1/26/02

INSTALLATION MANUAL

CHAMPION

Copyright © 1976, 2003 by Champion

TABLE OF CONTENTS

1.0 **INTRODUCTION** 2
1.1 HOW TO USE THIS MANUAL 2
1.2 PRE-INSTALLATION CONSIDERATION 2
1.3 SAFETY 2
1.4 IMPORTANT DOCUMENTS 3
2.0 **DEFINITIONS** 4
3.0 **SITE PREPARATION** 5
3.1 LOCATION 5
3.2 SITE ACCESS 5
3.3 SUPPORT REQUIREMENTS 5
3.4 MOISTURE PROTECTION 7
4.0 **FOUNDATIONS** 8
4.1 PIERS 8
4.2 FOOTINGS 12
4.3 OTHER FOUNDATIONS 14
4.4 SPECIAL CONSIDERATIONS 14
4.5 REFERENCE DOCUMENTS 19
5.0 **INSTALLATION PROCESS** 20
5.1 PRE-INSTALLATION PROCEDURES 20
5.2 POSITIONING HOME 20
5.3 RAISING, BLOCKING & LEVELING 20
5.4 INTERCONNECTION OF MULTI-SECTION HOMES 21
5.5 CLOSURE 25
5.6 ANCHORING INSTRUCTIONS 26
5.7 SPECIAL CONSIDERATIONS 30
5.8 SKIRTING 31
6.0 **OPTIONAL FEATURES** 33
6.1 HINGED ROOFS 33
6.2 GARDEN, AND BAY WINDOWS 33
6.3 ON-SITE ATTACHED STRUCTURES 33
6.4 ACCESSORY WINDOWS 35
6.5 MISCELLANEOUS LIGHTS AND FIXTURES 35
6.6 OPTIONAL PANELS, SIDING AND MOLDING 35
6.7 EXTERIOR COVERINGS 35
6.8 TELEPHONE AND CABLE TELEVISION 36
6.9 CONTINUOUS RIDGE VENT 36
7.0 **APPLIANCES** 39
7.1 HEATING APPLIANCES 39
7.2 CLOTHES DRYER VENT 39
7.3 COMFORT COOLING SYSTEMS 40
7.4 CHIMNEYS AND AIR INLETS 41
7.5 RANGE, COOK TOP AND OVEN VENTING 42
8.0 **UTILITIES** 43
8.1 WATER SUPPLY 43
8.2 DRAINAGE SYSTEM 45
8.3 GAS SUPPLY 46
8.4 HEATING OIL SYSTEMS 47
8.5 HOT WATER HEAT 48
8.6 ELECTRICITY 48
8.7 AIR DUCT CROSSOVERS 52
9.0 **FINAL INSPECTION** 54
9.1 INSTALLER'S INSPECTION 54
9.2 RETAILER'S INSPECTION 54
9.3 HOME RELOCATION 54
9.4 WINDOW & GLASS DOOR PROTECTION 56

Copyright © 1976, 2003 by Champion

DAPIA

APPROVED
PFS Corporation
Madison - 3
11/26/02
HUD Manufactured Home Construction & Safety Standard

1.1 HOW TO USE THIS MANUAL

This installation manual contains instructions for the proper installation of a manufactured home. Please review this entire manual before starting the installation process.

If you are professionally responsible for overseeing or completing the installation of this manufactured home, then you are the person to 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 homes are much too complicated to be installed by persons 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.

This manual includes one approved method of installing a manufactured home. There are other ways in which a home can be properly installed; this manual is dedicated to specifying the parameters 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 the intended end use of the product. Contact the factory for special instructions, which may be available for any items, not covered in this manual.

In some cases in this manual, we make recommendations rather than set requirements for installation. A requirement is given in order to ensure compliance with the minimum federal standards. Recommendations are practices that 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 may not have risen had the recommendation been followed.

If you make decisions to deviate from the installation specifications of this manual, you may be responsible for those decisions.

1.2 PRE-INSTALLATION CONSIDERATIONS

Refer to the Data Plate and the design load zone maps (Chapter 3) to make certain that the home is suitable for the geographic zone where a qualified installer will install it. Before locating or relocating the home, contact the local authority having jurisdiction over the installation to see if permits or inspections for such procedures as blocking, anchoring or utility connections are required. 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 a manufactured home. VARIOUS WARNINGS and NOTICES are published throughout this manual as reminders. As qualified professionals in the field of manufactured housing installation, you are the experts and you must be aware of the hazards and conditions that you face, and that may result from what you do. These published reminders may not represent or identify all hazards, all potential hazards, or all possible consequences of improper or unsafe installation practices.

1.4 IMPORTANT DOCUMENTS

In addition to this Installation Manual, the following documents 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 area, 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. Those pages identify requirements for special features included in the home which are not covered in this manual, or which differ from the details here in.

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 of the home.

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 constructed.

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 site designed to transfer home anchoring loads to the ground.

Information packet – the important papers provided with the home including appliance instructions, warranties, high wind coverage, 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 the building 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.

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 that is strongly 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 that 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.

CHAPTER 3 SITE PREPARATION

The integrity of the home depends on proper site preparation. No matter how the home was constructed or installed, it must ultimately suit the site upon which it sits. There are four primary considerations:

- Is the home designed for the site
- Is the site accessible
- Is the site capable of supporting the design loads
- Is the site designed to prevent moisture damage

3.1 LOCATION

The home is designed to meet wind, snow (roof loads), and climatic (heating and cooling) conditions for areas marked on the home's Data Plate (Figure 3.1). Do not locate the home where required loads exceed the loads for which it was designed. Locations with lower design loads are acceptable.

3.2 ACCESS

3.2.1 For Transporter

Ensure that the transportation equipment and home can be safely moved to the site without damage. Fill any holes or soft places in the access road, and make sure there is adequate space and a strong enough surface between the road and the site to support the home. Consideration must be given to any berms, ditches or soft fields that may need to be traversed. Remove any overhanging branches that are in the way, 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.

3.2.2 Encroachments and Setback Distances

Local laws regarding encroachments in streets, yards, and courts, and permissible setback distances from property lines and public roads may be applicable.

3.2.1 Issuance of Permits

Ensure that all necessary local permits have been obtained and fees paid.

3.3 SUPPORT REQUIREMENTS AND SOIL CAPACITY

3.3.1 Requirements

A firm foundation is necessary before the home is blocked and leveled. If the site is on filled in soil, it must be compacted to at least 95% of its maximum relative density.

Table 3.1: General Description of Soils

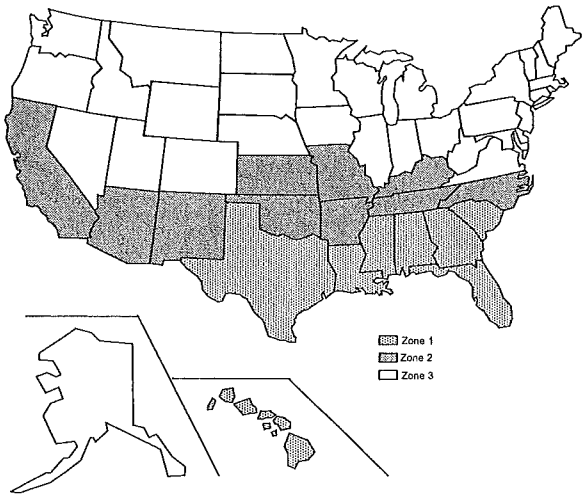
Soil Type (1)	Allowable Pressure (lbs. per sq. ft.) (2)
Sedimentary rock	4,000
Sandy gravel or gravel	2,000
Sand, silty sand, clayey sand, silty gravel and clayey gravel	1,500
Clay, sandy clay, silty clay, or clayey silt	1,000
Unconsolidated fill, peat or organic clays	Special Analysis Required

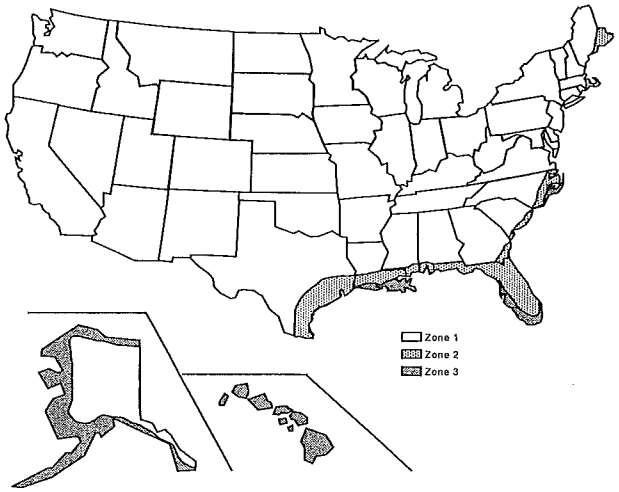
1- Based on the Unified Classification System
2- No allowance made for overburden pressure, embedment depth, water table height, or settlement problems

NOTE: This table to be used only when none of the following is available:

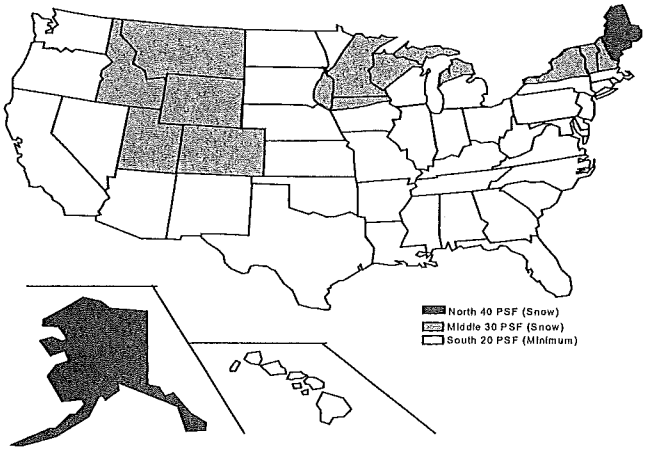
a. Soils investigation and analysis of the site.
b. Compliance with the local building code.
c. Competent opinion by a local engineer or code official.

Heating and Cooling Zone Map **FIGURE 3.1** Wind Load Zone Map





Roof Load Zone Map



WIND ZONE I (15 PSF design) 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 feet of the coastline in Wind Zones II and III.

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

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

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

Florida	FL (cont'd)	LA (cont'd)
Broward	Manatee	Plaquemines
Charlotte	Monroe	St. Bernard
Collier	Palm Beach	St. Charles
Dade	Pinellas	St. Mary
Franklin	Sarasota	Terrebonne
Gulf	Louisiana	North Carolina
Hendry	Jefferson	Carteret
Lee	LaFourche	Dare
Martin	Orleans	Hyde

The following states and territories are within Wind Zone III:
State of Hawaii
All Alaska costal regions between the 90 mph Isotach on ANSI/ASCE7-88 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

3.3.2 Bearing Capacity

After completing any grading and filling, test the bearing capacity of the soil at the depth of the footings (see below) 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 un-compacted fill, confer with the local building authority for the recommended soil bearing capacity in the area or consult a local geologist or a qualified registered professional engineer for their analysis to determine the bearing capacity.

3.3.3 Soil Bearing Testing Methods and Equipment

Use a pocket penetrometer (available from engineering supply homes) or other method acceptable to the local authority having jurisdiction.

3.3.4 Removal of Organic Material

Removal of all organic 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.

WARNING

Excessive moisture underneath the home can cause structural damage and other moisture-related problems, including the growth of mold and mildew, which may be hazardous to health.

3.4 MOISTURE PROTECTION

Water must not be allowed to accumulate or stand underneath the home. Excessive moisture under the home may cause settling of the foundation, dampness in the home, and structural damage or long term deterioration to the home, including damage to the siding and bottom covering, buckling of the walls and floors, and problems with the operation of doors and windows.

3.4.1 Grading and Elimination of Depressions

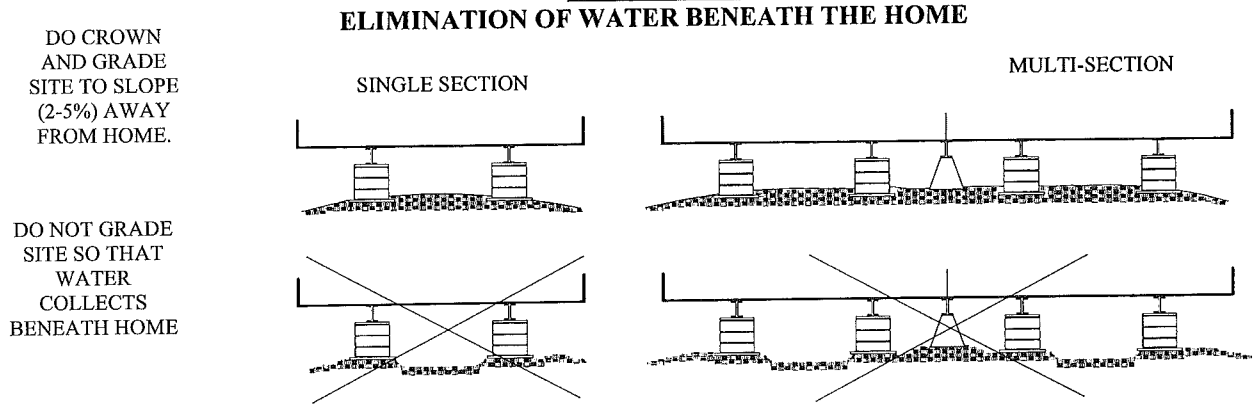
Grade the home site to permit water to drain from underneath the home (Figure 3.2). Grade the land to the edge of the home so it slopes away from the perimeter for a distance of 3-5 ft. or in accordance with local codes. Depending on the local landscape and local codes, drain tiles, ditches and culverts may be needed to drain surface runoff. If so, consult a qualified registered professional engineer. Regulated communities may have alternate grading provisions acceptable to the authority having jurisdiction.

3.4.2 Ground Moisture Control

A uniform 6-mil polyethylene or equivalent vapor retarder material installed on the ground surface beneath the home is recommended but not required. A vapor retarder will not correct poor drainage and when used should be in addition to proper drainage and grading. When used, a vapor retarder should cover the entire area under the home with the sheeting overlapped 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

ELIMINATION OF WATER BENEATH THE HOME



CHAPTER 4 FOUNDATIONS

The Foundation is the platform that connects the home to the ground. While a strong foundation will not, in the long run, overcome a poorly prepared site, an inadequate foundation can cause the home to fail in resisting the loads it was designed to meet. Failure can range anywhere from difficult-to-open doors or windows to structural collapse. Generally, the foundations covered by this manual consist of Piers and Footings (see Definitions), although provisions for other systems are also described.

4.1 PIERS

4.1.1 Location and Spacing

The location of piers depends upon the type and configuration of construction (single or multi-section; rectangular or offset), various design features, the size and weight of the home, and the roof load zone. The spacing of the piers depends on calculated pier loads, the design of the footings to transfer those loads to the soil, and the capacity of the soil. Each home section must be supported at the frames (Figure 4.1); at openings greater than 4 feet in sidewalls and any mating walls (Figure 4.2); at miscellaneous loading conditions (Figure 4.3); and some homes must be supported under the perimeter as well (Figure 4.4).

NOTICE

Failure to provide supports at the locations specified can cause loads to exceed the design capacity of the home and cause unwarranted damage.

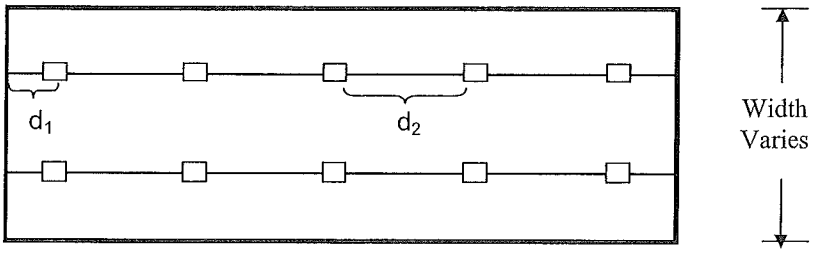
Some homes require both perimeter and frame footings and piers to safely support the home. Refer to the Data Plate and any addendum. If the serial number contains a "P" or if perimeter blocking is specified then both perimeter and frame blocking must be installed.

FIGURE 4.1

STEP 1: FRAME BLOCKING. Each section must be supported under the Main I-beams.

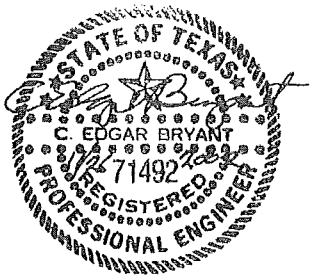
PIER LOCATIONS
FRAME (MAIN I-BEAM)

Single or multi-floor home (each floor)



Requirements

d^1 – distance from endwall; maximum 2 ft.
d^2 – distance between piers, based on loads given in Table 4.1A for Frame Blocking only, or Table 4.2A for Frame & Perimeter Blocking.

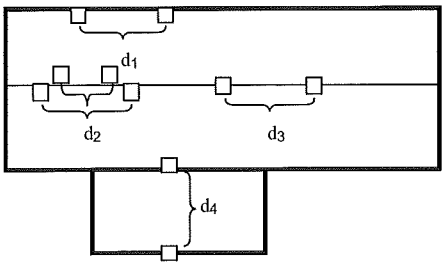


PROFESSIONAL ENGINEER SEAL

FIGURE 4.2

STEP 2: Sidewall & Mating Wall Openings. Each section must be supported at openings.

FIGURE 4.2: PIER LOCATIONS
SIDEWALL & MATING LINE OPENINGS



Requirements

d_1 - opening greater than 4 ft. in sidewall (e.g., sliding glass doors, porches, bay windows); pier load per Table 4.1B for Frame Blocking only, or Table 4.2B for Frame & Perimeter Blocking. All homes.

d_2 - mating wall openings same as sidewall openings (d_1), per home section.

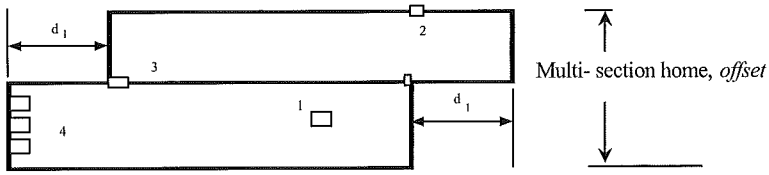
d_3 - if single pier is used to support two floors, load described in Table 4.1B or Table 4.2B is doubled. All multi-floor homes (sections).

d_4 - transverse section tag requires roof center beam support piers as shown, or as marked on bottom of home. Use Table 4.2B, with opening equal to width of tag.

FIGURE 4.3

STEP 3: Stabilizer Blocking. Each section may require supports.

FIGURE 4.3: PIER LOCATION
MISCELLANEOUS (STABILIZER BLOCKING)



Requirements

1 - under any concentrated heavy load (water beds, pianos, etc.) All homes

2 - under the hinge side of all entry doors. All homes*

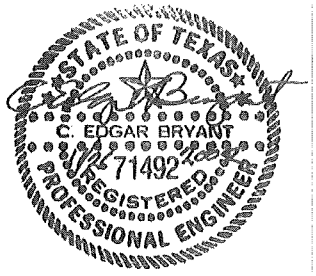
3 - at inside corners of offset multi-section units , as shown

4 - perimeter blocking required under stairwells, front and/or rear of all homes with front crossmembers and/or rear frame recessed 7 inches or more.
- typical piers are adequate. Footings of no lesser size than the base of the pier are required for stability.

* EXCEPTION: stabilizer blocking for entry doors not required if a factory-installed outrigger or a field-installed listed adjustable outrigger (e.g., Manufactured Housing foundations Systems, Inc.) is within 8 inches of the hinge side. Listed adjustable outriggers may only be used on 10 inch or larger I-beams; located within 24 inches horizontally of a frame pier; installed per the manufacturer's installation instructions. adjustable outriggers may not be substitutes for other pier applications and must be removed prior to any home move.

d_1 - NOTES FOR OFF-SET DESIGN

1. roof of off-set section must have center peak.
2. maximum off-set without center peak is 4' in wind zone I only.
3. all other off-sets need set-up addendum.
4. off-set should be tied down & blocked as a single section for that portion of the home. Also, blocking shall be placed at the inside corners where floors join.



