

2/2000



**CHAMPION**  
**HOME BUILDERS CO.**

# **MANUFACTURED HOME INSTALLATION MANUAL**

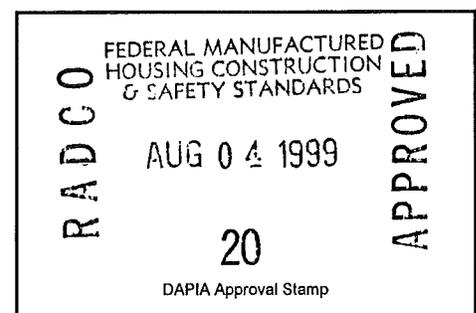
**This manual must remain with the home for reference by the Homeowner.**

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 included with this manual. Tear off and send in as required.

# CONTENTS

<b>1 – Introduction</b>	<b>1</b>
1.1 How to use this manual	1
1.2 Pre-installation considerations	1
1.3 Safety	1
1.4 Important documents	2
1.5 Consumer Information Cards	2
<b>2 – Definitions</b>	<b>3</b>
<b>3 – Site preparation</b>	<b>4</b>
3.1 Location and layout	4
3.2 Soil conditions	4
3.3 Removal of organic material	6
3.4 Drainage	6
3.5 Ground moisture control	6
<b>4 – Foundations</b>	<b>7</b>
4.1 Piers	7
4.2 Footings	9
4.3 Other foundations	15
4.4 Special considerations	15
4.5 Reference documents	15
<b>5 – Installation procedures</b>	<b>20</b>
5.1 Moving home to location	20
5.2 Positioning home	20
5.3 Interconnection of multi-section homes	22
5.4 Anchoring instructions	27
5.5 Skirting	36
<b>6 – Installation of optional features</b>	<b>36</b>
6.1 Hinged roofs	36
6.2 Garden, bay and accessory windows	36
6.3 Awnings and carports	36
6.4 Installation of on-site attached structures	36
6.5 Accessory windows	37
6.6 Miscellaneous lights and fixtures	37
6.7 Optional panels, siding and molding	37
6.8 Exterior coverings	37
6.9 Telephone and cable television	37
6.10 Continuous ridge vent	37



<b>7 – Preparation of appliances</b>	42
7.1 Heating appliances	42
7.2 Clothes dryer vent	42
7.3 Comfort cooling systems	42
7.4 Chimneys and air inlets	43
7.5 Range, cook top and oven venting	44
<b>8 – Utility system connection and testing</b>	44
8.1 Proper procedures	44
8.2 Water supply	44
8.3 Drainage system	46
8.4 Gas supply	47
8.5 Heating oil systems	48
8.6 Electricity	49
<b>9 – Final inspection</b>	54
9.1 Water and drain systems	54
9.2 Appliance function and operation	54
9.3 Windows, doors and drawers	54
9.4 Exit windows	54
9.5 Exterior siding and trim	54
9.6 Stack heads and vent pipe flashing on roof	54
9.7 Composition roof	54
9.8 Perimeter	54
9.9 Low-hanging trees or bushes	54
9.10 Exhaust fan operation and airflow	54
9.11 Bottom covering	54
9.12 Ground cover	54
9.13 Anchors and straps	54
9.14 Interior details	54
9.15 Retailer inspection	54
<b>10 – Relocating the home</b>	54
10.1 Relocation of the home	54
<b>11 – Window and glass door protection</b>	55
11.1 Wind protection	55



## 1 - Introduction

**1.1 How to use this manual** – Manufactured Homes are built in factories under some pretty rigorous controls and procedures. They are then shipped to a home site, perhaps after intermediate stops in the distribution process, where they are installed on a foundation and connected to the utilities. Each of those two separate components - building the houses in the factory and installing them on-site – are equally important in providing homeowners with the quality, durable homes that they expect. The marriage of the house to the land is the setup and the installation process and its importance must never be underestimated.

If you are reading this, then you are probably somehow involved with the installation and setup process. If you are professionally responsible for overseeing or completing installation and setup of manufactured homes, then you are the person for whom we are writing and directing this manual. This is not intended to be either a training guide or a step-by-step "how to" instruction for the homeowner or the untrained, inexperienced apprentice or handy man. Today's manufactured housing is much too complicated of a product to be installed by person's not qualified to do so. We assume that as a professional, you have the necessary knowledge and skills gained from experience and training that will allow you to perform your job safely, competently, and in accordance with all applicable codes, standards, rules and regulations. We also assume that you meet all necessary qualification tests including any license and certification requirements that may be in effect in your area.

The manual includes one approved method of installing a manufactured house. But of course there are numerous other ways in which a house can be properly installed and so much of the manual is dedicated to specifying the boundaries of each step of the process. There are several pages of charts and tables that are necessary to allow persons responsible for designing the foundation the flexibility to consider costs, terrain, climatic conditions, local requirements, and of course the intended end use of the product.

In some cases in this manual, we make recommendations rather than set requirements for installation. In general, a requirement is given in order to make the home comply with the minimum federal and local codes and standards. Recommendations, on the other hand, are practices that in the opinions of our engineers are good and sound; that give value to the homeowner by reducing the chance that minor cosmetic or durability related complaints might arise;

but which even if not followed will not cause the home to be out of compliance with the standards. Although compliance with a recommended installation process is optional, in some cases you or whoever made the decision to not follow the recommendation may become responsible for any complaints that likely would not have arisen had the recommendation been followed.

In many areas of the country, the installation and setup process is regulated by the state or local authorities, and often a local building inspector will need to inspect and approve the actual installation. Usually, the requirements they apply will be the requirements specified in this manual. You must be aware that in some cases, the local authority may demand compliance with a "recommendation", or in other instances, may waive a "requirement" if it is judged not necessary under the circumstances of that particular installation. In other instances, installation practices that are different than what is described in this manual may be acceptable to the jurisdictional authority as long as they have been approved by a licensed engineer or architect. In other words, there are situations where the professional judgement of you, the local authorities, or outside consultants may justify variations in the installation specifications of this manual. We, of course, cannot be held responsible for the consequences of any errors in those judgements.

Due to the many variations in the configurations of homes and in the sites and conditions, which may be encountered, there may be circumstances of the installation, which are not addressed herein. Refer to local building officials if uncertainties arise.

**1.2 Pre-Installation Considerations** – Refer to the Data Plate (see 1.4.1) and the design load zone maps (see 3.1.1) to make certain that the home is suitable for the geographic zone where a qualified installer will install it. Prior to locating or relocating the 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 must be taken into consideration.

**1.3 Safety** – There are inherent hazards associated with the installation of a manufactured home. We expect that you or your supervisors, as experienced professionals, recognize these hazards, are qualified to work with them, and are capable of providing safe work practices and equipment that minimize the risks of injury. These hazards are open and obvious, especially to experienced and qualified persons who

must be the only persons attempting to install or setup a manufactured home.

Even though the hazards are open and obvious, we are nevertheless putting WARNINGS in places throughout this manual for the purpose of reminding you of the importance of safe work practices.

**WARNING!**

Manufactured houses and sections of houses are large, heavy products and contain energized systems after they are connected to utilities.

**FAILURE TO COMPLY WITH MINIMUM SAFETY PRECAUTIONS MAY RESULT IN SERIOUS INJURY OR DEATH.**

- Never position yourself under a moving, heavy load without adequate safety bracing.
- Always comply with applicable safety requirements when working on ladders, rooftops, or other elevated surfaces.
- Never work on an energized electrical or fuel supply system for which you are not qualified.

Other, more specific WARNINGS, are placed throughout this manual in various locations and have the following format:

**WARNING!**

- Identification of Hazard
- IDENTIFICATION OF HAZARDOUS RISK
- Steps to Take to Minimize Risk

Additionally, we are publishing NOTICES where we want to bring to your attention particular damage that can be caused to the house by failure to follow a specified practice. NOTICES look like this:

**NOTICE**

Statement of potential damage and specified practice.

WARNINGS and NOTICES are published as reminders. As qualified professionals in the field of manufactured housing installation and setup, you are the experts and you must be aware of the hazards and conditions that you face. These published reminders

are not intended to represent or identify all hazards, all potential hazards, or all possible consequences of improper or unsafe installation and setup practices.

**1.4 Important Documents** – In addition to the Installation Manual, there are several documents that must be reviewed prior to the installation of this home:

**1.4.1 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 and reproduced in Figure 3.1, geographically identify the wind, roof load and climatic zones for the United States. This home shall not be located in or relocated to a zone, which has requirements exceeding those for which it was designed. 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.

**1.4.2 Addendum** – Supplemental addendum pages may be included with this manual. These addendum identify requirements for special features included in the home which are not covered in the manual, or which differ from details in the manual.

**1.5 Consumer Information Card** – The distributor or retailer of the manufactured home must fill out the *consumer information card* and return it to the home's manufacturer; so that the consumer may be notified of revised instructions, recalls or safety modifications.

## 2 - Definitions

**Anchoring equipment** – straps, cables, turnbuckles, and chains, including tension 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 overturning the home or moving it sideways.

**Authority having jurisdiction** – the organization, office, or individual responsible for approving plans, equipment, an installation, or an alteration procedure.

**Data plate** – an information sheet located at the main electrical panel, in the utility room, in a bedroom closet, or in a cabinet in the kitchen. It provides the various identification numbers and identifies the wind zone, roof snow load zone, and climatic zone for which the home was manufactured.

**Evaporative cooler** – a roof or window mounted cooling device utilizing air drawn through water soaked panels. Used primarily in arid climates.

**Footing** – that part of the support system that sits directly on the ground at, below, or partly below grade to support the piers.

**Ground anchor** – a device placed at the manufactured home stand designed to transfer home anchoring loads to the ground.

**Information packet** – the important papers provided with the home including appliance instructions, warranties, high wind covering sizes, etc.

**Labeled** – equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction; that is concerned with product evaluation; that maintains periodic inspection of production of labeled equipment or materials; and that provides labels, the use of which indicates a manufacturer's compliance with appropriate standards or performance in a specified manner.

**Listed** – equipment or materials included in a list that is published by an organization acceptable to the authority having jurisdiction; that is concerned with periodic evaluation; that maintains periodic inspection of production of listed equipment or materials; and that produces listings that state either that the equipment or materials meet appropriate standards or have been tested and found suitable for use in a specified manner.

**Local building authority** – county or city inspector from building department or zoning department. Whoever issues required permits in the area. See "authority having jurisdiction".

**Must** – indicates a mandatory requirement.

**N/A** – indicates not applicable.

**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)

**Qualified** – has the necessary knowledge and skills gained from experience and training that will allow performance of the job safely, competently, and in accordance with all applicable codes, standards, rules and regulations and meets all necessary qualification tests including any license and certification requirements that may be in effect in the area where the home will be installed.

**Should** – indicates a recommendation or that which is advised but not required.

**Shall** – indicates a mandatory requirement.

**Site for a manufactured home** – a designated parcel of land designed for the accommodation of one manufactured home, its accessory buildings or structures, and accessory equipment, for the exclusive use of the occupants of the home.

**Skirting** – a weather resistant material used to enclose the space from the bottom of the manufactured home to grade.

**Stabilizing system** – all components of the anchoring and support systems, such as piers, footings, ties, anchoring equipment, ground anchors, or any other materials and methods of construction that support and secure the manufactured home to the ground.

**Stand, manufactured home** – that area of a manufactured home site which has been reserved for the placement of a manufactured home.

**Support system** – A combination of footings, piers, caps, and shims that will, when properly installed, support the manufactured home.

**Utility connections** – the connection of the manufactured home to existing utilities that include, but are not limited to, electricity, water, sewer, gas, or fuel oil.

### 3 – Site preparation

#### 3.1 Location and Layout

3.1.1 **Use of zone maps** – The home is designed for certain weather conditions and roof loads. See the zone maps included on the home Data Plate. Do not site or relocate the home in a zone requiring greater wind, roof load, or heating or cooling capabilities than those for which it was designed. However, it is safe to locate the home in an area with **lower** load requirements 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, ensure that the transportation equipment and home can be routed to the installation site. 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 the property), and have a qualified person raise any overhead wires that are in the way. Special transportation permits may be required from state, county, or city officials.

3.1.3 **Encroachments and setback distances** – Local laws regarding encroachments in streets, yards, and courts shall be obeyed, and permissible setback distances from property lines and public roads shall be met.

3.1.4 **Issuance of permits** – Ensure that all necessary local permits have been obtained and fees paid.

#### 3.2 Soil Conditions

3.2.1 **Requirements** – A firm foundation is absolutely necessary before the home is blocked and leveled. If the site is on filled in soil, it must be compacted to at least 90% of its maximum relative density. If unsure of soil bearing capacity, confer with the local building authority for the recommended soil bearing capacity in the location. 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 (refer to paragraph 3.2.3.) before designing the foundation. If the soil cannot be tested, but its type can be identified, use the foundation bearing pressures shown in Table 3.1 as a guide. If the soil cannot be identified, or if the soil appears to be composed of peat or uncompacted fill, consult a local geologist or a registered professional engineer for their analysis to determine the bearing capacity.

3.2.3 **Soil bearing testing methods and equipment** – Use a pocket penetrometer (available from engineering supply houses) or other methods acceptable to the local jurisdiction having authority.

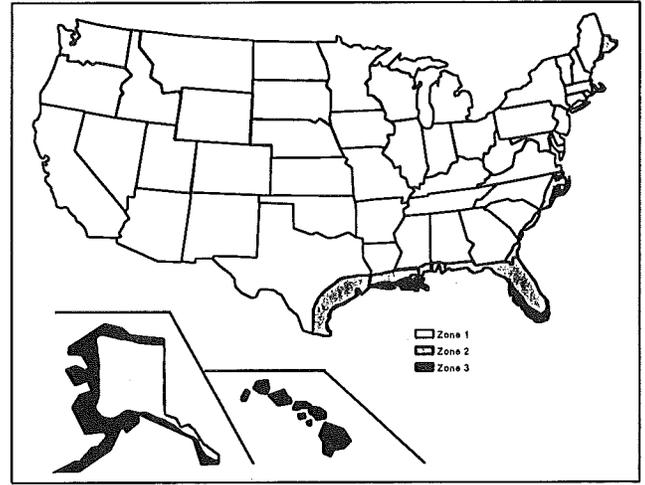
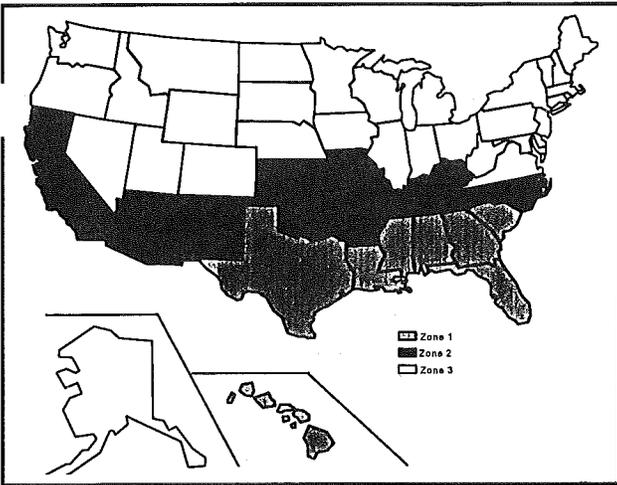
TABLE 3.1

General Description of Soils	
Soil Type <i>(Based on the Unified Classification System)</i>	Allowable Pressure (lbs. per sq. ft.) <i>(No allowance made for overburden pressure, embankment depth, water table height, or settlement problems)</i>
Rock or Hard Pan	4,000
Sandy Gravel and Gravel	2,000
Sand, Silt 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:	
<ul style="list-style-type: none"> <li>a. Soils investigation and analysis of the site</li> <li>b. Compliance with the local building code</li> <li>c. Competent opinion by a local engineer or code official</li> </ul>	

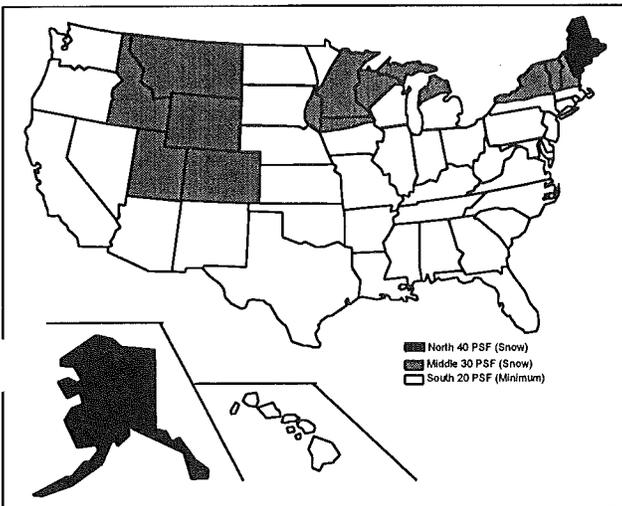
Heating and Cooling Zone Map

FIGURE 3.1

Wind Load Zone Map



Roof Load 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 III (110 MPH)**  
 The following local governments listed by State (counties or parishes, unless specified otherwise) are within Wind Zone III:

<b>FLORIDA</b>	<b>FL (cont'd)</b>	<b>LA (cont'd)</b>
Broward	Manatee	Plaquemines
Charlotte	Monroe	St. Bernard
Collier	Palm Beach	St. Charles
Dade	Pinellas	St. Mary
Franklin	Sarasota	Terrebonne
Gulf	<b>LOUISIANA</b>	<b>NORTH CAROLINA</b>
Hendry	Jefferson	Carteret
Lee	LaFourche	Dare
Martin	Orleans	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

**WIND ZONE II (100 MPH)**  
 The following local governments listed by state (counties or parishes, unless specified otherwise) are within Zone II:

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

**3.3 Removal of organic material** – Removal of all decayable material, such as grass, roots, twigs, and wood scraps, from beneath the home is required in areas where footings are to be placed, to minimize settling of footings and insect damage. Remove shrubs and overhanging branches from the immediate vicinity of the home site 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, and problems with the operation of doors and windows. **Damage caused by water build-up or ponding under the home is not covered by the warranty.**

**3.4.2 Elimination of depressions** – Grade the home site to permit water to drain from underneath the home. See Figure 3.2.

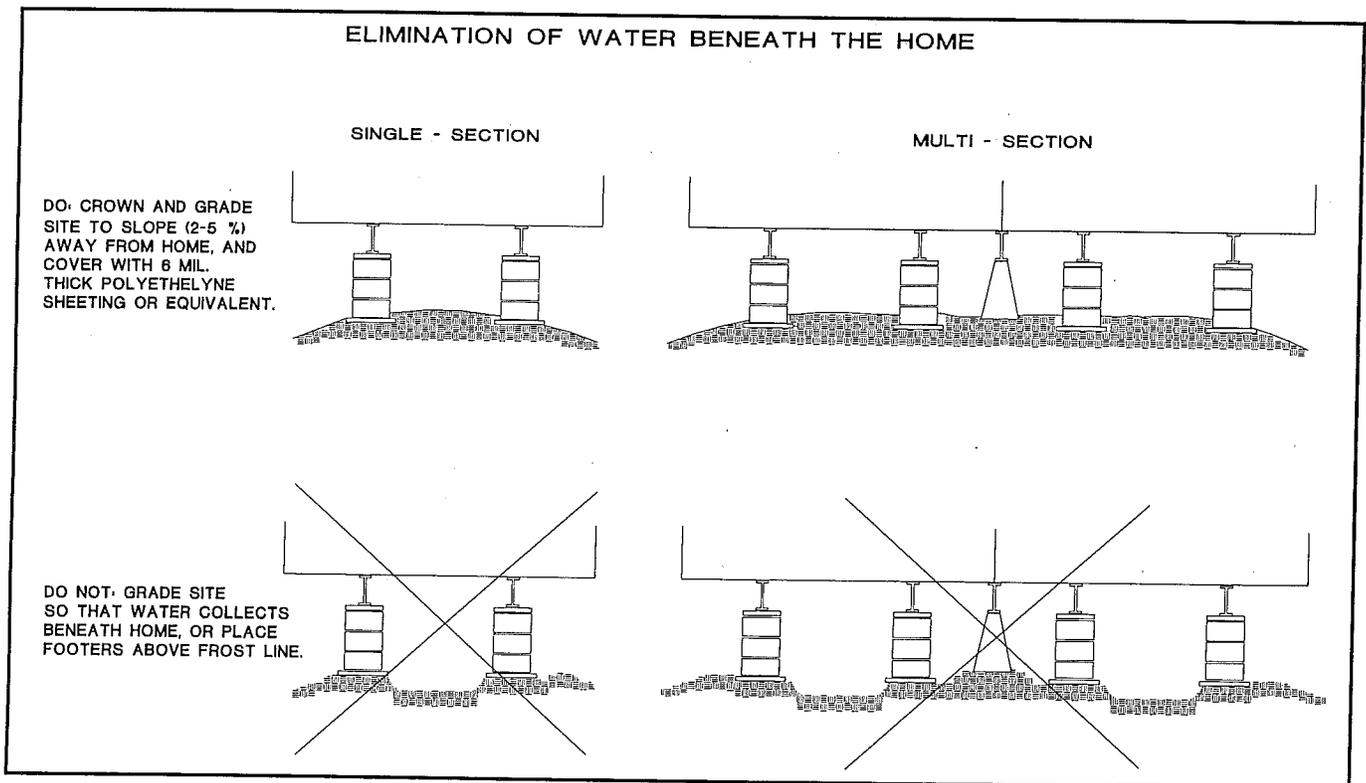
**3.4.3 Drainage structures** – Depending on the local landscape and local codes, ditches and culverts may be needed to drain surface runoff. If so, consult a registered professional engineer.

**3.5 Ground moisture control**

**3.5.1 Vapor retarder** – If the space under the home is to be enclosed with skirting or other material, a uniform 6-mil polyethylene sheet material or other equivalent and acceptable vapor retarder material shall be installed on the ground surface beneath homes with hardboard siding. It is recommended for all other homes.

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

**FIGURE 3.2**



## 4 - Foundations

### 4.1 Piers

4.1.1 **Importance** – Incorrect capacity or location of piers may cause structural damage (e.g. sagging floors, walls, and roofs, inoperative doors, etc.) which is not covered by warranty.

#### NOTICE

Some homes require both perimeter and frame footings and piers in order to safely support the home and prevent serious structural damage.

Refer to the Data Plate and any addendum. If the serial number contains a "P" or if perimeter blocking is specified then both perimeter and frame blocking must be installed.

4.1.2 **Acceptable types** – Piers may be concrete blocks, capped and shimmed with wedges, or adjustable manufactured metal or concrete devices (see Figure 4.1).

#### 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 load, the spacing of the piers, and the way the piers are used to support the home.

See Tables 4.1A & B, and 4.2A & B for minimum pier capacities. These tables allow eaves up to 16-inches for 12, 13 and 14 wide sections and eaves up to 12-inches for 16 and 18 wide sections. Manufactured piers must be rated at least to these capacities, and locally constructed piers must be designed to transmit these loads safely (see 4.1.3.2).

4.1.3.2 **Configuration** – Figure 4.1 shows the recommended arrangement of concrete block piers constructed on site. Load bearing (not decorative) concrete blocks shall have nominal dimensions of at least 8 inches x 8 inches x 16 inches. They must be stacked with their hollow cells aligned vertically. When piers are constructed of blocks stacked side by side, every layer shall be at right angles to the previous one (see Figure 4.1).

Cap hollow block piers as shown in Figure 4.1 to distribute the structural load evenly across them. Caps may be of solid masonry or wood. All caps shall be of the same length and width as the piers they rest upon. Avoid plywood, as it may lead to unwanted settling or movement.

Use 4-inch x 6-inch hardwood shims to level the home and fill any gaps between the base of the I-beam and the top of the pier cap. Always use shims in pairs and drive them in tightly so they occupy no more than 1 inch of vertical space. When the space to be shimmed is more than 1 inch, up to 3 inches of dimension lumber may be used under the shims. (See Figure 4.1.)

All piers must rest on footings that are placed on either undisturbed soil or compacted fill and are protected from the effects of ground frost heave.

4.1.3.3 **Clearance under the home** – A minimum clearance of 12 inches shall be maintained beneath the lowest member of the frame in the area of utility connections. No more than 25 percent of the frame shall be less than 12 inches above the ground and no part of the frame shall be in contact with the ground. Wood floor joists, including perimeter joists, shall be a minimum of 6 inches above the ground. Additionally, sufficient clearance shall be maintained to allow interconnection of multi-section units and for proper installation of ground anchors at the required anchor strap angle.

