



Site Construction Manual

Revised June 2018

Using the Manual

This manual is organized into a series of steps that will take you through the entire installation process using only those pages required for the specific home being installed. First, review the entire manual, including the Introduction chapter. As you read it, identify sections of the manual that you will need; identify other documents or information you will need; construct lists of tools and materials required for your particular installation; and make sure you have everything you need before starting work.

After reviewing the entire manual, refer to the sequence of installation steps in the table below. Identify the pathway for your installation and follow the arrows downward. Select either **Single Section Home** or a **Multi-Section Home** and choose the column corresponding to the home's foundation type, either **Pier and Ground Anchor** or **Load-Bearing Perimeter Wall** (see **Definitions**, p. 6). Then complete the work in each of the sections starting with **Getting Started**.

If using an alternative (proprietary) foundation system, the installation process will change from that described in this manual. Consult the system manufacturer's directions for instructions. See page 8 for alternative foundation system criteria.

SINGLE SECTION HOME		MULTI-SECTION HOME	
Pier and Ground Anchor	Load-Bearing Perimeter Wall	Pier and Ground Anchor	Load-Bearing Perimeter Wall
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Please refer to Appendix for any plant specific details that may supplement or supercede information listed in the following installation manual.

The following is a list of revisions to this manual since the 2017 version:

Page 17 - revised the third bullet point discussing the water table

Page 18 - revised frost line requirements and added Table 4A

Page 24 - added statement to allow interpolation for footer tables

Page 30 - revised Appropriate Use for ABS plastic in Table 8

Page 31 - increased pier capacities without mortar

Page 32 - shaded chart to easily identify round footer capacities

Page 33 - revised Fig. 11 to include allowance for footings exceeding the maximum extension

Page 41 - revised note on spacers and increased pier capacities without mortar

Page 63 - Eliminated pier requirement under in-floor crossover duct

Page 96 - added 125 amp and 150 amp options in Table 26

Page 98 - revised wording in Step 2 Note 4 Connect Valve

All pages containing a chart or table were revised to reduce the dark shading in order to increase the legibility of these pages.

Introduction

This installation manual contains instructions that must be followed for the proper installation of the home. It complies with the HUD Installation Standards. Please read all instructions and any other documents (including addendum pages and supplements) that may apply to the specific home prior to commencing site work or installation.

This installation manual covers permits and site work through final inspection of the installation. It covers both single and multi-section homes installed over pier and anchor and load bearing crawl space walls. It contains instructions, including specifications and procedures, for the set and hookup of homes to be used as single-family dwellings.

The importance of correct installation cannot be over-emphasized. Correct installation is absolutely essential to homeowner satisfaction and the structural integrity of the home. All instructions must be followed to provide the customer with a safe, quality home.

No manual can cover all circumstances that may exist for certain home designs or building sites. For questions, further clarification or if you encounter conditions at the site or in the design of the home or its foundation not covered by this manual, please contact the manufacturer, a registered engineer or registered architect.

Supplemental addendum pages may be included with this manual. Supplements include requirements not covered in this manual or that supercede the manual instructions.

Once the home installation is complete, leave this manual with the home.

IMPORTANT NOTICES

- The home manufacturer is not responsible for installation or for the materials supplied by the set-up crew at the time of installation. The installer may be responsible for any deviations from the installation instructions of this manual.
- To keep the home in compliance with its warranty, the home installation must follow the procedures described in this manual or other procedures approved by the manufacturer. Deviation from the instructions in this manual may void the home's warranty. Any alterations or changes to the home shall be approved by a registered engineer or registered architect and may still be subject to warranty violations.
- When an installer does not provide support and anchorage in accordance with the approved manufacturer's installation instructions, or encounters site conditions (such as areas that are subject to flood damage or high seismic risk) or other conditions that prevent the use of the instructions provided in this manual, the installer must obtain special site-specific instructions from the manufacturer or use a design approved by a registered engineer or registered architect. Designs provided by registered professional engineers or registered architects must also be approved by the manufacturer and DAPIA. Alternative support and anchorage designs may be used which are state approved and acceptable to the local authority having jurisdiction.

SAFETY

There are potential hazards associated with the installation of a manufactured home. Home installers are licensed and, as experienced professionals, should recognize these hazards, be qualified to work with them, and be capable of providing safe work practices and equipment that minimize the risks of injury.

Only qualified persons should install a manufactured home. The installer must possess a valid installation license as a manufactured home installer. As qualified professionals in the field of home installation, installers are the experts and must be aware of the hazards and conditions faced. Warnings are published throughout this manual as reminders. These reminders may not cover all hazards, all potential hazards, or all possible consequences of improper or unsafe installation practices.

Construction crews should be trained in the skills required and be supervised by experienced personnel. Installers should regularly inspect work performed by crews and subcontractors.

Obey OSHA regulations, particularly those related to home construction, such as Title 29 Code of Regulations Part 1926. For copies of OSHA regulations, call (202) 512-1800 or visit www.osha.gov on the web.