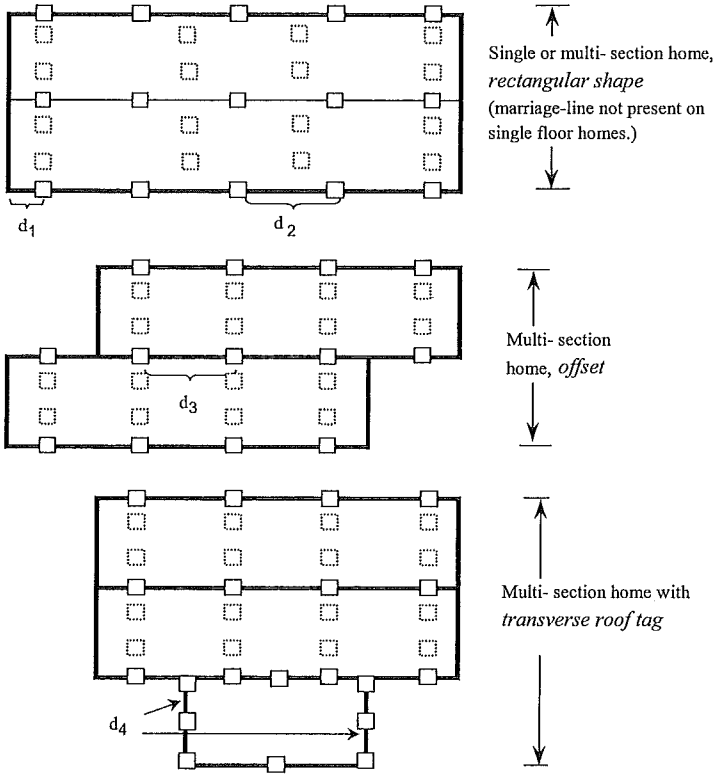
PROFESSIONAL ENGINEER SEAL

FIGURE 4.4

STEP 4: Perimeter Mandatory when specified on data plate or "P" in serial number. Must be used in addition to Frame Blocking shown in Figure 4.1.

PIER PERIMETER

(Mandatory when specified on data plate)



d_1 - distance from endwall; maximum 2 ft.

d_2 - distance between piers, based on loads given in Table 4.2A

d_3 - distance between piers at mating line shall not exceed 4 ft. Based on loads given in Table 4.2A

d_4 - Transverse tags require 3 perimeter piers under each side, as shown. Use Table 4.2A.

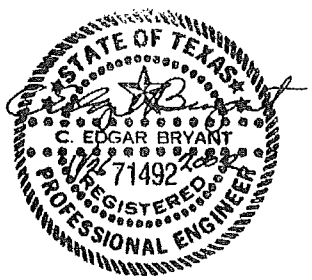
NOTE: Perimeter piers not required under openings as shown in Figure 4.2.

4.1.2 Pier Loads

The load that each pier must carry depends on factors such as the dimensions of the home, the roof live load, the spacing of the piers, and the way the piers are used to support the home. See Tables *4.1A & B, and 4.2A& B* for minimum required pier capacities. Maximum eaves for these charts are 16 inches for sections 14 ft. wide or less, and 12 inches for wider sections.

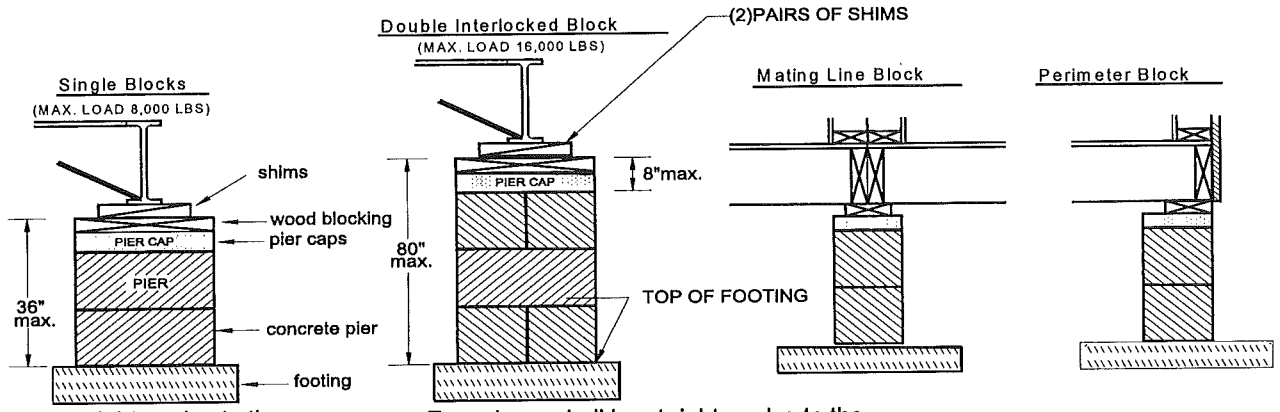
4.1.3 Pier Design

- Type & configuration (Figure 4.5).



PROFESSIONAL ENGINEER SEAL

FIGURE 4.5: TYPICAL TYPES OF PIERS



Install at right angles to the supported I-beam. Horizontal offsets shall not exceed 1/2 inch top to bottom. Mortar is not normally required.

Every layer shall be at right angles to the previous one. Piers over 36 inches high must be spaced not more than 8 feet on center. Mortar will not normally be required.

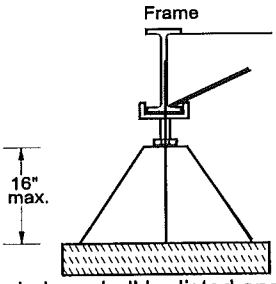
Up to 25 percent of the piers may be more than 36 inches high but no pier may be more than 80 inches high. Construct all piers that will be over 36 inches high, and all corner piers that will be over three blocks high, out of double interlocked concrete blocks. Every layer shall be at right angles to the previous one. Mortar will not normally be required. Piers over 36 inches high must be spaced not more than 8 feet on center.
Load bearing (not decorative) concrete blocks shall have nominal dimensions of at least 8"x 8"x 16" and shall be ASTM C-90 Grade N, minimum. They must be stacked with hollow cells aligned vertically.

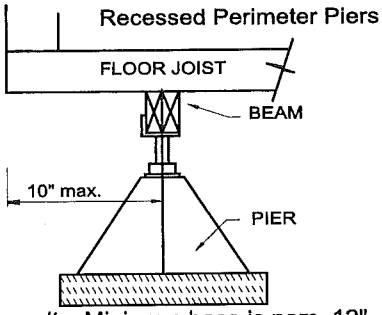
HARDWOOD SHIMS: Use 4-inch x 6-inch hardwood shims to level the home and fill any gaps between the base of the top of the pier cap. Always use shims in pairs and drive them in tightly so they occupy no more than 1 inch of vertical space

WOOD BLOCKS: Same width and length as cap, may be used to fill space between cap & shims.

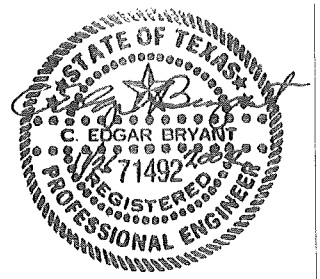
CAPS: Caps may be of solid masonry or wood. all caps shall be of the same length and width as the piers they rest upon. Avoid plywood, as it may lead to unwanted settling or movement.

Manufactured & Labeled Metal or Concrete Devices





* Manufactured piers shall be listed and labeled for the required load capacity. Minimum base is nom. 12". Adjustable risers shall not extend more than 3 inches or beyond the limits specified by the pier manufacturer, whichever is less, when finally positioned.
* Recessed perimeter piers to be located no more than 48" on center and 10" from the edge of the floor. Beams are (2) SPF #3 2x6x24, to be placed on the adjusting screw and shall bear under at least (2) floor joists. Maximum pier load is 2,500 lbs.



PROFESSIONAL ENGINEER SEAL

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.

NOTICE

If clearance under the home is less than 24", service provided through the manufacturer's limited warranty for components normally accessible from the underside, including but not limited to plumbing, electrical, and structural issues, may require that means of access to the components be provided at the homeowner's expense.

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

4.2 FOOTINGS

4.2.1 Concrete

Footings shall consist of pre-cast 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 that specified in Table 4.3 for the applicable load or the pier base, whichever is greater, and the effective load area of concrete footings shall not extend beyond the pier base by more than the thickness of the footing. When used in conjunction with anchoring systems, slabs and ribbons shall be designed by a qualified registered professional engineer with knowledge of the anchorage requirements of 5.4, and shall be acceptable to the authority having jurisdiction.

- Pressure-treated wood (Fig. 4.6A).
- Pressure-treated plywood (Fig. 4.6B).

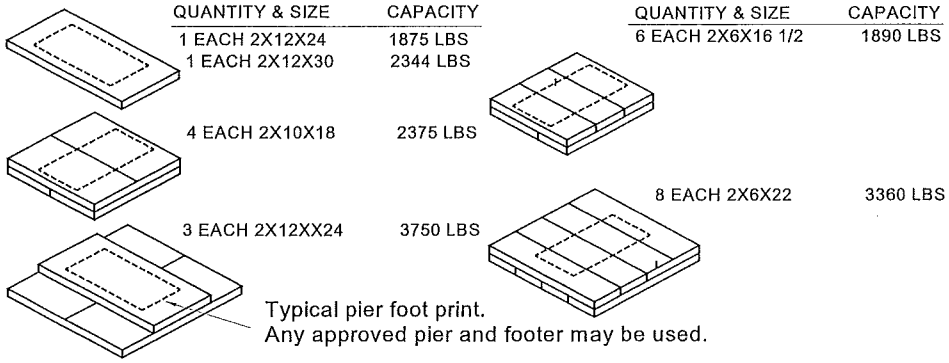
4.2.2 ABS Plastic Pads

Using the ABS footing pad manufacturer's instructions, select ABS footing pads that are rated for the soil condition and applied pier loading. Install the footing pad according to the pad manufacturer's instructions. All footing pads must be on either undisturbed soil or compacted fill, with all vegetation removed, and footing pads must be below the frost line or otherwise protected from the effects of ground frost heave.

4.2.3 Other Materials

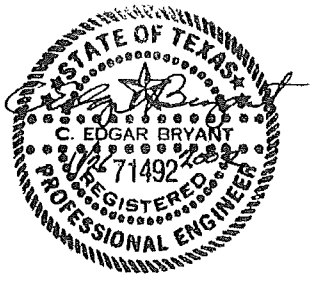
Other materials may be used when approved by local authorities if they provide equal load bearing capacity and resistance to decay.

FIGURE 4.6A



Typical pier foot print.
Any approved pier and footer may be used.

2x 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. Soil Capacity is 1000 PSF.



PROFESSIONAL ENGINEER SEAL

FIGURE 4.6B
PLYWOOD PIER/PAD SIZE [1]

Plywood Pad Size, Inches [2]	Minimum Plywood Thickness, Inches [3]		Maximum Pier Load, Pounds
	Metal Stands	Concrete Blocks	For 1000 PSF Soil
16x16	½	1	1780
16x19.2	5/8	1 1/8	2130
24x24	1 1/8	1 ¼	4000

1- 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 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 Preservators Association (AWPA) standard no. C-9 with salt preservatives as required for soil contact exposure. Plywood grade recommended for all pads is PS1.

2- Face grain may be either direction relative to the pad or pier thickness.

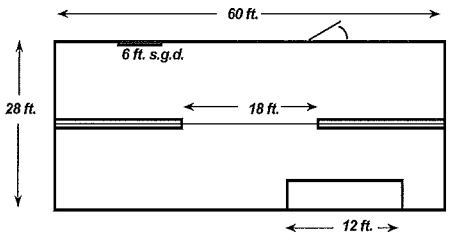
3- Plywood thickness is for a metal stand with an 11-1/2 inch square base, or a concrete block with an 8x16 inch base. Thickness of one inch or more may be fabricated from two layers of plywood, stacked with or without fastening.

4.2.4 Proper Size

Proper sizing of footings depends upon the load-carrying capacity of both the piers and the soil. The useful or "Effective Area" of concrete footings may not exceed the base of the pier in any direction by more than the thickness of the footing. Determine the pier loads from Table 4.1A & B or 4.2A & B and select an adequately sized footing from Table 4.3.

EXAMPLE

28x60 ft home, with 12 ft. recessed entry (porch), 6 ft. sliding glass door, a rear hinged home-type door, and 18 ft. opening in marriage wall, 10 in. I-beams, located in an area with a 30 psf roof load. Pier type: concrete block. Soil capacity = 2000 psf. Poured concrete footings, 4" thick.



Frame Piers

From Table 4.1A, maximum 9' spacing, piers must be capable of carrying 6700 lbs.

Sidewall & Mating Wall Piers

From Table 4.1B, piers on either side of 6' sliding glass door must be designed for 1,650 lb. Load;

- piers under 12' porch posts must be designed for 2,500 lbs;
- piers under 18' mating wall opening designed for 2 x 3,300 = 6,600 lbs.

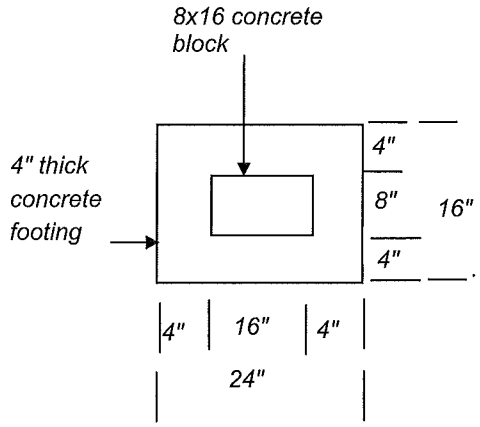
Miscellaneous Support

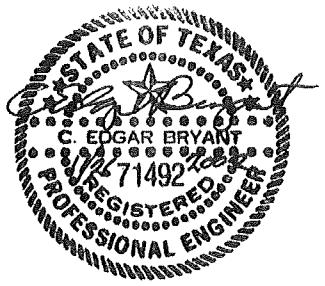
Stabilizer support under hinge of rear home-type door.

Footing Size

Frame

Minimum area required: 6700 lb/2000 psf = 3.35 sq. ft. Effective area available, based on pier size & thickness of footing = (16 x 24)/144 = 2.66 sq. ft.





PROFESSIONAL ENGINEER SEAL

Maximum pier load allowed is 2.66 sq. ft. x 2000 psf = 5,300 lbs.

Therefore, need to reduce spacing to 6 ft, based on Table 4.1A or increase footing size to 20" x 28" and thickness to 6". The effective footing size would then be 20"x28" or 3.88 sq.ft. at 2000psf=7,760lbs. which would allow for a 9 ft. spacing.

Sidewall Openings

Minimum area required: 2500 lb./2000 psf = 1.25sq. ft.

Mating Wall Opening

Minimum area required: 6,600 lb./2000 psf = 3.3 sq. ft. Effective area available is 2.6 sq. ft.;

Therefore need to increase Effective Area by increasing pier base size or footing size. Using double interlocked block increases Effective Area to 4 sq. ft.

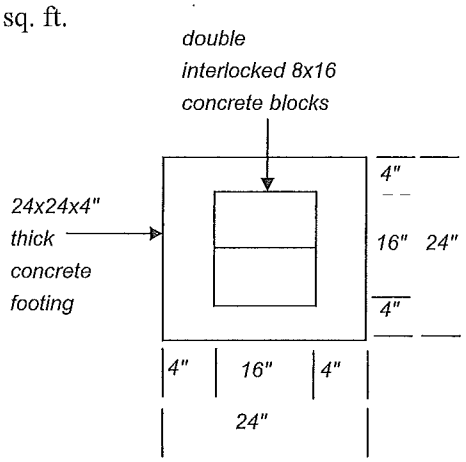
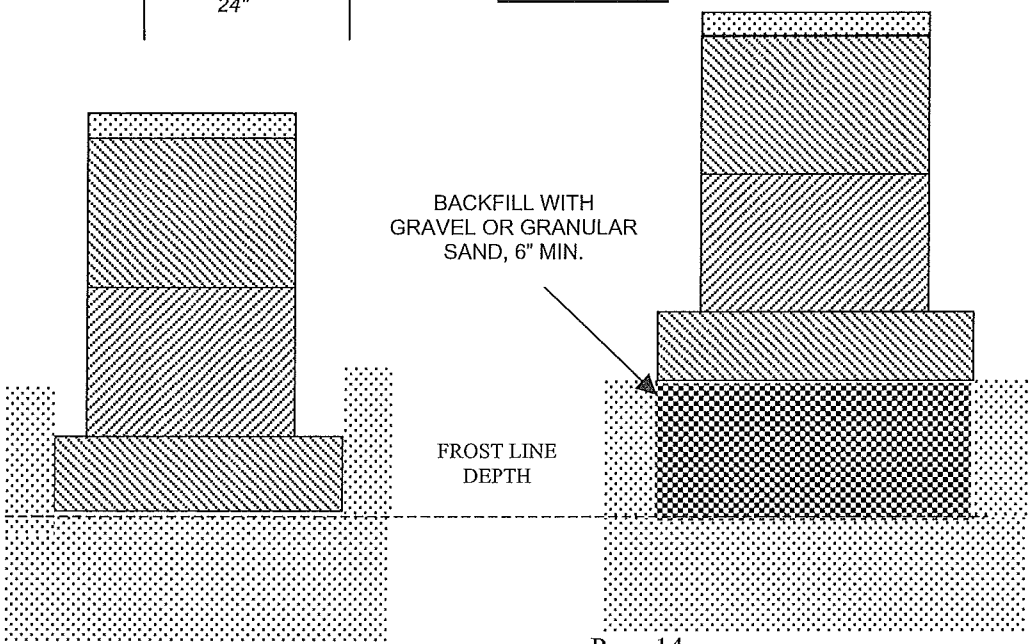


FIGURE 4.7



FOOTINGS FOR FROST AREAS

TO PRECLUDE THE HARMFUL EFFECTS OF GROUND FROST HEAVE, FOOTINGS MUST BE AT OR 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.

4.2.5 Placement In Freezing Climates

- Conventional Footings (Figure 4.7).

When 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.

4.3 OTHER FOUNDATIONS

Check local building codes and regulations when placing the home on a basement, crawl space or load-bearing perimeter foundation. Do not allow an open porch to be installed over a basement or other enclosed space. A qualified registered professional engineer's design may be required. In some instances, the manufacturing facility may provide foundation designs that meet many local codes. Design guidelines may also be found in reference publications such as those listed at the end of this chapter.

4.4 SPECIAL CONSIDERATIONS

4.4.1 Flood-Prone Areas

If the home is intended to be located in a river or coastal flood-prone area, assess the level of hazard, and consider any building or insurance restrictions.

The local Federal Emergency Management Administration (FEMA) is a primary source of information. Consult a qualified registered professional engineer to make sure that the foundation design and construction conform to applicable federal, state and local codes and regulations. Special regulations or flood insurance provisions may apply, which may include unique elevation and anchoring techniques. The FEMA publication listed at the end of this chapter 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 identified on the data plate. These installation instructions are not designed for sites within 1,500 feet of the coastline in Wind Zone II and Wind Zone III.

4.4.3 Special Snow Load

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 qualified registered professional engineer must design them to be acceptable by the local authority having jurisdiction. Extreme snow loads often require a separate specific design for the snow load.

4.5 TABLES

(intermediate spacings require proportional loading.)

TABLE 4.1A: MINIMUM PIER LOADS
FRAME BLOCKING ONLY
When Perimeter Support is Not Required Except at Openings

Nominal Floor Width, ft.	Roof Live Load, PSF	Minimum Pier Capacity, lbs.					
		Maximum Pier Spacing, ft.					
		4	6	8	9	10	11
12	20	2,300	3,400	4,600	5,200 (a)	5,700 (a)	6,300 (b)
	30	2,600	3,900	5,200	5,800 (a)	6,500 (a)	7,100 (b)
	40	2,900	4,300	5,700	6,500 (a)	7,200 (b)	7,900 (b)
14	20	2,700	4,000	5,300	6,000 (a)	6,600 (b)	7,300 (b)
	30	3,000	4,500	6,000	6,700 (a)	7,500 (b)	8,200 (b)
	40	3,300	5,000	6,600 (a)	7,400 (a)	8,300 (b)	9,100 (b)
16	20	2,900	4,400	5,800	6,500 (a)	7,300 (b)	8,000 (b)
	30	3,300	4,900	6,500 (a)	7,300 (b)	8,200 (b)	9,000 (b)
	40	3,600	5,400	7,200 (a)	8,100 (b)	9,000 (b)	9,900 (b)
18	20	3,300	4,900	6,500 (a)	7,400 (b)	8,200 (b)	9,000 (b)
	30	3,700	5,500	7,300 (a)	8,200 (b)	9,200 (b)	10,100 (b)

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

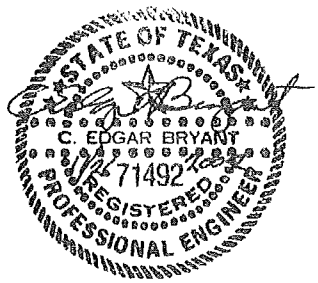
(b) - Minimum 12 inch High Main Frame I-Beam

- IF CONDITIONS CANNOT BE FOUND IN THIS TABLE, USE TABLES 4.2A & B.

TABLE 4.1B: MINIMUM PIER LOADS, LBS
SIDEWALL & MATING WALL OPENINGS (per section)
For Frame Blocking Only, Perimeter Support Not Required Except At Openings
For single piers supporting both mate line walls, double the load shown.

