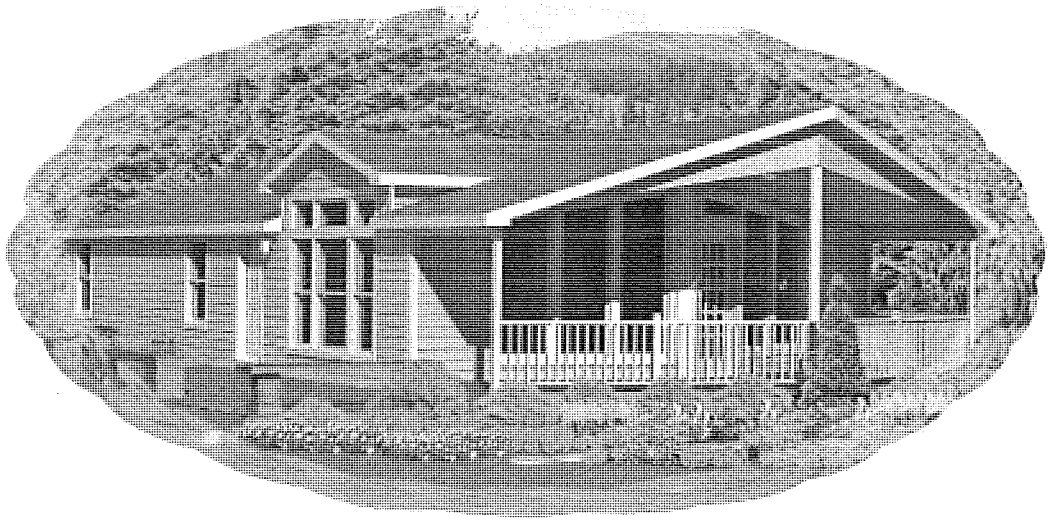
Liberty HOMES, INC.

Quality. Innovation. Pride.

Installation Instruction Manual



A copy of this Manual must remain with the home for reference by the homeowner

Revised: August 14, 2009

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INTRODUCTION

Thank you for purchasing one of our manufactured homes. This Installation Manual contains instructions that must be followed for the proper installation of your home. PLEASE READ ALL INSTRUCTIONS PRIOR TO SET-UP.

1. Chapter One – Introduction

1.1. **How To Use This Manual.** This manual contains detailed installation instructions, including specifications and procedures for erection and hookup of your manufactured home. It has been written in an objective and easy-to-understand manner so it can be understood by people without extensive technical training. It discusses the set-up of the home from preparing the site through final inspection. It includes many tables and figures giving important data for proper set-up. Careful adherence to this manual by the homeowner and installation crew will assure you of a quality, safe and affordable home for many years to come.

1.2. **Pre-Installation Considerations**. Prior to locating or relocation of your home, contact the local authority having jurisdiction for installation to see if permits for such procedures as blocking, anchoring, or utility connections are required. Inspections may be required during installation. On private property, zoning or development covenants may apply and should be taken into consideration. [NOTE: Preparations of the site, when accomplished by someone other than the home installer, may not be in accordance with these instructions.]

1.3. **SAFETY. ONLY TRAINED CREWS SHOULD INSTALL THE HOME. INSTALLERS SHOULD FOLLOW THE SAFETY INSTRUCTIONS PROVIDED IN THIS MANUAL.**

1.4. **Consumer Information Card**. See your Homeowners Manual for information. If you bought your home from a retailer, please be sure that your retailer has completed and mailed the card for you. If you acquired your home from someone who is not a retailer, you should promptly fill out and send a card to us.

1.5. **Alterations.** Prior to altering this home after installation, (such as modifying the electrical, plumbing or heating systems, adding a room, carport, garage, or major repairs) be sure to contact the authority having jurisdiction as a permit or plan approval may be required. ALSO, SUCH ALTERATIONS MAY VOID, IN WHOLE OR IN PART, THE LIMITED WARRANTY CONTAINED IN THE HOMEOWNER'S MANUAL.

THIS HOME WEIGHS SEVERAL TONS.

USE ENOUGH TEMPORARY WOOD BLOCKING TO SUPPORT THE HOME DURING SET-UP OR WHEN LOCATED AT DEALER LOTS OR FACTORY FOR AN EXTENDED PERIOD OF TIME. NO ONE SHOULD BE ALLOWED UNDER THE HOME UNLESS THE BLOCKING IS SECURELY IN PLACE, EVEN IF THE HOME IS NOT MOVING.

3. Chapter 3 – Site Preparation

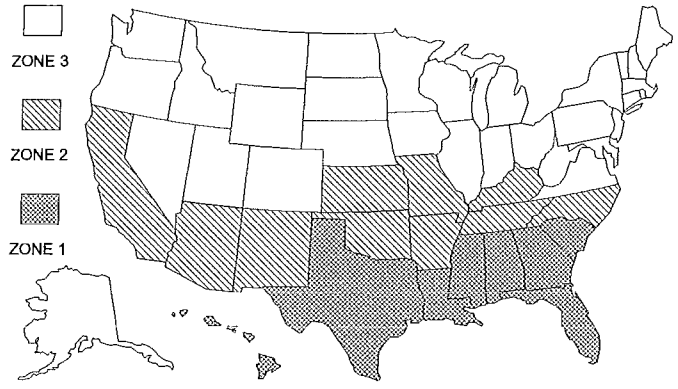
3.1. **Location and Layout - Use of Zone Maps.** Your home is designed for certain weather conditions and roof loads (see zone maps in a bedroom closet or near main electrical panel and Figure 3.1 of this manual). Do not site or relocate your home in a zone requiring greater wind, roof load, or heating/cooling capabilities than those for which it was designed. However, it is safe to locate your home in an area with lower load or weather requirements. For example, a home designed for a northern roof load or 40 psf may be sited in the southern roof load zones.

FIGURE 3.1 – ZONE MAPS OF THE UNITED STATES

WIND ZONE 1 (15 PFS) – Includes areas of the United States and its territories that are not otherwise included as being in Wind Zone 2 or 3.

This home was not designed for the higher wind pressure and anchoring provisions required for ocean/coastal areas and should not be located within 1,500' of the coastline in Wind Zones 2 and 3, unless the home and its anchoring and foundation system have been designed for the increased requirements specified for Exposure D in ANSI/ASCE 7-88.

WIND ZONE 2 (100 MPH) – Following are the local governments, listed by state (counties or parishes, unless specified otherwise) which are within Wind Zone 2:
ALABAMA – Baldwin, Mobile
FLORIDA – All counties except those identified as being within Wind Zone 3
GEORGIA – Bryan, Camden, Chatam, Glynn, Liberty, McIntosh
LOUISIANA – Acadia, Allen, Ascension, Assumption, Calcasieu, Cameron, East Baton Rouge, East Feliciana, Evangeline, Iberia, Iberville, Jefferson Davis, LaFayette, Livingston, Pointe Coupee, St. Helena, St. James, St. John the Baptist, St. Landry, St. Martin, St. Tammany, Tangipahoa, Vermillion, Washington, West Baton Rouge, West Feliciana
MAINE – Handcock, Washington
MASSACHUSETTS – Barnstable, Bristol, Dukes, Nantucket, Plymouth
MISSISSIPPI – George, Handcock, Harrison, Jackson, Pearl River, Stone
NORTH CAROLINA – Beaufort, Brunswick, Camden, Chowan, Columbus, Craven, Currituck, Jones, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell, Washington
SOUTH CAROLINA – Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Herry, Jasper, Williamsburg
TEXAS- Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kenedy, Kleberg, Matagorda, Nueces, Orange, Refugio, San Patricio, Willacy
VIRGINIA – (cities) Chesapeake, Norfolk, Postmouth, Princess Anne, Virginia Beach

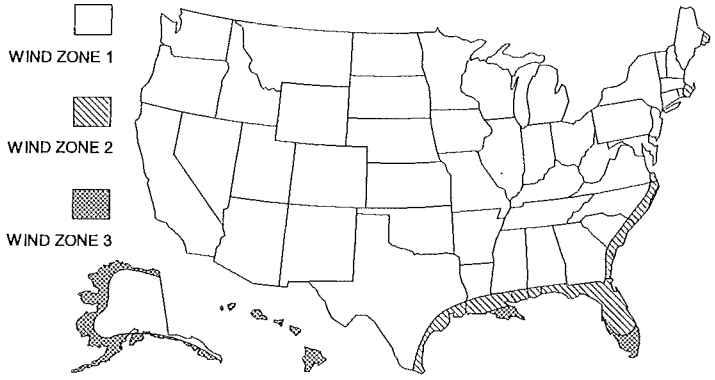


CLIMATIC ZONE MAP

3.1.1. **Access For Transporter.** Before attempting to move your home to the installation site, be sure the transportation equipment can get through. Remove any overhanging branches and contact your local utility company to raise any overhead wires. Special transportation permits may be required from state, county or city officials.

3.1.2. **Encroachments And Setback Distances.** Obey local laws regarding encroachments in streets, yards and courts, and permissible setback distances from property lines and public roads. Consider future additions, such as awnings and screen rooms.

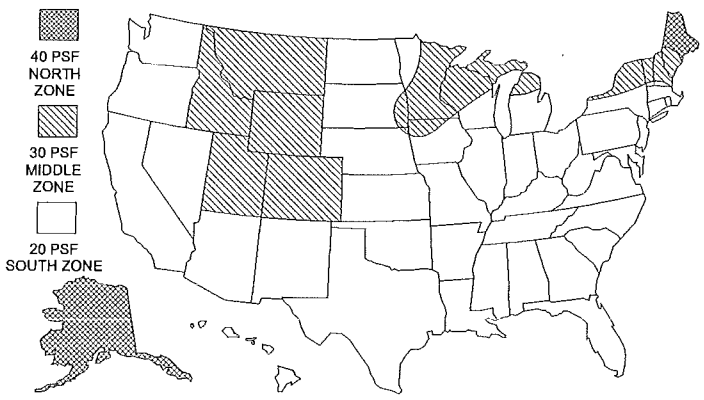
3.1.3. **Issuance Of Permits.** Be sure that all necessary local permits have been obtained and fees paid.



BASIC WIND ZONE MAP

WIND ZONE 3 (110 MPH) – The following local governments listed by Sate (counties or parishes, unless specified otherwise) are within Wind Zone 3:
FLORIDA – Broward, Charlotte, Collier, Dade, Franklin, Gulf, Hendry, Lee, Martin, Manatee, Monroe, Palm Beach, Pinellas, Sarasota
LOUISIANA – Jefferson, LaFourche, Orleans, Palquemines, St. Bernard, St. Charles, St. Mary, Terrebonne
NORTH CAROLINA – Carteret, Dare, Hyde

The following States and territories are within Wind Zone 3:
State of **HAWAII**
All **ALASKA** coastal regions between the 90 mph isotach on ANSI/ASCE 7-88 wind map and the coast
US TERRITORIES: American Samoa, Guam, Northern Mariana Islands, Puerto Rico, Trust Territory of Pacific Island, US Virgin Islands



ROOF LOAD MAP

3.2. Soil Conditions.

3.2.1. Requirements. To help prevent settling of your home, site it on firm, undisturbed soil or fill compacted at least 90% of its maximum relative density. Installation on loose, uncompacted fill may cause the home to shift and settle in such a way as to damage the home which may invalidate the home's limited warranty.

3.2.2. Bearing Capacity. Test the bearing capacity of the soil at the depth of the footings after completing any grading and filling (see 3.2.3). If you can't test the soil but can identify its type, use the foundation bearing pressure shown in Figure 3.2 as a guide. If you cannot identify the soil, use the lowest value (1,000 psf from Figure 3.2). Under unusual conditions, or if the soil appears to be peat or uncompacted fill, consult a local geologist or professional engineer.

3.2.3. Soil Bearing Testing Methods and Equipment. A pocket penetrometer (available from engineering supply houses) or other methods acceptable to local jurisdictions may be used.

3.3. Removal of Organic Material. Remove all decayable material such as grass, roots, and wood scraps from beneath the home, especially 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 homesite to prevent windstorm damage.

3.4. Drainage.

3.4.1. Purpose. Drainage prevents water buildup under the home which may cause settling of the foundation, dampness in the home, damage to siding and bottom board, buckling of walls and floors, problems with the operation of doors and windows, AND COULD VOID YOUR WARRANTY.

3.4.2. Elimination of Depressions. Grade the home site to divert drainage from under and away from the home. The grade must slope a minimum of 1/2" per foot and a minimum 10' from the side of the home (see Figure 3.3).

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

3.5. Ground Moisture Control.

3.5.1. Importance. If the crawlspace under the home is to be enclosed with skirting or other material, a vapor retarder ground cover shall be installed that keeps ground moisture out of the home. Where a concrete pad is installed (solid) under the entire home floor area, the vapor barrier is not required, if the concrete is a minimum of 4" thick.

3.5.2. Acceptable Types of Ground Cover. Use polyethylene sheeting or its equivalent, minimum 6 mils thick.

3.5.3. Proper Installation. Cover the entire area under the home with the sheeting and overlap it at least 12" at all joints. Where soil and frost condition permit placement of footings at grade level, place the sheeting directly beneath them.

FIG. 3.2 GENERAL DESCRIPTION OF SOILS

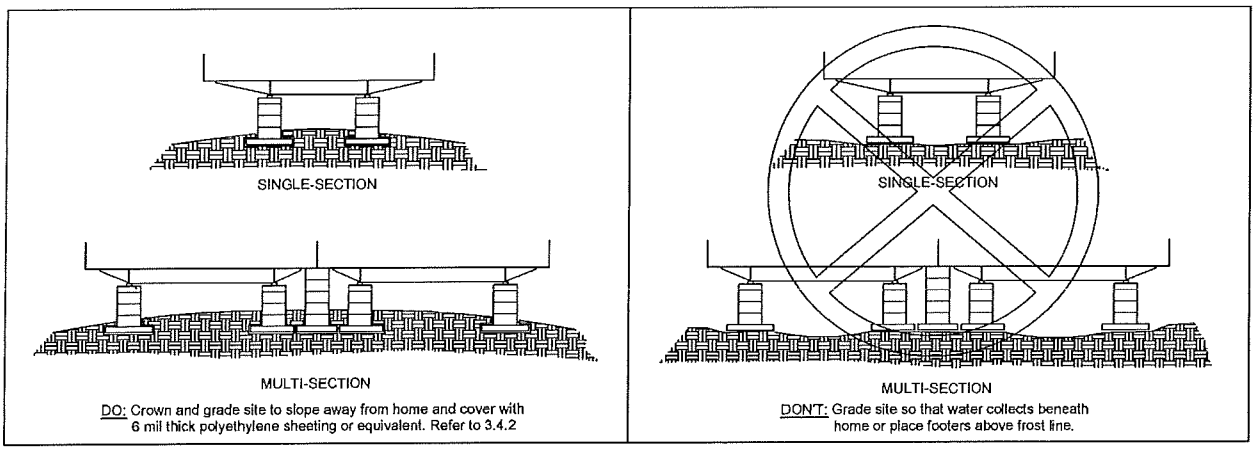
SOIL TYPE BASED ON THE UNIFIED CLASSIFICATION SYSTEM	ALLOWABLE PRESSURE (POUNDS PER SQUARE FOOT)*
ROCK OR HARD PAN	4,000 AND UP
SANDY GRAVEL AND GRAVEL	2,000
SANDY, SILTY SAND, CLAYEY SAND, SILTY GRAVEL, OR CLAYEY GRAVEL	1,500
CLAY, SANDY CLAY, SILTY CLAY, OR CLAYEY SILT	1,000
UNCOMMITTED FILL (TYPES OF SOIL NOT LISTED)	SPECIAL ANALYSIS IS REQUIRED
PEAT OR ORGANIC CLAYS	SPECIAL ANALYSIS IS REQUIRED

NOTE: THIS TABLE IS TO BE USED ONLY WHEN NONE OF THE FOLLOWING IS AVAILABLE:

A. SOIL TESTING INVESTIGATION AND ANALYSIS OF THE SITE.
B. COMPLIANCE WITH THE LOCAL BUILDING CODE.
C. COMPETENT OPINION BY A LOCAL ENGINEER OR BUILDING OFFICIAL.

* NO ALLOWANCES MADE FOR OVERBURDEN PRESSURE, EMBEDMENT DEPTH, WATER TABLE HEIGHT SETTLEMENT PROBLEMS.

FIGURE 3.3
ELIMINATION OF WATER BENEATH HOME



4. Chapter 4 – Foundations

NOTE: This chapter covers only foundations. Figure 4.1 and Table 4.1 summarizes the usual types. Set-up procedures and methods for securing the home to its foundation are discussed in Chapter 5.

4.1. Piers.

4.1.1. Importance. Incorrect size, location or spacing of piers may cause serious structural damage to your home. It is important to install piers around the perimeter, if required for your home. Failure to do so may lead to sagging floors, walls and roofs, and could void your limited warranty.

4.1.2. Acceptable Types. Piers are to be concrete blocks capped and shimmed with wedges, or adjustable manufactured metal or concrete stands (See Figure 4.1).

4.1.3. Design Requirements.

4.1.3.1. Load-Bearing Capacity. The load that each pier must carry depends on factors such as the dimensions of the home, the roof live load, the spacing of the piers, and the way they are used to support the home. Center beam/marriage wall blocking is required for multi-section homes. See tables 4.2 and 4.3 for pier loads. Piers must be rated to resist the noted loads (see 4.1.3.2).

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

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

Use 4" x 6" hardwood shims to level the home and fill any gaps between the base of the I-beam and the top of the pier cap. Always use shims in pairs (see Figure 4.1). Drive them in tightly so they do not occupy more than 1" of vertical space. When the space to be shimmed is less than the minimum thickness of available caps or concrete blocks, pressure treated hardwood dimension lumber may be used under the caps.

Select manufactured pier heights so that their adjustable risers do not extend more than 2" when finally positioned.

All piers must be set on footings (see Paragraph 4.2) that are installed in such a manner so as to provide a stable environment for your home.

4.1.3.3. Clearance Under the Home. After the home is leveled, the resulting distance between the bottom of the chassis and the ground must be no less than 12". Clearance must be maintained without exceeding the maximum pier heights describe in Figure 4.1.

4.1.4. Design Procedures.

4.1.4.1. Piers Up to 36" High. You may construct piers less than 36" high out of single, open or closed-cell concrete blocks, 8" x 8" x 16". Install them so that the long side is at right angles to the supported I-beam (see Figure 4.1). Position open cells at right angles to the footers. Horizontal offsets should not exceed 1/2" top to bottom. Mortar is not normally required. Manufactured piers should be listed and labeled. Do not extend their adjusting studs beyond the limits specified by the manufacturer of the pier.

4.1.4.2. Piers 36" to 67" High. Construct all piers between 36" and 67" high, and all corner piers over three blocks high, out of double, interlocked concrete blocks (see Figure 4.1). Mortar will not normally be required.

4.1.4.3. Piers Over 67" High. Where permitted by local codes, lay them in concrete mortar with steel reinforcing bars inserted in the block cells and fill the cells with concrete. Where such construction is not permitted by local codes, have piers over 67" high designed by a registered professional or structural engineer.

4.1.5. Location and Spacing. The location and spacing of piers depends upon the dimensions and weight of the home, the roof load zone, the type of construction and other factors such as the locations of doors or other openings and heavy pieces of furniture. In general, locate piers no more than 2' from either end (unless specified). Place piers of your home as follows:

4.1.5.1. Single And Multi-Section Homes.

A. Homes not requiring perimeter support. Figure 4.2 shows the recommended location and spacing of piers for homes not requiring perimeter blocking generally located at south (20 PSF) and middle (30 PSF) roof zone areas.

B. Homes requiring perimeter support. See Figure 4.3 for homes requiring additional perimeter supports (generally at 40 PSF or higher roof load zones).

4.1.5.2. **Under Doors And Heavy Furniture.** Place piers on both sides of all exterior doors, sidewall openings wider than 4' (such as entry and sliding glass doors), under porch posts, fireplaces and wood stoves, and under the expected locations of heavy pieces of furniture such as pianos, waterbeds, etc. This additional blocking is required with all types of foundation.

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

4.2.1. **Acceptable Types Of Footings.**

4.2.1.1. **Concrete.** Footings may consist of precast of poured-in-place concrete, pads slabs, or ribbons with a 28-day compressive strength of at least 3,000 psi (see Figure 4.4 for minimum footer thickness).

4.2.1.2. **Other Materials.** You may also use other materials approved for this use by local authorities if they provide equal load-bearing capacity and resistance to decay.

4.2.2. **Footer Placement.** For homes which are to be set in areas susceptible to frost, in order to prevent the potentially harmful effects of frost heave, footings should be placed below the frost line or the home must be installed in such a manner as to provide a stable environment.

4.2.3. **Proper Sizing Of Footings.** Proper sizing of footings depends upon the load-carrying capacity of both the piers and the soil. See Table 4.4 for recommended footing sizes based on pier load (Table 4.2 and 4.3) and minimum soil bearing capacity.

4.2.4. **Other Footing Design Considerations.** You should check with applicable state or local building authorities concerning any other requirements they may have concerning design, construction or placement of acceptable footings.

4.3. **Permanent Foundations.** Check local building codes and regulations and consult a registered professional or structural engineer when you are setting your home on a permanent foundation (such as a full basement, crawl space or load-bearing perimeter foundation). You may get a permanent foundation design that meets most local codes by writing to the address located on the back cover of manual, Attention Customer Service.

4.3.1. **Flood-Prone Areas.** We do not recommend setting your home in river or coastal flood-prone areas. Special local regulations or flood insurance provisions may apply. Special elevation and anchoring techniques are required when locating in a flood-prone area. Consult a registered professional or structural engineer to make sure that the home design and construction conform to applicable federal, state and local codes and regulations. The FEMA publication listed in Section 4.4.3 contains design and construction recommendations.

4.3.2. **Severe Wind Areas.** Special foundation and anchoring techniques are required when your home is located in a severe wind area. Consult a registered professional or structural engineer. HUD foundations design guide listed in Section 4.4.4 contains recommendations for designing foundations and anchoring systems. Do not place your home in a wind zone more severe than the one indicated on your home's Data Plate.

4.3.3. **Special Snow Load Conditions.** Homes designed for and located in heavy snowfall areas or subject to other extreme loading conditions will require special piers or footings. See Table 4.2 for pier loads up to 50 psf roof load. For higher roof load consult a registered professional engineer for your foundation design. Do not place your home in a roof zone more severe than the one indicated on your home data plate.

4.4. **Important Reference Documents**.

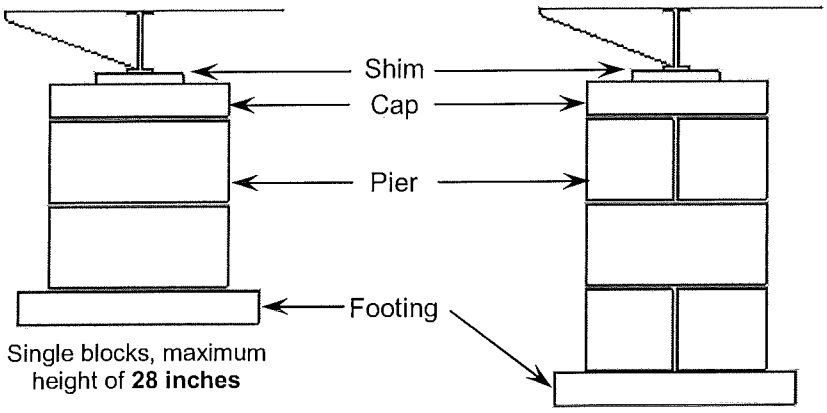
4.4.1. ANSI/NCSBCS A225.1 - 1987, "Manufactured Home Installations," NCSBCS, 505 Huntmar Park Drive, Herndon VA 22070 (703) 437-0100.

4.4.2. ANSI A58.1 - 1982, "Minimum Design Loads for Buildings and Other Structures," ANSI, 1430 Broadway, New York NY 10018.

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

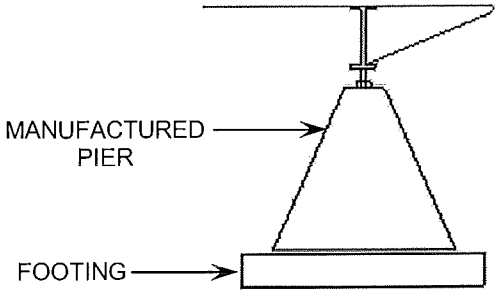
4.4.4. HUD Handbook 4930.3 (1989), "Permanent Foundations Guide for Manufactured Housing," HUD, 415 7th Street, SW, Washington DC 20036, June, 1976.

FIGURE 4.1 - TYPICAL FOOTING & PIER INSTALLATION

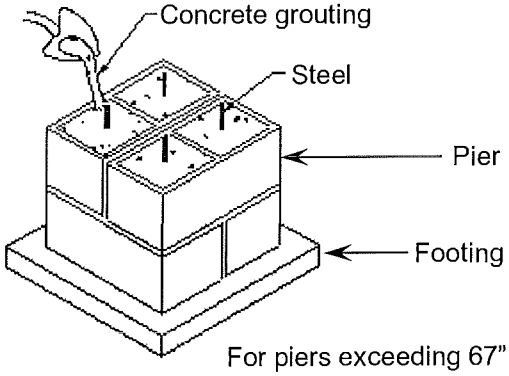


Single blocks, maximum height of **28 inches**

Double interlocked blocks, maximum height of **67 inches**



Steel or concrete manufactured pier



For piers exceeding 67" in height, the concrete blocks must be filled with concrete grouting and steel bars must be utilized. (see Paragraph 4.1.4.3.)

