

Redman
Homes, Inc.

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BLDG. CODES & STDS. DIV

Manufactured Home Installation Manual

12-16-96

This manual must remain with the home
for reference by the homeowner

Keep this booklet with your manufactured home. Title VI of the Housing and Community Development Act of 1974 provides you with protection against certain construction and safety hazards in your manufactured home. To help assure your protection, the manufacturer of your manufactured home needs the information which the Homeowner Information Cards, when completed and mailed, will supply. If you bought your home from a retailer or developer, please be sure that your retailer or developer has completed and mailed a card for you. If you acquired your home from someone who is not a retailer or developer, you should promptly fill out and send a card to the manufacturer. It is important that you keep this booklet and give it to any person who buys the manufactured home from you.

NOTE: Homeowner Information Cards are located inside this manual.
Tear off and send in as required.

BEFORE YOU START.....

I. Pre-Installation Considerations

Prior to locating or relocating your home, contact the local authority having jurisdiction over the installation to see if permits for such procedures as blocking, anchoring or utility connections are required. Inspections may be required during installation. On private property, zoning or development covenants may apply and should be taken into consideration.

II. Safety

Only trained crews should install the home. Installers should follow the instruction provided in this manual and all general safety procedures and practices.

Warning
Homes weigh several tons. Support blocking should be used to safeguard workers and the structure during all installation procedures. Never allow anyone under the home unless blocking is in place which will safely support the weight of the home.

III. Important Documents

There are several documents that must be reviewed prior to the installation of this home:

A. The Data Plate. The Data Plate is an important document located either at the main electrical panel, in the utility room, in a bedroom closet, or in a cabinet in the kitchen. The Data Plate provides various identification numbers for the home and identifies the wind zone, roof load zone and climatic zone for which the home was designed. Zone maps, included on the Data Plate, geographically identify the wind, roof load and climatic zones for the United States. This home should not be located in or relocated to a zone which has requirements exceeding those for which it was designed.

B. Zone Maps. On page 3, you will find reproductions of the Data Plate Zone Maps for wind zones, roof load zones and climatic zones. Review the information on the Data Plate and the Zone Maps to determine that the home site location is within the acceptable boundaries. For clarification, the counties or parishes, and states in Wind Zones II and III have been listed.

C. Installation Manual Supplements. Supplemental pages may be included with this manual. These supplements outline special features included in the home which are not covered in the manual, or which differ from details in the manual.

IV. Homeowner Information Card

If a Homeowner Information Card hasn't been filled out, please fill out one of the cards on the opposite page, and return it to the manufacturer.

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APPROVED #1
PFS Corporation-Dallas, TX
SEP 18 1995
HUD Manufactured Home
Construction and Safety Standard

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Set-Up Tools _____ **Inside Back Cover**

SECTION 1 - INTRODUCTION

1.1 How to use this manual. This manual contains detailed installation instructions, including specifications and procedures for erection and hookup of your manufactured home. It has been written in an objective and easy-to-understand manner so it can be understood by people without extensive technical training. The installation of the home from preparing the site through the final inspection is covered. Many tables and figures are included to provide important data for proper installation. Careful adherence to this manual by the homeowner and installation crew, and consultation with a registered professional engineer in those unusual circumstances not covered here, will help you achieve a proper installation of your home.

SECTION 2 - DEFINITIONS

Anchoring Equipment - Straps, cables, turnbuckles, chains, and tensioning devices that are used with ties to secure a manufactured home to ground anchors

Anchoring System - A combination of ties, anchoring equipment, and ground anchors that will, when properly designed and installed, resist the wind's force to overturn the home or move it sideways

Data Plate - An information sheet located at the main electrical panel, in the utility room, in a bedroom closet, or in an overhead cabinet in the kitchen, and which provides the various identification numbers and identifies the wind zone, roof load zone, and climatic zone for which the home was manufactured

Footing - That part of the support system that sits directly on the ground at, below, or partly below grade

Pier - That portion of the support system between the footing and the manufactured home, exclusive of caps and shims. Types of piers include, but are not limited to, the following:

1. Manufactured steel stands (See 4.1.2)
2. Manufactured concrete stands (See 4.1.2)
3. Concrete blocks (See 4.1.2)

Site for a Manufactured Home - A parcel of land designed and designated for the location of a manufactured home, its accessory buildings or structures, and accessory equipment for exclusive use of the home's occupants

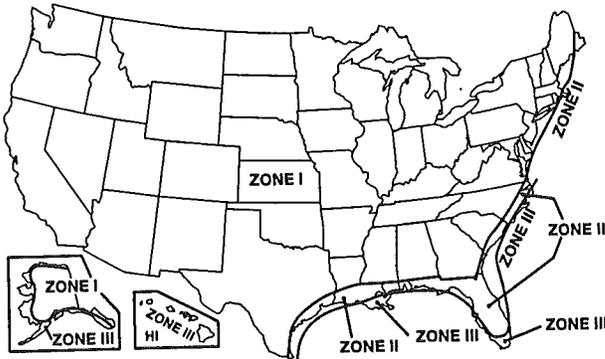
Stabilizing System - A combination of properly installed anchoring and support systems

Stand for a Manufactured Home - That area of a manufactured home site which has been reserved for the placement of the home.

Support System - A combination of footings, piers, caps, and shims that, when properly installed, support the manufactured home

ZONE MAPS

Basic Wind Zone Map



WIND ZONE I (15 PSF)

Consists of those areas of the United States and its territories that are not identified as being in Wind Zone II or III.

This home has not been designed for the higher wind pressure and anchoring provisions required for ocean/coastal areas and should not be located within 1,500' of the coastline in Wind Zones II and III, unless the home and its anchoring and foundation system have been designed for the increased requirements specified for Exposure D in ANSI/ASCE 7-88.

WIND ZONE II (100 MPH)

The following local governments listed by state (counties or parishes, unless specified otherwise) are within Wind Zone II:

| | | | | |
|---|--|---|---|---|
| ALABAMA Baldwin Mobile FLORIDA All counties except those identified as being within Wind Zone III GEORGIA Bryan Camden Chatham Glynn Liberty McIntosh LOUISIANA Acadia Allen Ascension Assumption Calcasieu Cameron East Baton Rouge East Feliciana Evangeline Iberia | LA (cont'd) Iberville Jefferson Davis LaFayette Livingston Pointe Coupee St. Helena St. James St. John the Baptist St. Landry St. Martin St. Tammany Tangipahoa Vermillion Washington West Baton Rouge West Feliciana MAINE Hancock Washington MASSACHUSETTS Barnstable Bristol Dukes Nantucket | MA (cont'd) Plymouth MISSISSIPPI George Hancock Harrison Jackson Pearl River Stone NORTH CAROLINA Beaufort Brunswick Camden Chowan Columbus Craven Currituck Jones New Hanover Onslow Pamlico Pasquotank Pender Perquimans Tyrrell | NC (cont'd) Washington SOUTH CAROLINA Beaufort Berkeley Charleston Colleton Dorchester Georgetown Horry Jasper Williamsburg TEXAS Aransas Brazoria Calhoun Cameron Chambers Galveston Jefferson Kenedy Kleberg Matagorda Nueces Orange | TX (cont'd) Refugio San Patricio Willacy VIRGINIA - The Cities of: Chesapeake Norfolk Portsmouth Princess Anne Virginia Beach |
|---|--|---|---|---|

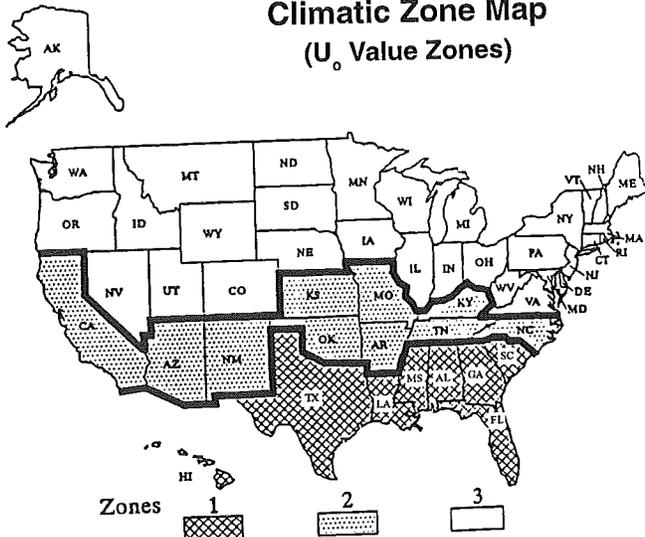
WIND ZONE III (110 MPH)

The following local governments listed by State (counties or parishes, unless specified otherwise) are within Wind Zone III:

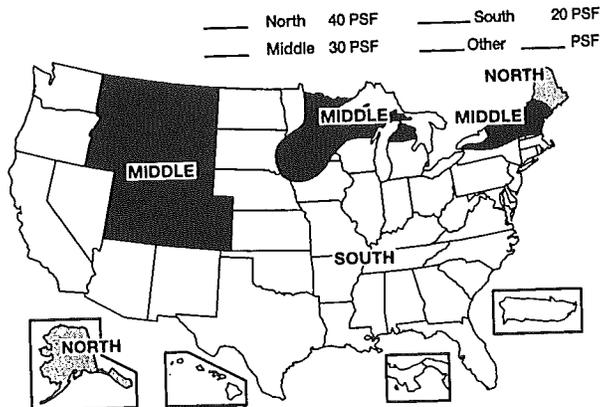
| | | |
|--|---|--|
| FLORIDA Broward Charlotte Collier Dade Franklin Gulf Hendry Lee Martin | FL (cont'd) Manatee Monroe Palm Beach Pinellas Sarasota LOUISIANA Jefferson La Fourche Orleans | LA (cont'd) Plaquemines St. Bernard St. Charles St. Mary Terrebonne NORTH CAROLINA Carteret Dare Hyde |
|--|---|--|

The following states and territories are within Wind Zone III:
 State of Hawaii
 All Alaska coastal regions between the 90 mph isotach on ANSI/ASCE 7-88 wind map and the coast
U.S. Territories:
 America Samoa
 Guam
 Northern Mariana Islands
 Puerto Rico
 Trust Territory of Pacific Islands
 U.S. Virgin Islands

Climatic Zone Map (U_o Value Zones)



Roof Load Map



SECTION 3 - SITE PREPARATION

3.1 Location and Layout

3.1.1 **Use of zone maps.** Your home is designed for certain weather conditions and roof loads. See the zone map included on the home Data Plate. Do not site or relocate your home in a zone requiring greater wind, roof load, or heating/cooling capabilities than those for which it was designed. However, it is safe to locate your home with **lower** loads or **less** weather requirements. For example, a home designed for a roof load of 30 PSF may be sited in the 20 PSF load zone.

3.1.2 **Access for transporter.** Before attempting to move the home to the installation site, be sure it can reach the site safely. Fill any holes or soft places in the access road. Remove any overhanging branches which are in the way (get approval first if they are not on your property), and have a qualified person raise any overhead wires which are in the way. Special transportation permits may be required from state, county, or city officials.

3.1.3 **Encroachments and setback distances.** Obey local laws regarding encroachments in streets, yards, and courts, and permissible setback distances from property lines and public roads.

3.1.4 **Fire separation distance.** The distance your home must be sited from other structures depends on local requirements. Contact the local authority having jurisdiction.

3.1.5 **Issuance of permits.** Be sure that all necessary local permits have been obtained.

3.2 Soil Conditions

3.2.1 **Requirements.** To help prevent settling or sagging of your home, site it on firm, undisturbed soil or fill compacted to at least 90% of its maximum relative density. Installation on loose, uncompacted fill may void the home's limited warranty.

3.2.2 **Bearing capacity.** After completing any grading and filling, test the bearing capacity of the soil at the depth of the footings (see 3.2.3). If you can't test the soil, but can identify its type, use the foundation bearing pressures shown in Table 3.1 as a guide. If you can not identify the soil, use the lowest value (1,000 psf). Under unusual conditions, or if the soil appears to be peat or uncompacted fill, consult a local professional engineer.

3.2.3 **Soil bearing testing methods and equipment.** A pocket penetrometer (available from engineering supply houses) or other methods acceptable to local jurisdictions may be used.

TABLE 3.1

| General Description of Soils | |
|---|---|
| Soil Type <i>(Based on the Unified Classification System)</i> | Allowable Pressure (lbs. per sq. ft.) <i>(No allowances made for overburden pressure, embedment depth, water table height, or settlement problems)</i> |
| Rock or Hard Pan | 4,000 |
| Sandy Gravel and Gravel | 2,000 |
| Sand, Silty Sand, Clayey Sand, Silty Gravel, or Clayey Gravel | 1,500 |
| Clay, Sandy Clay, Silty Clay, or Clayey Silt | 1,000 |
| Unconsolidated Fill | Special Analysis Required |
| Peat or Organic Clays | Special Analysis Required |
| NOTE: This table to be used only when none of the following is available: a. Soils investigation and analysis of the site b. Compliance with the local building code c. Competent opinion by a local engineer or code official | |

3.3 Removal of organic material. To minimize the settling of footings and insect damage, remove all decayable material from beneath the home in areas where footings are to be placed. Removal of decayable material in other areas is recommended, but is not mandatory. Remove shrubs and overhanging branches from the immediate vicinity of the homesite to prevent windstorm damage.

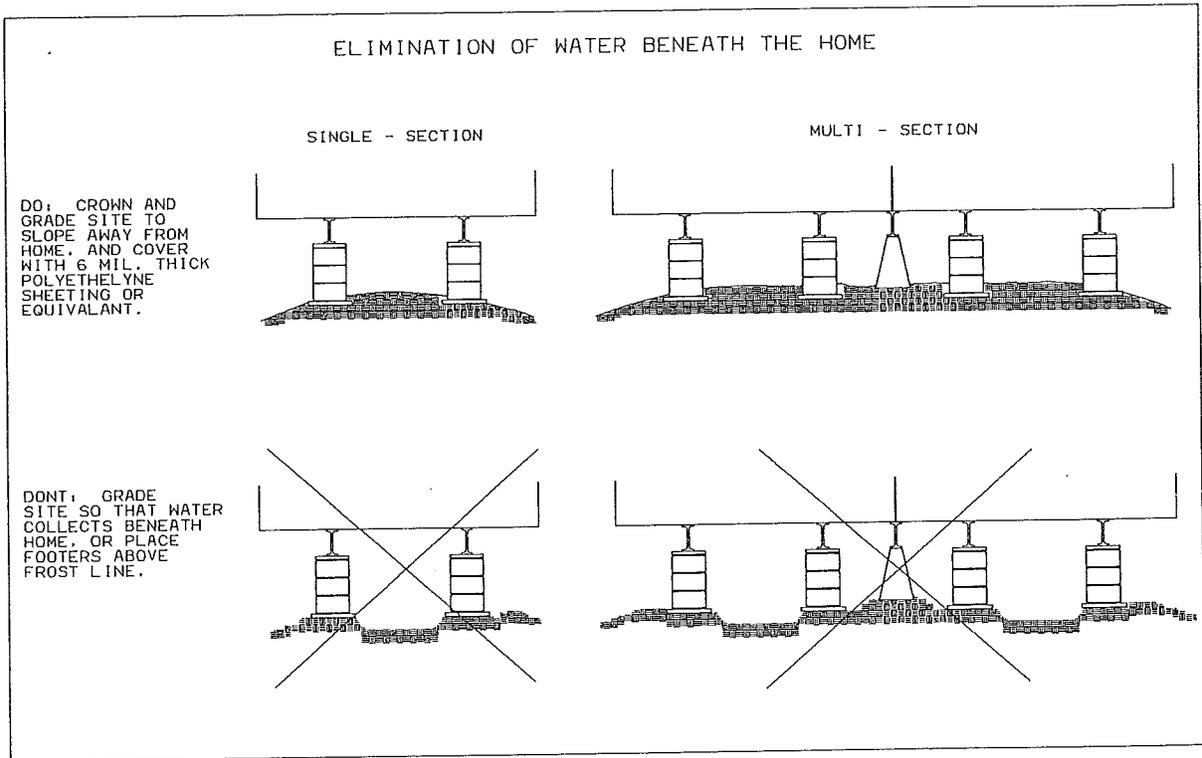
3.4 Drainage

3.4.1 Purpose. Proper drainage helps prevent water build-up under the home which may cause settling of the foundation, dampness in the home, damage to the siding and bottom covering, buckling of the walls and floors, problems with the operation of doors and windows, and may void the home's warranty.

3.4.2 Elimination of depressions. Grade the homesite to permit water to drain from under the home. See FIG. 3.1.

3.4.3 Drainage structures. Depending on the local landscape and local codes, ditches and culverts may be needed to drain surface runoff. If so, consult a registered professional engineer.

FIG. 3.1



3.5 Ground moisture control

3.5.1 **Importance.** When ground moisture is likely to be present, a vapor barrier should be placed on the ground under the home to minimize the entry of ground moisture into the home.

3.5.2 **Acceptable vapor barrier for ground moisture control.** Use polyethylene sheeting or its equivalent that is at least 6 mils thick.

3.5.3 **Proper installation.** Cover the entire area under the home with the sheeting and overlap it at least 6" at all seams. It is not necessary that the vapor barrier be stretched tight. Where soil and frost conditions permit placement of footings at grade level, place the sheeting directly beneath them.

SECTION 4 - FOUNDATIONS

NOTE: *This chapter covers only foundations. Installation procedures and methods for securing the home to its foundation are discussed in Chapter 5.*

4.1 Piers

4.1.1 Importance. The most important part of the home installation is proper pier and footing installation. - Incorrect size, kind, location, or spacing of piers may cause serious structural damage to your home. If required, it is also important to install perimeter piers. Failure to do so may lead to sagging floors, walls, and roofs.

If "P" is the last character in the identifying serial number which may be found on the Data Plate and on the front structural crossmember or the bottom flange of the curb side longitudinal beam within 24 inches of the front end, the home requires an approved perimeter support system at the edge of each floor section.

4.1.2 Acceptable types. Piers may be concrete blocks capped and shimmed with wedges (see 4.1.3.2) or adjustable manufactured metal or concrete devices (see FIG. 4.1). Manufactured piers should be listed and labeled for the required load capacity, and concrete block must comply with ASTM Standard C-90.

4.1.3 Design requirements

4.1.3.1 Load-Bearing Capacity. The load that each pier must carry depends on factors such as the dimensions of the home, the roof live load, the spacing of the piers, and the way they are used to support the home. Center beam/marriage wall blocking is required for multi-section homes.

See Tables 4.1, 4.2 and 4.3 for pier loads. Manufactured piers shall be rated to at least these loads. Locally constructed support systems shall be designed to support these loads. Capped single-stacked concrete blocks will support up to 10,000 pounds (see 4.1.3.2.).

4.1.3.2. Configuration. FIG. 4.1 shows the recommended arrangement of concrete block piers. Concrete blocks should have nominal dimensions of at least 8" x 8" x 16". They must be stacked with their hollow cells aligned vertically. When piers are constructed of blocks stacked side by side, every layer should be at right angles to the previous one (see FIG. 4.1). For maximum height of piers, see Table 5.1.

Cap hollow block piers as shown in FIG. 4.1 to distribute the structural load evenly across them. Caps may be of solid masonry or hard wood at least 4" thick, or of steel, and must be at least the same length and width as the piers they rest upon. Avoid soft woods and plywood, as they may lead to unwanted settling or movement.

Use 1" x 4" wide x 6" long hardwood shims to fill any gaps between the base of the I-beam and the top of the pier cap. Always use shims in pairs (see FIG. 4.1). Drive them in tightly so they occupy no more than 1" of vertical space. Use hardwood plates no thicker than 2" to fill in any remaining vertical gaps.



4.1.3.3 Clearance under the home. Minimum ground clearance of 12" should be maintained beneath the lowest part of the main frame in the area of the utility connections. No more than 25 percent of the frame should be less than 12" above the ground. Wood floor joists, including the perimeter joists, should be a minimum of 6" above the ground.