Nominal Floor Width, ft.	Roof Live Load, PSF	Minimum Pier Capacity, lbs.						
		Opening Width, ft.						
		5	10	15	20	25	30	35
12	20	550	1,100	1,650	2,200	2,700	3,250	3,800
	30	750	1,450	2,200	2,900	3,650	4,350	5,100
	40	900	1,800	2,700	3,650	4,550	5,450	6,350
14	20	600	1,250	1,850	2,500	3,100	3,700	4,350
	30	850	1,650	2,500	3,300	4,150	4,950	5,800
	40	1,050	2,050	3,100	4,150	5,150	6,200	7,200
16	20	650	1,300	1,950	2,650	3,300	3,950	4,600
	30	900	1,750	2,650	3,500	4,400	5,250	6,150
	40	1,100	2,200	3,300	4,400	5,450	6,550	7,650
18	20	750	1,450	2,200	2,950	3,650	4,400	5,100
	30	1,000	1,950	2,950	3,900	4,900	5,850	6,850

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

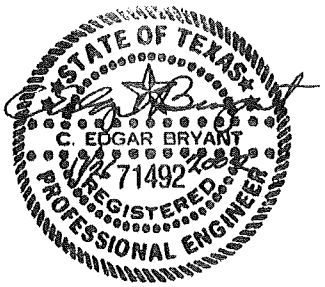


PROFESSIONAL ENGINEER SEAL

TABLE 4.2A: MINIMUM PIER LOADS
FRAME PLUS PERIMETER BLOCKING
Both Frame and Perimeter Blocking Required
For single piers supporting both sides of a mate line , foundation loads must be doubled.

Nominal Floor Width, ft.		Roof Live Load, PSF	Minimum Pier Capacity, lbs.						
			Maximum Pier Spacing, ft.						
			4	5	6	7	8	10	12
12	*Frame*	*20-120*	*1,300*	*1,600*	*2,000*	*2,300*	*2,600*	*3,300*	*3,900*
	Perimeter	20	1,000	1,200	1,500	1,700	2,000	-	-
		30	1,300	1,600	1,900	2,200	2,600	-	-
		40	1,600	2,000	2,400	2,700	3,100	-	-
		60	2,100	2,700	3,200	3,800	4,300	-	-
		80	2,700	3,400	4,100	4,800	5,500	-	-
		100	3,300	4,100	5,000	5,800	-	-	-
		120	3,900	4,900	5,800	-	-	-	-
14	*Frame*	*20-120*	*1,500*	*1,900*	*2,300*	*2,700*	*3,000*	*3,800*	*4,600*
	Perimeter	20	1,100	1,400	1,700	2,000	2,300	-	-
		30	1,500	1,800	2,200	2,600	2,900	-	-
		40	1,800	2,200	2,700	3,100	3,600	-	-
		60	2,400	6,100	3,700	4,300	4,900	-	-
		80	3,100	3,900	4,700	5,400	6,200	-	-
		100	3,800	4,700	5,700	-	-	-	-
		120	4,400	-	-	-	-	-	-
16	*Frame*	*20-80*	*1,700*	*2,100*	*2,600*	*3,000*	*3,400*	*4,300*	*5,100*
	Perimeter	20	1,200	1,500	1,800	2,100	2,400	-	-
		30	1,600	1,900	2,300	2,700	3,100	-	-
		40	1,900	2,400	2,900	3,300	3,800	-	-
		60	2,600	3,300	3,900	4,600	5,200	-	-
		80	3,300	4,100	5,000	5,800	-	-	-
18	*Frame*	*20-40*	*1,900*	*2,400*	*2,900*	*3,400*	*3,900*	*4,800*	*5,800*
	Perimeter	20	1,300	1,700	2,000	2,400	2,700	-	-
		30	1,700	2,200	2,600	3,000	3,500	-	-
		40	2,100	2,700	3,200	3,700	4,300	-	-

- Perimeter support recommended for gypsum board tape and texture homes.
- Perimeter/Mate Line support spacing & loading may not exceed 8 feet.

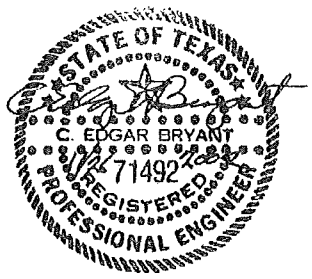


PROFESSIONAL ENGINEER SEAL

TABLE 4.2B: MINIMUM PIER LOADS, LBS
SIDEWALL & MATING WALL OPENINGS (per section)
- Both Frame & Perimeter Blocking Required
For single piers supporting both mating walls, double the load shown.

Nominal Floor Width	Roof Live Load, PSF	Minimum Pier Capacity - Lbs.						
		Mating Wall Opening - Feet						
		5	10	15	20	25	30	35
12	20	1,400	2,000	2,500	3,000	3,600	4,100	4,700
	30	1,900	2,600	3,300	4,100	4,800	5,500	6,200
	40	2,400	3,300	4,200	5,100	6,000	6,900	7,800
	60	3,300	4,600	5,800	7,100	-	-	-
	80	4,200	5,900	7,500	-	-	-	-
	100	5,200	7,200	-	-	-	-	-
	120	6,100	-	-	-	-	-	-
14	20	1,600	2,200	2,800	3,500	4,100	4,700	5,300
	30	2,100	3,000	3,800	4,600	5,400	6,300	7,100
	40	2,700	3,700	4,700	5,800	6,800	7,800	-
	60	3,800	5,200	6,600	-	-	-	-
	80	4,800	6,700	-	-	-	-	-
	100	5,900	-	-	-	-	-	-
	120	7,000	-	-	-	-	-	-
16	20	1,700	2,400	3,000	3,700	4,300	5,000	5,600
	30	2,300	3,200	4,000	4,900	5,800	6,700	7,500
	40	2,800	3,900	5,000	6,100	7,200	-	-
	60	4,000	5,500	7,000	-	-	-	-
	80	5,100	7,100	-	-	-	-	-
18	20	1,900	2,600	3,400	4,100	4,800	5,600	6,300
	30	2,500	3,500	4,500	5,500	6,400	7,400	-
	40	3,200	4,400	5,600	6,800	8,000	-	-

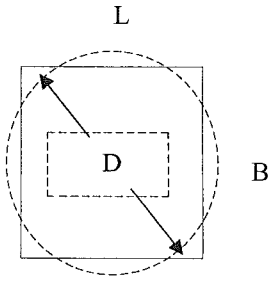
-For piers supporting two adjacent openings, use the sum of the capacities from each span.



PROFESSIONAL ENGINEER SEAL

TABLE 4.3: MINIMUM FOOTING SIZE IN SQUARE INCHES					
PIER LOADS, LBS.	SOIL CAPACITY IN POUNDS PER SQUARE FOOT				
	1000	1500	2000	3000	4000
	SQUARE INCHES				
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

FOOTING SIZE GUIDE		
AREA (INCHES^2)	TYPICAL SIZE (BxL)	EQUIVALENT DIAMETER (D)
128	8x16	18
144	12x16	18
256	16x16	18
384	16x24	24
400	20x20	24
576	24x24	28
720	24x30	32
900	30x30	34
1080	30x36	38
1296	36x36	42
1728	36x48	48
2304	48x48	56



4.5 REFERENCE DOCUMENTS

The following reference documents are identified for informational purposes only.

ANSI/NCSBCS A225.1-1994: *Manufactured Home Installations IBTS, 505 Huntmar ParkDr., Herndon, VA 20170*

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

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

HUD Handbook 4930.3 (1989): *Permanent Foundations Guide for Manufactured Housing, HUD, 415 7th St., SW Washington, DC 20410*

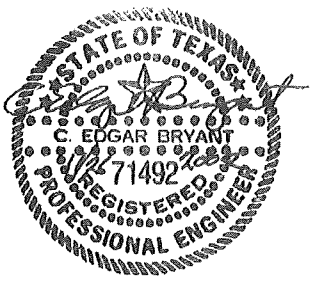
All-Weather Wood Foundation Systems Manual: *National Forest Products Association, 1619 Massachusetts Ave., NW Washington, DC 20036, June 1976*

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

Building Foundation Design Guidebook: *Document No. DE 88013350, National Technical Information Service, 528 Port Royal Road, Springfield, VA22161*

Manufactured Home Installation Guide by Porter, George *Manufactured Housing Institute, 2101 Wilson Boulevard, Suite 610 Arlington, VA. 22201-3062*

Guide to Foundation and Support for Manufactured Homes *Manufactured Housing Research Alliance 2109 Broadway, Suite 203, New York, NY. 10023*



PROFESSIONAL ENGINEER SEAL

CHAPTER 5 INSTALLATION PROCESS

5.1 PRE-INSTALLATION PROCEDURES

After moving the home to the site location, make sure the following items are completed before installation:

- ❑ The home is designed for the proper geographic zone: wind, snow, thermal (Chapter 3).
- ❑ The site is properly prepared (Chapter 3).
- ❑ All footings are properly placed and constructed (Chapter 4).
- ❑ 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.

5.2 POSITIONING THE HOME

- ❑ Place the support piers close to where they will be used and move the home or first section of the home into the desired location.
- ❑ Remove the close-up material (plastic wrap) from areas in which sections will be joined, including the roof cavity. Failure to do so could effect the ventilation characteristics of the home and result in moisture damage. Drive flush or remove all protruding nails or staples or other objects that could hold the sections apart along the mating surfaces.
- ❑ If the home has a hinged roof, refer to section 6.1 or addendum before mating sections together.
- ❑ Locate piers at the ridge beam support columns of the blocked section so they will support both sections. Raise, block and level the section as described in section 5.3.
- ❑ Before the final positioning of the subsequent mating sections, fasten (staple or nail) strips of sill sealer around the mating edges of the floor, walls, and ceiling (at the ceiling panel location) to prevent air infiltration and condensation.
    - 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 that might cross at the floor line or through the ridge beam.

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 appropriate blocking is in place, which will safely support the weight of the home.

    - If there is an internal crossover duct, make certain that a connection seal is in place prior to joining the two sections.
- ❑ Position and align subsequent mating sections near the first section.

Move the home section over to meet the previously installed section using a properly functioning rolling and jacking system in accordance with the system manufacturer's operational instructions.

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.

5.3 RAISING, BLOCKING AND LEVELING

- ❑ Locate 12-ton jacks in front of and behind the axle assembly and at least every 20 feet along the remainder of the I-beam, and directly under the vertical web of the I-beam. To prevent tipping or settling, use a firm, stable wooden support under jacks.
- ❑ Jack only on the main chassis 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 (Figure 5.1).
    - Use jacks only for raising and lowering the home. Do not rely on the jacks to support the home.
    - It is very important that safety support timbers are installed under the home to support its weight (Figure 5.1), and that they follow the

home up as it becomes higher off the ground. Only one side should 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. **For added safety, the tires should always remain on the home until after it is placed on the piers.**

- ❑ Uniformly raise the home to an inch or two above the level you want to set your piers. Take care not to cause the home to lean too much to one side with the jacks; never jack one beam more than 6-inches above the other. The home shall also be in very nearly a level position end to end as the lifting process proceeds.

- ❑ Design and locate piers as required by Chapter 4. Adjust all pier heights using a transit, water level (Figure 5.2) or other acceptable leveling procedure. Since the level will be setting the tops of the piers at the point you wish the bottom of the main beam to be, any 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 and the shims & caps.

- ❑ 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. Lower the outside beam first and then the inner beam, while using several come-a-longs to tighten secondary sections of the home to the set section.

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 their operation, check that area with the level. If the home is found to be level and properly supported then adjust the window or door to the home.

- ❑ Remove the safety supports.

5.4 INTERCONNECTION OF MULTI-SECTION HOMES

- ❑ After the sections have been positioned together, aligned, and leveled, install the lag screws to connect the floors as shown in Figure 5.3. If the home has through-the-floor-crossover air ducts, make sure the spacing of the lags avoids the duct area.

  - Gaps between floors, roofs and column supports, 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 fastener length by 1.5 times the thickness of the shims.

  - 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 the side rails together.

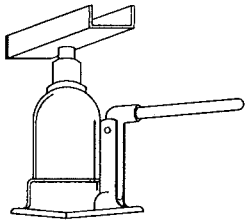
  - Continue to check, level, and fasten the sections together for the length of the home.

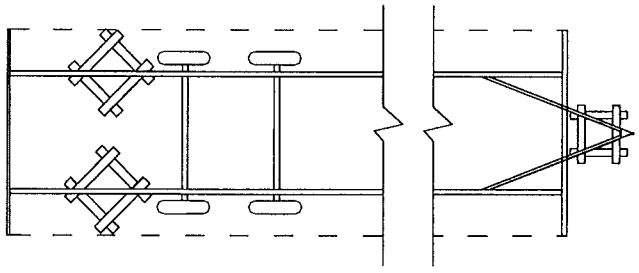
FIGURE 5.1

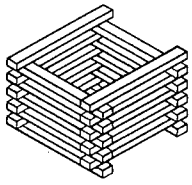
BLOCKING IS RECOMMENDED BEHIND THE AXLE AREA AND AT THE HITCH END OF THE UNIT, AS SHOWN.

FRAMESAVER

JACK WITH STAND







TYPICAL BLOCKING
Use 4x6 Timbers
5 Foot Long
Stack as Shown

- Any holes cut in the bottom covering must be repaired (Chapter 9.)

- ❑ Align the ceiling and the end walls of the sections with each other on the inside of the home.
- ❑ If the sections are not in proper alignment, they may be adjusted (racked) by raising (jacking) the two opposite corners of the home. This will cause the ceiling on the opposite side to move forward.

When the end walls become flush, fasten them together at the front and back end of the home with16d nails, or equivalent, spaced at a maximum of 18 inch on center. Once the end walls 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.

FIGURE 5.2

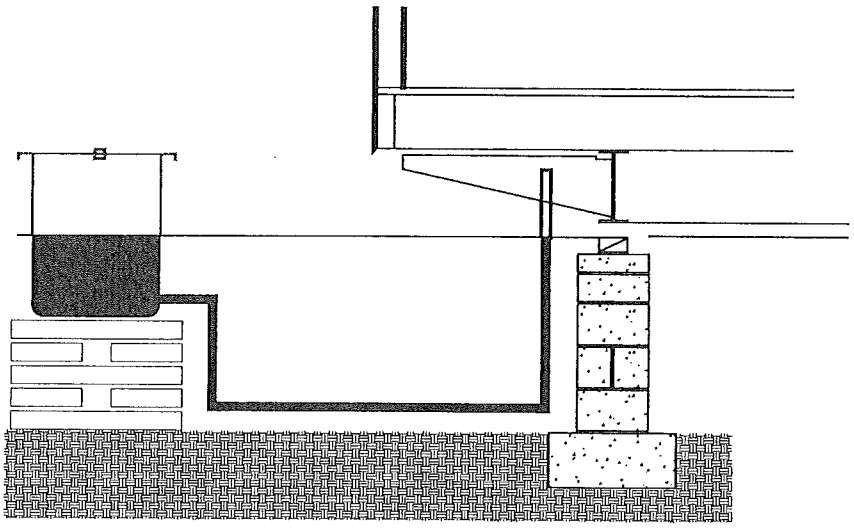
HOW TO USE A WATER LEVEL

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 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.

- 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 it's final position.

- 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 the tubing can be moved without losing any of the liquid. 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.



WATER LEVEL

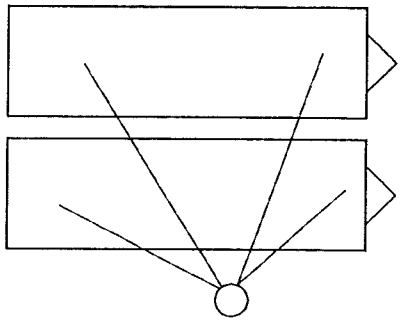


FIGURE 5.3

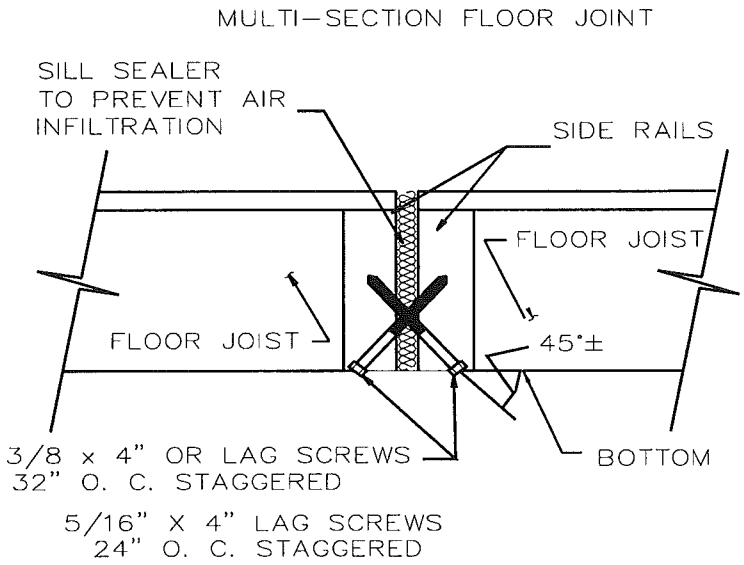


FIGURE 5.4

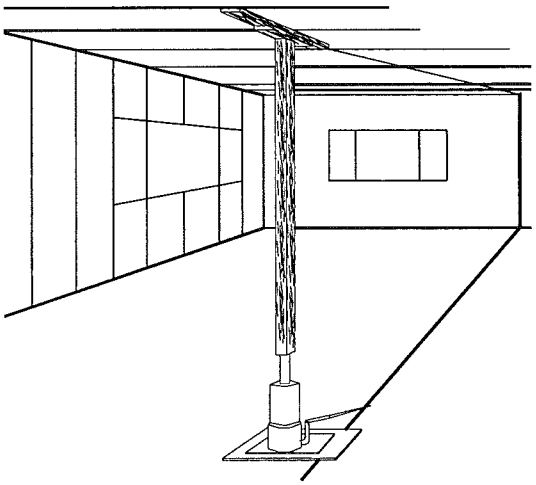


FIGURE 5.5

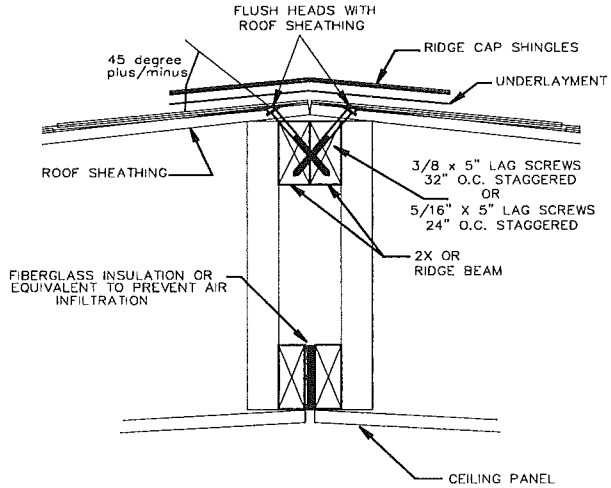


FIGURE 5.6

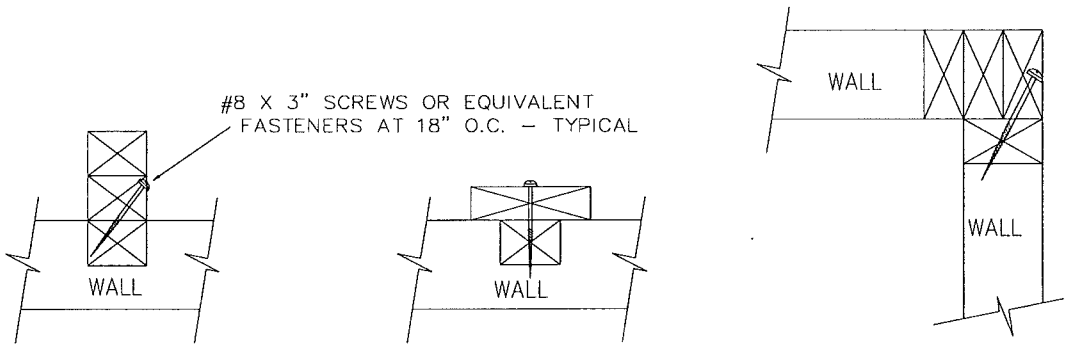
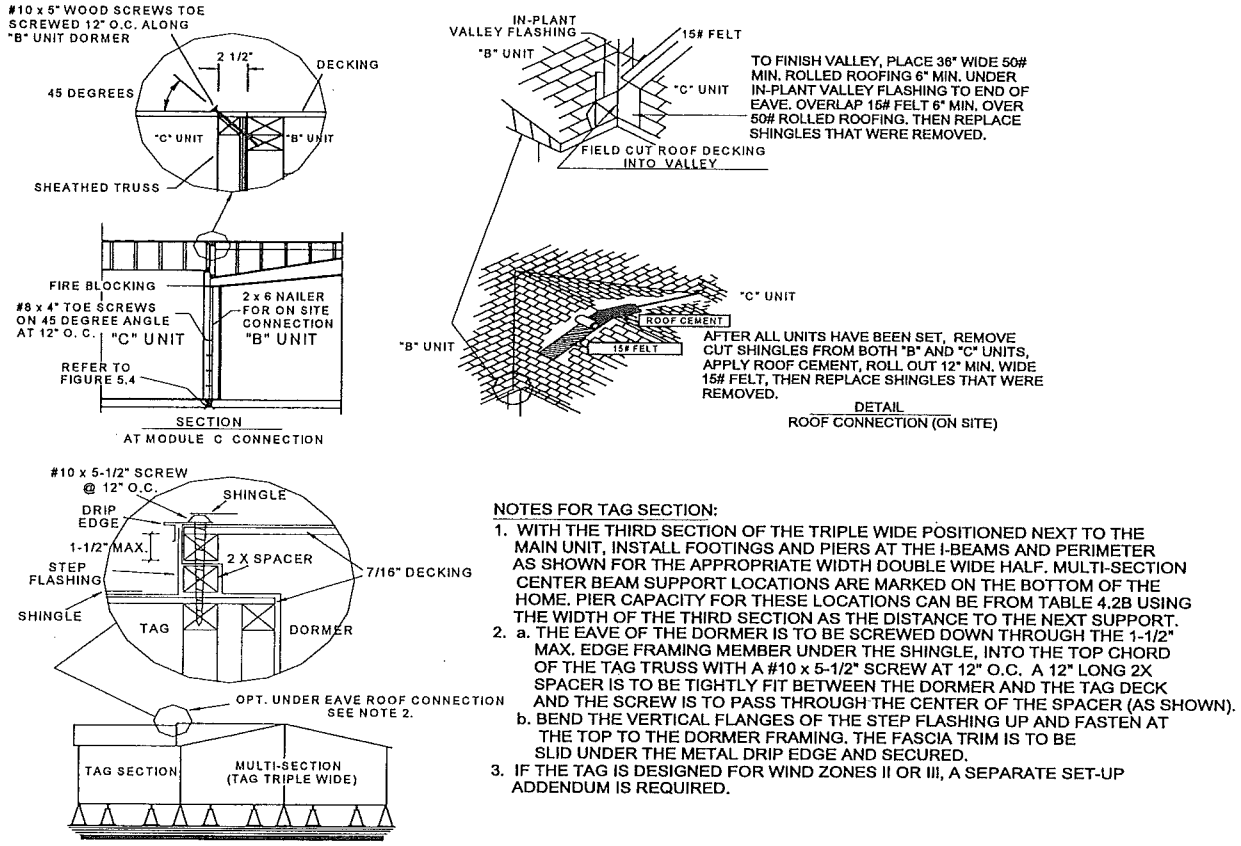