TABLE 4.1

TYPE OF CONCRETE BLOCK	MAXIMUM PIER HEIGHT
SINGLE STACK	28"
DOUBLE INTERLOCK	67"

NORMAL MANUFACTURED HOME INSTALLATION
Type of Foundation System

1. **Piers** - Ground Anchors. Home rests on piers of concrete block, formed-in-place concrete, permanent wood or steel pedestals on permanent wood, crushed stone or concrete footers. Ground anchors in soil angled to resist straps or embedded in concrete deadmen soil. Straps tied to the frame, with or without over-the-top straps.

2. **Concrete slab or continuous footing.** Home rests on a concrete slab or ribbons of concrete. Straps tied between frame and perimeter footers or concrete slab. Recommend installing earth anchors prior to pouring concrete slab. Concrete slab should be sloped to prevent water accumulation under home.

3. **Pile/post system**. Home rests on piles/posts. Place sufficiently deep in the ground to resist all wind, snow, frost heave and earthquake forces. Straps fasten home to piles/posts or caps placed thereon.

4. **Concrete or Concrete block load-bearing perimeter walls (basement or crawl space).** Home rests on exterior load bearing walls which sit on concrete footings, sufficiently heavy to hold down home to resist all external forces.

REQUIRED FOOTINGS & PIER BLOCKING
(For Homes NOT Requiring Perimeter Blocking)

In Table 4.2 below are the design loads used to determine the support structure for homes not requiring perimeter blocking. The minimum values to be used for pier and footing design based on the indicated roof live load and a floor live load of 40 pounds per square foot (PSF) are specified in Table 4.2. See Figure 4.2 for typical pier layout. All required support locations for marriage wall columns, side wall openings and any other special supports are marked by paint, label, decal or stencil. Provide support (piers & footings) at all marked locations per tables 4.4 & 4.5 as required. Note: Do not remove this support location marking as these locations must be visible after home is installed.

All load bearing pier supports and footings may be subject to approval by the local enforcement agency. As specified in Table 4.2, each pier shall have adequate capacity to support the design load shown. The required sizes of footings will depend on soil bearing capacity test results. In lieu of soil tests, confer with the local building authority for recommended soil bearing capacity in your area. The areas beneath the footing shall have all grass and organic materials removed before installation. All footers must be placed on either undisturbed soil or compacted fill.

TABLE 4.2
PIER LOADING UNDER MAIN I-BEAMS
(When only frame blocking is required.)

	12' or 24' WIDE HOMES			14', 28', or 42' WIDE HOMES			16' or 32' WIDE HOMES		
Pier Spacing Under Main I-Beams (Ft)	Pier Load (Lbs) 20 PSF Roof Load (South Zone)	Pier Load (Lbs) 30 PSF Roof Load (Middle Zone)	Pier Load (Lbs) 40 PSF Roof Load (North Zone)	Pier Load (Lbs) 20 PSF Roof Load (South Zone)	Pier Load (Lbs) 30 PSF Roof Load (Middle Zone)	Pier Load (Lbs) 40 PSF Roof Load (North Zone)	Pier Load (Lbs) 20 PSF Roof Load (South Zone)	Pier Load (Lbs) 30 PSF Roof Load (Middle Zone)	Pier Load (Lbs) 40 PSF Roof Load (North Zone)
4	2130	2420	2560	2410	2740	2940	2700	3060	3320
5	2660	3020	3190	3020	3420	3670	3370	3830	4150
6	3190	3620	3830	3620	4110	4410	4050	4590	4980
7	3720	4230	4470	4220	4790	5140	4720	5360	5810
8	4250	4830	5110	4820	5480	5880	5400	6120	6640
9	4780	5440	5750	5430	6160	6610	6070	6890	7470
10	5320	6040	6380	6030	6850	7340	6750	7650	8300
12	6390	7250	7660	7250	8250	8800	8100	9200	9950

NOTES:

1. See Table 4.4 for minimum footing sizes based on pier loads and allowable soil bearing capacities. The footing sizes and pier loads are minimums required for the applicable conditions. The footing shall not be smaller than the pier it supports or 256 square inches.

2. The maximum spacing of supports is not to exceed 12 feet.

3. Where it is impractical to maintain spacing, such as in the axles area, the average of the distance to each adjacent support may be used to determine support requirements, for example: if the distances to the adjacent supports were 6'-0" and 8'-0", the average spacing would be 7'-0".

4. Homes located in the north (40 PSF) roof load zones MUST have perimeter blocking per Table 4.3 unless indicated otherwise by a letter from plant of manufacturing.

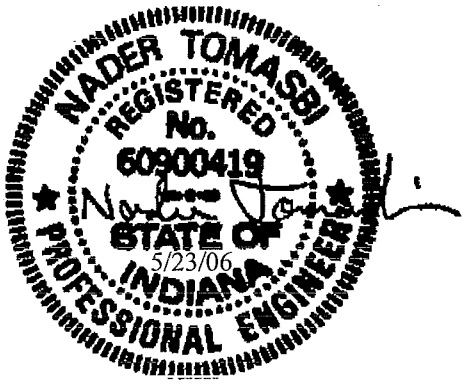
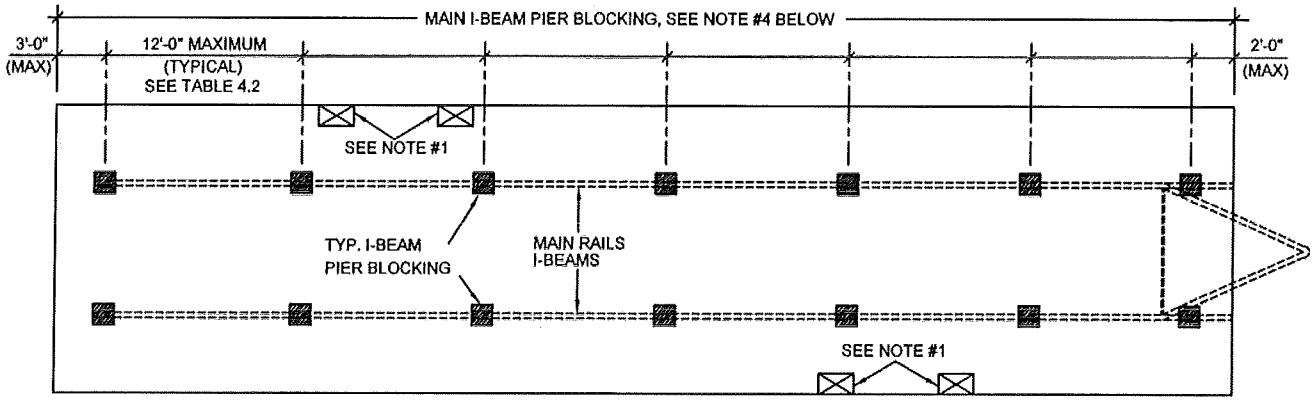
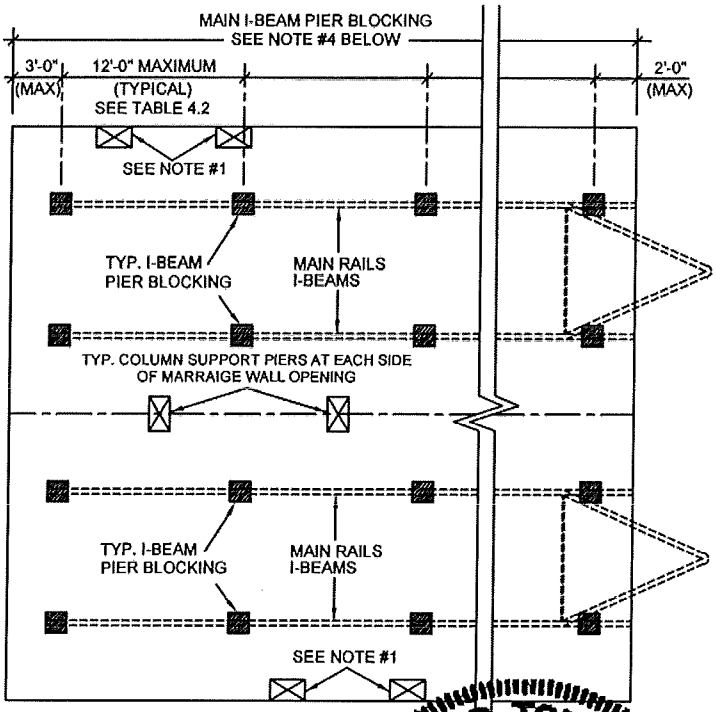


FIGURE 4.2 PIER LAYOUT FOR HOMES @ SOUTH AND MIDDLE ROOF LOAD ZONES

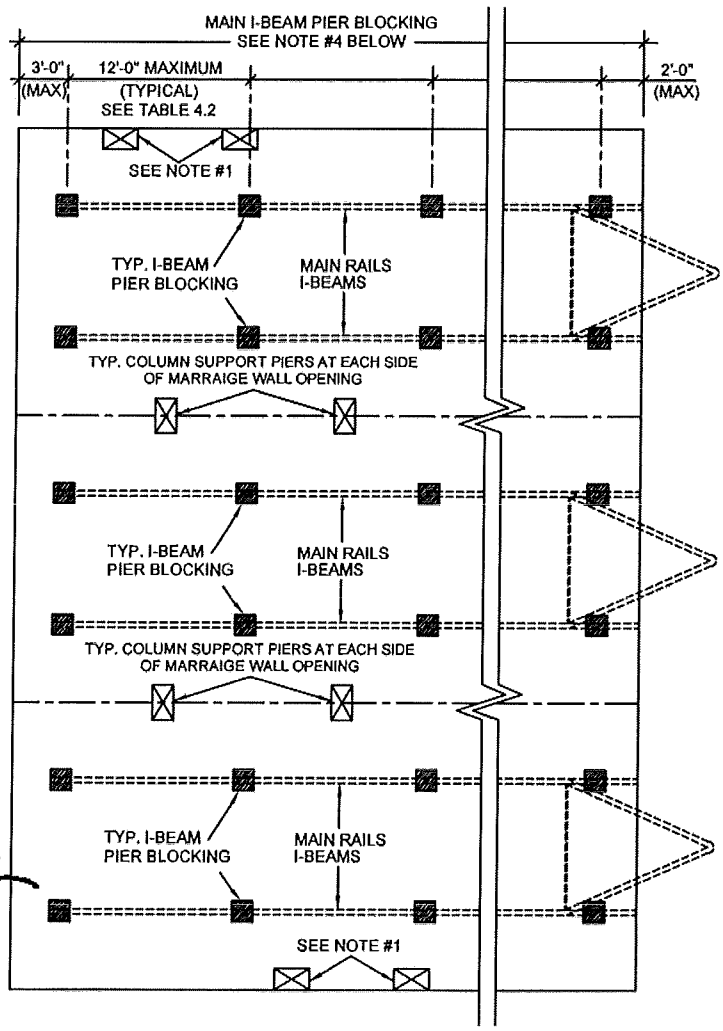
TOP VIEW - SINGLE SECTION

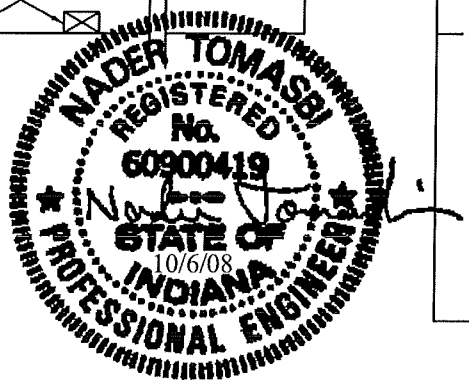


TOP VIEW - DOUBLE SECTION



TOP VIEW - TRIPLE SECTION





GENERAL NOTES

1. PERIMETER PIER BLOCKING MUST BE PROVIDED AT BOTH SIDES OF ALL EXTERIOR DOORS (EXCEPT AT ENDS OF HOMES) AND ANY OPENING IN THE EXTERIOR SIDEWALL 4'-0" OR WIDER (INCLUDING PATIO DOORS, RECESSED ENTRIES, BAY WINDOWS AND PORCHES).
   NOTE:
   PIERS USED FOR PERIMETER SUPPORT MUST BE INSTALLED WITH THE LONG DIMENSION PARALLEL TO THE PERIMETER RAIL.
2. FOOTINGS AND PIER SUPPORTS MUST BE DESIGNED TO SUPPORT THE LOAD VALUES SHOWN.
3. COLUMN SUPPORT PIERS, LOCATE ONLY AT BOTH SIDES OF CENTER LINE WALL OPENING.
4. THE TABULATED PIER LOADS INCLUDE THE INDICATED LIVE LOADS PLUS HOME DEAD LOADS (INCLUDING CHASSIS AND WALLS).
5. RECOMMENDED MAXIMUM PIER SPACING FOR MAIN I-BEAM FOR THE FOLLOWING I-BEAM SIZES IS:
   8" I-BEAM.....8'-0" O.C.
   10" I-BEAM.....10'-0" O.C.
   12" I-BEAM.....12'-0" O.C.
6. PIERS MAY BE OFFSET UP TO 6" IN EITHER DIRECTION ALONG THE SUPPORT MEMBERS TO ALLOW FOR PLUMBING, ELECTRICAL, MECHANICAL, EQUIPMENT, CRAWL SPACES OR OTHER DEVICES.

REQUIRED FOOTINGS & PIER BLOCKING

(For Homes Requiring Perimeter Blocking)

In Table 4.3 below are the design loads used to determine the support structure for homes requiring perimeter blocking. The minimum values to be used for pier and footing design based on the indicated roof live load and a floor live load of 40 pounds per square foot (PSF) are specified in Table 4.3. See Figure 4.3 for typical pier layout. . All required support locations for marriage wall columns, side wall openings and any other special supports are marked by paint, label, decal or stencil. Provide support (piers & footings) at all marked locations per tables 4.4 & 4.5 as required. Note: Do not remove this support location marking as these locations must be visible after home is installed.

All load bearing pier supports and footings may be subject to approval by the local enforcement agency. As specified in Table 4.3, each pier shall have adequate capacity to support the design load shown. The required sizes of footings will depend on soil bearing capacity test results. In lieu of soil tests, confer with the local building authority for recommended soil bearing capacity in your area. The areas beneath the footing shall have all grass and organic materials removed before installation. All footers should be placed on either undisturbed soil or compacted fill.

TABLE 4.3
PIER LOAD
FRAME PLUS PERIMETER BLOCKING
(When Both Frame And Perimeter Blocking Are Required. See Note #1)

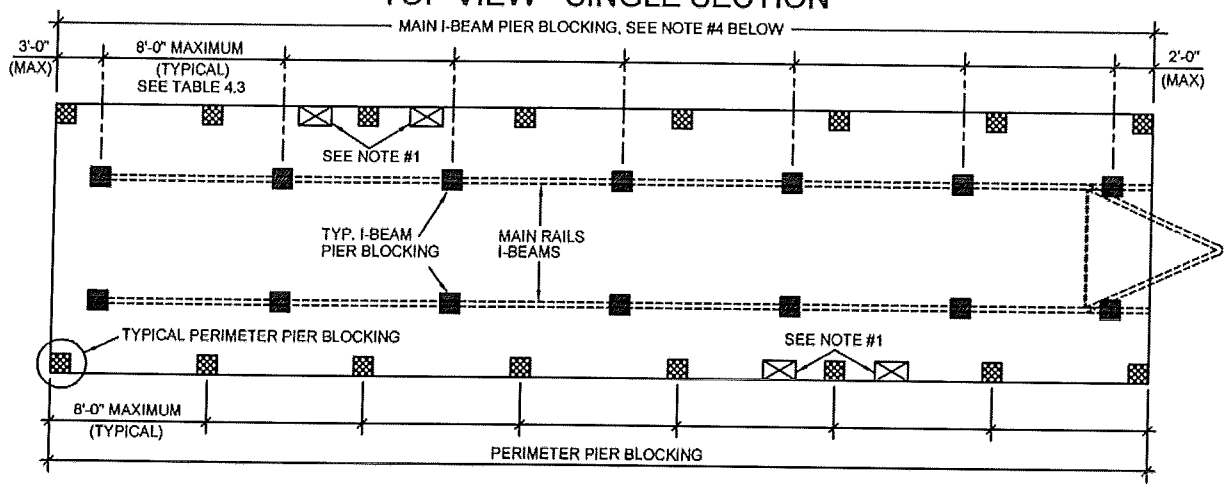
			Maximum pier loads:		
			Maximum pier spacing		
Section Width Ft.	Roof Live Load PSF	Pier Location	4'	6'	8'
12', 14', or 16' Single Section	20	Frame Perimeter	1400# 1470#	2100# 2206#	2800# 2941#
	30	Frame Perimeter	1400# 1800#	2100# 2701#	2800# 3601#
	40	Frame Perimeter	1400# 2130#	2100# 3196#	2800# 4261#
	60, 80, or 120	Frame Perimeter	1100# See note 2	2100# See note 2	2800# See note 2
24', 28', 32' or 42' Multi-Section	20	Frame Perimeter Marriage Line	1400# 1470# 2941#	2100# 2206# 4411#	2800# 2941# 5882#
	30	Frame Perimeter Marriage Line	1400# 1800# 3601#	2100# 2701# 5401#	2800# 3601# 7202#
	40	Frame Perimeter Marriage Line.	1400# 2130# 4261#	2100# 3196# 6391#	2800# 4261# 8522#
	60, 80, or 120	Frame Perimeter Marriage Line	1400# See note 2 See note 2	2100# See note 2 See note 2	2800# See note 2 See note 2

NOTES:

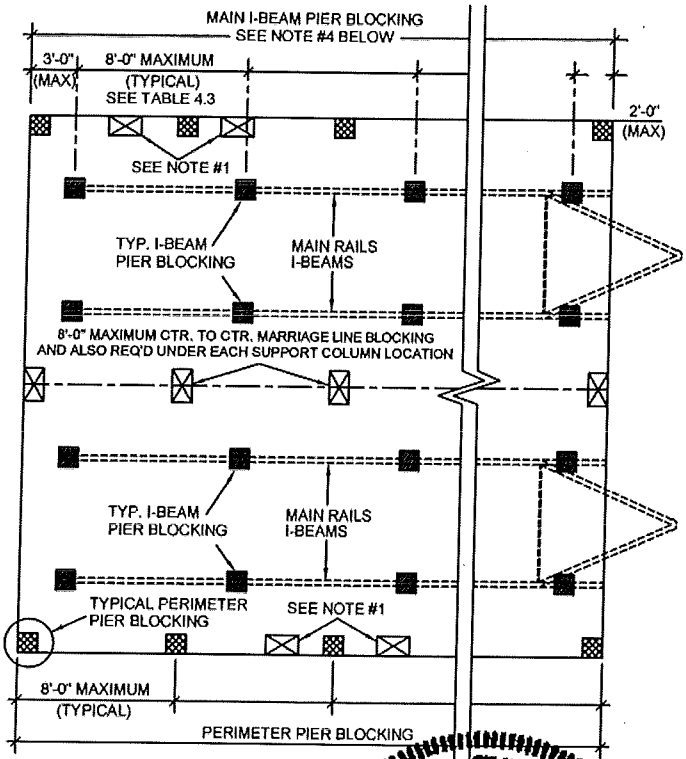
1. Perimeter blocking is required at North Zone (40 PSF) or higher roof load areas. Use above loads when optional perimeter blocking is provided at South (20 PSF) and Middle (30 PSF) roof load zones.
2. Homes at 60, 80 and 120 PSF roof load areas MUST have a continuous perimeter and marriage line foundation support.

FIGURE 4.3 PIER LAYOUT FOR HOMES @ NORTH ROOF LOAD ZONE

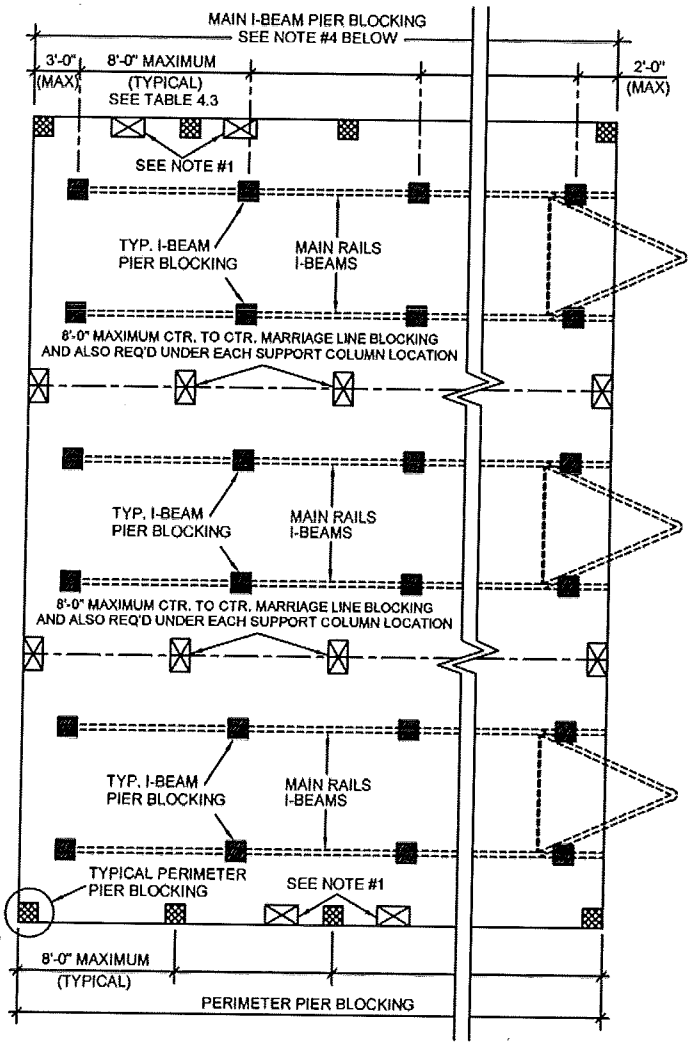
TOP VIEW - SINGLE SECTION

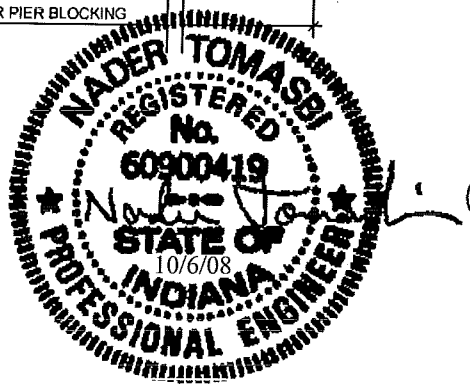


TOP VIEW - DOUBLE SECTION



TOP VIEW - TRIPLE SECTION





GENERAL NOTES

1. ADDITIONAL PERIMETER PIER BLOCKING MUST BE PROVIDED AT BOTH SIDES OF ALL EXTERIOR DOORS (EXCEPT AT ENDS OF HOMES) AND ANY OPENING IN THE EXTERIOR SIDEWALL 4'-0" OR WIDER (INCLUDING PATIO DOORS, RECESSED ENTRIES, BAY WINDOWS AND PORCHES).
   NOTE:
   PIERS USED FOR PERIMETER SUPPORT MUST BE INSTALLED WITH THE LONG DIMENSION PARALLEL TO THE PERIMETER RAIL.
2. FOOTINGS AND PIER SUPPORTS MUST BE DESIGNED TO SUPPORT THE LOAD VALUES SHOWN.
3. COLUMN SUPPORT PIERS, LOCATE ONLY AT BOTH SIDES OF CENTER LINE WALL OPENING.
4. THE TABULATED PIER LOADS INCLUDE THE INDICATED LIVE LOADS PLUS HOME DEAD LOADS (INCLUDING CHASSIS AND WALLS).
5. PIERS MAY BE OFFSET UP TO 6" IN EITHER DIRECTION ALONG THE SUPPORT MEMBERS TO ALLOW FOR PLUMBING, ELECTRICAL, MECHANICAL, EQUIPMENT, CRAWLSPACES OR OTHER DEVICES.

2. Chapter 2 – Definitions

Anchoring Equipment: Straps, cables, turn-buckles and chains, including tensioning devices, that are used with ties to secure a manufactured home to ground anchors.

Anchoring System: A combination of ties, anchoring equipment, and ground anchors that will, when properly designed and installed, resist the wind which might overturn the home or move it sideways.

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

Foundation: That part of a building that is an engineered structure designed to transfer the weight of the building or structure to the soil.

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

1. Manufactured steel stands
2. Manufactured concrete stands, and
3. Concrete blocks

Site, Manufactured Homes: A parcel of land designed and designated for the location of one manufactured home, its accessory buildings or structures, and accessory equipment for exclusive use of the home's occupants.

Stabilizing System: A combination of properly installed anchoring and support system.

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

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

TABLE 4.4
FOOTING SIZES

SOIL CAPACITY (PSF)	MINIMUM PAD SIZE (IN X IN)	FOOT CAPACITY	SINGLE STACK PIER	PAD THICKNESS DOUBLE STACK PIER
1000	20 X 20	2778	4"	4"
	24 X 24	4000	4"	4"
	30 X 30	6250	4"	4"
1500	16 X 16	2667	4"	4"
	20 X 20	4167	4"	4"
	24 X 24	6000	4.5"	4"
	30 X 30	9375	6.5"	4"
2000	16 X 16	3556	4"	4"
	20 X 20	5556	4"	4"
	24 X 24	8000	5.5"	4"
2500	16 X 16	4444	4"	4"
	20 X 20	6944	5"	4"
	24 X 24	10000	6"	4"
3000	16 X 16	6222	4"	4"
	20 X 20	8333	5"	4"
3500	16 X 16	5333	4"	4"
	20 X 20	9722	5"	4"
4000	16 X 16	7111	4"	4"
	20 X 20	11111	6"	4"

Foundations in soil with a bearing capacity of less than 1,000 PSF or more than 4,000 PSF must have soil capacities verified by a local Registered Professional Engineer familiar with local site conditions.