TABLE 4.1

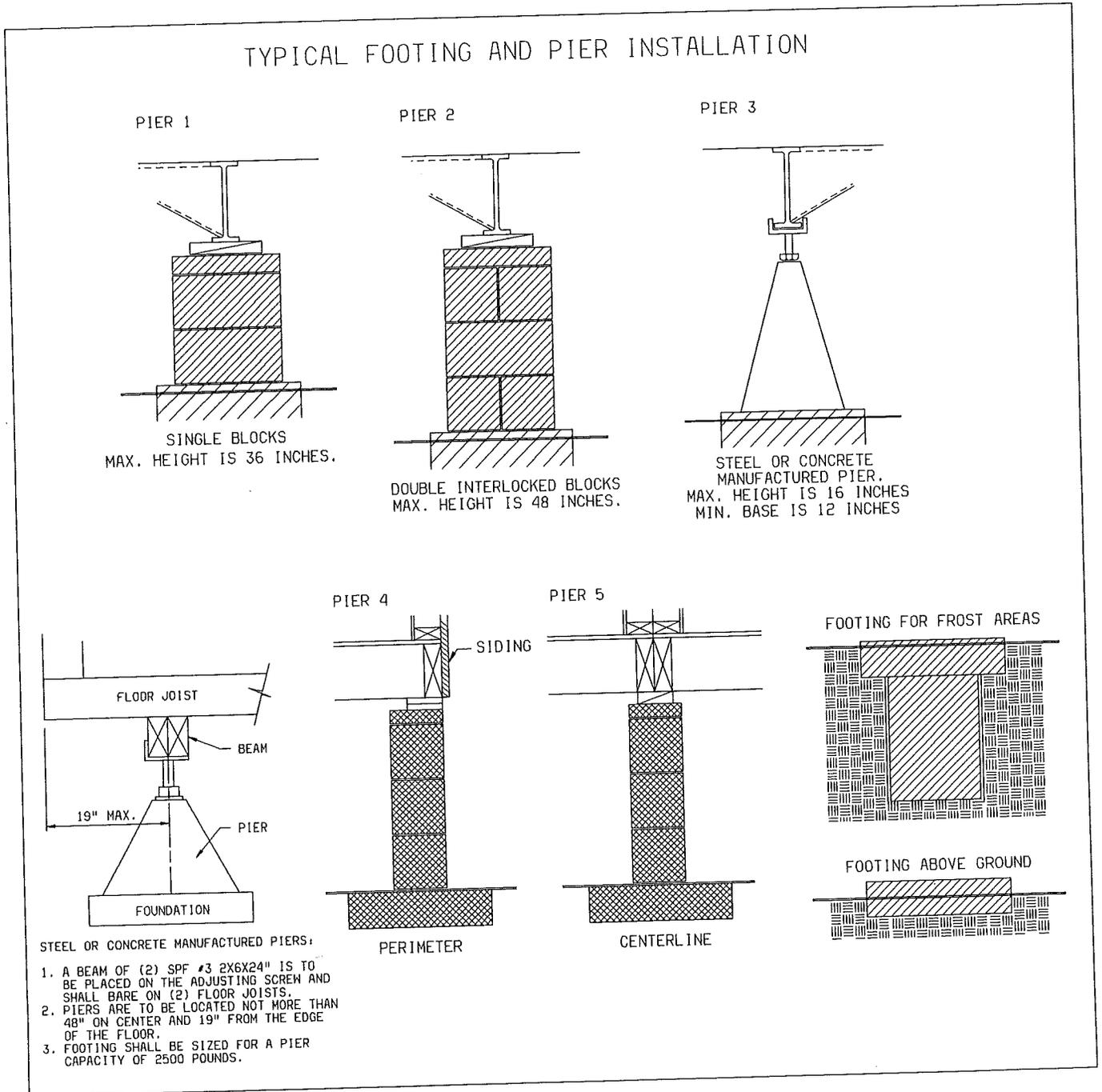
| MINIMUM PIER LOADS FRAME BLOCKING ONLY Perimeter Support Not Required Except At Openings IF CONDITIONS CANNOT BE FOUND IN THIS TABLE YOU MUST USE TABLE 4.2 | | | | | | | | | | |
|--|--------------------|-----------------------------|------|------|------|------|------|------|------|-----|
| SECTION WIDTH FEET | ROOF LIVE LOAD PSF | Minimum Pier Capacity - Lbs | | | | | | | | |
| | | Maximum Pier Spacing - Feet | | | | | | | | |
| | | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| 8 | 20 | 1500 | 1800 | 2200 | 2600 | 2900 | 3300 | 3600 | 4000 | (b) |
| | 30 | 1600 | 2000 | 2400 | 2800 | 3200 | 3600 | 4000 | 4400 | (b) |
| | 40 | 1800 | 2200 | 2700 | 3100 | 3600 | 4000 | 4400 | 4900 | (b) |
| | 60 | 2100 | 2600 | 3200 | 3700 | 4200 | 4700 | 5200 | 5800 | (b) |
| 10 | 20 | 1800 | 2300 | 2700 | 3200 | 3600 | 4100 | 4500 | 5000 | (b) |
| | 30 | 2000 | 2500 | 3000 | 3500 | 4000 | 4500 | 5000 | 5500 | (b) |
| | 40 | 2200 | 2800 | 3300 | 3900 | 4400 | 5000 | 5500 | 6100 | (b) |
| | 60 | 2600 | 3300 | 3900 | 4600 | 5200 | 5900 | 6500 | 7200 | (b) |
| 12 | 20 | 2200 | 2700 | 3300 | 3800 | 4400 | 4900 | 5400 | 6000 | (b) |
| | 30 | 2400 | 3000 | 3600 | 4200 | 4800 | 5400 | 6000 | 6600 | (b) |
| | 40 | 2700 | 3300 | 4000 | 4700 | 5300 | 6000 | 6600 | 7300 | (b) |
| 14 | 20 | 2600 | 3200 | 3800 | 4500 | 5100 | 5700 | 6300 | 7000 | (b) |
| | 30 | 2800 | 3500 | 4200 | 4900 | 5600 | 6300 | 7000 | 7700 | (b) |
| | 40 | 3100 | 3900 | 4700 | 5400 | 6200 | 7000 | 7700 | 8500 | (b) |
| 16 | 20 | 2900 | 3600 | 4400 | 5100 | 5800 | 6500 | 7200 | 8000 | (b) |
| | 30 | 3200 | 4000 | 4800 | 5600 | 6400 | 7200 | 8000 | 8800 | (b) |
| | 40 | 3600 | 4400 | 5300 | 6200 | 7100 | 8000 | 8800 | 9700 | (b) |
| 18 | 20 | 3300 | 4100 | 4900 | 5700 | 6500 | 7300 | 8100 | 9000 | (b) |
| | 30 | 3600 | 4500 | 5400 | 6300 | 7200 | 8100 | 9000 | 9900 | (b) |

(a)-Minimum 10 Inch High Main Frame I - Beam
(b)-Minimum 12 Inch High Main Frame I - Beam



9-13-95

FIG. 4.1



Select manufactured pier heights so that their adjustable risers do not extend more than 3" when at their maximum height.

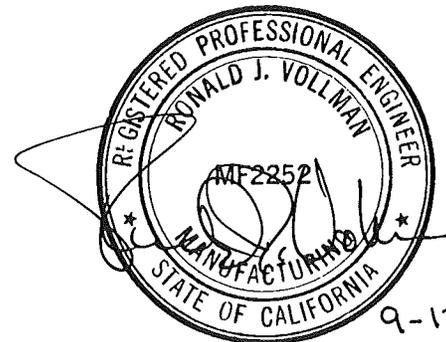


TABLE 4.2

| MINIMUM PIER LOADS FRAME PLUS PERIMETER BLOCKING Both Frame And Perimeter Blocking Required | | | | | | | | | | | | | |
|---|-----------------------------|------------------|-----------------------------|------|------|------|------|------|------|------|------|------|------|
| SECTI WIDTH FEET | ROOF LIVE LOAD PSF | PIER LOCATION | Minimum Pier Loads - Lbs. | | | | | | | | | | |
| | | | Maximum Pier Spacing - feet | | | | | | | | | | |
| | | | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 12 | 20 | FRAME | 1000 | 1300 | 1500 | 1800 | 2000 | 2300 | 2500 | 2800 | 3000 | 3300 | 3500 |
| | | PERIMETER | 1100 | 1400 | 1600 | 1900 | 2100 | 2400 | 2700 | 2900 | 3200 | 3500 | 3700 |
| | 30 | FRAME | 1000 | 1300 | 1500 | 1800 | 2000 | 2300 | 2500 | 2800 | 3000 | 3300 | 3500 |
| | | PERIMETER | 1300 | 1700 | 2000 | 2300 | 2600 | 2900 | 3300 | 3600 | 3900 | 4200 | 4600 |
| | 40 | FRAME | 1000 | 1300 | 1500 | 1800 | 2000 | 2300 | 2500 | 2800 | 3000 | 3300 | 3500 |
| | | PERIMETER | 1600 | 2000 | 2300 | 2700 | 3100 | 3500 | 3900 | 4300 | 4600 | 5000 | 5400 |
| | 60 | FRAME | 1000 | 1300 | 1500 | 1800 | 2000 | 2300 | 2500 | 2800 | 3000 | 3300 | 3500 |
| | | PERIMETER | 2100 | 2600 | 3100 | 3600 | 4100 | 4600 | 5100 | 5600 | 6100 | 6600 | 7100 |
| 14 | 20 | FRAME | 1100 | 1400 | 1700 | 1900 | 2200 | 2500 | 2800 | 3000 | 3300 | 3600 | 3900 |
| | | PERIMETER | 1300 | 1600 | 2000 | 2300 | 2600 | 2900 | 3200 | 3500 | 3900 | 4200 | 4500 |
| | 30 | FRAME | 1100 | 1400 | 1700 | 1900 | 2200 | 2500 | 2800 | 3000 | 3300 | 3600 | 3900 |
| | | PERIMETER | 1600 | 2000 | 2400 | 2800 | 3100 | 3500 | 3900 | 4300 | 4700 | 5100 | 5500 |
| | 40 | FRAME | 1100 | 1400 | 1700 | 1900 | 2200 | 2500 | 2800 | 3000 | 3300 | 3600 | 3900 |
| | | PERIMETER | 1900 | 2300 | 2800 | 3200 | 3700 | 4200 | 4600 | 5100 | 5500 | 6000 | 6400 |
| | 60 | FRAME | 1100 | 1400 | 1700 | 1900 | 2200 | 2500 | 2800 | 3000 | 3300 | 3600 | 3900 |
| | | PERIMETER | 2400 | 3000 | 3600 | 4200 | 4800 | 5400 | 6000 | 6600 | 7200 | 7800 | 8400 |
| 16 | 20 | FRAME | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 | 3300 | 3600 | 3900 | 4200 |
| | | PERIMETER | 1500 | 1900 | 2300 | 2700 | 3000 | 3400 | 3800 | 4100 | 4500 | 4900 | 5300 |
| | 30 | FRAME | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 | 3300 | 3600 | 3900 | 4200 |
| | | PERIMETER | 1600 | 2300 | 2800 | 3200 | 3700 | 4100 | 4600 | 5000 | 5500 | 5900 | 6400 |
| | 40 | FRAME | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 | 3300 | 3600 | 3900 | 4200 |
| | | PERIMETER | 1900 | 2700 | 3200 | 3800 | 4300 | 4800 | 5400 | 5900 | 6400 | 7000 | 7500 |
| | 60 | FRAME | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 | 3300 | 3600 | 3900 | 4200 |
| | | PERIMETER | 2800 | 3500 | 4200 | 4900 | 5600 | 6300 | 7000 | 7700 | 8400 | 9000 | 9700 |
| 18 | 20 | FRAME | 1300 | 1600 | 2000 | 2300 | 2600 | 2900 | 3300 | 3600 | 3900 | 4200 | 4600 |
| | | PERIMETER | 1800 | 2200 | 2600 | 3000 | 3500 | 3900 | 4300 | 4700 | 5200 | 5600 | 6000 |
| | 30 | FRAME | 1300 | 1600 | 2000 | 2300 | 2600 | 2900 | 3300 | 3600 | 3900 | 4200 | 4600 |
| | | PERIMETER | 2100 | 2600 | 3200 | 3700 | 4200 | 4700 | 5200 | 5700 | 6300 | 6800 | 7300 |
| | 40 | FRAME | 1300 | 1600 | 2000 | 2300 | 2600 | 2900 | 3300 | 3600 | 3900 | 4200 | 4600 |
| | | PERIMETER | 2500 | 3100 | 3700 | 4300 | 4900 | 5500 | 6100 | 6700 | 7300 | 7900 | 8500 |

All piers must rest on footings (see paragraph 4.1) that either extend below the frost line or are otherwise protected from the effects of frost.

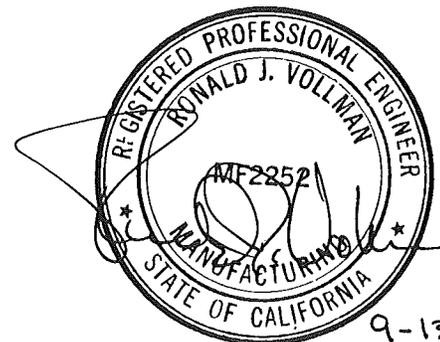


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TABLE 4.3

| MINIMUM PIER LOADS MULTI-SECTION CENTER BEAM SUPPORTS | | | | | | | | |
|--|-----------------------------|---|------|------|-------|-------|-------|-------|
| SECTION WIDTH FEET | ROOF LIVE LOAD PSF | Mazimum span between adjacent supports - feet | | | | | | |
| | | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 8 | 20 | 700 | 1300 | 2000 | 2600 | 3200 | 3900 | 4500 |
| | 30 | 900 | 1700 | 2600 | 3400 | 4200 | 5100 | 5900 |
| | 40 | 1100 | 2100 | 3200 | 4200 | 5200 | 6300 | 7300 |
| | 60 | 1500 | 2900 | 4400 | 5800 | 7200 | 8700 | 10100 |
| 10 | 20 | 800 | 1600 | 2400 | 3200 | 4000 | 4800 | 5600 |
| | 30 | 1100 | 2100 | 3200 | 4200 | 5300 | 6300 | 7400 |
| | 40 | 1300 | 2600 | 3900 | 5200 | 6500 | 7800 | 9100 |
| | 60 | 1800 | 3600 | 5400 | 7200 | 9000 | 10800 | 12600 |
| 12 | 20 | 1000 | 2000 | 2900 | 3900 | 4800 | 5800 | 6800 |
| | 30 | 1300 | 2600 | 3800 | 5100 | 6300 | 7600 | 8900 |
| | 40 | 1600 | 3200 | 4700 | 6300 | 7800 | 9400 | 11000 |
| | 60 | 2200 | 4400 | 6500 | 8700 | 10800 | 13000 | 15200 |
| 14 | 20 | 1200 | 2300 | 3400 | 4500 | 5600 | 6800 | 7900 |
| | 30 | 1500 | 3000 | 4500 | 5900 | 7400 | 8900 | 10300 |
| | 40 | 1900 | 3700 | 5500 | 7300 | 9100 | 11000 | 12800 |
| | 60 | 2600 | 5100 | 7600 | 10100 | 12600 | 15200 | 17700 |
| 16 | 20 | 1300 | 2600 | 3900 | 5200 | 6400 | 7700 | 9000 |
| | 30 | 1700 | 3400 | 5100 | 6800 | 8400 | 10100 | 11800 |
| | 40 | 2100 | 4200 | 6300 | 8400 | 10400 | 12500 | 14600 |
| | 60 | 2900 | 5800 | 8700 | 11600 | 14400 | 17300 | 20200 |
| 18 | 20 | 1500 | 2900 | 4400 | 5800 | 7200 | 8700 | 10100 |
| | 30 | 1900 | 3800 | 5700 | 7600 | 9500 | 11400 | 13300 |
| | 40 | 2400 | 4700 | 7100 | 9400 | 11700 | 14100 | 16400 |
| | 60 | 3300 | 6500 | 9800 | 13000 | 16200 | 19500 | 22700 |

NOTE: Labels, located along the centerline on the bottom side of a multi-section home, indicates where the column supports must be placed. Measure the longest span between these supports and refer to the Minimum Pier Loads, Table 4.3 above. Once the pier load has been determined, the minimum footing size can be found in the Footing Size Table 4.4.



4.1.4 Design procedures. Refer to Table 5.1 to determine the maximum pier height. Then use the appropriate paragraph below for design requirements.

4.1.4.1 Piers up to 36" high. You may construct piers up to 36" high using single, open or closed-cell - concrete blocks, 8" x 8" x 16". Install them so that the long side is across the supported I-beam (see FIG. 4.1). Position open cells vertically. Horizontal offsets should not exceed 1/2" from the top to the bottom of a pier. Mortar is not required. Manufactured piers should be listed and labeled. Do not extend their adjusting studs beyond the limits specified by the manufacturer.

4.1.4.2 Piers over 36" to 48" high. Construct all piers that will be between 36" and 48" high, and all corner piers that will be over three blocks high, out of double, interlocked concrete blocks (see FIG. 4.1). Mortar will not be required. Piers over 36" high must not be spaced more than 8 feet on center. When more than 25 percent of the required main beam support piers will be over 36" in height, the foundation shall be designed by a registered professional engineer or architect and the installation shall be approved by the local authority having jurisdiction.

4.1.4.3 Piers over 48" high. Where such construction is permitted by local codes, piers over 48" high must be designed by a registered professional engineer.

4.1.5 Location and spacing. The location and spacing of piers depends upon the dimensions and weight of the home, the roof load zone, the type of construction (single or multi-section), and other factors such as the locations of the doors, other openings, and heavy items such as fireplaces, heavy furniture, or appliances. In general, locate the end piers no more than two feet from either end of the home. See FIG. 4.2.

4.1.5.1 Single-section homes. FIG. 4.2 shows the recommended location of all piers for single-section homes. See the appropriate tables for spacing.

4.1.5.2 Multi-section homes set square or offset. FIG. 4.2 shows the recommended location of all piers for multi-section homes.

4.1.5.3 Places that require perimeter blocking. Place perimeter piers at all sidewall openings wider than four feet, at all porch posts, on both sides of fireplaces or wood stoves, and expected locations of heavy pieces of furniture such as pianos, organs, waterbeds, etc. Hinged exterior doors are to function as intended and shall have the hinge side vertical and the opening square or shall be made vertical and square by re-setting the door in it's opening or by piercing the hinge side and shimming the floor edge.



4.2 Footings. Support every pier with a properly designed footing, as follows:

4.2.1 Acceptable types of footings

4.2.1.1 Concrete. Footings, as specified by this manual, may consist of precast or poured-in-place concrete pads, slabs or ribbons a minimum of 4" thick. Poured-in-place concrete shall be ordinary 2,500 psi concrete that is acceptable to the building official. Footings may be any configuration equal to or greater in size than shown in Table 4.5, provided the pad does not extend beyond the pier edge more than the thickness of the pad. Pads shall not be less than four inches thick. Example: The largest 4" thick pad that may be used under a pier of 8" x 8" x 16" concrete blocks is 16" x 24" [(the 8" width of the blocks plus 4" for the thickness of the pad on each side for a total of 16" wide) x (the 16" length of the blocks plus 4" for the thickness of the pad on each end for a total of 24" long)]. Two pads may be used in place of one, provided the joint is parallel to the main frame I-beam.

4.2.1.2 Pressure-treated lumber meeting AWPB-FDN Standard C-22-1988. Two layers of 2" nominal thickness pressure-treated wood, with the long dimension of the second layer placed perpendicular to that of the first, may be used. Cut edges should be painted or retreated.

A treated wood 2" x 12" x 24" may be used as a foundation pad under a single stack of 8" x 8" x 16" blocks used as a pier when the listed footing size is not required to be greater than 16" x 16". The pier is to be placed on the pad with the 16" dimension of the block parallel with the 24" dimension of the pad.