FIGURE 5.7
CONNECTION OF TAG TRIPLES



NOTES FOR TAG SECTION:

1. WITH THE THIRD SECTION OF THE TRIPLE WIDE POSITIONED NEXT TO THE MAIN UNIT, INSTALL FOOTINGS AND PIERS AT THE I-BEAMS AND PERIMETER AS SHOWN FOR THE APPROPRIATE WIDTH DOUBLE WIDE HALF. MULTI-SECTION CENTER BEAM SUPPORT LOCATIONS ARE MARKED ON THE BOTTOM OF THE HOME. PIER CAPACITY FOR THESE LOCATIONS CAN BE FROM TABLE 4.2B USING THE WIDTH OF THE THIRD SECTION AS THE DISTANCE TO THE NEXT SUPPORT.
2. a. THE EAVE OF THE DORMER IS TO BE SCREWED DOWN THROUGH THE 1-1/2" MAX. EDGE FRAMING MEMBER UNDER THE SHINGLE, INTO THE TOP CHORD OF THE TAG TRUSS WITH A #10 x 5-1/2" SCREW AT 12" O.C. A 12" LONG 2X SPACER IS TO BE TIGHTLY FIT BETWEEN THE DORMER AND THE TAG DECK AND THE SCREW IS TO PASS THROUGH THE CENTER OF THE SPACER (AS SHOWN).
   b. BEND THE VERTICAL FLANGES OF THE STEP FLASHING UP AND FASTEN AT THE TOP TO THE DORMER FRAMING. THE FASCIA TRIM IS TO BE SLID UNDER THE METAL DRIP EDGE AND SECURED.
3. IF THE TAG IS DESIGNED FOR WIND ZONES II OR III, A SEPARATE SET-UP ADDENDUM IS REQUIRED.

- ❑ Look for low points by carefully inspecting the ceiling or by using a straight edge. Start in the front and work to the back of the home. To raise a low portion, use a hydraulic jack and a padded tee underneath the low point (Figure 5.4). Carefully raise the jack until the adjoining ceiling sections are flush. Then, fasten the two ridge beams together on the outside of the home.

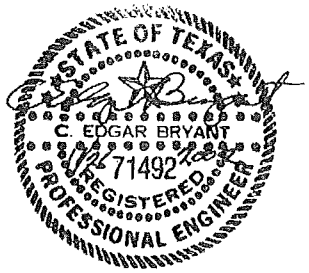
- ❑ Secure adjoining roof sections together by installing lag screws at a 45-degree angle so they penetrate both ridge beams (Figure 5.5). Install the lag screws from alternate sides.

- ❑ Remember that the fasteners are used to secure the sections together and must **NOT** be used as a way to pull the roofs together.

- ❑ Check inside the home along the centerline for a label that identifies any support column requiring special attachment. If found, fasten support columns to the structure of the other section as shown in Figure 5.6.

- ❑ 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.

  - Special connection details are shown in Figures 5.7 and 5.8 for Triple-Wide homes.



PROFESSIONAL ENGINEER SEAL

5.5 CLOSURE

5.5.1 Exterior Roofs

Composition shingle roofs: cover the joint between roof sections with a piece of 8 inch wide roofing felt or underlayment, stapled to the underlying roof decking with 16 ga. x 1 inch x 1 inch staples spaced a maximum of 6 inches apart. Use 36 inch x 12-inch shingles cut into three sections for the ridge cap. Start from the end that is opposite the direction of the prevailing wind. Overlap each ridge shingle per manufacturers instructions and secure with four 16 ga. x 1 inch x 1-inch staples or roofing nails (Figure 5.5). Also see Figures 5.7 and 5.8.

Metal roofs: use an 8 inch wide galvanized metal cap to cover the joint. Apply sealant tape under edge of cap. Secure the cap down each side with 1inch 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 (Figure 5.9).

Other roofing materials may be used in accordance with their manufacturer's installation instructions.

5.5.2 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 (Figure 5.10).

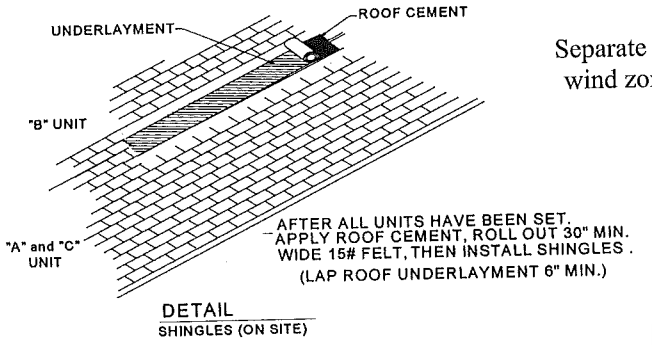
5.5.3 Exterior Trim

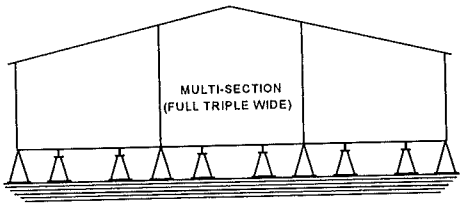
Homes manufactured with wood or vinyl siding are described in Figure 5.11. The closure material is shipped with each home and can be identified by matching it with the front and rear of the home.

- Remove any polyethylene material from the end walls and install the siding with the provided fasteners, using the nailing pattern given in Figure 5.11.
- Install the matching bottom trim in the front and rear with the nails provided.

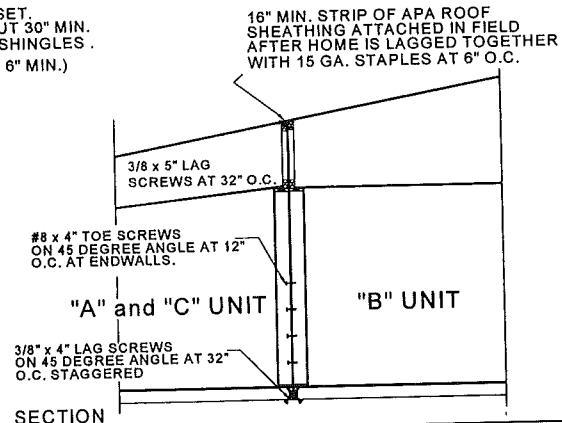
FIGURE 5.8
CONNECTION OF FULL TRIPLES

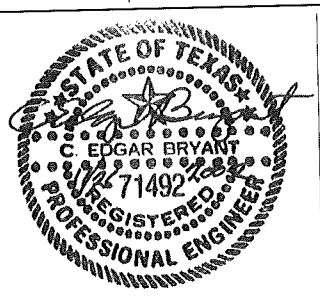
Separate set-up addendum is required if home is designed for wind zones II and III, or offset more than 4' in wind zone I.





FRAME OR FRAME PLUS PERIMETER BLOCKING SEE SUPPORT TABLE





PROFESSIONAL ENGINEER SEAL

FIGURE 5.9
METAL ROOF JOINT

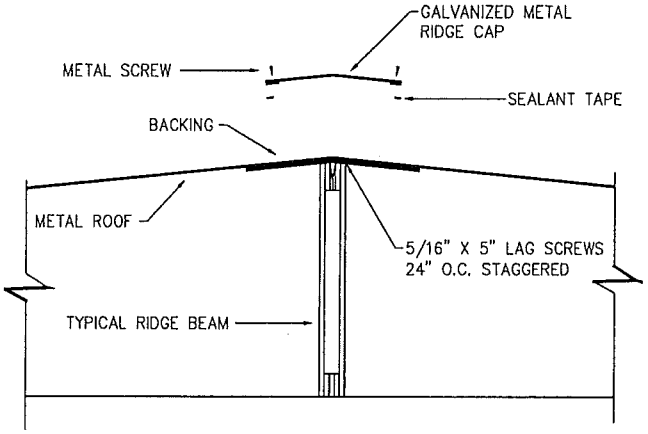
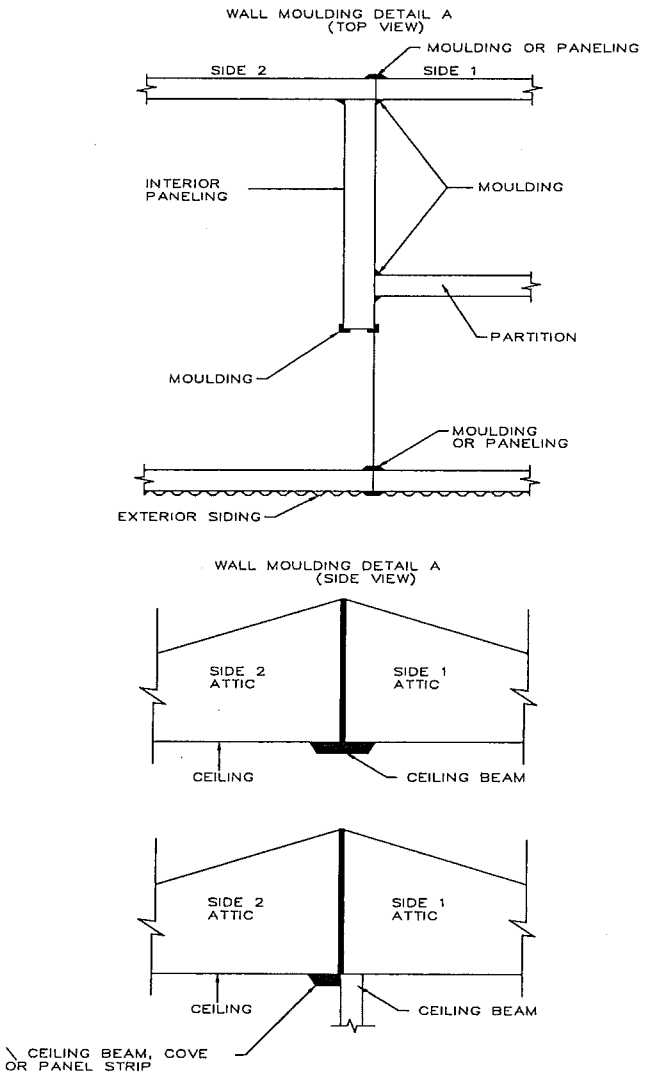


FIGURE 5.10
INTERIOR TRIM



- Match and install the gable trim material

- 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.

5.5.4. Metal Siding

Install the bottom starter with the fasteners provided, and then install the siding by snapping the pieces into the S-Locks. Secure with the screws provided. Attach the roof closure metal to the front and rear roof.

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.

5.5.5 Utility Crossovers

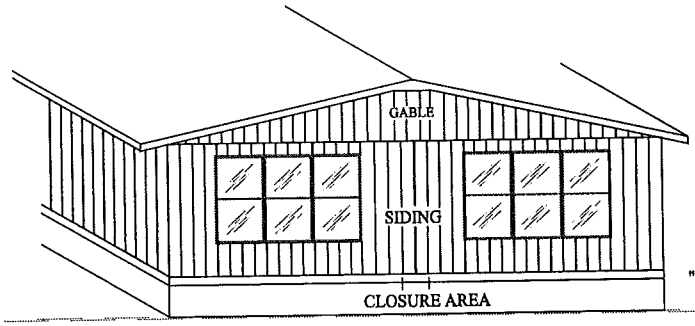
Water, drainage, gas, electricity, and telephone utility crossovers. Correct procedures are outlined in Chapter 8.

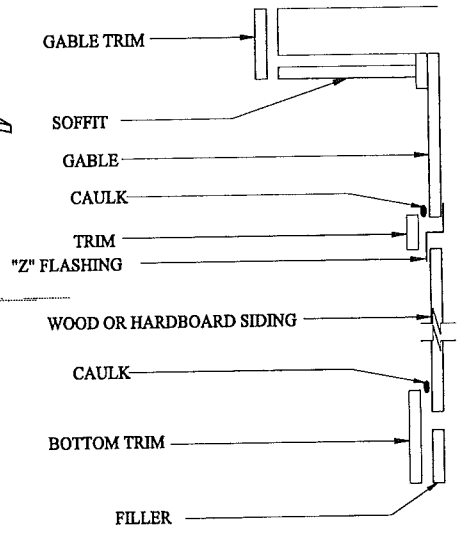
5.6 ANCHORING INSTRUCTIONS

The home must be anchored to the ground in order to resist overturning and lateral movement (sliding) caused by wind. The ground anchoring system described in this section is one acceptable method of anchoring the home to the ground. See Section 5.6.5 for other acceptable systems. Unless otherwise noted, all tie down and anchoring instructions are for homes with a roof pitch that does not exceed 20 degrees (4.3 inches rise for every 12 inches in run).

FIGURE 5.11

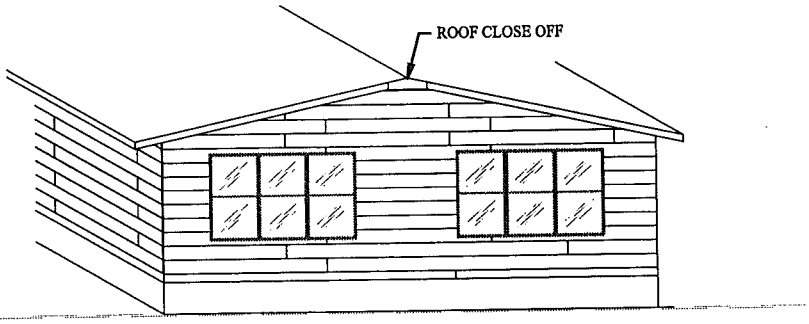
EXTERIOR CLOSURE - WOOD OR HARDBOARD SIDING



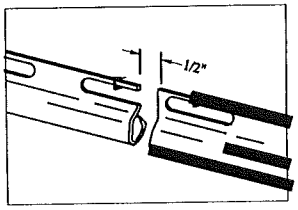


SIDE VIEW

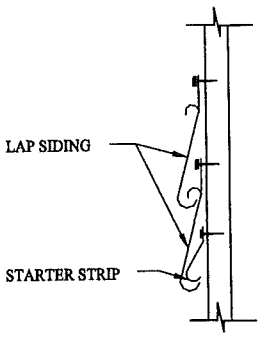
EXTERIOR CLOSURE - LAP SIDING



FRONT OR REAR VIEW



STARTER STRIP



SIDE VIEW

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" LOMG 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 ACCRSSORIES. 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.

5.6.1 Locate the Ground Straps

Anchors are required within 2 feet of each end wall. Add additional anchors using Table 5.1 to identify the proper spacing between tie-down straps. Measurements for the specific location of the ground anchors must be taken directly from the home unless an anchor plan is provided. *[The Manufactured Housing Research Alliance (MHRA) chart "Maximum Anchor Spacing Selector", dated 3/1/00, may be used as an alternate to Table 5.1 provided the anchor selection and installation is in full compliance with all requirements on that chart.]*

In Wind Zones II and III, a vertical sidewall strap is required at each diagonal frame strap. Therefore diagonal frame straps must be located to coincide with the factory installed vertical straps or brackets.

5.6.2 Types of Ground Anchors & Straps

Ground anchors for all Wind Zones must have a stabilizer plate at the top of the anchor unless the ground anchor manufacturer's instructions do not require them 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. Instead of a stabilizing plate, ground anchors may be installed vertically with an adequate concrete cylindrical "collar" poured around the anchor shaft.

Ground anchors for Wind Zone I may have a single head. Ground anchors for Wind Zone II and III must have double heads.

Straps must be minimum 1 ¼" x 0.035 " zinc coated (0.30 oz per sq. ft.) steel strapping conforming to ASTM D3953, Type 1, Grade 1, Finish B with a minimum working load capacity of 3150 lbs. and a minimum ultimate load capacity of 4725 lbs. Slit or cut edges of zinc-coated strapping do not need to be zinc coated.

Instructions for Using Table 5.1

This Table is used to find the horizontal spacing between ground anchors, on the long sides of the home. To determine the appropriate Anchor Spacing, in feet, do the following:

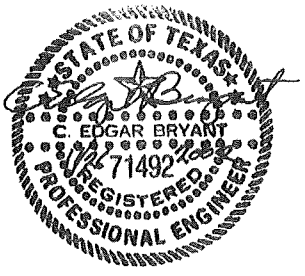
1. Identify the following:
   a.) **Section Width (W)**, in feet (nominal) (does not include projections or overhangs.) On multi-section units with varying Section Widths, use the narrowest section;
   b.) **Main I-beam Spacing (W_{FR})**, is distance between I-beams, in inches;
   c.) **Pier Height (H_P)**, in inches, is the distance to the bottom of the I-beam from grade. Use the tallest pier in determining the Pier Height;
   d.) the **Wind Zone** for the home site. (A map of the three Wind Zones is on the Data Plate provided with the home.)
2. In the table, find the group of rows associated with the home's Section Width (**W**), and then find the subgroup of rows for the correct I-Beam Spacing (W_{FR}). Select the row which identifies the max. Pier Height (H_P).
3. Select the column for the appropriate Wind Zone and Sidewall Height (floor to ceiling measurement, in inches.). The intersection of the selected row and column provides the maximum appropriate Anchor Spacing, in feet.
4. All the spacings given in Table 5.1 are based on straps connected to the **Near Beam** (DETAIL A, FIGURE 5.12). Homes in Wind Zones II and III may be anchored with straps to the **Far Beam** at the spacings specified in the Table 5.1 footnotes.

NOTE: The Anchor Spacings are determined based on the angle the strap makes with respect to the ground (DETAIL A, FIGURE 5.12) which is based on the Pier Height (**HP**), The Section Width (**W**), the I-Beam Spacing (W_{FR}), and the assumption that the ground anchor is inset towards the frame no more than 6" from the perimeter of the home. The angle may not be exceeded (the Pier Height increased or the horizontal distance between the anchor and the I-beam decreased) without causing the design load on the strap to exceed its capacity. Other designs that result in the same strap angle (Pier Height and Horizontal Distance between anchor and I-beam changed proportionetly) may be used at the same spacings given in the Table.