TABLE 4.5
PIER LOADING UNDER MARRIAGE LINE OF MULTI SECTION HOMES

	24' WIDE HOMES			26', 28', & 42' WIDE HOMES			32' WIDE HOMES		
Span Between Columns (FT.) See Note 1	Pier Load (Lbs) 20 PSF Roof Zone	Pier Load (Lbs) 30 PSF Roof Zone	Pier Load (Lbs) 40 PSF Roof Zone	Pier Load (Lbs) 20 PSF Roof Zone	Pier Load (Lbs) 30 PSF Roof Zone	Pier Load (Lbs) 40 PSF Roof Zone	Pier Load (Lbs) 20 PSF Roof Zone	Pier Load (Lbs) 30 PSF Roof Zone	Pier Load (Lbs) 40 PSF Roof Zone
6	1080	1440	1800	1260	1680	2100	1440	1920	2400
10	1800	2400	3000	2100	2800	3500	2000	3200	4000
12	2160	2880	3600	2520	3360	4200	2880	3840	4800
14	2520	3360	4320	2940	3920	4900	3360	4480	5600
16	2880	3840	4800	3360	4480	5600	3840	5120	6400
18	3240	4320	5400	3780	5040	6300	4320	5760	7200
20	3600	4800	6000	4200	5600	7000	4800	6400	8000
24	4320	5460	7200	5040	6720	8400	5760	7680	9600

NOTES:

1. Where a column is located between two openings or when two columns are too close for separate piers, sum the loads for each opening to obtain the required pier load.
2. See Table 4.4 for minimum footing sizes based on pier loads and allowable soil bearing capacities.
3. The concentrated loads consists of roof loads only.
4. Pier locations at the marriage wall are marked with paint or metal indicator straps (or see specific foundation plans for pier locations.)
5. Use the following procedure for pier loads at each sides of opening(s) in 60, 80, & 120 psf roof loads:
   Pier load @ 30 psf from above table x 2 = Pier load at 60 psf
   Pier load @ 40 psf from above table x 2 = Pier load at 80 psf
   Pier load @ 40 psf from above table x 3 = Pier load at 120 psf

5. Chapter 5 – Set-Up Procedures

5.1. **Moving Home To Location.** Make sure the following items are completed before placing the home:

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

CAUTION: THE HOME WEIGHS SEVERAL TONS. USE ADEQUATE TEMPORARY SUPPORT BLOCKING TO SAFEGUARD WORKERS. WOOD BLOCKING FOR YOUR HOME IS RECOMMENDED.

5.1.1. **Positioning the home.** When not placing the home on a concrete slab or poured-in-place footings, mark the corners of the home and lay out footings, and support devices close to where they will be used.

5.1.2. Then move the home or first section into position.

5.2. Singlewide Homes – Blocking and Leveling

5.2.1. Before doing any jacking, place support piers for the home in the locations under the home as specified in the home installation instructions.

5.2.2. Use a minimum of two jacks, each with a rating of at least ten tons.

5.2.3. Jack only on the main chassis I-Beam. Locate the jack directly under the vertical web of the I-Beam. Do not jack on the seam (joint between flanges) of a twin I-Beam.

5.2.4. 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.

5.2.5. The jack base, and any blocking, must be located on firm ground.

5.2.6. Do not operate the jacks while you are under the main I-Beams of the home.

5.2.7. Use jacks only for raising the home. Do not rely on the jacks to support the home.

5.2.8. Place 4" x 6" x 48" minimum safety timbers between the I-Beams and ground in case of jack failure. Timber should be hardwood.

5.2.9. Raise the home in small increments and provide additional blocking between the home and the piers and safety piers as the home is raised.

5.2.10. Do not go under the home while it is supported on the jacks,

FAILURE TO FOLLOW THESE WARNINGS MAY RESULT IN SERIOUS INJURY OR DEATH.

Reminders before jacking...

1. Use only jacks in good condition with a minimum rating of 10 tons.
2. Use a Minute Man C-Channel jacking plate or equivalent between jack and steel I-Beam to distribute the concentrated loads from jack to I-Beam.
3. Use a firm support under the jack base to prevent tipping or settling of the jack. A 12" x 12" or larger pad is recommended.
4. Always follow the sequence of jacking outlined below to avoid overstressing structural members.

5.2.11. The jacking procedure is as follows:

5.2.11.1. After the home is located in its final position, you can preliminary level it by using the hitch jack but only after adequately wheel blocking the home so it does not roll.

5.2.11.2. Jack up one side of the home by placing one jack just forward of the front spring hanger and the other just behind the rear spring hanger of the same I-Beam. These two jacks must be operated simultaneously to raise the home. Jack low side of the home first. Install footings and piers; one just forward of the front jack and another just behind the rear jack (taking care not to exceed the correct spacing selected from Table 4.2.)

5.2.11.3. Next, jack the main I-beam at the front and position a pier within 2'-0" of the end of the I-Beam. At the completion of this step, this side of the home should be approximately level.

5.2.11.4. Repeat Steps 5.2.11.2 and 5.2.11.3 for the other side of the home. At the completion of this step, the home should be roughly level from front to rear and from side to side.

5.2.11.5. Place the remaining pier supports under the main I-Beam on each side taking care to maintain a maximum distance of no more than the spacing determined from Table 4.2 with piers located as specified at each end of each I-Beam (see Figure 4.2).

5.2.11.6. Level the home within reasonable tolerances, using a 6 foot carpenter's level, water level or similar equipment. The final height adjustment is obtained by jacking the I-Beam and placing hardwood shims between the piers and I-Beam or other approved methods such as adjustable piers. THIS LEVELING PROCESS IS IMPORTANT FOR THE APPEARANCE AND IS ESSENTIAL FOR THE PROPER OPERATION OF DOORS, WINDOWS AND THE DRAINAGE SYSTEM.

5.2.11.7. Place additional supports at each side of sidewall openings over 4'-0" wide and each side of exterior doors.

5.2.11.8. Within 90 days after initial set-up, the home should be releveled, if necessary, to compensate for any pier settlement. Following the procedure in Item 5.2.11.6. above.

5.2.11.9. NOTE: DURING THE LEVELING OR RELEVELING PROCESS, LOOSEN FRAME TIES AND OVER-THE-ROOF TIES (IF PROVIDED) PRIOR TO JACKING THE HOME.

5.3. Multi-Section Homes – Blocking and Leveling

With the exception of the requirement for support under the marriage wall of multisection units, leveling and blocking procedure are the same as for single section units. Prepare the site as previously described. It may be desirable to construct the footing and piers (to grade height) prior to moving the home to its final location. Figure 4.2 and 4.3 illustrate the typical pier layouts, making special note of additional piers required at center beam support locations. The following procedure describes the setting of a double-section home only. The procedure required for a triple-section home is similar, except for the blocking & leveling the "T-Section" first, prior to that of the "U" Section and "X" section.

5.3.1. **Leveling and blocking the U Half.** Figure 5.1 shows the way we recommend you level the home. To prevent tipping or settling, use a firm support under jacks. Use a steel channel or plate between jacks and steel beams to distribute the load. Use equipment in good working condition and strong enough to handle the loads. Work safely whenever you are under, in, or around a home that is being set. Use the following jacking sequence:

5.3.1.1. Using the water level described in Figure 5.1 or a 6' level, check the level of the floor crosswise in the axle area. If the floor is not level from side to side, place the 10 ton jack under the low side I-beam at the axle area and carefully raise the I-beam until the floor is level. Place blocks under the I-beam, on each side, at the pier points closest to the jack. Insert wedges, as shown on Figure 5.1, so that the blocks bear the weight.

5.3.1.2. Place the level lengthwise on the floor, and working towards each end of the home, place blocks and wedges under both I-beams, at selected pier spacings. Make continuous checks with the level, both lengthwise and crosswise. If you must jack the U-side to keep it level as you work towards the ends, jack it only under the I-beams and only enough to make it level.

5.3.2. **Leveling and Blocking the X Half.** CAUTION: Do not proceed with the X-half until the U-half is completely level and properly blocked. After it is, proceed as follows:

5.3.2.1. Remove the plastic used to close up the open side of each half during transportation, but DO NOT remove the wood supports holding up the ceiling at the open sides. At this point, make sure a mating gasket has been installed on one half at the floor line, endwalls and roof. Park the X-side as closely as possible to the U-side. Slide the X-half sideways to the U-half by using two come-a-longs, placing one end on the U-half I-beam and the other end on the X-half I-beam. Use one come-a-long at the front and one at the rear, or more if necessary at interim locations.

5.3.2.2. Place a 10 ton jack under the X-half inside I-beam about 1/3 of the floor length from each end. Carefully jack the X-half inside I-beam until the X-half floor edge is about even with the U-half floor edge, as shown in Figure 5.3.

5.3.2.3. Loosely lag the X-half floor joists to the U-half floor per Figure 5.10 at Wind Zone 1 and per Figure 5.13 for Wind Zone 2 and 3. To prevent the splitting of rim joist pre-drilling of holes may be required. Do not tighten these lags at this time.

5.3.2.4. Temporarily block the X-half inside I-beam at selected pier spacings, removing the jacks and place them under the X-half outside I-beam about 1/3 of the floor length from each end.

5.3.2.5. Carefully jack the X-half outside I-beam until the X-half floor is approximately level crosswise. Temporarily block the X-half outside I-beam at pier points. The X-half should be very close to the U-half, and the small space (if any) between the floors and ceilings of the X and U halves should be the same. The two sides should now be loosely attached at the floor joists. The U-side is completely level and blocked. The X-side should be nearly level because the ceilings and floors were made to match up. You are now ready to level the X-half so that it is even with the U-half, and to permanently block it.

5.3.2.6. Place a 10 ton jack under each I-beam of the X-half at the axle area. Carefully adjust the floor to the X-half until it is level with the floor of the U-half. Go to the outside I-beam of the X-half and adjust it so that the X-half floor is level crosswise. The X-half floor should now be level crosswise and even with the U-half floor.

5.3.2.7. Place blocks under the I-beams, on each side of the X-half at the pier points closest to the jacks. Insert wedges, as shown on the drawing, so that the blocks bear the weight.

5.3.2.8. Work towards either end, placing blocks and wedges under the I-beams on both sides, at selected pier spacing. Make continuous checks with the level to be sure that the floor of the X-half is level and even with the U-half. CAUTION: Do not over-jack the X-half or you will strain the lags attaching the two halves together, make the floor unlevel or cause other problems.

5.3.2.9. Both halves should now be blocked and level. Before tightening the lags through the floor joists underneath the home, check all alignments. Are the front and rear end walls flush? Are the floors and ceilings flush? Tighten the lags through the floor joists, starting in the center and working towards each end.

NOTE: When the two sections are in place, aligned and leveled, gaps between floors or ridge beams, 1 1/4" wide maximum, which DO NOT extend the full length of the home may be closed up with plywood or lumber shims. The lag screws in the shimmed portion may need to be increased in length to ensure that they engage both the floor rim or roof ridge beam with the same penetration as area's without gap. Reduce the lag application angle to 30 degrees in gap area for proper penetration (see Detail "A" fig. 5.4).

5.3.2.10. Now that each half is properly leveled and blocked, and the floors are securely lagged together, you are ready to move to the ridge beam.

5.3.3. **Roof Ridge Fastening.** See Figure 5.4.

5.3.4. **End Wall Fastening.**

5.3.4.1. Secure the end wall studs, where the two halves come together, by driving 16d nails every 6" into both sides of the matching end wall studs at Wind Zone 1 (Ref. Figure 5.13 at Wind Zone 2 & 3.)

5.3.4.2. The home should now be level, properly blocked and properly and securely fastened together. CAUTION: Once again, use the level and be sure that the floor is properly level throughout the home. Many problems will result if the floors are not level or if the home is not properly fastened together. This is your final check for level. Adjust the wedges between the blocks and the I-beams so that the floor is level.

5.3.5. **Shingle Roof Close-Up.** (see Figure 5.5)

5.3.6. **Interior Closure.**

5.3.6.1. Carefully remove the ridge beam supports used to brace the ridge beam during shipment. Do not damage the ceiling.

5.3.6.2. Interior marriage column support studs at each end of open span area must be toe-nailed together with 16d nails 12" O.C. or #8 x 4" wood screws at 24" O.C. staggered. (see Figure 5.6).

5.3.6.3. Install the center beam furnished with the home.

5.3.6.4. **Fit and secure carpet.** Use your carpet stretcher. Bond carpet seams with your heat bond tape and seaming iron. Put the tape (glue side next to carpet) under the seam and apply heat to the top of the tape, pressing the carpet into the glue. (NOTE: You must stretch the carpet up to the seam and tack it down temporarily until you get the carpet seamed.)

5.3.6.5. Install interior trim moldings, as necessary.

5.3.6.6. Adjust for proper operation all cabinet doors, interior and exterior doors and sliding or folding doors, as necessary.

5.3.7. **Exterior Closure.**

5.3.7.1. The house-type exterior lap siding (if applicable) needed to close-up the ends has been furnished with the home. Starting at the bottom, install each course of siding, cutting to fit as necessary (see Figure 5.7).

5.4. Crossover Connections For Multi-Section Homes.

5.4.1. **Utility Crossovers.** Connect water, drainage, gas, electricity, telephone and utility crossovers as outlined in Chapter 8.

5.4.2. **Ductwork Crossovers.** Clamp the flexible air conditioning and/or heating ducts to the sleeves projecting through the bottom covering, seal the ducts adjustable collars with several wraps of duct tape, and suspend them above the ground. If sleeves are not installed, cut opening for one sleeve and attach to main duct as close as possible directly under furnace (see Figure 5.8); opposite sleeve(s) should be attached to the main duct(s) at a point where there are approximately as many registers forward as there are to the rear. Inspect to insure that duct work is not crushed or touching the ground and is as level as possible.

FIGURE 5.1 - USE OF WATER LEVEL

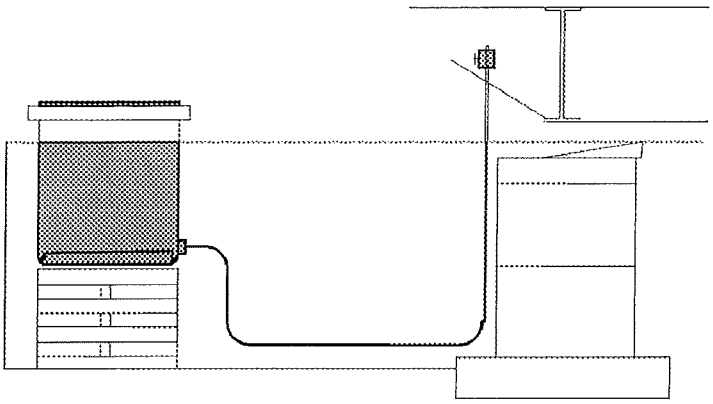
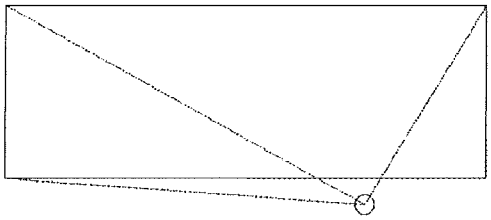


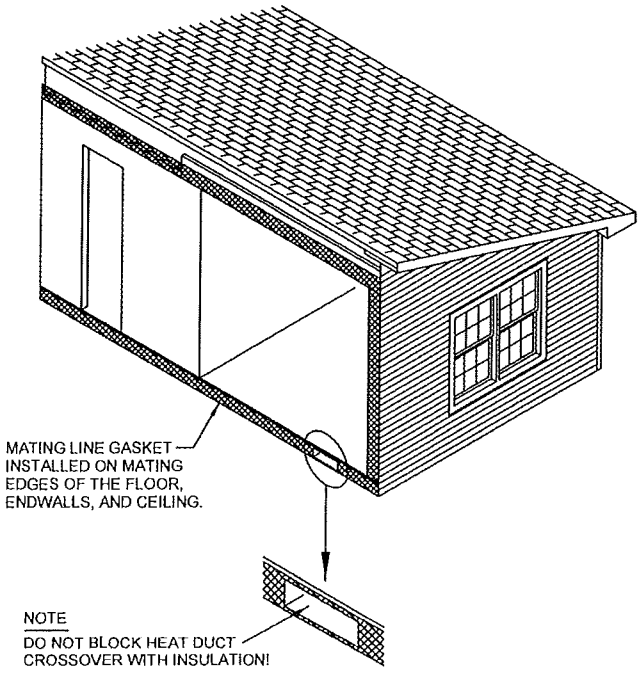
FIGURE 5.2 - WATER LEVEL PLACEMENT



Material to Make Level
Five gallon pail with lid
Plastic tubing - 100 feet x 3/8" or 1/2"
Cork - 1-1/2"
Male barbed fitting - 3/8" x 3/4"
Steel washer - 7/8"
Nut - 3/4"
Female barbed fitting - 3/8" x 1/2"
Male valve - 1/2"
Pipe sealant....
Food coloring - 8 oz.
Use RV solvent in cold weather....

"How to Use a Water Level"
Unroll tubing: Position level where it is to be used. Take care not to have kink in it, step on it or lay anything on it...
Check for air bubbles: To remove bubbles; lower valve below bottom of container and open. Close valve when bubbles are out...
Container location: Located so valve can reach all areas of home. Build up container so water line in valve end of tubing is at the predetermined height support devices will be set...
Leveling: Secure valve above determined height and open. Adjust device as needed. Close valve and move to next leveling location...
NOTE: Level all support devices before lowering home.

FIGURE 5.3 - JOINING OF MULTI-SECTION UNITS



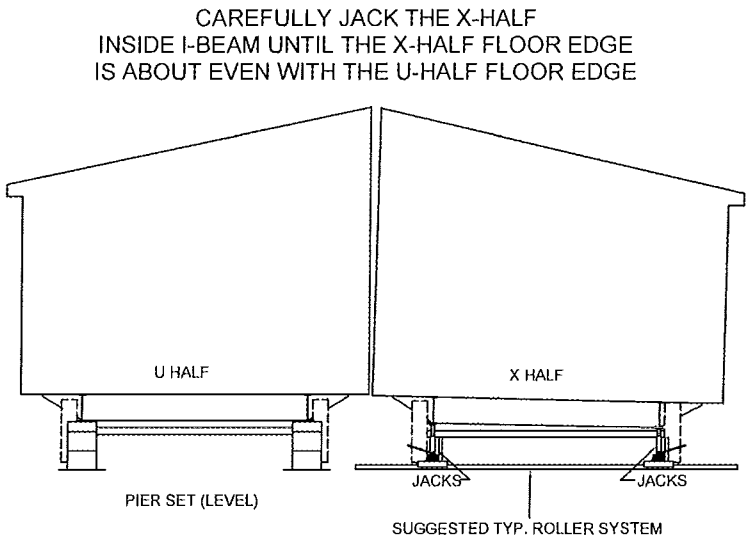
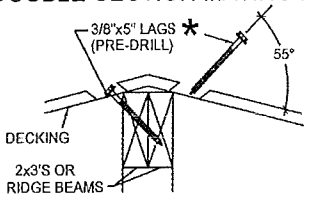


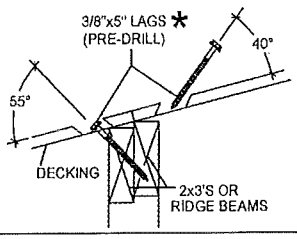
FIGURE 5.4 FASTENING AT ROOF MATING LINE

DETAIL "A"
DOUBLE-SECTION MATING LINE



* WIND ZONE 1 36" O.C.
WIND ZONE 2 16" O.C.
WIND ZONE 3 14" O.C.

DETAIL "A"
TRIPLE-SECTION MATING LINE



ALT. DETAIL "A"
TRIPLE-SECTION MATING LINE

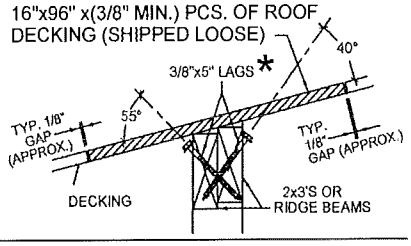
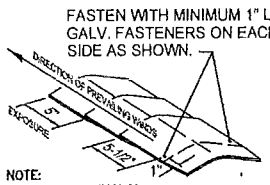


FIGURE 5.5 SHINGLE ROOF CLOSE-UP

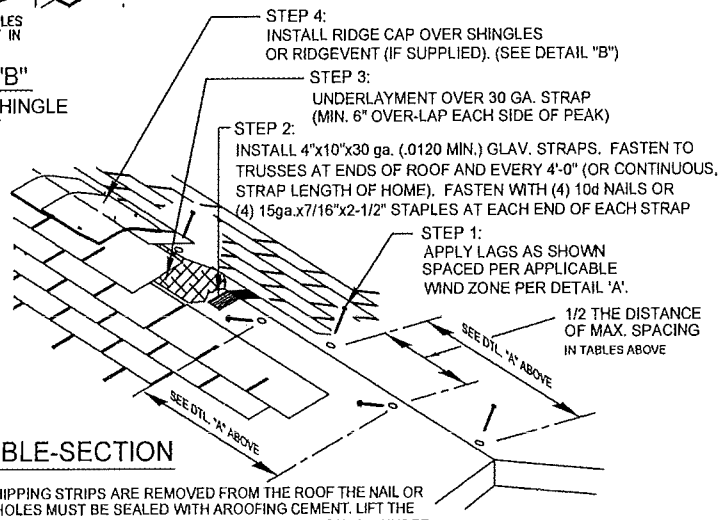


NOTE:
RIDGE CAP SHINGLES ARE 36"x12" CUT IN THREE SECTIONS.

DETAIL "B"
RIDGE CAP SHINGLE LAYOUT

ZONE 1:
UNDERLAYMENT PER ARMA REQUIREMENTS.

ZONE 2 & 3 ONLY:
NOTE: APPLY 6" MIN. OF ASPHALT CEMENT BETWEEN ROOF DECKING AND UNDERLAYMENT @ WZ 2 & 3 AT PEAK AND GABLE ENDS (MEASURED FROM PEAK DOWN EITHER SIDE OR FROM EITHER EDGE OF GABLE END.



DOUBLE-SECTION

WHEN SHIPPING STRIPS ARE REMOVED FROM THE ROOF THE NAIL OR STAPLE HOLES MUST BE SEALED WITH AROOFING CEMENT. LIFT THE SHINGLE TAB WHERE THE HOLE IS AND APPLY CEMENT ON THE UNDER-SIDE OF THE FASTENER HOLE.

ALT. #1
(W/ CONTINIOUS GALV. STRAP @ MATELINE, SHIPPED LOOSE)

STEP 1:
APPLY LAGS AS SHOWN
SPACED PER APPLICABLE
WIND ZONE PER DETAIL 'A'.

1/2 THE DISTANCE
OF MAX. SPACING
IN TABLES ABOVE

STEP 4:
FIELD INSTALLED
SHINGLES AT
EACH HALF

STEP 3:
UNDERLAYMENT
OVER 30 GA.STRAP
(MIN. 6" OVER-LAP
EACH SIDE OF MATE
LINE)

SEE DTL. "A" ABOVE

SEE DTL. "A" ABOVE

STEP 2:
INSTALL 6"x144"x30ga. (.0120" MIN.) GALV.
CONTINUOUS STRAP FASTEN TO RAFTERS
AT ENDS OF ROOF AND EVERY 4'-0".
FASTEN WITH 10d NAILS OR 15 GA. x7/16"x
2-1/2" STAPLES 6" O.C. AT EACH SIDE OF SEAM.

TRIPLE-SECTION MATE-LINE

ALT. #2
(W/ CONTINIOUS PLY. PC'S. @ MATELINE, SHIPPED LOOSE)

STEP 1:
APPLY LAGS AS SHOWN
SPACED PER APPLICABLE
WIND ZONE PER DETAIL 'A'.

STEP 4:
FIELD INSTALLED
SHINGLES AT
EACH HALF

1/2 THE DISTANCE
OF MAX. SPACING
IN TABLES ABOVE

SEE DTL. "A" ABOVE

STEP 3:
UNDERLAYMENT
OVER ROOF DECK
(MIN. 12" OVER-LAP
AT EACH ROOF DECK
JOINT). FASTEN W/
ROOFING NAILS
48" O.C.

SEE DTL. "A" ABOVE

NOTE: PLY-CLIPS,
(1) W/ RAFTERS 16: O.C.
(2) W/ RAFTERS 24: O.C.

STEP 2:
16"x96"x(3/8" MIN.) PCS. OF ROOF DECKING
(SHIPPED LOOSE). FASTENING, 7/16"x1-1/2"
x15 GA. STAPLES AT ZONE 1 & 2, 4" O.C. &
AT ZONE 3, 3" O.C. (AT ZONE 2 & 3 DBL.
ROW OF FASTENERS AT DBL. TRUSSES)
NOTE: DECKING BUTT JOINTS MUST BE
LOCATED AT TRUSSES.