4.2.1.3 Pressure-treated Plywood. See chart below for recommended pad sizes and thickness for use under manufactured home support piers. The recommendations are based on an 11-1/2" square metal support pier, or an 8" x 16" concrete block pier. All recommendations are for soils with a bearing capacity of 1,000 psf, upon which the maximum pier load is based.

The plywood grade recommended for all pads is APA-rated sheathing exposure I, marked PS1. Plywood beneath manufactured home piers must be preservative treated. Pressure-preservative treatment provides protection against decay, development of mold growth, and common insect infestation. Plywood shall be certified by the treater as complying with the treating, drying retention, and penetration requirements of American Wood - Preservers Bureau's AWPB-FDN Standard. Alternatively, plywood may be pressure-treated in accordance with AWPA C-9 with salt preservatives as required for soil contact exposure.

TABLE 4.4

| PLYWOOD PIER/PAD SIZE | | | |
|-------------------------|--------------------------------|-----------------|-------------------------------------|
| PLYWOOD PAD SIZE INCHES | MINIMUM PLYWOOD THICKNESS (IN) | | MAXIMUM PIER LOAD FOR 1000 PSF SOIL |
| | METAL STANDS | CONCRETE BLOCKS | |
| 16 X 16 | 1/2 | 1 | 1780 |
| 16 X 19.2 | 5/8 | 1 1/8 | 2130 |
| 24 X 24 | 1 1/8 | 1 1/4 | 4000 |



1. Face grain may be in either direction relative to the pad or pier dimension.
2. Plywood thickness is for a metal stand with 11-1/2" square base, or a concrete block with an 8" x 16" base. Thicknesses of one inch or more may be fabricated from two layers of plywood, stacked with or without fastening.

4.2.1.4 Other Materials. Materials approved for this use by local authorities if they provide equal load bearing capacity and decay resistance. Examples include:

ABS Pier Pads by Mobile Home Safety Products.
Installed per their instructions and this manual.

A six-inch thick layer of:
3/8" or 3/4" graduated gravel.
Course sand with grains not smaller than 1/16", placed to provide a bearing capacity of at least 3000 psf.



TABLE 4.5

| MINIMUM FOOTING SIZE IN SQUARE INCHES(FEET) | | | | | |
|---|--|---------|---------|---------|---------|
| PIER LOAD (POUNDS) | SOIL CAPACITY IN POUNDS PER SQARE FOOT | | | | |
| | 1000 | 1500 | 2000 | 3000 | 4000 |
| | SQ. IN. | SQ. IN. | SQ. IN. | SQ. IN. | SQ. IN. |
| 600 | 86 | 58 | 43 | 29 | 22 |
| 800 | 115 | 77 | 58 | 38 | 29 |
| 1000 | 144 | 96 | 72 | 48 | 36 |
| 1500 | 216 | 144 | 108 | 72 | 54 |
| 2000 | 288 | 192 | 144 | 96 | 72 |
| 2500 | 360 | 240 | 180 | 120 | 90 |
| 3000 | 432 | 288 | 216 | 144 | 108 |
| 3500 | 504 | 336 | 252 | 168 | 126 |
| 4000 | 576 | 384 | 288 | 192 | 144 |
| 4500 | 648 | 432 | 324 | 216 | 162 |
| 5000 | 720 | 480 | 360 | 240 | 180 |
| 5500 | 792 | 528 | 396 | 264 | 198 |
| 6000 | 864 | 576 | 432 | 288 | 216 |
| 6500 | 936 | 624 | 468 | 312 | 234 |
| 7000 | 1008 | 672 | 504 | 336 | 252 |
| 7500 | 1080 | 720 | 540 | 360 | 270 |
| 8000 | 1152 | 768 | 576 | 384 | 288 |
| 8500 | 1224 | 816 | 612 | 408 | 306 |
| 9000 | 1296 | 864 | 648 | 432 | 324 |
| 9500 | 1368 | 912 | 684 | 456 | 342 |
| 10000 | 1440 | 960 | 720 | 480 | 360 |
| 11000 | 1584 | 1056 | 792 | 528 | 396 |
| 12000 | 1728 | 1152 | 864 | 576 | 432 |
| 13000 | 1872 | 1248 | 936 | 624 | 468 |
| 14000 | 2016 | 1344 | 1008 | 672 | 504 |
| 15000 | 2160 | 1440 | 1080 | 720 | 540 |
| 16000 | 2304 | 1536 | 1152 | 768 | 576 |
| 17000 | 2448 | 1632 | 1224 | 816 | 612 |
| 18000 | 2592 | 1728 | 1296 | 864 | 648 |
| 19000 | 2736 | 1824 | 1368 | 912 | 684 |
| 20000 | 2880 | 1920 | 1440 | 960 | 720 |



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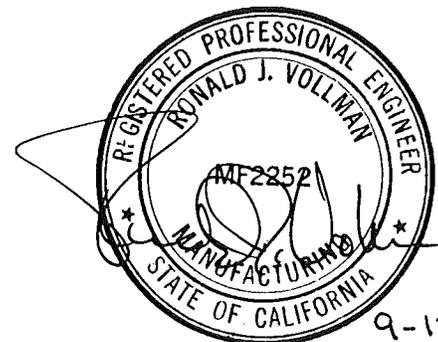
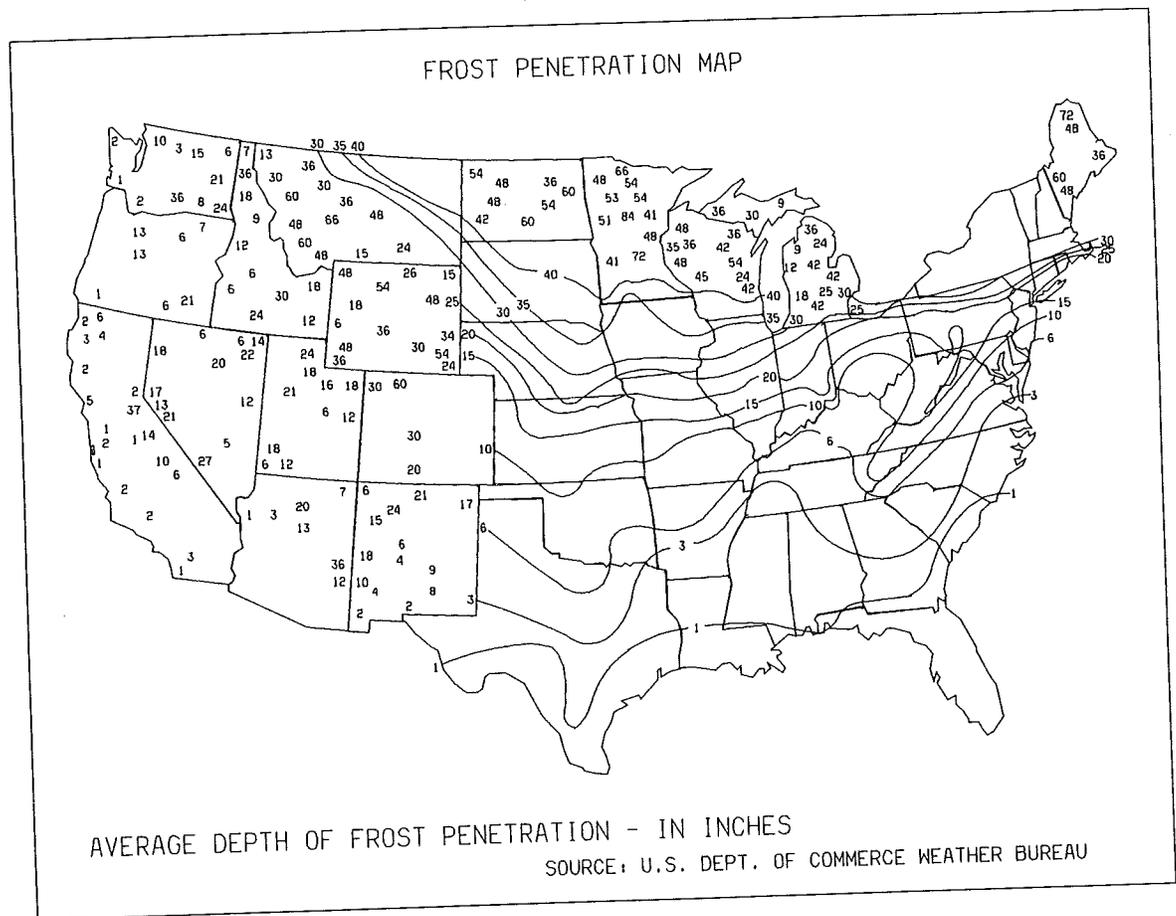
4.2.2 Placement in freezing climates

4.2.2.1 Conventional Footings. To preclude the harmful effects of ground frost heave, footings should be below the frost line. Consult the local authorities to determine the frost penetration. In the absence of a local code, use the frost penetration map of FIG. 4.3 as a guide.

4.2.2.2 Floating Slab Systems. When properly designed by a registered professional engineer with knowledge of the anchorage requirements of section 5.4, and accepted by the local authority having jurisdiction, a "floating slab system" may be used above the frost line.

4.2.2.3 Insulated Foundations. Footings may also be placed above the frost line when the home is provided with a perimeter foundation or skirting having insulation properties sufficient to prevent freezing of the soil under or adjacent to load-bearing component of the foundation and accepted for this purpose by the local authority having jurisdiction. Insulation systems should be compatible with the requirement to cross-ventilate the entire space under the home (see para. 5.6).

FIG. 4.3



4.2.3 Proper sizing of footings. Proper sizing of footings depends upon the load-carrying capacity of both the piers and the soil. See Table 4.5 for the recommended footing capacity for your home.

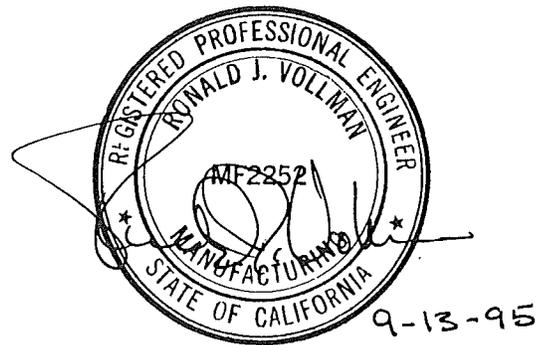
4.3 Permanent foundations. Check local building codes and regulations, and consult a registered professional engineer when you are siting your home on a permanent foundation (such as a full basement, crawl space or load-bearing perimeter foundation). You may get a typical permanent foundation design that meets most local codes by writing to the Redman facility which manufactured your home. Refer to your Homeowner's Manual or the Data Plate located in your home for the address.

4.4 Special Considerations (Also see section 5.4.2.)

4.4.1 Flood-prone areas. Redman Homes, Inc. does not recommend siting your home in river or coastal flood-prone areas. Special local regulations or flood insurance provisions may apply. Special elevation and anchoring techniques are required when locating in a flood-prone area. Consult a registered professional engineer to make sure that the home design and construction conform to applicable federal, state and local codes and regulations.

4.4.2 Severe wind areas. This home and the installation instructions contained in this manual are not adequate to cover set-up within 1,500 feet of the coastline in Wind Zones II and III.

4.4.3 Special snow load conditions. Homes designed for and located in heavy snowfall areas or subject to other extreme loading conditions may require special piers and footings. If the plans for these piers and footings are not provided with your home, they must be designed by a professional engineer or architect.



SECTION 5 - SET-UP PROCEDURES

5.1 Moving home to location. Make sure the following items are completed before placing the home:

- The site is properly prepared. See Chapter 3.
- All concrete work necessary to set the home is finished, and the required structural capabilities have been achieved.
- Utilities are installed or available.
- Any trenching, for crossover drain lines or for wheels that will be left in place, is complete.
- Items that could be difficult to install after the home is sited (such as anchors and ground moisture retarders) are in their proper locations.

Warning

Homes weigh several tons. Support blocking should be used to safeguard workers and the structure during all installation procedures. Never allow anyone under the home unless blocking is in place which will safely support the weight of the home.

5.2 Positioning home. When placing the home, mark the corners of the home, and lay out footings and support devices close to where they will be used. Then, move the home or first section into position.

FIG. 5.1

5.2.1 Leveling and blocking. To prevent tipping or settling, use a firm support under jacks. Use a steel channel between jacks and steel beams to distribute the load (see FIG. 5.1). The equipment used should be in good working condition and be able to handle the loads. Work safely whenever you are under, in, or around a home that is being set. Use the following jacking sequence:

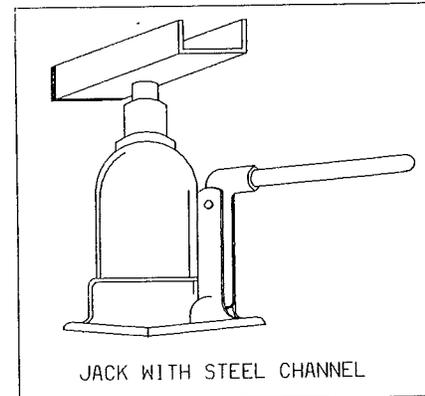
1. Remove the close-up material from areas in which sections will be joined. Be careful not to damage adjacent paneling or siding as you remove the close-up materials. Drive flush or remove **ALL** protruding nails or staples along the mating surfaces. Anything sticking out could hold the sections apart. Do **NOT** remove the shipping braces at this time. If the home has a hinged roof, refer to paragraph 6.1.

2. Raise the hitch higher than its intended final position. Place a support crib underneath it to prevent the home from falling if the jack or hitch fails. Place jacks in the wheel area under each steel beam and raise the home higher than its final position. Make sure the jacks are on a firm base to prevent tipping.

3. Place the piers at the locations determined from Chapter 4. Adjust all pier heights using leveling procedure per paragraph 5.2.1.1. Additional support is required under doors and heavy furniture per paragraph 4.1.5.3, and failure to install it may void your warranty.

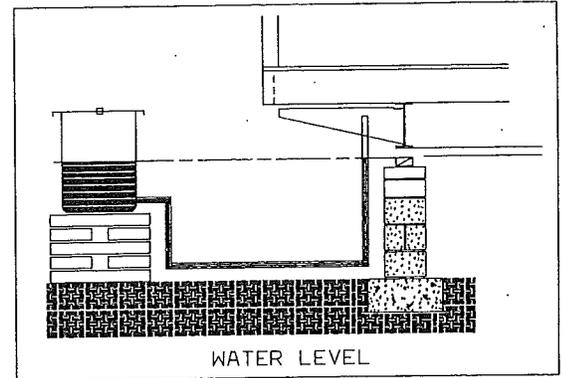
4. Remove the safety supports and lower the home onto the piers.

5. Check the soundness of all piers and adjust as required to assure the normal operation of all windows and doors.



5.2.1.1 Leveling. To level the home, use a “water level.” One configuration consists of 100 feet of 3/8” or 1/2” clear plastic tubing which is connected near the bottom of a plastic container that is filled with colored water. The container has a lid with a vent hole that can be sealed with a cork when the water level is not being used. A shut-off valve is on the other end of the tube. The water in the tubing will always be level with the water in the container if the shut-off valve is open and the cork is removed (see FIG. 5.2). Comparable “water levels” may be purchased from some building supply and hardware retailers.

FIG. 5.2



5.2.1.2 How to use a water level

1. Position the container so that the valve end of the tubing can reach anywhere under the home. Put blocks under the container so the water line in the tubing is at the height that you want the bottom of the I-beam to be in its final position. See Figures 5.2 and 5.3.

2. Unroll the tubing. Be sure there are no kinks in the tubing. Don't set or lay anything on the tubing.

3. Check for air bubbles in the tubing. To remove any bubbles, remove the thing on the tubing, cork from the lid and lower the valve below the water level in the container. Open the valve to let any bubbles flow out. When the tubing is free of bubbles, close the valve.

4. Determine the height that the home will set off the ground. Prepare the “water level” for use. Remove the cork and raise the shut-off valve above the container. Open the valve and set the water line in the tubing to the predetermined height. Close the valve so the container and tubing can be moved without losing any of the liquid.

5. With the valve end of the tubing, check both the front and rear of the home to determine if either has to be raised to allow the piers to be set. Raise the home as needed.

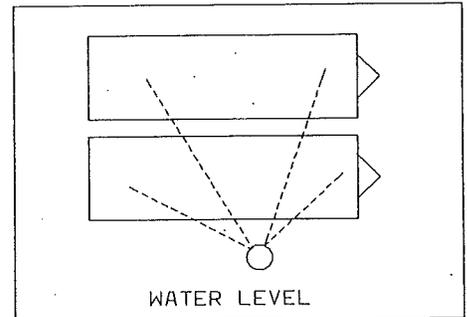
6. At each pier location, secure the end of the tube above the bottom of the I-beam and open the valve. Adjust the height of the pier by adding or removing approved materials until the top of the pier is level with the water line in the tube. Close the valve so the end of the tubing can be moved to the next pier location. Repeat the procedure until all the piers are leveled.

NOTE: *All the piers should be leveled before the home is lowered. This allows the weight of the home to be evenly distributed on all the piers.*

5.2.2 Positioning multi-section homes. Following the positioning and leveling procedures of Paragraph 5.2.1 for the first section, set the other section(s) as follows:

- Place the second section near the first.
- Remove all shipping materials and items from the mating surfaces of both sections.
- If your home has an optional hinged roof or eaves, refer to paragraph 6.1.

FIG. 5.3

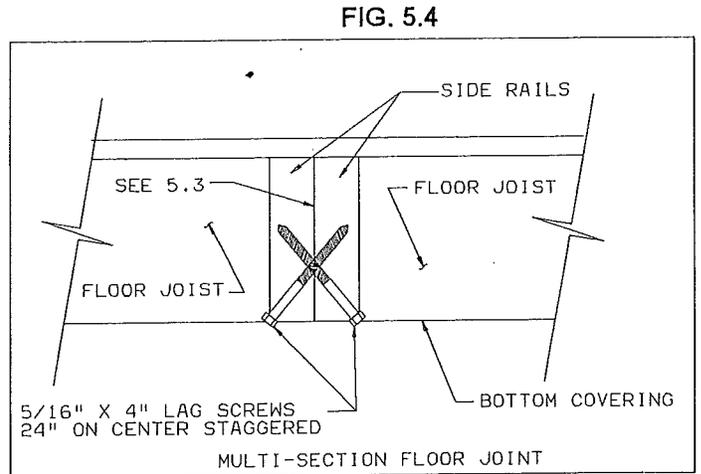


- Before the final positioning of the second section, fiberglass insulation or an equivalent material should be fastened on the mating edges of the floor, walls, and ceiling to prevent air infiltration. Alternately, place sealant on the mating edges of the floor, end walls, and ceiling. Material used for this purpose should not be placed in a position where it could restrict the air ducts of the heating system, or supply or return air ducts which might cross at the floor line or through the ridge beam. If there is a crossover duct, it will require a connection seal. Make certain that it is in place prior to joining the two sections.
- Position the second unit near the first section, and line up the sections.
- Raise the second section the same way as the first section. Refer to the paragraph 5.2.1. Position the pads and piers, and level each pier with the "water level." When this operation is complete, lower the jacks so that the steel frame members rest on the piers.

5.3 Closure and crossover connections for multi-section homes. After the sections have been positioned together and aligned, the provided log screws are to be driven to connect the floor and roof of both halves as outlined below. If the sections are not tight fitted they are to have wood shims fitted for the total length of the gap in the area of the lag screws when the gap is greater than 1/2 inch. Shims may be up to 1 inch in thickness. See FIG. 5.4.