TABLE 5.1: Max. Tie-Down Spacing For Maximum Sidewall Heights (in.)

W	W_{FR}	H_P	Wind Zone I: Diagonal Ties Only to Near Beam						Wind Zone II: Diagonal & Vertical Ties to Near Beam[1]					Wind Zone III: Diagonal & Vertical Ties to Near Beam[1]		
			84	90	96	102	108	114	84	90	96	102	108	84	90	96
12	80	20	12'-4"	11'-6"	10'-10"	10'-3"	9'-8"	9'-3"	5'-4"	5'-4"	5'-4"	5'-4"	5'-4"	4'-0"	4'-0"	4'-0"
		40	8'-10"	8'-4"	7'-10"	7'-5"	7'-0"	6'-8"	FAR	FAR	FAR	FAR	FAR	4'-0"	FAR	FAR
		60	6'-9"	6'-4"	6'-0"	5'-8"	5'-4"	5'-1"	FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
		80	5'-5"	5'-1"	4'-10"	4'-6"	4'-3"	4'-1"	FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
	96	20	9'-11"	9'-3"	8'-9"	8'-3"	7'-10"	7'-5"	5'-4"	FAR	FAR	FAR	FAR	4'-0"	4'-0"	4'-0"
		40	6'-8"	6'-3"	5'-11"	5'-7"	5'-3"	5'-0"	FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
		60	5'-0"	4'-8"	4'-5"	4'-2"	3'-11"		FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
	99.5	20	9'-3"	8'-8"	8'-2"	7'-8"	7'-4"	6'-11"	FAR	FAR	FAR	FAR	FAR	4'-0"	4'-0"	FAR
		40	6'-2"	5'-10"	5'-5"	5'-2"	4'-11"	4'-8"	FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
		60	4'-7"	4'-4"	4'-1"				FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
14	80	20	14'-1"	13'-3"	12'-5"	11'-9"	11'-2"	10'-7"	5'-4"	5'-4"	5'-4"	5'-4"	5'-4"	4'-0"	4'-0"	4'-0"
		40	10'-10"	10'-2"	9'-7"	9'-0"	8'-7"	8'-1"	5'-4"	5'-4"	5'-4"	FAR	FAR	4'-0"	4'-0"	4'-0"
		60	8'-6"	8'-0"	7'-6"	7'-1"	6'-9"	6'-5"	FAR	FAR	FAR	FAR	FAR	4'-0"	FAR	FAR
		80	7'-0"	6'-6"	6'-2"	5'-10"	5'-6"	5'-3"	FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
	96	20	12'-6"	11'-9"	11'-1"	10'-5"	9'-11"	9'-5"	5'-4"	5'-4"	5'-4"	5'-4"	5'-4"	4'-0"	4'-0"	4'-0"
		40	9'-1"	8'-6"	8'-0"	7'-7"	7'-2"	6'-10"	FAR	FAR	FAR	FAR	FAR	4'-0"	4'-0"	FAR
		60	7'-0"	6'-6"	6'-2"	5'-10"	5'-6"	5'-3"	FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
		80	5'-7"	5'-3"	4'-11"	4'-8"	4'-5"	4'-3"	FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
	99.5	20	12'-1"	11'-4"	10'-8"	10'-1"	9'-7"	9'-1"	5'-4"	5'-4"	5'-4"	5'-4"	FAR	4'-0"	4'-0"	4'-0"
		40	8'-8"	8'-1"	7'-8"	7'-3"	6'-10"	6'-6"	FAR	FAR	FAR	FAR	FAR	4'-0"	FAR	FAR
		60	6'-7"	6'-2"	5'-10"	5'-6"	5'-3"	4'-11"	FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
		80	5'-4"	5'-0"	4'-8"	4'-5"	4'-2"	4'-0"	FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
16	80	20	15'-0"	14'-7"	13'-8"	12'-11"	11'-5"	10'-3"	5'-4"	5'-4"	5'-4"	5'-4"	5'-4"	4'-0"	4'-0"	4'-0"
		40	12'-8"	11'-10"	11'-2"	10'-7"	10'-0"	9'-6"	5'-4"	5'-4"	5'-4"	5'-4"	5'-4"	4'-0"	4'-0"	4'-0"
		60	10'-4"	9'-8"	9'-2"	8'-8"	8'-2"	7'-9"	5'-4"	5'-4"	FAR	FAR	FAR	4'-0"	4'-0"	4'-0"
		80	8'-8"	8'-1"	7'-7"	7'-2"	6'-10"	6'-6"	FAR	FAR	FAR	FAR	FAR	4'-0"	FAR	FAR
	96-99.5	20	14'-4"	13'-5"	12'-8"	11'-11"	11'-4"	10'-9"	5'-4"	5'-4"	5'-4"	5'-4"	5'-4"	4'-0"	4'-0"	4'-0"
		40	11'-1"	10'-4"	9'-9"	9'-3"	8'-9"	8'-4"	5'-4"	5'-4"	5'-4"	5'-4"	FAR	4'-0"	4'-0"	4'-0"
		60	8'-9"	8'-3"	7'-9"	7'-4"	6'-11"	6'-7"	FAR	FAR	FAR	FAR	FAR	4'-0"	FAR	FAR
		80	7'-2"	6'-9"	6'-4"	6'-0"	5'-8"	5'-5"	FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR
18	80-99.5	20	15'-0"	14'-10"	14'-0"	13'-2"	12'-6"	11'-11"	5'-4"	5'-4"	5'-4"	5'-4"	5'-4"	4'-0"	4'-0"	4'-0"
		40	13'-1"	12'-3"	11'-7"	10'-11"	10'-4"	9'-10"	5'-4"	5'-4"	5'-4"	5'-4"	5'-4"	4'-0"	4'-0"	4'-0"
		60	10'-10"	10'-2"	9'-7"	9'-0"	8'-7"	8'-1"	5'-4"	5'-4"	5'-4"	FAR	FAR	4'-0"	4'-0"	FAR
		80	9'-1"	8'-6"	8'-0"	7'-7"	7'-2"	6'-10"	FAR	FAR	FAR	FAR	FAR	FAR	FAR	FAR

W = Nominal Section Width (ft.), per Section. See Figure 5.12.
W_{FR} = Frame Width (in.). See Figure 5.12.
H_P = Max. Pier Height, (in.). See Figure 5.12.
1 - Configurations showing "FAR" must have straps moved to the far beam at a maximum spacing of 5'-4" for Wind Zone II and 4'-0" for Wind Zone III.



PROFESSIONAL ENGINEER SEAL

Anchors and anchoring equipment shall be certified by a professional engineer, architect or a nationally recognized testing laboratory as to their resistance, based on the maximum angle of diagonal tie or and/or vertical tie loading, in accordance with ASTM Standard Specification D3953.

5.6.3 Tie-Down Installation

The home should be set on its piers and be level, with sections fastened together, before ground straps are installed.

- Install ground anchors vertically with stabilizers as shown in Figure 5.12. All ground anchors shall be embedded below the frost line and be at least 12 inches above the water table.

- Connect the straps to the ground anchor heads and the home as instructed by the anchor manufacturer and to prevent structural damage to the home.

- Install diagonal straps from the anchor to either the near or far chassis I-beam as indicated by Table 5.1.

- For Wind Zone II and III, connect anchors to the vertical factory-installed straps or brackets at the sidewalls of the home. Vertical ground straps must be fastened to anchors capable of resisting the total tension of both straps. Protect straps where they pass over sharp corners (Figure 5.12).

- Tighten straps to remove slack. After all straps are installed and the slack is removed, lightly tension the straps to assure that the ground anchor shaft is in full contact with the stabilizer. Alternate tightening on opposite sides of the home to avoid moving the home. Periodic inspection of the straps is important; it may be necessary to retighten the straps from time to time. CAUTION: During re-leveling, do not jack the home against tight straps.

5.6.4 End Straps

Each end of the home is required to be strapped longitudinally to resist wind forces on the end wall (Figure 5.13). Use swivel brackets (available from anchor equipment manufacturers), where necessary, to prevent angular stress on the straps. Wind Zone III homes wider than 42 feet are not included in this design.

5.6.5 Other Acceptable Systems

The pier and ground anchor system described in this manual is a common method to stabilize the home. Other systems are acceptable when allowed by the authority having jurisdiction, when installed in accordance with the system manufacturer's instructions, and when certified by a qualified registered professional engineer. Such systems may include but are not limited to:

- Vector Dynamics Foundation System by Tie Down Engineering, Inc., Atlanta, GA
- OTI Steel Foundation by Oliver Technologies, Inc.
- Minute Man EZ Anchor Adjustable Support Tube System, by Minute Man Anchors, Inc.
- Rigid Foundation Anchoring System by JM Products, Inc.
- W. Byrd Cast-In-Place Ground Anchor and Stabilizer System.

5.7 SPECIAL CONSIDERATIONS

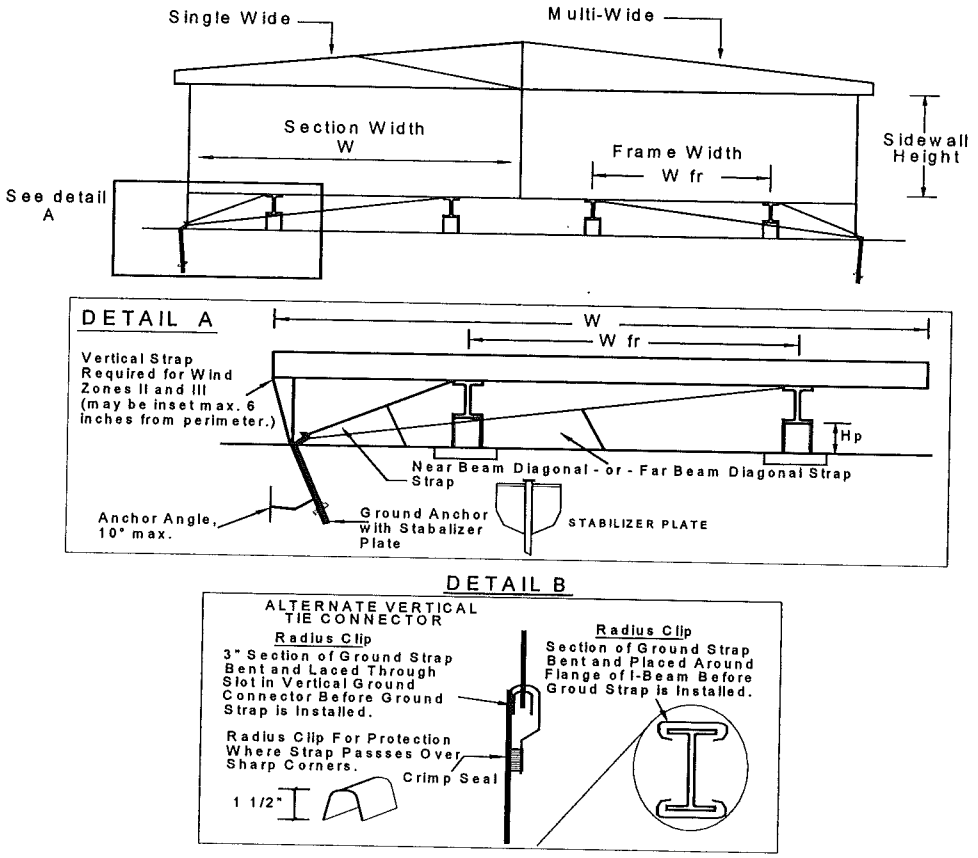
5.7.1 Elevated Homes

Homes with high piers (Figure 5.1) may require straps connected to the "Far Beam" as shown in Figure 5.12. Deviations from these guidelines shall be reviewed by a qualified registered engineer and approved by the local authority having jurisdiction over such matters.

5.7.2 Severe Climatic Conditions

- (Also see Section 4.4.)

FIGURE 5.12
TIE-DOWN DETAILS-TYPICAL



5.7.3 Freezing Climates

Be sure anchor augers are installed below the frost line.

5.7.4 Severe Wind Zones

The home shall not be installed in any zone that requires greater wind-resisting capabilities than those for which it was designed (see Data Plate).

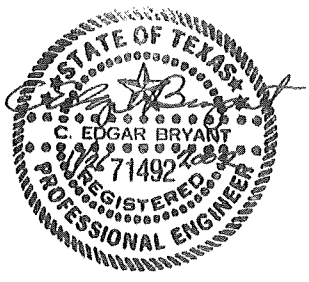
5.7.5 Flood-Prone Areas

The manufacturer does not recommend setting 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 and special elevated foundations may be required in flood-prone areas. Consult a registered professional engineer.

5.8 SKIRTING

Skirting, if used, shall be of durable materials suitable for exterior exposures. 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.

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.



PROFESSIONAL ENGINEER SEAL

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 (Chapter 3), lot is properly graded, 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 1500 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.

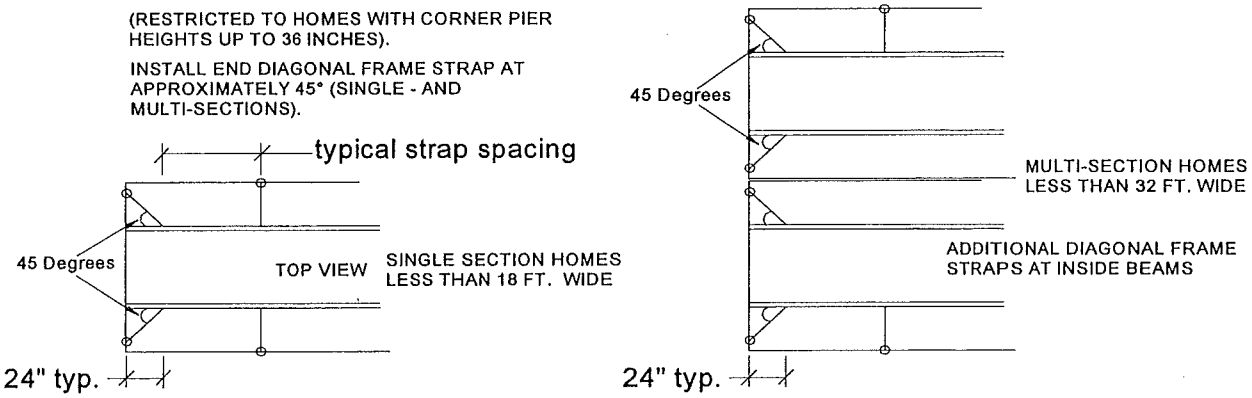
Dryer vents, air-conditioning condensation drains, and combustion air inlets must pass through the skirting to the outside.

FIGURE 5.13 LONGITUDINAL STRAPS

DETAIL A WIND ZONE I

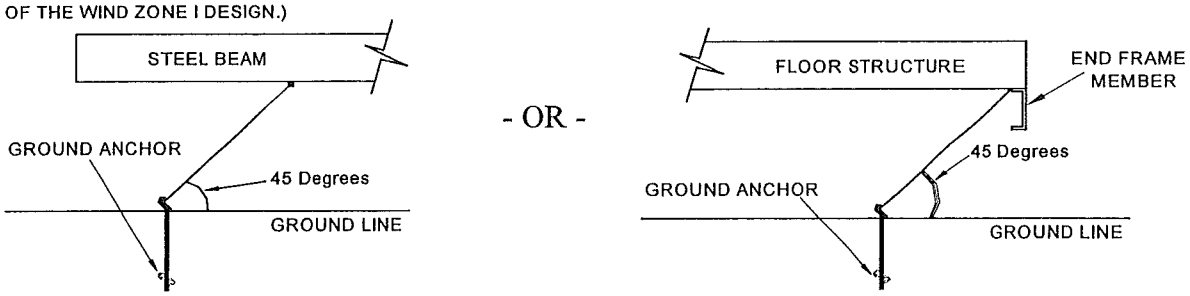
(RESTRICTED TO HOMES WITH CORNER PIER HEIGHTS UP TO 36 INCHES).

INSTALL END DIAGONAL FRAME STRAP AT APPROXIMATELY 45° (SINGLE - AND MULTI-SECTIONS).

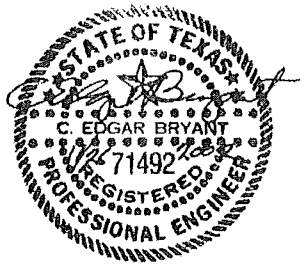


DETAIL B WIND ZONE II AND III

(ALSO APPLICABLE TO WIND ZONE I HOMES THAT ARE WIDER THAN OR INSTALLED HIGHER THAN THE RESTRICTIONS OF OF THE WIND ZONE I DESIGN.)



- TWO STRAPS, EACH SECTION.
- WIND ZONE III HOMES WITH SIDEWALLS GREATER THAN 84 INCHES REQUIRE MIN. 3 STRAPS, EACH SECTION WITH ANCHORS AT LEAST 4' APART. WIND ZONE III HOMES MAY NOT EXCEED 96 INCHES SIDEWALLS.



PROFESSIONAL ENGINEER SEAL

6.1 HINGED ROOFS

If the home has an optional hinged roof or eaves, see Figure 6.1A & B for wind zone I and 4.3:12 roof pitch maximum. Alternate designs shall be described in an installation addendum. 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 INSTALLATION OF ON-SITE ATTACHED STRUCTURES

Any structures, devices, accessories, etc. added by others are not the responsibility of the home manufacturer. 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.

6.3.1 Garages and Carports

A garage or carport must be supported independently of the factory-built portion of the home and to all applicable local codes. Electrical circuits in garages shall be provided with ground fault interruption.

6.3.2 Awnings

Choose freestanding products with columns to support their weight. Where snow loads do not exceed 10 pounds per square foot, 12 foot wide maximum awnings with a one pound per square foot dead load may be attached directly to the home in accordance with local jurisdictional authority,

6.3.3 Porches

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

FIGURE 6.1A

HINGED ROOF

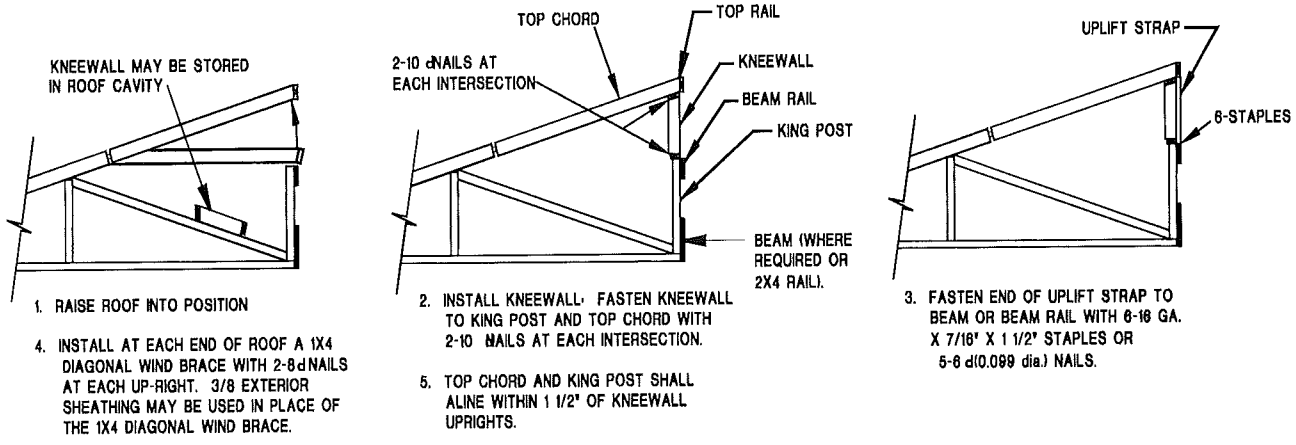
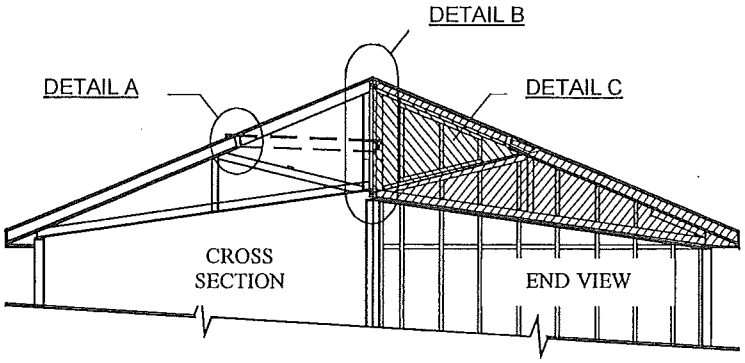


FIGURE 6.1B

HINGED ROOF SETUP PROCEDURE



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 2x4 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 HOME.