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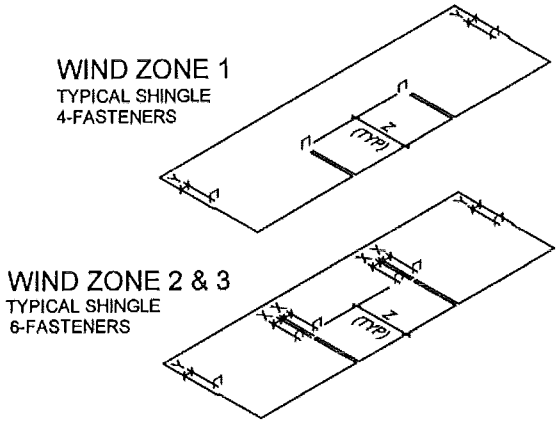
FIGURE 5.5 (continued) - SHINGLE ROOF CLOSE-UP



SHINGLE FASTENING DETAIL

1"x1"x16 GA. (MIN) GALV. STAPLES OR
0.407 x 1" x 12 GA. (MIN) ROOFING NAILS
(4 PER SHINGLE, MIN.) @ WIND ZONE 1
(6 PER SHINGLE) @ WIND ZONE 2 AND 3

X = 1" +/- 1"
Y = 1" FROM END OF SHINGLE
Z = 5-5/8" FROM EDGE OF SHINGLE

FASTENERS ARE NOT TO BE ABOVE
TAR STRIP OR BELOW RAIN SLOTS

1. INSTALL 15# FELT RIDGE CAP OVER PREVIOUSLY INSTALLED 4x10 METAL STRAPS AND LAGS.
2. ADD TWO ROWS OF SHINGLES AS SHOWN OVER 15# FELT RIDGE CAP.

FIGURE 5.6 - TYPICAL FASTENING AT MARRIAGE WALL COLUMNS

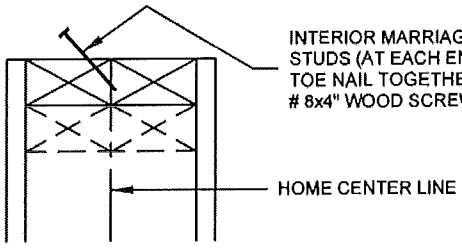
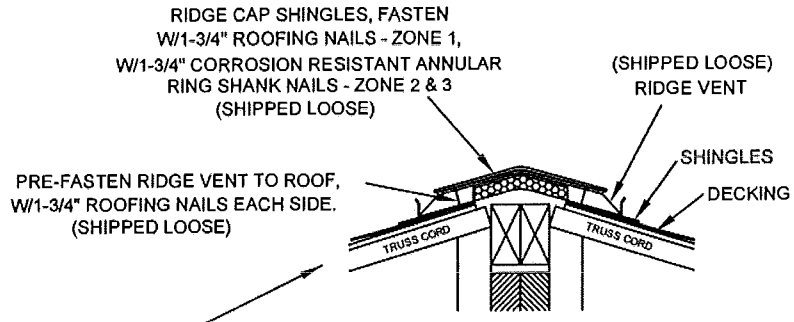
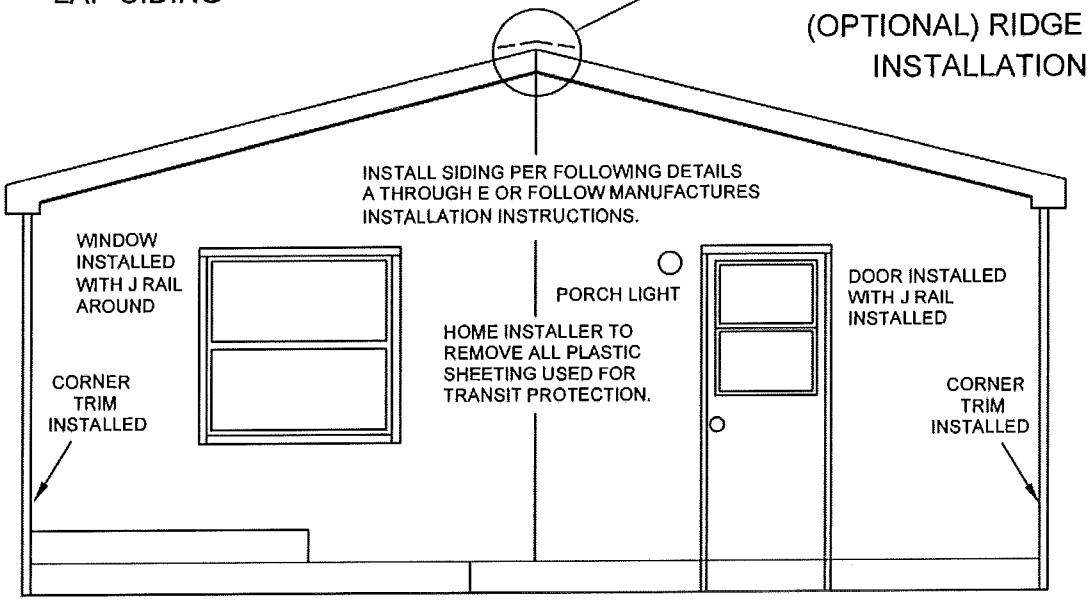


FIGURE 5.7 - FIELD APPLIED HORIZONTAL LAP SIDING



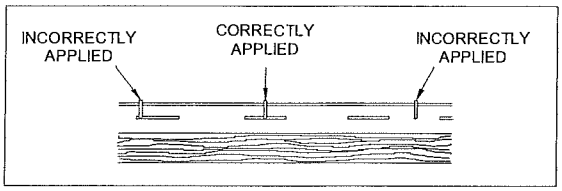
(OPTIONAL) RIDGE VENT INSTALLATION



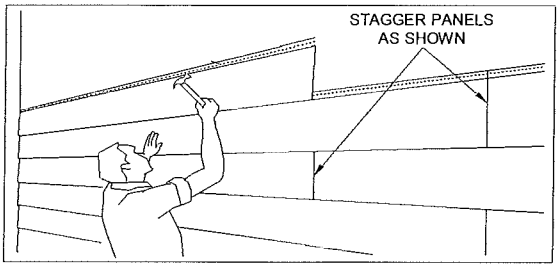
MULTI-SECTION HOMES WITH HORIZONTAL LAP SIDING MAY BE SHIPPED WITH NO SIDING ON THE FRONT AND REAR END WALLS. LIBERTY HOMES WILL INSTALL: DOORS/WINDOWS TRIMMED WITH J-RAIL, CORNER TRIM AND COVER WITH PLASTIC SHEETING FOR TRANSIT. ALL SIDING, STARTER TRIM, FASTENERS AND VENTS WILL BE SHIPPED LOOSE IN THE HOME FOR INSTALLATION ON SET UP.

HOME INSTALLER TO COMPLETE INSTALLATION AFTER HOME IS SET UP. THIS WOULD INCLUDE THE INSTALLATION OF ROOF VENTS IF REQUIRED.

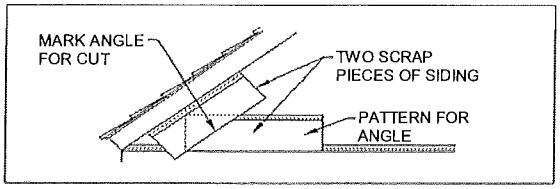
FIGURE 5.7 (CONTINUED) LAP SIDING INSTALLATION



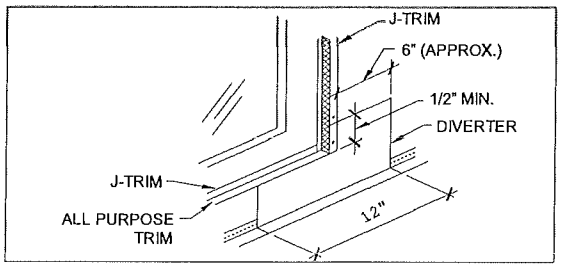
DETAIL A



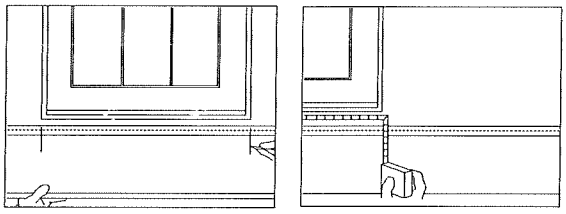
DETAIL B



DETAIL C



DETAIL D



DETAIL E

VINYL LAP SIDING

Apply a 2" wide strip of duct tape at the marriage joint of the endwalls for the entire height of the walls. Apply the duct tape directly over the sheathing.

The siding panels should be attached using 7/16 x 1 1/2" x 16 gauge galvanized steel or aluminum staples. (6d galvanized nails may also be used.) Staples should be driven so that there is a 1/32" clearance between the siding and staple crown to allow some lateral movement. Fasten every 16" to each stud. See Detail A for proper fastening.

Snap the bottom course of siding into the starter strip and fasten to the wall. Leave a 1/4" space at corner posts and 'J' channels around window and door openings to allow for expansion. Do not fasten within 4" of an accessory. Vertical butt joints in panels should overlap 1". Do not fasten the panel within 4" of the joint. Install vinyl, aluminum, felt or other suitable material for flashing at bottom corners of doors and windows per Detail E. Apply caulk around siding and light blocks, water faucets, or other small penetrations.

Install successive courses similarly to the first. Butt joints in adjacent courses should be offset by at least 24". Joints in alternate courses should be aligned vertically (see Detail B).

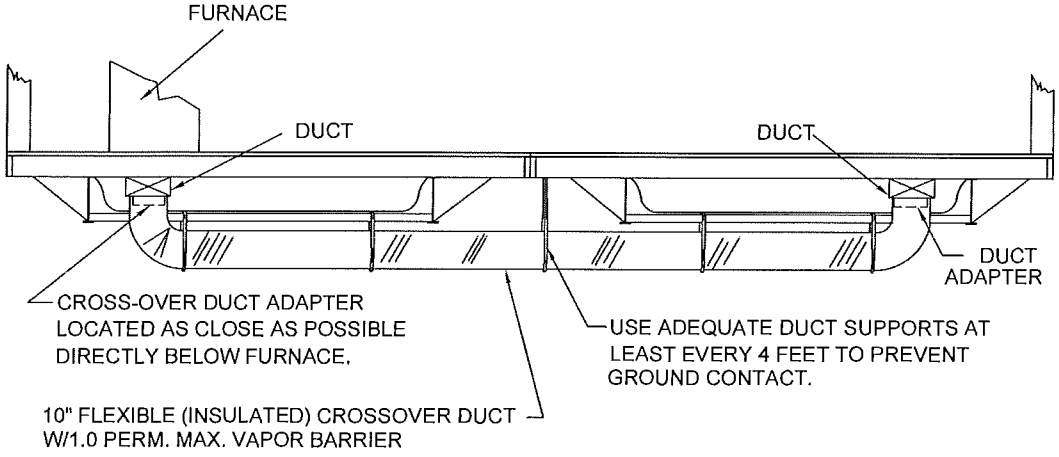
Panels will have to be cut at headers and sills. A single panel should extend without joints across the width of the opening. When cutting a panel at a sill, measure the distance between the bottom of the opening and the top lock of the lower course, then deduct 1/4" (see Detail C.)

Slide the cut panel into the under sill trim and install. Note that the undersill trim piece may have to be furred to maintain the proper pitch of the siding.

Measure and cut the header panel in the same manner as indicated above.

The top sections at the gable will need to be angle cut. Use two scrap pieces of siding to make a pattern (see Detail D). Interlock one piece with the siding panel below. Hold the other piece on top against the gable. Mark a line on the bottom piece and cut. Use this piece as a pattern for cutting gable pieces. Install the gable pieces by interlocking with the lower course, sliding into the gable 'J' rail and fastening.

FIGURE 5.8 CROSSOVER DUCT INSTALLATION



5.5. **Tie Down Requirements For Single and Multi Section Homes**.

5.5.1. **Anchoring Instructions.** After blocking and leveling, the installer should secure the home against the wind loads. The type of installation determines how this should be done, as follows:

CAUTION: In order to avoid electrocution and the possibility of damage to underground services, prior to digging for the purpose of securing anchors, make sure that the location of underground electrical cables, gas lines, sewer lines, and water lines are clearly marked above ground.

5.5.1.1. **Number and Location of Anchors.** Select the number and location of straps and anchors from the charts and diagrams from Figures 5.9 thru 5.13. Only listed and approved ground anchors capable of resisting at least the minimum loads given in the chart must be used.

5.5.1.2. **Installation Of Anchors**. Tie down systems are designed using anchors with minimum working capacity of 3150 lbs. Installation of anchors (angle, stabilizer plates, type of soiling, ...) should be per anchor's installation instructions. When connecting more than one strap to a single anchor, lining the shaft of each anchor between the two straps is recommended (refer to anchor's installation instruction).

5.5.1.3. **Tie-Down Instructions.** Because high winds can occur anywhere, the home should be "tied down" to the ground in order to withstand sliding and/or overturning. See Figures 5.9 through 5.13 for anchor and tie down strap at applicable wind zones. Vertical ties or straps positioned at studs are available as an optional item for additional stability in Wind Zone 1 (standard at Wind Zone 2 and 3). When provided, attach to ground anchors with 3,150# minimum rating.

5.5.1.4. **Steps to Proper Tie Down.** To properly install ground anchors and tie-down straps for a home, certain criterias must be established. These criterias are as follows:

1. Wind Zone area where home is to be placed.
2. Main I-beam spacing of the home.
3. Width and length of the home.
4. Distance from top of I-beam to ground.
5. Torque reading of the soil.
6. Nominal roof pitch of unit (for doublesection)

After determining the above criteria:

1. Make sure the distance from the bottom of the floor to ground level is within allowable range noted on the tables. Note: Allowable heights vary based on the wind zone, width of the home and frames main I-beam spacing. For example, the Table in the Figure 5.11 would allow 42" maximum height from ground for 28' double section in Wind Zone 2 with 75.5" I-beam spacing.
2. Based on your wind zone, space the anchor and straps per Tables in Figure 5.9 through 5.13. Note: Homes with roof pitch higher than 4/12 (roof slope in excess of 20 degrees) may require additional tie downs. See addendum to installation instructions for this option.
3. Determine the correct soil anchors to be used. An anchor soil test probe is required to test the soil where the home is to be set. The soil test probe looks like a long drill bit with a fitting at the top which accepts a torque wrench. The torque required to turn the probe, when the probe reaches the desired anchor depth is measured. The anchor manufacturer provides a chart relating the measured torque value to the type of anchor required to provide the desired holding force. AN INCORRECTLY SELECTED ANCHOR WILL NOT PROVIDE THE REQUIRED LOAD RESISTANCE. For example, assume a torque of 300 inch-pounds was measured at a probe depth of 4 feet. A class 4 soil is indicated from the anchor manufacturer data. The correct anchor would be identified and rated for a class 4 soil.

Soil anchors must be installed as directed by the anchor manufacturer. The anchor manufacturer installation instructions should describe the correct anchor placement with regard to direction, water table level and frost line location.

5.5.2. **Severe Climatic Conditions.**

5.5.2.1. **Freezing Climates.** Be sure anchor augers are installed below the frost line. During period of frost heave, be prepared to adjust tension on the straps to take up slack.

5.5.2.2. **Severe Wind Zones.** Installing your home in any zone that requires greater wind-resisting capabilities than those for which it was designed is not recommended. (See data plate.)

5.5.2.3. **Flood-Prone Areas.** Installation of our manufactured homes in flood prone areas are not recommended. Foundation considerations are discussed in section 4.3.1 and the FEMA document referenced in Paragraph 4.4.3. Unconventional anchorage and tie downs often are needed in designing and constructing the special elevated foundations that may be required in flood-prone areas. Consult a registered professional or structural engineer.

5.6. **Installation Of On-Site Attached Structures.** Design all attached buildings and structures to support all of their own live and dead loads, and to have fire separation as required by state or local ordinances.

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

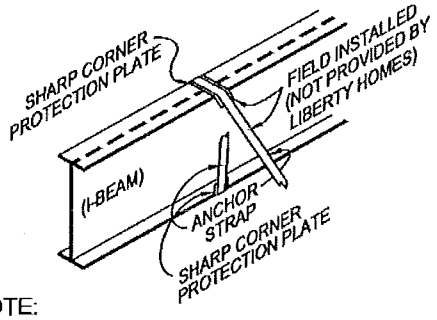
5.6.2. **Porches.** Site-constructed porches must be constructed and inspected according to applicable local building codes. They must be supported independently of the factory-built portion of the home.

5.6.3. **Steps, Stairways and Landings.** Steps, stairways and landings must be constructed and inspected according to applicable local building codes.

5.6.4. **Skirting.** Skirting installed around the home must be provided with ventilation openings located at or near each corner and as high as possible to cross-ventilate the entire space under the home. Open vent area must not be less than 1 square foot for every 150 square feet of the home's floor area. The total area of ventilation may be reduced to 1 square foot for 1,500 square feet of the home's floor area where a 6 mil polyethylene sheet material or other acceptable vapor retarder is installed on the ground surface beneath the entire floor area of the home (reference Section 3.5). In freezing climates, install skirting so as to accommodate 1" – 2" of frost heave uplift to prevent buckling of floors. Take care to be sure that rainwater cannot be channeled or trapped between the skirting and siding, and that normal movement of siding is not restricted.

NADER TOMASBI
REGISTERED
No.
60900419
STATE OF
INDIANA
PROFESSIONAL ENGINEER
10/6/08

FIGURE 5.9 - TIE DOWN LOCATION REQUIREMENTS

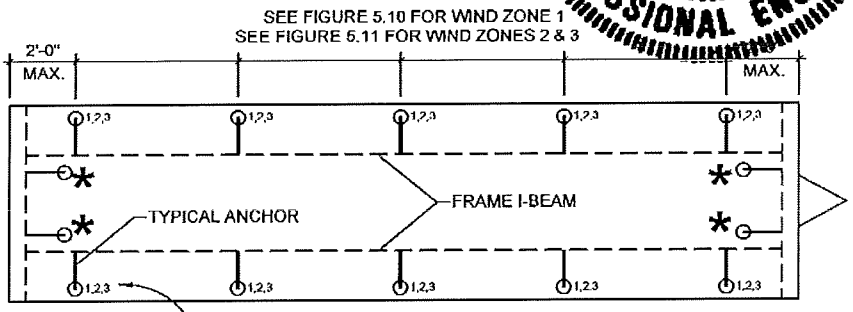


NOTE:
SHARP CORNER PROTECTION PLATE - 2"x6" (MIN.) PLATE GUAGE SAME AS ANCHOR STRAP OR GREATER.

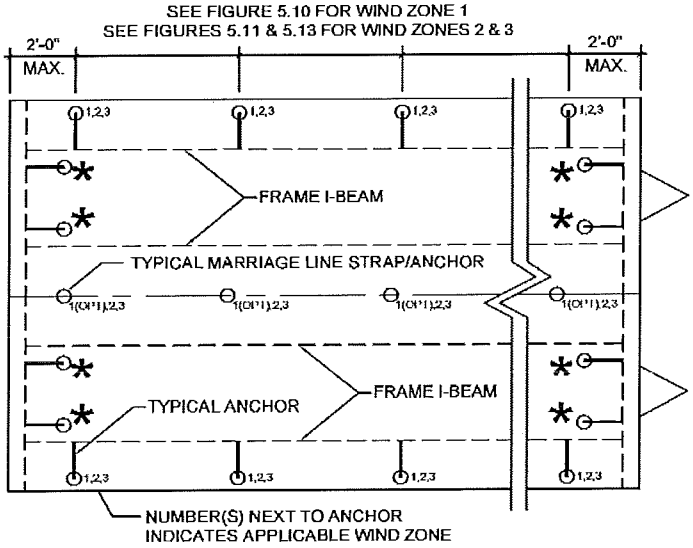
* SEE FIGURE 5.12 FOR TIEDOWN REQUIREMENT

NUMBERS NEXT TO ANCHORS INDICATE APPLICABLE WIND ZONE

SINGLE SECTION HOME



DOUBLE SECTION HOME



TRIPLE SECTION HOME

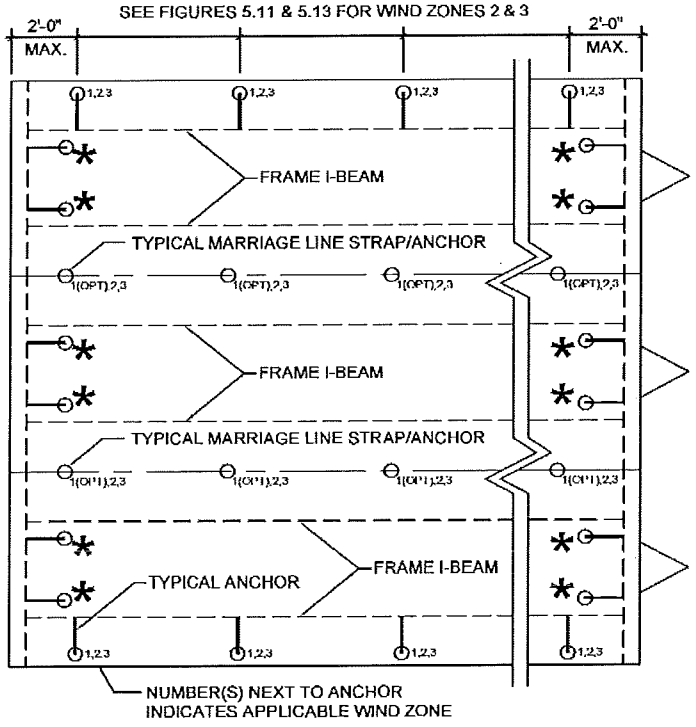
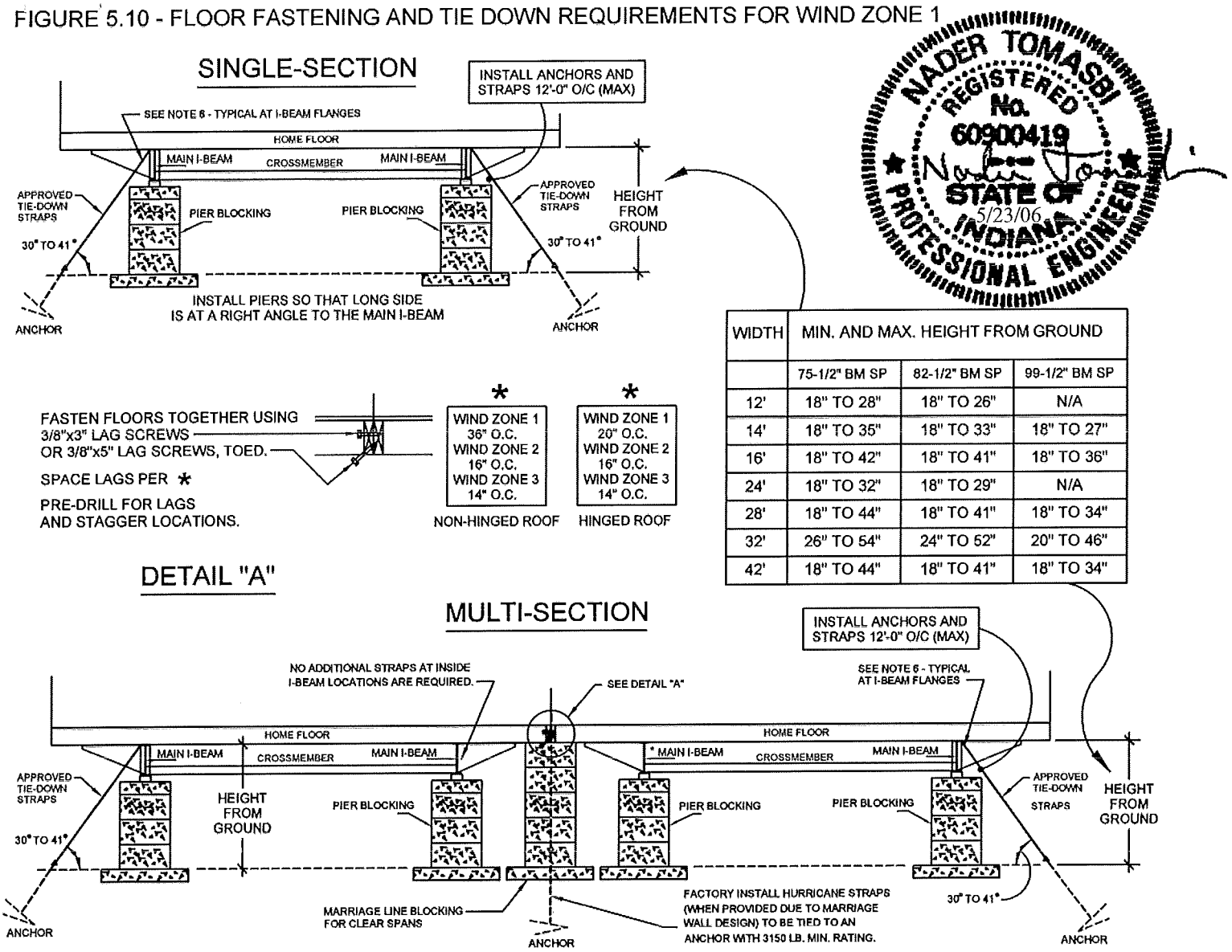


FIGURE 5.10 - FLOOR FASTENING AND TIE DOWN REQUIREMENTS FOR WIND ZONE 1



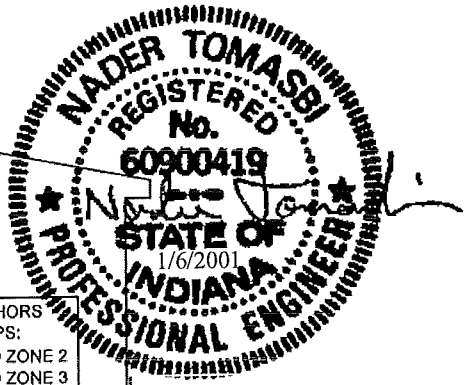
WIDTH	MIN. AND MAX. HEIGHT FROM GROUND		
	75-1/2" BM SP	82-1/2" BM SP	99-1/2" BM SP
12'	18" TO 28"	18" TO 26"	N/A
14'	18" TO 35"	18" TO 33"	18" TO 27"
16'	18" TO 42"	18" TO 41"	18" TO 36"
24'	18" TO 32"	18" TO 29"	N/A
28'	18" TO 44"	18" TO 41"	18" TO 34"
32'	26" TO 54"	24" TO 52"	20" TO 46"
42'	18" TO 44"	18" TO 41"	18" TO 34"