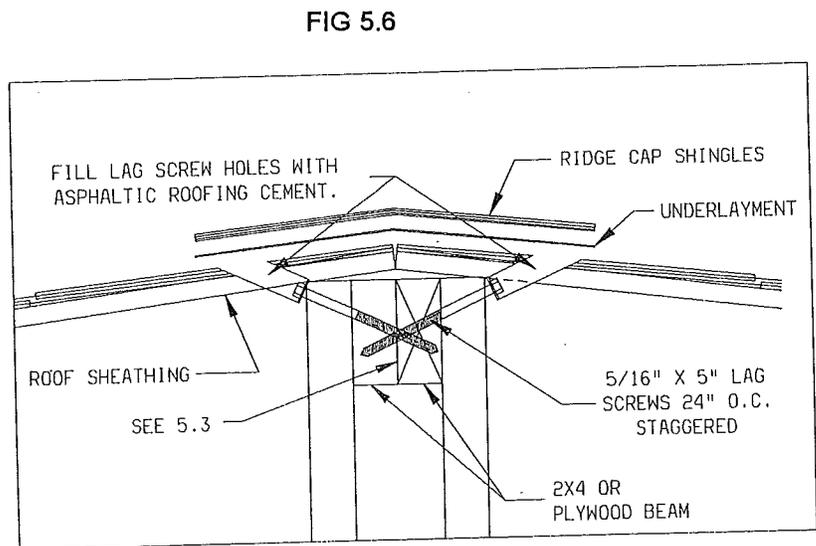
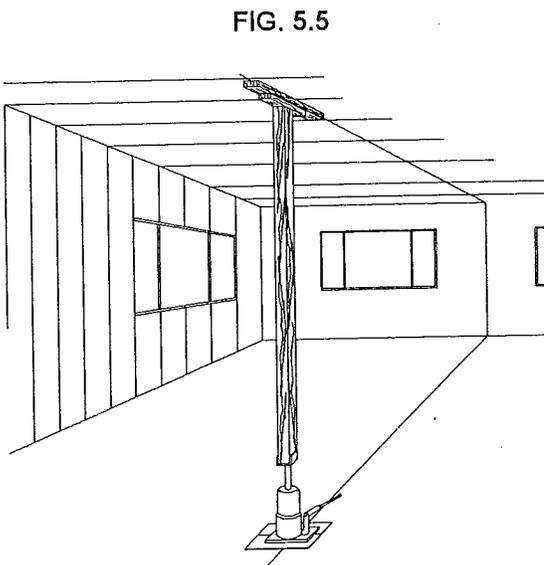
To avoid splitting the rails, pilot holes should be drilled. ***Do not use the lag screws to pull the home sections together.*** When one side of the section is lower than the other, use a jack to raise the side rail of the low side. Once the sections are even, lag or nail the side rails together. Continue to check, level, and fasten the sections together for the length of the home. Any holes cut in the bottom covering must be repaired.

- Inside the home, the ceiling panels and the endwalls of the sections must align with each other. If the sections are not in proper alignment, they may be adjusted (racked) by raising (jacking) a corner of the home. This will cause the ceiling on the opposite side to move forward. When the endwalls become flush, fasten them together at the front and back end of the house with 16d nails, or equivalent, spaced at a maximum of 18" on center. Once the endwalls are secured, make sure the roofs are aligned and the ceilings line up. If they are still off, rack the section a little more to bring the roofs and ceilings into alignment.



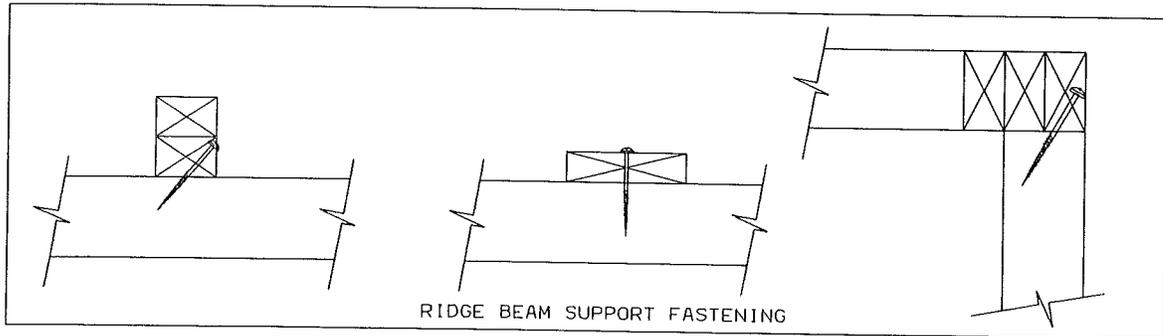
- By carefully inspecting the ceiling or by using a straight edge, low points can be determined. Start in the front and work to the back of the house. To raise a low portion, use a hydraulic jack and a padded tee underneath the low point (see FIG. 5.5). Carefully raise the jack until the adjoining ceiling sections are flush. Then, fasten the two ridge beams together on the outside of the home.
- To secure adjoining roof sections together, install 5/16" x 5" long (minimum) lag screws at a 45-degree angle so they penetrate both ridge beams (see Figures 5.5 and 5.8). Install the lag screws from alternate sides on 24" centers. Remember, the fasteners are used to secure the sections together and must NOT be used as a way to pull the roofs together.

NOTE: *It is imperative that the ceilings on each section be exactly flush before fastening the ridge beams together.*



Inside the house, check along the center line for a label that identifies a support column requiring special attachment. If you find one, fasten that column to the structure of the other section as shown in FIG. 5.7.

FIG 5.7

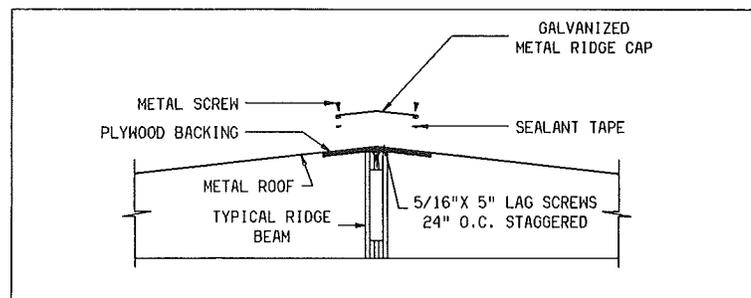


- On composition shingle roofs, cover the joint between roof sections with a piece of roofing felt which is stapled to the underlying roof decking. The staples should be 16 Ga. x 1" x 1" and spaced a maximum of 6" apart.
- Shingles used for the ridge cap are 36" x 12" cut into three sections. Start from the end that is opposite the direction of the prevailing wind. Overlap each ridge shingle 6" and secure with four 16 Ga. x 1" x 1" staples or roofing nails.

NOTE: *Shingles on certain areas of the roof may be secured with tack strips for transportation. Tack strips must be removed and any visible holes that are left by the tack-strip fasteners must be filled with roofing cement.*

- On metal roof applications, use an 8 inch wide galvanized metal cap to cover the joint. Secure the cap down each side with 1 inch sheet metal screws installed at 4 inches on center. The screws used to attach the cap must go through the underlying sealant tape. After the installation, the screws used in a metal roof application should be covered with a roof sealant. See FIG. 5.8 below.
- For other roofing materials, see the roofing manufacturer's installation instructions.

FIG. 5.8

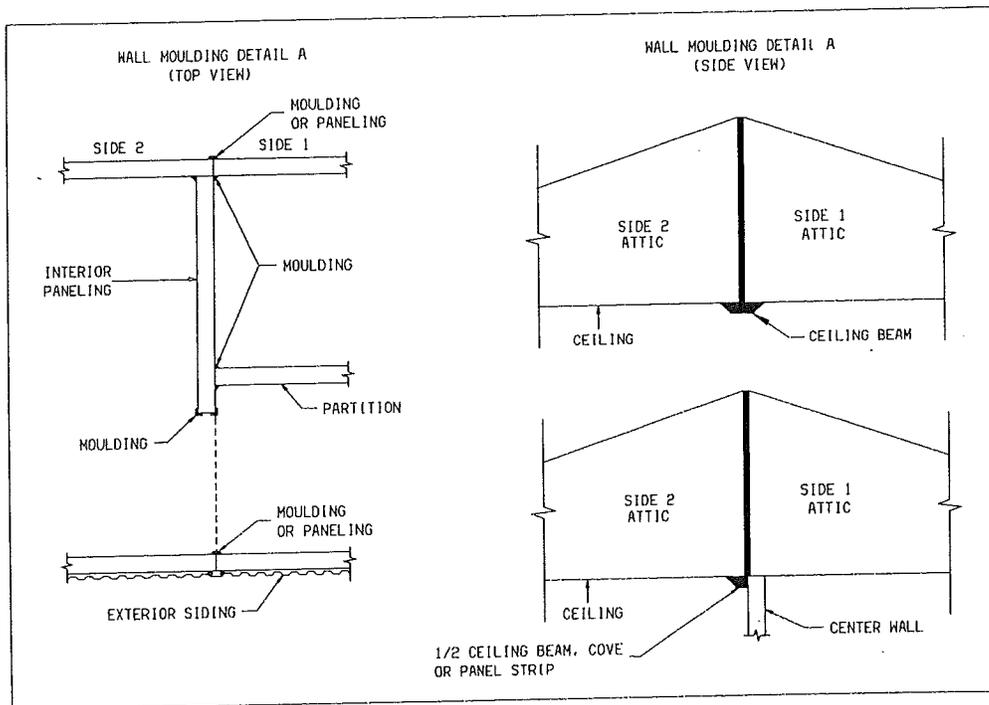


After you have completed the leveling of the home, check the door and window operation. Minor adjustment of the shims at some piers may be needed to improve the operation of a door or window.

Interior closure. All the materials necessary to trim out the interior of the home are shipped with each home and can be easily identified by matching the mouldings or paneling with the materials installed by the manufacturer. See FIG. 5.9.

Before installing mouldings, fill all gaps in the exterior walls with fiber glass insulation or caulking. Then, staple or nail the mouldings in place. Color-coordinated putty (not supplied by the manufacturer) may be used to cover staple and nail holes.

FIG. 5.9



NOTE: *A section of panel may have been shipped loose for installation on site in order to achieve a more desirable finished appearance.*

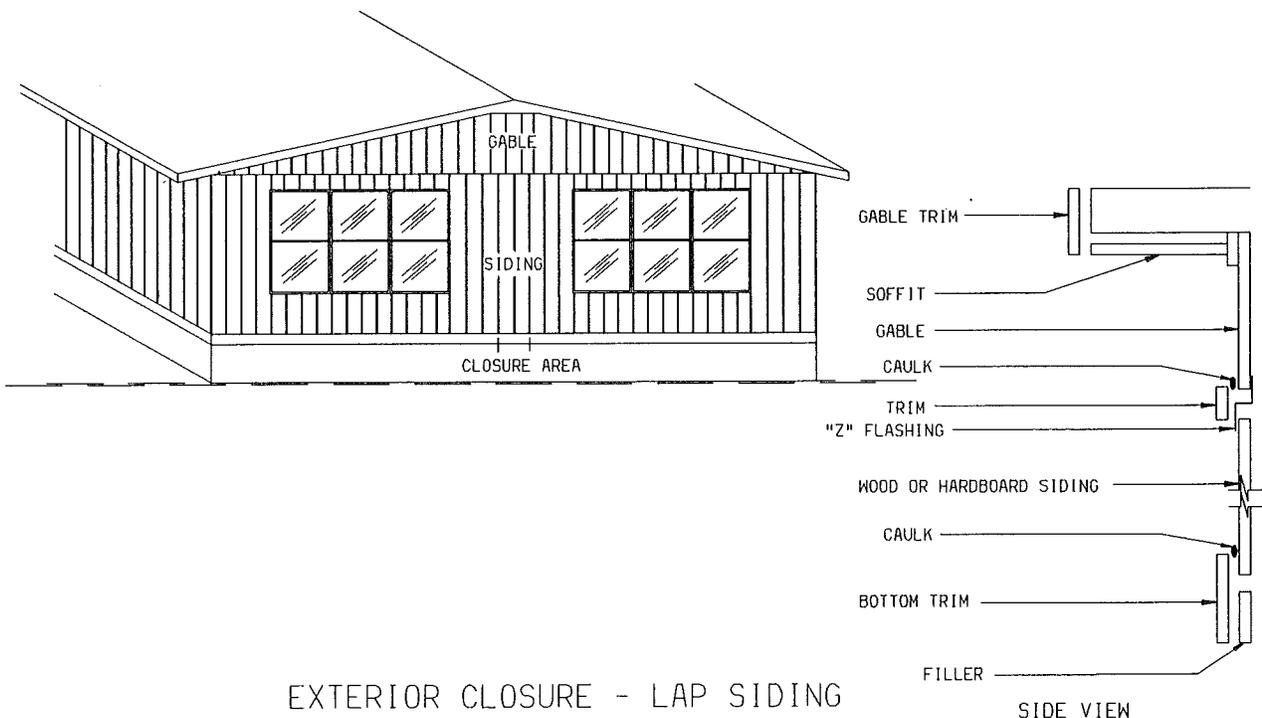
Installation of Exterior Closure Trim

1. Remove any polyethylene shipping material from the end wall and install the vertical siding with the provided fasteners, following the nailing pattern given in FIG. 5.10.
2. Install the matching bottom trim in the front and rear with the nails provided.
3. Match and install the gable trim material. See FIG. 5.10.
4. All cracks, seams and openings must be sealed with caulking to prevent entry of moisture.
5. All exposed raw edges of trim and siding must be painted, sealed or treated to provide moisture and weather tightness.

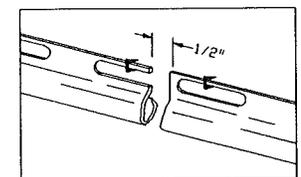
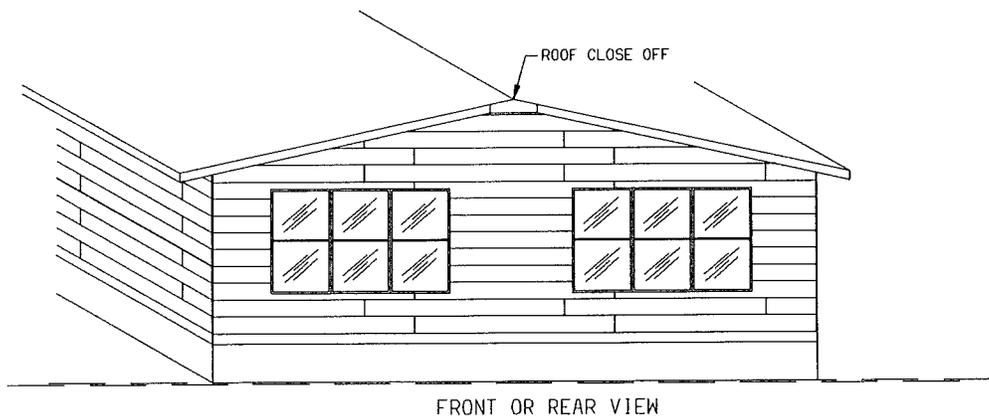
For homes manufactured with metal or vinyl siding, the detail drawing shown (see FIG. 5.10) is typical. The closure material is shipped with each home and can be identified by matching it with the front and rear of the home.

FIG. 5.10

EXTERIOR CLOSURE - WOOD OR HARDBOARD SIDING



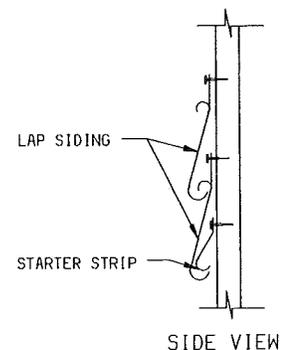
EXTERIOR CLOSURE - LAP SIDING



STARTER STRIP

NOTES:

1. WOOD OR WOOD PRODUCT SIDING SHALL HAVE ALL JOINTS LOCATED ON FRAMING MEMBERS. USE THE CORROSION RESISTANT NAILS SHIPPED WITH THE HOME AND INSTALL THEM PER THE INSTRUCTION OF THE SIDING MANUFACTURER ALSO SHIPPED WITH THE HOME.
2. VINYL LAP SIDING SHALL BE ATTACHED TO THE SHEATHING WITH A CORROSION RESISTANT FASTENER WITH MAY BE A 1 1/2" SIDING NAIL OR A 16 GA. X 7/16" CROWN X 1 1/4" LONG STAPLE. ALL SIDING SHALL BE ATTACHED LOOSE TO ALLOW FOR EXPANSION AND CONTRACTION AND THE FASTENER SHALL BE IN THE CENTER OF THE SLOT EXCEPT THE TOP FASTENER TO HANG VERTICAL ACCRSORIES. ALLOW 1/2" BETWEEN ACCESSORY BUTT JOINTS AND A MINIMUM OF 1" ON THE LAP JOINTS.
3. MINIMUM FASTENING SPACING SHALL BE:
 - A. WIND ZONE I:
HORIZONATL LAP: 16" ON CENTER
SHEET SIDING: EDGES 6" ON CENTER AND FIELD 12" ON CENTER.
 - B. WIND ZONE II AND III:
ALL SIDING SHALL BE FASTENED 6" ON CENTER.



SIDE VIEW

Installation of Exterior Closure Metal

1. Remove any polyethylene material from the end walls and install the bottom starter with the provided fasteners (see FIG. 5.11).
2. Install the siding by snapping the sides into the S-Locks; secure with the screws provided.
3. Attach the roof closure metal to the front and rear roof. See FIG. 5.9.

5.3.1 **Utility crossovers.** Connect water, drainage, gas, electricity, and telephone utility crossovers. Section 8 outlines the correct procedures.

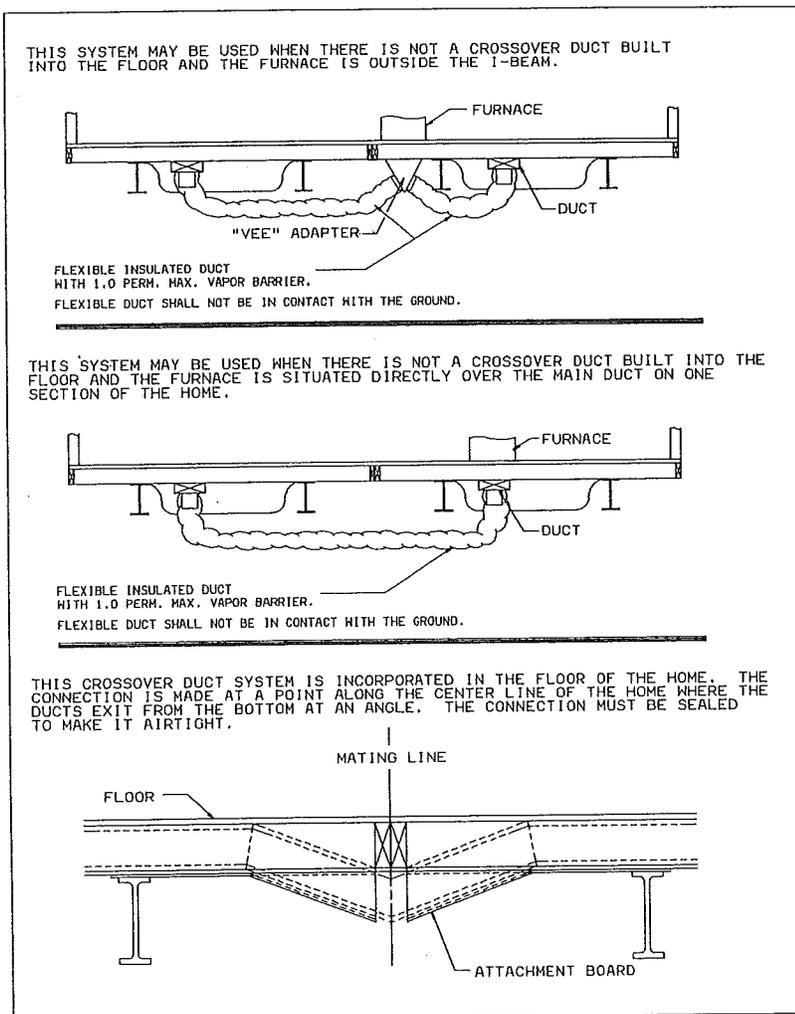
5.3.2 **Ductwork crossovers.** Multi-section homes may require a heat/AC duct connection below the floor. Compare the inlets/outlets under the home with FIG. 5.12 and connect the inlets/outlets with the flexible duct(s) and clamps that have been shipped with the home. Support all ductwork so it is not in contact with the ground, and cover all exposed ductwork with material having an insulating value of not less than R-4 under a vapor barrier with a perm rating of not greater than 1.

