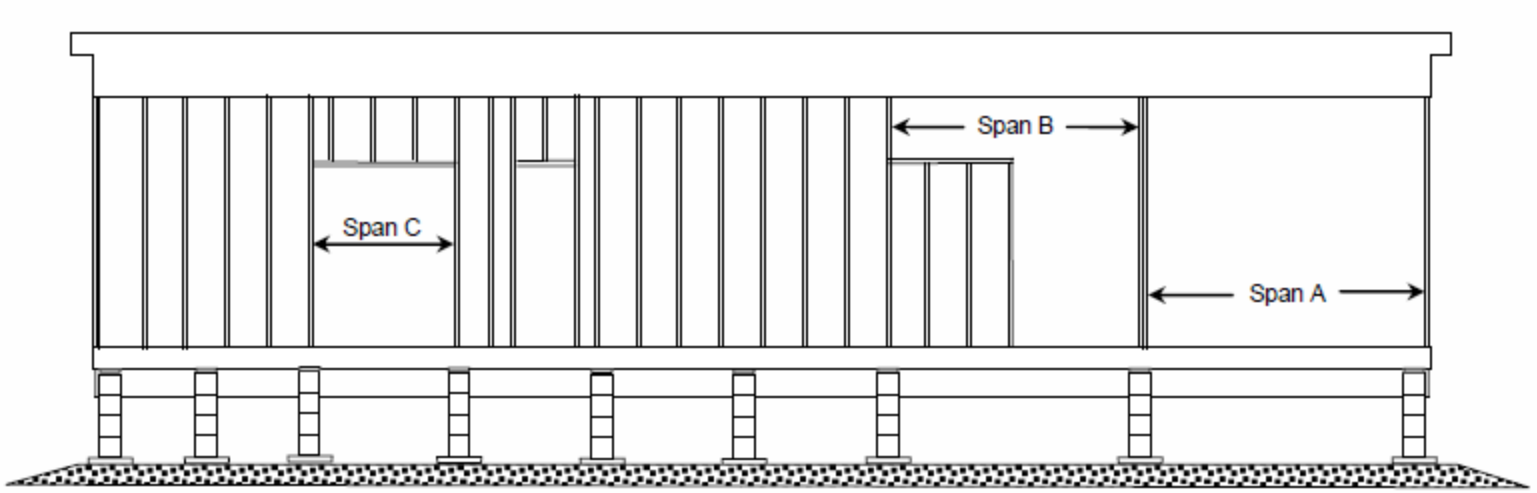
Pads and piers cannot be placed on uncompacted soil. Soil cannot be loosely piled up under pads and supports.

Column Pier Support when Frame Only Blocking is Required



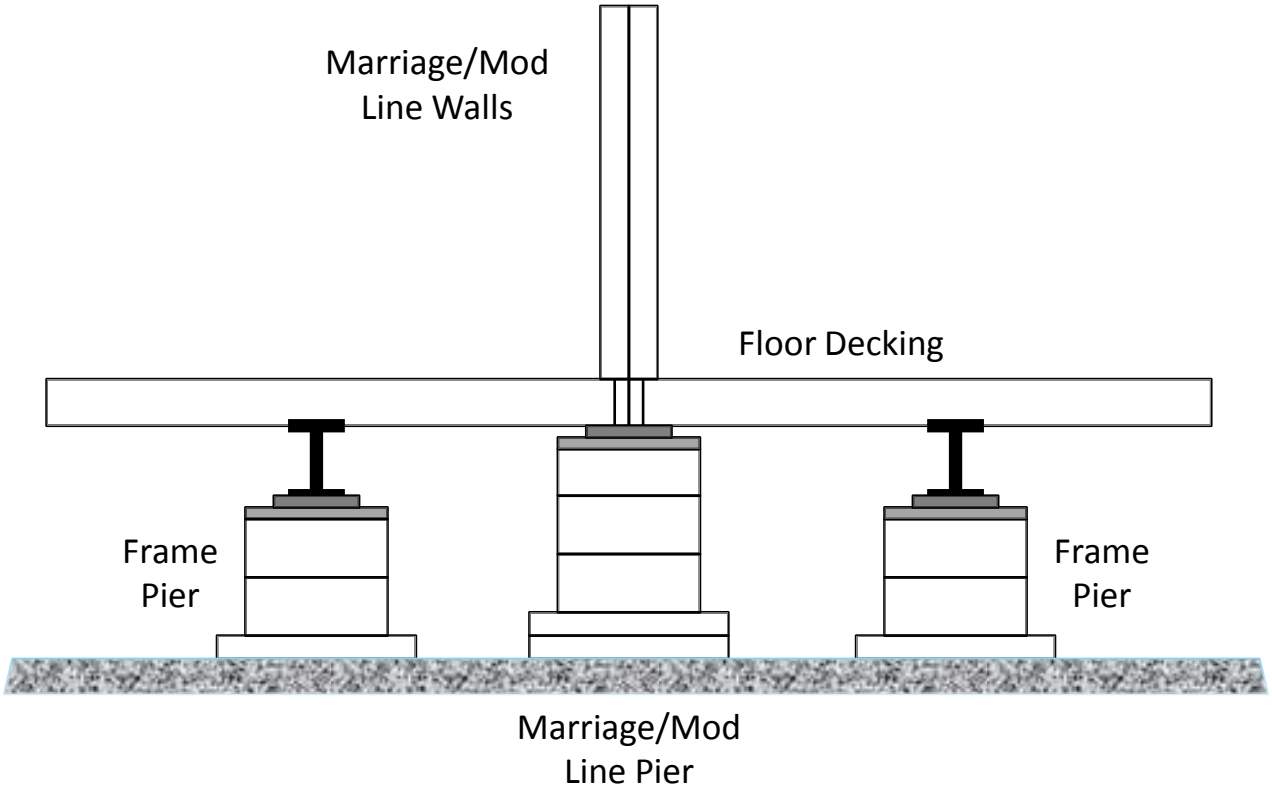
- **Required on both sides of open spans and doorways over 48 inches**
- **Additional piers are required with open spans over 10 feet**
- **Unsupported ridge-beams are included in open span spacing**
- **Column supports are always required**