#### 4.1.4 Design

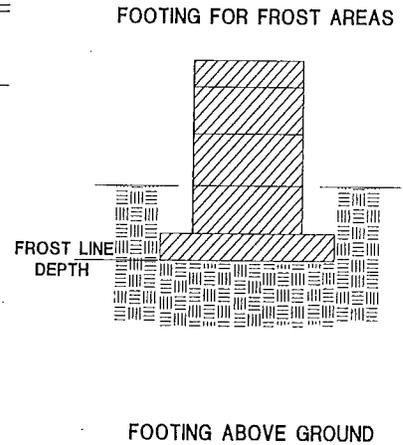
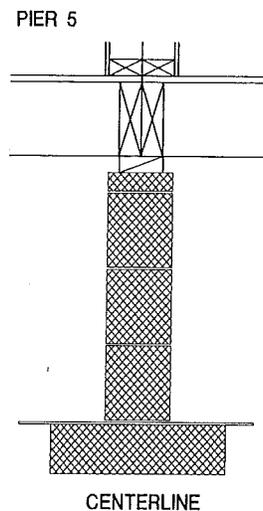
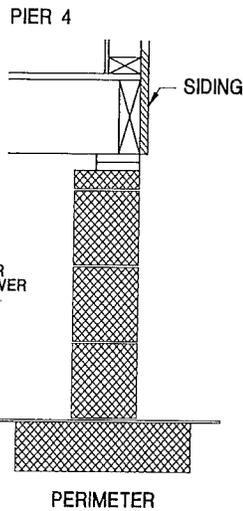
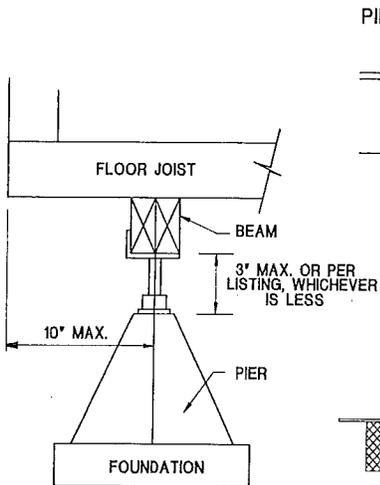
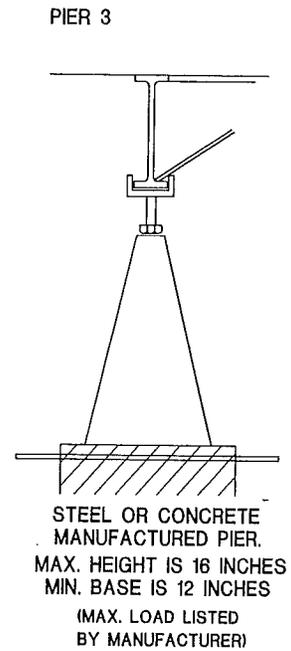
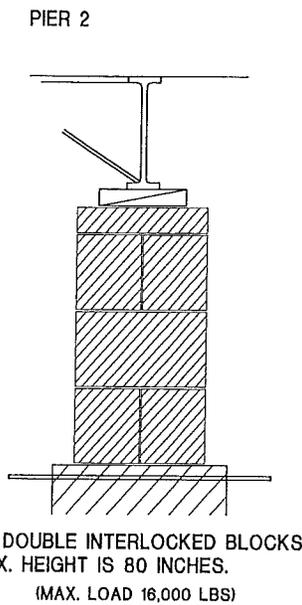
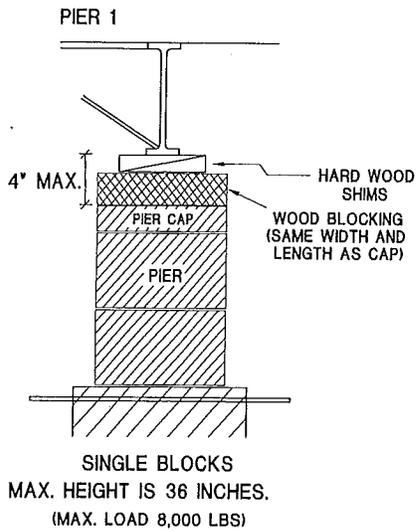
4.1.4.1 **Piers up to 36 inches high** – Piers up to 36 inches high may be constructed of single, open, or closed-cell concrete blocks, 8 inches x 8 inches x 16 inches. Install them so that the long sides are at right angles to the supported I-beam and open cells are vertical. See Figure 4.1. Horizontal offsets shall not exceed 1/2 inch top to bottom. Mortar is not normally required. Manufactured piers shall be listed and labeled for the required load capacity. Adjustable risers of manufactured piers shall not extend more than 3 inches or beyond the limits specified by the pier manufacturer, whichever is less, when finally positioned.

4.1.4.2 **Piers 36 to 80 inches high** – Up to 25 percent of the piers may be more than 36 inches high but no pier may be more than 80 inches high. Construct all piers that will be over 36 inches high, and all corner piers that will be over three blocks high, out of double interlocked concrete blocks. See Figure 4.1. Mortar will not normally be required. Piers over 36 inches high must be spaced not more than 8 feet on center.

**Elevated Homes** – When more than 25 percent of the required support piers will be over 36 inches high, or any pier will be more than 80 inches high, or any other criteria or combination of parameters of the installation are

FIGURE 4.1

TYPICAL FOOTING AND PIER INSTALLATION

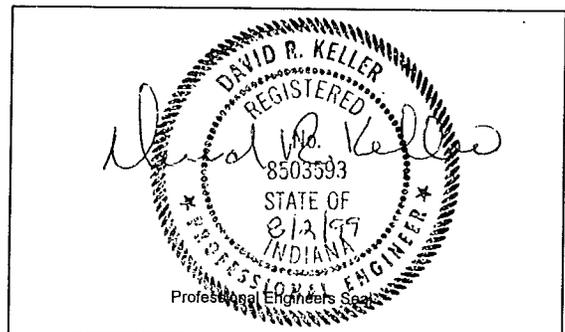


STEEL OR CONCRETE MANUFACTURED PIERS:

1. A BEAM OF (2) SPF #3 2X6X24" IS TO BE PLACED ON THE ADJUSTING SCREW AND SHALL BARE ON (2) FLOOR JOISTS.
2. PIERS ARE TO BE LOCATED NOT MORE THAN 48" ON CENTER AND 10" FROM THE EDGE OF THE FLOOR.
3. FOOTING SHALL BE SIZED FOR A PIER CAPACITY OF 2500 POUNDS.

SELECT MANUFACTURED PIER HEIGHTS SO THAT THEIR ADJUSTABLE RISERS DO NOT EXTEND MORE THAN 3 INCHES WHEN AT THEIR MAXIMUM HEIGHT.

ALL CONCRETE BLOCKS SHALL BE ASTM C.90.GRADE N MIN.



not specifically addressed by this manual, the foundation and stabilizing devices shall be designed by a qualified registered professional engineer or architect and the installation shall be approved by the authority having jurisdiction.

**4.1.5 Location and spacing** – The location and spacing of piers depends upon the size 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 or other openings. Figures 4.3, 4.4 and 4.5 show the location of piers. Tables 4.1A, 4.1B, 4.2A and 4.2B specify pier spacing requirements.

**4.1.5.1 Sidewall piers.** – Refer to Tables 4.2A and 4.2B for pier spacing for homes with both frame and perimeter piers. Refer to Tables 4.1A and 4.1B for pier spacing for “frame blocking only” homes.

Homes also require perimeter piers on both sides of all sidewall openings greater than 4 feet (such as doors, sliding glass doors and recessed entries) and under porch posts. Sidewall piers shall be designed for half the values in Tables 4.1B and 4.2B. Piers are not normally required for endwall openings.

Additionally, to stabilize entry doors, place one perimeter pier or approved adjustable outrigger at the hinge side of each door opening in the sidewall except when a factory installed outrigger is within 8-inches of hinge side of the door. A listed adjustable outrigger (e.g. Manufactured Housing Foundations Systems, Inc.) is acceptable when used with 10-inch minimum I-beam, located within 24-inches horizontally of a frame pier and installed per the outrigger manufacturer's installation instructions. Adjustable outriggers are not allowed for other pier applications. Remove adjustable outriggers prior to any home move.

**4.1.5.2 Multi-section mate line piers.** – Refer to Table 4.2A for pier spacing for homes with both frame and perimeter piers. Refer to Table 4.1B or 4.2B for pier loading requirements for openings in mate line for multi-section homes.

#### **4.2.1 Acceptable types of footings**

**4.2.1.1 Concrete** – Footings shall consist of precast or poured-in-place concrete pads, slabs or ribbons at least 4 inches thick with a 28-day compressive strength of at least 3,000-psi. Footings shall be no smaller than the minimum specified in Table 4.4 for the applicable load or the pier base, whichever is greater, and the effective load area of footings shall not extend

beyond the pier by more than the thickness of the footing. When used in conjunction with anchoring systems, slabs and ribbons shall be designed by a registered professional engineer with knowledge of the anchorage requirements of 5.4, and shall be acceptable to the local authority having jurisdiction.

**4.2.1.2 Pressure-treated wood** – 2 x pressure-treated wood planks having 0.60 retention in accordance with AWPA C22 Standard, with the long dimensions of the second layer placed perpendicular to that of the first. Cut edges shall be painted or retreated. Tack wood layers to hold in place. See Figure 4.2.

**4.2.1.3 Pressure-treated plywood** – See Table 4.3 for recommended pad sizes and thickness for use under manufactured home support piers. The recommendations are based on an 11-1/2 inch square metal support pier, or an 8-inch x 16-inch concrete block pier. All recommendations are for soils with a bearing capacity of 1,000 pounds per square foot, upon which the maximum pier load is based.

The plywood grade recommended for all pads PS1. Plywood beneath manufactured home piers must be pressure 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 AWPB-FDN standards. Alternatively, plywood may be pressure-treated in accordance with American Wood Preservers Association (AWPA) standard no. C-9 with salt preservatives as required for soil contact exposure.

**4.2.1.4 ABS Plastic Pads** – Select pad from manufacturer's tables that is rated for the soil condition and applied loading. Install flat side down, ribbed side up. The ground under the pads shall be leveled smooth with all vegetation removed. Pads are to be placed on natural grade unless otherwise permitted by local building authority. The open cells between the ribbing on the upper side of the pads may be filled with soil or sand after installation to prevent accumulation of water.

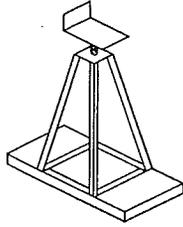
**4.2.1.5 Other Materials** – Other materials may be used when approved by local authorities if they provide equal load bearing capacity and resistance to decay.

FIGURE 4.2

Treated Wood Footings  
Maximum Footing Capacities

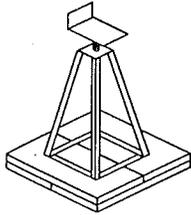
Piers shown are typical. Any approved pier can be used.

TYP. STEEL JACK PIER



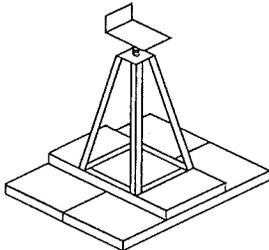
FOOTING #1		SOIL CAPACITY	FOOTING CAPACITY
QUANTITY/SIZE	GRADE/SPECIES		
1 each 2X12X24	#2 SPF/DFL	1000 PSF	1333 lb

TYP. STEEL JACK PIER



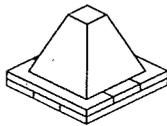
FOOTING #2		SOIL CAPACITY	FOOTING CAPACITY
QUANTITY/SIZE	GRADE/SPECIES		
4 each 2X10X18 1/2	#2 SPF/DFL	1000 PSF	2375 lb

TYP. STEEL JACK PIER



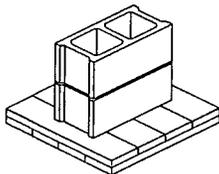
FOOTING #3		SOIL CAPACITY	FOOTING CAPACITY
QUANTITY/SIZE	GRADE/SPECIES		
3 each 2X12X24	#2 SPF/DFL	1000 PSF	3750 lb

TYP. CONCRETE CONE PIER

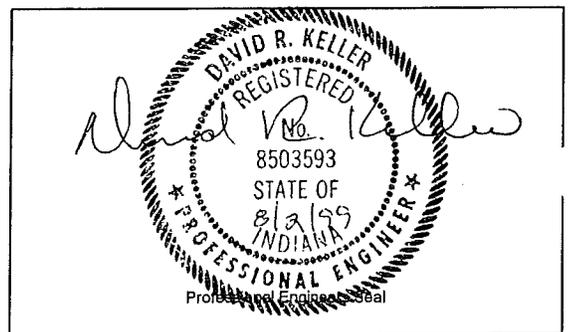


FOOTING #4		SOIL CAPACITY	FOOTING CAPACITY
QUANTITY/SIZE	GRADE/SPECIES		
6 each 2X6X16 1/2	#2 SPF/DFL	1000 PSF	1890 lb

TYP. CONCRETE BLOCK PIER



FOOTING #5		SOIL CAPACITY	FOOTING CAPACITY
QUANTITY/SIZE	GRADE/SPECIES		
8 each 2X6X22	#2 SPF/DFL	1000 PSF	3360 lb



**4.2.2 Placement in freezing climates**

**4.2.2.1 Conventional Footings** – To preclude the harmful effects of ground frost heave, footings must be below the frost line or otherwise protected from the effects of ground frost heave. Consult local authorities to determine the depth of the frost line.

**4.2.2.2 Floating slab systems** – When properly designed by a registered professional engineer with knowledge of the anchorage requirements of 5.4, and accepted by the local authority having jurisdiction, a "floating slab system" may be used above the frost line. The design must accommodate the anchorage requirements identified in 5.4.

**4.2.2.3 Insulated foundations** – Interior 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 every load-bearing component of the foundation acceptable for this purpose to the authority having jurisdiction. Insulation systems must comply with the requirement to cross-ventilate the entire space under the home. Refer to 5.6.

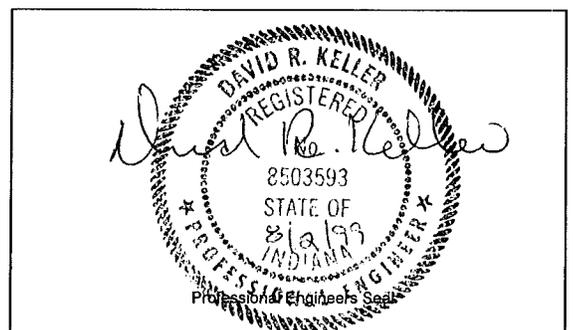
**4.2.3 Proper sizing of footings** – Proper sizing of footings depends upon the load-carrying capacity of both the piers and the soil. Determine the pier loads from Table 4.1A & B or 4.2A & B and select an adequately sized footing from Table 4.3, 4.4 and Figure 4.2.

**TABLE 4.1A**

MINIMUM PIER LOADS FRAME BLOCKING ONLY Perimeter Support Not Required Except at Openings IF CONDITIONS CANNOT BE FOUND IN THIS TABLE YOU MUST USE TABLES 4.2A & B									
SECTION WIDTH	ROOF LIVE LOAD PSF	Minimum Pier Capacity - Lbs.							
		Maximum Pier Spacing - Feet							
		4	5	6	7	8	9	10	11
12	20	2,300	2,900	3,400	4,000	4,600	5,200 (a)	5,700 (a)	6,300 (b)
	30	2,600	3,200	3,900	4,500	5,200	5,800 (a)	6,500 (a)	7,100 (b)
	40	2,900	3,600	4,300	5,000	5,700	6,500 (a)	7,200 (b)	7,900 (b)
13	20	2,500	3,100	3,800	4,400	5,000	5,600 (a)	6,300 (a)	6,900 (b)
	30	2,800	3,500	4,200	4,900	5,600	6,300 (a)	7,000 (b)	7,700 (b)
	40	3,100	3,900	4,700	5,500	6,300	7,000 (a)	7,800 (b)	8,600 (b)
14	20	2,700	3,300	4,000	4,600	5,300	6,000 (a)	6,600 (b)	7,300 (b)
	30	3,000	3,700	4,500	5,200	6,000	6,700 (a)	7,500 (b)	8,200 (b)
	40	3,300	4,100	5,000	5,800	6,600 (a)	7,400 (a)	8,300 (b)	9,100 (b)
16	20	2,900	3,600	4,400	5,100	5,800	6,500 (a)	7,300 (b)	8,000 (b)
	30	3,300	4,100	4,900	5,700	6,500 (a)	7,300 (b)	8,200 (b)	9,000 (b)
	40	3,600	4,500	5,400	6,300	7,200 (a)	8,100 (b)	9,000 (b)	9,900 (b)
18	20	3,300	4,100	4,900	5,700	6,500 (a)	7,400 (b)	8,200 (b)	9,000 (b)
	30	3,700	4,600	5,500	6,400	7,300 (a)	8,200 (b)	9,200 (b)	10,100 (b)

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

1. Blocking shall be located each side of openings in perimeter and marriage walls over 4 ft. (see tables 4.1B or 4.2B).
2. Perimeter support recommended for gypsum board tape and texture homes.



**TABLE 4.1B**

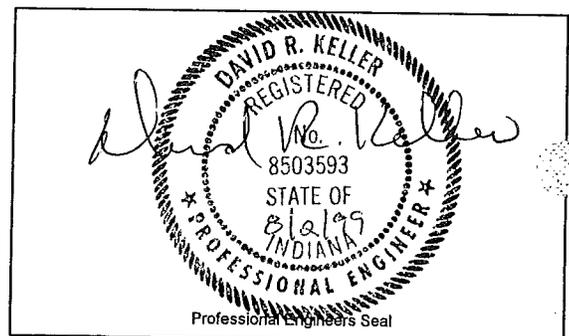
**MINIMUM PIER LOADS**  
**MULTI-SECTION MATE LINE BLOCKING**  
 Sidewall Opening Pier Capacity is 1/2 the Load Shown.  
 For Frame Blocking Only  
 Perimeter Support Not Required Except at Openings

SECTION WIDTH FT	ROOF LIVE LOAD PSF	Minimum Pier Capacity - Lbs.						
		Mating Wall Opening - Feet						
		5	10	15	20	25	30	35
12	20	1,100	2,200	3,300	4,400	5,400	6,500	7,600
	30	1,500	2,900	4,400	5,800	7,300	8,700	10,200
	40	1,800	3,600	5,400	7,300	9,100	10,900	12,700
	60	2,500	5,100	7,600	10,200	12,700	15,200	N/A
	80	3,300	6,500	9,800	13,100	N/A	N/A	N/A
13	20	1,200	2,400	3,500	4,700	5,900	7,100	8,200
	30	1,600	3,100	4,700	6,300	7,800	9,400	11,000
	40	2,000	3,900	5,900	7,800	9,800	11,800	13,700
	60	2,700	5,500	8,200	11,000	13,700	N/A	N/A
	80	3,500	7,100	10,600	14,100	N/A	N/A	N/A
14	20	1,200	2,500	3,700	5,000	6,200	7,400	8,700
	30	1,700	3,300	5,000	6,600	8,300	9,900	11,600
	40	2,100	4,100	6,200	8,300	10,300	12,400	14,400
	60	2,900	5,800	8,700	11,600	14,400	N/A	N/A
	80	3,700	7,400	11,100	14,900	N/A	N/A	N/A
16	20	1,300	2,600	3,900	5,300	6,600	7,900	9,200
	30	1,800	3,500	5,300	7,000	8,800	10,500	12,300
	40	2,200	4,400	6,600	8,800	10,900	13,100	15,300
18	20	1,500	2,900	4,400	5,900	7,300	8,800	10,200
	30	2,000	3,900	5,900	7,800	9,800	11,700	13,700
	40	2,400	4,900	7,300	9,800	12,200	14,600	N/A

**EXAMPLE:** 14-foot section width  
 30-psf roof live load  
 18- foot mating wall opening

Follow down the "section width" column to "14 feet"; follow across to "30 psf" in the "Roof Live Load" column. Since the opening is 18 feet wide, follow across to the "20 foot" column (for any opening width that is not shown, use the next highest number on the chart). The required pier capacity is 6600 pounds.

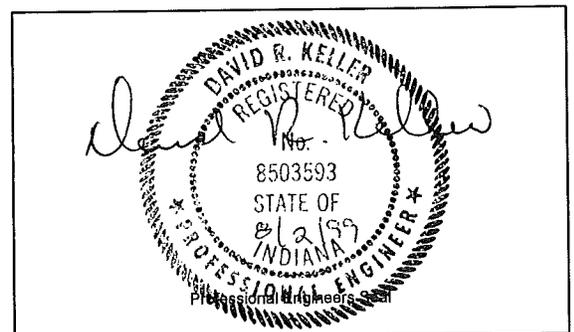
For piers supporting two adjacent openings, the capacity shall be the sum of the capacities from each span.



**TABLE 4.2A**

MINIMUM PIER LOADS FRAME PLUS PERIMETER BLOCKING Both Frame and Perimeter Blocking Required										
SECTION WIDTH	ROOF LIVE LOAD PSF		Minimum Pier Capacity - Lbs.							
			Maximum Pier Spacing - Feet							
			4	5	6	7	8	10	12	14
12	20	FRAME	1,300	1,600	2,000	2,300	2,600	3,300	3,900	4,600
		PERIMETER	1,000	1,200	1,500	1,700	2,000	N/A	N/A	N/A
	30	FRAME	1,300	1,600	2,000	2,300	2,600	3,300	3,900	4,600
		PERIMETER	1,300	1,600	1,900	2,200	2,600	N/A	N/A	N/A
	40	FRAME	1,300	1,600	2,000	2,300	2,600	3,300	3,900	4,600
		PERIMETER	1,600	2,000	2,400	2,700	3,100	N/A	N/A	N/A
	60	FRAME	1,300	1,600	2,000	2,300	2,600	3,300	3,900	4,600
		PERIMETER	2,100	2,700	3,200	3,800	4,300	N/A	N/A	N/A
	80	FRAME	1,300	1,600	2,000	2,300	2,600	3,300	3,900	4,600
		PERIMETER	2,700	3,400	4,100	4,800	5,500	N/A	N/A	N/A
13	20	FRAME	1,400	1,800	2,100	2,500	2,900	3,600	4,300	5,000
		PERIMETER	1,100	1,300	1,600	1,900	2,100	N/A	N/A	N/A
	30	FRAME	1,400	1,800	2,100	2,500	2,900	3,600	4,300	5,000
		PERIMETER	1,400	1,700	2,100	2,400	2,800	N/A	N/A	N/A
	40	FRAME	1,400	1,800	2,100	2,500	2,900	3,600	4,300	5,000
		PERIMETER	1,700	2,100	2,500	3,000	3,400	N/A	N/A	N/A
	60	FRAME	1,400	1,800	2,100	2,500	2,900	3,600	4,300	5,000
		PERIMETER	2,300	2,900	3,500	4,100	4,600	N/A	N/A	N/A
	80	FRAME	1,400	1,800	2,100	2,500	2,900	3,600	4,300	5,000
		PERIMETER	3,000	3,700	4,400	5,200	5,900	N/A	N/A	N/A
14	20	FRAME	1,500	1,900	2,300	2,700	3,000	3,800	4,600	N/A
		PERIMETER	1,100	1,400	1,700	2,000	2,300	N/A	N/A	N/A
	30	FRAME	1,500	1,900	2,300	2,700	3,000	3,800	4,600	N/A
		PERIMETER	1,500	1,800	2,200	2,600	2,900	N/A	N/A	N/A
	40	FRAME	1,500	1,900	2,300	2,700	3,000	3,800	4,600	N/A
		PERIMETER	1,800	2,200	2,700	3,100	3,600	N/A	N/A	N/A
	60	FRAME	1,500	1,900	2,300	2,700	3,000	3,800	4,600	N/A
		PERIMETER	2,400	3,100	3,700	4,300	4,900	N/A	N/A	N/A
	80	FRAME	1,500	1,900	2,300	2,700	3,000	3,800	4,600	N/A
		PERIMETER	3,100	3,900	4,700	5,400	6,200	N/A	N/A	N/A
16	20	FRAME	1,700	2,100	2,600	3,000	3,400	4,300	5,100	N/A
		PERIMETER	1,200	1,500	1,800	2,100	2,400	N/A	N/A	N/A
	30	FRAME	1,700	2,100	2,600	3,000	3,400	4,300	5,100	N/A
		PERIMETER	1,600	1,900	2,300	2,700	3,100	N/A	N/A	N/A
	40	FRAME	1,700	2,100	2,600	3,000	3,400	4,300	5,100	N/A
		PERIMETER	1,900	2,400	2,900	3,300	3,800	N/A	N/A	N/A
18	20	FRAME	1,900	2,400	2,900	3,400	3,900	4,800	5,800	N/A
		PERIMETER	1,300	1,700	2,000	2,400	2,700	N/A	N/A	N/A
	30	FRAME	1,900	2,400	2,900	3,400	3,900	4,800	5,800	N/A
		PERIMETER	1,700	2,200	2,600	3,000	3,500	N/A	N/A	N/A
	40	FRAME	1,900	2,400	2,900	3,400	3,900	4,800	5,800	N/A
		PERIMETER	2,100	2,700	3,200	3,700	4,300	N/A	N/A	N/A

1. Mate line pier blocking capacity is 2 x perimeter pier capacity and shall not exceed 4 ft. spacing.
2. Blocking shall be located each side of openings in perimeter and marriage walls over 4 ft. (see tables 4.1B or 4.2B).
3. Perimeter support recommended for gypsum board tape and texture homes.