5.4 **Anchoring instructions.** This home was designed for the wind loads specified on the Data Plate located in the home. In order to resist the design wind loads, diagonal frame tie-downs should be installed in accordance with the following instructions and in accordance with the instructions provided by the manufacturer of the tie-down hardware.

The frame tie-down anchoring devices shall be certified by a registered professional engineer, architect or a nationally recognized testing laboratory as capable of resisting an allowable working load equal to or exceeding 3,150 pounds and should be capable of withstanding a 50 percent overload (4,725 pounds total) at an angle of 45 degrees from the vertical. Ground anchors must be installed as specified by the anchor manufacturer. Commercial designs are available from retailers or contractors.

Anchoring equipment exposed to weather-ing should have a resistance to weather deterioration at least equivalent to that provided by a coating of zinc on steel of not less than 0.30 ounces per square foot of surface coated. Slit or cut edges of zinc-coated strapping do not need to be zinc coated. Straps should be Type 1, Finish B, Grade 1 steel strapping, 1 1/4" wide and 0.035" thick, conforming with Federal Specifications QQ-D-781-H or equivalent.

FIG 5.11



The home must be in its final position prior to installing tie-down equipment. The following tie-down procedure may be used:

5.4.1 Normal Installations. Table 4.1 (Section 4) summarizes normal installations. The piers and ground anchors system installation described in this manual is the most common. When using another type of installation, consult a registered professional engineer.

5.4.1.1 Number and location of anchors. Select the proper spacing of tie-down straps from Table 5.1, and install listed or certified ground anchors under both sidewalls as directed by the anchor manufacturer. In Wind Zones II and III, HUD requires a vertical sidewall strap to be installed at each diagonal frame strap, therefore diagonal frame straps should be located to coincide with these factory installed vertical straps; however, do not exceed the spacing in Table 5.1. The measurements for the specific location of the ground anchors for your particular home must be taken directly from the home or an anchor plan may be available from the manufacturing facility that built the home.

Homes installed in Wind Zone I are not required to have longitudinal straps installed. Homes installed in Wind Zone II and III shall have two (2) longitudinal straps installed at each end of each floor from the factory installed bracket, at the end of each beam to an approved ground anchor.

In Wind Zone II, all homes shall have two (2) anchors installed at the end of each section. In Wind Zone III, homes with 84" interior sidewall height shall have two anchors installed. All other homes in Wind Zone III shall have three. The third anchor shall be installed close to either of the required two, but within the parameters set by the anchor manufacturer. The strap shall be installed around the front crossmember that is adjacent to each main frame beam and at the back around each rear outrigger and adjacent to the main frame beam.



TABLE 5.1

GROUND ANCHOR AND TIE-DOWN STRAP SPACING

ALL SINGLE-SECTION HOMES

| WIND ZONE | INTERIOR SIDE WALL HEIGHT | | | * | MAX. HEIGHT FOR MAIN PIERS |
|-----------|---------------------------|-------|-------|-------|----------------------------|
| | 84" | 90" | 96" | | |
| I | 9'-6" | 9'-0" | 8'-6" | 6'-6" | 36 INCHES |
| II | 6'-4" | 6'-0" | 5'-8" | 4'-4" | 20 INCHES |
| III | 5'-4" | 5'-0" | 4'-9" | 3'-8" | 20 INCHES |

TWENTY-FOUR WIDE MULTI-SECTION HOMES

| WIND ZONE | INTERIOR SIDEWALL HEIGHT | | | * | MAX. HEIGHT FOR MAIN PIERS |
|-----------|--------------------------|--------|-------|--------|----------------------------|
| | 84" | 90" | 96" | | |
| I | 7'-3" | 6'-10" | 6'-6" | 5'-0" | 36 INCHES |
| II | 5'-0" | 4'-9" | 4'-6" | 3'-6" | 20 INCHES |
| III | 4'-2" | 4'-0" | 3'-9" | 2'-10" | 20 INCHES |

TWENTY-EIGHT WIDE MULTI-SECTION HOMES

| WIND ZONE | INTERIOR SIDEWALL HEIGHT | | | * | MAX. HEIGHT FOR MAIN PIERS |
|-----------|--------------------------|-------|--------|-------|----------------------------|
| | 84" | 90" | 96" | | |
| I | 9'-10" | 9'-4" | 8'-10" | 6'-9" | 36 INCHES |
| II | 6'-4" | 6'-0" | 5'-8" | 4'-4" | 20 INCHES |
| III | 5'-4" | 5'-0" | 4'-9" | 3'-8" | 20 INCHES |

* USE THIS ANCHOR AND TIE-DOWN STRAP SPACING WHEN:

1. AT THE ENDS WHEN A MULTI SECTION HOME IS OFF-SET AND EXPOSED EXTERIOR WALL EXCEEDS 96".
2. AT ALL LOCATIONS WHERE PIER HEIGHTS EXCEED HEIGHTS SHOWN ABOVE, TO A MAXIMUM OF 48" AND THE INTERIOR WALL HEIGHT DOES NOT EXCEED 96".

EVERY HOME SHALL HAVE A TIE-DOWN INSTALLED WITHIN 24" OF THE END OF THE HOME. FOR CONDITIONS OR TIE-DOWN METHODS NOT COVERED IN THIS MANUAL, THE SUPPORT SYSTEM SHALL BE DESIGNED AND CERTIFIED BY A REGISTERED ENGINEER OR ARCHITECT.



5.4.1.2 Installation of Ground Anchors. Ground anchors must be installed in full conformance with the anchor manufacturers instructions.

Ground anchors for all Wind Zones must have a stabilizer plate at the top of the anchor. Ground anchors for Wind Zone I may have a single head. Ground anchors for Wind Zone II and III must have double heads. All ground anchors must be installed at their full depth, and below the frost line and at least 12" above the water table.

All tie-down straps must be properly installed to keep from damaging a structural part of the home. All straps must be alternately tensioned on opposite sides of the home.

5.4.1.3 Tie-down instructions. Install all ground anchors and connect the straps to the ground anchor heads as instructed by the anchor manufacturer.

1. **WIND ZONE I:** Position and install ground anchors so that a 40 to 50 degree strap angle is achieved and the maximum spacing is not greater than that shown in Table 5.1. If this angle to the horizontal is greater than 50 degrees, an additional strap is to be added from the anchor to the opposite I-beam. Straps may be offset from piers by not more than three feet.
2. **WIND ZONE II and III:** Connect anchors to the vertical factory-installed straps at the perimeter, and install straps from the anchor to the opposite I-beam.

Tighten the straps to remove the slack. Use caution to avoid excessive tension. After all straps are installed and the slack is removed, lightly tension the straps alternately on opposite sides to avoid disturbing the home set-up.

Strap tension should be checked frequently until all pier movement has stopped.

CAUTION: *During re-leveling, do not jack the home against tight straps.*

5.4.2 Severe climatic conditions

5.4.2.1 Freezing Climates. Be sure anchor augers are installed below the frost line. During periods of frost heave, be prepared to adjust the tension on the straps.

5.4.2.2 Severe wind zones. The home should not be installed in an area known to experience severe winds, or in any zone that requires greater wind-resisting capabilities than those for which it was designed (see Data Plate). If a home must be installed in such a zone, seek the advice of a registered professional engineer. Have engineered drawings showing foundation, connection and anchorage details approved by local authorities.

5.4.2.3 Flood-prone areas. Redman Homes, Inc. does not recommend siting manufactured homes in flood-prone areas and Redman Homes, Inc. will not be responsible for damage if the home is installed in a flood-prone area. Foundation considerations are discussed in section 4.4.1. Unconventional anchorage and tie-downs often are needed in designing and constructing the special elevated foundations that may be required in flood-prone areas. Consult a registered professional engineer.

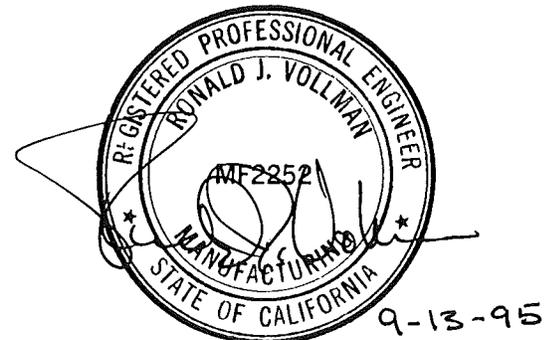
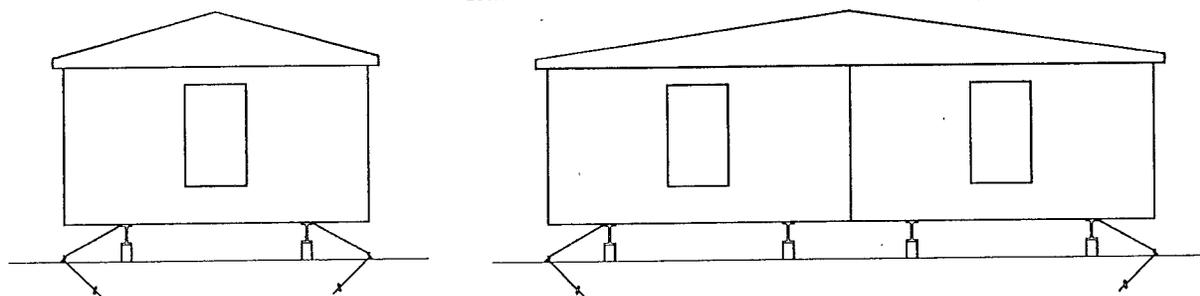
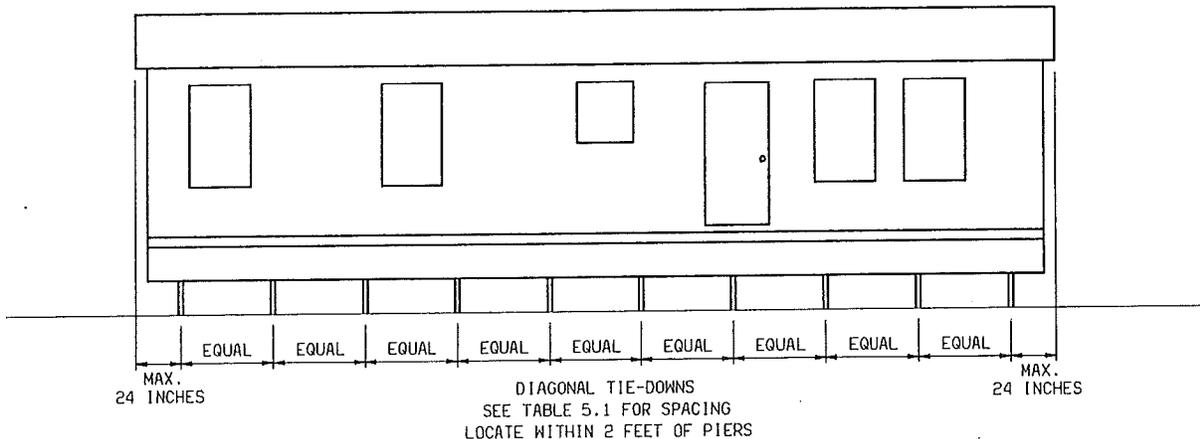
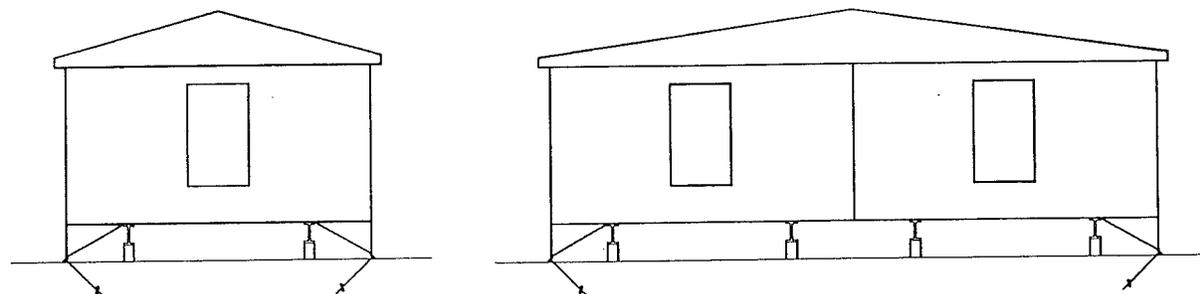


FIG. 5.12

TIE-DOWN DETAILS - TYPICAL



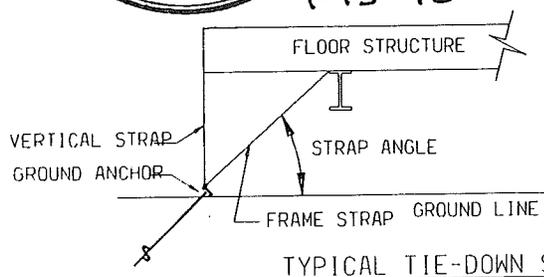
TYPICAL SINGLE TIE-DOWN STRAPS
WIND ZONE I ONLY



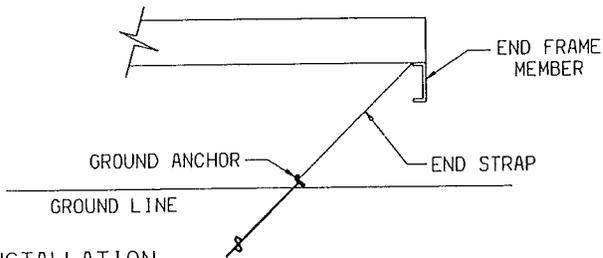
TYPICAL DOUBLE TIE-DOWN STRAPS
WIND ZONES II AND III



9-13-95



TYPICAL TIE-DOWN STRAP INSTALLATION



5.5 Installation of on-site attached structures. Any structures, devices, accessories, etc. added by others are not the responsibility of Redman Homes, Inc. Any such items should be designed to support their own weight independent of the home structure and should meet applicable local codes. Examples are awnings, carports, garages, decorative trims on flue pipe extension, etc. Design all attached buildings and structures to support all of their own dead, live and wind loads, and to have fire separation as required by state or local ordinances.

5.5.1 Attached garages. Attached garages must be installed according to the manufacturer's instructions and to all applicable local codes. They must be supported independently of the factory-built portion of the home. Electrical circuits in garages should be provided with ground fault interruption.

5.5.2 Porches. Site-constructed porches must be constructed and inspected according to the applicable local building codes.

5.5.3 Steps, stairways and landings. Steps, stairways and landings must be constructed and inspected - according to the applicable local building codes.

5.6 Ventilation. The crawl space beneath the home, between the floor joists and the ground, when there is a perimeter barrier installed and no basement, shall be provided with vents to the outside equal to one (1) square foot of free air for each 150 square feet of crawl space area. One such vent shall be located within three (3) feet of each corner.

Exceptions:

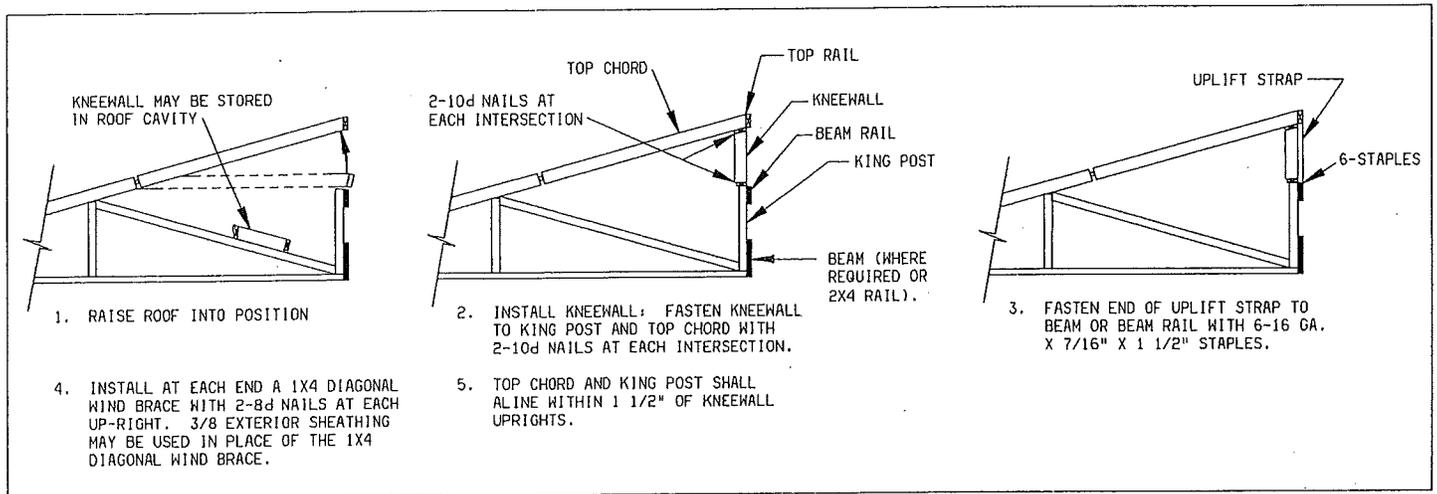
1. The total area of ventilation openings may be reduced to 1/1,500 of the under-floor area where the ground surface is treated with an approved vapor barrier material and one such ventilation opening is within 3 feet of each corner of the home. The vents may have operable louvers.

2. Ventilation openings may be omitted on one side.

SECTION 6 - INSTALLATION OF OPTIONAL FEATURES

6.1 Hinged roofs and eaves. Some multi-section homes may have a fold-up roof which will need to be raised and assembled prior to blocking. FIG. 6.1 shows the three steps required.

FIG. 6.1



6.2 Garden and bay windows. If your home was supplied with an optional garden or bay window, follow the manufacturer's installation instructions.

6.3 Awnings and carports. Choose free-standing products with columns to support their weight.

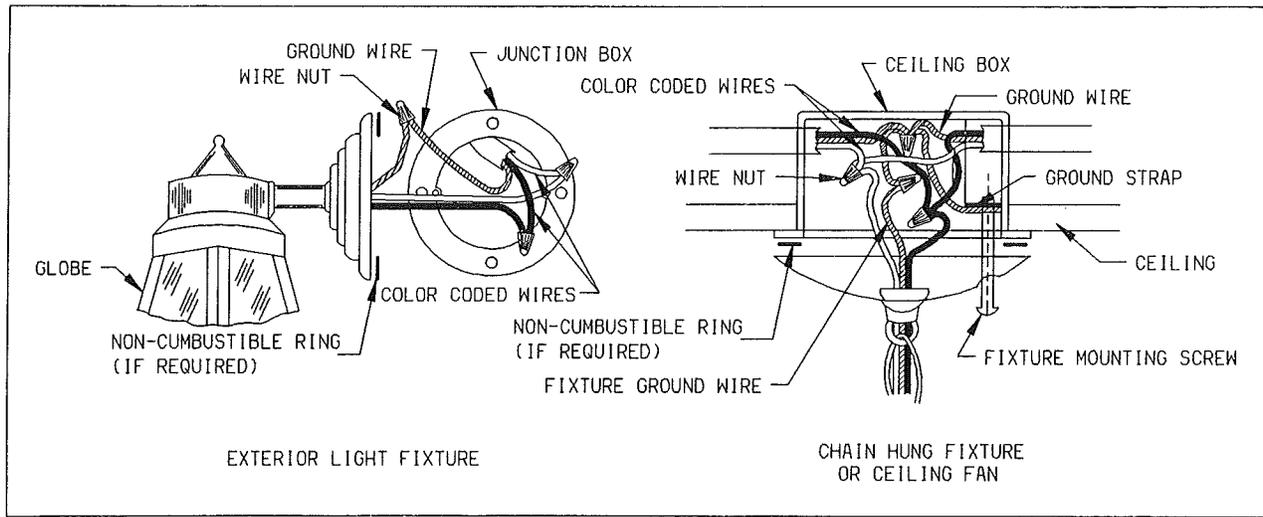
6.4 Accessory windows. Install accessory windows or components with the installation materials supplied, and follow the manufacturer's installation instructions.