RESOURCES

Office of Regulatory Affairs and Manufactured Housing

US Department of Housing and Urban Development
451 Seventh Street, SW, Room 9164
Washington, DC 20410-8000
Telephone: (202) 708-6423 or (800) 927-2891
FAX: (202) 708-4213

State Administrative Agencies

A list of SAAs may be found on the web at www.hud.gov/offices/hsg/sfh/mhs/mhssaa.cfm or by contacting the Office of Regulatory Affairs and Manufactured Housing or in the Homeowners Manual.

FEDERAL PREEMPTION

This home was engineered, constructed and inspected in conformance with the Federal Manufactured Home Construction and Safety Standards of the US Department of Housing and Urban Development (24 CFR Part 3280, commonly referred to as the "HUD Code") in effect on the date of construction. These Standards set forth minimum requirements for the design and construction of manufactured homes designed to be used as dwellings.

Individual states, counties and cities shall have no authority to establish standards regarding the construction or safety of a manufactured home. A metal certification label is affixed to each section of the home to certify that it has been constructed and inspected to comply with these Standards. The design plans and in-plant construction of all homes are inspected by independent third party agencies to assure compliance with the Standards.

The installation of the home and any alterations made to the home shall conform to the requirements of the Federal Manufactured Home Construction and Safety Standards and the HUD Model Manufactured Home Installation Standards. These installation instructions are minimum requirements. Applicable local or state laws may have more stringent installation requirements than outlined in this manual and must be followed. Consult with the local authority having jurisdiction (LAHJ) for regulations that may require licenses and/or permits or which may affect procedures described in this manual.

DEFINITIONS

ANCHOR ASSEMBLY. Any device or other means designed to transfer home anchoring loads to the ground.

ANCHORING EQUIPMENT. Ties, straps, cables, turnbuckles, chains, and other approved components, including tensioning devices that are used to secure a home to anchor assemblies.

ANCHORING SYSTEM. A combination of anchoring equipment and anchor assemblies that will, when properly designed and installed, resist the uplift, overturning, and lateral forces on the home.

BASEMENT. A load bearing perimeter wall foundation that includes habitable space (finished or unfinished, heated or unheated) completely or partially below grade.

CONCRETE ANCHOR. A specific anchoring assembly device designed to transfer home anchoring tension loads from straps to concrete foundation or slab system.

CRAWLSPACE. The space underneath the home's floor system, enclosed with either load- or non-load bearing perimeter walls. The ground may be covered with a concrete slab or by a plastic ground cover. Crawlspace walls must be vented and an access must be provided.

CROSSOVERS. Utility interconnections between sections of multi-section homes, including heating and cooling ducts, electrical circuits, and water pipes, drain plumbing, and gas lines.

DATA PLATE. An information sheet located on a cabinet door under the kitchen sink or on a wall panel or door face near the electrical panel, utility room or in the master bedroom closet. It contains a unique identification number and identifies the wind zone, roof load zone, and climatic zone for which the home was constructed.

DIAGONAL TIE. A tie intended to resist horizontal or shear forces, but which may resist vertical, uplift, and overturning forces.

FOOTING. That portion of the support system that transmits loads directly to the soil.

GROUND ANCHOR. A specific anchoring assembly device designed to transfer home loads to the ground.

H-BEAM. Steel H-beams, also called cross beams, are often used to support a home over a basement or crawlspace. They span across the foundation from sidewall to sidewall, typically with an intermediate support pier and footing (typically in the center point resulting in a line of piers under the centerline of a double section home).

INFORMATION PACKET. A set of important documents provided with the home including warranties, information on high wind coverage, and other features of the specific home.

INSTALLATION LICENSE. The proof that an installer meets the requirements for installing manufactured homes under the HUD-administered installation program.

LABELED. Equipment or materials to which has been attached a label, symbol, or other identifying mark of a certified testing laboratory, inspection agency, or other organization concerned with product evaluation. The label indicates compliance with nationally recognized standards or tests to determine suitable usage in a specified manner.

LISTED OR CERTIFIED. Included in a list published by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

LOAD-BEARING PERIMETER WALL FOUNDATION. A support system for the home whereby the home is mechanically fastened to a structural wall(s) that transfers gravity, lateral and uplift loads to the ground.

LOCAL AUTHORITY HAVING JURISDICTION (LAHJ). The state, city, county, municipality, utility, or organization that has local responsibilities that must be complied with during the installation of a manufactured home.

MUST. Indicates a mandatory requirement.

N/A. Indicates not applicable.

PIER. That portion of the support system between the footing and the home, exclusive of shims. Types of piers include, but are not limited to: (1) manufactured steel stands; (2) pressure-treated wood; (3) manufactured concrete stands; (4) concrete blocks; and (5) portions of foundation walls.