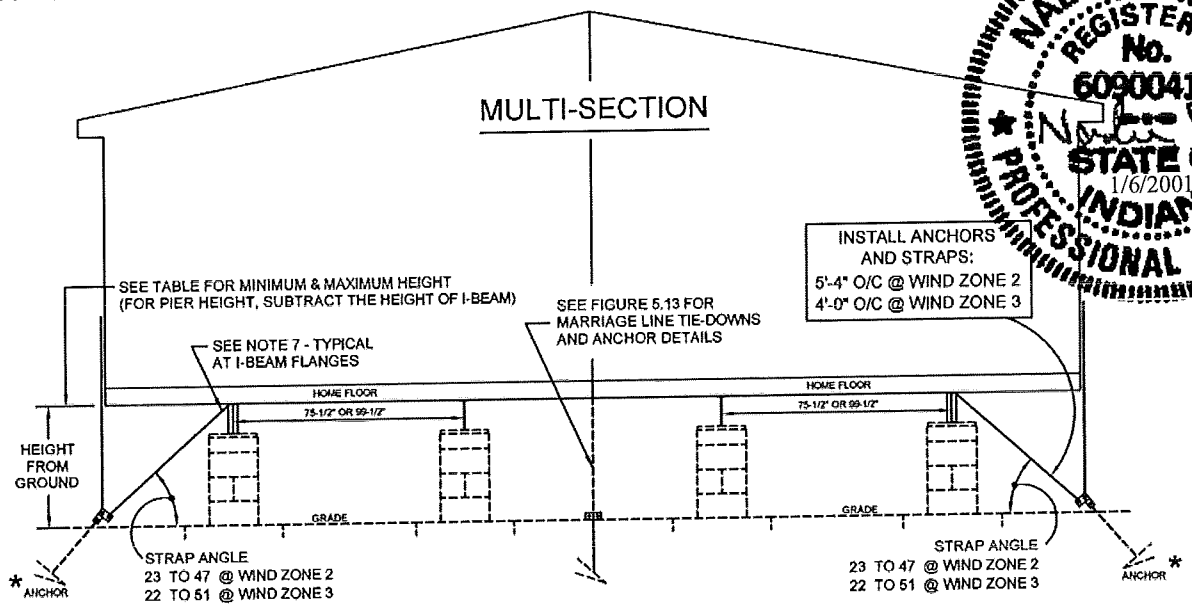
INSTALL PIERS SO THAT LONG SIDE IS AT A RIGHT ANGLE TO THE MAIN I-BEAM
EXCEPTION: PIER BLOCKS UNDER MARRIAGE WALL OR SIDEWALL MAY BE TURNED 90 DEGREES

SEE FIGURE 4.1 FOR TYPICAL PIER CONSTRUCTION

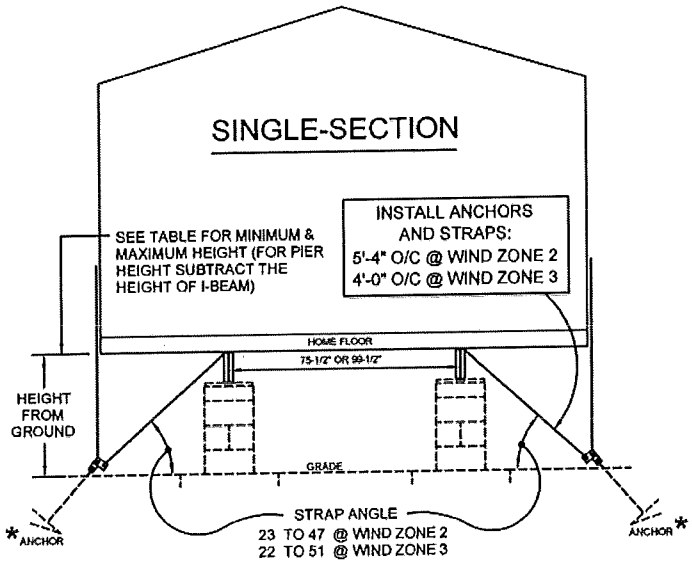
1. OTHER METHODS APPROVED BY LOCAL BUILDING AUTHORITIES MAY BE USED.
2. STEEL ANCHORING EQUIPMENT EXPOSED TO THE WEATHER SHALL BE PROTECTED WITH AT LEAST 0.30 OZ. OF ZINC PER SQUARE FOOT OF STEEL.
3. ANCHORING EQUIPMENT SHALL BE CAPABLE OF RESISTING AN ALLOWABLE LOAD OF 3150# AND SHOULD BE CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER OR ARCHITECT TO RESIST THESE SPECIFIED FORCES IN ACCORDANCE WITH TESTING PROCEDURES IN ASTM STANDARD SPECIFICATION D3593-91, STANDARD SPECIFICATION FOR STRAPPING FLAT STEEL AND SEALS.
4. ANCHORS SHOULD BE CERTIFIED FOR THESE CONDITIONS BY A PROFESSIONAL ENGINEER, ARCHITECT OR A NATIONALLY RECOGNIZED TESTING LABORATORY AS TO THEIR RESISTANCE, BASED ON THE INSTALLED ANGLE OF DIAGONAL TIE AND/OR VERTICAL TIE LOADING AND ANGLE OF ANCHOR INSTALLATION, AND TYPE OF SOIL IN WHICH THE ANCHOR IS TO BE INSTALLED.
5. GROUND ANCHORS SHOULD BE INSTALLED TO THEIR FULL DEPTH AND EMBEDDED BELOW THE FROST LINE AND BE AT LEAST 12" ABOVE THE WATER TABLE.
6. TIEDOWNS MUST START NO MORE THAN 2'-0" FROM EACH END OF UNIT (I.E. OPEN END ANCHORAGE). PROTECTION SHALL BE PROVIDED AT SHARP CORNERS WHERE THE ANCHORING SYSTEM REQUIRES EXTERNAL STRAPS OR CABLES. IN ALL CASES, NO EXPOSED PART OF ANCHORING SYSTEM SHALL PROTRUDE PAST EDGE OF FLOOR.
7. DESIGN BASED ON 75-1/2", 82-1/2", AND 99-1/2" I-BEAM SPACING WITH A MAXIMUM SIDEWALL HEIGHT OF 9'-0"

FIGURE 5.11 - TIE DOWN REQUIREMENTS FOR WIND ZONE 2 & 3 AT EXTERIOR WALLS



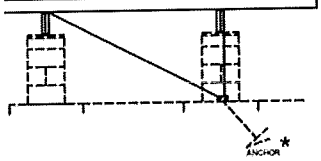


* ANCHOR TO BE RATED 3150# TOTAL FOR BOTH STRAPS
(INSTALL PER MANUFACTURERS INSTALLATION INSTRUCTIONS)



INSTALL HURRICANE STRAPS (VERTICAL & DIAGIONAL) PER DETAIL "A" ONLY AT AREA'S WHERE ANCHOR & STRAP INSTALLATION DIRECTLY UNDER SIDEWALL IS NOT POSSIBLE DUE TO CUT FLOOR AT ENDS (SKEWED CORNERS) OR RECESSED ENTRY AT SIDEWALL

DETAIL "A"



WIDTH	MIN. AND MAX. HEIGHT FROM GROUND (SEE ABOVE) @ WIND ZONE			
	ZONE 2		ZONE 3	
	75-1/2" BM SP	99-1/2" BM SP	75-1/2" BM SP	99-1/2" BM SP
12'	18" TO 35"	N/A	18" TO 41"	N/A
14'	21" TO 47"	18" TO 35"	19" TO 55"	18" TO 41"
16'	26" TO 58"	18" TO 41"	22" TO 64"	18" TO 49"
24'	18" TO 30"	N/A	18" TO 35"	N/A
28'	18" TO 42"	18" TO 30"	18" TO 50"	18" TO 35"
32'	18" TO 52"	18" TO 40"	18" TO 61"	18" TO 47"
42'	18" TO 42"	18" TO 30"	18" TO 50"	18" TO 35"

Notes

1. Vertical ties are required in addition to frame tiedowns. Frame tiedowns and anchors are not provided.

2. Steel anchoring equipment exposed to the weather shall be protected with at least 0.30 oz. of zinc per square foot of steel.

3. Anchoring equipment shall be capable of resisting an allowable load of 3150# and should be certified by a registered Professional Engineer or Architect to resist these specified forces in accordance with procedures in ASTM standard specification D3593-91, Standard Specification For Strapping Flat Steel And Seals.

4. Anchors should be certified for these conditions by a Professional Engineer, Architect, or a nationally recognized testing laboratory as to their resistance, based on the installed angle of the diagonal tie and/or vertical tie loading and angle of anchor installation, and type of soil in which the anchor is to be installed.

5. Ground anchors should be installed to their full depth, and embedded below the frost line, and be at least 12" above the water table.

6. Tiedowns must start no more than 2'-0" from each end of unit (i.e.: open end anchorage).

7. Protection shall be provided at sharp corners where the anchoring system requires external straps or cables.

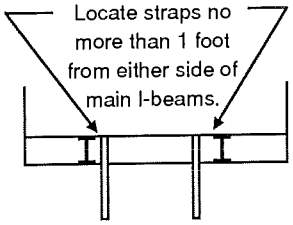
8. In all cases, no exposed part of anchoring system shall protrude past edge of floor. Anchor may be located within 6" max. in from edge of floor.

9. Design based on 75-1/2" to 99-1/2" I-beam spacing and a maximum sidewall height of 8'-0".

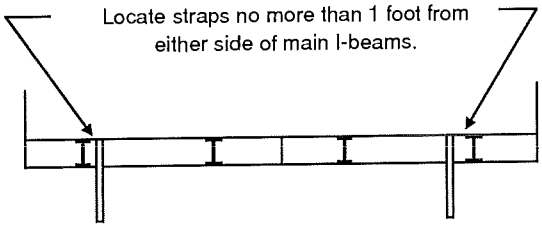
Figu e 5.12 - LONGITUDINAL TIEDOWN STRAPS AT FRONT AND REAR OF THE HOME

WIND ZONE 1:
Only homes at length noted below or less would require lontitudinal straps:

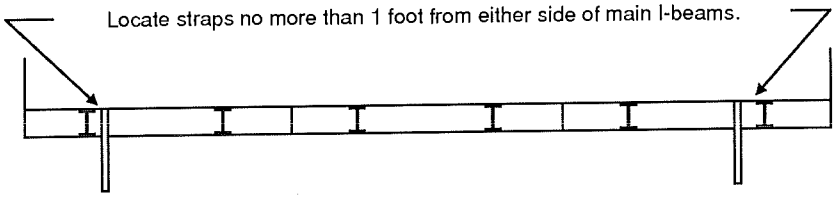
Single section homes: 52' long or less would require longitudinal straps.
Double section homes: 55' long or less would require longitudinal straps.
Double section homes
with hinged trusses: 63' long or less would require longitudinal straps.
Triple section homes: 58' or less would require longitudinal straps.
(lengths noted above are actual size and do not reflect the length of the hitch)



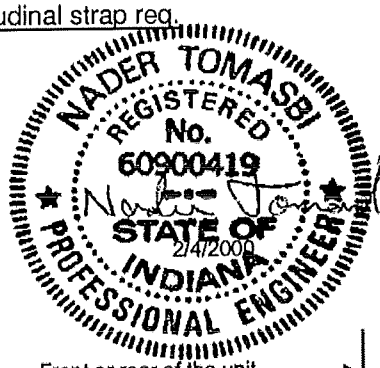
Single section longitudinal strap req.



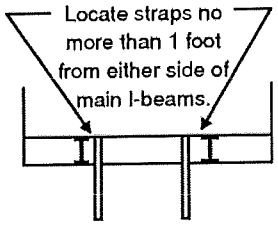
Double section longitudinal strap req.



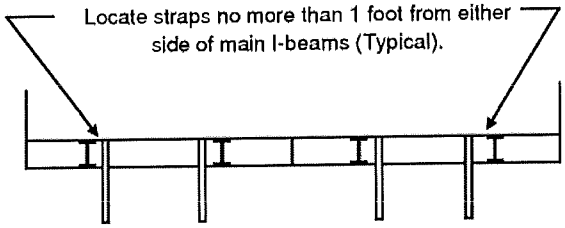
Triple section longitudinal strap req.



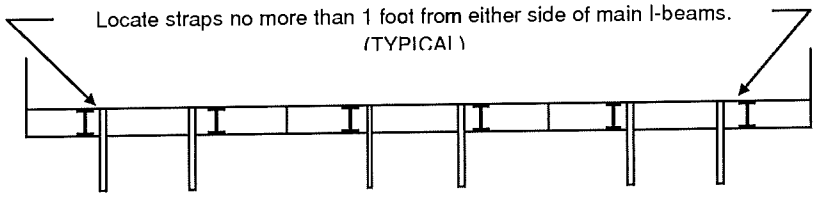
WIND ZONE 2 AND 3:
All homes in wind zone 2 & 3 would require longitudinal staps.



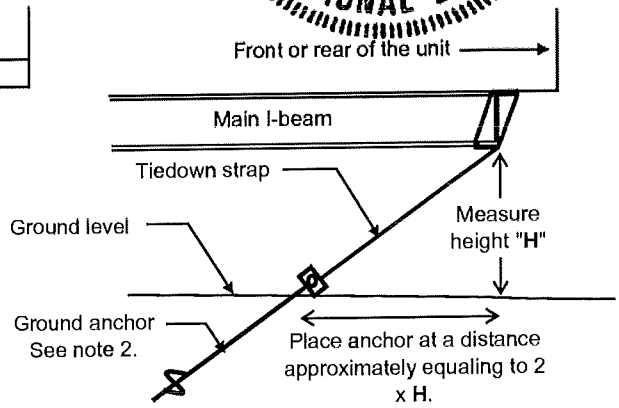
Single section longitudinal strap req.



Double section longitudinal strap req.



Triple section longitudinal strap req.



Longitudinal strap installation detail.

Notes:

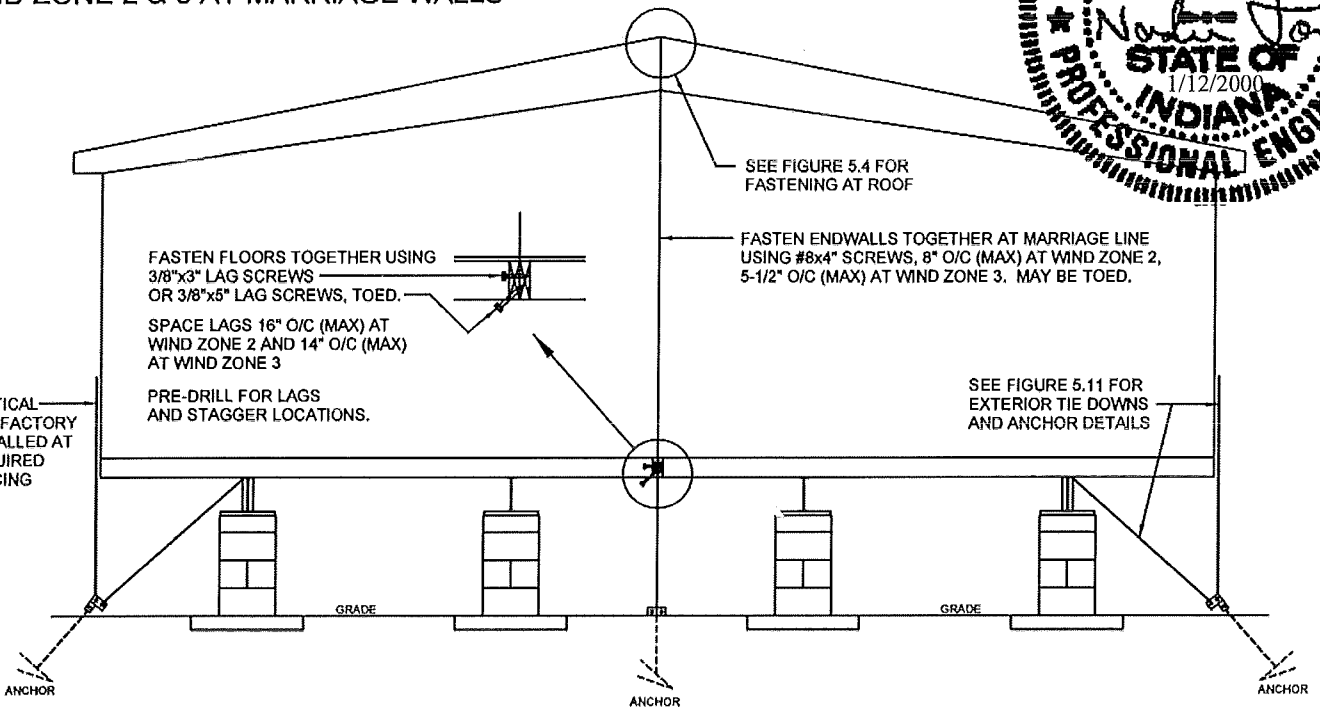
1) Longitudinal tie-downs are in addition to diagonal tie downs at the sidewalls. Longitudinal straps should be installed at front and rear of all homes at each I-beam location per above details.

2) Longitudinal anchor must be rated for 3150# (design load) at wind zone 1 & 2 and 3700# (design load) at wind zone 3 (exception: 14' single section and 28' double section homes with 7' ceiling height may use 3150# anchor system at wind zone 3 area's). Anchor should be certified for these conditions by a professional engineer, architect or a nationally recognized testing laboratory as to their resistance, based on the installed angle and type of soil in which the anchor is installed. Steel anchoring equipment exposed to the weather shall be protected with at least 0.30 oz. of zinc per square of steel.

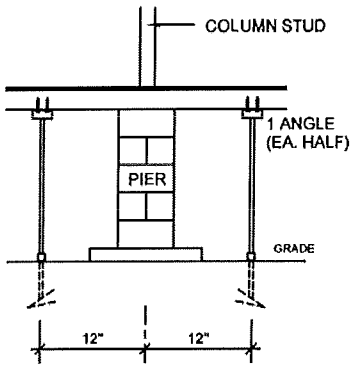
3) Ground anchors must be installed to their full depth and embedded below the frost line and to be at least 12" above the water table.

4) Care must be taken at sharp edges when tie down straps are connected to framing members. Sharp edges could cause premature failure of the straps. Installtion of thick rubber or "U" shape steel between the tie down strap and the frame is one method to protect the sharp edges.

FIGURE 5.13 - FLOOR FASTENING AND TIE DOWN REQUIREMENTS FOR WIND ZONE 2 & 3 AT MARRIAGE WALLS



SEE DETAILS BELOW



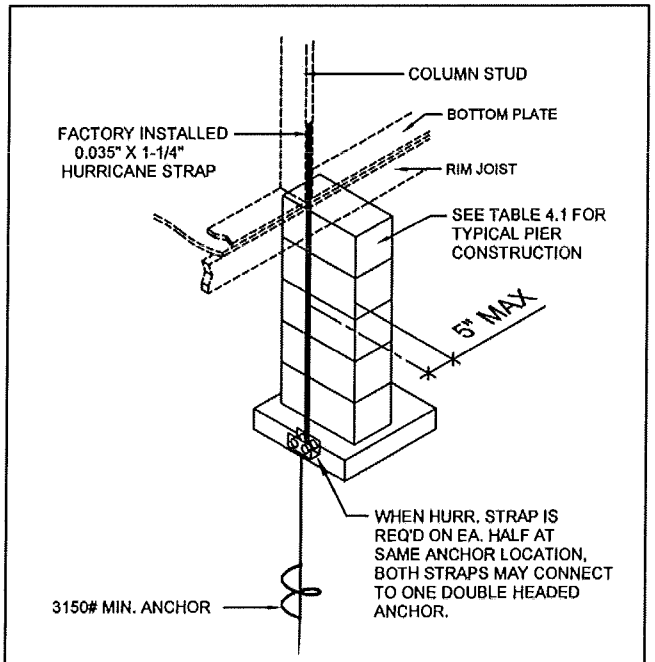
2" ANGLE (EACH SIDE) WHEN SPECIFIED IS ON OPPOSITE SIDE OF PIER AT COLUMN

NOTE: POSITIONING OF ANCHORS FROM EACH OTHER TO BE PER ANCHOR INSTRUCTIONS.

ANGLES @ COLUMN

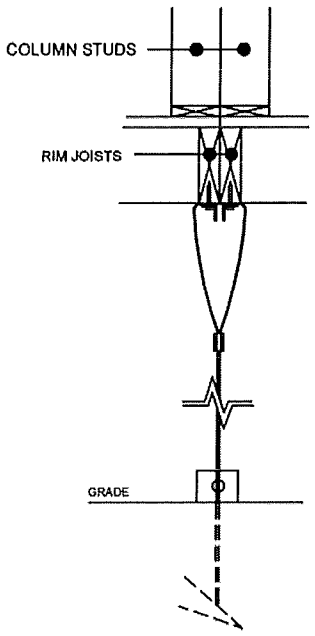
ALT#1 MARRIAGE LINE STRAP DETAIL

(SEE NOTE #2)



MARRIAGE LINE STRAP DETAIL

ONLY ONE SECTION OF HOME IS SHOWN FOR CLARITY.



ALT#2 MARRIAGE LINE STRAP DETAIL

(SEE NOTE #2)

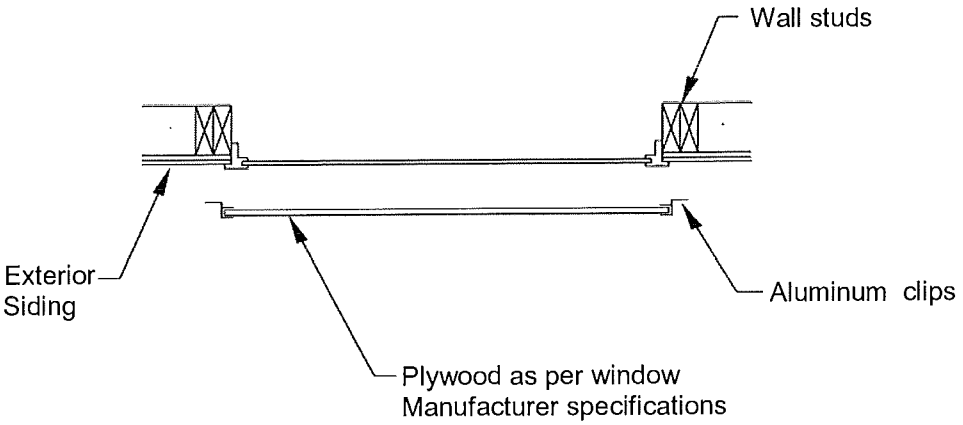
NOTES:

1. MARRIAGE WALL ANCHORS TO BE RATED AT 3150# MINIMUM CAPACITY (4725# ULTIMATE).
2. OPTIONAL ANGLES OR 1-1/2"x1-1/2"x11ga. (MIN) STEEL ANGLE WITH TWO (2) 7/16" DIA. HOLES 3/4" MINIMUM FROM EACH END AND 2" TO 3" BETWEEN HOLE CENTERS. ANGLE IS LAGGED TO CENTERLINE JOIST WITH (2) 3/8"x3-1/2" LAGS.
   MAXIMUM OPENING AT ZONE 2 FOR 1 SET OF ANGLES = 23'-11"
   MAXIMUM OPENING AT ZONE 3 FOR 1 SET OF ANGLES = 17'-8"
   IF OPTIONAL ANGLES ARE USED, ANGLES ARE REQUIRED AT ALL COLUMN LOCATIONS.

5.7. PROTECTION OF WINDOWS & SLIDING GLASS DOORS BY HOMEOWNER

For homes designed to be located in Wind Zones 2 & 3, the homeowner should install shutters or equivalent covering devices. It is strongly recommended that the home be made ready to be equipped with these devices with the following recommended methods:

a) Window clips - Optional aluminum clips may be provided with certain windows. The clips are designed to hold the protective plywood in place. If your home is equipped with this type of window, instructions for attaching the plywood and the clips will be shipped with your home. For plywood type and attachments, follow the instructions provided to you by the window manufacturer. If clip attachment and plywood specification are not provided, use Table 5.1 below for plywood and the figure shown below for a typical application of this type of protective covering.