6.5 Miscellaneous lights and fixtures. Some exterior lights, ceiling fans and chain-hung fixtures may not yet be installed when the home is delivered. All of these fixtures must be grounded by a fixture-grounding screw or wire. For chain-hung fixtures, use **both** methods. When fixtures are mounted on combustible surfaces such as hardboard, install a noncombustible ring to completely cover the combustible surface exposed between the fixture canopy and the wiring outlet box. If siding has not been installed at a fixture location, remove the outlet box and install the siding with a hole for the outlet box. Then, reinstall the outlet box and proceed as for other fixtures.

6.5.1 Exterior lights. Remove any junction box covers and make wire-to-wire connections using wire nuts. Connect the wires as follows: Black to black, white to white, and ground to ground. Caulk around the base of the light fixture to ensure a water-tight seal to the sidewall. Push the wires into the box and secure the light fixture to the junction box. Install the light bulb and attach the globe. Refer to FIG. 6.2.

6.5.2 Ceiling fans. To reduce the risk of injury, install ceiling fans with the lowest edges of the blades at least 76 inches above the floor. Follow the manufacturer's instructions. If no instructions are available, connect the wiring as shown in FIG. 6.2.

FIG. 6.2



6.6 Ventilation Options. Follow the ventilation equipment manufacturer's instructions.

6.7 Optional panels, siding and molding. If your home came equipped with optional panels, siding or molding, refer to any special installation procedures provided with the materials.

6.8 Exterior coverings. Install exterior coverings (e.g. stucco, metal, vinyl, plywood, or hardboard exterior siding, etc.; shingled or tiled roofs, etc.) according to the material manufacturer's instructions. Do not cover the HUD label when applying any field exterior covering.

6.9 Telephone and cable television. *Careless installation of telephone and cable television lines may be hazardous.* The walls and floors of your manufactured home contain electrical circuits, plumbing and ductwork. Avoid contact with these home systems when drilling through and placing cables within these cavities. Only trained professionals should perform such work. *Failure to follow these instructions may result in serious personal injury or death.*

SECTION 7 - PREPARATION OF APPLIANCES

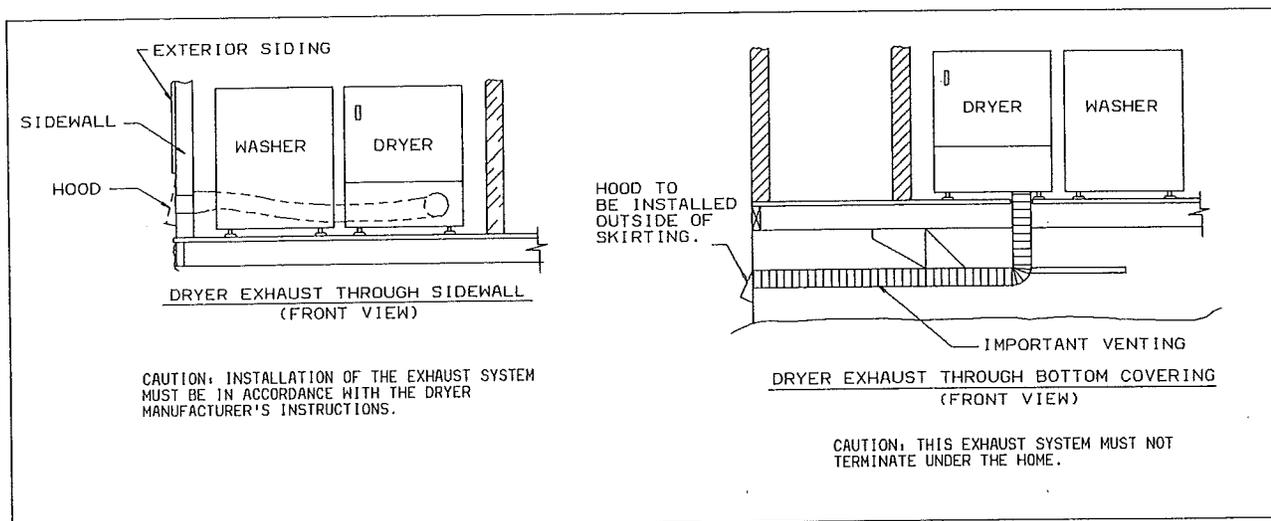
7.0 All homes may not contain a heating appliance. Those homes that have been designed to accept a remote forced air heating appliance must have a remote forced air heating appliance installed to assure that the home remains in conformance with the "Manufactured Home Construction And Safety Standards". When a home is built to accept a remote forced air heating system the home must have installed, in addition to the foundation and tie-down requirements:

1. The appropriate forced air heating appliance.
2. All utility connections to the home.
3. The connecting ductwork. (The cold air return duct must be connected to the factory installed cold air duct connection).
4. The thermostat, for the forced air heating appliance, must contain an operating fan system.

7.1 Clothes dryer vent. Your clothes dryer must exhaust outside the exterior of the home, or any perimeter foundation or skirting installed around it, through a moisture-lint exhaust system, as shown in FIG. 7.1. **IMPORTANT: DO NOT** let the exhaust system end under the home where excess moisture or flammable material can accumulate. Install a metal flex duct after the home is set up at the site. Hold the duct in place with metal straps spaced 2 feet on centers secured to the bottom of the floor joists or frame. Vent openings are located in either the wall or the floor. After the duct is installed, seal the openings, both inside and outside, with approved duct tape or equivalent. Follow the dryer manufacturer's instructions for installing the exhaust system.

If your home did **not** come equipped with a gas dryer, remember that installing one requires substantial alteration to the home. You must provide gas supply piping and adequate venting as specified by the gas dryer manufacturer. Only a trained and experienced person should install a gas dryer. Cutting major structural elements (such as rafters or floor joists) to allow for a gas dryer installation is not permissible.

FIG. 7.1



7.2 Comfort cooling systems. Only qualified personnel may install any comfort cooling system not provided with the home. Follow the manufacturer's installation instructions and conform to all local codes.

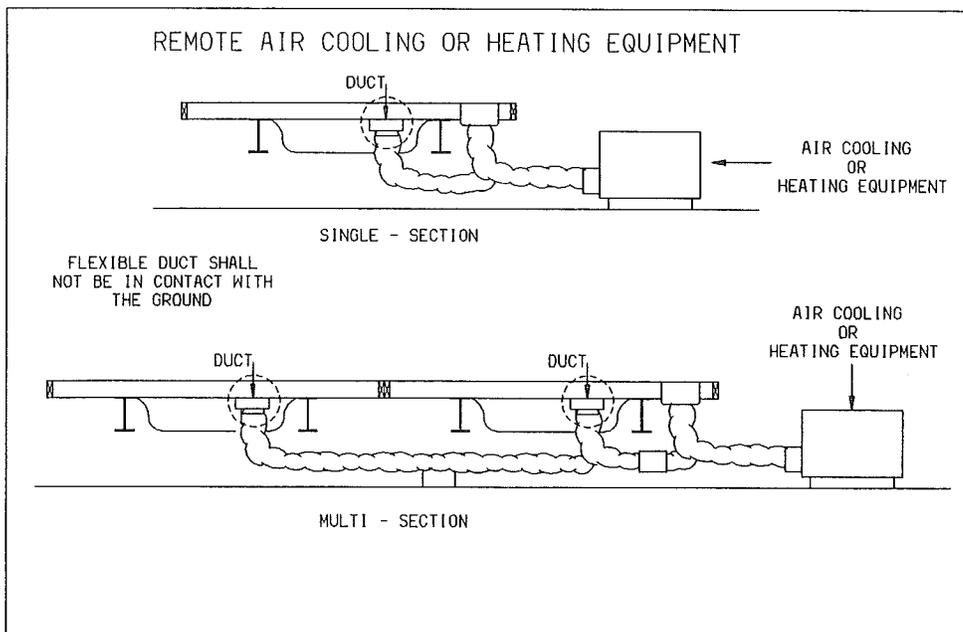
7.2.1 Air conditioners. The air distribution system of this home has been designed for a central air conditioning system. Equipment you install must not exceed the rating shown on the home's compliance certificate. Redman Homes, Inc. does not recommend installing window air conditioning units. The home's electrical distribution panel may contain optional factory-installed circuits for air conditioning. The maximum full load ampere draw for the desired air conditioning unit must not exceed the circuit rating shown.

On the other hand, electrical circuits within the home may not have been sized for the additional load of non-factory-installed air conditioning, and a separate, outside electrical supply may have to be provided.

Any field-installed wiring beyond the junction box must include a fused disconnect located within sight of the condensing unit. The maximum fuse size is marked on the condenser data plate. Local codes will determine the acceptability of the air conditioning equipment, rating, location of disconnect means, fuse-type branch circuit protection, and connections to the equipment.

"A" coil air conditioning units must be compatible and listed for use with the furnace in the home. Follow the air conditioner manufacturer's instructions.

FIG. 7.2



If a remote (self-contained) air conditioner (cooling coil and blower are located outside the home, see FIG. 7.2) is to be connected to the heating supply duct, install an automatic damper between the furnace and the home's air duct system, and another between the remote unit and the home's air duct system. Secure the duct system leading from the remote unit to the home, and do not allow it to touch the ground. Insulate ducts with material of thermal - resistance (R) not less than 4, and a perm rating of not more than 1 perm. Connect the duct carrying air to the home to the main duct at a point where there are approximately as many registers forward of the connection as there are to the rear. Locate the return air duct in the center of the home.

Do not cut or damage floor joists. Return air and supply ducts are sized to fit between the floor joists. Replace insulation removed during the installation, and seal the bottom covering around the duct connections.

Direct all condensation runoff away from the home by connecting a hose to the equipment runoff outlet or by other means specified by the equipment manufacturer.

7.2.2 Heat Pumps. Install heat pumps according to the heat pump manufacturer's instructions.

7.2.3 Evaporative Coolers. Install a roof-mounted cooler following the evaporative cooler manufacturer's - instructions. In the absence of instructions, proceed as follows:

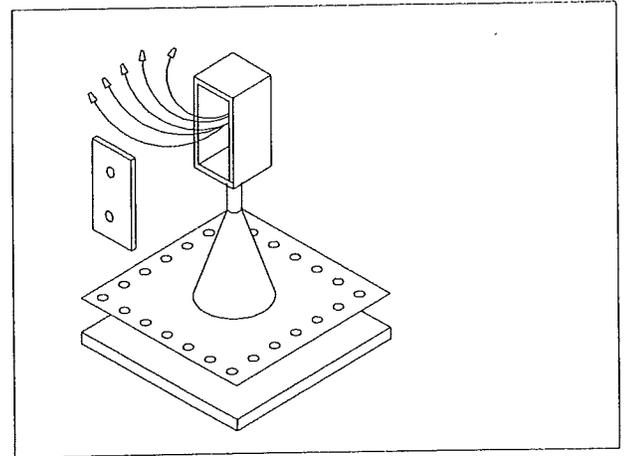
FIG. 7.3

Using wire nuts, connect the wires from the roof-mounted junction box as shown in FIG. 7.3, and replace the cover on the box.

Check to be sure a rigid base has been provided to evenly distribute the cooler's weight over several rafters. Tightly seal all roof penetrations and the boot connecting the cooler to the roof/ceiling opening to prevent leakage of water into and cool air out of the home.

Connect the cooler to an external water supply and attach an overflow hose to its accumulation pan to route overflow water away from the home.

Do not attach guy wires to roof vents, flues or other items protruding from the roof. To eliminate potential leaks, route guy wires over the side of the home and attach them to the roof rafter edge rails rather than



7.3 Chimneys and air inlets for fireplaces and wood stoves. Fireplaces and wood stoves require on-site - installation of additional section(s) of approved, listed chimney pipe, a spark arrestor and rain cap assembly. See FIG. 7.4.

7.3.1 Minimum extensions above the roof. To assure sufficient draft for proper operation, extend the finished chimney at least 3 feet above the highest point where it penetrates the roof and at least 2 feet higher than any building or other obstruction located within a horizontal distance of 10 feet. If the site has obstructions extending higher than the home's roof peak within 10 feet of the chimney, the installer may have to provide an additional section of chimney pipe if required by local codes.

7.3.2 Assembly and sealing sequence. When a fireplace is installed in your home, the installation will be complete except for the chimney and combustion air ducts.

Remove the protective materials covering the roof flashing and any foreign material from the installed part of the chimney. All parts required for a typical installation and instructions for their installation are provided with your home.

Warning

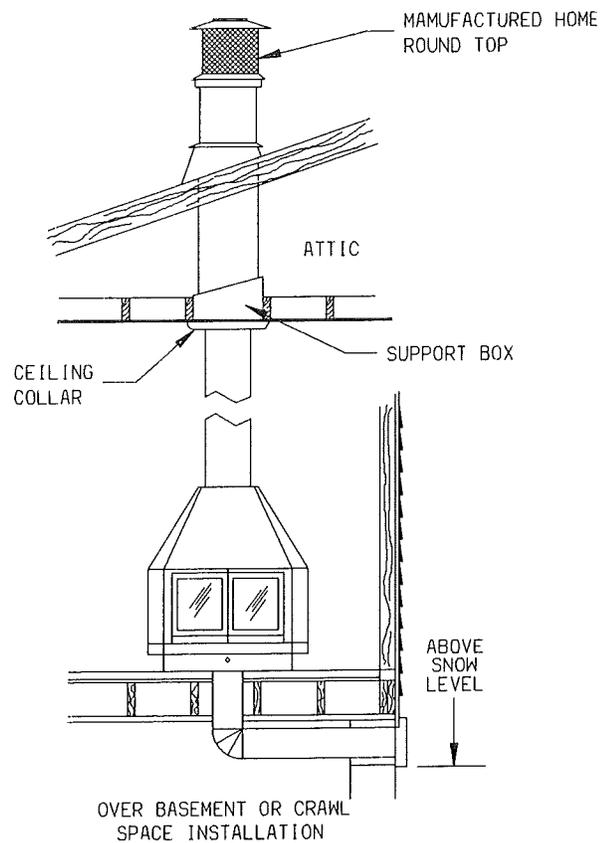
Both the chimney and the combustion air ducts must be installed before the fireplace is used. The hearth must also be installed before the fireplace is used, or a serious fire hazard will be created.

When a fireplace is factory-installed such that the firebox is in one section of a multi-section home and the hearth in the adjacent section, the hearth cannot be factory-installed. Therefore, the hearth must be shipped with the unit and field installed in strict compliance to the fireplace manufacturer's installation instructions.

7.3.3 Combustion air duct inlets. Combustion air-intake ducts end just below the bottom covering of the floor. You must extend them to the outside when your home has a basement or crawl space. These added ducts are not supplied, but they may be purchased at your local hardware store. The fireplace manufacturer's instructions for installing combustion air ducts are placed in the fireplace/stove or with the chimney parts. Do not allow the combustion air inlet to drop material from the hearth beneath the home. Locate the inlet damper above the expected snow level, as shown in FIG. 7.4.

7.4 Range, cooktop and oven venting. If your home is equipped with a combination range (cooktop)/grill or oven that contains its own exhaust system, route the exhaust so that it does not exit under the home. Connect flexible metallic duct between the elbow protruding from the floor and the termination fitting, and support it according to the manufacturer's installation instructions.

FIG.7.4



SECTION 8 - UTILITY SYSTEM CONNECTION AND TESTING

8.1 Proper procedure. Consult local, county or state authorities before connecting any utilities. Only qualified service personnel, familiar with local codes and licensed where required, should make utility connections and tests.

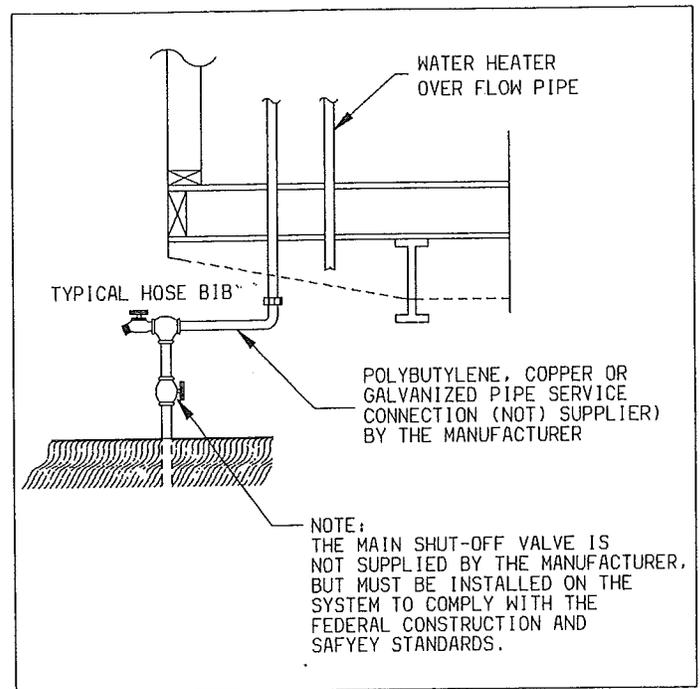
8.2 Water supply

8.2.1 Maximum supply pressure and reduction. The water system for your home was designed for a maximum inlet pressure of 80 psi. If you are located in a water district where the local water supply pressure exceeds 80 psi, install a pressure-reducing valve.

8.2.2 Connection procedures

8.2.2.1 To supply main. Connect the home's water system to the water source through the inlet located under the home, usually below the water heater compartment. A tag on the side of the home marks its location.

FIG. 8.1



8.2.2.2 Mandatory Shut-off valve. You must install an accessible shut-off valve between the water supply and the inlet, as shown in FIG. 8.1. It must be a full-flow gate or ball valve.

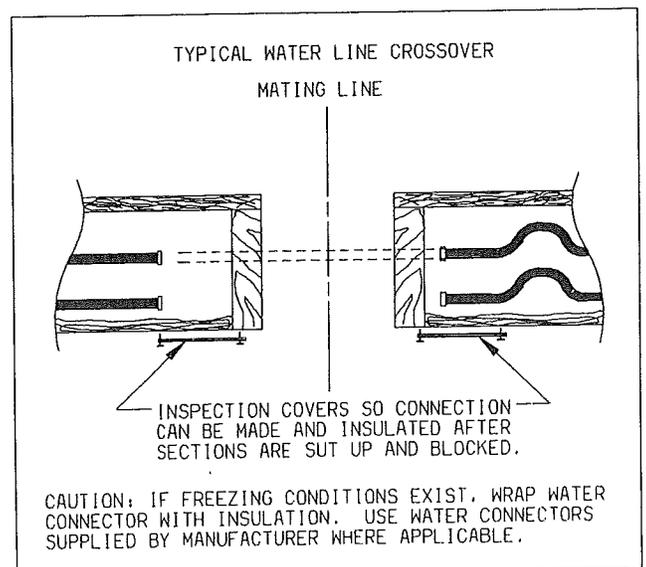
8.2.2.3 Crossovers. Multi-section homes with plumbing in both sections require water line crossover connections, as shown in FIG. 8.2. Remove the shipping caps from the water lines and install the crossover connectors provided with the home.

8.2.3 Freezing protection

8.2.3.1 Necessity. In areas subject to subfreezing temperatures, protect from freezing any exposed sections of water supply piping, shut-off valves, pressure reducers, and pipes in a water heater compartment with a noninsulated door. Otherwise, burst pipes and costly damage may result.

8.2.3.2 Use of heat tape. Heat tapes (either automatic or non-automatic) can protect exposed plumbing from freezing. *Use only heat tapes listed by a nationally-recognized testing laboratory for use with manufactured homes, and install them only in accordance with the manufacturer's instructions.* Plug the 3-wire, grounded cordset of the heat tape into the outlet located under the home near the water supply inlet.