**TABLE 4.2B**

**MINIMUM PIER LOADS  
MULTI-SECTION MATE LINE BLOCKING**  
Sidewall Opening Pier Capacity is 1/2 the Load Shown.  
Both Frame and Perimeter Blocking Required

SECTION WIDTH	ROOF LIVE LOAD PSF	Minimum Pier Capacity - Lbs.						
		Mating Wall Opening - Feet						
		5	10	15	20	25	30	35
12	20	2,800	3,900	5,000	6,100	7,200	8,300	9,400
	30	3,800	5,200	6,700	8,100	9,600	11,000	12,500
	40	4,700	6,500	8,300	10,200	12,000	13,800	15,600
	60	6,600	9,100	11,700	14,200	N/A	N/A	N/A
	80	8,500	11,700	15,000	N/A	N/A	N/A	N/A
13	20	3,100	4,200	5,400	6,600	7,800	8,900	10,100
	30	4,100	5,600	7,200	8,800	10,300	11,900	13,500
	40	5,100	7,100	9,000	11,000	12,900	14,900	N/A
	60	7,100	9,900	12,600	15,400	N/A	N/A	N/A
	80	9,200	12,700	16,200	N/A	N/A	N/A	N/A
14	20	3,200	4,500	5,700	6,900	8,200	9,400	10,600
	30	4,300	5,900	7,600	9,200	10,900	12,500	14,200
	40	5,400	7,400	9,500	11,600	13,600	15,700	N/A
	60	7,500	10,400	13,300	16,200	N/A	N/A	N/A
	80	9,700	13,400	17,100	N/A	N/A	N/A	N/A
16	20	3,400	4,700	6,000	7,400	8,700	10,000	11,300
	30	4,600	6,300	8,100	9,800	11,600	13,300	15,100
	40	5,700	7,900	10,100	12,300	14,400	N/A	N/A
18	20	3,800	5,300	6,700	8,200	9,700	11,100	12,600
	30	5,100	7,000	9,000	10,900	12,900	14,800	N/A
	40	6,300	8,800	11,200	13,700	N/A	N/A	N/A

**EXAMPLE:** 14-foot section width  
30-psf roof live load  
18- foot mating wall opening

Follow down the "section width" column to "14 feet"; follow across to "30 psf" in the "Roof Live Load" column. Since the opening is 18 feet wide, follow across to the "20 foot" column (for any opening width that is not shown, use the next highest number on the chart). The required pier capacity is **9200 pounds.**

For piers supporting two adjacent openings, the capacity shall be the sum of the capacities from each span.



**4.3 Other foundations** – Check local building codes and regulations when siting the home on a basement, crawl space or load-bearing perimeter foundation. A registered professional engineer's design may be required. The manufacturing facility may provide foundation designs that meet many local codes. Useful ideas and design guidelines may also be found in reference publications such as those listed in 4.5.

**4.4 Special Considerations** (Also see 5.4.2 and 5.4.3.)

**4.4.1 Flood-prone areas** – The manufacturer does not recommend siting a 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 qualified registered professional engineer to make sure that the home design and construction conform to applicable federal, state and local codes and regulations. The FEMA publication listed in 4.5 contains design and construction recommendations.

**4.4.2 Severe wind areas** – Do not place the home in a wind zone more severe than the one indicated on the data plate located in the home. The home for which these instructions are intended, and these installation instructions, are not applicable to and shall not be used for installation of homes within 1,500 feet of the coast line in Wind Zone II and Wind Zone III. Installations within 1,500 feet of the coastline shall be designed by a qualified registered professional engineer with knowledge of

the home construction and wind zone requirements and shall be accepted by the local authority having jurisdiction.

**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 or footings. If the plans for these piers and footings are not provided with the home, a registered professional engineer or architect must design them. Check with the local authority having jurisdiction. Extreme snow loads often require a separate Ramada design for the snow load.

**4.5 Reference Documents** – The following reference documents are identified for informational purposes only. They are not part of the requirements of this manual.

**4.5.1 ANSI/NCSBCS A225.1-1987:**

"Manufactured Home Installations", NCSBCS, 505 Huntmar Park Dr., Herndon, VA 22070, (707) 437-0100

**4.5.2 ANSI/ASCE 7-88:** "Minimum Design Loads for Buildings and other Structures", ASCE, 345 East 47<sup>th</sup> St., New York, NY 10017-2398

**4.5.3 FEMA 85:** "Manufactured Home Installation in Flood Hazard Areas", FEMA, Washington, DC 20472 (202) 646-2708, September 1985.

**4.5.4 HUD Handbook 4930.3 (1989):**

"Permanent Foundations Guide for Manufactured Housing", HUD, 415 7<sup>th</sup> St., SW Washington, DC 20410

**4.5.5 "All-Weather Wood Foundation**

**Systems Manual":** National Forest Products Association, 1619 Massachusetts Ave., NW Washington, DC 20036, June 1976

**4.5.6 "Frost-Free Shallow Foundation Design Guidelines":** Energy Design Update, March 1988

**4.5.7 "Building Foundation Design Guidebook":** Document No. DE 88013350, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161

**TABLE 4.3**

PLYWOOD PIER/PAD SIZE			
PLYWOOD PAD SIZE INCHES	MINIMUM PLYWOOD THICKNESS		MAXIMUM PIER LOAD FOR 1000 PSF SOIL
	METAL STANDS	CONCRETE BLOCKS	
16 X 16	1/2 inch	1 inch	1780 pounds
16 X 19.2	5/8 inch	1 1/8 inches	2130 pounds
24 X 24	1 1/8 inches	1 1/4 inches	4000 pounds

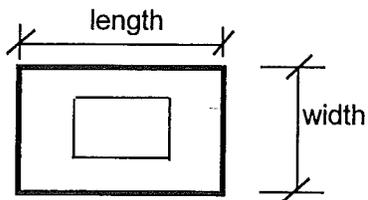
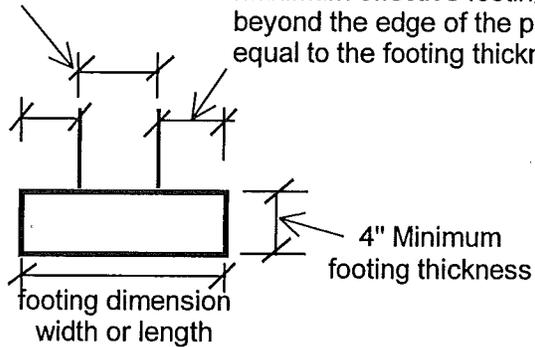
**NOTES:**

1. Face grain may be either direction relative to the pad or pier dimension.
2. Plywood thickness is for a metal stand with 11-1/2 inch square base, or a concrete block with an 8 inch x16 inch base. Thicknesses of one inch or more may be fabricated from two layers of plywood, stacked with or without fastening.

**TABLE 4.4**

PIER LOADS  (POUNDS)	MINIMUM FOOTING SIZE IN SQUARE INCHES FOR SOIL CAPACITY IN POUNDS PER SQUARE FOOT (PSF)				
	1000 PSF	1500 PSF	2000 PSF	3000 PSF	4000 PSF
	SQ. IN.	SQ. IN.	SQ. IN.	SQ. IN.	SQ. IN.
1,000	144	128	128	128	128
1,500	216	144	128	128	128
2,000	288	192	144	128	128
3,000	432	288	216	144	128
4,000	576	384	288	192	144
5,000	720	480	360	240	180
6,000	864	576	432	288	216
7,000	1,008	672	504	336	252
8,000	1,152	768	576	384	288
9,000	1,296	864	648	432	324
10,000	1,440	960	720	480	360
11,000	1,584	1,056	792	528	396
12,000	1,728	1,152	864	576	432
13,000	1,872	1,248	936	624	468
14,000	2,016	1,344	1,008	672	504
15,000	2,160	1,440	1,080	720	540

Pier dimension  
 Maximum effective footing extension beyond the edge of the pier is equal to the footing thickness - See 4.2.1.1



Footing size (sq-in) = width x length  
 Example = 8 x 16 = 128 sq. in.

TYPICAL FOOTINGS	
Size	Sq. In.
8 x 16	128
12 x 12	144
16 x 16	256
20 x 20	400
24 x 24	576
24 x 30	720
30 x 30	900
30 x 36	1080
36 x 36	1296
36 x 48	1728
48 x 48	2304

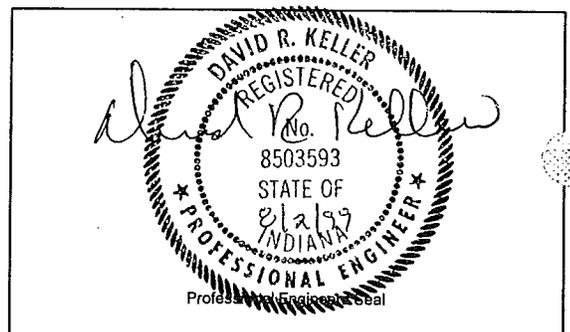


FIGURE 4.3

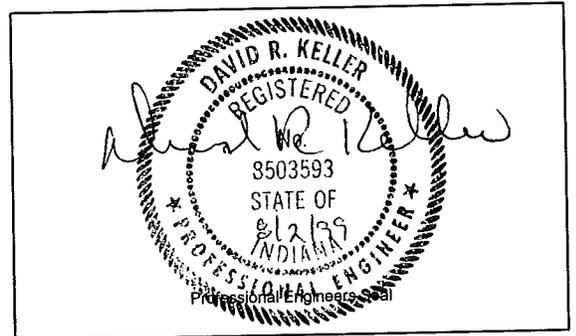
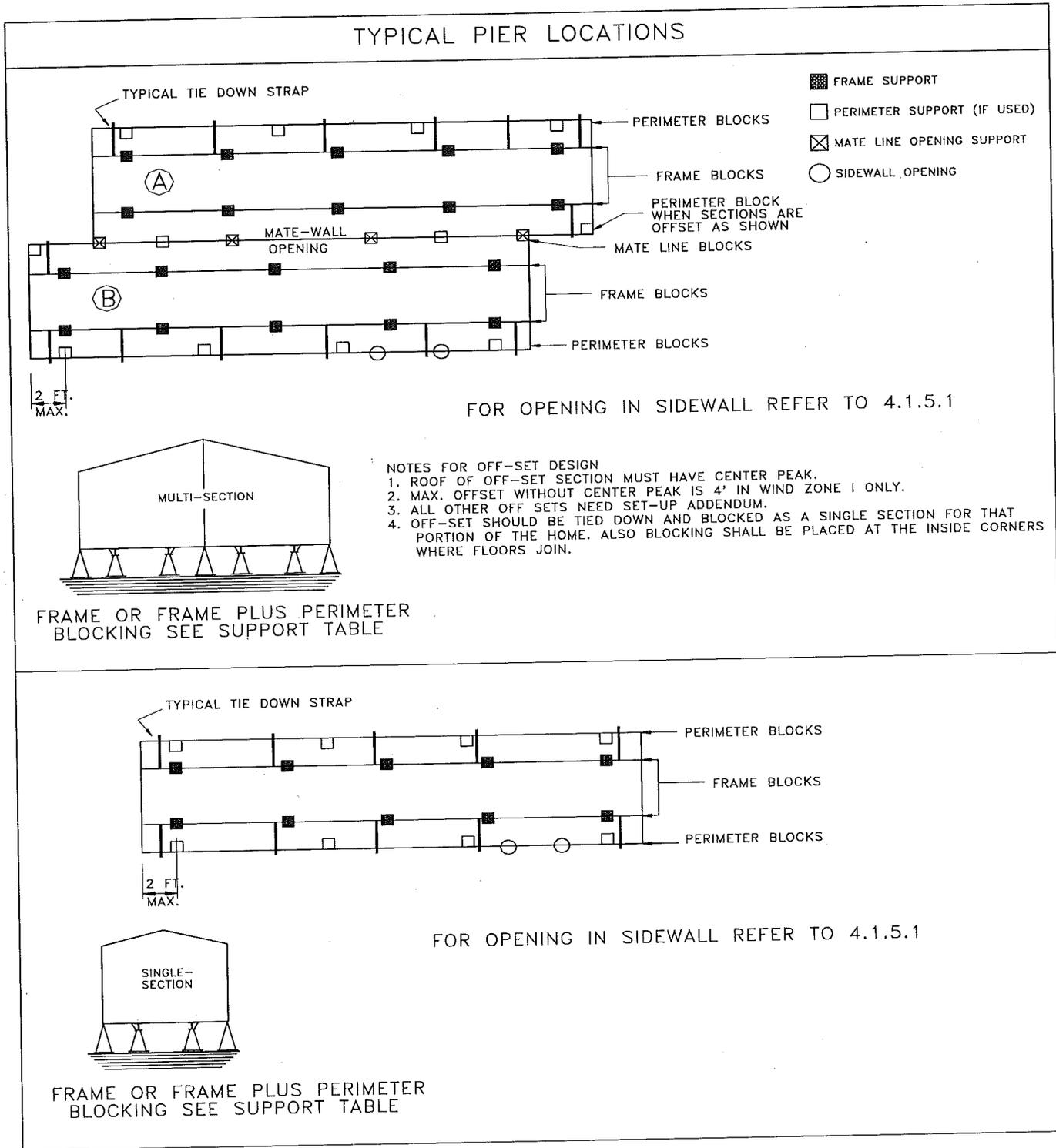
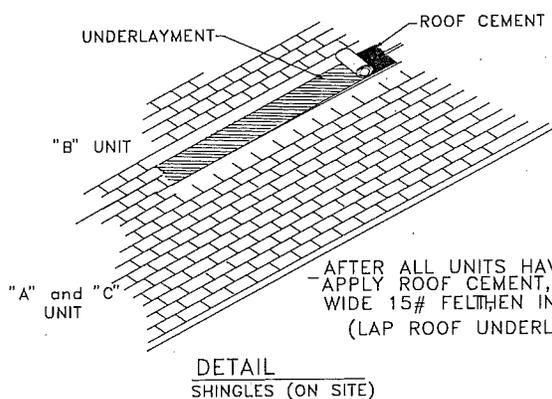
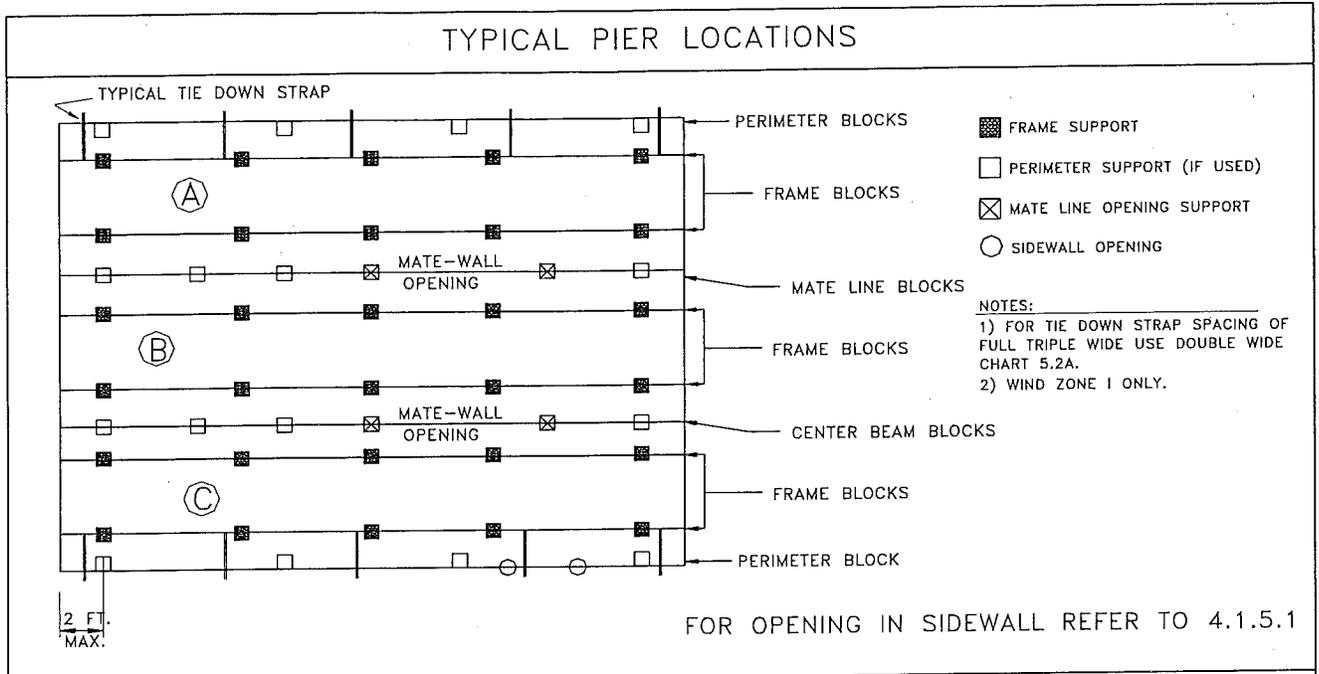


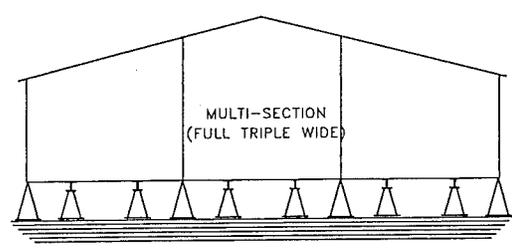
FIGURE 4.4



LONGITUDINAL TIE-DOWN STRAPS ARE REQUIRED AT THE FRONT AND REAR OF FULL TRIPLE WIDE HOMES IN ALL WIND ZONES. REFER TO 5.4.1.3 AND FIGURE 5.12. USE SWIVEL BRACKETS TO PREVENT ANGULAR STRESS ON THE STRAPS.

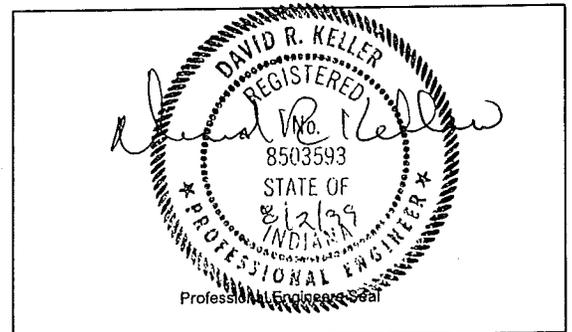
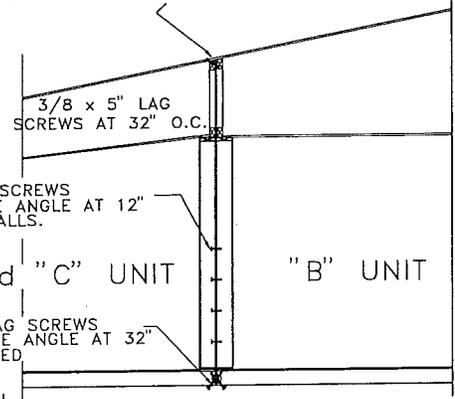
AFTER ALL UNITS HAVE BEEN SET, APPLY ROOF CEMENT, ROLL OUT 30" MIN. WIDE 15# FELT THEN INSTALL SHINGLES (LAP ROOF UNDERLAYMENT 6" MIN.)

16" MIN. STRIP OF APA ROOF SHEATHING ATTACHED IN FIELD AFTER HOME IS LAGGED TOGETHER WITH 15 GA. STAPLES AT 6" O.C.

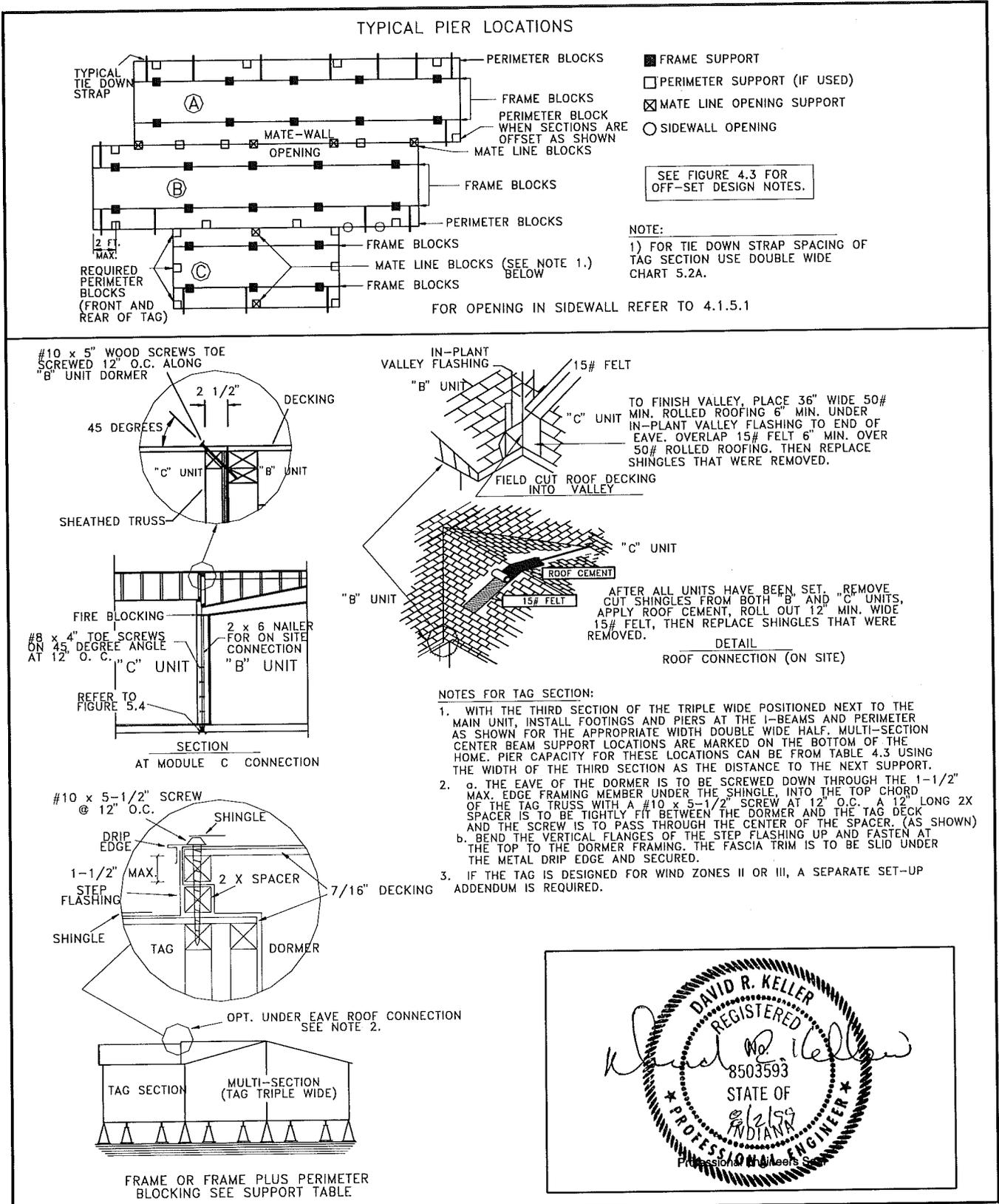


#8 x 4" TOE SCREWS ON 45 DEGREE ANGLE AT 12" O.C. AT ENDWALLS.

3/8" x 4" LAG SCREWS ON 45 DEGREE ANGLE AT 32" O.C. STAGGERED



**FIGURE 4.5**



## 5 – Installation procedures

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

- The home is designed for the geographic zone where it will be installed (see 1.2).
- The site is properly prepared (see 3)
- All footing and 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 and can fall off jacks during installation.

**FAILURE TO USE SUPPORT  
BLOCKING MAY RESULT IN SERIOUS  
INJURY OR DEATH.**

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 of the home into the desired location. Work safely whenever under, in, or around a home that is being set.

### **NOTICE**

**Foundations that are not level can cause structural damage to the home.**

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

5.2.1 **Leveling and blocking** – To prevent tipping or settling, use a firm support under jacks. Place minimum 12-ton rated jacks under the I-beam in front of and behind the axle assembly. Also place one 12-ton jack at least every 20 feet along the remainder of the I-beam. All jacks shall be resting on firm, stable wooden supports. Jack only on the main chassis I-beam. Locate the jacks directly under the vertical web of the I-beam. Do not jack on the seam of a twin I-beam. Use a large 3/8-inch thick steel plate, C-channel or other equivalent plate between the main chassis I-beam and the jack head to distribute the load (see Figure 5.1). Use jacks only for raising the home. Do not rely on the jacks to support the home. Proceed as follows.