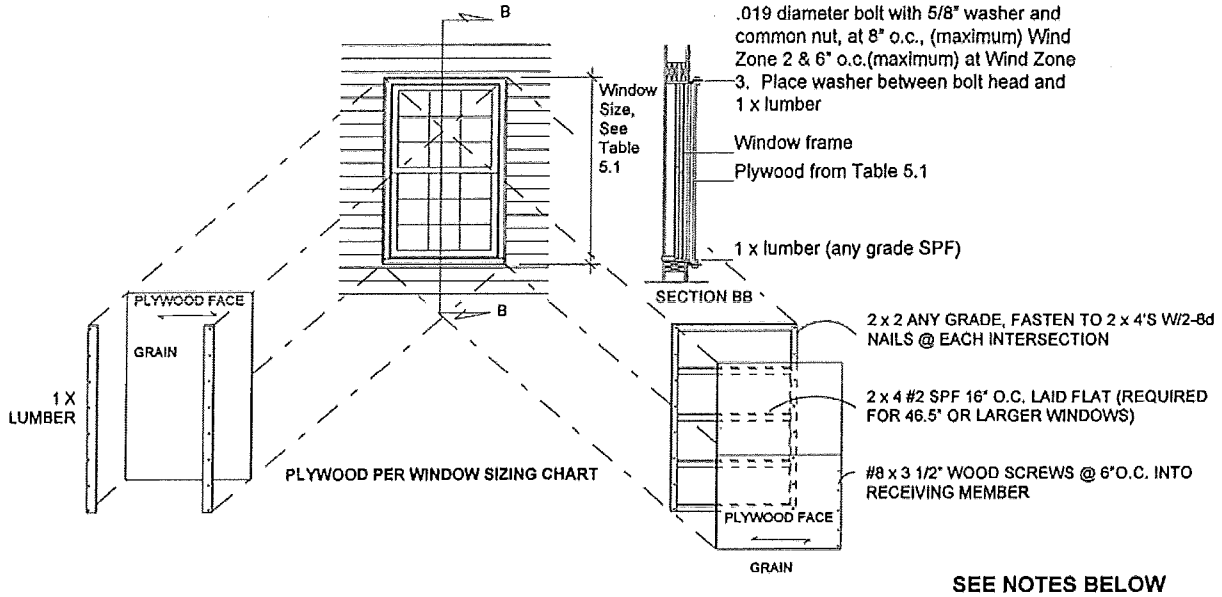
b) Direct plywood attachment -If your home is not equipped with any of the previous types of protective window covering provisions, then the following instructions apply to your home. This type of wind storm protective window and door covering is plywood installed over the window and doors. Plywood is to be bolted to the window frame with a 0.19" dia. bolt with 5/8" washer, and a common nut. The bolts are spaced 8" on center along the long sides of the window frame. Holes will have to be predrilled into the window frame. Use plywood listed in table below for the application of this type of window covering. For doors, sliding glass doors and windows without flange, remove mounting screws holding the door or window frame to exterior wall. Place the required plywood (from table below) over the door or window framing and fasten the plywood and framing back into the wall studs through the same holes in the door or window frame. Use #8x3" screws 8" o.c. for windows, and #8x4" screws 6" o.c. for sliding glass doors. See Figure 5.14 for a typical application of this type of protective covering.

TABLE 5.1

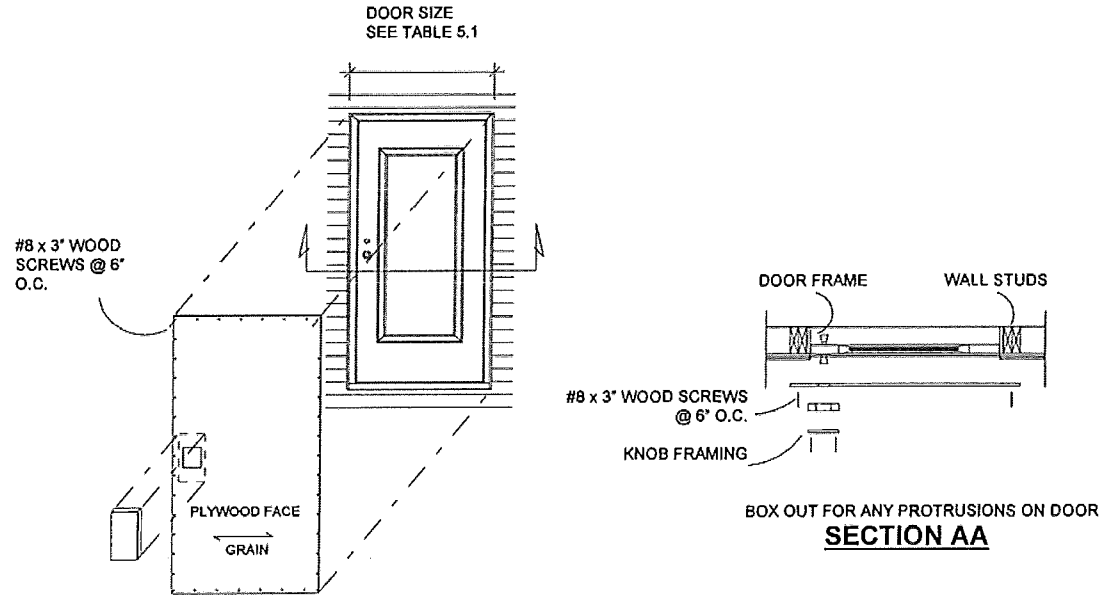
MAXIMUM WINDOW SIZE	WIND ZONE 2 PLYWOOD TYPE REQUIREMENTS	WIND ZONE 3 PLYWOOD TYPE REQUIREMENTS
14.5"	3/8" APA rated ply. 20/0 span rating	3/8" APA rated ply. 20/0 span rating
24.5"	3/8" APA rated ply. 24/0 span rating	1/2" APA rated ply. 32/16 span rating
30.5"	5/8" APA rated ply. 32/16 span rating	5/8" APA rated ply. 40/20 span rating
36.5"	5/8" APA rated ply. 40/20 span rating	7/8" APA rated ply. 48/24 span rating
40"	7/8" APA rated ply. 48/24 span rating	3/4" APA rated ply. 48/24 span rating
46.5"	3/8" APA rated ply. w/wood framing	3/8" APA rated ply. w/wood framing *
72"	3/8" APA rated ply. w/wood framing	3/8" APA rated ply. w/wood framing *

*see **Figure 5.14** for wood framing construction.

FIGURE 5.14 - PROTECTION OF WINDOWS AND SLIDING DOORS BY HOME OWNER



SEE NOTES BELOW



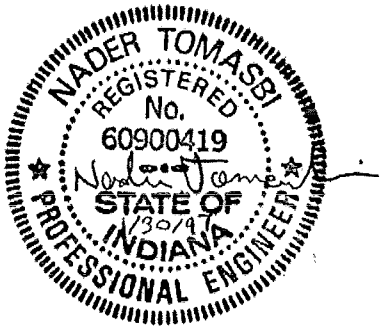
SECTION AA

Notes:

1) 3/8" plywood APA rated exterior sheathing with 20/0 span rating

2) Locate plywood seam over 2 x 4 member

3) Fasten plywood to 2 x framing members with full PVA white glue and 6d nails or #8 x 2" screws @ 6" o.c. all around



6. Chapter 6 - Installation of Optional Features

6.1. **Awnings And Carports.** Choose free-standing products with columns to support their weight.

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

6.3. **Miscellaneous Lights And Fixtures.**

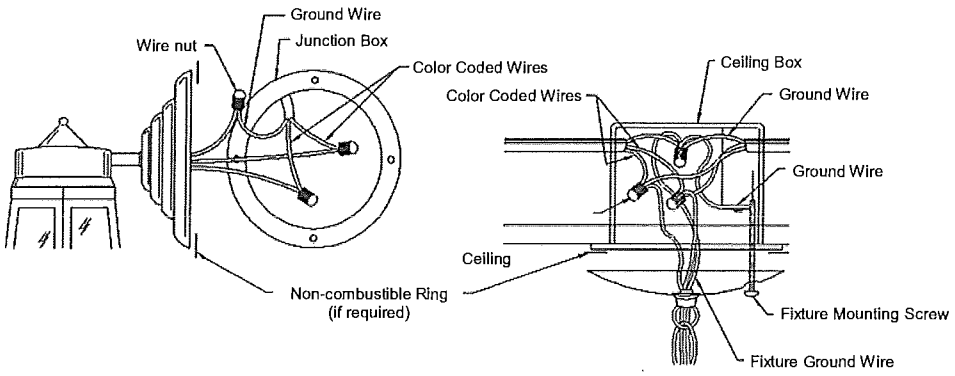
NOTE: Circuits must be turned off to eliminate the risk of shock.

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 non-combustible ring to completely cover the combustible surface exposed between the fixture canopy and the wiring outlet box. If siding has not been installed at a fixture location, remove the outlet box and install the siding with a hole for the outlet box. Then reinstall the outlet box and proceed as for other fixtures.

6.3.1. **Exterior Lights.** Remove the junction box covers and make wire-to-wire connections using wire nuts. Connect wires black to black, white to white and ground to ground. Caulk around the base of the light fixture to ensure water tight seal to the sidewall. Push the wires into the box and secure the light fixture to the junction box. Install the light bulb and attach to the globe. Refer to Figure 6.1(a).

6.3.2. **Ceiling Fans.** Follow manufacturer's installation instructions. To reduce the risk of injury, install ceiling fans with the trailing edges of the blades at least 6'4" above the floor (see manufacturers instructions). If no instructions are available, connect the wiring as shown in Figure 6.1(b) (max. 35# ceiling fan).

FIGURE 6.1 – INSTALLATION OF EXTERIOR LIGHTS



a) Exterior Light Fixture

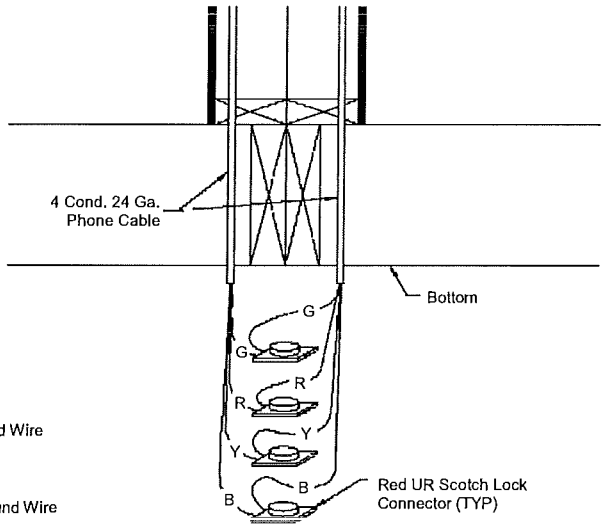
b) Chain hung fixture or ceiling fan (35# max.)

6.3.3. **Whole House Ventilation.** Your house is equipped with one of the following to introduce outdoor air to interior environment.

A) Fresh air through furnace. (Philips-Ventline)
How it works:
When the furnace air circulator is ON, a negative pressure (suction) is created in the furnace plenum. This suction draws in fresh air which is mixed with the return air from the room, and distributed through the home duct system. The fresh air supply to your home may be energized at any time by switching the furnace control (or thermostat control, if so equipped) to ventilation.
B) Fresh air by an exhaust fan.
How it works:
Inside air is exhausted outside by a mechanical fan allowing fresh air in through the louvered grill installed in exterior wall. Exhaust fan is operated by a manual switch.

6.4. **Telephone And Cable TV.** CARELESS INSTALLATION OF THE TELEPHONE AND CABLE TELEVISION LINES MAY BE HAZARDOUS. The walls and floors of your manufactured home contain electrical circuits, plumbing and duct work. Avoid contact with these home systems when drilling through and placing cables within these cavities. Only trained professionals should handle such work. **FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.** Figure 6.2 shows one procedure for telephone crossover connections in multi-section homes.

FIGURE 6.2 - TELEPHONE WIRING FOR MULTI-SECTION HOMES



Notes:
1. Connect blue to blue, ted to red, yellow to yellow, and green to green
2. Do not strip the individual wires.
3. Insert the same color wires into the connector, then using channel lock pliers, press the round portion to make the connection.

7. Chapter 7 - Preparation of Appliances

7.1. **Clothes Dryer Vent.** Your clothes dryer must exhaust to the exterior of the home, or of any perimeter skirting installed around it, through a moisture-lint exhaust system, as shown in Figure 7.1. IMPORTANT: DO NOT LET THE EXHAUST SYSTEM END UNDER THE HOME WHERE EXCESS MOISTURE OR FLAMMABLE MATERIAL CAN ACCUMULATE. Install a flex duct after the home is set up at the site. The access for the dryer vent is located under the home in the bottom board at the dryer location (bottom board is taped and marked with paint or colored tape for access). Hold the duct in place with metal straps spaced 2' on center secured to the bottom of the floor joists or frame. Vent openings are located in either the wall or the floor. After the duct is installed, seal the openings, both inside and outside. Follow the dryer manufacturer's instructions for installing the exhaust system.

If your home did NOT come equipped for a gas dryer, remember that installing one requires substantial alteration to the home. You must provide gas supply piping and adequate venting as specified by the gas dryer manufacturer. Only a trained and experienced person should install a gas dryer. Cutting major structural elements (such as rafters or floor joist) to allow for gas dryer installation is not permissible. Home manufacturer is not responsible for any weakening of the home's structural soundness resulting from dryer installation.

NOTE: Some dryer manufacturers require that metallic duct be connected to the dryer and vented through floor and or sidewall.

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

7.2.1.1. **Air Conditioners.** The air distribution system of this home has been designed for a central air conditioning system. Equipment you install must not exceed the rating shown on the home's compliance certificate.

The home's electrical distribution panel may contain optional factory installed circuits (Figure 7.2) for air conditioning. The maximum full load amperes draw for the desired air conditioning unit must not exceed the circuit rating shown.

On the other hand, electrical circuits within the home may NOT have been sized for additional load or 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 furnaces in the home. Follow the air conditioner manufacturer's instructions.

If a remote (self-contained, packaged) air conditioner (cooling coil and blower located outside the home, Figure 7.3) 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) no less than 4, and a perm rating of not more than 1 perm. Connect the duct carrying air to the home to the main duct at a point where there are approximately as many registers forward of the connection as there are to the rear. Locate the return air duct in the center of the home.

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

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

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

7.2.3. **Evaporative Coolers.** Install a roof-mounted cooler following the manufacturer's instructions.

7.3. **Fireplace Chimneys And Air Inlets.** Fireplaces require on-site installation of additional section(s) of approved, listed chimney pipe, a spark arrestor and a rain cap assembly. See Figure 7.4.

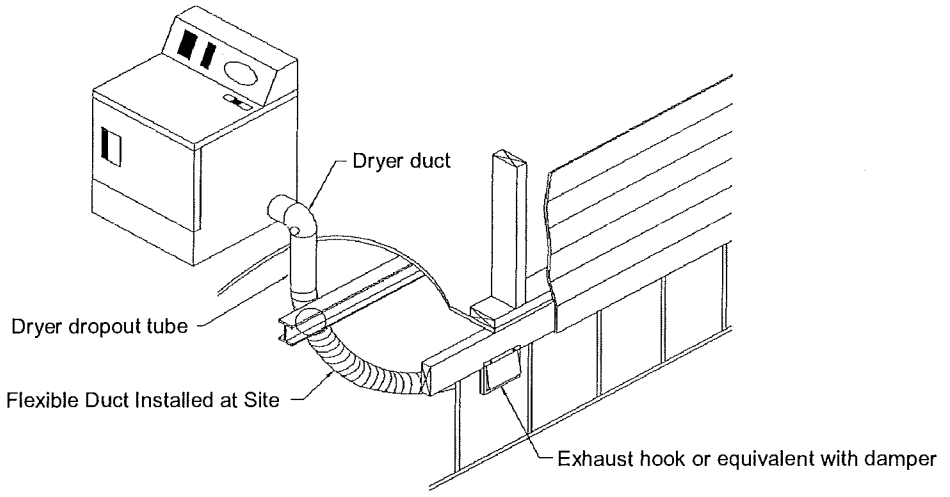
7.3.1. **Minimum Extensions Above Roof.** To assure sufficient draft for proper operation, extend the finished chimney at least 3' above the highest point where it penetrates the roof and at least 2' higher than any building or other obstruction located within a horizontal distance of 10'. If the site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

7.3.2. **Required Components.** The required components of a correctly-installed chimney are as shown in Figure 7.4.

7.3.3. **Assembly And Sealing Sequence.** Assemble and seal your fireplace chimney in accordance with the fireplace manufacturer's instructions supplied with the home. Avoid cutting any roof trusses or floor joists when installing chimney pipes or combustion air intakes. Carefully seal all roof penetrations to avoid leakage. Periodic inspections and resealing of all roof penetrations are required.

7.3.4. **Combustion Air Duct Inlets.** Combustion air intake ducts end just below the bottom covering of the floor. You must extend them to the outside when your home has a basement or crawlspace. These added ducts are not supplied, but may be purchased at your local hardware store. The fireplace manufacturer's instructions for installing combustion air ducts are in the fireplace or with the chimney parts. Do not allow the combustion air inlet to drop material from the hearth beneath the home. Locate its inlet damper above expected snow level, as shown in Figure 7.4.

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



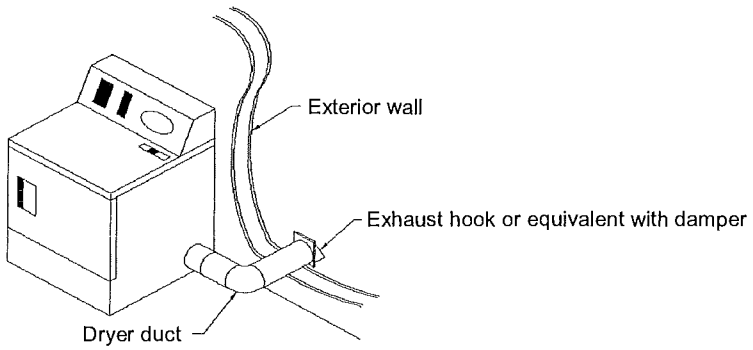
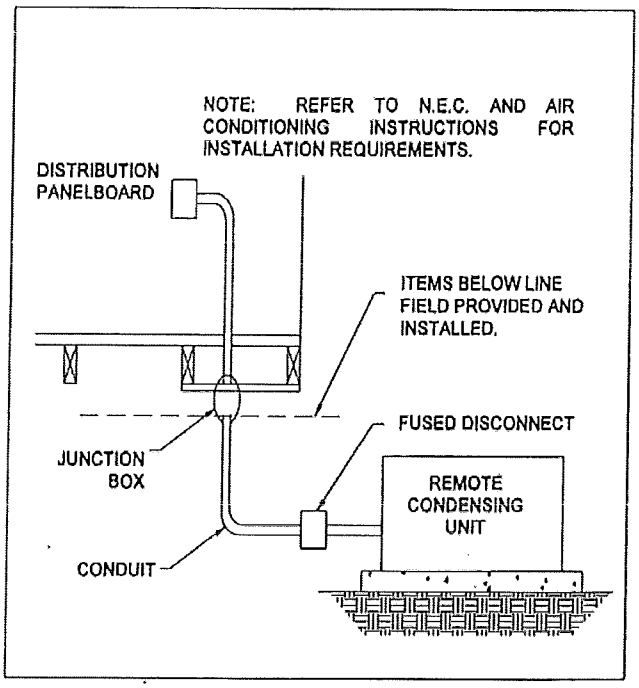


FIGURE 7.2 - OPTIONAL FACTORY-INSTALLED AIR CONDITIONING CIRCUITS



Note: Electrical connections made to energize air-conditioning equipment should be made only by qualified personnel. The completed installation must conform to Article 440 of the National Electric Code and applicable local codes. When the electrical connection is made at the junction box, the field installation wiring beyond the junction box must incorporate a disconnect (sized in accordance with NEC Article 440) located within sight of the condensing unit.

The acceptability of all air-conditioning equipment and its installation are to be determined by the local inspection authorities.

FIGURE 7.3 - TYPICAL INSTALLATION OF SELF-CONTAINED OR AIR CONDITIONING EQUIPMENT

REMOTE AIR CONDITIONING OR HEATING EQUIPMENT

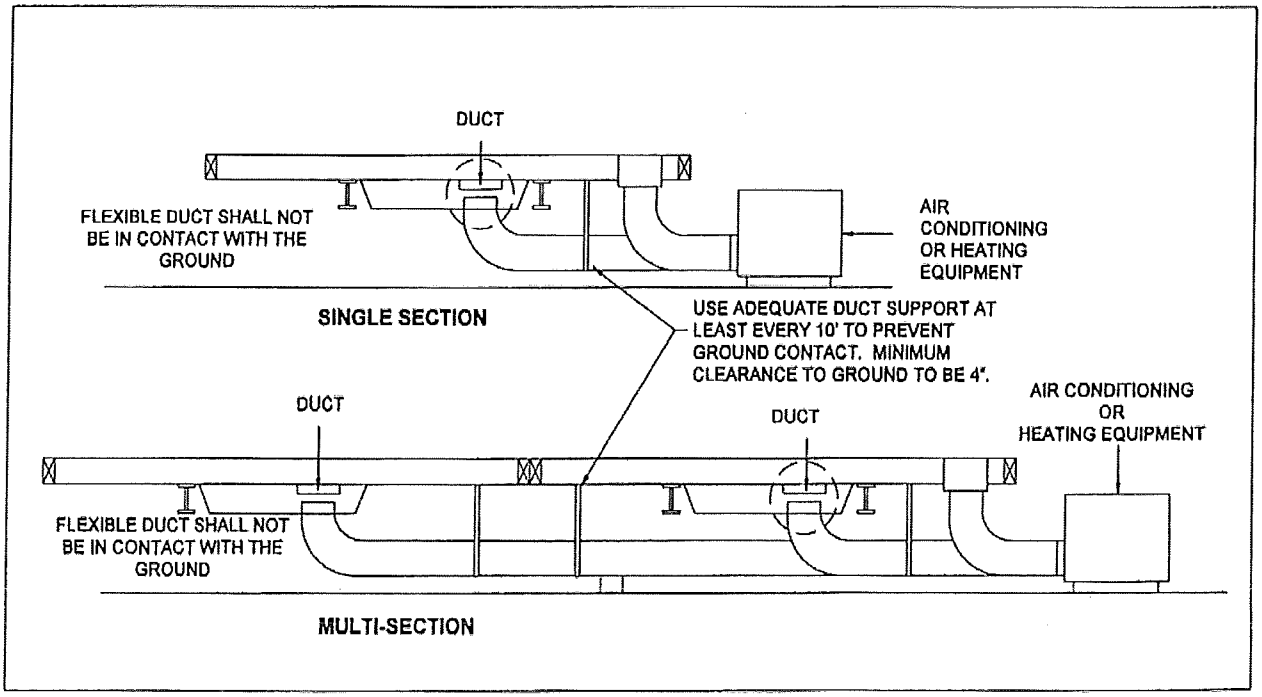
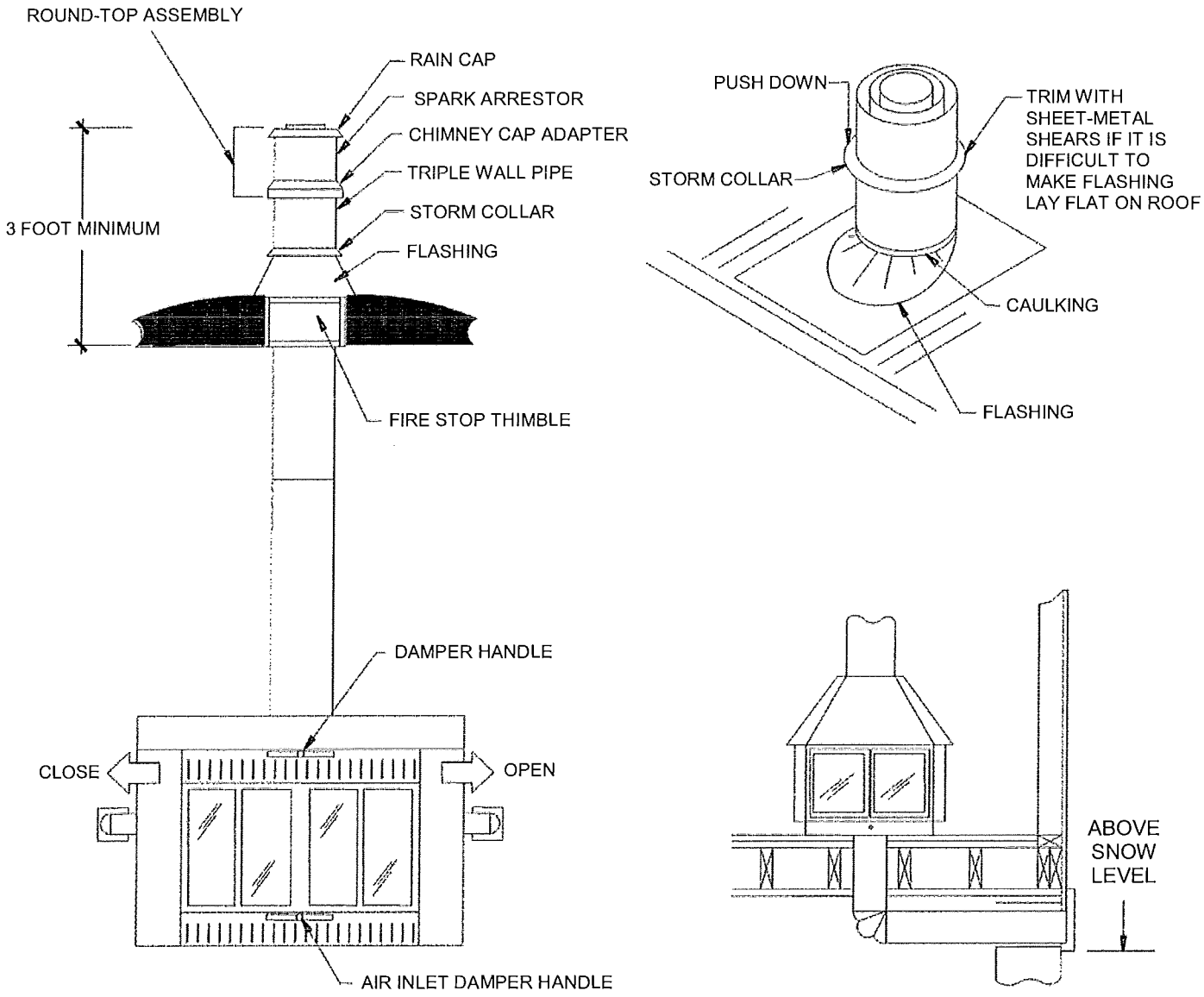


FIGURE 7.4 – FIREPLACE CHIMNEY AND AIR INTAKE INSTALLATION



OVER BASEMENT OR CRAWL SPACE INSTALLATION

7.5. **WATER HEATER.** Note: Your Water Heater is equipped with a pressure and temperature relief drain and a separate drain for the pan under the water heater. These drains are extended to beneath your home at the factory. The water heater pan drain MUST be routed to the exterior of the home (shiploose fittings, pipe and cement will be provided with the home). If your home is installed on a basement, extend these drains down to your basement drain. Refer to your water heater installation manual for additional information.