FIG. 8.2



8.2.3.2.1 Automatic heat tape. This tape (with a thermostat) is approved for installation on all types of water pipe, including plastic. According to the manufacturer's instructions, secure it to the pipe, insulate it, and weatherproof it.

8.2.3.2.2 Non-automatic heat tape. This tape (without a thermostat), may not be approved for plastic pipe unless it is left exposed, with no outer wrap of insulation. Installation is otherwise the same as with the automatic heat tape.

8.2.3.3 Freezing protection for unoccupied homes. If the home is to be left unheated in cold weather turn off the water heater, and then drain the water lines and blow them clear with compressed air to prevent damage from freezing.

8.2.4 Test procedure. Even though the water system was tested at the factory, it must be rechecked for leaks at the installation site. Close all water faucets, spigots and toilet-tank float valves, and use one of the following procedures:

8.2.4.1 Hydrostatic. Be sure the water heater tank is full of water. Pressurize the system with water at 100 psi, and then isolate it from the pressure source. The system must hold this pressure for at least 15 minutes without any loss. If the pressure falls off, repressurize the system, and locate and correct any leaks.

8.2.4.2 Pneumatic. ***CAUTION: If this procedure is used, you must bypass the hot water tank by hooking its cold inlet and hot outlet lines together. This procedure will protect the hot water tank from damage and protect those involved in the test from possible injury.*** Connect an air pump and pressure gauge to the water inlet and pressurize the system to 100 psi. Isolate the pressure source from the system. The gauge must stand for at least 15 minutes with no drop in pressure. If there is a drop in pressure, locate any leaks by applying soapy water to the connections and looking for bubbles. Correct any leaks indicated by the bubbles, repeating the procedure until all have been eliminated. Reconnect the water heater and the water supply.

8.3 Drainage System

8.3.1 Assembly and support. Because of the remoteness of the plumbing fixtures or to protect the drainage system from over the road damage it is sometimes necessary to assemble any under-the-floor piping on site after the home has been set on its foundation and the tie-down operation is complete. If portions of the drainage system were not installed at the factory, all materials and diagrams required to complete it have been shipped as loose items in the home. The completion of the drain, vent and waste systems should be done by personnel who have been properly trained in the plumbing trade and the solvent welding of ABS pipe.

The following steps, if done in the order shown, will result in a completed system that will perform as designed. Start at the most remote end and work toward the outlet, supporting the piping with temporary blocking to achieve the proper slope (see paragraph 8.3.2). Assemble the complete system as shown on the diagram without using any solvent cement. At this point check all of the following:

1. Check that all fittings are in proper alignment.
2. Check that all pipe has been cut square and has been deburred.
3. Check that all piping is supported at 4 feet or less with a slope between 1/8" and 1/4" per foot.

8.3.2 Proper slopes and connector sizes. Drain lines must slope at least 1/4 inch fall per foot of run unless otherwise noted on the schematic diagram (see FIG. 8.3). Exception: 1/8" fall per foot is allowed when a cleanout is installed at the upper end of the run. Connect the main drain line to the site sewer hookup using an approved coupler (see FIG. 8.4).

When the entire system has been completed, install permanent drain line supports at 4 feet on center, as shown in FIG. 8.4. Hangers may be secured to any frame member, or to the wood floor joists that can be located just above the bottom covering material.

8.3.3 Solvent welding procedures. The solvent cement used to assemble the drain lines must be compatible with the pipe installed in the home. Follow the manufacturer's instructions on the container and complete the permanent connection of all pipe and fittings, again starting at the remote fixture.

8.3.4 Crossovers. Connect multi-section home drainage line crossovers that have been plant installed as shown in FIG. 8.3.

8.3.5 Protection from freezing. The floor insulation provides freeze protection for fittings in the floor. If this insulation is removed during assembly or testing, replace it. If the home is to be left unheated in cold weather, pour an approved antifreeze into P-traps at all fixtures and toilets. Fittings and piping outside the floor insulation may need insulation in cold climates.

8.3.6 Test procedure. Even though the drainage system was tested at the factory, it must be rechecked for leaks at the installation site after all on-site connections have been completed. Plug all fixtures, sinks, showers, and tubs, and fill with water. Release the water in each fixture simultaneously to obtain the maximum possible flow in the drain piping. Check all P-traps and the drain system for possible leaks. Repair any leaks and retest.

8.4 Gas supply

8.4.1 Type of gas system furnished with home. All gas appliances in this home, including the heating system, are equipped for natural gas. If LP gas is to be used as the gas supply instead, a qualified service person must convert the appliances to LP gas following the instructions provided by each appliance manufacturer.

FIG. 8.3

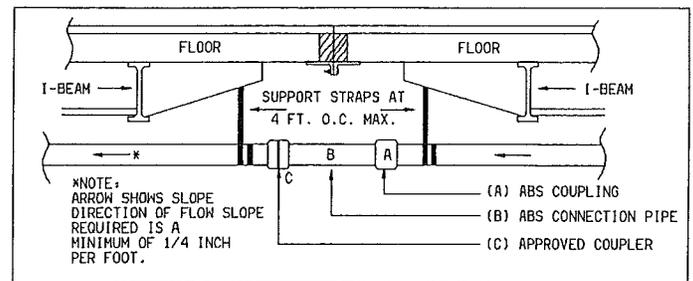


FIG. 8.4

8.4.2 Proper supply pressure. The gas piping system in your home has been designed for a pressure not to exceed 14" of water column (8 oz. or 1/2 PSI). If gas from any supply source exceeds, or may exceed this pressure, you must install a pressure-reducing valve. To operate gas appliances safely and efficiently, do not exceed the designed pressure limitations. For natural gas systems, the incoming gas pressure should remain between 6" and 8" of water column. For LPG systems, the pressure should be between 12" and 14" of water column.

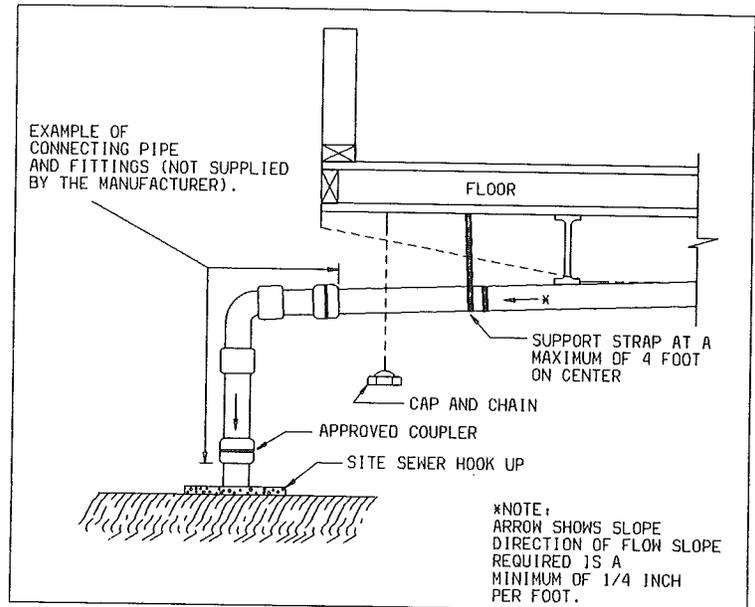
8.4.3 Orifice for specific gases. Special orifices and regulators are required for each kind of gas and for altitudes above 3,000 feet. See the instructions accompanying each gas-burning appliance for modification instructions. Before making any connections to the site supply, check the inlet orifices of all gas appliances to ensure they are correctly set up for the type of gas to be supplied.

8.4.4 Crossovers. Before performing any system tests or connecting the system to the gas supply, install the gas line crossover in multi-section homes as shown in FIG. 8.5. All crossovers and fittings must be listed for manufactured housing exterior use and be the same size as the main unit pipe. Do not use tools to connect or remove the quick disconnect connector.

8.4.5 Test procedure. Even though the gas system was tested at the factory, it is essential that it be rechecked for leaks at the site. Do not apply pressures in excess of those specified below, or you may damage gas valves and/or pressure regulators. Conduct one of the following two tests when the air and piping temperatures are nearly equal and will remain stable.

8.4.5.1 Piping Only Test. Close all appliance shut-off valves. Attach a pressure gauge calibrated in ounces to the home's gas inlet. Pressurize the system with air to at least 3 psi (48 oz.). Isolate the pressure source from the system. The gauge must stand for at least 10 minutes with no drop in pressure. If any pressure loss occurs, check all joints in the piping system and at all shut-off valves with soapy water or a bubble solution until the leaks are located. Repair the leaks and retest until the pressure holds.

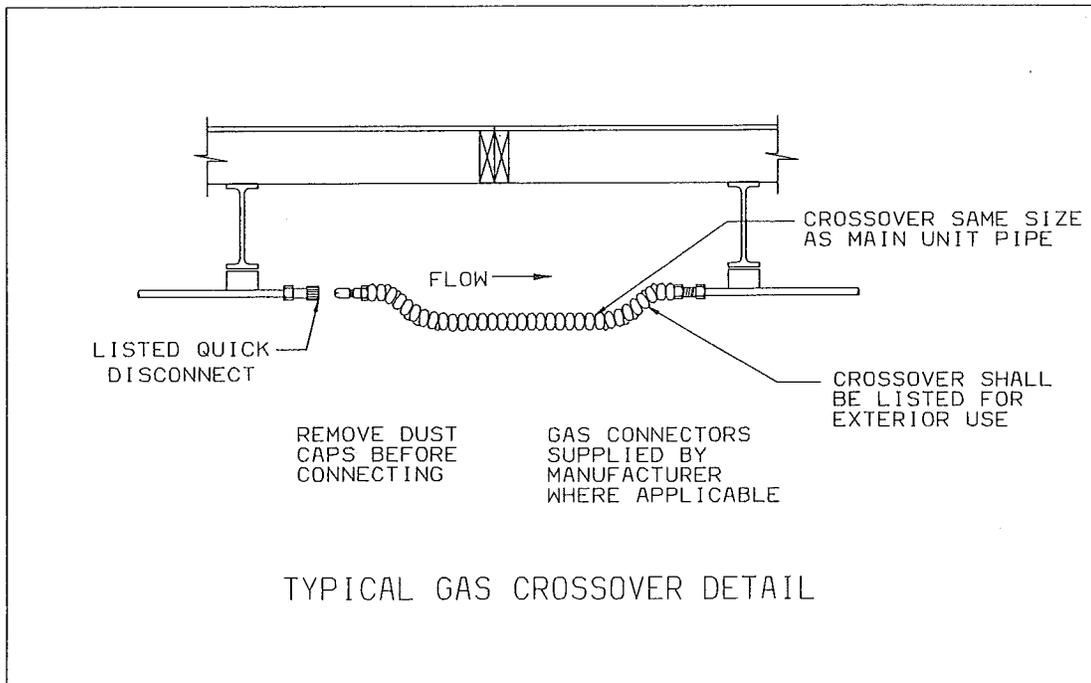
8.4.5.2 Test of entire system. Close all gas equipment controls and pilot light valves according to the individual gas equipment manufacturer's instructions. Assure that gas shut-off valves for all gas equipment are in the OPEN position. Attach a pressure gauge calibrated in ounces to the home's gas inlet. Pressurize the system with air to at least 6 oz. Check all gas shut-off valves and flex-line connections to valves and appliances for leaks using soapy water or a bubble solution. Do not bubble-check brass fittings with solutions containing ammonia. Repair any leaks found and retest. Close all equipment shut-off valves upon completion of the testing.



8.4.6 **Connection procedures.** Inspect gas appliance vents to ensure they have been connected to the appliance, and make sure that roof jacks are installed and have not come loose during transit. Have the gas system connected to the gas supply only by an authorized representative of the gas company.

8.4.7 **Gas appliance start-up procedures.** One at a time, open each equipment shut-off valve, light pilots and adjust burners according to each appliance manufacturer's instructions. **Make sure the water heater is filled with water before lighting its pilot.** Check the operation of the furnace and water heater thermostats, and set them to the desired temperatures.

FIG. 8.5



8.5 **Heating oil systems.** Homes equipped with oil-burning furnaces must have their oil supply tankage and piping installed on site. These items are not supplied by Redman Homes, Inc. Consult the oil furnace manufacturer's instructions for proper pipe sizing and installation procedures. **All oil storage tank and piping installations must meet all applicable local regulations and should be made only by experienced, qualified personnel.**

8.5.1 Tank installation requirements. Unless the home is installed in a community with a centralized oil distribution system, you must install an oil storage tank outside the home. Locate the tank where it is accessible for service and supply, and safe from fire and other hazards.

8.5.1.1 Vaporizing (gravity-feed) furnaces. Install oil tanks that feed vaporizing-type oil furnaces so that oil flows freely by gravity. To achieve efficient gravity flow, install the tank so that its bottom is at least 8" above the level of the furnace's oil control and its top is within 8 feet of the oil control level.

8.5.1.2 Gun (pump-fed) furnaces. Since the furnace includes a fuel pump, the tank may be installed above or below ground. For tanks installed below ground, **do not exceed the lifting capacity of the pump**, extend the filler neck 1 foot above grade and provide a 1-1/4" diameter minimum vent pipe extending at least 2 feet above grade.

8.5.1.3 Sloping and draining requirements. Regardless of the type of oil furnace or the tank location, install the tank to provide a gradual slope toward the fill end or drain plug (if so equipped). This facilitates the pumping or draining of water or sludge.

8.5.2 Shut-off valve and fuel line filter. Install an accessible and approved manually-operated shut-off valve at the oil tank outlet. Installing a suitable filter in the fuel line near the tank to trap dirt and water is recommended.

8.5.3 Leak test procedure. Before operating the systems, check for leaks in the tank and supply piping. Fill the tank to capacity with fuel and examine all points in the system for leakage.

8.6 Electricity. A large enough power supply must be available at the site. An inadequate power supply may result in improper operation of, and possible damage to, motors and appliances. It may also increase your electricity costs. The current rating in amperes of your home can be found on the tag located on the outside next to the feeder or service entrance, and also on the electrical distribution panel.

8.6.1 Description and rating of house wiring. Your home is designed for connection to an electrical wiring system rated at 120/240 volt AC. **Proper and safe connection depends on the type of supply system your home is equipped with.** The connection to this home is a **feeder** (unless it is equipped with a factory-installed service meter base) requiring wiring at the site. The following paragraphs describe the wiring and grounding of electrical feeders; if your home is equipped with a factory-installed service meter base, skip directly to section 8.6.4.4.

Warning: Feeders require four insulated conductors

8.6.2 Proper feeder wire and junction box material and size. The main breaker and the label on the electrical distribution panel give the feeder current capacity in amperes. Using this information, determine the required feeder size from Table 8.1. These sizes are based on an ambient temperature of 86° Fahrenheit and do not take voltage drop into consideration. Feeders require four insulated conductors, one of which must be an equipment-grounding conductor.

8.6.2.1 Overhead Feeders. Homes equipped with overhead (mast weatherhead) feeder entrances contain all necessary conduit to the electrical distribution panel. However, you must install the four feeder conductors (not provided) on site.

8.6.2.2 Underside Feeders. Homes with an under the floor entrance come with a the floor. permanently attached conduit raceway that runs from the electrical distribution panel to a point under

TABLE 8.1

| ELECTRICAL FEEDER & EQUIPMENT SIZES | | | | | | | | | |
|-------------------------------------|-----------------------|------------------|-------------------------|----------|---------------|----------|-------------------------|----------|---------------------------|
| FEEDER AND MAIN BREAKER SIZE | MINIMUM SIZES | | CONDUCTORS RED OR BLACK | | NEUTRAL WHITE | | GROUNDING BARE OR GREEN | | CHASIS BOND BARE OR GREEN |
| | JUNCTION BOX (INCHES) | CONDUIT (INCHES) | COPPER | ALUMINUM | COPPER | ALUMINUM | COPPER | ALUMINUM | COPPER ONLY |
| | | | | | | | | | |
| 100 AMP | 10X10X4 | 1 1/4 | AWG 4 | AWG 2 | AWG 4 | AWG 2 | AWG 8 | AWG 6 | AWG 8 |
| 150 AMP | 10X12X4 | 1 1/2 | AWG 1 | AWG 2/0 | AWG 2 | AWG 1/0 | AWG 6 | AWG 4 | AWG 8 |
| 200 AMP | 12X12X4 | 2 | AWG 2/0 | AWG 4/0 | AWG 1 | AWG 2/0 | AWG 6 | AWG 4 | AWG 8 |

8.6.3 Grounding of homes with feeder connections

8.6.3.1 Necessity. The home must be properly grounded to protect the occupants. The only safe and approved method of grounding your feeder-connected home is through the grounding bar in the electrical distribution panel. This bar grounds all noncurrent-carrying metal parts of the electrical system at a single point.

8.6.3.2 Procedure. The ground conductor of the power supply feeder cable connects the grounding bar to a good electrical ground. Follow the feeder connection procedures described in 8.6.4.1, -.2, -.3, or -.4 to achieve proper grounding. (Exception: Homes with a factory-installed service meter base must be grounded differently. Refer to the specific instructions in 8.6.4.4 if applicable.) Isolate (insulate) the grounded circuit conductor (neutral or white wire) from the grounding conductors (green wires) and from equipment enclosures and other grounded parts. Isolate (insulate) the neutral circuit terminals in the distribution panel board and in ranges, clothes dryers, and counter-mounted cooking units from the equipment enclosure. Bonding screws, straps or buses in the distribution panel board or in appliances should have been removed and discarded at the manufacturing facility.

You may provide the required continuity of ground between sections of multi-section homes through a metallic roof or siding, or by bolting outriggers together. When the outriggers or other overlapping metal joints of adjoining sections are not bolted together on houses with shingle roofs and non-metallic siding, install a ground wire connection between the metal frame members. This bonding connection is commonly made with a #8 AWG bare copper wire or other approved positive connection between the parts (see FIG. 8.8), using the approved grounding lugs with bolts, star washers and nuts, or self-tapping screws that are shipped with the home.

8.6.3.3 Unacceptable methods of grounding homes. Grounding to a rod, a water pipe, or through the home's hitch caster will not satisfy the important grounding requirement. **Never use the neutral conductor of the feeder cable as a ground wire.** Do not ground the neutral bar in the electrical distribution panel.

8.6.4 Connection procedures. Connections should be made only by a qualified electrician using one of the following methods:

8.6.4.1 50-amp feeder cord. Your home may be equipped with a permanently-connected 50-amp feeder cord stored under the floor. If so, it is ready to be plugged into a 50-amp, 3-pole, 4-wire, 120/240 volt grounding service receptacle after the electrical tests have been completed (see 8.6.6). **WARNING: Many homes are equipped for 100 amp or greater service. Unless your home is equipped for only 50-amp service, do not attempt to use a feeder cord or "pigtail" connection.** Connect homes equipped for 100 amp or greater service by one of the three following methods:

8.6.4.2 Mast weatherhead feeder. The routing, connection, and support of the service drop must meet local codes. Homes equipped this way contain all necessary conduit to the electrical distribution panel. However, the four feeder conductors (not provided) must be installed on site. If the masthead is located above the roof overhang, allow a minimum clearance of 8 feet above all roof points which the conductors pass over. There are two exceptions to this rule: (1) The vertical clearance may be reduced to 3 feet if the roof has a minimum slope of 4 in 12; and (2) The vertical clearance may be reduced to 18" if no more than 4 feet of service-drop conductors pass above the roof overhang, and if they terminate at a through-the-roof raceway or approved support. A minimum clearance must also be provided from the final grade to the service-drop conductors. This measurement may vary from 10 feet to 18 feet, depending on the types of traffic anticipated below the service drop (refer to the National Electric Code). Unless impractical, locate service heads above the point of attachment of the service-drop conductors and make them rain-tight. If individual conductors do not extend downward, form drip loops.