- Remove the close-up material from areas in which sections will be joined. Be careful not to damage adjacent paneling or siding. 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 6.1.
- It is very important that safety support timbers are installed under the home that will support the weight of the home (see Figure 5.1) and that they follow the home up as it becomes higher off the ground. Only one side shall be jacked at a time so that the other side is always supported and stable. Build the support blocking roughly level under one side of the home and use them to support the home while you raise the other side. Be especially aware of external forces such as the potential for a sudden gust of wind or failure of a jack, and be sure the safety supports will hold if needed.
- Uniformly raise the home to slightly above where you want to set your piers. Care shall be taken not to cause the home to lean too much to one side with the jacks. When it is necessary to raise the sides of a home up in steps, never jack one beam more than 6-inches above or below the other. The home shall be in very nearly a level position end to end as the lifting process proceeds.
- Place the piers at the required locations. All piers shall be built squarely and solidly with no defects in the blocks and conform to Figure 4.1. Be sure the tops of the piers are capped and cushioned with wooden shims. Adjust all pier heights using leveling procedure per 5.2.1.1. Additional support is required under doors and heavy furniture per 4.1.5.1, and failure to install it may void the warranty. Place all required supports under doors and any openings over 4 feet wide in exterior wall.

- When the home is raised an inch or two over the desired final leveling point, use the water level to level all the piers on one side of the home. Keep in mind that the water level will be setting the tops of the piers at the point you wish the bottom of the main beam to be. Special bracing (e.g. flat iron on bottom of I-beam) must be compensated for by lowering the appropriate piers exactly the thickness of that bracing.
- Lower the home onto the piers. Lower one side of the home on to the pre-leveled piers and repeat the procedure on the other beam.
- Check the soundness of all piers and adjust as required to assure the normal operation of all windows and doors. If any difficulties are found with the operation of any doors or windows a check shall be made in that area with the water level. If the home is found to be level and properly supported then the window or door shall be refitted to the home.
- Remove the safety supports.

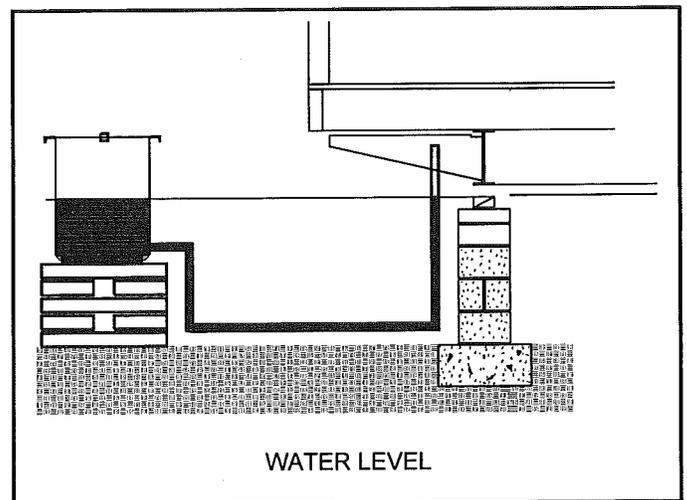
**5.2.1.1 Leveling** – To level the home, use a water level, transit level, or 6-foot carpenter level. One configuration of a water level consists of 100 feet of 3/8 inch clear plastic tubing with a shut-off valve at one end and the other end connected near the bottom of a plastic container that is filled with colored water and has a removable cap (e.g. cork).

The water in the tubing will always be level with the water in the container if the shut-off valve is open, air bubbles have been removed and the cap is removed (see Figure 5.2). Comparable "water levels" may be purchased from some building supply and hardware retailers.

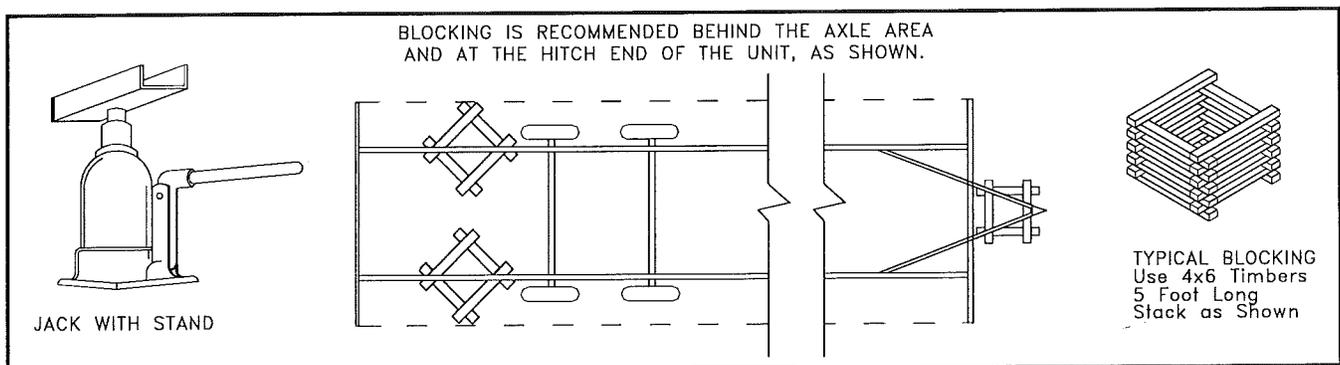
### 5.2.1.2 How to use a water level

- 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 level in the tubing is at the height wanted for the bottom of the I-beam when in its final position. See Figures 5.2 and 5.3.
- Prepare the "water level" for use. Remove the cap and raise the shut-off valve above the container. Open the valve and set the water level in the tubing to the predetermined height. Close the valve so tubing can be moved without losing any of the liquid.

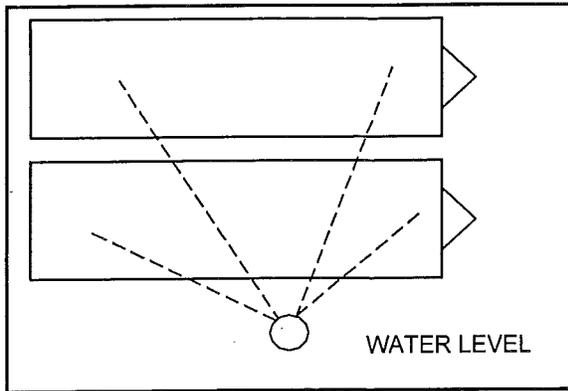
**FIGURE 5.2**



**FIGURE 5.1**



**FIGURE 5.3**



- 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.
- 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.

**5.2.2 Positioning multi-section homes** – Following the leveling and blocking procedures of 5.2.1, set the other section(s) as follows:

- Remove all shipping materials and items from the mating surfaces of both sections.
- Position piers under the ridge beam support columns of the blocked home section so that they will support both home sections.
- If the home has an optional hinged roof or eaves, refer to 6.1.
- Before the final positioning of the second section, fiberglass insulation or an equivalent material must 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 shall 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

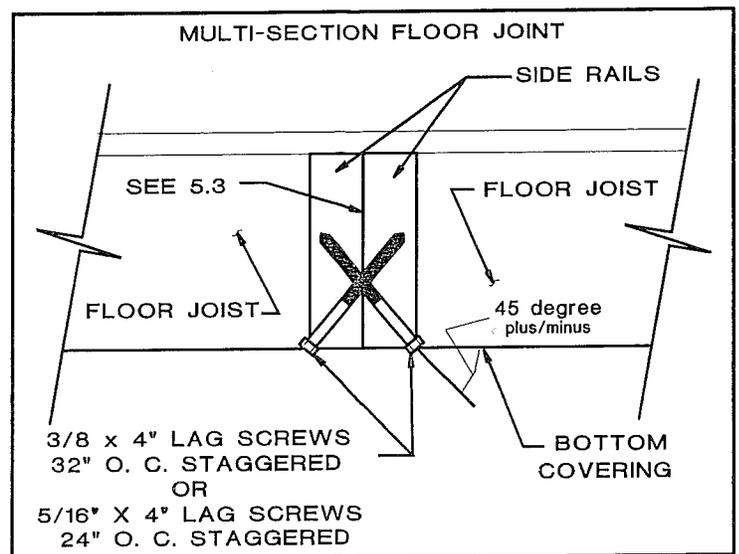
seal. Make certain that it is in place prior to joining the two sections.

- Position the second section near the first section, and line up the sections. Using a properly functioning rolling and jacking system in a manner commensurate with the manufacturer of that systems operational instructions, move the home section over to meet the previously installed section. Take care that the inner beam is slightly higher than the outer beam so there is no opportunity for the roof sections to touch before the floor when the home sections meet.

- Raise the second section the same way as the first section. Refer to 5.2.1. Position the footings and piers, and level each pier including the ridge beam support piers. When this is complete, lower the jacks so that the steel frame members rest on the piers and the ridge beam supports rest on their piers. Lower the outside beam first and then the inner beam, while tightening the home sections with several come-alongs.

**5.3 Interconnection of multi-section homes** – After the sections have been positioned together, aligned, and leveled, install the lag screws to connect the floors and roofs. See Figure 5.4. and 5.6. Gaps between floors and roofs, up to 1-1/2 inches maximum, may be closed with lumber or plywood shims fitted for the total length of the gap. When shims are used increase lag screw length by 1.5 times the thickness of the shims.

**FIGURE 5.4**

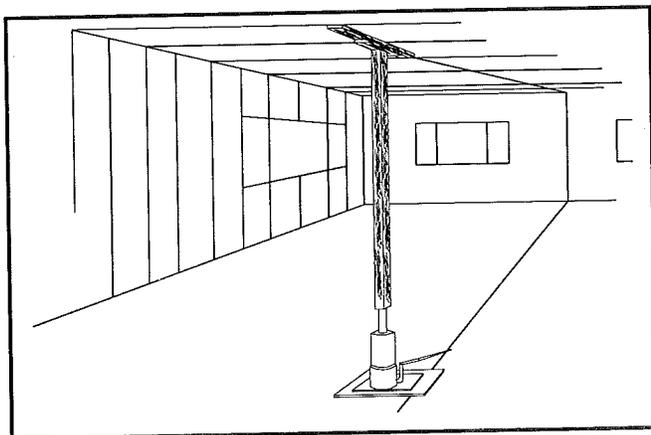


To avoid splitting the rails, pilot holes shall be drilled. **Do not use the lag screws to pull the home sections together.** When one side of the section is lower than the other, use a jack to raise the side rail of the low side. Once the sections are even, lag or nail the side rails together. Continue 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 inch 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 Figure 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.

**FIGURE 5.5**



To secure adjoining roof sections together, install lag screws at a 45-degree angle so they penetrate both ridge beams (see Figure 5.6). Install the lag screws from alternate sides. Remember that the fasteners are used to secure the sections together and must **NOT** be used as a way to pull the roofs together.

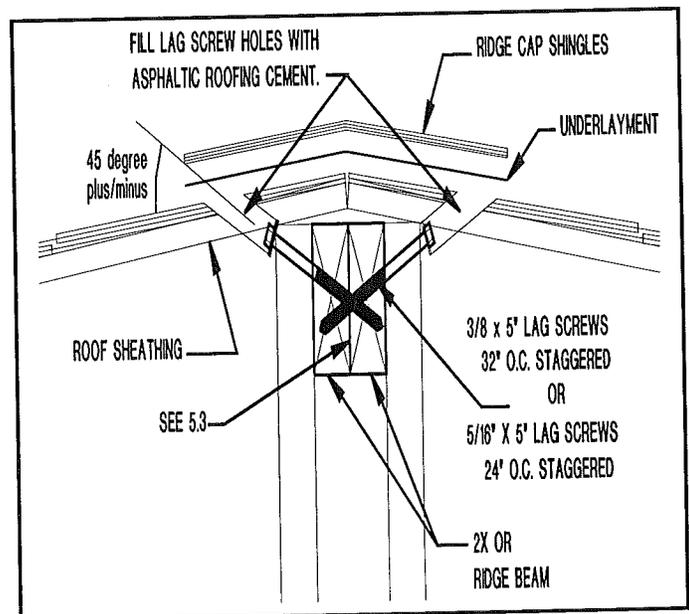
**NOTICE**

Roofs and ceilings that are not aligned can cause trim damage and allow weather (rain and snow) damage.

It is imperative that the ceilings on each section be exactly flush before fastening the ridge beam together.

Inside the house, check along the centerline for a label that identifies a support column requiring special attachment. If found, fasten that column to the structure of the other section as shown in Figure 5.7.

**FIGURE 5.6**



On composition shingle roofs, cover the joint between roof sections with a piece of 8 inch wide roofing felt, which is stapled to the underlying, roofs decking. The staples shall be 16 Ga. x 1 inch x 1 inch and spaced a maximum of 6 inches apart.

Shingles used for the ridge cap are 36 inch x 12 inch cut into three sections. Start from the end that is opposite the direction of the prevailing wind. Overlap each ridge shingle 6 inches and secure with four 16 Ga. x 1 inch x 1 inch staples or roofing nails.

#### NOTICE

Shingles on certain areas of the roof may be secured with tack strips or other material for transportation. Failure to remove any shipping material and sealing of any fastener holes can resultant in weather damage (rain and snow).

Tack strips and other shipping materials must be removed and any visible holes that are left by the 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 shall be covered with a roof sealant. See Figure 5.8.

For other roofing materials, see the roofing manufacturer's installation instructions.

After completing 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 moldings or paneling with the materials installed by the manufacturer. See Figure 5.9.
- Before installing moldings, fill all gaps in the exterior walls with fiberglass insulation or caulking. Then, staple or nail the moldings in place. Color-coordinated putty (not supplied by the manufacturer) may be used to cover staple and nail holes.

#### NOTICE

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

- Remove any polyethylene shipping material from the end wall and install the vertical siding with the provided fasteners, following the nailing pattern given in Figure 5.10.
- Install the matching bottom trim in the front and rear with the nails provided.
- Match and install the gable trim material. See Figure 5.10.
- All cracks, seams and openings must be sealed with caulking to prevent entry of moisture.
- 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 Figure 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.

#### Installation of Exterior Closure Metal –

- Remove any polyethylene material from the end walls and install the bottom starter with the provided fasteners (see Figure 5.10).
- Install the siding by snapping the sides into the S-Locks; secure with the screws provided.
- Attach the roof closure metal to the front and rear roof. See Figure 5.10.

**Utility crossovers** – Connect water, drainage, gas, electricity, and telephone utility crossovers. Correct procedures are outlined in 8.

**5.3.1 Ductwork crossovers** – Multi-section homes may require a heat/AC duct connection below the floor. Compare the inlets/outlets under the home with Figure 5.11 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.

FIGURE 5.7

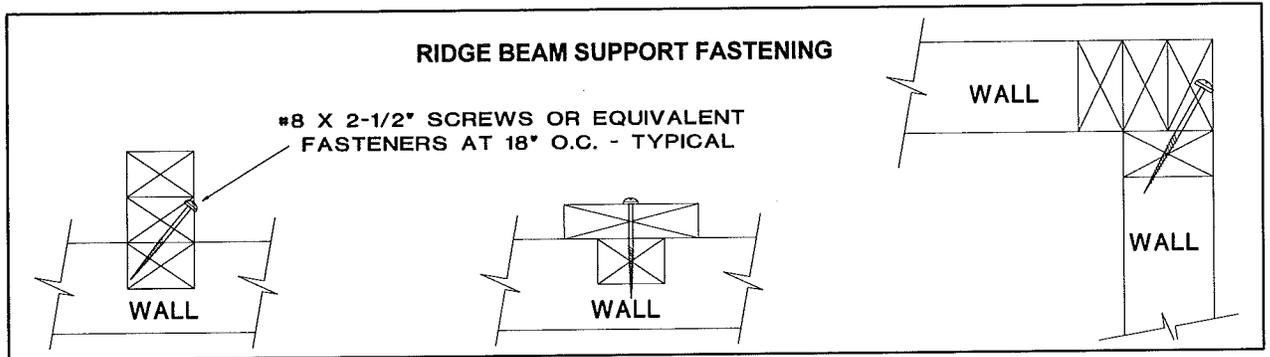


FIGURE 5.8

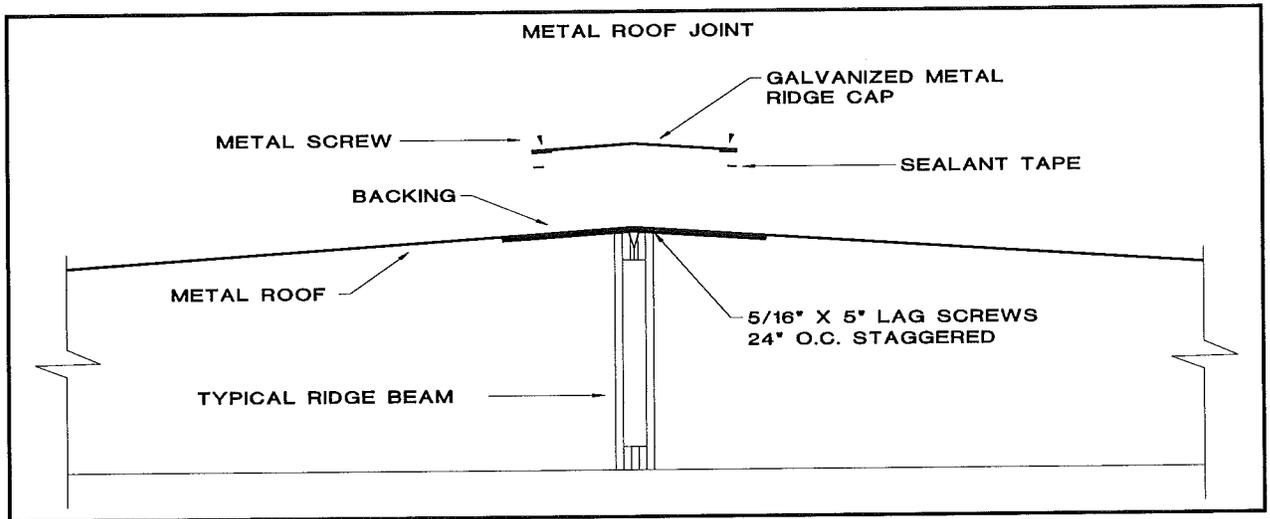


FIGURE 5.9

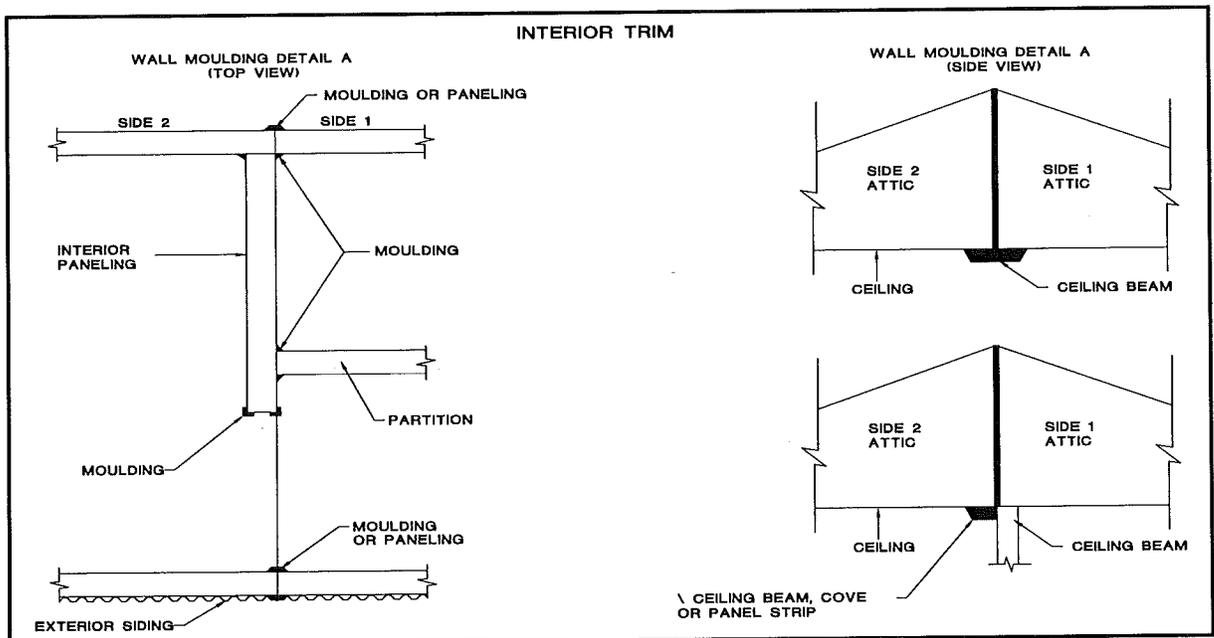
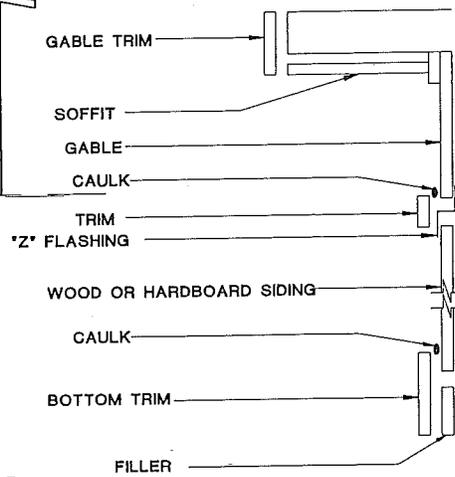
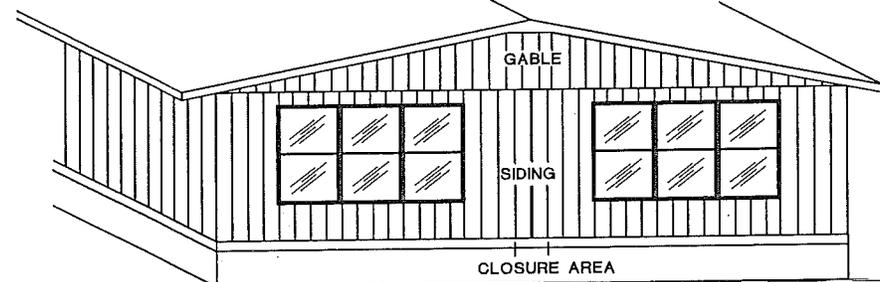


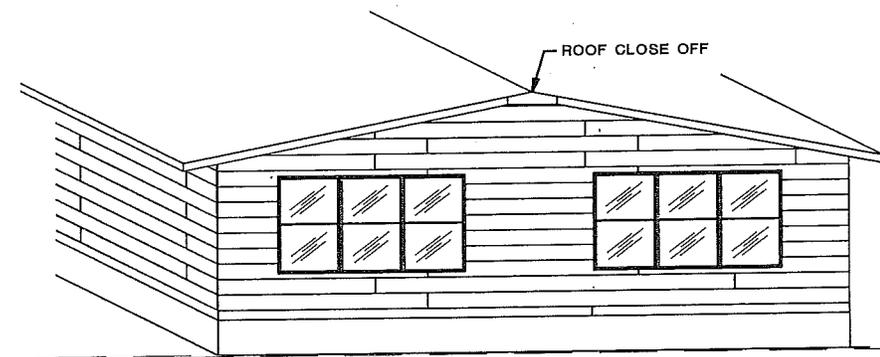
FIGURE 5.10

EXTERIOR CLOSURE - WOOD OR HARDBOARD SIDING

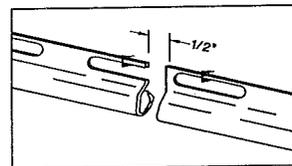


SIDE VIEW

EXTERIOR CLOSURE - LAP SIDING



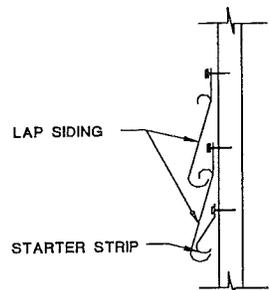
FRONT OR REAR VIEW



STARTER STRIP

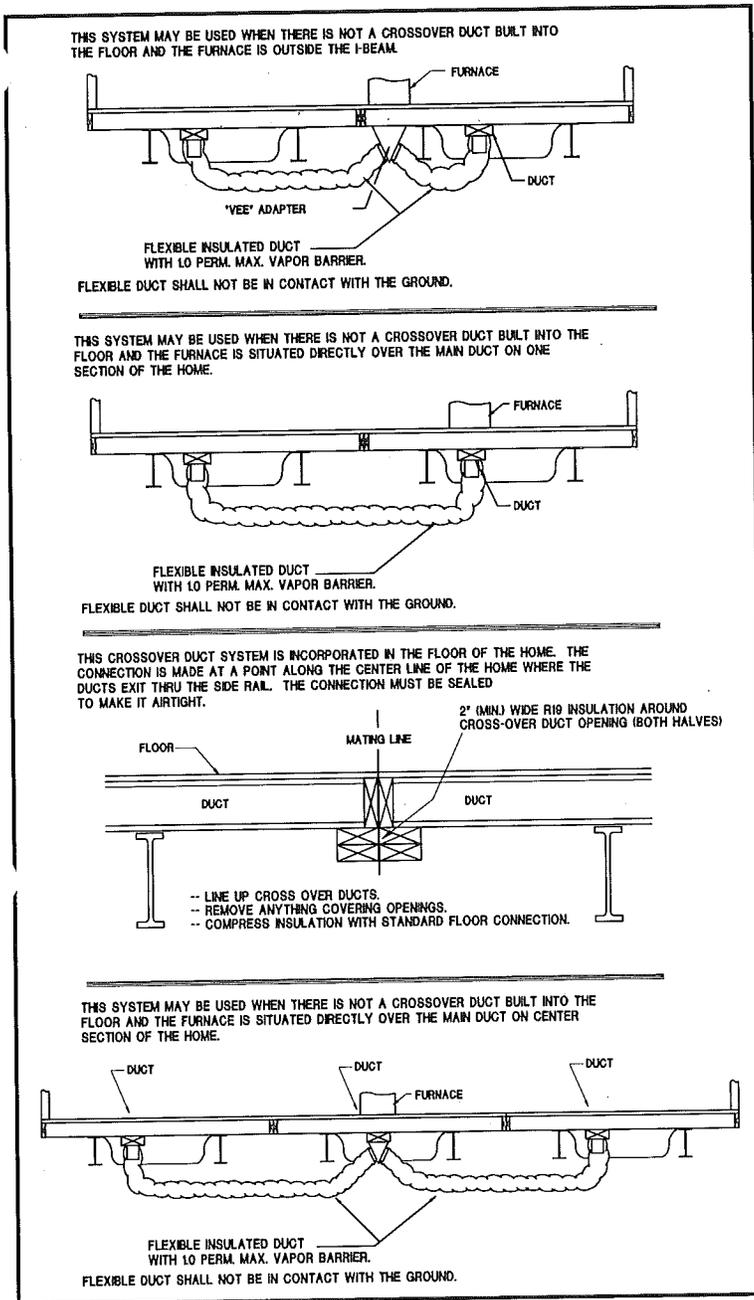
NOTES:

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:  
HORIZONTAL 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

**FIGURE 5.11**



**5.4 Anchoring instructions** – The home must be anchored to the ground in order to resist overturning and lateral movement (sliding) of the home caused by the forces imposed by the design wind load. The tie-down anchoring system described in this section is one acceptable method of anchoring the home to withstand its design wind load without dislocation.