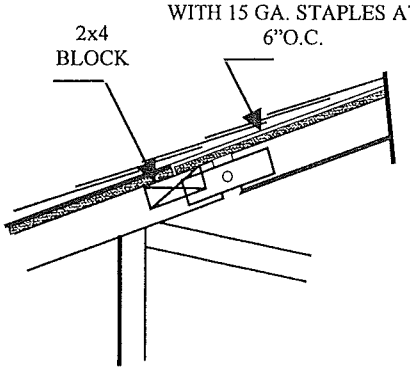
5- FROM THIS POINT ON, THE CONNECTION ARE THE SAME AS A TYPICAL DOUBLE SECTION.

6- FURNACE/FIREPLACE/ WOOD BURNING STOVE AND WATER HEATER VENT STACKS MUST BE SIZED (FOR LENGTH) AND INSTALLED PER MANUFACTURER INSTALLATION INSTRUCTIONS INCLUDED IN HOME.

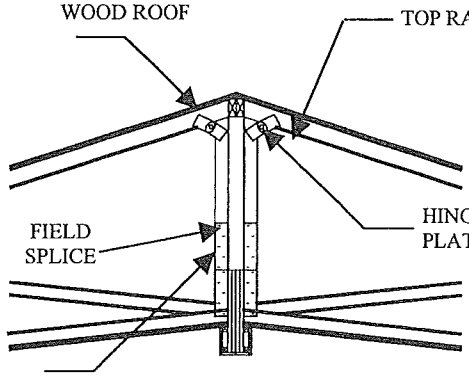
7- PLUMBING VENT PIPES MUST EXTEND THROUGH THE ROOF.

DETAIL A

ROOF SHEATHING STAPLED TO 2x4 BLOCK WITH 15 GA. STAPLES AT 6"O.C.



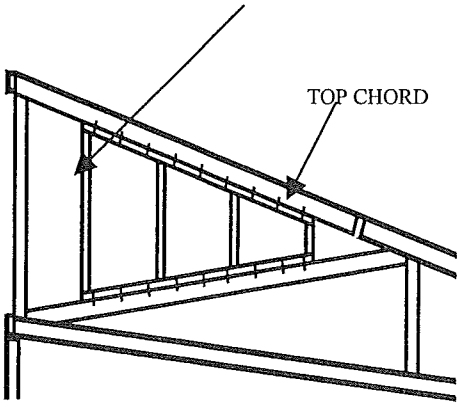
DETAIL B



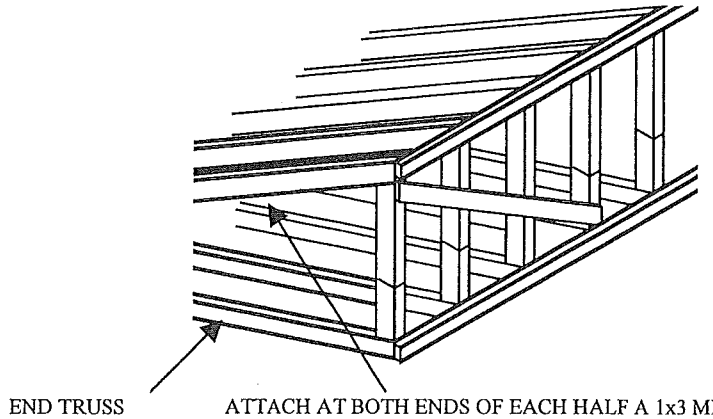
12" 2x3 SPF ATTACHED TO ONE SIDE OF TRUSS WITH (5) 7/16"x2-1/2"x15GA. STAPLES STAGGERED EACH END (OR EQUAL)

DETAIL C

WEDGE ATTACHED TO TRUSS TOP CHORD AND WEB WITH 7/16"x2-1/2"x15GA STAPLES AT 6" O.C.



DETAIL D



ATTACH AT BOTH ENDS OF EACH HALF A 1x3 MIN. DIAGONAL BRACE FROM TOP END OF TRUSS AT APPROX. 45 DEGREES. KEEP TRUSSES UPRIGHT. FASTEN 1x3 TO EACH TRUSS VERTICAL WITH (2) 7/16"x1-3/4"x16GA. STAPLES.

6.3.4 Steps, Stairways and Landings

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

6.4 ACCESSORY WINDOWS

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

6.5 MISCELLANEOUS LIGHTS AND FIXTURES

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

6.5.1 Exterior Lights

Remove any junction box covers and make wire-to-wire connections using wire nuts. Connect the wires as follows: black to black, white to white, and ground to ground. Push the wires into the box and secure the light fixture to ensure a watertight seal to the sidewall. Install the light bulb and attach the globe. Refer to Figure 6.2A.

6.5.2 Ceiling Fans

To reduce the risk of injury, install ceiling fans with the lowest edges of the blades at least 76 inches above the floor. Follow the manufacturer's instructions. If no instructions are available, connect the wiring as shown in Figure 6.3.

6.6 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.

6.7 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.

FIGURE 6.2A

Installation of Exterior Light Fixture
Disconnect Circuit Before Installation

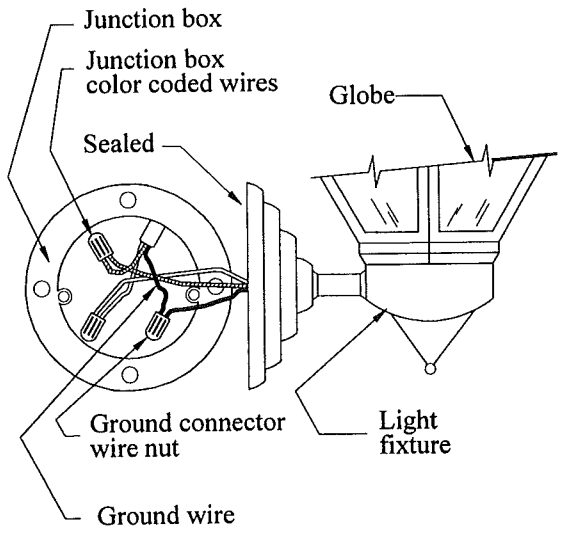


FIGURE 6.2B

Installation of Chain Hung Fixture or Fan
Disconnect Circuit Before Installation

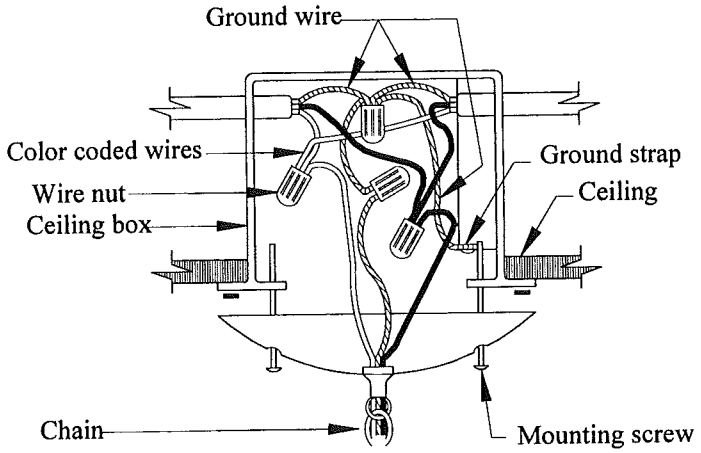
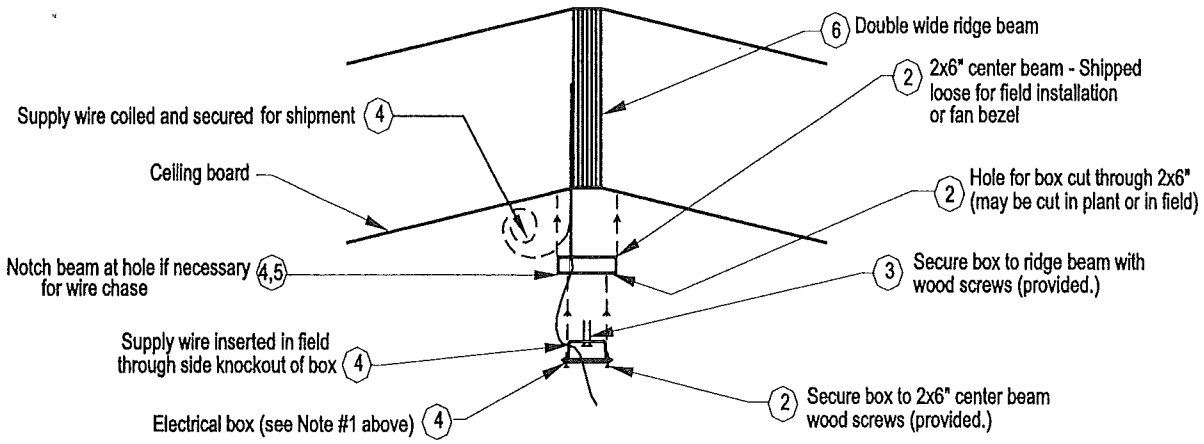


FIGURE 6.3

ELECTRICAL BOX INSTALLATION
FOR PADDLE FAN

Note: Applicable to U.L. Listed paddle fan with a swivel type mounting bracket.



WARNING: TURN OFF ELECTRICITY AT CIRCUIT BREAKER BEFORE INSTALLING TO PREVENT ELECTRICAL SHOCK.

1. Remove the manufacturer's installation instructions and determine the method of fan attachment to the beam. (hanging or flush mount)
2. If the center beam (shipped loose) does not contain a precut hole for the electrical box, cut a hole approximately 1/4" larger than the box diameter, centered in the width of the beam. Center line of hole shall align with location of supply wire through ceiling.
3. Install the box in the hole and secure flange to the center beam with screws (provided.)
4. Insert the ceiling wire through a knockout hole in the side of the electrical box. It may be necessary to cut a notch in the side of the center beam to allow the supply wire to be inserted in the electrical box without binding against center beam during installation. Leave approximately 4" of wire free in the box.
5. Secure the center beam in place over the center line joint. Be sure that the fan supply wire is not pinched or penetrated with fasteners.
6. Secure electrical box to ridge beam with the wood screws (provided) through the two holes in the top of the box.
7. Strip about 3/4" of insulation from the white and black conductor ends.
8. Position the non-combustible flash ring (provided) over the electrical box so that the finished surface around the electrical box is not exposed.
9. Follow the manufacturer's installation instructions for mounting the fan assembly to the box and for electrical wiring of the fan. Use provided electrical connectors for splicing wire. Be certain that fan is grounded as specified in manufacturer's instructions and that wires are connected properly (white wire to white wire and black wire to black wire).

6.8 TELEPHONE AND CABLE TELEVISION

The walls and floors of the manufactured home contain electrical circuits, plumbing and ductwork. Avoid contact with these systems when drilling through and placing cables within the cavities. Only trained professionals shall perform such work. Figure 6.4 shows one procedure for telephone crossover connection in multi-section homes.

6.9 CONTINUOUS RIDGE VENT

If provided, install per manufacturer's Installation instructions, or see Figure 6.5.

FIGURE 6.4

Phone Cable Crossover for Multi-Section Homes

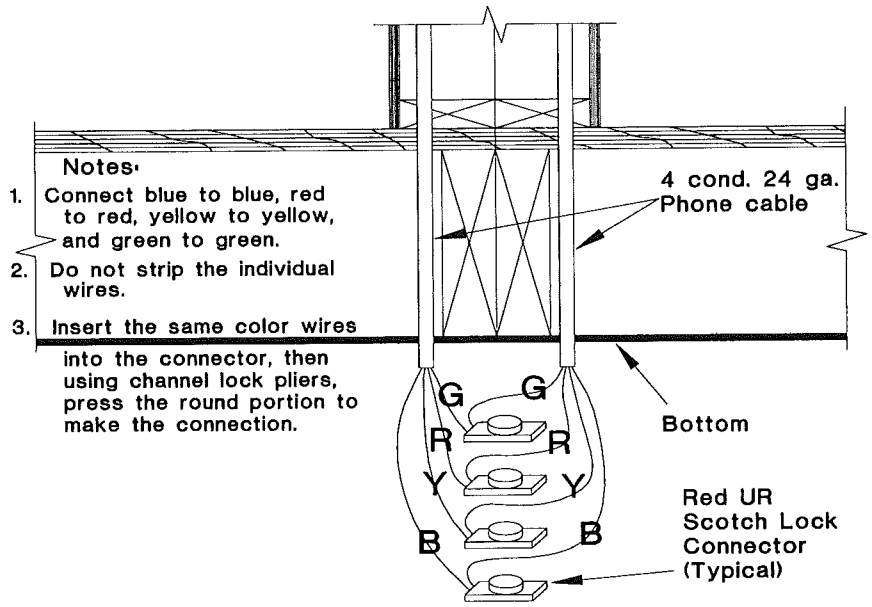


FIGURE 6.5

Continuous Ridge Vent

Fasten ridge rail together with 3/8"x5" lag screws at 32" o.c. staggered from section to section for the entire length (Screws must be located at ridge blocking.)

Install screws at 45 degree angle starting 3" from the end and 2-1/2" from center of double section. (Flush heads with roof sheathing.)

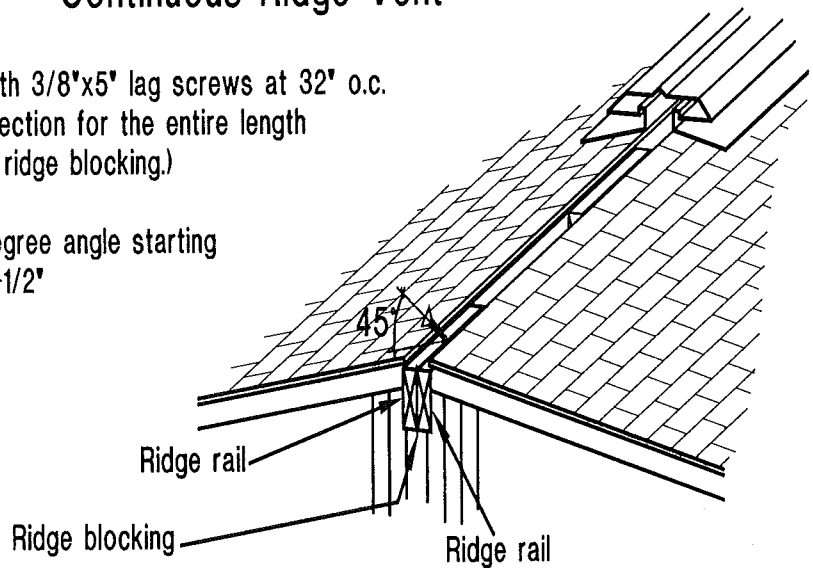
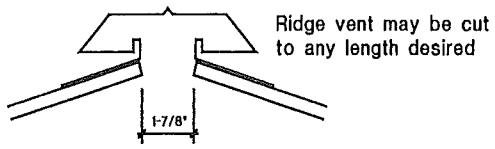


FIGURE 6.5 (cont.)

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.

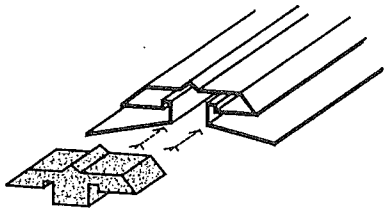


Figure 3

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

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

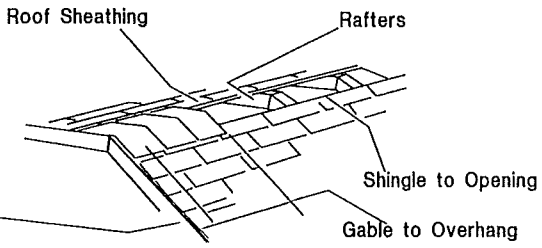


Figure 4

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.

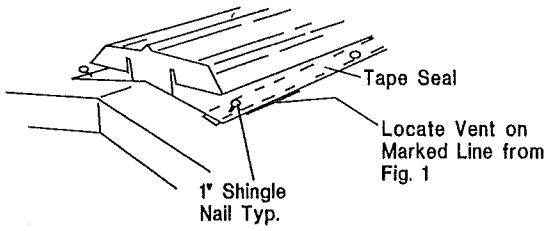


Figure 5

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.

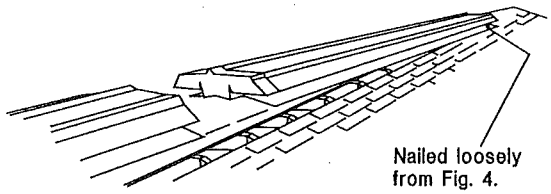
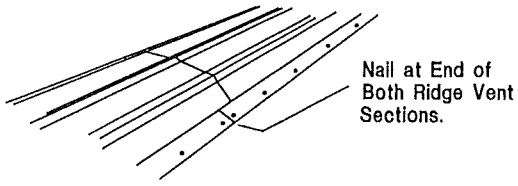


Figure 6

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.



7.1 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 on site:

- The appropriate forced air-heating appliance;
- All utility connections to the home;
- The connecting distribution ductwork; The cold air return duct must be connected to the factory installed cold air duct connection.
- The thermostat for the forced air-heating appliance must contain an operating fan switch.

7.2 CLOTHES DRYER VENT

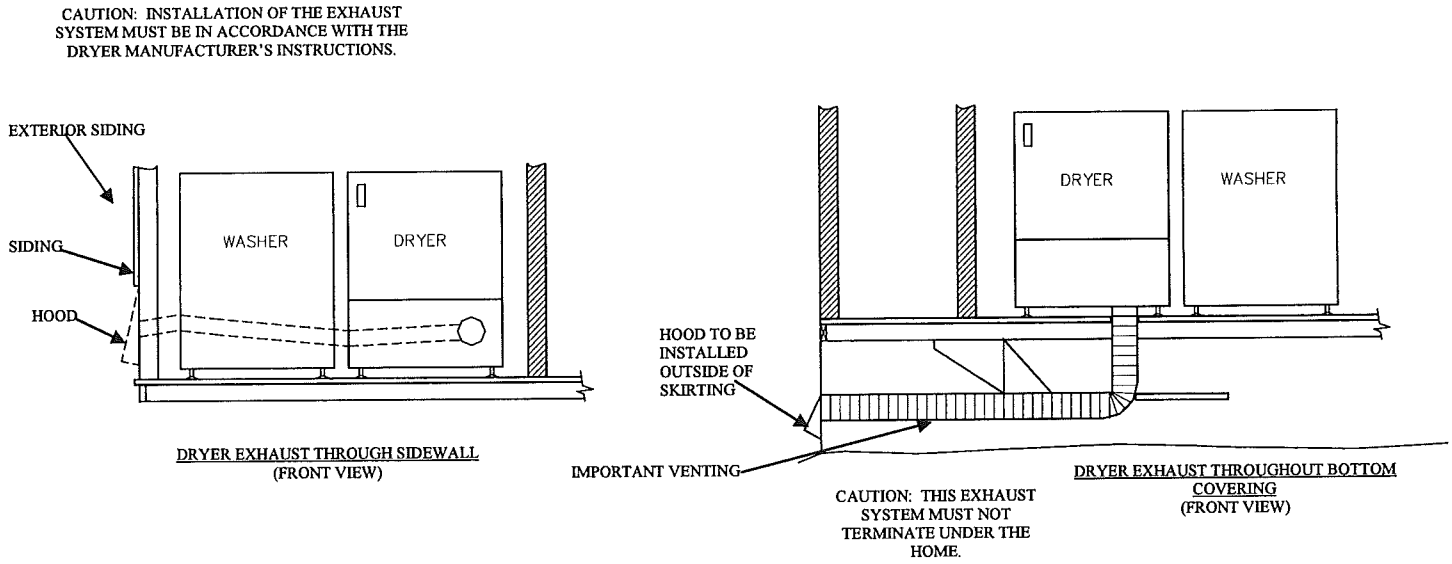
The clothes dryer must exhaust outside the exterior of the home or outside any perimeter foundation or skirting installed around it, through a moisture-lint exhaust system, as shown in Figure 7.1.

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.

Install a metal duct after the home is installed on 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. Do not let the exhaust system terminate under the home where excess moisture or flammable material can accumulate.

FIGURE 7.1

CLOTHES DRYER EXHAUST



If the home did **not** come equipped with a gas dryer connection, 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 trusses 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, unless otherwise indicated on the home's data plate.

Equipment installed must not exceed the rating shown on the home's date plate. The manufacturer does not recommend installing window air conditioning units.