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.

HARD PLASTIC PAD

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.

PRE-CAST CONCRETE PAD

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

POURED-IN-PLACE CONCRETE PADS, SLABS OR RIBBONS

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**

METAL PIERS

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.

POURED IN PLACE COLUMNS

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 a Engineer or Architect**

BESIDES SPECIFIED SIDEWALL OPENINGS HOW DO I KNOW WHICH HOMES REQUIRE FULL PERIMETER SUPPORT?

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 eve 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

Manufacturer Address:
CHAMPION HOMES BUILDERS
6420 W. Allison, P.O.Box 5075
Chandler, AZ 85226

MFG DATE:
PLANT NO: 157
DATE OF MFG: 2/7/13

HUD Label No. (s)
ARZ346406

Manufacturer's Serial Number and Model Unit Designation
157-OOP-H-A000751A RVN1660A

Design Approval
P.F.S. Corporation

This manufactured home is designed to comply with the federal manufactured home construction and safety standards in force at time of manufacture.

The factory installed equipment includes:

Equipment	Manufacturer	Model Designation
Heating	NORDYNE	
Air cooling		
Cooking	WP	WFC1330MOAV
Refrigerator	WP	W8TXNWFW
Water Heater	STATE	SCI30DHMSE4

Manufacturer Address

CMH MANUFACTURING WEST, INC.
CLAYTON HOMES
231 N. APACHE ROAD
BUCKEYE, AZ 85326

Data Plate

Date of Manufacture	Plant Number	HUD No.	
'/03/13	00951	AHZ346235	AHZ346236

Manufacturer's Serial Number and Model Unit Designation
If Serial Number ends with "P" - Perimeter Blocking Required (See Below)

BOC004009AZAB AB 519TH28563AH1?

Design Approval by (D.A.P.I.A.)	Perimeter Blocking
NTA	X Yes ☐ No

This manufactured home is designed to comply with the federal manu... ed home construction and safety standards in force at time of manufac...
(For additional information, consult the owner's manual.)

The factory installed equipment includes:

Equipment	Manufacturer	Model Designation
HEATING	NORDYNE	MIMC-056
COOKING	GE	JGBS07BB
REFRIGERATOR	GE	GTH18CBBB
WATER HEATER	RHEEM	72-40-2
WASHER	GE	GCWP1000M
CLOTHES DRYER	GE	GTDX200GM
DISHWASHER		
GARBAGE DISPOSAL		
FIREPLACE		
COOKTOP		
MICROWAVE		
SMOKE ALARM		

Manufactured Home Constructed for: Zone 1

This home has not been designed for the higher wind pressures and anchoring provisions required for ocean/coastal areas and should not be located within 1500' of the coastline in the Wind Zones II an... (If, unless the home and its anchoring and foundation system have been designed for the increased lo... vels specified for Exposure D in ANSI/ASCE 7-88.

Th... s Has Not been equipped with storm shutters or other protective coverings for windows and exterior door openings. For homes designed to be located in Wind Zones II and III which have not been provided with shutter or equivalent covering devices, it is strongly recommend that the home be made ready to be equipped with these devices in accordance with the method recommended in the manufacturers printed instructions.

Wind Zone Map

DESIGN ROOF LOAD ZONE MAP South 20 PSF

Comfort Heating

This manufactured home has been thermally insulated to conform with the requirements of the federal manufactured home construction and safety standards for all locations within climatic zone 3.

Heating equipment manufacturer and model (see list at left).
The above heating equipment has the capacity to maintain an average 70 degree Fahrenheit temperature in this home at outdoor temperatures of -26 F.

To maximize furnace operating economy and to conserve energy, it is recommended that this home be installed where the outdoor winter design temperature (97 1/2%) is not higher than 3 degrees Fahrenheit.