7.6. **WHOLE HOUSE VENTILATION.** Your home is equipped with a system to introduce outdoor freshness to interior environments. It works in conjunction with the furnace blower and existing duct system and is able to work independently when the heating and cooling system is off. Fresh air is a cost-effective way to substantially improve air quality and help control attic condensation in your home. It is encouraged to operate the WHOLE HOUSE VENTILATION system whenever the home is occupied.

How it works. The home's Thermostat is the control device for selecting continuous Whole-House Ventilation. When the Thermostat is in the "WHOLE-HOUSE VENTILATION" position, the unit blower will operate continuously: independent of COOL or HEAT modes. When the furnace blower is operating, a negative pressure (suction) is created in the furnace plenum. This suction draws in fresh outdoor air which is mixed with the homes return air then distributed through the home duct system. When HEAT or COOL modes are selected, the fresh outdoor air and home return air are conditioned prior to being distributed throughout the home.

8. Chapter 8 – Utility System Connection and Testing

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

8.2. **Water Supply**.

8.2.1. **Maximum Supply Pressure And Reduction**. The water systems of your home were designed for a maximum inlet pressure of 80 psi. If you are located in a water district where the local water supply pressure exceeds 80 psi, install a pressure-reducing valve.

8.2.2. **Connection Procedures.**

8.2.2.1. **To Supply Mains.** Connect the home's water system to the water source through the inlet located under the house, usually below the water heater compartment. A tag on the side of the home marks its location. The connection is via a single 3/4 inch inlet beneath the home. A master shut-off full flow valve must be installed in the water supply line adjacent to the home; this valve should be a full port gate or ball valve with threaded or solder joints. After removing the aerators from all the faucets, open all the faucet valves and allow the water to run for 15 minutes. This should remove any foreign particles left in the line that might cause an unpleasant taste or become lodged at faucet washers and cause dripping faucets.

8.2.2.2. Remove the shipping caps from the crossover water line connectors, provided with the home, and install as shown (see Figure 8.2).

8.2.3. **Freezing Protection.**

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

8.2.3.2. **Use Of Heat Tapes.** Heat tapes (either automatic or non-automatic) can protect exposed plumbing from freezing. USE ONLY HEAT TAPES LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY FOR USE WITH MANUFACTURED HOMES, AND INSTALL THEM ONLY IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTION. Plug the 3-wire, grounded cordset of the heat tape into the outlet under the home near the water supply (Figure 8.1) .

FIGURE 8.1 TYPICAL WATER CONNECTION

WARNING! HEAT TAPE RECEPTICAL IS NOT GFCI PROTECTED. DO NOT USE THIS OUTLET FOR ANY CONNECTION EXCEPT THE HEAT TAPE.

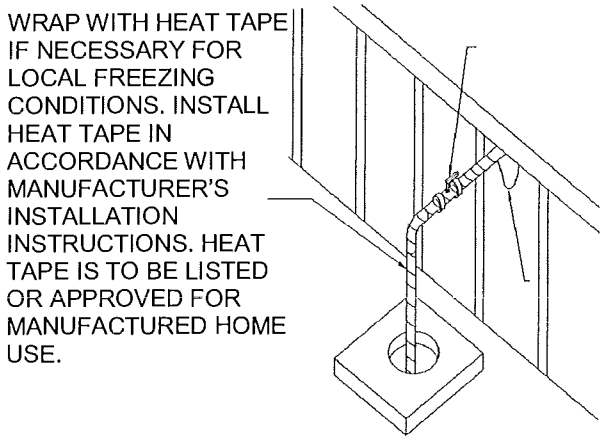
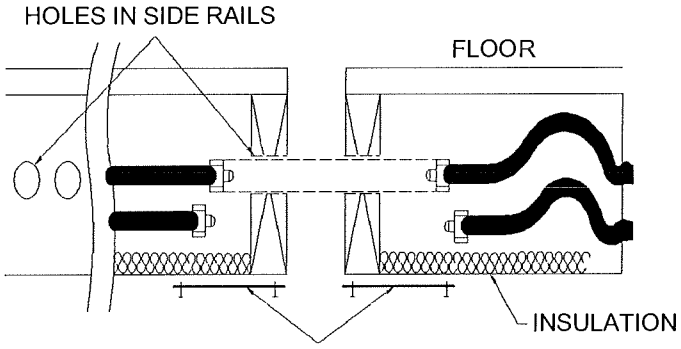


FIGURE 8.2 TYPICAL WATER LINE CROSSOVER



INSPECTION COVERS ALLOW CONNECTION TO BE MADE AND INSULATED AFTER THE TWO HALVES ARE SET UP AND BLOCKED

CAUTION: If freezing conditions exist, wrap water connector with insulation. Use water connectors supplied by manufacturer, where applicable.

8.2.3.3. **Freezing Protection For Unoccupied Homes.** If the home is to be left unheated in cold weather, drain the water lines and blow them clear with compressed air to prevent damage from freezing.

8.2.4. **Testing Procedures.** 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 stool tank float valves, and use the following procedure:

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

8.2.5. Anti-Siphon Frost-Proof Sill Cock (Faucet).

All Materials Provided

8.2.5.1. Locate area on home for installation of faucet.

8.2.5.2. Remove access panel, cover, etc. underside of home at this location.

8.2.5.3. Place putty tape material to back side of faucet (between mounting flange of faucet and home).

8.2.5.4. Position siding wedge between faucet and side of home.

8.2.5.5. Insert shaft of faucet through hole provided in side of home from outside.

8.2.5.6. Position faucet so the outside spout is pointing down and in a slightly downward angle to the outside (so it will drain properly).

8.2.5.7. Secure faucet to side of home with two (2) #8 or #10 wood screws (provided). Make sure that putty tape is between faucet mounting flange and side of home to provide weatherproof installation.

8.2.5.8. Remove plug from end of factory installed tubing.

8.2.5.9. Thread on end of factory installed tubing to end of faucet tightly.

8.2.5.10. Pressurize water tubing system with air to 100 PSI and hold for 15 minutes. Check field installed connection at exterior faucet.

8.2.5.11. Remove 100 PSI air from system and fill with on-site water and again check field installed connection for water leak.

8.2.5.12. Replace access panel, cover, etc. making sure the insulation is positioned between faucet/tubing and access panel cover.

8.3. Drainage System.

8.3.1. 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. Assemble the drainage system following these specific instructions and diagrams. Start at the most remote end and work toward the outlet, supporting the piping with temporary blocking to achieve the proper slope (see Paragraph 8.3.2). When the entire system has been completed, install permanent drain line supports at 4' on center, as shown in Figure 8.3.

8.3.2. Proper Slopes And Connector Sizes. Drain lines must slope at least 1/4" fall per foot of run unless otherwise noted on the schematic diagram (see Figure 8.4).

Exception: 1/8" fall per foot is allowed when a cleanout is installed at the upper end of the run. Connect the main drain line to the site sewer hookup using an approved elastomer coupler (Figure 8.5).

8.3.3. Crossovers. Connect multi-section home drain line crossovers as shown in Figure 8.6.

8.3.4. Solvent Welding Procedures. The solvent cement used to connect drain lines must be compatible with the pipe installed in the home. Follow the manufacturer's instructions on the container.

8.3.5. Protection From Freezing. Fittings in the drainage system subject to freezing, such as P-traps in the floor have been insulated. Replace this insulation if removed during assembly or testing. Insulate drain lines installed below the bottom board in areas subject to freezing as shown in Figure 8.7. If the home is to be left unheated in cold weather, pour an approved antifreeze into P-traps at all fixtures and stools.

8.3.6. Flood Level Test Procedure. You must conduct a flood level test on the completed drainage system before connecting it to the site sewer. With the home in a level position, all fixtures connected, and all tub and shower drains plugged, connect the drainage piping system to the site water inlet and fill the system with water to the rim of the toilet bowl through a higher fixture. Release all trapped air. Allow the system to stand at least 15 minutes. Check for leaks. Drain the system. 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 drain piping. Check all P-traps and the drain system for possible leaks. Repair any leaks and retest.

8.4. Gas Supply.

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

8.4.2. Proper Supply Pressure. THE GAS PIPING SYSTEM IN YOUR HOME HAS BEEN DESIGNED FOR A PRESSURE NOT TO EXCEED 14" OF WATER COLUMN (8 OZ. OR 1/2 PSI). IF GAS FROM ANY SUPPLY SOURCE EXCEEDS, OR MAY EXCEED THIS PRESSURE, YOU MUST INSTALL A PRESSURE REDUCING VALVE. To operate gas appliances safely and efficiently, do not exceed the design pressure limitations. For natural gas systems, the incoming gas pressure should remain between 6" and 8" of water column. For LP gas systems, the pressure should lie between 12" and 14" of water column.

8.4.3. **Orificing For Specific Gases.** SPECIAL ORIFICES AND REGULATORS ARE REQUIRED FOR EACH KIND OF GAS AND AT ALTITUDES ABOVE 2,000 FEET. SEE THE INSTRUCTIONS ACCOMPANYING EACH GAS-BURNING APPLIANCE FOR MODIFICATION INSTRUCTIONS. BEFORE MAKING ANY CONNECTIONS TO THE SITE SUPPLY, CHECK THE INLET ORIFICES OF ALL GAS APPLIANCES TO ENSURE THEY ARE CORRECTLY SET UP FOR THE TYPE OF GAS TO BE SUPPLIED.

8.4.4. **Crossovers.** Install the gas line crossover in multi-section homes as shown in Figure 8.8 before performing any system tests or connecting the system to the gas supply. All crossovers and fittings must be listed for manufactured housing exterior use and be properly sized. Do not use tools to connect or remove the flexible connector quick disconnect. Flex connector with shut off valve when used must be listed for outside use. Shut off valve (nondisplaceable rotor type) must conform to ANSI Z.21.15 - 1992.

8.4.5. **Testing Prior To Connection To Mains.** 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 PRESSURE IN EXCESS OF THOSE SPECIFIED BELOW OR YOU MAY DAMAGE GAS VALVES AND/OR PRESSURE REGULATORS. Conduct the following test prior to any gas line connection to main supply hook-up.

8.4.5.1. **Test Of Gas Appliance Connections.** 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 at the home gas inlet. Pressurize the system with air to at least 6 oz. and no more than 8 oz. Check all gas shut-off valves and flex line connections to valves and appliances for leaks, using soapy water or 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 testing.

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

8.4.7. **Gas Appliance Start Up Procedures.** One at a time, open each equipment shut-off valve. Light pilots and adjust burners according to each appliance manufacturer's instructions. MAKE SURE THE WATER HEATER IS FILLED WITH WATER BEFORE LIGHTING IT'S PILOT. Check the operation of the furnace and water heater thermostats and set them to the desired temperatures.

8.5. **Heating Oil Systems.** Homes equipped with oil burning furnaces must have their oil supply tankage and piping installed on site. These items are not supplied with your home. Consult the oil furnace manufacturer's instructions for proper pipe sizing and installation procedures. ALL OIL STORAGE TANK AND PIPING INSTALLATIONS MUST MEET ALL APPLICABLE LOCAL REGULATIONS AND SHOULD BE MADE ONLY BY EXPERIENCED QUALIFIED PERSONNEL.

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

8.6.1. **Description And Rating Of Housing Wiring.** Your home is designed for connection to an electrical wiring system rated at 120/240 volt AC. PROPER AND SAFE CONNECTION DEPENDS ON THE TYPE OF SUPPLY SYSTEM YOUR HOME IS EQUIPPED WITH. The connection to this home requires feeder wiring at the site. The following paragraphs describe the wiring and grounding of electrical feeders; if your home is equipped with a service meter base, skip directly to Section 8.6.3.4.

8.6.1.1. **Proper Feeder Wiring And Junction Box Material And Size**. The main breaker and the label on the electrical distribution panel give the feeder current capacity and amperes. Using this information, determine the required feeder size from the tables at Figures 8.9 and 8.10. These sizes are based on an ambient temperature of 86oF and do not take voltage drop into consideration.

8.6.1.2. **Overhead Feeders.** Homes equipped with overhead (mast weatherhead) feeder entrances contain all necessary conduit to the electrical distribution panel. However, you must install feeder conductors (not provided) on site. Refer to Figure 8.9.

8.6.1.3. Underside Feeders. Homes with an under-the-floor entrance come with a permanently-attached conduit raceway that runs from the electrical distribution panel to a point under the floor. Install an approved conduit panel to a point under the floor. Install an approved conduit fitting or junction box at the termination point. Refer to Figure 8.10.

8.6.2. **Grounding Of Homes With Feeder Connections.**

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

8.6.2.2. **Procedure.** The ground conductor of the power supply feeder cable connects the grounding bar to a good electrical ground. Follow the feeder connection procedures described in 8.6.3.1, -8.6.3.2, or -8.6.3.3 to achieve proper grounding. Insulate the grounded circuit conductor (neutral or white wire) from the grounding conductors (green wires) and from equipment enclosures and other grounded parts. Insulate neutral circuit terminals in the distribution panel board -- and in ranges, clothes dryers, and counter-mounted cooking units -- from the equipment enclosure. Bonding screws, straps or buses in the distribution panel board or in appliances should have been removed and discarded at the manufacturing facility. (Bonding screws, straps, etc. in appliances must be removed on appliances to be installed by persons other than the manufacturer.) You may provide the required continuity of ground between sections of multi-section homes by bolting outriggers together. When the outriggers or other overlapping metal joints of adjoining units are not bolted together on houses with shingle roofs and non-metallic siding, install a ground wire connection between the chassis. This bonding connection is commonly made with a #8 AWG bare copper wire or other approved positive connection between parts (Figure 8.11), using approved grounding lugs with bolts, star washers and nuts, or self-tapping screws that are shipped with the home.

8.6.2.3. **Unacceptable Methods Of Grounding Homes.** Grounding to a rod, a water pipe, or through the home's hitch caster will not satisfy the important grounding requirement. NEVER USE THE NEUTRAL CONDUCTOR OF THE FEEDER CABLE AS A GROUND WIRE. DO NOT GROUND THE NEUTRAL BAR IN THE ELECTRICAL DISTRIBUTION PANEL.

8.6.3. **Connection Methods.** Connections should be made only by a qualified electrician. Connect homes equipped for 100 amp or greater service by one of the three following methods.

8.6.3.1. **A Feeder Cord.** Your home may be equipped with a permanently-connected 50 amp feeder cord stored in a compartment under the floor. If so, it is ready to be plugged into a 5 amp, 3-pole, 4-wire, 120/240 volt grounding service receptacle after electrical tests have been completed (see 8.6.6). WARNING: MANY HOMES ARE EQUIPPED FOR 100 AMP OR GREATER SERVICE. UNLESS YOUR HOME IS EQUIPPED FOR ANY 50 AMP SERVICE, DO NOT ATTEMPT TO USE A FEEDER CORD OR 'PIGTAIL' CONNECTION.

8.6.3.2. **Mast Weatherhead Feeder.** The routing, connection and support of the service drop must meet local codes. Homes equipped this way contain all necessary conduit to the electrical distribution panel. However, feeder conductors (not provided) must be installed on site in accordance with Figure 8.9. If the masthead is located above the roof overhang, allow a minimum 8' clearance above all roof points the conductors pass over. There are two exceptions to this rule: 1) The vertical clearance may be reduced to 3' if the roof has a minimum slope of 4 in 12; and 2) The vertical clearance may be reduced to 18" if no more than 4' 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' to 18' depending on the types of traffic anticipated below the service drop (refer to the National Electric Code). Unless impractical, locate service heads above the point of attachment of the service-drop conductors and make them rain-tight. If individual conductors do not extend downward, form drip loops.

8.6.3.3. **Underside Junction Box Feeder.** A raceway from the main panel board to the underside of the home allows for installing an approved junction box or fitting, which must be used to connect it to the supply raceway (see Figures 8.10 and 8.12). Install properly-sized conductors from the main power supply to the panel board. Refer to Figure 8.10 for conductors and junction box requirements. The homeowner or installer must provide the supply connection including the feeder conductors, junction box and raceway connectors. Protect conductors emerging from the ground from a minimum 18" below grade to 8' 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 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

measured from the top surface of a buried cable, conduit or raceway to the finished grade must meet minimum burial requirements outlined in the National Electric Code. Use a moisture-proof bushing at the end of the conduit from which the buried cable emerges.

8.6.3.4. **Service Equipment Meter Base.** Either an overhead or underground entrance may be provided. The exterior equipment and enclosure must be weatherproof, and conductors must be suitable for use in wet locations. When a meter is provided on the home, connect the neutral (white) conductor to the system grounding (green) conductor on the supply side of the main disconnect. Refer to Figure 8.13 for typical meter base installation and on method of grounding the service equipment. The homeowner must provide the grounding electrode conductor(s). The grounding electrode shall be an 8' length of 1/2" diameter copper rod or 3/4" galvanized steel pipe. Drive it into the ground at least 12" below the surface and 2' from the foundation, or bury it horizontally in a 2 1/2' deep trench. Connect the grounding conductor wire to the grounding electrode with a grounding clamp. For added protection, homes with metal frames or siding should be connected to earth by means of an additional bonding wire to underground metallic water pipes, ground rings, additional ground rods, etc. to prevent buildup of hazardous voltages.

8.6.4. **Crossover Connections.** Refer to Figure 8.14 for typical crossover wiring connections, for multi-section homes (located along the centerline between sections). Crossover locations can be distinguished by metal junction boxes or access cover panels. Remove these panels and connect the enclosed wires as illustrated. Some crossover connectors plug together and do not require junction boxes.

8.6.5. **System Test Procedures And Equipment.**

8.6.5.1. **Pre-Connection Tests.** Conduct both of the following tests before any electrical power is supplied to the home.

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

8.6.5.1.2 **Grounding Continuity.** Using a continuity tester, test all noncurrent-carrying metal parts to assure continuity to ground. The parts to be checked include: appliance enclosures, including fans; fixture enclosures and canopies; metal siding and roofs; metal water supply and gas lines; metal ducts (except foil-covered insulated ducts); and the home's frame. On multi-section units, perform this test only after completing all electrical and bonding connections between the units. NOTE: Grounding is not required on the metal inlet of a plastic water system or on plumbing fixtures such as tubs, faucets, shower risers, and metal sinks when they are connected only to plastic water and drain piping.

8.6.5.2. **Post-Connection Tests.** Conduct the following three tests after turning on the main circuit breaker and each individual circuit breaker. CAUTION: Allow the water heater to fill completely before activating the water heater circuit. Failure to do so will cause the water heater element to burn out, an event not covered by the warranty.

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

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

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

FIGURE 8.3 - DRAINPIPE SUPPORT METHODS

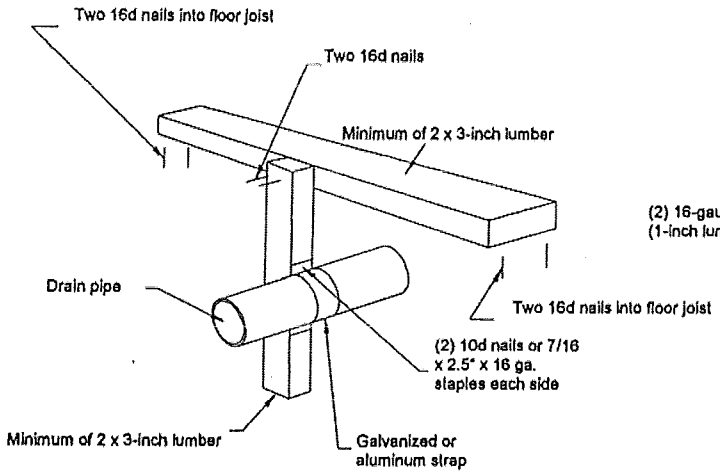


FIGURE 8.4 - DRAINAGE SLOPES AND CONNECTIONS

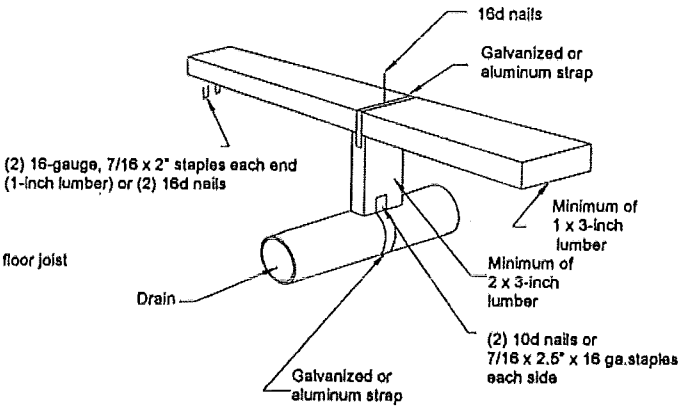
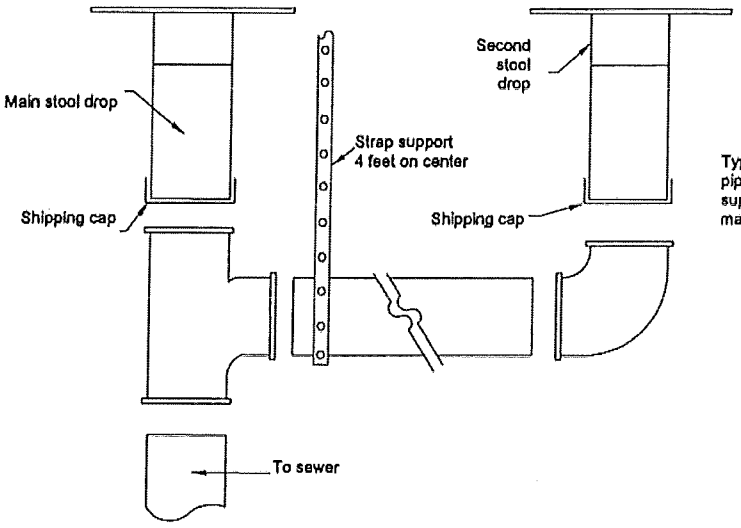
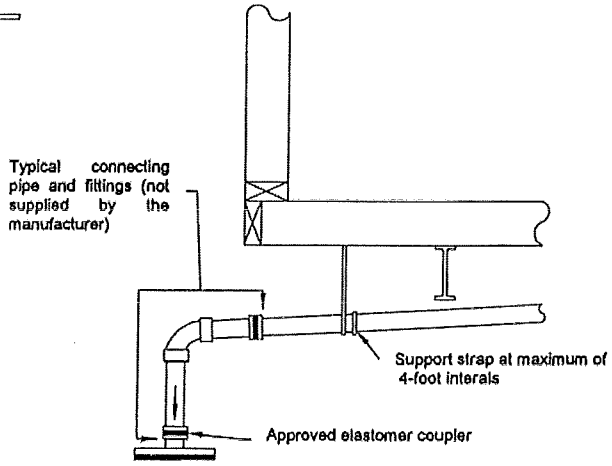


FIGURE 8.5 CONNECTION TO SITE SEWER



Field-installed, slope 1/4 inch per foot



Site sewer hook-up

Note: Fittings in the drainage system that are subject to freezing, such as P-traps in the floor, have been protected with insulation by the manufacturer. Insulation must be replaced if it is removed to gain access to the P-trap.