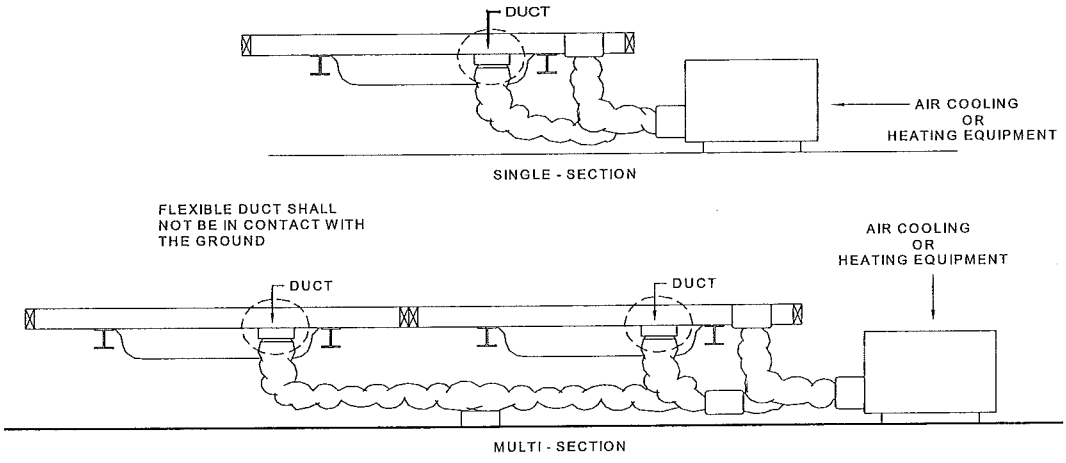
The home's electrical distribution panel may contain optional factory-installed circuits for air conditioning. The maximum full load ampere draw for the desired air conditioning unit must not exceed the circuit rating shown.

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. 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.

FIGURE 7.2
REMOTE AIR COOLING OR HEATING



- 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.

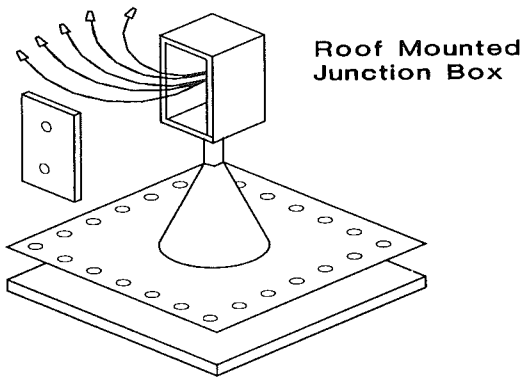
7.3.2 Heat Pumps

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

7.3.3 Evaporative Coolers

Install a roof-mounted cooler, with a maximum 500 CFM blower, following the evaporative cooler manufacturer's instructions. In the absence of instructions, proceed as follows:

FIGURE 7.3



- Using wire nuts, connect the wires from a junction box such as the one 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.

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

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 (Figure 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

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.

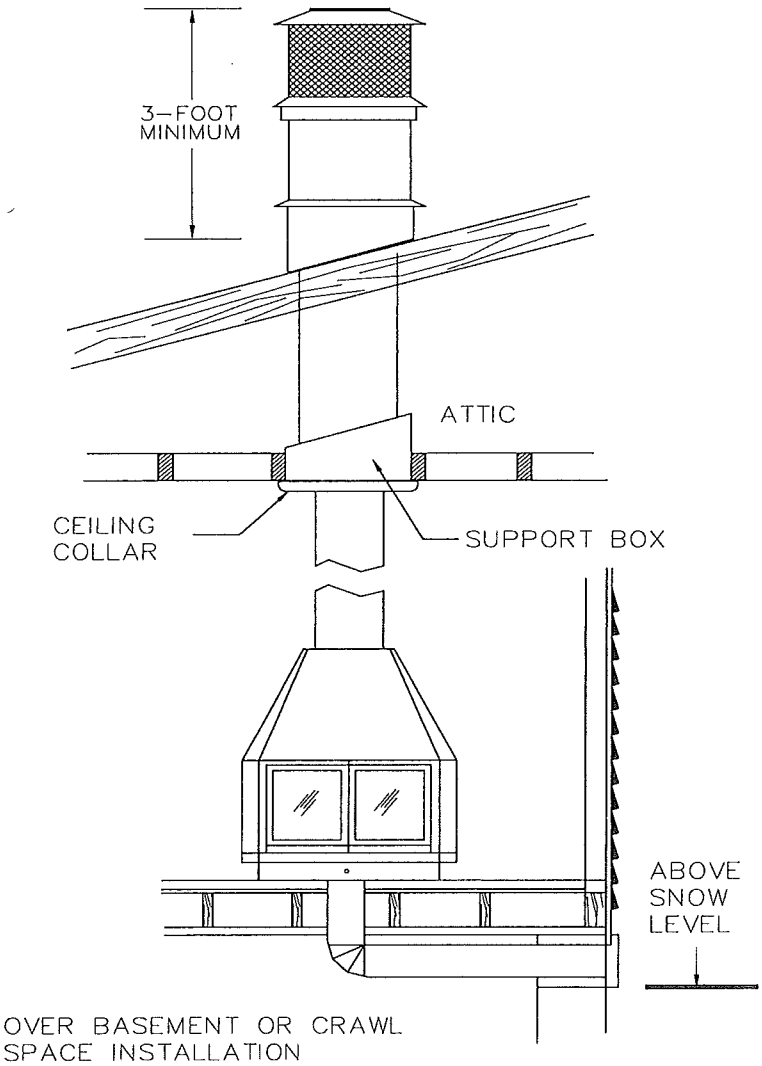
7.4.3 Combustion Air Duct Inlets

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.

FIGURE 7.4



OVER BASEMENT OR CRAWL SPACE INSTALLATION

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.

Utility system connection and testing - 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.

8.1 WATER SUPPLY

8.1.1 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.

8.1.2 Connection Procedures

- 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.
- Mandatory Shut-off valve – (Figure 8.1)
- Crossovers – Multi-section homes with plumbing in both sections require crossover connections, as shown in Figure 8.2.

8.1.3 Freeze Protection

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.

- Use of heat tape – Heat tape is an electrical heating element designed to protect exposed plumbing from freezing, and is certified by UL, CSA or FMRC for use with manufactured homes. Install heat tape in strict conformance with the tape manufacturer's instructions.

FIGURE 8.1
MASTER WATER SHUT-OFF

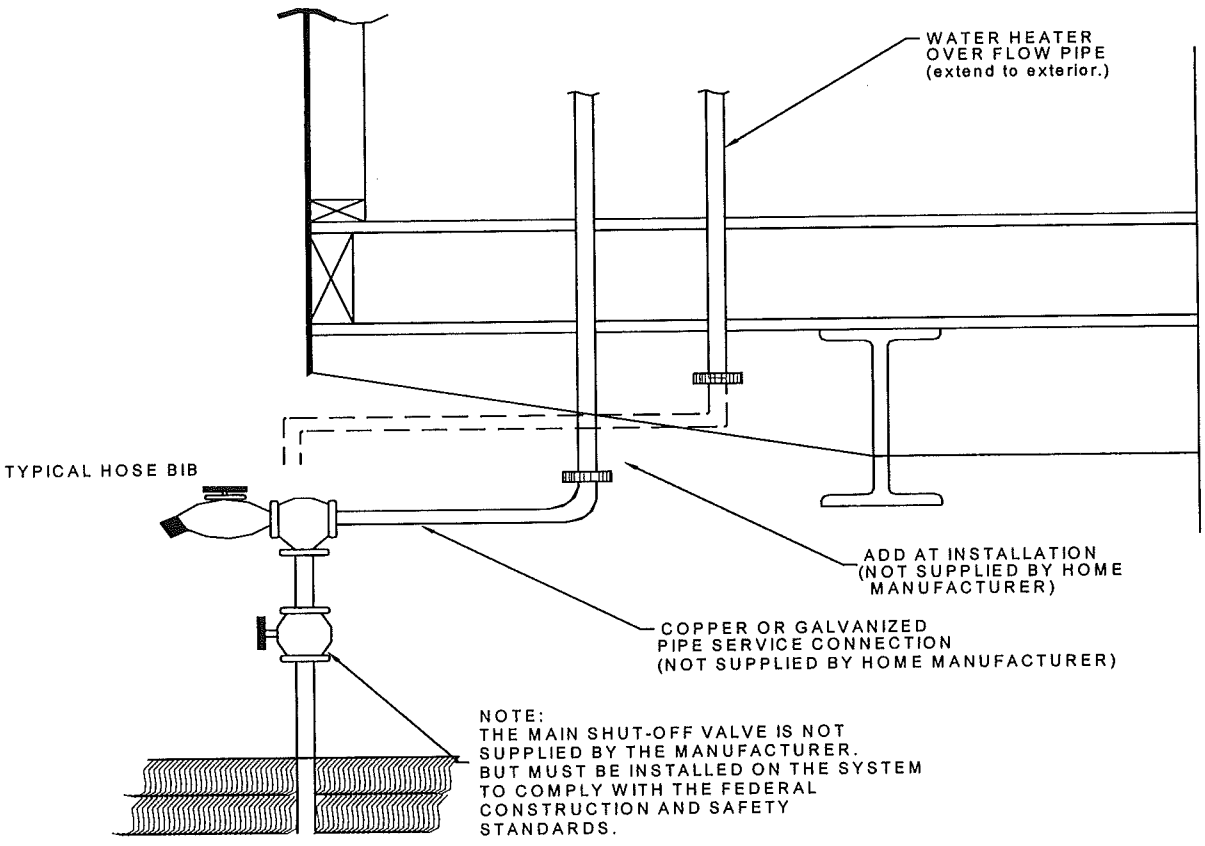
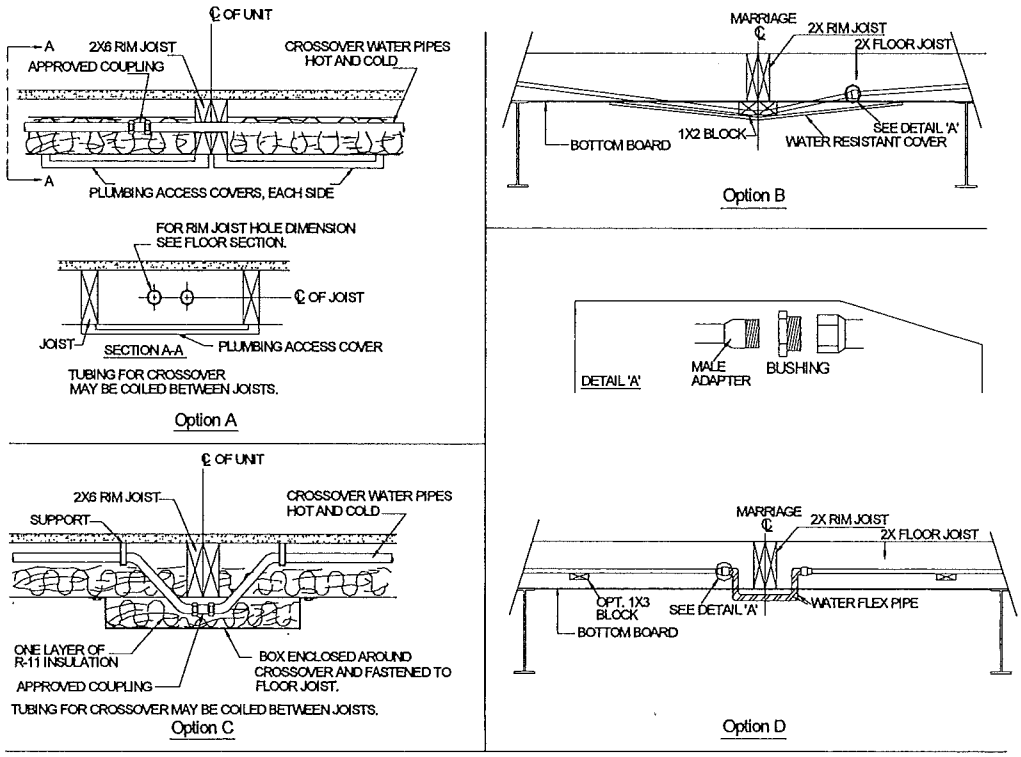


FIGURE 8.2
MASTER WATER SHUT-OFF



- Heat tape connection - Connect heat tape to the electrical outlet located next to the water supply inlet.

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

WARNING!

Improperly designed or installed heat tapes CAN CAUSE A FIRE.

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.

• 8.1.4 Testing

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:

- 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.

- 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. This procedure may not be used with CPVC systems. 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 DRAINAGE SYSTEM

8.2.1 Assembly and support

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 qualified personnel.

Assemble shipped-loose drain line according to the following steps in the order shown: Start at the most remote end and work toward the outlet, support the piping with temporary blocking to achieve a slope of at least 1/4 inch fall per foot of run unless otherwise noted on the schematic diagram. Exception: 1/8-inch fall per foot is allowed when a clean out is installed at the upper end of the run. Pre-assemble the complete system as shown on the diagram without using any solvent cement. Check the following:

- ❑ Fittings are in proper alignment.
- ❑ Pipes have been cut square and de-burred.
- ❑ Piping, when supported, will have proper slope.

- Weld the fittings together with solvent cement. The cement used 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.
- Connect the main drain line to the site sewer hookup using an approved coupler (Figure 8.3).
- Support the drain lines as shown. Hangers may be secured to any frame member, or to the wood floor joists that can be located just above the bottom covering material.

8.2.2 Crossovers

Connect multi-section home drainage line crossovers that have been plant installed as shown in Figure 8.5.

8.2.3 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.

FIGURE 8.3

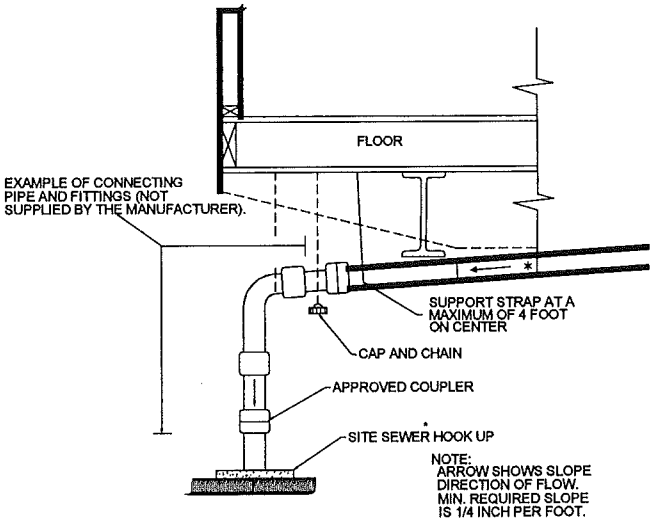


FIGURE 8.4

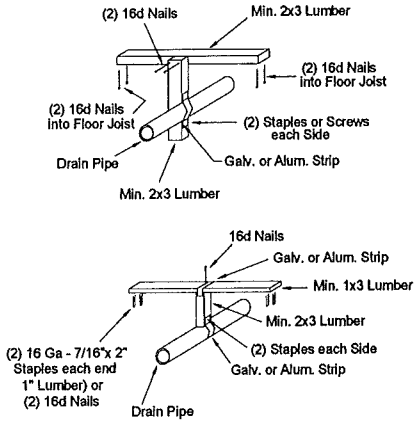


FIGURE 8.5

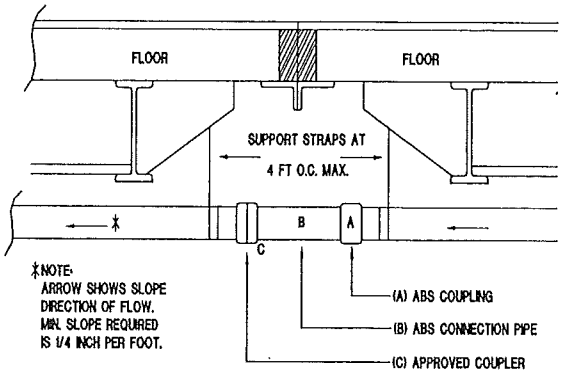
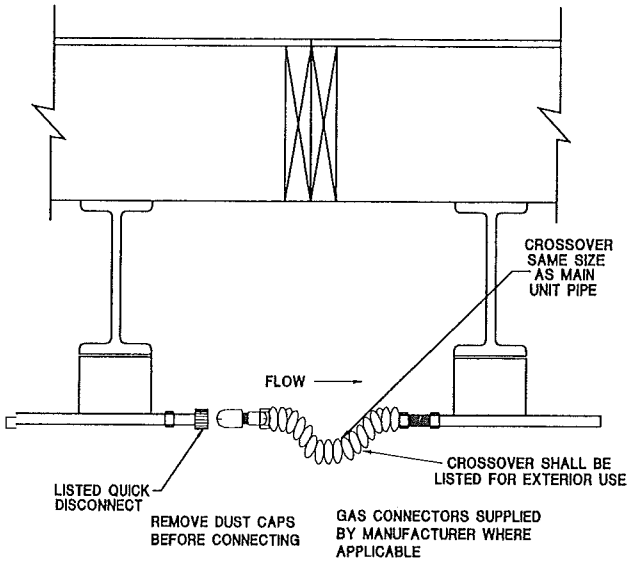


FIGURE 8.6

TYPICAL GAS CROSSOVER DETAIL



8.2.4 Testing

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.

8.3 GAS SUPPLY

8.3.1 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.

8.3.2 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.

8.3.3 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.

8.3.4 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.

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.

8.3.5 Testing

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.

- 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.

- 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. Repair any leaks found and retest. Close all equipment shut-off valves upon completion of the testing.

8.3.6 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.

8.3.7 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.

8.4 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.

8.4.1 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.

8.4.2 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.

8.4.3 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.

8.4.4 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.

8.4.5 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.

8.4.6 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.

8.4.7 Winterizing

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

8.5 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. The connection to the home panelboard is a 4-wire feeder cable (unless the home is equipped with a factory-installed service meter base).

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 size from Table 8.1. These sizes are based on an ambient temperature of 86° Fahrenheit and do not take voltage drop into consideration.

WARNING!

Installation of the electric power to the home can cause exposure to live electrical circuits. The neutral conductor must not be grounded in the distribution panel board.

EXPOSURE TO LIVE ELECTRICAL CIRCUITS OR IMPROPER GROUNDING OF THE CONDUCTOR IN THE PANELBOARD MAY RESULT IN SEVERE SHOCK OR POSSIBLE ELECTROCUTION.

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

8.6.3 Grounding

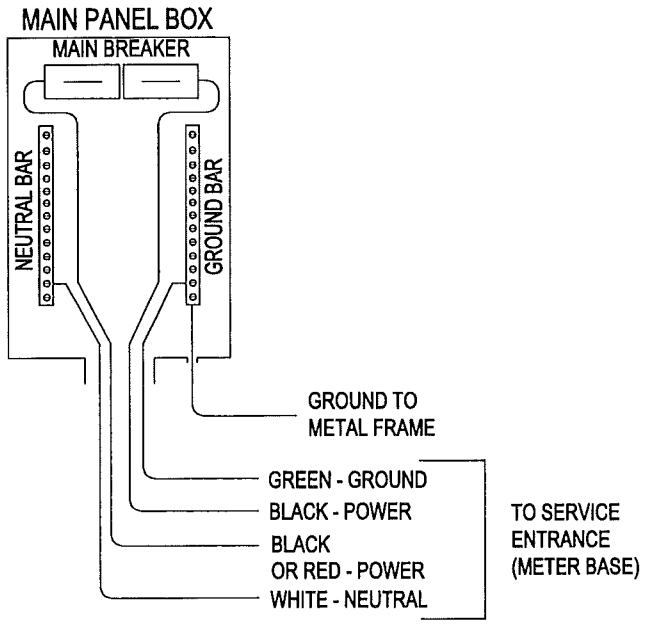
The home must be properly grounded to protect the occupants. The only safe and approved method of grounding the home is through an electrical-isolated grounding bar in the manufactured home distribution panelboard which grounds all non-current-carrying metal parts to the electrical system in the home 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 (Fig. 8.7). This means that for 120/240 volt service, you must have a 4-wire power supply feeder cable.

- 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.

FIGURE 8.7

ELECTRICAL FEEDER CONNECTION



- Bonding screws, straps or buses in the distribution panel board or in appliances have been removed and discarded at the manufacturing facility.

8.6.4 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.

8.6.5 Feeder Connections

- 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.
- 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

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	CONDUIT DIAMETER INCHES		POWER RED OR BLACK		NEUTRAL WHITE		GROUNDING GREEN		
	INCHES	COPPER	ALUMINUM	COPPER	ALUMINUM	COPPER	ALUMINUM	COPPER	ALUMINUM	
100	10x10x4	1 1/4	1 1/2	#4	#2	#6	#4	#8	#6	100
150	10x12x4	1 1/2	2	#1	#2/0	#3	#1	#6	#4	115
200	12x12x4	2	2	#2/0	#4/0	#1	#2/0	#6	#4	115

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.

- 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 8.8.

8.6.6 Crossover Connections

For multi-section homes, refer to Figure 8.9 for typical crossover wiring connections (located along the centerline between the sections). Crossover locations can be identified by metal junction boxes or access cover panels. Remove these panels and connect the enclosed wires. Some crossover connectors plug together and do not require junction boxes. When the mating section contains a bathroom which requires Ground Fault Circuit Interrupter (GFCI) protection for the receptacle, it is important that the bathroom circuit wiring be connected to the proper GFCI protected circuit in the power supply panel.

8.6.7 Multi-Section Bonding

Bonding between sections of a home 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 (Figure 8.10).