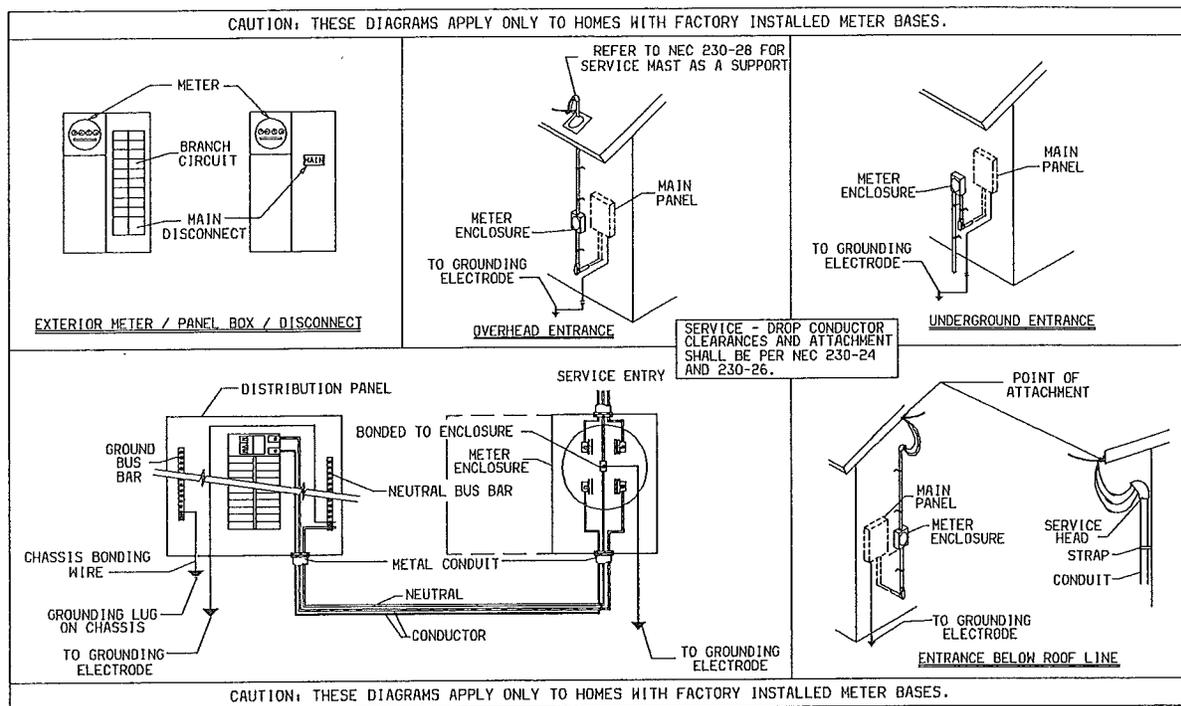
8.6.4.3 Underside junction box feeder. A raceway from the main panelboard to the underside of the home allows for installing an approved junction box or fitting, which must be used to connect it to the supply raceway. Install properly-sized conductors from the main power supply to the panelboard. Refer to Table 8.1 for the conductor and junction box requirements. The homeowner or installer must provide the supply connection - including the four feeder conductors, junction box and raceway connectors. Protect conductors emerging from the ground from a minimum of 18" below grade to 8 feet above grade, or to the point of entrance to the home. The distance measured from the top surface of a buried cable, conduit, or raceway to the finished grade must meet the minimum burial requirements outlined in the National Electric Code. Use a moisture-proof bushing at the end of the conduit from which the buried cable emerges.

Caution: The following section 8.6.4.4 and Fig. 8.6 are applicable only to homes which have factory-installed service meter bases.

8.6.4.4 Service equipment meter base (factory-installed). When a factory-installed service meter base is provided on the home, either an overhead or underground entrance may be provided. The exterior equipment and enclosure must be weatherproof, and conductors must be suitable for use in wet locations. When a meter base is installed on the home, a main bonding jumper is to be installed to connect the equipment-grounding conductor and the service-equipment enclosure to the grounded conductor of the system within the service equipment. The main bonding jumper may be a wire, a bus, or a screw. A grounding electrode conductor shall be used to connect the equipment-grounding conductors, the service-equipment enclosures, and the grounded service conductor to the grounding electrode as shown in FIG. 8.6. The homeowner must provide the grounding electrode conductor(s) which should be #4 (minimum) copper in one piece (not spliced). The grounding electrode should be an 8-foot length of 1/2" diameter copper rod or 3/4" galvanized steel pipe. Drive it into the ground at least 12" below the surface and 2 feet from the foundation, or bury it horizontally in a 2-1/2-foot deep trench.

Connect the grounding conductor wire to the grounding electrode with a grounding clamp, and cover with 12" (min.) of earth. For added protection, homes with metal frames or siding should be connected to the earth by means of additional bonding-jumper ground-fault return paths to underground metallic water pipes, ground-rings, additional ground rods, etc., to prevent the buildup of hazardous voltages.

FIG. 8.6



8.6.5 Crossover connections. For multi-section homes, refer to FIG. 8.7 for typical crossover wiring connections (located along the centerline between the sections). Crossover locations can be distinguished by metal junction boxes or access cover panels. Remove these panels and connect the enclosed wires as illustrated in FIG. 8.7. Some crossover connectors plug together and do not require junction boxes.

When the mating section contains a bathroom which requires Ground Fault Circuit Interrupter (GFCI) protection for the receptacle, it is important that the bathroom circuit wiring be connected to the proper GFCI protected circuit in the power supply panel.

Multi-section bonding. Bonding between the sections of a home with metal siding or a metal roof is provided by the overlapping metal joints fastened with metal screws. Bonding between sections of a home with non-metallic siding and a non-metallic roof must be accomplished at set-up by connecting a #8 AWG bare copper wire between the metal frame members using the approved grounding lugs with bolts, star washers and nuts, or self-tapping screws that are shipped with the home. Refer to FIG. 8.8.

FIG. 8.7

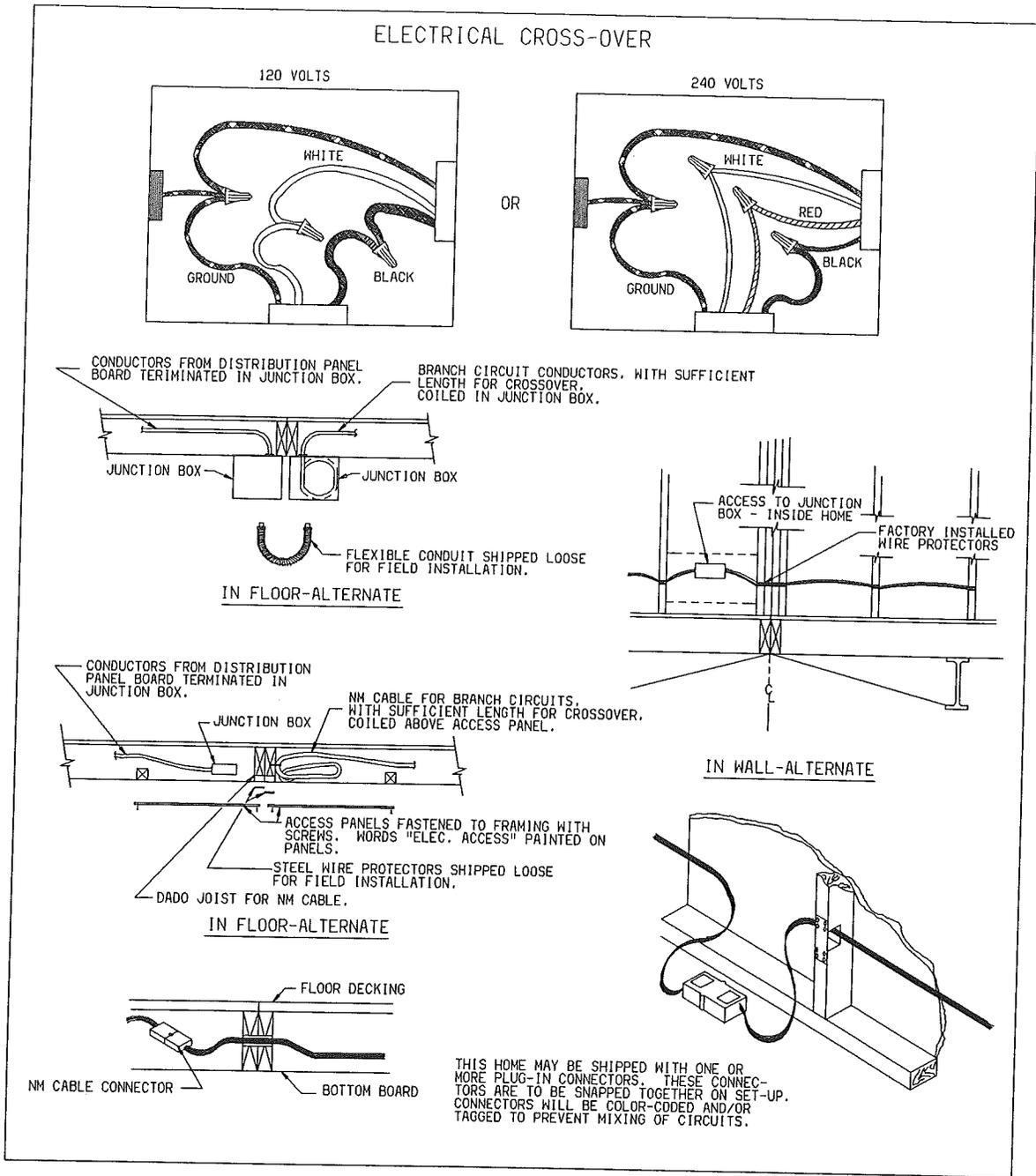
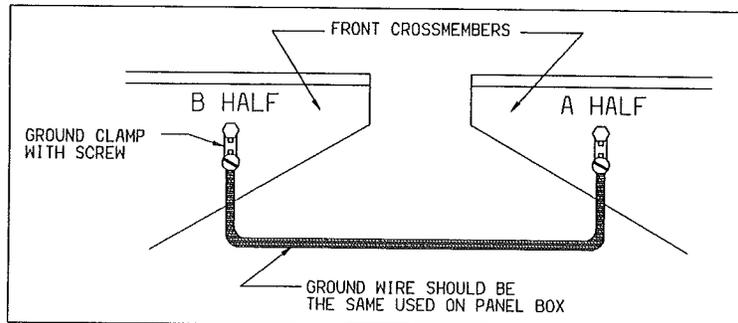


FIG. 8.8



8.6.6 System test procedures and equipment

8.6.6.1 **Pre-connection tests.** Conduct both of the following tests before any electrical power is supplied to the home:

8.6.6.1.1 **Circuit conductor continuity.** Conduct a continuity test by placing all branch circuit breakers and switches controlling individual outlets in the "on" position. The test should give no evidence of a connection between any of the supply conductors (including the neutral) and the grounding circuit. You may use a flashlight continuity tester.

8.6.6.1.2 **Grounding continuity.** Using a continuity tester, test noncurrent-carrying metal parts to assure continuity to ground. The parts to be checked include:

- appliance enclosures, including fans
- fixture enclosures and canopies
- metal siding and roofs
- metal water supply and gas lines
- metal ducts (except foil covered insulated ducts)
- the home's frame

On multi-section homes, perform this test only after completing all electrical and bonding connections between the sections. **NOTE: Grounding is not required on the metal inlet of a plastic water system or on plumbing fixtures such as tubs, faucets, shower risers, and metal sinks when they are connected only to plastic water and drain piping.**

8.6.6.2 **Post-connection tests.** Conduct the following three tests after turning on the main circuit breaker and each individual circuit breaker.

Caution

Allow the water heater to fill completely before activating the water heater circuit. Failure to do so will cause the water element to burn out, an event not covered by the warranty.

8.6.6.2.1 **Polarity and grounding of receptacles.** With receptacle and lighting circuits energized, check the polarity and grounding of each 120-volt receptacle and light socket using a polarity tester capable of determining an incorrect wiring configuration. A conversion device may be required to test various fixture bulb sizes and outlet configurations. Investigate any indication of reversed polarity, open grounds or shorts, and correct them.

8.6.6.2.2 **Ground Fault Circuit Interruption (GFCI).** Make certain that all receptacles requiring GFCI protection are in fact on the correct circuit(s). Check each ground fault circuit interrupter device by pushing the test button to determine if the power route to the receptacle has been interrupted, or follow the manufacturer's instructions. Replace any GFCI that does not operate properly.

8.6.6.2.3 **Operational check.** Check all light fixtures by placing a bulb in the socket and turning the switch on and off. Using a pigtail light, check all 240 volt receptacles to determine if both legs of the circuit are powered. Check all 120 volt receptacles to be sure that each is operational. Switched receptacles require the switch to be turned on and off. It is not necessary to check appliances, but their power sources must be assured. Failure of any electrical wiring or fixtures requires repair and retesting.

SECTION 9 - FINAL INSPECTION

To make sure that no items have been overlooked and that all work was done properly, make a final inspection when the home installation is complete. Place special emphasis on the following "checklist" items:

- 9.1 Water and drain systems.** All water and drain systems work properly and do not leak.
- 9.2 Appliance function and operation.** Appliances have been tested and work properly.
- 9.3 Windows, doors and drawers.** All windows, doors and drawers work properly.
- 9.4 Exit windows.** One window in each bedroom is designated as a secondary exit (egress) to be used in case of emergency. Each exit window is labeled as such with operating instructions. All shipping hardware should be removed, and the window should operate as explained in the window manufacturer's instructions. Check each window to assure it opens properly.
- 9.5 Exterior siding and trim.** There are no gaps, voids, or missing fasteners, all seams are sealed, and hardboard edges are sealed.
- 9.6 Stack heads and vent pipe flashings on the roof.** All stack head or vent pipe flashings are properly attached and sealed.
- 9.7 Composition roof.** All shingles are properly attached, none are loose or missing, and all holes are filled.
- 9.8 Skirt venting.** The skirting around the home has vents along a minimum of three (3) sides at each corner to cross-ventilate and keep the crawl space as dry as possible. See Section 5.6 for the total vent area required.
- 9.9 Low-hanging trees or bushes.** If there are any low-hanging trees or bushes near your home, trim or cut them. In limiting their future growth, think about the plants' possible movement during windy conditions or under snow or ice loads.
- 9.10 Exhaust fan operation and air flow.** Check all exhaust fans for proper operation and air flow.
- 9.11 Bottom covering.** Carefully inspect the bottom covering of the home for loosening or tears from the installation of pipes or wires.
 - 9.11.1 Bottom covering repair.** A special material is fastened to the bottom side of your new home, to provide a protective covering. This covering was inspected at the factory, but could have been damaged later. It is important that any areas that are damaged be sealed.
 - 1. If the covering is a vinyl coated material, use a vinyl patching material to repair tears or holes.

2. If the bottom covering is an asphalt impregnated material, use a patch of the same material with beads of adhesive around the contact edges. When the overlay is positioned over the damaged area, it is fastened in position using an outward flare tacker. This requires a special tool designed to outward flare a 3/8 inch crown staple with 1 inch long legs through both the overlay and the bottom covering. The flaring action of this tool causes both materials to be tightly clenched together so that no other support is required. The spacing of these staples should be no more than 6 inches apart around the perimeter of the overlay, with the second row placed inside approximating the edge of the damaged or cut area.

9.12 Ground cover. Repair any cuts or tears in the ground cover with tape.

9.13 Anchors and straps. Be sure the correct number of anchors have been installed at the proper angle, and that all straps are tight.

9.14 Interior details. Inspect for and correct all interior finishing details, such as loose molding, carpet seams, etc.

The retailer's representative should inspect the home with the homeowner and brief the homeowner about maintaining the home.

SECTION 10 - RELOCATING THE HOME

10.1 Relocation of the home. If it is necessary to move your home, HAVE IT MOVED BY A PROFESSIONAL MANUFACTURED HOME MOVER, MAKE SURE HE USES ENOUGH TEMPORARY WOOD BLOCKING and check the following items:

10.1.1 New zones. Check the roof and wind load and the temperature requirements at the new location. If the new requirements are greater than those shown on your home's compliance certificate, check the cost of adapting the home before moving. Otherwise, any resulting damages will not be covered under your warranty, and you may be held liable for any failures. Check with Redman Homes, Inc., your home retailer, or a qualified manufactured home mover about making these home improvements.

10.1.2 Tires and axles. Replace any removed tires or axles as required by the manufacturer. Be sure that tires are inflated correctly, have at least 1/16 inch tread, and do not have any cracks or splits. Check and repair bearings and brakes as necessary.

10.1.3 Appliances. Secure appliances to prevent movement during transportation.

10.1.4 Dust caps. Place dust caps on the ends of all pipe connections.

10.1.5 Blocking during storage. Any home placed in storage, including those on sales lots, must be immediately blocked under each I-beam, both at the rear of the home and midway between the axles and the hitch, to prevent excessive deflection and possible structural damage.

10.1.6 Transit of furniture and belongings. Substantial damage may result if furniture, personal belongings, setup materials or other items are stored in the home during transit. TRANSIT DAMAGE IS NOT COVERED UNDER YOUR WARRANTY.

10.1.7 Multi-section homes. Re-install temporary structural supports and bracing materials before moving the home. Cover open sides of sections with weather-proof material such as 6-mil plastic sheeting. After the sections have been separated, secure 2 x 6 shipping braces at the front end and in the axle area. Place ridge beam supports in open areas per the manufacturer's instructions, or at a maximum of 12 feet on center if manufacturer's instructions are not available.

SECTION 11 - PROTECTION OF WINDOWS AND DOORS IN HIGH-WIND AREAS

11.1 Wind Protection. As explained on the data plate, this home has not been equipped with storm shutters or other protective coverings for windows and exterior door openings. We strongly recommend, that should a storm with high winds be evident, the homeowner take steps to protect the windows and doors against driven rain and air borne debris. One recommended way is:

11.1.1 Installation. Cover all windows and doors with 3/4" exposure I plywood. Secure the plywood to the opening framing with 16d common nails at 6" on-center around the outer edge driven into the framing members that form the opening. #8 x 3" wood screws may be substituted for the 16d nails. If the window or door mounting screws are visible, the nails should be driven in the same line as the screws. If the window or door mounting screws are not visible and the window or door has a pocket for the exterior siding, the nails are to be driven as close to the exposed edge of the window or door as possible. Following these instructions will ensure that the nails are driven into framing members and the plywood will be secure during high winds. If the nail is easily driven without much resistance, you are driving the nail only through the sheathing which is not acceptable. You may leave the nail in, but drive another one in its place after establishing a new nailing line.

Caution

After securing the windows and doors, do not occupy the home as the required egress will be rendered inoperative.

11.1.2 Removal. After all danger is past remove nails and plywood and permanently weather-proof all holes left from nails and debris.

SET-UP TOOLS

General:

- Eye Protection
- 16 Foot Steel Tape Measure
- Water Level with 75 to 100 Feet of Plastic Hose
- Hydraulic Jacks in Good Condition
- Jack Blocks
- Steel Channel to Distribute Concentrated Loads Created by Jacks
- Two - 2 Ton Come-Alongs (Hand Winches)
- Impact Wrench
- Miter Box & Saw
- Circular Saw
- Hand Saw
- 100 Foot Heavy Duty Extension Cord, 12 AWG Wire with Ground
- Assorted Staple Guns
- 16 Ounce Claw Hammer
- 24 Inch Nail Bar or Carpenter (Pry) Bar
- Drill Motor with 3/16, 1/4, 3/8, and 1/2 Inch Drill Bits
- Power Screw Gun
- Standard Blade Screwdriver
- Phillips Screwdriver
- Pliers
- Crescent Wrench
- Sheets Metal Snips
- Utility Knife
- Nail Set
- Putty Stick Touch-Up Kit
- Step Ladder

For Multi-Section Homes:

- Roller System
- Ceiling Jack T-Bar
- Portable Table Saw
- Extension Ladder
- Carpet Stretcher
- Heat-Bond Seaming Tool for Carpet
- Straight Edge for Cutting Carpet

For Utility Tests:

- Electrical High Potential Tester
- Continuity Tester
- Polarity Checker
- Gas System Leak Tester
- Water System Leak Tester

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MIDG. CODES & STDS. DIV