FIGURE 8.6 - DRAIN LINE CROSSOVER CONNECTION

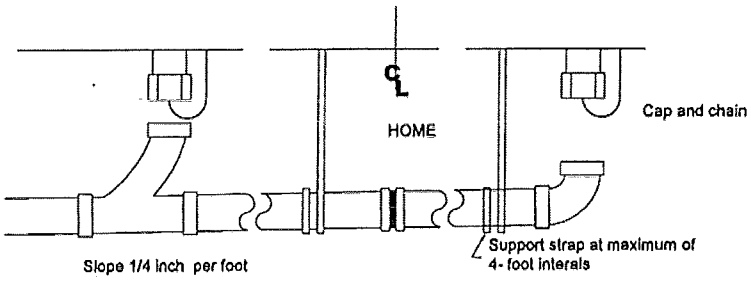


FIGURE 8.7 - DRAIN LINE FREEZE PROTECTION

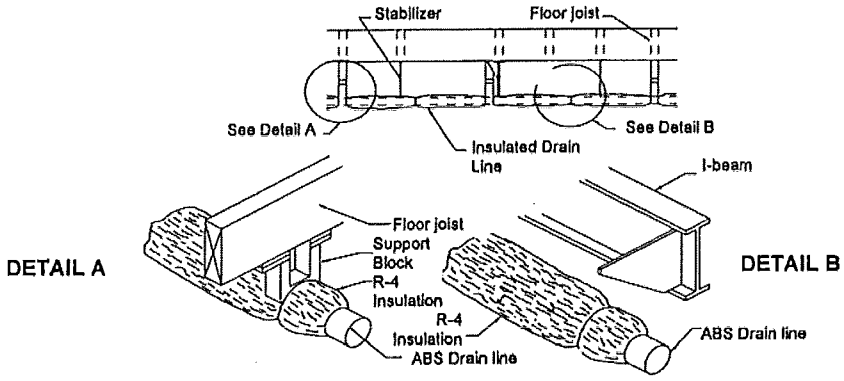
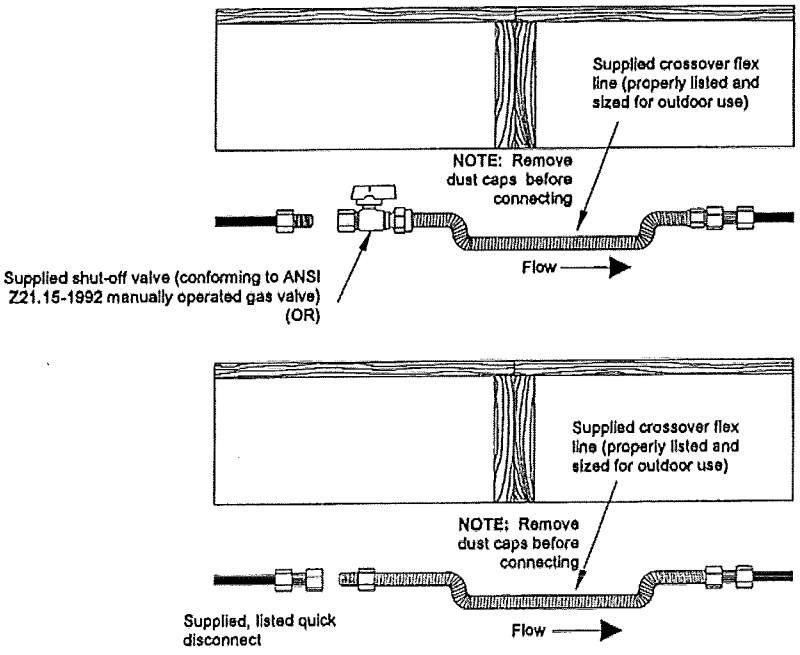
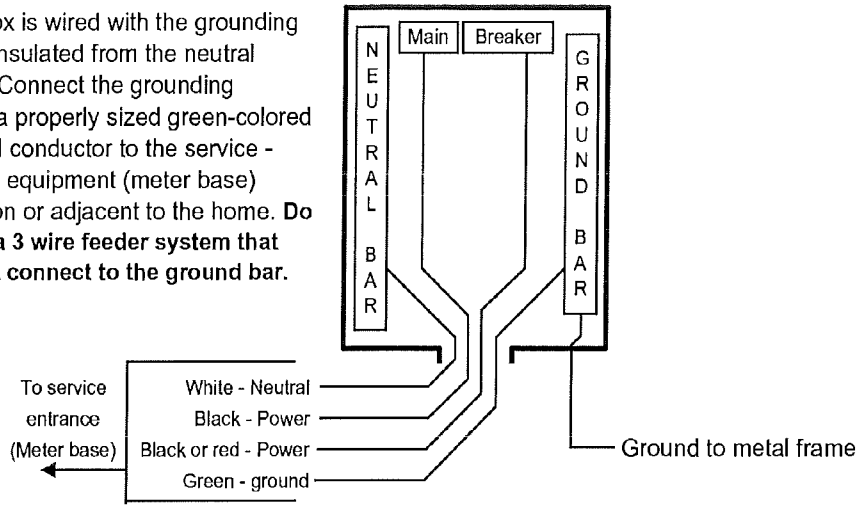


FIGURE 8.8 TYPICAL GAS LINE CROSSOVER

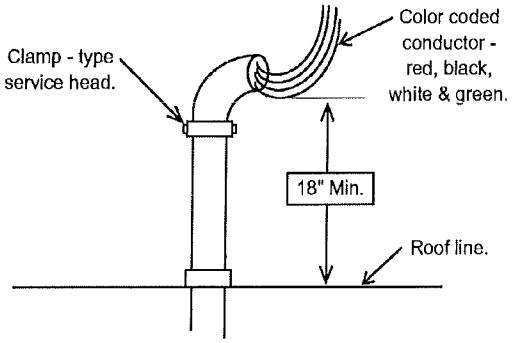


Electrical feeder & utility service connection

NOTE:
Panel box is wired with the grounding system insulated from the neutral system. Connect the grounding through a properly sized green-colored insulated conductor to the service - entrance equipment (meter base) located on or adjacent to the home. **Do not use a 3 wire feeder system that does not connect to the ground bar.**



Electrical feeder sizing									
Main breaker size in panel box :	Junction Box min. size (Inches)	Min. size raceway Conduit diameter with Copper conductors	with Aluminum conductors	Feeder conductors Copper conductors / sizes black / red (Power)	White (Neutral)	Green (Grounding)	Aluminum conductors / sizes black / red (Power)	White (Neutral)	Green (Grounding)
100 amp.	10x10x4	1.25 "	1.5 "	#4	#4	#8	#2	#2	#6
125 amp.	10x12x4	1.5 "	2 "	#2	#2	#6	#1/0	#1/0	#6
150 amp.	10x12x4	1.5 "	2 "	#1	#1	#6	#2/0	#2/0	#4
200 amp.	12x12x4	2 "	2 "	#2/0	#1	#6	#4/0	#2/0	#4



CAUTION: Be sure to connect double - section chassis together with bonding wire and lug. Connect wire with screw terminal on each end to frame parts on each half of the double - section home.

FIGURE 8.9
TYPICAL OVERHEAD FEEDER ASSEMBLY

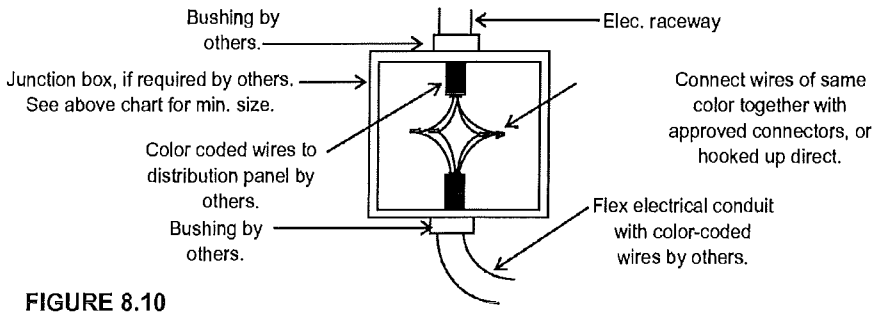


FIGURE 8.10
TYPICAL UNDERSIDE FEEDER ASSEMBLY

FIGURE 8.11 - MULTI-SECTION FRAME BONDING

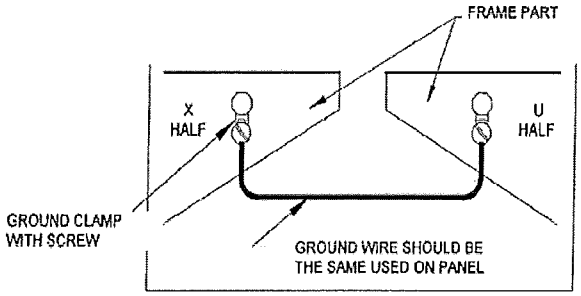


FIGURE 8.12 - TYPICAL UNDER CHASSIS FEED CONNECTIONS

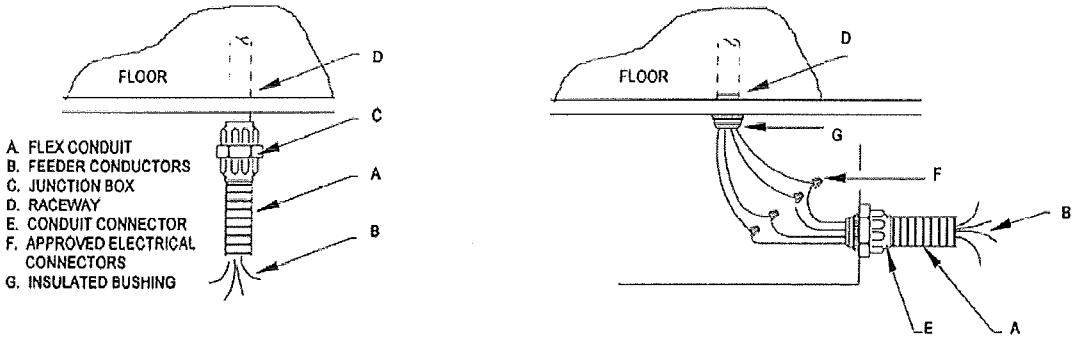


FIGURE 8.13 - TYPICAL METER BASE INSTALLATIONS AND GROUNDING

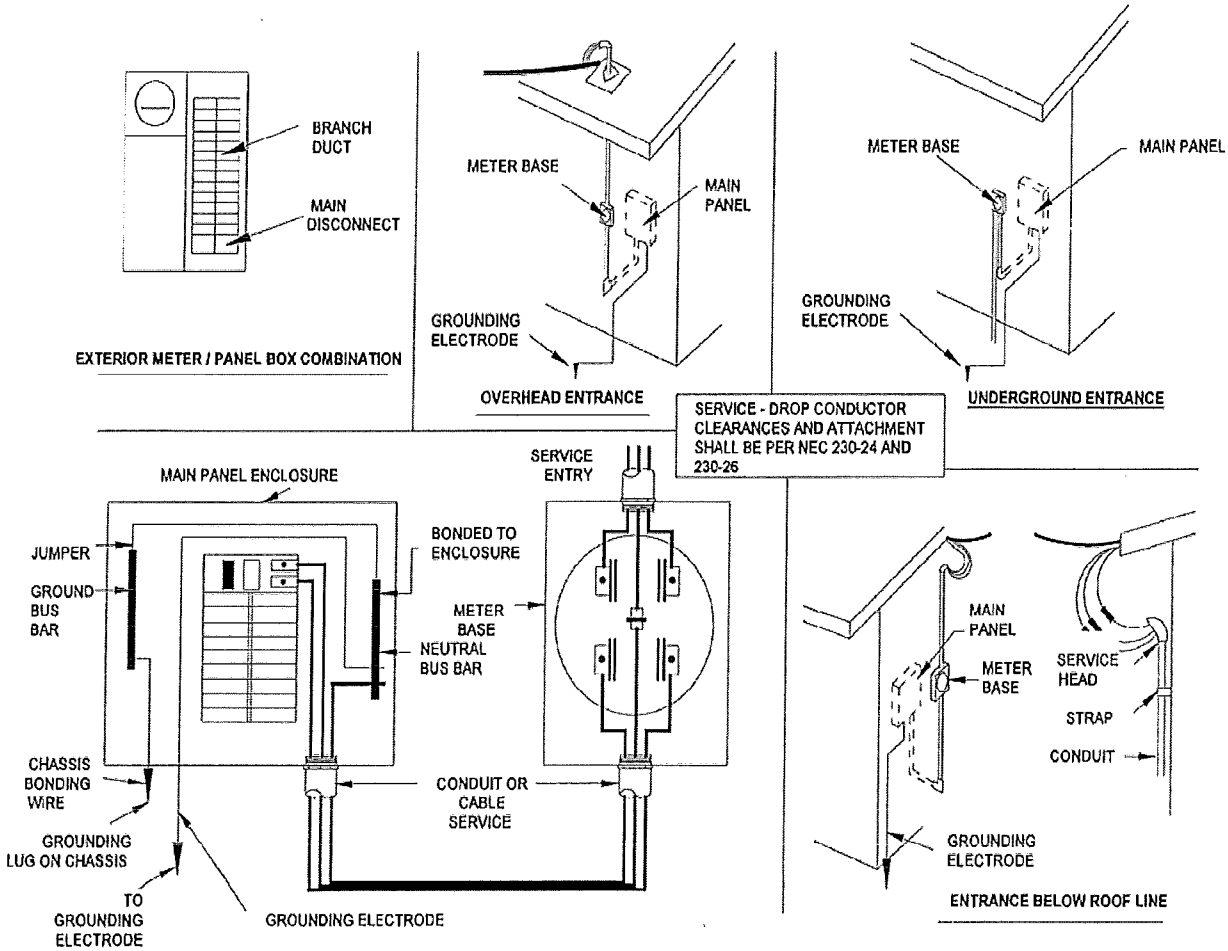
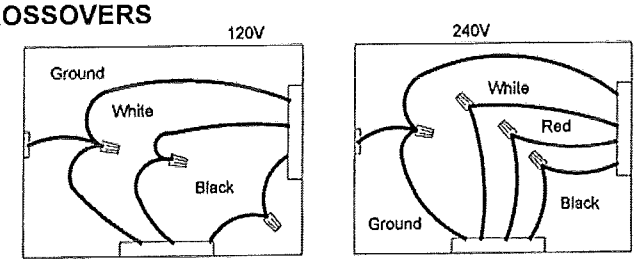
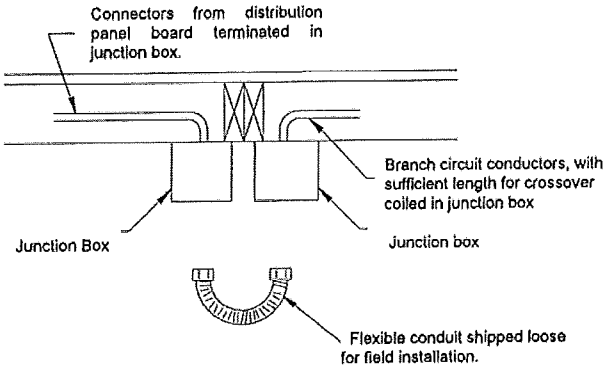
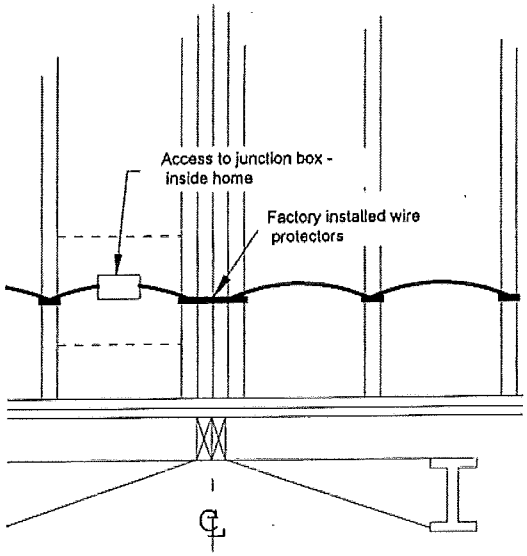


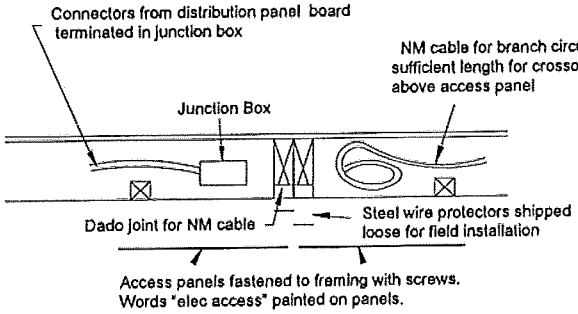
FIGURE 8.14 - ELECTRICAL CROSSOVERS

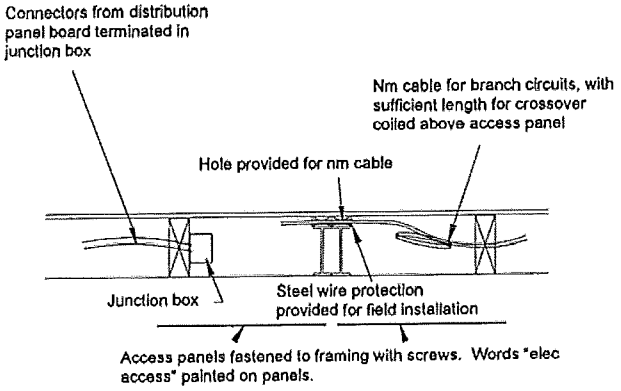






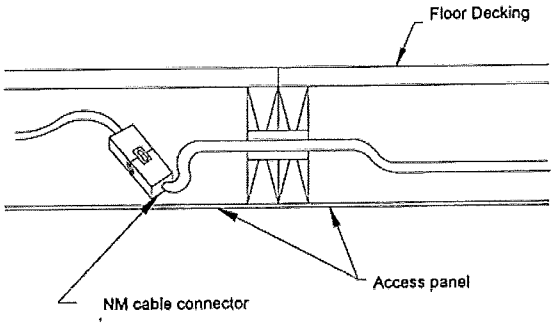
IN WALL - ALTERNATE





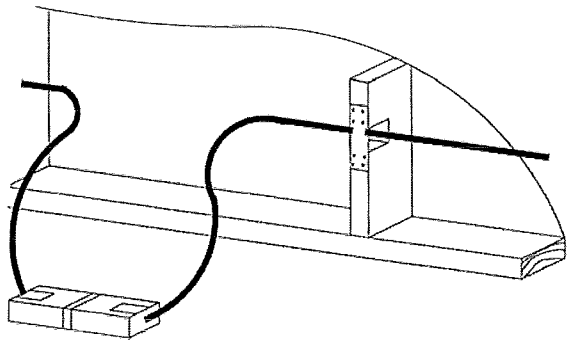
IN FLOOR - ALTERNATE A (SIDE VIEW)

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



IN FLOOR - ALTERNATE B (SIDE VIEW)

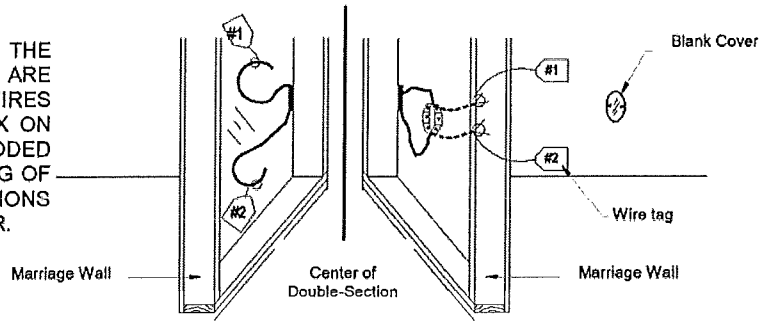
(PERIMETER TYPE FRAME)



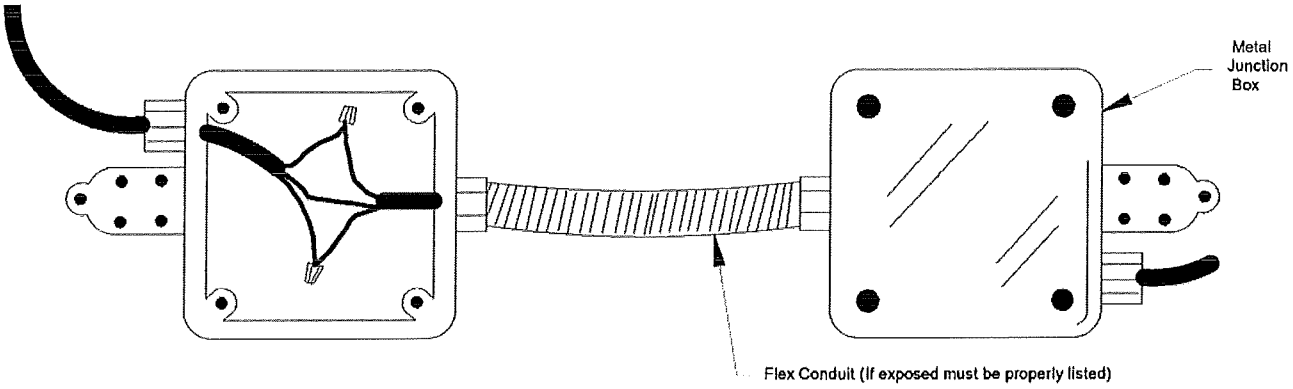
THE CONNECTORS ARE INTENDED FOR FACTORY OR ON-SITE INTERCONNECTION OF MODULES OR OTHER BUILDING COMPONENTS. THEY MAY BE CONCEALED OR SURFACE-MOUNTED AS DESCRIBED IN ARTICLES 545-13, 550-10(1) AND 551-16(A) OF THE NATIONAL ELECTRIC CODE.

FIGURE 8.14 - TYPICAL ELECTRIC CROSSOVERS

THE WIRES ARE COILED UP UNDER THE SHIPPING SEAL. BEFORE THE UNITS ARE PULLED TOGETHER PLACE THE WIRES FROM "U" HALF INTO JUNCTION BOX ON "X" HALF. WIRES WILL BE COLOR CODED AND/OR TAGGED TO PREVENT MIXING OF CIRCUITS. MAKE FINAL CONNECTIONS AFTER UNITS ARE PULLED TOGETHER.

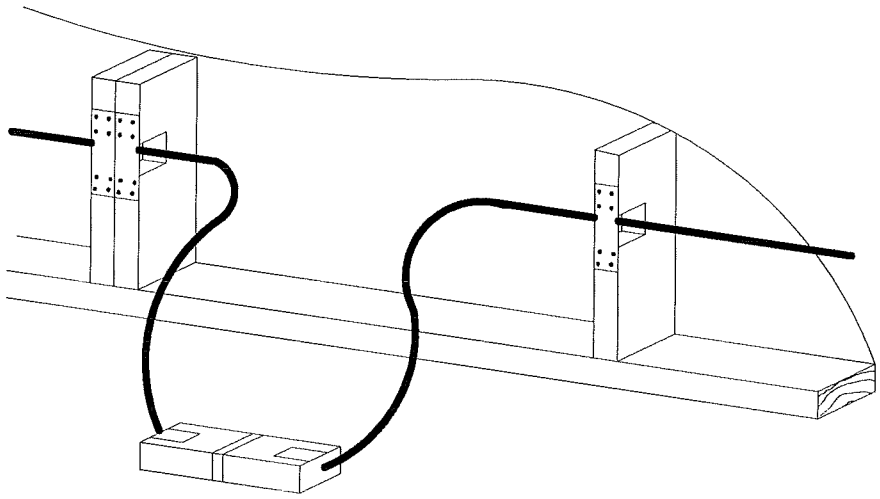


ALTERNATE ELECTRIC CROSSOVER



CONNECT THE FLEX CONDUIT TO THE JUNCTION BOX ON THE "X" HALF. THEN MAKE THE WIRE CONNECTIONS USING APPROVED WIRE CONNECTORS. WIRES WILL BE COLOR CODED AND/OR TAGGED TO PREVENT MIXING OF CIRCUITS.

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.



THE CONNECTORS ARE INTENDED FOR FACTORY OR ON-SITE INTERCONNECTION OF MODULES OR OTHER BUILDING COMPONENTS. THEY MAY BE CONCEALED OR SURFACE-MOUNTED AS DESCRIBED IN ARTICLES 545-13, 550-10(I) AND 551-16(O) OF THE NATIONAL ELECTRIC CODE.

9. Chapter 9 – Final Inspection

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

9.1. **Water and Drain Systems.** All water and drain systems work properly and do not leak.

9.1.1. **Accesses Under Home.** Access for P-traps, etc. located under the home in the bottom board are taped and marked with paint or colored tape for access.

9.2. **Appliance Function and Operation.** Appliances have been tested and work properly.

9.3. **Windows, Doors and Drawers.** All windows, doors and drawers work properly.

9.4. **Exit Windows.** One window in each bedroom is designated as a secondary exit to be used in case of emergency. Each exit window is labeled as such with operating instructions. All shipping hardware should be removed, and the window should operate as explained in the window manufacturer's instructions.

9.5. **Exterior Siding and Trim.** No gaps, voids or missing fasteners and all seams are sealed.

9.6. **Stack Heads and Vent Pipe Flashings on Roof.** All stack head or vent pipe flashings are properly attached and sealed.

9.7. **Composition Roof.** Shingles are properly attached, none are loose or missing, and all holes are filled.

9.8. **Skirt Venting.** (See Page 21, 5.6.4)

9.9. **Low-Hanging Trees and Bushes.** If there are any low-hanging trees or bushes near your home, trim or cut them. Think about the plants' possible movement during windy conditions or under snow or ice loads in limiting their future growth.

9.10. **Exhaust Fan Operation and Air Flow.** Check all exhaust fans for proper operation and air flow.

9.11. **Bottom Board.** Carefully inspect the bottom covering of the home for loosening or tears from installation of pipes or wires. Seal openings around the floor perimeter, pipes or pipe hangers and splits or tears with weather-resistant tape.

9.12. **Ground Cover.** Repair material must overlap any cuts or tears in the ground cover by a minimum of 12" and may be secured with tape.

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

9.14. **Interior Details.** Inspect for, and correct, all interior finishing details, such as loose molding, carpet seams, etc. The retailer's representative should inspect the home with the homeowner, give the homeowner a copy of the Homeowner's Manual, and brief the homeowner about maintaining the home.

10. Chapter 10 – Relocating the Home

10.1. **Relocation of Home.** If it is necessary to move your home, have it moved by a professional manufactured home mover, making sure he uses enough temporary wood blocking, and check the following items:

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

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

10.1.3. **Appliances.** Secure appliances to prevent movement during transportation.

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

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

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

10.1.7. **Multi-Section Homes.** Re-install temporary structural supports and bracing materials before moving the home. Cover open sides of sections with weather-proof material such as 6 mil plastic sheeting. After the sections have been separated, secure 2" x 6" shipping braces at the front end and in the axle area. Place ridge beam supports in open areas or at a maximum of 4' on center.

10.1.8. Multi-section homes with stairwell must have the stairwell cutout reinforced for transportation. Locate the factory installed framing plug and fasten to floor framing with #8 x 3" wood screws. If the factory installed stairwell plug cannot be located, construct a temporary stairwell plug with 2 x 6's #3 SPF at 24" o.c. with 5/8" APA rated decking. Fasten all framing members with (3) 16d nails and decking with 10d nails 6" o.c.

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