Unless otherwise noted, all tie down and anchoring instructions are for homes with roof pitch that does not exceed 20 degrees (4.3 inches in 12 inches).

The 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 shall 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 weathering shall 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 shall be Type 1, Finish B, Grade 1 steel strapping, 1-1/4 inches wide and 0.035 inches in thickness, certified by a registered professional engineer or architect as conforming with ASTM Standard Specification D3953-91, Standard Specification for Strapping, Flat Steel and Seals.

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

**5.4.1 Normal Installations** – The pier and ground anchor system described in this manual is the most common method to stabilize the home. Other systems (such as the Vector Dynamics Foundation System by Tie Down Engineering Inc. of Atlanta, GA) are acceptable when allowed by the authority having jurisdiction, when installed according to the system manufacturer's instructions, and when certified by a registered professional engineer.

**Warning**

Digging can cause exposure to underground utilities such as electrical and gas line.

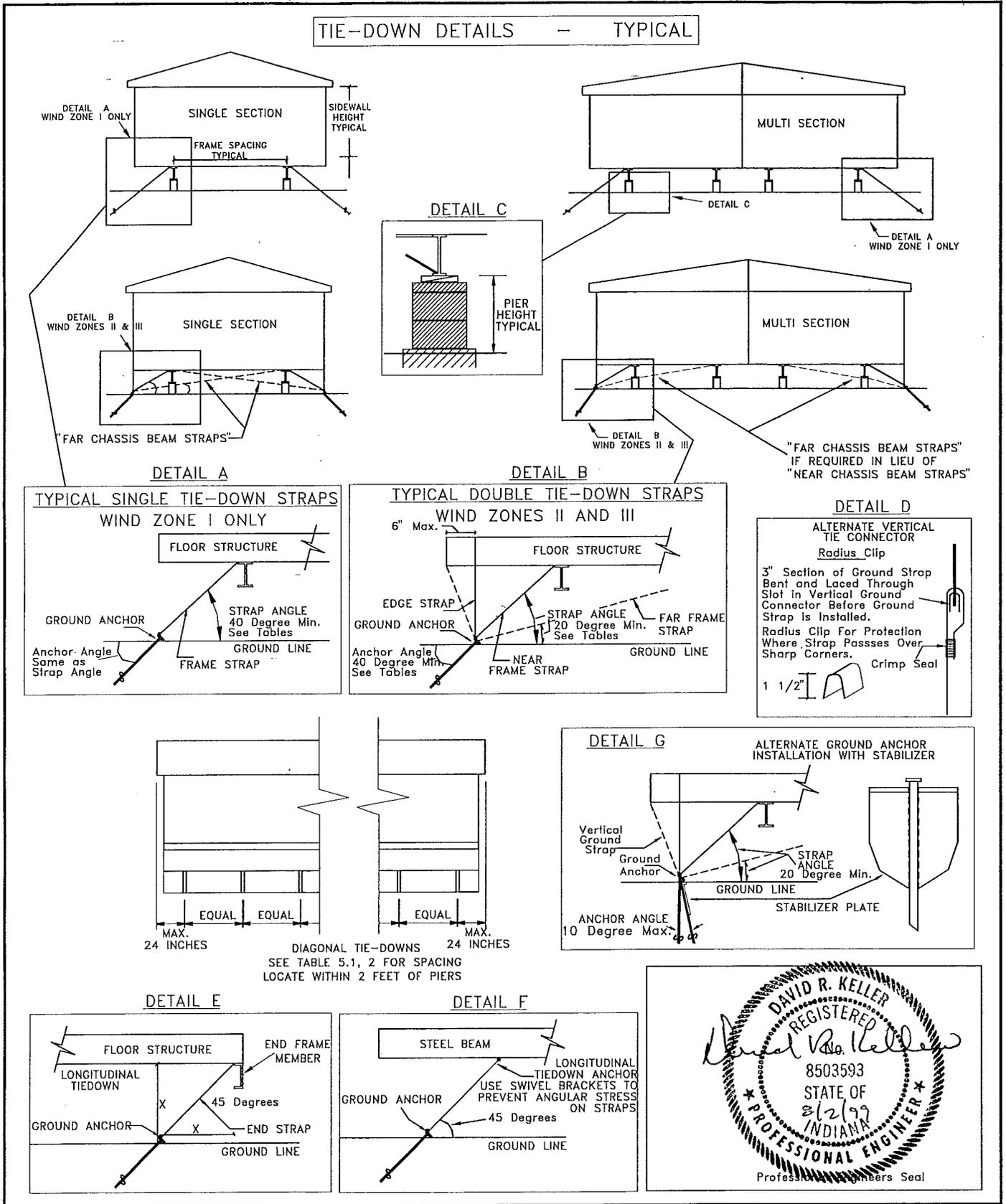
**EXPOSURE TO LIVE ELECTRICAL CIRCUITS OR RUPTURED UTILITY LINES MAY RESULT IN SERIOUS INJURY OR DEATH.**

Prior to digging for any purpose, but especially before auguring metal anchors in the ground, make sure that the location of all underground electric cables, gas lines, sewer lines and water lines are clearly marked. Contact local utility companies for this service.

The angle of the anchor shaft will be dependent on the respective dimensions and whether the installation is in Wind Zone I, which requires only a single frame strap, or in Zones II or III, which require a frame and edge strap. See Figure 5.12.

**FIGURE 5.12**

**TIE-DOWN DETAILS — TYPICAL**



**5.4.1.1 Number and location of anchors –**  
 Select the proper spacing of tie-down straps from Table 5.1 A/B/C or Table 5.2 A/B/C. In Wind Zones II and III, a vertical sidewall strap must be installed at each diagonal frame strap, therefore diagonal frame straps shall be located to coincide with these factory installed vertical straps; however, do not exceed the

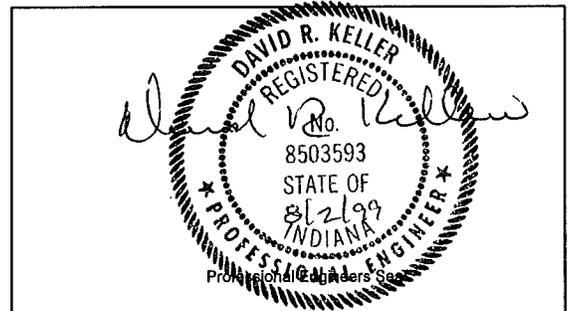
spacing in Tables 5.1 or 5.2. The measurements for the specific location of the ground anchors for the particular home must be taken directly from the home or an anchor plan may be available from the manufacturing facility that built the home. In Wind Zones II and III, straps at the end of home ("longitudinal straps") are required; see 5.4.1.3.

**TABLE 5.1A**  
**Wind Zone I - Single Section Homes**

		Frame Spacing (in)			Strap Angle Max. Degrees	Max. Beam Tie Spacing ft o.c.		
		80	96	99.5		Max. Sidewall Ht. (in)		
		Max. Pier Ht. (in)	Max. Pier Ht. (in)	Max. Pier Ht. (in)		84	90	96
12 Single Wide	Near Beam	14	NA	NA	40	13-2	12-4	11-8
		19	NA	NA	45	12-1	11-5	10-9
		25	15	13	50	11-0	10-4	9-10
		32	21	18	55	9-10	9-3	8-9
		42	28	25	60	8-7	8-1	7-7
		54	37	34	65	7-3	6-10	6-5
		73	51	46	70	5-10	5-6	5-2
		80	74	67	75	4-5	4-2	NA
14 Single Wide	Near Beam	24	17	16	40	13-2	12-4	11-8
		31	23	21	45	12-1	11-5	10-9
		39	30	28	50	11-0	10-4	9-10
		49	38	35	55	9-10	9-3	8-9
		62	49	46	60	8-7	8-1	7-7
		80	63	59	65	7-3	6-10	6-5
		NA	80	79	70	5-10	5-6	5-2
		NA	NA	80	75	4-5	4-2	NA
16 Single Wide	Near Beam	32	26	24	40	13-2	12-4	11-8
		41	33	31	45	12-1	11-5	10-9
		51	42	40	50	11-0	10-4	9-10
		64	52	50	55	9-10	9-3	8-9
		80	66	63	60	8-7	8-1	7-7
		NA	80	80	65	7-3	6-10	6-5
18 Single Wide	Near Beam	43	36	34	40	13-2	12-4	11-8
		53	45	43	45	12-1	11-5	10-9
		65	56	54	50	11-0	10-4	9-10
		80	69	67	55	9-10	9-3	8-9
		NA	80	80	60	8-7	8-1	7-7

**Example:**

14 wide with 96-in. frame spacing, 84-in. sidewall and 30-in. pier height requires anchors at 11 ft.- 0 in. maximum and 50 degree maximum strap angle.

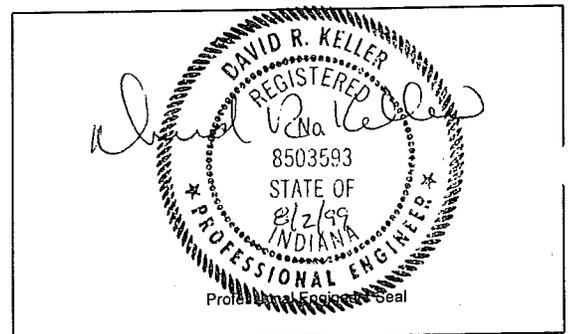


**TABLE 5.1B**  
**Wind Zone II - Single Section Homes**

		Frame Spacing (in)		Strap Angle Max. Degrees	Anchor Angle Max. Degrees	Max. Beam Tie Spacing ft o.c.			
		96	99.5			Max. Sidewall Ht. (in)			
		Max. Pier Ht. (in)	Max. Pier Ht. (in)	84	90	96			
12 Single Wide	Near Beam	NA	NA	45	59	7-0	6-7	6-3	
		NA	NA	50	62	6-4	6-0	5-8	
		12	NA	55	64	5-8	5-4	NA	
	Far Beam	29	30	20	45	9-3	8-9	8-3	
		41	42	25	48	8-11	8-5	8-0	
		53	54	30	51	8-7	8-1	7-7	
		67	68	35	54	8-1	7-7	7-2	
		80	80	40	56	7-7	7-2	6-9	
	14 Single Wide	Near Beam	NA	NA	35	52	8-1	7-7	7-3
			12	NA	40	55	7-7	7-1	6-9
17			15	45	58	7-0	6-7	6-3	
23			20	50	61	6-4	6-0	5-8	
29			27	55	64	5-8	5-4	NA	
Far Beam		33	34	20	44	9-3	8-9	8-3	
		46	47	25	47	8-11	8-5	8-0	
		60	61	30	50	8-7	8-1	7-7	
		76	77	35	52	8-1	7-7	7-2	
		80	80	40	55	7-7	7-1	6-9	
16 Single Wide	Near Beam	NA	NA	30	48	8-6	8-1	7-7	
		15	14	35	51	8-1	7-7	7-2	
		21	19	40	54	7-7	7-2	6-9	
		27	25	45	57	7-0	6-7	6-3	
		34	32	50	60	6-4	6-0	5-8	
		44	41	55	63	5-8	5-4	NA	
	Far Beam	37	38	20	42	9-3	8-9	8-3	
		51	52	25	45	8-11	8-5	8-0	
		66	67	30	48	8-7	8-1	7-7	
		80	80	35	51	8-1	7-7	7-2	
18 Single Wide	Near Beam	NA	NA	25	44	8-11	8-5	8-0	
		17	16	30	47	8-7	8-1	7-7	
		24	22	35	50	8-1	7-7	7-2	
		31	29	40	53	7-7	7-2	6-9	
		39	37	45	57	7-0	6-7	6-3	
		49	47	50	60	6-4	6-0	5-8	
		61	58	55	63	5-8	5-4	NA	
	Far Beam	41	42	20	41	9-3	8-9	8-3	
		57	57	25	44	8-11	8-5	8-0	
		73	74	30	47	8-7	8-1	7-7	
80		80	35	50	8-1	7-7	7-2		

**Example**

16 wide with 99.5-in. frame spacing, 90-in. sidewall and 38-in. pier height requires anchors at 8 ft.- 9 in. maximum, 20 degree maximum strap angle, 42 degree maximum anchor angle and attachment to far beam.

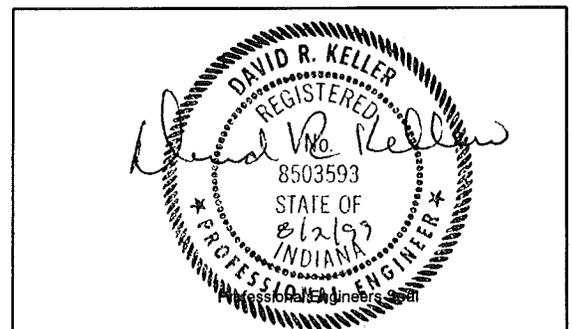


**TABLE 5.1C**  
**Wind Zone III - Single Section Homes**

		Frame Spacing (in)		Strap Angle Max. Degrees	Anchor Angle Max. Degrees	Max. Beam Tie Spacing ft o.c.		
		96	99.5			Max. Sidewall Ht. (in)		
		Max. Pier Ht. (in)	Max. Pier Ht. (in)			84	90	96
12 Single Wide	Near Beam	12	NA	55	65	4-8	4-5	4-2
		17	14	60	68	4-1	NA	NA
	Far Beam	29	30	20	47	7-8	7-3	6-10
		41	42	25	49	7-5	7-0	6-7
		53	54	30	52	7-1	6-8	6-4
		67	68	35	54	6-8	6-4	6-0
		80	80	40	57	6-3	5-11	5-7
14 Single Wide	Near Beam	12	NA	40	56	6-3	5-11	5-7
		17	15	45	59	5-9	5-5	5-2
		23	20	50	61	5-3	4-11	4-8
		29	27	55	64	4-8	4-5	4-2
		38	35	60	67	4-1	NA	NA
	Far Beam	33	34	20	45	7-8	7-3	6-10
		46	47	25	48	7-5	7-0	6-7
		60	61	30	51	7-1	6-8	6-4
		76	77	35	53	6-8	6-4	6-0
		80	80	40	56	6-3	5-11	5-7
16 Single Wide	Near Beam	15	14	35	52	6-8	6-4	6-0
		21	19	40	55	6-3	5-11	5-7
		27	25	45	58	5-9	5-5	5-2
		34	32	50	61	5-3	4-11	4-8
		44	41	55	64	4-8	4-5	4-2
		56	53	60	67	4-1	NA	NA
	Far Beam	37	38	20	44	7-8	7-3	6-10
		51	52	25	47	7-5	7-0	6-7
		66	67	30	49	7-1	6-8	6-4
		80	80	35	52	6-8	6-4	6-0
18 Single Wide	Near Beam	17	16	30	49	7-1	6-8	6-4
		24	22	35	52	6-8	6-4	6-0
		31	29	40	54	6-3	5-11	5-7
		39	37	45	57	5-9	5-5	5-2
		49	47	50	60	5-3	4-11	4-8
		61	58	55	63	4-8	4-5	4-2
		76	73	60	66	4-1	NA	NA
	Far Beam	41	42	20	43	7-8	7-3	6-10
		57	57	25	46	7-5	7-0	6-7
		73	74	30	49	7-1	6-8	6-4
80		80	35	52	6-8	6-4	6-0	

**Example**

18 wide with 96-in. frame spacing, 96-in. sidewall and 57-in. pier height requires anchors at 6 ft.- 7 in. maximum, 25 degree maximum strap angle, 46 degree maximum anchor angle and attachment to far beam.



**TABLE 5.2A**

**Wind Zone I - Multi-Section Homes**

		Frame Spacing (in)			Strap Angle Max. Degrees	Max. Beam Tie Spacing ft o.c. Max. Sidewall Ht. (in)		
		80	96	99.5		84	90	96
		Max. Pier Ht. (in)	Max. Pier Ht. (in)	Max. Pier Ht. (in)				
24 Double Wide	Near Beam	14	NA	NA	40	13-5	12-7	11-11
		19	NA	NA	45	12-4	11-7	11-0
		25	15	13	50	11-3	10-6	10-0
		32	21	18	55	10-0	9-5	8-11
		42	28	25	60	8-9	8-3	7-9
		54	37	34	65	7-4	6-11	6-6
		73	51	46	70	6-0	5-7	5-4
		80	74	67	75	4-6	4-3	4-0
26 Double Wide	Near Beam	19	13	NA	40	13-5	12-7	11-11
		26	18	16	45	12-4	11-7	11-0
		33	24	22	50	11-3	10-6	10-0
		42	31	28	55	10-0	9-5	8-11
		54	40	37	60	8-9	8-3	7-9
		69	52	49	65	7-4	6-11	6-6
		80	70	66	70	6-0	5-7	5-4
		NA	80	80	75	4-6	4-3	4-0
28 Double Wide	Near Beam	24	17	16	40	13-5	12-7	11-11
		31	23	21	45	12-4	11-7	11-0
		39	30	28	50	11-3	10-6	10-0
		49	38	35	55	10-0	9-5	8-11
		62	49	46	60	8-9	8-3	7-9
		80	63	59	65	7-4	6-11	6-6
		NA	80	79	70	6-0	5-7	5-4
		NA	NA	80	75	4-6	4-3	4-0
32 Double Wide	Near Beam	32	26	24	40	13-5	12-7	11-11
		41	33	31	45	12-4	11-7	11-0
		51	42	40	50	11-3	10-6	10-0
		64	52	50	55	10-0	9-5	8-11
		80	66	63	60	8-9	8-3	7-9
		NA	80	80	65	7-4	6-11	6-6
36 Double Wide	Near Beam	43	36	34	40	13-5	12-7	11-11
		53	45	43	45	12-4	11-7	11-0
		65	56	54	50	11-3	10-6	10-0
		80	69	67	55	10-0	9-5	8-11
		NA	80	80	60	8-9	8-3	7-9

**5.4.1.2 Installation of Ground Anchors –**

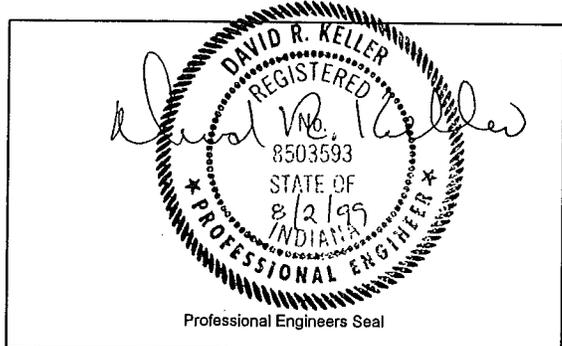
Ground anchors must be installed in full conformance with the anchor manufacturer's instructions.

Ground anchors for all Wind Zones must have a stabilizer plate at the top of the anchor unless the manufacturer's instructions do not require stabilizer plates for a particular installation of their model. In the latter case, conform to the manufacturer's instructions provided that the required holding capacity is produced.

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 shall be embedded below the frost line and be at least 12 inches above the water table.

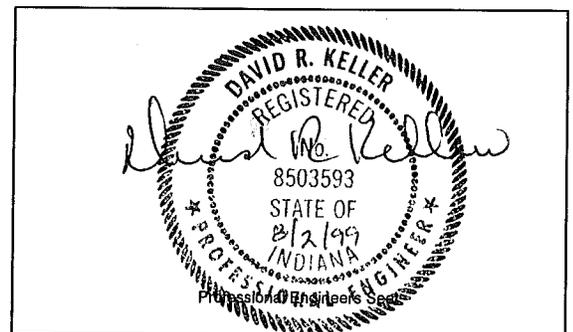


**TABLE 5.2B**  
**Wind Zone II - Multi-Section Homes**

		Frame Spacing (in)		Strap Angle Max. Degrees	Anchor Angle Max. Degrees	Max. Beam Tie Spacing ft o.c.		
		96	99.5			Max. Sidewall Ht. (in)		
		Max. Pier Ht. (in)	Max. Pier Ht. (in)			84	90	96
24 Double Wide	Near Beam	12	NA	55	63	5-9	5-5	NA
		29	30	20	42	9-6	8-11	8-5
	Far Beam	41	42	25	45	9-2	8-7	8-1
		53	54	30	48	8-9	8-3	7-9
		67	68	35	51	8-3	7-9	7-4
		80	80	40	54	7-8	7-3	6-10
26 Double Wide	Near Beam	12	NA	45	57	7-1	6-8	6-4
		17	15	50	60	6-6	6-1	5-9
		22	20	55	63	5-9	5-5	NA
	Far Beam	32	32	20	42	9-6	8-11	8-5
		44	45	25	45	9-2	8-7	8-1
		57	58	30	48	8-9	8-3	7-9
		72	73	35	51	8-3	7-9	7-4
		80	80	40	54	7-8	7-3	6-10
28 Double Wide	Near Beam	12	NA	40	54	7-8	7-3	6-10
		17	15	45	57	7-2	6-8	6-4
		23	20	50	60	6-6	6-1	5-9
		29	27	55	63	5-9	5-5	NA
	Far Beam	33	34	20	42	9-6	8-11	8-5
		46	47	25	45	9-2	8-7	8-1
		60	61	30	48	8-9	8-3	7-9
		76	77	35	51	8-3	7-9	7-4
80	80	40	54	7-8	7-3	6-10		
32 Double Wide	Near Beam	15	14	35	51	8-3	7-8	7-4
		21	19	40	54	7-8	7-3	6-10
		27	25	45	57	7-1	6-8	6-4
		34	32	50	60	6-6	6-1	5-9
		44	41	55	63	5-9	5-5	NA
	Far Beam	37	38	20	42	9-6	8-11	8-5
		51	52	25	45	9-2	8-7	8-1
		66	67	30	48	8-9	8-3	7-9
80	80	35	51	8-3	7-9	7-4		
36 Double Wide	Near Beam	17	16	30	48	8-9	8-3	7-9
		24	22	35	51	8-3	7-9	7-4
		31	29	40	54	7-8	7-3	6-10
		39	37	45	57	7-1	6-8	6-4
		49	47	50	60	6-6	6-1	5-9
		61	58	55	63	5-9	5-5	NA
	Far Beam	41	42	20	42	9-6	8-11	8-5
		57	57	25	45	9-2	8-7	8-2
73	74	30	48	8-9	8-3	7-9		
80	80	35	51	8-3	7-9	7-4		

**Example**

28 wide with 96-in. frame spacing, 84-in. sidewall and 29-in. pier height requires anchors at 5 ft.- 9 in. maximum, 55 degree maximum strap angle, 63 degree maximum anchor angle and attachment to near beam.