8.6.8 System Test Procedures and Equipment

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

- 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.

- Grounding continuity – Using a continuity tester test non-current-carrying metal parts to assure continuity to ground. The parts to be checked include:

FIGURE 8.8

GROUNDING CONDUCTOR INSTALLATION
METER BASE

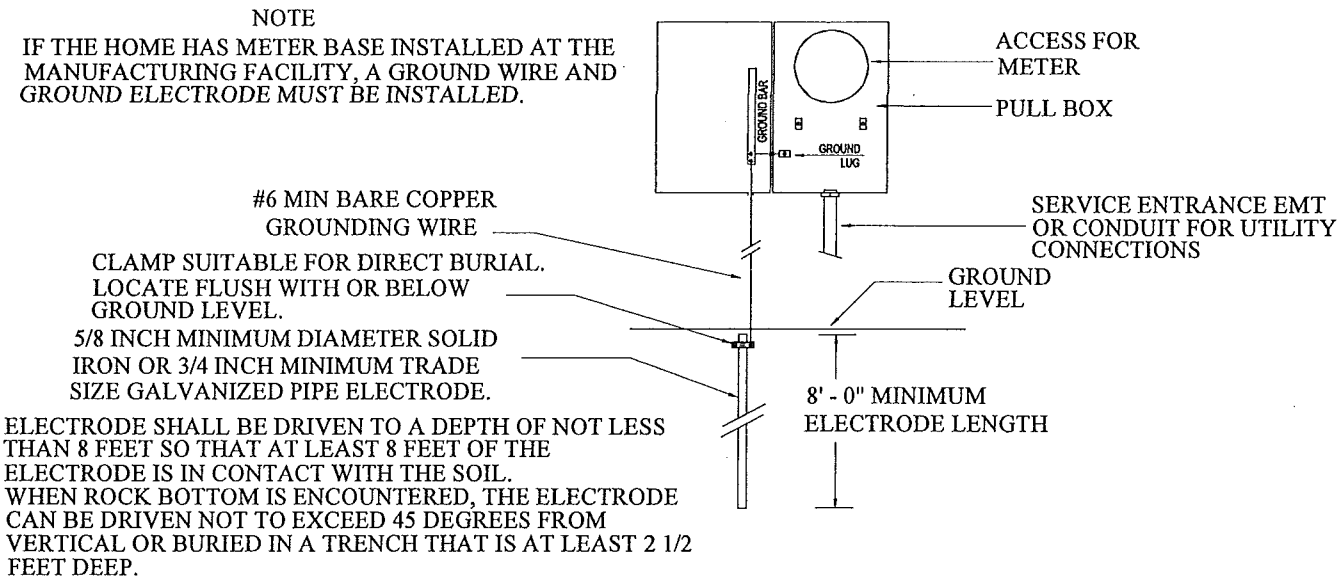
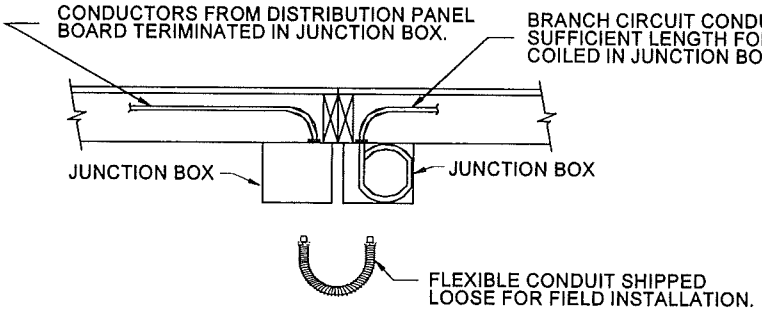
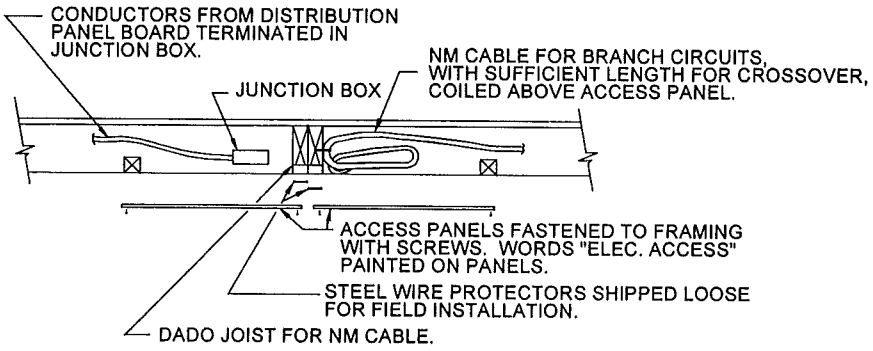


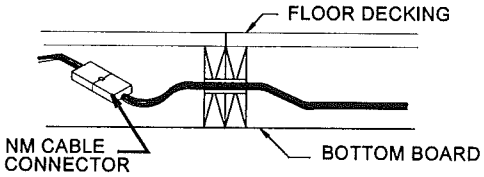
FIGURE 8.9

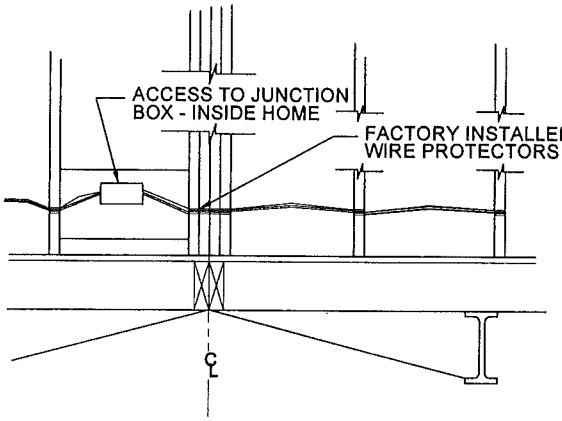


IN FLOOR-ALTERNATE

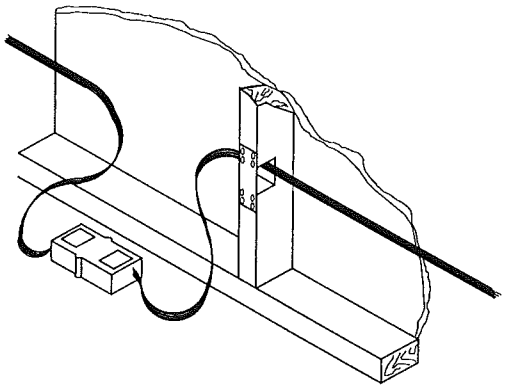


IN FLOOR-ALTERNATE



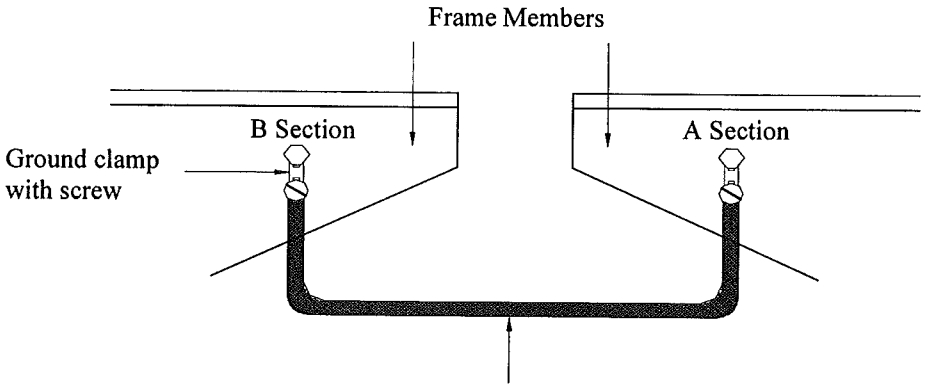


IN WALL-ALTERNATE



THIS HOME MAY BE SHIPPED WITH ONE OR MORE PLUG-IN CONNECTORS. THESE CONNECTORS ARE TO BE SNAPPED TOGETHER ON SET-UP. CONNECTORS WILL BE COLOR-CODED AND/OR TAGGED TO PREVENT MIXING OF CIRCUITS.

FIGURE 8.10



Ground wire shall be #8 AWG bare copper.

- ❑ Appliance enclosures, including fans
- ❑ Fixture enclosures and canopies
- ❑ Metal siding and roofs
- ❑ Metal water supply and gas lines and metal ducts (except foil covered insulated ducts)
- ❑ The home's frame

NOTE 1: On multi-section homes, perform this test only after completing all electrical and bonding connections between the sections.

NOTE 2: 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.

8.6.9 Post-Connection Tests

Conduct the following tests after turning on the main circuit breaker and each individual circuit breaker.

- 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.

- 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.

- 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.

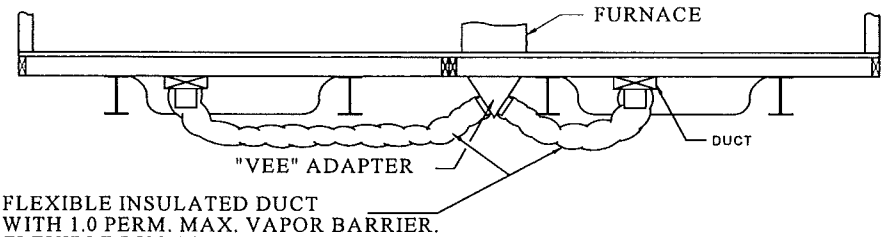
- Install any smoke alarms shipped loose. If the home is designed for installation over a basement, install the factory provided smoke alarm to the electrical junction box in the basement ceiling near the basement stairwell opening. All smoke alarms must be inter-connected to other smoke alarms in the home. Follow the smoke alarm manufacturer's installation instructions provided. Test all smoke alarms, including alarms installed during the setup process, following the smoke alarm manufacturer's instructions. When testing a series of inter-connected units, test each unit individually. Make sure all units alarm when each one is tested. Any smoke alarm that does not meet the inspection or test requirements of the manufacturer shall be replaced and retested.

8.7 AIR DUCT CROSSOVERS

Multi-section homes may require a heat/AC duct connection below the floor. Compare the inlets/outlets under the home with Figure 8.10 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.

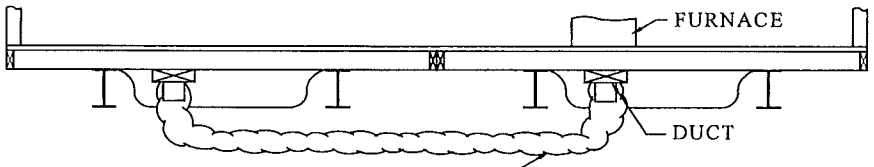
FIGURE 8.11

THIS SYSTEM MAY BE USED WHEN THERE IS NOT A CROSSOVER DUCT BUILT INTO THE FLOOR AND THE FURNACE IS OUTSIDE THE I-BEAM.



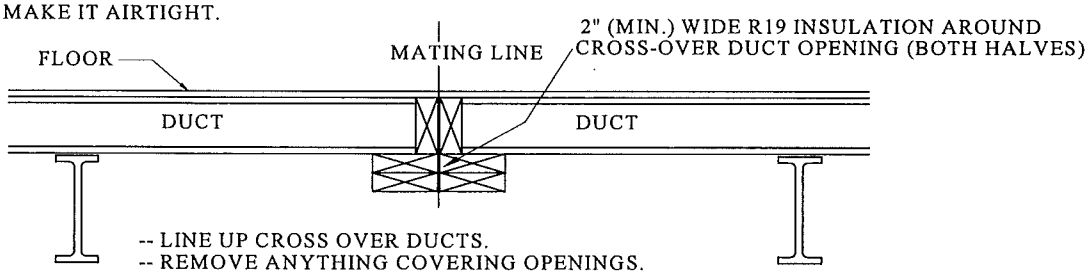
FLEXIBLE INSULATED DUCT
WITH 1.0 PERM. MAX. VAPOR BARRIER.
FLEXIBLE DUCT SHALL NOT BE IN CONTACT WITH THE GROUND.

THIS SYSTEM MAY BE USED WHEN THERE IS NOT A CROSSOVER DUCT BUILT INTO THE FLOOR AND THE FURNACE IS SITUATED DIRECTLY OVER THE MAIN DUCT ON ONE SECTION OF THE HOME.



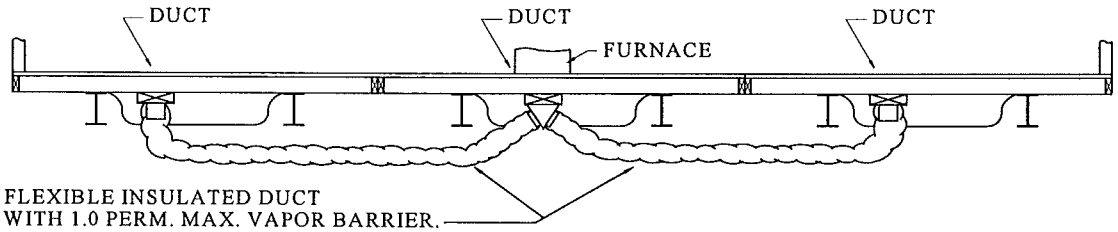
FLEXIBLE INSULATED DUCT
WITH 1.0 PERM. MAX. VAPOR BARRIER.
FLEXIBLE DUCT SHALL NOT BE IN CONTACT WITH THE GROUND.

THIS CROSSOVER DUCT SYSTEM IS INCORPORATED IN THE FLOOR OF THE HOME. THE CONNECTION IS MADE AT A POINT ALONG THE CENTER LINE OF THE HOME WHERE THE DUCTS EXIT THRU THE SIDE RAIL. THE CONNECTION MUST BE SEALED TO MAKE IT AIRTIGHT.



-- LINE UP CROSS OVER DUCTS.
-- REMOVE ANYTHING COVERING OPENINGS.
-- COMPRESS INSULATION WITH STANDARD FLOOR CONNECTION.

THIS SYSTEM MAY BE USED WHEN THERE IS NOT A CROSSOVER DUCT BUILT INTO THE FLOOR AND THE FURNACE IS SITUATED DIRECTLY OVER THE MAIN DUCT ON CENTER SECTION OF THE HOME.



FLEXIBLE INSULATED DUCT
WITH 1.0 PERM. MAX. VAPOR BARRIER.
FLEXIBLE DUCT SHALL NOT BE IN CONTACT WITH THE GROUND.

Chapter 9 FINAL INSPECTION

9.1 INSTALLER'S 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:

- ❑ All water and drain systems work properly and do not leak.
- ❑ Appliances have been tested and work properly.
- ❑ All windows, doors and drawers work properly.
- ❑ 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.
- ❑ Exterior siding and trim contain no gaps, voids, or missing fasteners, all seams are sealed, and hardboard edges are sealed.
- ❑ All stack head or vent pipe flashings are properly attached and sealed.
- ❑ All shingles are properly attached, none are loose or missing, and all holes are filled.
- ❑ 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 Chapter 5 for the total vent area required.
- ❑ Trim or cut any low hanging trees or bushes near the home. In limiting their future growth, think about the plants' possible movement during windy conditions or under snow or ice loads.
- ❑ Check all exhaust fans for proper operation and airflow.
- ❑ Carefully inspect the bottom covering of the home for loosening or tears from the installation of pipes or wires.
- ❑ Repair any cuts or tears in the ground cover with tape.
- ❑ Be sure the correct number of anchors have been installed at the proper spacing and alignment, and that all straps are tight.
- ❑ Inspect for and correct all interior finishing details, such as loose molding, carpet seams, etc.

9.2 RETAILER INSPECTION

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

9.3 RELOCATING THE HOME

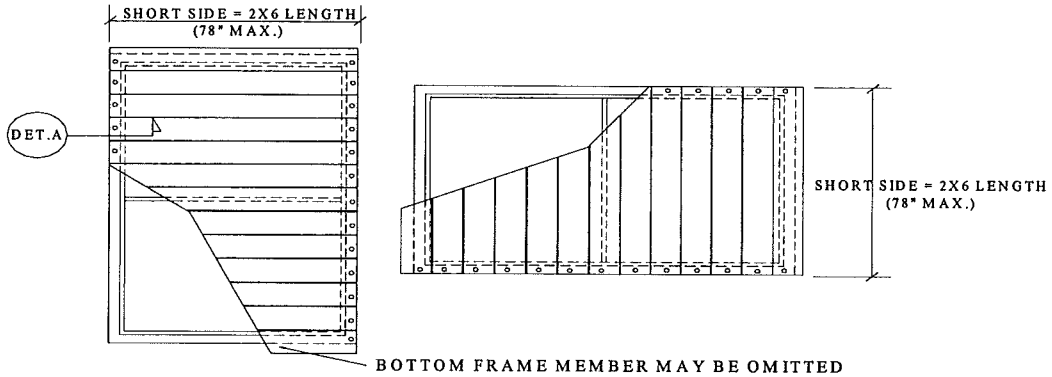
When relocating the home, have it moved by a professional manufactured home mover. Make sure he uses enough temporary wood blocking and check the following items:

- ❑ 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.
- ❑ Tires and axles – Replace any removed tires or axles. 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 wheel bearings and brakes as necessary.
- ❑ Appliances – Secure appliances to prevent movement during transportation.
- ❑ Dust caps – Place dust caps on the ends of all pipe connections.
- ❑ 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.

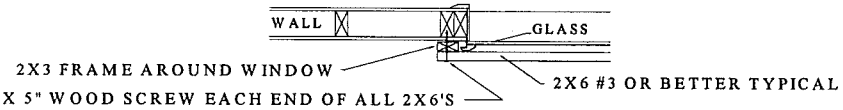
FIGURE 9.1

PROTECTION OF WINDOWS AND GLASS DOORS
WIND ZONES II AND III

LUMBER METHOD



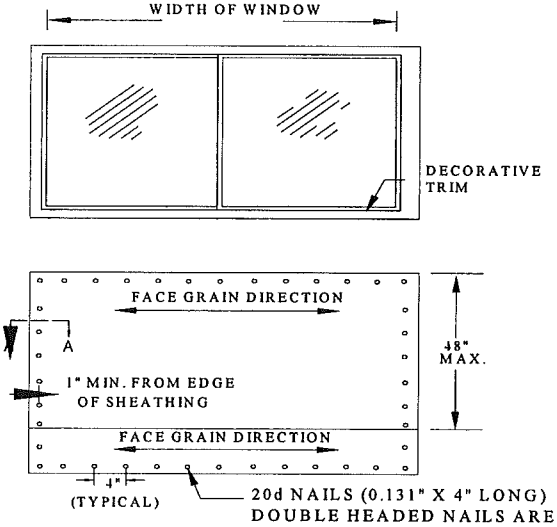
DETAIL A

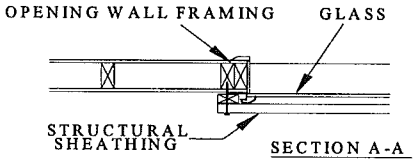


PLYWOOD METHOD

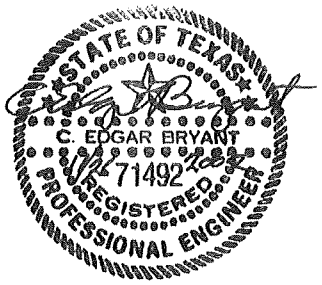
PROTECTED AREAS ARE TO BE COVERED WITH STRUCTURAL SHEATHING. THE THICKNESS AND SPAN RATINGS ARE SHOWN IN THE TABLE. THE STRUCTURAL SHEATHING SHALL BE LABELED "APA RATED SHEATHING EXTERIOR" OR EQUIVALENT. THE SHEATHING SHALL BE PLACED OVER THE OENING WITH THE FACE GRAIN RUNNING HORIZONTAL.

WHERE ANY PORTION OF ANY WINDOW OR SLIDING GLASS DOOR IS WITHIN 3 FEET FROM A CORNER OF THE HOME, THE OPENING SHOULD BE COVERED WITH TWO LAYERS OF SHEATHING EACH OF WHICH MEETS THE REQUIREMENTS FROM THE TABLE. THE FIRST LAYER IS FASTENED AS SHOWN. FASTEN THE SECOND LAYER USING A MINIMUM 40d NAILS (0.131"x 5" LONG) AT 3" ON CENTER SPACING.





STRUCTURAL SHEATHING TO PROTECT WINDOWS IN WIND ZONES II AND III		
WIDTH OF WINDOW	SHEATHING REQUIREMENTS	
	THICKNESS	SPAN RATING
UP TO 36"	15/32" MIN.	32/16
37" TO 46"	23/32" MIN.	48/24
47" TO 72"	1-1/8" MIN.	48" O.C.



PROFESSIONAL ENGINEER SEAL

- 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.

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.

Also refer to the Homeowner's Guide

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.

9.4 WINDOW AND GLASS DOOR PROTECTION

9.4.1 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 9.1.

Copyright © 1976, 2003 by Champion