The above information has been calculated assuming a maximum wind velocity of 15 m.p.h.

Air conditioner manufacturer and model (see list at left).

Certified capacity ____ B.T.U./hour in accordance with the appropriate air conditioning and refrigeration institute standards.

The central air conditioning system provided in this home has been sized assuming an orientation of the front (hitch end) of the home facing ____. On this basis the system is designed to maintain an indoor temperature of 75 degrees Fahrenheit when outdoor temperatures are ____ F dry bulb and ____ F wet bulb.

The temperature to which this home can be cooled will change depending upon the amount of exposures of the windows of this home to the sun's radiant heat. Therefore, the home's heat gains will vary dependent upon its orientation to the sun and any permanent shading provided. Information concerning the calculation of cooling loads at various locations, window exposure and shadings are provided in Chapter 22 of the 1981 edition of the ASHRAE Handbook of Fundamentals.
Information necessary to calculate cooling loads at various locations and orientations is provided in the special comfort cooling information provided with this manufactured home.

X Air Conditioner not provided at factory (Alternate II)

The air distribution system of this home is suitable for the installation of central air conditioning. The supply air distribution system installed in this home is sized for manufactured home central air conditioning system of up to 58,000 B.T.U./hr. rated capacity which are certified in accordance with the appropriate air conditioning and refrigeration institute standards when th... air circulators of such air conditioners are rated at 0.3 inch water column static pressure or greater for the cooling air delivered to the manufactured home supply air duct system. Information necessary to calculate cooling loads at various locations and orientation is provided in the special comfort cooling information provided with this manufactured home.

☐ Air Conditioner not recommended (Alternate III)

The air distribution system of this home has not been designed in anticipation of its use with a central air conditioning system.

INFORMATION PROVIDED BY THE MANUFACTURER
NECESSARY TO CALCULATE SENSIBLE HEAT GAIN

Walls (without windows and doors)	"U"	.0907
Ceilings and roofs of light color	"U"	.0667
Ceilings and roofs of dark color	"U"	
Floors	"U"	.0917
Air ducts in floor	"U"	.0674
Air ducts in ceiling	"U"	
Air ducts installed outside the home	"U"	

The following are the duct areas in this house:

Air ducts in the floor	93	Sq. Ft.
Air ducts in the ceiling		Sq. Ft.
Air ducts outside the home	18	Sq. Ft.

To determine the required capacity of equipment to cool a home efficiently and economically, cooling load (heat gain) calculation is required. The cooling load is dependent on the orientation location and the structure of the home. Central air conditioners operate most efficiently and provide the greatest comfort when their capacity closely approximates the calculated cooling load. Each home's air conditioner should be sized in accordance with Chapter 22 of the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals, once the location and orientation are known.

U_o Value Map

DO NOT REMOVE

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

This home shall be fully supported by a foundation that will adequately bear the loads that are placed on the home. See the Set up manual for details.

Cavco Industries
2502 W. Durango
Phoenix, AZ 85009

Date of Manufacture
02/05/2013

HUD label No.(s)
ARZ346454
ARZ346455

Manufacturer's Serial Numbers) and Model Unit Designation
110LC-Palm Harbor LCD Series-28573A

CAV110AZ13-12525A
CAV110AZ13-12525B

Design Approval by (NTA)
This manufactured home is designed to comply with the federal manufactured home construction and safety standards in force at time of manufacture.

_____(For additional information, consult owner's manual) _____

The factory installed equipment includes:

Equipment	Manufacturer	Model Designation
For Heating	Nordyne	E3EB-015H
For Cooking	General Electric	JBS27DM2BB
Refrigerator	General Electric	GTH18CBDELBB
Water Heater	Rheem	72-30-1
Washer	N/A	N/A
Clothes Dryer	N/A	N/A

COMFORT

This manufactured home has been thermally ins
manufactured home construction and safety star
Zone 2 . (See map at bottom
Heating equipment manufacturer and model (Se
The listed heating equipment has the capacity to
temperature in this home at outdoor temperature
To maximize furnace operating economy, and to
be installed where the outdoor winter design tem
degrees Fahrenheit.
The above information has been calculated assu
standard atmospheric pressure.

COMFORT

☐ Air conditioner provided a

Air conditioner manufacturer and model (see list
Certified capacity _____ B.T.U./hour in acc
refrigeration institute standards.
The central air conditioning system provided in t
the front (hitch end) of the home facing. _____
Maintain an indoor temperature of 75°F when ou
_____ °F wet bulb.
The temperature to which this home can be cool
of the windows of this home to the sun's radiant
dependent upon its orientation to the sun and ar
the calculation of cooling loads at various locatio
Chapter 22 of the 1989 edition of the ASHRAE H
Information necessary to calculate cooling loads
the special comfort cooling information provided


Multiple window openings with a single stud separation

Perimeter piers at door openings

Perimeter support required throughout on some homes


06/24/2010 12:27

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