**TABLE 5.2C**  
Wind Zone III - Multi-Section Homes

		Frame Spacing (in)		Strap Angle Max. Degrees	Anchor Angle Max. Degrees	Max. Beam Tie Spacing ft o.c.			
		96	99.5			Max. Sidewall Ht. (in)			
		Max. Pier Ht. (in)	Max. Pier Ht. (in)	84	90	96			
24 Double Wide	Near Beam	12	NA	55	64	4-9	4-6	4-3	
		17	14	60	67	4-2	NA	NA	
	Far Beam	29	30	20	45	7-10	7-5	7-0	
		41	42	25	48	7-7	7-2	6-9	
		53	54	30	51	7-3	6-10	6-5	
		67	68	35	53	6-10	6-5	6-1	
		80	80	40	56	6-5	6-0	5-8	
	26 Double Wide	Near Beam	12	NA	45	59	5-11	5-7	5-3
			17	15	50	61	5-4	5-1	4-9
			22	20	55	64	4-10	4-6	4-3
30			27	60	67	4-2	NA	NA	
Far Beam		32	32	20	45	7-10	7-5	7-0	
		44	45	25	48	7-7	7-2	6-9	
		57	58	30	51	7-3	6-10	6-5	
		72	73	35	53	6-10	6-5	6-1	
		80	80	40	56	6-5	6-0	5-8	
		28 Double Wide	Near Beam	12	NA	40	56	6-5	6-0
17	15			45	59	5-11	5-7	5-3	
23	20			50	62	5-4	5-1	4-9	
29	27			55	64	4-9	4-6	4-3	
38	35			60	67	4-2	NA	NA	
Far Beam	33		34	20	45	7-10	7-5	7-0	
	46		47	25	48	7-7	7-2	6-9	
	60		61	30	51	7-3	6-10	6-5	
	76		77	35	54	6-10	6-5	6-1	
	80		80	40	56	6-5	6-0	5-8	
32 Double Wide	Near Beam	NA	NA	30	51	7-3	6-10	6-5	
		15	14	35	53	6-10	6-5	6-1	
		21	19	40	56	6-5	6-0	5-8	
		27	25	45	59	5-11	5-7	5-3	
		34	32	50	61	5-4	5-1	4-9	
		44	41	55	64	4-9	4-6	4-3	
	Far Beam	56	53	60	67	4-2	NA	NA	
		37	38	20	45	7-10	7-5	7-0	
		51	52	25	48	7-8	7-2	6-9	
		66	67	30	51	7-3	6-10	6-5	
36 Double Wide	Near Beam	80	80	35	53	6-10	6-5	6-1	
		17	16	30	51	7-3	6-10	6-5	
		24	22	35	54	6-10	6-5	6-1	
		31	29	40	57	6-5	6-0	5-8	
		39	37	45	59	5-11	5-7	5-3	
		49	47	50	62	5-4	5-1	4-9	
	Far Beam	61	58	55	65	4-9	4-6	4-3	
		76	73	60	67	4-2	NA	NA	
		41	42	20	46	7-10	7-5	7-0	
		57	57	25	49	7-7	7-2	6-9	
		73	74	30	51	7-3	6-10	6-5	
		80	80	35	54	6-10	6-5	6-1	

**Example**

28 wide with 99.5-in. frame spacing, 90-in. sidewall and 47-in. pier height requires anchors at 7 ft.-2 in. maximum, 25 degree maximum strap angle, 48 degree maximum anchor angle and attachment to far beam.



**5.4.1.3 Tie-down instructions** – Install ground anchors and connect the straps to the ground anchor heads as instructed by the anchor manufacturer. Straps must be alternately tensioned on opposite sides of the home. All tie-down straps shall be properly installed to prevent structural damage to the home. Protection shall be provided where straps pass over sharp corners. See Figure 5.12.

1. **WIND ZONE I:** Refer to Table 5.1A for Single Section Homes or Table 5.2A for Multi Section Homes to determine the required anchor spacing based on the home dimensions and the pier heights. At the home site, use stakes and string to mark the perimeter outline where the home will be located. Position and install ground anchors so that the spacing is not greater than that shown in the respective table. Straps may be offset from piers by not more than 3 feet. Install anchors just inside the perimeter line to allow for skirting.

2. **WIND ZONES II and III:** Refer to Table 5.1B/C for Single Section Homes or Table 5.2 B/C for Multi Section Homes to determine the required anchor spacing based on the home dimensions and the pier heights. The home must be set on its piers and leveled at the site before ground anchors are installed because they must be placed directly under the factory-installed tie-down straps or brackets at the frame perimeter. Install double-head ground anchors vertically with stabilizing devices and spaced so that the interval is not greater than as shown in the respective table. Straps may be offset from piers by not more than 2 feet. Connect anchors to the vertical factory-installed straps or brackets at the perimeter, and install straps from the anchor to either the near or far chassis I-beam as indicated by the tables.

Do not use vertical straps without diagonal beam straps. Vertical ground straps must be fastened to anchors capable of resisting the total tension of both straps. Use double head anchors which are approved by the anchor manufacturer for both diagonal and vertical tie-down straps.

Optional method for stabilization: Instead of a stabilizing device, ground anchors may be installed vertically with an adequate concrete cylindrical “collar” poured around the anchor shaft. Any vertically installed ground anchor

must be listed for the required capacity with the load applied at the angle shown.

Longitudinal/End Straps: Except for full triple section homes (Figure 4.4), homes installed in Wind Zone I do not require longitudinal straps. Full triple section homes in Wind Zone I, all homes installed in Wind Zone II, and homes with maximum 84 inch interior sidewall height in Wind Zone III shall have two longitudinal straps installed at each end of each section of the home. All other homes in Wind Zone III shall have three straps at each end of each section. The third strap shall be installed close to either of the required two, but within the parameters set by the anchor manufacturer. Install straps from the end of each frame I-beam to an approved ground anchor. Use swivel brackets (available from anchor equipment manufacturers), where necessary, to prevent angular stress on the longitudinal straps.

Tighten straps to remove slack, using caution to avoid excessive tension. After all straps are installed and the slack is removed, lightly tension the straps alternately on opposite sides of the home to avoid disturbing the home set-up. Strap tension shall be checked frequently until all pier movement has stopped. Periodic inspection of the straps is important; it may be necessary to retighten frame and ground straps from time to time. **CAUTION: During re-leveling, do not jack the home against tight straps.**

**5.4.2 Elevated homes** – Homes, which have a significant portion of their length, raised more than 36 inches above the ground have higher overturning forces than similar homes at grade level. To counteract these forces, **strap connections may be required at the “far chassis beam”** as shown in Figure 5.12. Deviations from these guidelines shall be reviewed by a registered engineer and approved by the local authority having jurisdiction over such matters.

With the above, there is a limit to pier heights in Zones II and III due to the overturning moments developed by the higher wind loads imposed. Tables 5.1 and 5.2 show these limitations. No pier higher than 80 inches is permitted within these installation instructions. If such a condition is encountered the installation plans shall be reviewed by a registered engineer and approved by the local authority having jurisdiction over such matters.

**5.4.3 Severe climatic conditions** (Also see 4.4.)

**5.4.3.1 Freezing Climates** – Be sure anchor augers are installed below the frost line.

**5.4.3.2 Severe wind zones** – The home shall 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.

**5.4.3.3 Flood-prone areas** – The manufacturer does not recommend siting homes in flood-prone areas and will not be responsible for damage if the home is installed in a flood-prone area. 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.

**5.5 Skirting** – Skirting, if used, shall be of durable materials suitable for exterior exposures. Skirting shall be recessed under the siding or trim and must not be attached in a manner that could cause water to be trapped between the siding or trim and the skirting. Skirting made from wood or wood products, including all wood siding, shall be pressure treated to prevent decay and termite infestations if it will be used within 6 inches of the ground.

**NOTICE**

Moisture can damage the home. Ventilation of the crawl space must be provided.

A minimum of one square foot of net free ventilation area for every 150 square feet of the home's floor area shall be provided for the crawl space. [Note: Typically net free area is about 70% of the gross area of a vent.] Ventilation openings shall be placed at or near each corner of the home and as high as practical. Openings shall be located to provide cross-ventilation on at least two opposite sides.

Where an acceptable ground vapor retarder is installed (see 3.5.1) and one ventilation opening is within 3 feet of each corner of the home, the total area of ventilation openings may be reduced to one square foot for every 1,500 square feet of the home's floor area. Access opening(s) not less than 18 inches in any dimension and not less than three square feet in area shall be provided

and shall be located so that any water supply and sewer drain connections located under the home are accessible for inspections.

Dryer vents, air conditioning condensation drains, and combustion air inlets must pass through the skirting to the outside.

**6 – Installation of optional features**

**6.1 Hinged roofs** – If the home has an optional hinged roof or eaves, see Figure 6.1A & B. Some hinged roof homes have fuel fired heating appliances located under the hinged portion of the roof, which require installation and inspection at the site prior to occupancy.

**WARNING!**

Fuel fired heating appliance vents that pass through the hinged roof must be completed and professionally inspected at the site prior to energizing the appliance or occupying the home.

**FAILURE TO COMPLY WITH THIS SAFETY PRECAUTION MAY RESULT IN SERIOUS INJURY OR DEATH.**

Venting systems must be installed in conformance with the appliance manufacturer's instructions and any special instructions supplied with the home.

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

**6.3 Awnings and carports** – Choose freestanding products with columns to support their weight.

**6.4 Installation of on-site attached structures** – Any structures, devices, accessories, etc. added by others are not the responsibility of the home's manufacturer. 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.

**6.4.1 Garages and carports** – A garage or carport must be installed according to the manufacturer's instructions and to all applicable local codes. The garage or carport must be supported independently of the factory-built portion of the home. Electrical circuits in garages shall be provided with ground fault interruption.

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

**6.4.3 Steps, stairways and landings** – Steps, stairways and landings must be constructed and inspected according to the applicable local building codes.

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

**6.6 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 an exterior fixture location, remove the outlet box and install the exterior siding with a hole for the outlet box. Then, reinstall the outlet box and proceed as for other fixtures.

**6.6.1 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. Push the wires into the box and secure the light fixture to the junction box. Caulk around the base of the light fixture to ensure a watertight seal to the sidewall. Install the light bulb and attach the globe. Refer to Figure 6.2.

**6.6.2 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 Figure 6.3.

**6.7 Optional panels, siding and molding** – If the 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. and 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** – The walls and floors of the 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 shall perform such work. Figure 6.4 shows one procedure for telephone crossover connection in multi-section homes.

**WARNING!**

Careless installation of telephone and cable television lines can cause exposure to live electrical circuits.

**EXPOSURE TO LIVE ELECTRICAL CIRCUITS MAY CAUSE SEVERE SHOCK OR POSSIBLE ELECTROCUTION.**

Disconnect electrical power to home before proceeding

**6.10 Continuous ridge vent** – See Figure 6.5.

**FIGURE 6.1A**

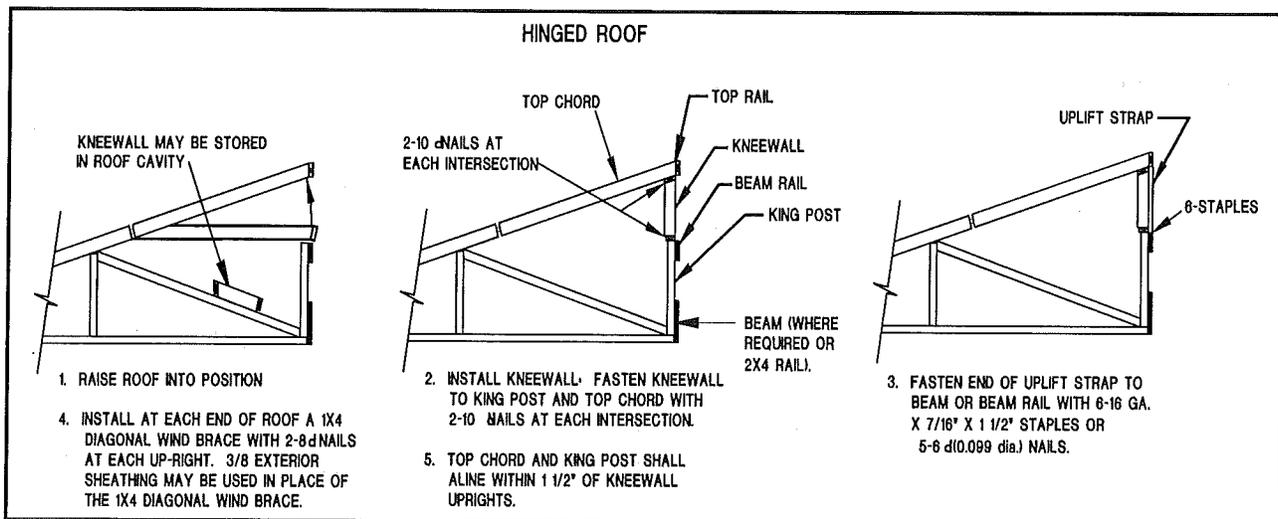
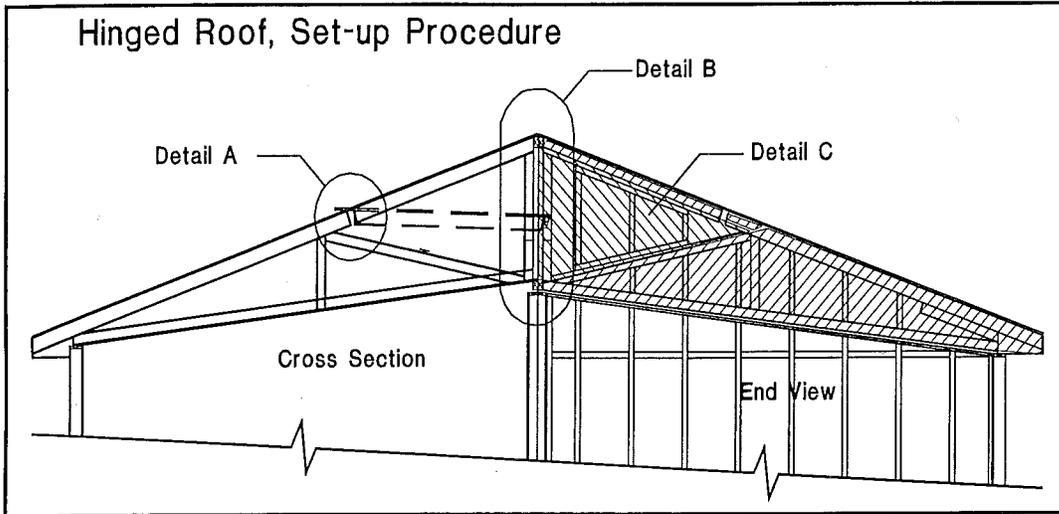
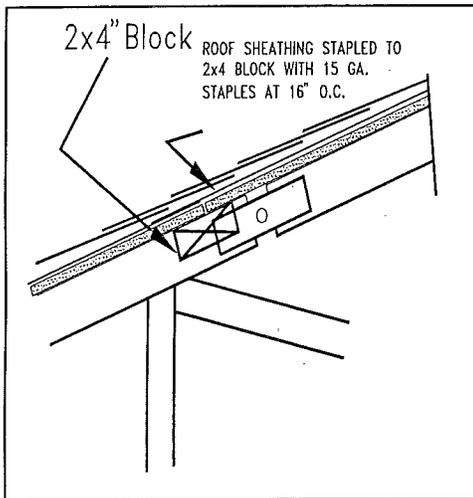


FIGURE 6.1B

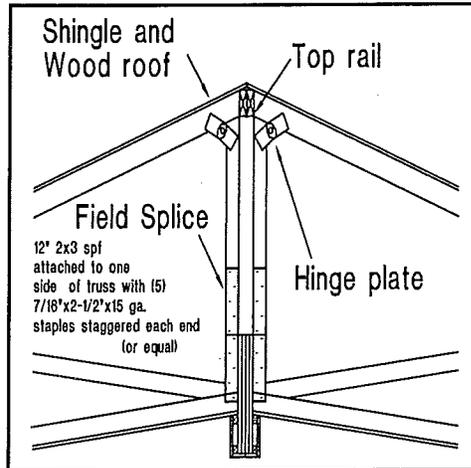


1. Carefully lift (jack) complete hinged roof up to full up-right position, then swing down end vertical and scab as shown in detail B. When all verticals are scabbed, remove jacks.
2. Attach roof sheathing to 2 x 4 blocks as shown in detail A and add the missing 1 or 2 rows of shingles per manufacturer's specifications.
3. Install corner braces as shown in detail D.
4. Install end wall fill wedges as shown in detail C and sheath to match end of house.
5. From this point on, the connections are the same as a typical double section.
6. Furnace/fireplace/ wood burning stove/ water heater vent stacks must be sized (for length) and installed per manufacturer installation instructions included in home.
7. Plumbing vent pipes must extend through the roof.

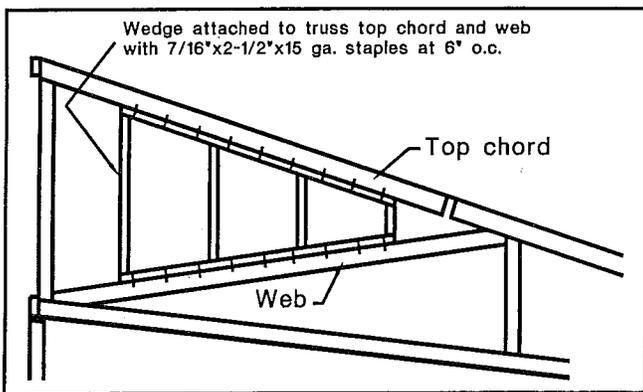
DETAIL A



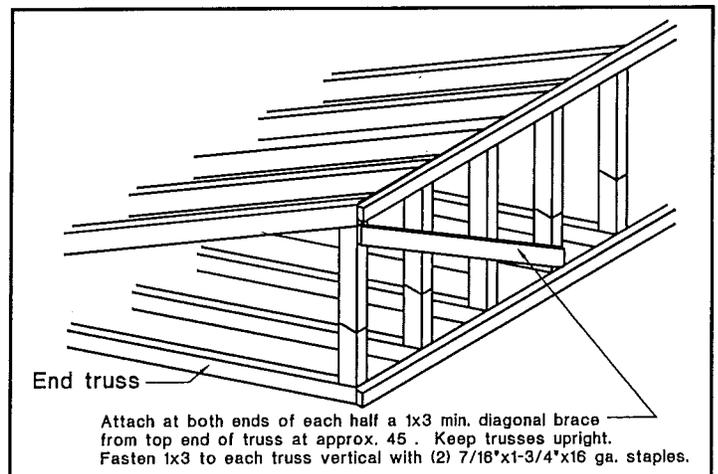
DETAIL B



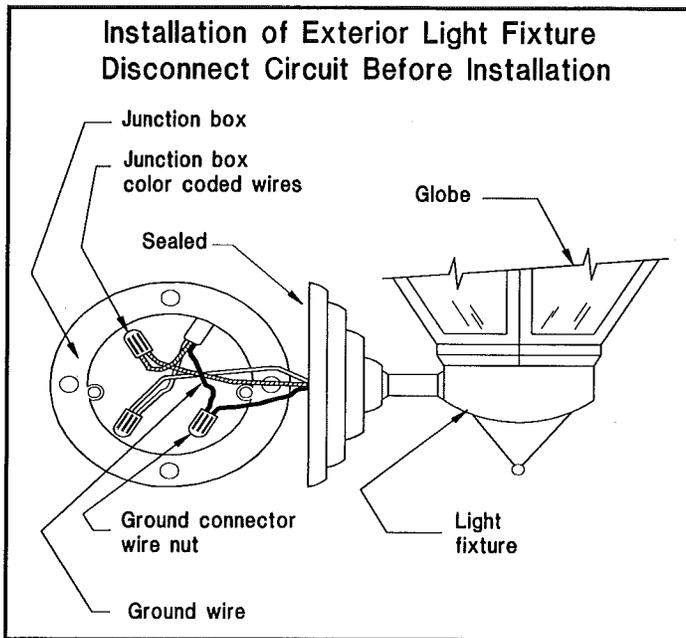
DETAIL C



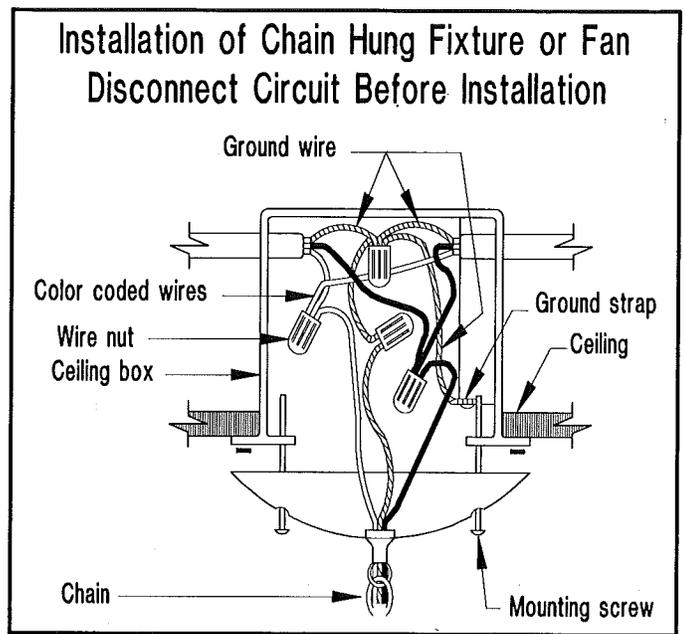
DETAIL D



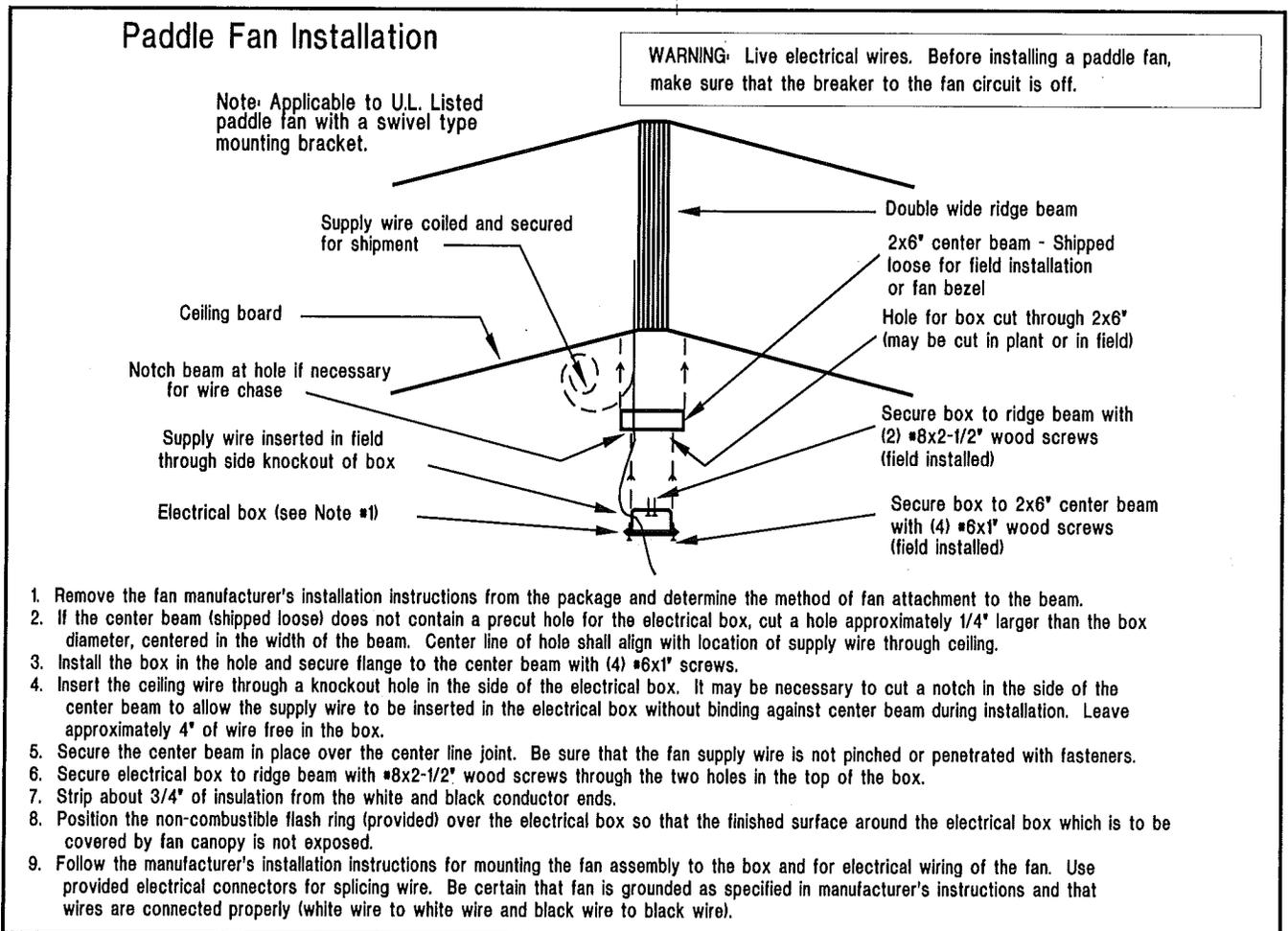
**DETAIL 6.2A**



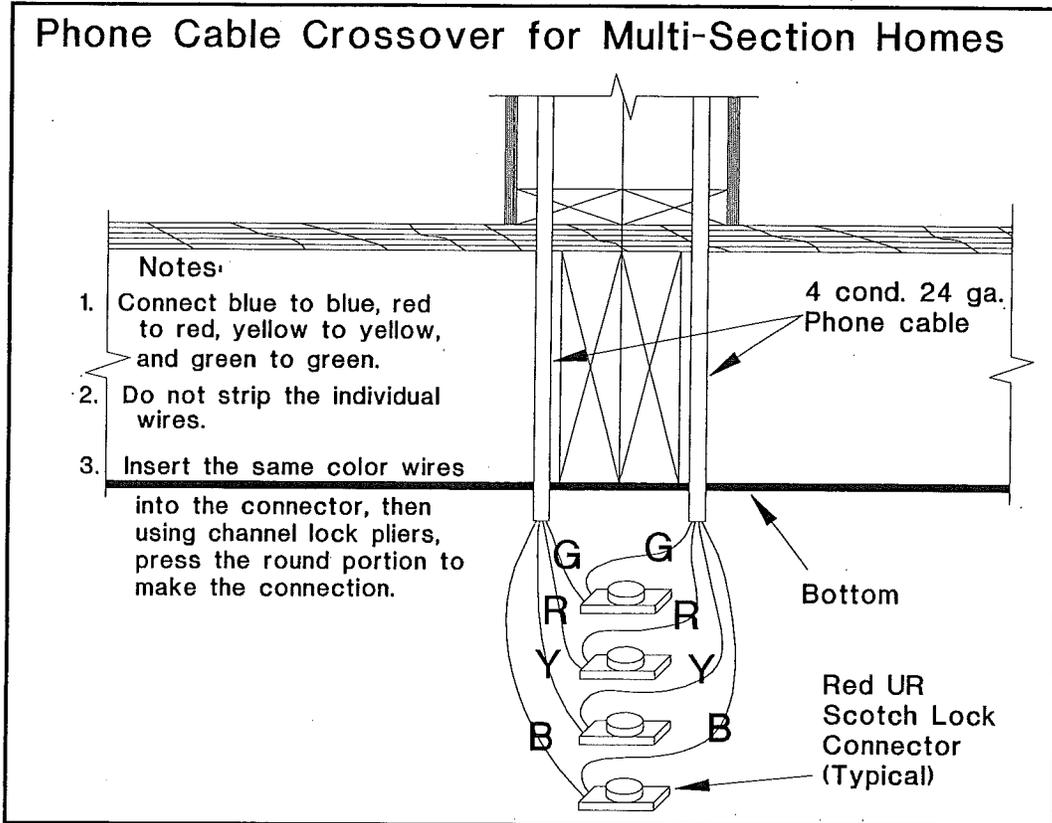
**DETAIL 6.2B**



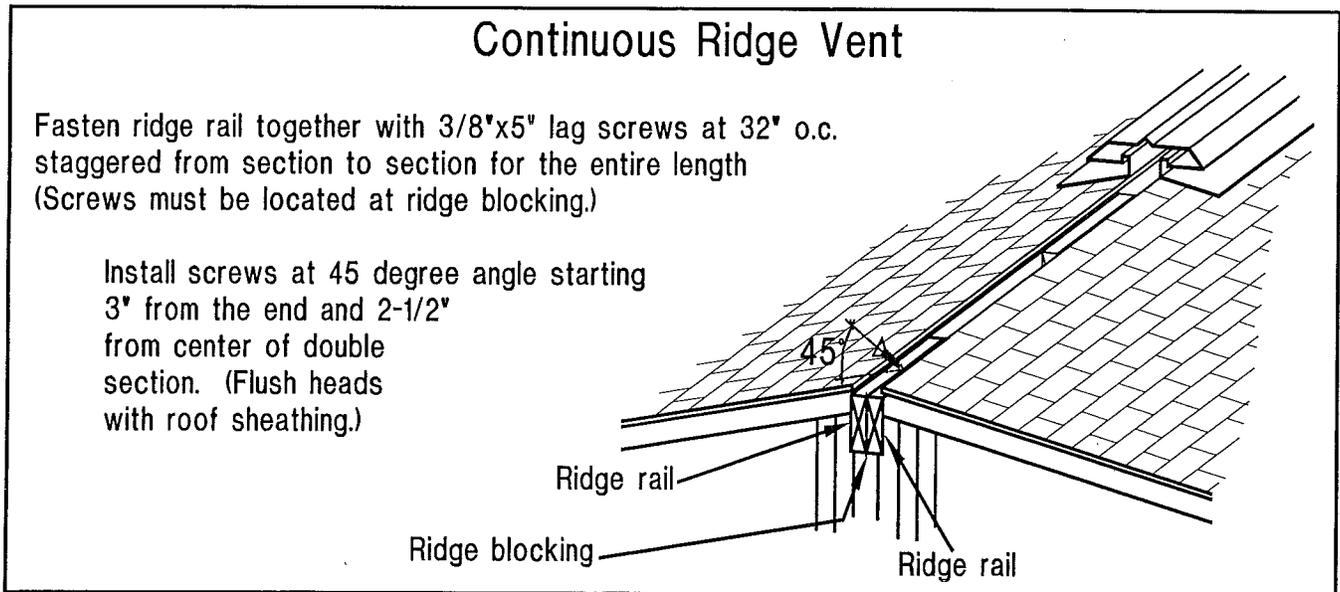
**DETAIL 6.3**



DETAIL 6.4



DETAIL 6.5A

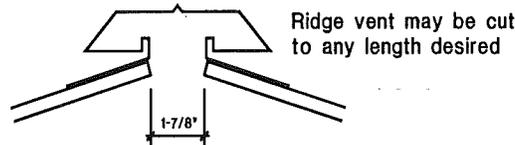


DETAIL 6.5B

Ridge Vent Installation Instructions

Figure 1

Center each ridge vent section over slot in roof.  
Mark edge of ridge vent on roof on both sides  
at each end.



Maintain vent dimensions during installation

Figure 2

Insert "connect-or-seal" into end of ridge vent.

Model #656 "connect-or-seal" to be used at each end  
and as many connections as required.

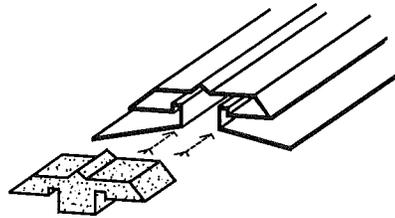


Figure 3

Apply shingle cap same as std. double section  
roof connection.

Locate ends of ridge vent 1" min. from edge of  
roof.

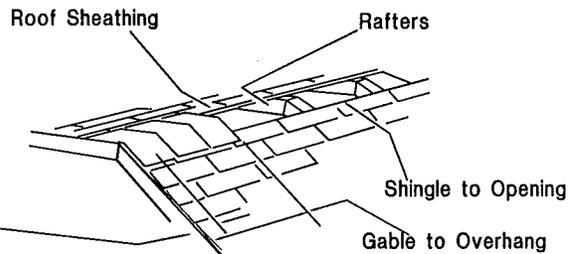


Figure 4

Nail 2 places on sealed end of ridge vent. Nail  
loosely until opposite end is sealed or adjoining  
vent is connected. Do not allow vent to "spread  
open" when nailing in place.

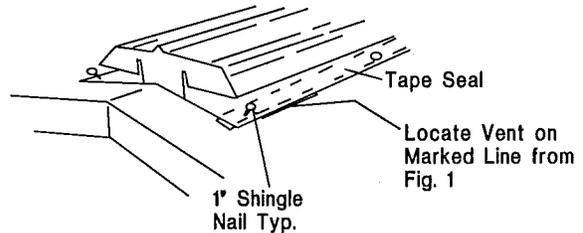


Figure 5

To make ridge vent connection, insert "connect-or-seal"  
approximately halfway into existing ridge vent.  
Insert by hand 2 nails into top of "connect-or-seal"  
to hold in place while an additional section is being added.  
For all subsequent connection, repeat instructions.

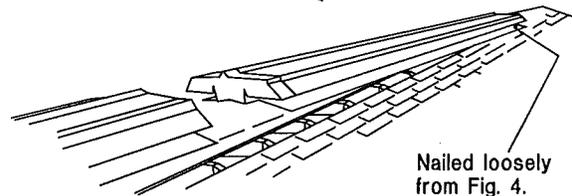
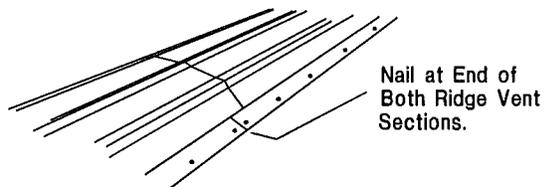


Figure 6

Remove nails from Fig. 5 and butt ridge vent  
tightly together and seal joint with caulking.

Insert final "connect-or-seal" in remaining  
open end before nailing down completely with  
1" shingle nails.



## 7- Preparation of appliances

**7.1 Heating appliance** – Not all homes contain a factory-installed 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 HUD “Manufactured Home Construction and Safety Standards.” If built to accept a remote forced air heating system, in addition to the foundation and tie-down requirements, the home must have the following installed:

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 switch.

**7.2 Clothes dryer vent** – The clothes dryer must exhaust outside the exterior of the home or outside any perimeter foundation or skirting installed around it, through a moisture-lint exhaust system, as shown in

**WARNING!**

Termination of the dryer exhaust underneath the home can cause condensation and moisture damage to the home. Lint and dust accumulation can ignite, causing a fire.

**A FIRE MAY RESULT IN SERIOUS INJURY OR DEATH.**

Periodically check for and remove accumulated lint and dust.

Figure 7.1. Do not let the exhaust system terminate under the home where excess moisture or flammable material can accumulate.

Install a metal 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, inside and outside, with approved duct tape or equivalent. Follow the dryer manufacturer's instructions for installing the exhaust system.

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

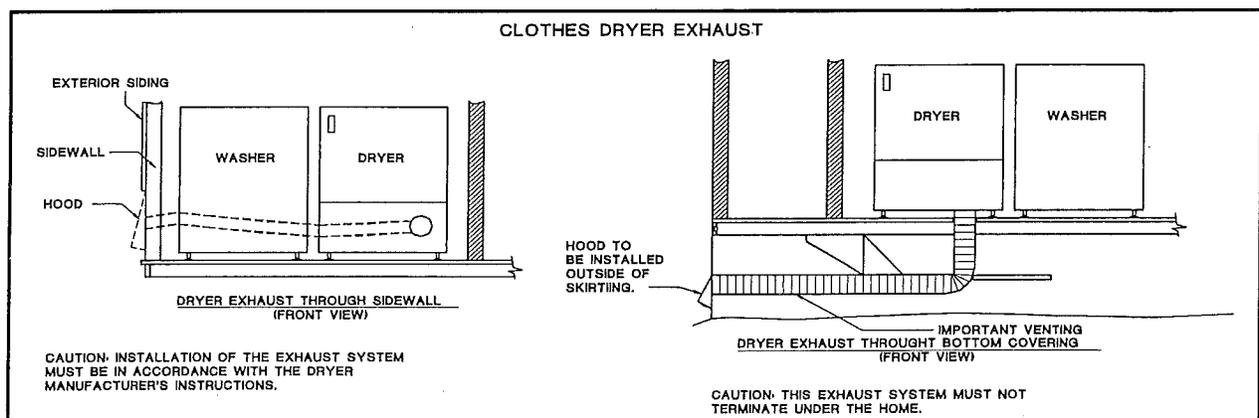
**7.3 Comfort cooling systems** – Only qualified personnel may install any comfort cooling system not provided with the home. Follow the manufacturer's installation instructions and conform to all local codes.

**7.3.1 Air conditioners** – The air distribution system of this home has been designed for a central air conditioning system. Equipment installed must not exceed the rating shown on the home's compliance certificate. The manufacturer 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.

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.

**FIGURE 7.1**



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 installation instructions.

If a remote (self-contained) air conditioner (cooling coil and blower are located outside the home, see Figure 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.

**7.3.2 Heat Pumps** – Install heat pumps according to the heat pump manufacturer's instructions.

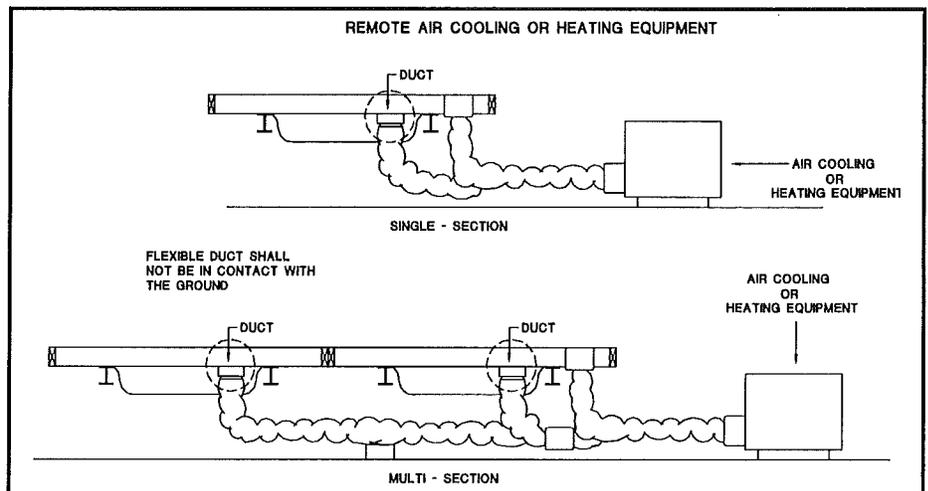
**7.3.3 Evaporative Coolers** – Install a roof-mounted cooler following the evaporative cooler manufacturer's instructions. In the absence of instructions, proceed as follows:

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

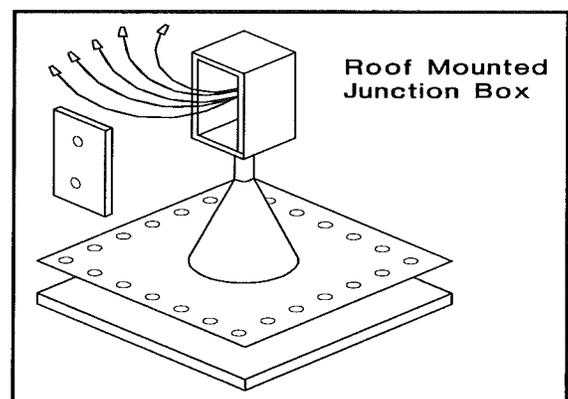
Check to be sure that a rigid base has been provided to evenly distribute the cooler's weight over several rafters. Tightly seal all roof penetrations and the boot connecting the cooler to the roof/ceiling opening to prevent leakage of water into and cool air out of the home. Connect the cooler to an 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 guys wires over the side of the home and attach them to the roof rafter edge rails rather than the roof itself. Seal all fastener penetrations.

**FIGURE 7.2**



**FIGURE 7.3**



**7.4 Chimneys and air inlets** – Fireplaces, wood stoves and some gas water heaters require on-site installation of combustion air inlets. Fireplaces and wood stoves require on-site installation of additional section(s) of approved, listed chimney pipe, spark arrestor and rain cap assembly (see 7.4).

#### 7.4.1 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 within 10 feet of the chimney, the installer may have to provide an additional section of chimney pipe.

#### 7.4.2 Assembly and sealing sequence –

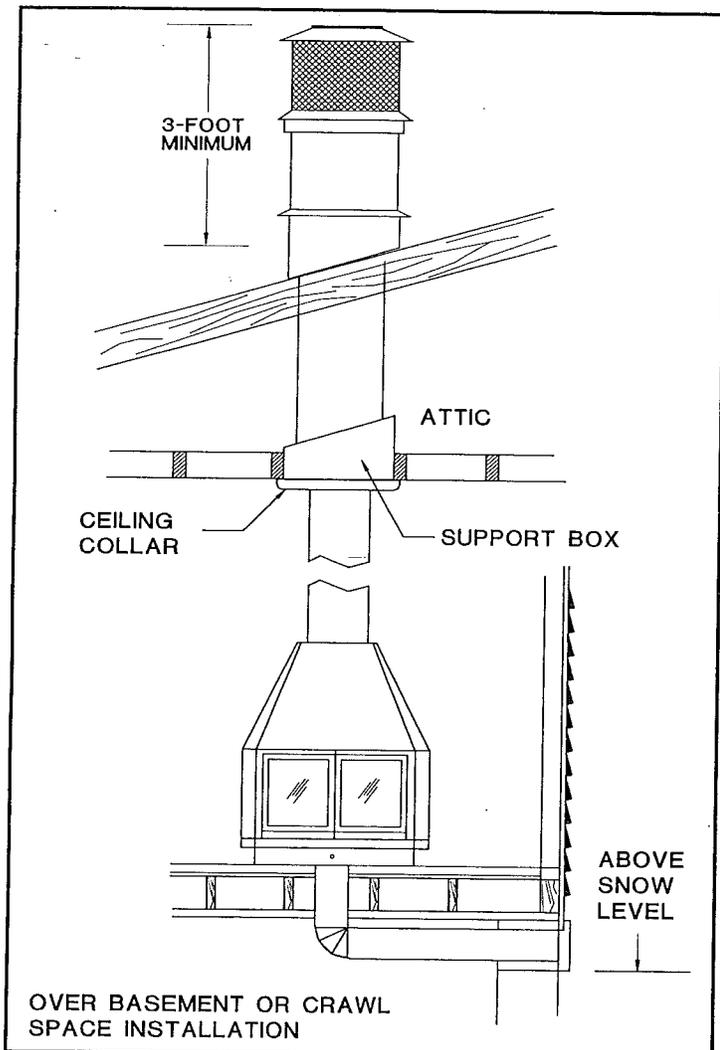
### WARNING!

Chimneys and hearths that are incomplete could cause a fire if they are used prior to completion.

**A FIRE MAY RESULT IN SERIOUS INJURY OR DEATH.**

The chimney, combustion air ducts and hearth must be installed before the fireplace is used.

FIGURE 7.4



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 the home.

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 with the fireplace manufacturer's installation instructions.

**7.4.3 Combustion air duct inlets –** Combustion air-intake ducts end just below the bottom covering of the floor. They must be extended to the outside when the home has a basement or crawl space. These added ducts are not supplied, but they may be purchased at the 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 Figure 7.4.

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

## 8 – Utility system connection and testing

**8.1 Proper procedure –** Consult the local authority before connecting any utilities. Only qualified installers, familiar with local codes and licensed where required, shall make utility connections and conduct tests.

### 8.2 Water supply

**8.2.1 Maximum supply pressure –** The water system for the home was designed for a maximum inlet pressure of 80 pounds per square inch. If the home is located in a water district where the local water supply pressure exceeds 80 pounds per square inch, install a pressure-reducing valve.

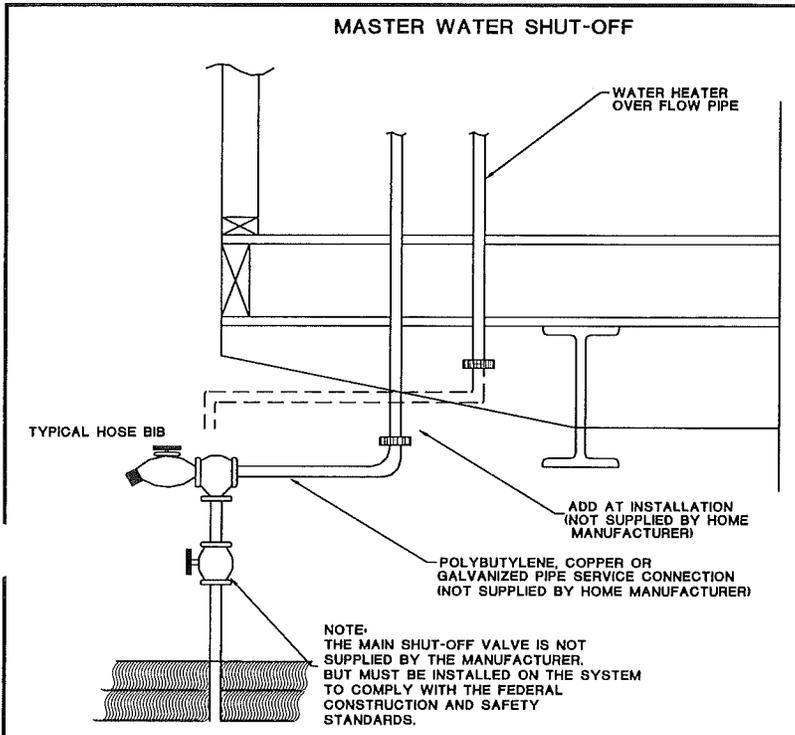
#### 8.2.2 Connection procedures

**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.

**8.2.2.2 Mandatory Shut-off valve** – An accessible full-flow shut-off valve (gate or ball valve) must be installed between the water supply and the inlet, as shown in Figure 8.1.

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

**FIGURE 8.1**



**8.2.3 Freezing protection**

**8.2.3.1 Necessity** – In areas subject to freezing temperatures, protect exposed sections of water supply piping, shut-off valves, pressure reducers, and pipes in a water heater compartments with a non-insulated door. Otherwise, burst pipes and costly damage may result.

**WARNING!**

Improperly designed or installed heat tapes can cause a fire.

**A FIRE MAY RESULT IN SERIOUS INJURY OR DEATH.**

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.

**8.2.3.2 Use of heat tape** – Heat tapes (either automatic or non-automatic) can protect exposed plumbing from freezing.

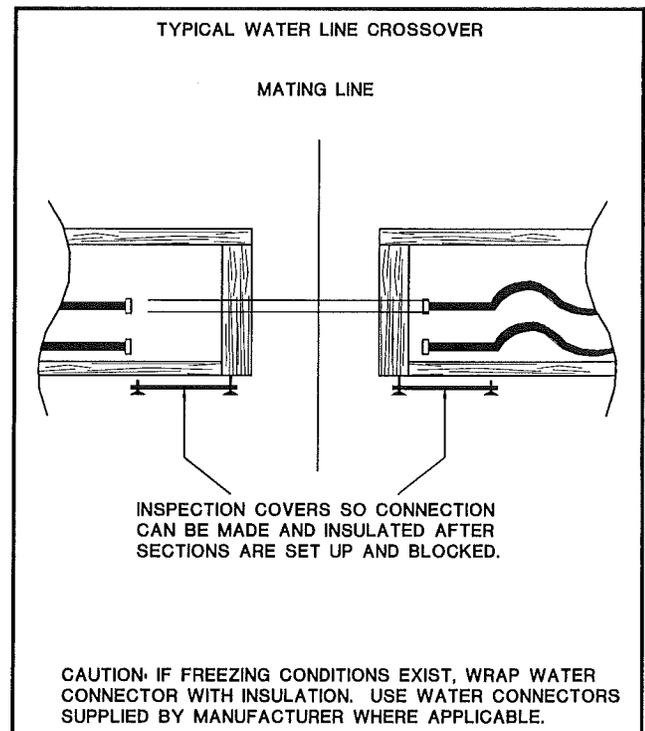
Plug the 3-wire, grounded cord set of the heat tape into the outlet located under the home near the water supply inlet.

**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 weather-proof 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.

**FIGURE 8.2**



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, locate and correct any leaks and then retest the system.

8.2.4.2 **Pneumatic** – **CAUTION: If this procedure is used, the hot water tank must be bypassed by hooking its cold inlet and hot outlet lines together. This method 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.

8.2.4.3 Use only hydrostatic test on CPVC systems.

### 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 shall 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 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 pipes have been cut square and have been deburred.
3. Check that all piping is supported at 4 feet or less with a slope between 1/8 inch and 1/4 inch per foot.

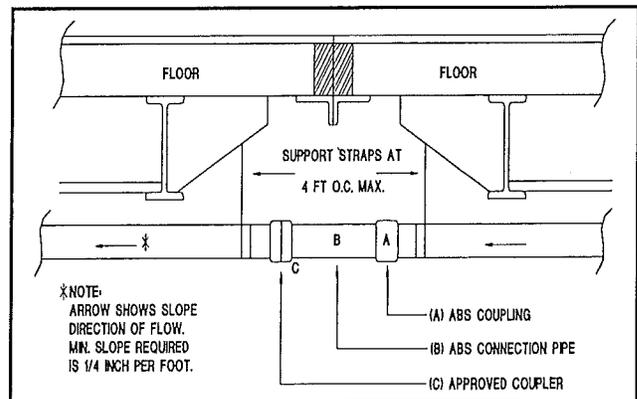
8.3.2 **Proper slopes and connector sizes** – Drain lines must slope at least 1/4 inch fall per foot of run unless otherwise noted on the schematic diagram (see Figure 8.3). Exception: 1/8 inch fall per foot is allowed when a clean out is installed at the upper end of the run. Connect the main drain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

When the entire system has been completed, install permanent drain line supports at 4 feet on center, as shown in Figure 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.

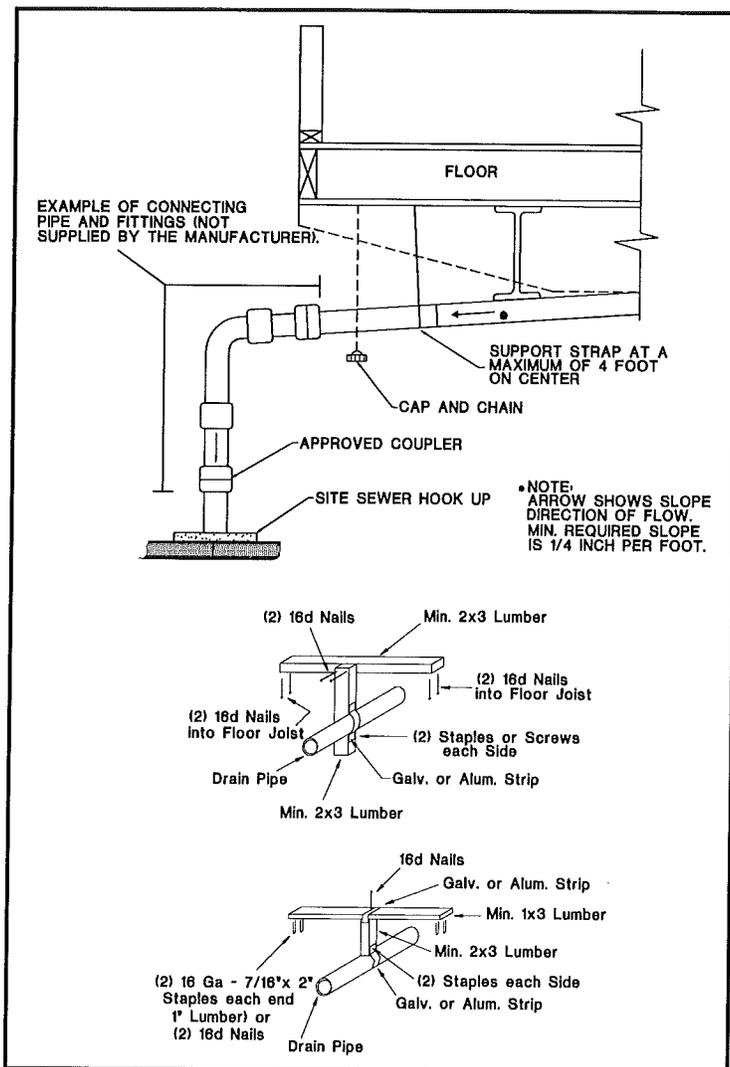
8.3.3 **Solvent welding procedures** – The solvent cement used to assemble the drain lines must be compatible with the pipe installed in the home. Follow the manufacturer's instructions on the container and complete the permanent connection of all pipe and fittings, again starting at the most remote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

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

FIGURE 8.3



**FIGURE 8.4**



**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 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**

**WARNING!**

Improperly connected or modified fuel gas systems can cause fire or explosion.

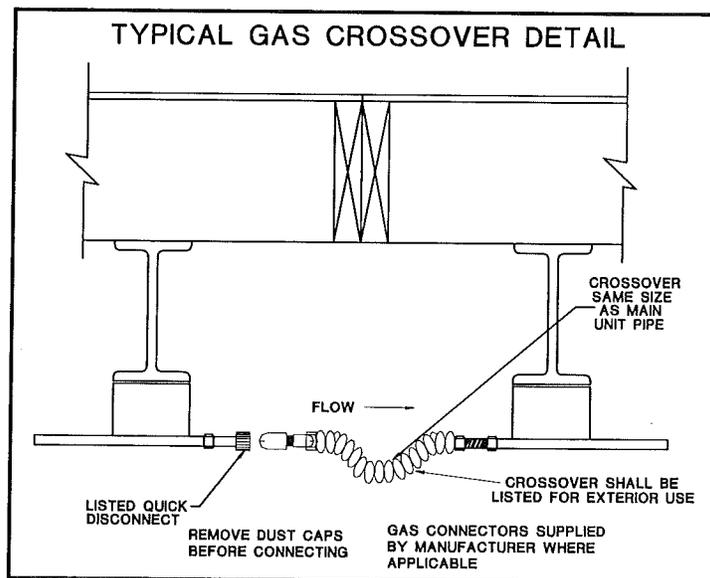
**A FIRE OR EXPLOSION MAY RESULT IN SERIOUS INJURY OR DEATH.**

Qualified personnel must make all connections to and alterations of fuel gas systems, including installation of appliances.

**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.

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

**FIGURE 8.5**



**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 Figure 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 the gas valves and/or pressure regulators may be damaged.** 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.

**8.5 Heating oil systems –** Homes equipped with oil-burning furnaces must have their oil supply tank and piping installed on site. The manufacturer does not supply these items. 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 shall 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, an oil storage tank must be installed 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 inches 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 inch 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.

**8.5.4 Winterizing** – Fuel oil specifically formulated for winter conditions is required to prevent the oil from jelling at low temperatures.

**8.5.5 Hot water baseboard heat** – All crossover connections shall be made with copper sweat fittings, copper unions or other approved metal connections.

**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 the electricity costs.

**8.6.1 Description and rating of home wiring** – The 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 the home is equipped with. The connection to the home is a feeder (unless the home is equipped with a factory-installed service meter base). The following paragraphs describe the wiring and grounding of electrical feeders; if the home is equipped with a factory-installed service meter base, skip directly to 8.6.4.3.

**8.6.2 Feeder wire and junction box material and size** – The feeder must contain four continuous insulated, color-coded, feeder conductors, one of which shall be an equipment grounding conductor. The current rating in amperes of the 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. 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.

**8.6.3 Grounding of homes with feeder connections**

**8.6.3.1 Grounding is required** – The home must be properly grounded to protect the occupants. The only safe and approved method of grounding the home is through an electrical-isolated grounding bar in the manufactured home distribution panelboard which grounds all non-current-carrying metal parts to the electrical system in the home at a single point.

The ground conductor of the power supply feeder cable in turn connects the grounding bar to a good electrical ground back through the power supply system. This means that for 120/240 volt service, you must have a 4-wire power supply feeder cable. **IT IS EXTREMELY IMPORTANT THAT THE NEUTRAL CONNECTOR NOT BE GROUNDED IN THE MANUFACTURED HOME DISTRIBUTION PANELBOARD.**

**8.6.3.2 Procedure** – The ground conductor of the power supply feeder cable must connect the grounding bar to a good electrical ground. Follow the feeder connection procedures described in 8.6.4.1 and 8.6.4.2

TABLE 8.1

MAIN BREAKER SIZE IN PANEL BOX AMPS	ELECTRICAL FEEDER AND EQUIPMENT SIZES									MAXIMUM CALCULATED NEUTRAL FEEDER LOAD AMPS
	MINIMUM SIZES									
	JUNCTION BOX INCHES	CONDUIT DIAMETER INCHES		POWER RED OR BLACK		NEUTRAL WHITE		GROUNDING GREEN		
		COPPER	ALUMINUM	COPPER	ALUMINUM	COPPER	ALUMINUM	COPPER	ALUMINUM	
100	10X10X4	1 1/4	1 1/2	# 3	# 1	# 3	# 1	# 8	# 6	100
150	10X12X4	1 1/2	2	# 1/0	# 3/0	# 2	# 1/0	# 6	# 4	115
200	12X12X4	2	2	# 3/0	# 250 MCM	# 2	# 1/0	# 6	# 4	115

to achieve proper grounding. (Exception: Homes with a factory-installed service meter base must be grounded differently. Refer to the specific instructions in 8.6.4.3 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 have been removed and discarded at the manufacturing facility.

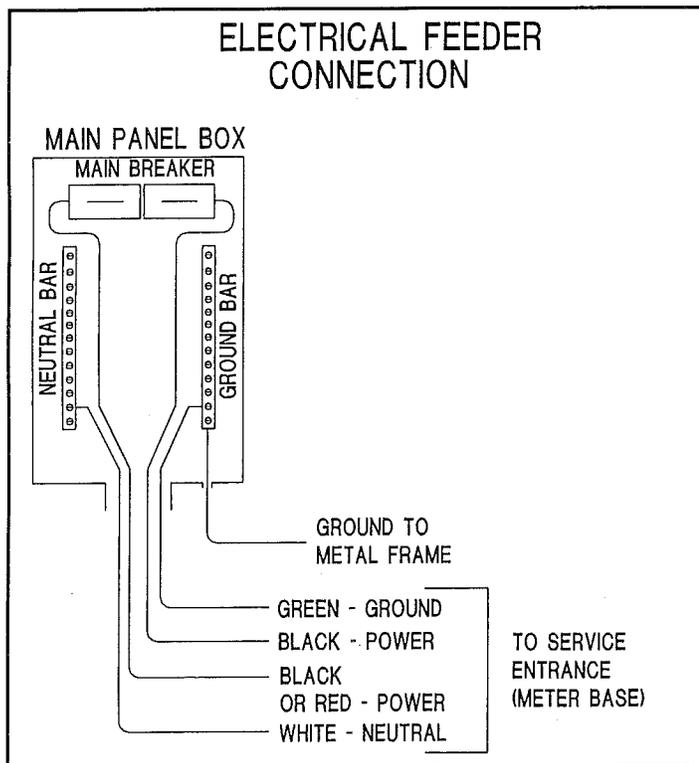
The installer may provide the required continuity of ground between sections of multi-section homes through a metallic roof or siding, or by bolting outriggers together. When the outriggers or other overlapping metal joints of adjoining sections are not bolted together on houses with shingle roofs and 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 Figure 8.9), 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 Only a qualified installer using one of the following methods shall make connections** – Any method that does not provide a ground wire connection from the service entrance to the ground bar in the distribution panel board is not acceptable. Refer to Figure 8.6.

**FIGURE 8.6**



**WARNING!**

Installation of the electric power to the home can cause exposure to live electrical circuits.

**EXPOSURE TO LIVE ELECTRICAL CIRCUITS MAY RESULT IN SEVERE SHOCK OR POSSIBLE ELECTROCUTION.**

A qualified installer must make the connections for the electric power.

**8.6.4.1 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 inches 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.

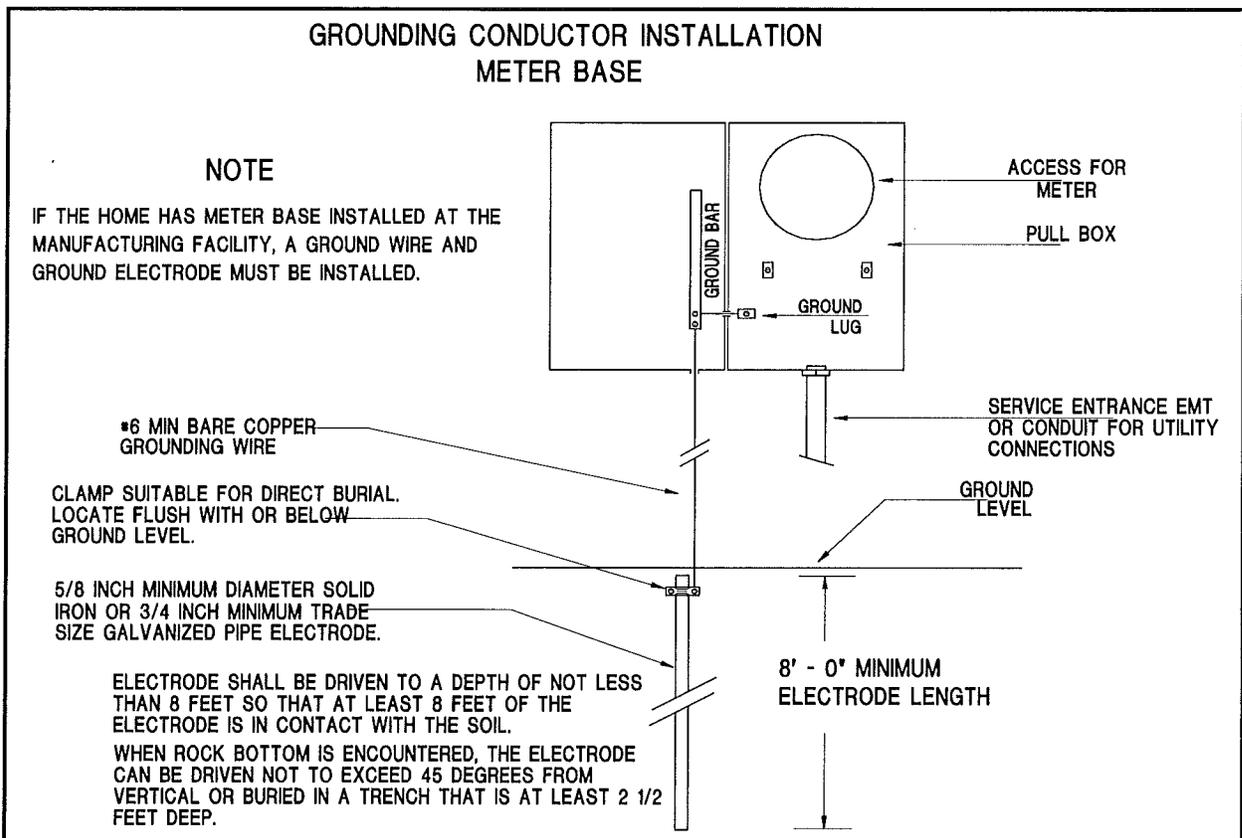
**8.6.4.2 Underside junction box feeder** – A conduit from the main panel board to the underside of the home allows for installing an approved junction box or fitting, which must be used. Install properly sized conductors from the main power supply to the panel board. Refer to Table 8.1 for the conductor and junction box requirements. The homeowner or installer must provide the supply connection including the four feeder conductors, junction box and conduit 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.

**8.6.4.3 Grounding of homes with service meter base.** When a factory-installed service meter base is provided on the home, a grounding electrode conductor and a ground wire must be installed as detailed in Figure 8.7.

**8.6.5 Crossover connections** – For multi-section homes, refer to Figure 8.8 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 Figure 8.8. Some crossover connectors plug together and do not require junction boxes.

**FIGURE 8.7**



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.

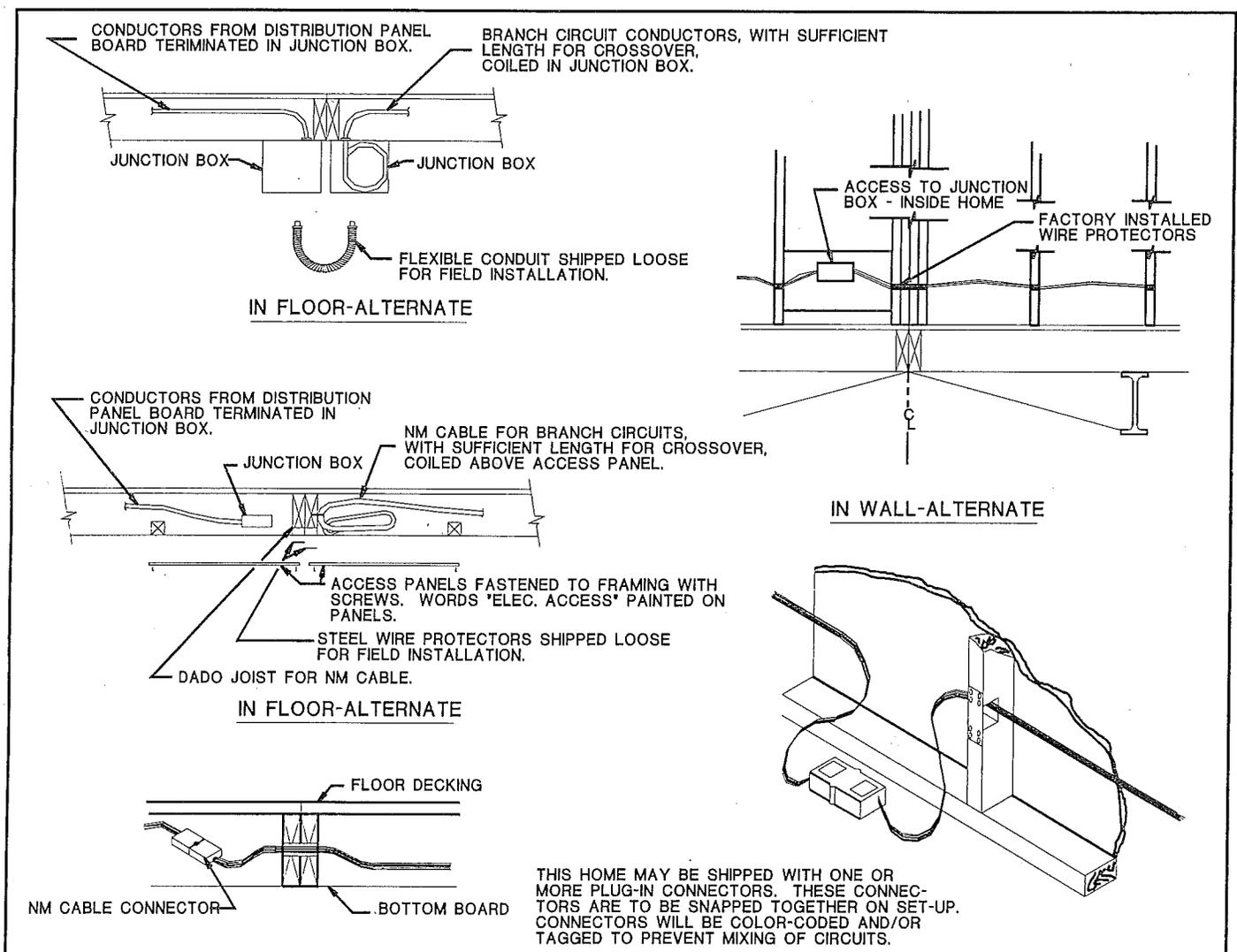
**Multi-section bonding** – Bonding between the sections of a home with metal siding or a metal roof is provided by the overlapping metal joints fastened with metal screws. Bonding between sections of a home with non-metallic siding and a non-metallic

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 Figure 8.9.

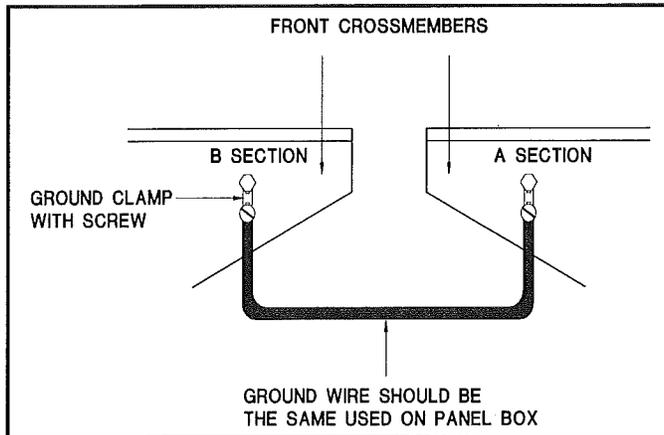
### 8.6.6 System test procedures and equipment

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

**FIGURE 8.8**



**FIGURE 8.9**



**NOTICE**

Energizing the water heater before the water heater is filled with water will cause the water heater element to burn out, an event not covered by the warranty. Allow the water heater to fill completely before activating the water heater circuit.

**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 shall give no evidence of a connection between any of the supply conductors (including the neutral) and the grounding circuit. A flashlight continuity tester may be used.

**8.6.6.1.2 Grounding continuity** – Using a continuity tester test non-current-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 tests after turning on the main circuit breaker and each individual circuit breaker.

**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 checks** – 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 re-testing. Check smoke detectors to be sure they are operational (test per smoke detector manufacturer's instructions). If a smoke detector was shipped loose with the home, locate it, plug it in and check operation.

## 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 must be removed, and the window shall 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 flashing 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 3 sides at each corner to cross-ventilate and keep the crawl space as dry as possible. See 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 the 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 airflow** – Check all exhaust fans for proper operation and airflow.

**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 the 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 shall 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 has been installed at the proper spacing and alignment, 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.

**9.15 Retailer inspection** – The retailer's representative should inspect the home with the homeowner and brief the homeowner about maintaining the home.

## 10 – Relocating the home

**10.1 Relocation of the home** – If it is necessary to move the 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 heating and cooling requirements at the new location. The home is designed for certain weather conditions and roof loads. See the zone maps included on the home Data Plate. Do not site or relocate the home in a zone requiring greater wind, roof load, or heating or cooling capabilities than those for which it was designed. (See 1.2, 1.4 and 3.1)

**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. Inspect hitch and running gear connection welds for corrosion and repair as necessary. Check and repair bearings and brakes as necessary.

**FIGURE 11.1**

**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 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 THE 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 weatherproof 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.

**11 – Window and glass door protection**

**11.1 Windstorm Protection** – As explained on the data plate, this home has not been equipped with storm shutters or other protective coverings for windows and glass door openings. For homes located in Wind Zones II or III, we strongly recommend that the home be made ready to be equipped with these devices in accordance with one of the methods illustrated in figure 11.1.

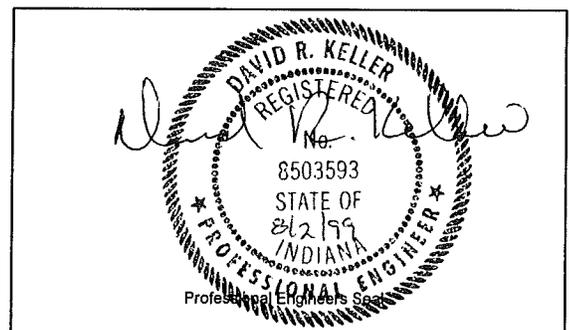
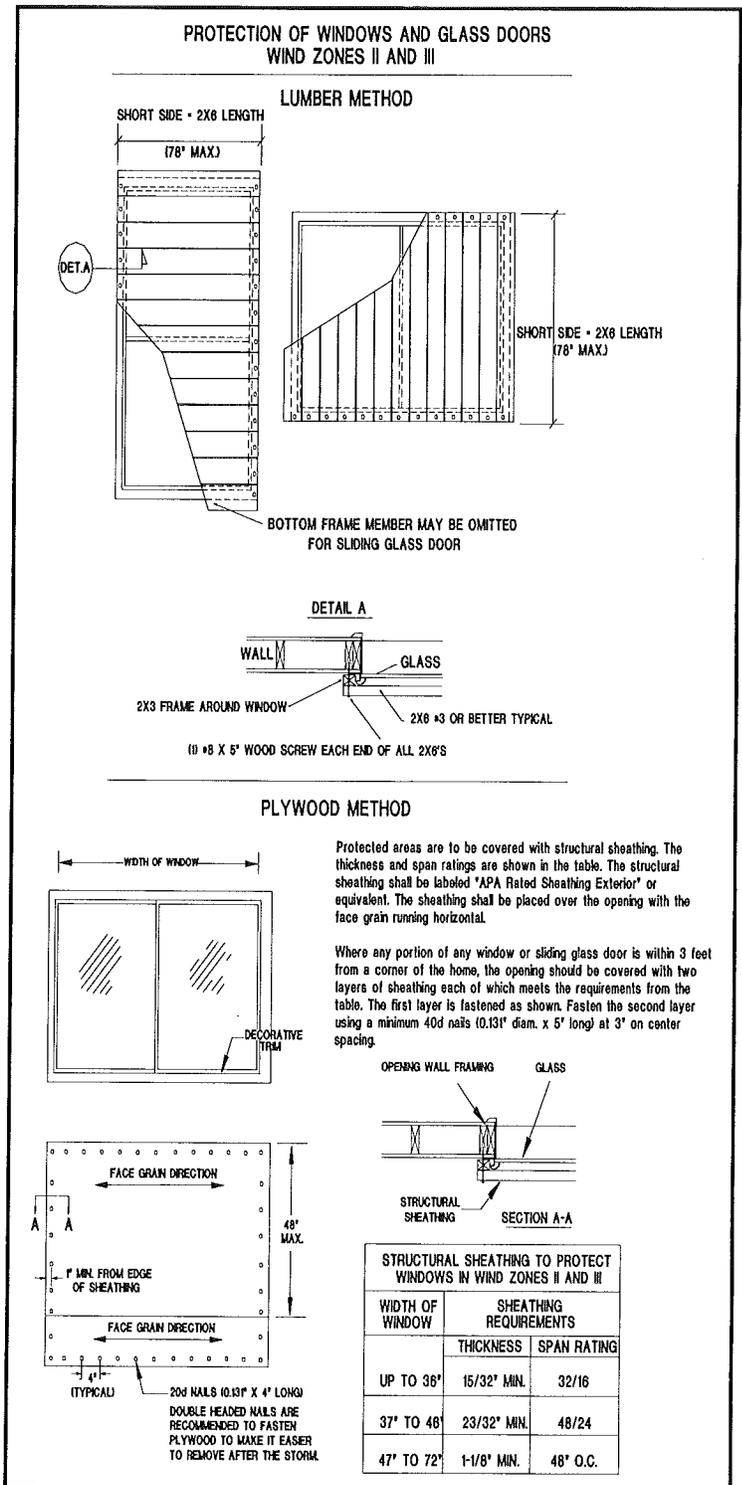
**WARNING!**

Covering the windows and doors will block safe egress from the home in the event of a fire or other hazard.

**INOPERABLE EGRESS WINDOWS OR DOORS MAY RESULT IN SERIOUS INJURY OR DEATH.**

Do not occupy the home if the egress windows or doors are covered or otherwise inoperable.

**11.1.2 Removals** – After all danger is past, remove and store the protective materials for possible reuse. Permanently weatherproof all holes left from nails and debris.





# **CHAMPION HOME BUILDERS CO.**

Division 05  
P.O. Box 585  
3200 Enterprise Ave.  
York, NE 68467  
(402) 362-4455  
Fax (402) 362-7724