PIER AND GROUND ANCHOR FOUNDATION. A support system for the home that employs piers under the chassis and other locations to support gravity loads and employs ground anchors and tie downs (the stabilizing system) to resist lateral and uplift loads.

PERIMETER BLOCKING. Regularly spaced piers supporting the sidewalls and marriage line of the home. Some homes require perimeter blocking in addition to supports under the home's frame.

QUALIFIED (OR LICENSED). Has the necessary knowledge and skills gained from experience and training that will allow performance of the job safely, competently, and in accordance with all applicable codes, standards, rules and regulations. Meets all necessary qualification tests including any license and certification requirements that may be in effect in the area where the home will be installed, including the requirements for installing manufactured homes under the HUD-administered installation program. The term does not incorporate a state-issued installation license or certification, except to the extent provided in this part. The term does not imply that HUD approves or recommends an installer or warrants the work of an installer, and should not be used in any way that indicates HUD approval in violation of 18 U.S.C. 709.

RAMADA. Any freestanding roof or shade structure, installed or erected over a home or any portion of the home.

SHOULD. Indicates a recommendation that is strongly advised but not mandatory.

SHALL. Indicates a mandatory requirement.

SITE FOR A HOME. A designated parcel of land designed for the accommodation of one home, its accessory buildings or structures, and accessory equipment, for the exclusive use of the occupants of the home.

SKIRTING. A weather-resistant material used to enclose the perimeter, under the living area of the home, from the bottom of the home to grade.

STABILIZING SYSTEM. All components of the anchoring and support systems, such as piers, footings, ties, anchoring equipment, ground anchors, or any other materials and methods of construction that support and secure the home to the ground.

SUPPORT SYSTEM. Pilings, columns, a combination of footings, piers, foundation walls, caps, and shims and any combination thereof that will, when properly installed, support and secure the home to the ground.

TIE. Straps, cable, or securing devices used to connect the home to anchoring assemblies.

UTILITY CONNECTION. The connection of the home to utilities that include, but are not limited to, electricity, water, sewer, gas, or fuel oil.

VERTICAL TIE. A tie intended to resist uplifting and overturning forces.

WIND ZONE. The areas designated on the Basic Wind Zone Map, as further defined in by the Manufactured Home Construction and Safety Standards

ENGINEER'S STAMP

Certain pages of this manual, display the seal of a registered engineer. Federal guidelines only require the seal from one state to be displayed, but the details herein apply to all states.

SYMBOLS USED IN THE MANUAL



This icon indicates an important warning. It is critical to heed these warnings.



This icon indicates a recommended best practice. While not required, following these practices will result in a superior installation, reducing the chance that cosmetic or durability related complaints might arise.

ABBREVIATIONS

ABS	Acrylonitrile Butadiene Styrene	max.	Maximum
ANSI	American National Standards Institute	MHCSS	Manufactured Home Construction and Safety Standards
APA	American Plywood Association	min.	Minimum
ASTM	American Society for Testing and Materials	mph	Mile(s) per hour
AWPA	American Wood Preservers Association	NEC	National Electric Code
CFM	Cubic feet per minute	NFIP	National Flood Insurance Program
CFR	Code of Federal Regulations	NFPA	National Fire Protection Association
DWV	Drain, Waste, Vent	o.c.	On center
EMT	Electrical metallic tubing	OSHA	Occupational Safety and Health Administration
FEMA	Federal Emergency Management Agency	oz	Ounce(s)
ft	Foot/feet	p.	Page
ga	Gauge	psf	Pounds per square foot
HUD	US Department of Housing and Urban Development	psi	Pounds per square inch
in	Inch(es)	SAA	State Administrative Agency
LAHJ	Local Authority Having Jurisdiction	sq ft	Square foot/feet
lb(s)	Pound(s)		

ALTERNATIVE FOUNDATION SYSTEMS

Alternative foundation systems or designs are permitted in accordance with the following:

- System designs are prepared by a registered engineer or a registered architect or tested and certified by a registered engineer or registered architect in accordance with acceptable engineering practice and are manufactured and installed so as not to take the home out of compliance with the Manufactured Home Construction and Safety Standards.
- An Alternative Foundation and/or Tiedown system design must be submitted to the manufacturer if it is not listed on the following website: www.claytonhomes.com. Click the **Builders Resource** tab at the lower right hand corner of the page to view all DAPIA approved Alternative Tiedown systems. Prior to obtaining an alternative design contact the home building facility for available approved alternative designs or instructions for submitting an alternative design.

DISPLAY AND STORAGE OF THE HOME

WEATHER PROTECTION

If the installation is not started immediately upon delivery of the home, the retailer and/or installer has the responsibility to ensure the exterior weather protection covering of marriage walls and the roof of homes has not been damaged during shipment. Inspect the home immediately upon the delivery and frequently during storage. Promptly repair tears in the home closure materials to prevent damage from the elements. Inspect and repair nail holes in roof shingles with asphalt cement or replace damaged shingles. Inspect and repair siding as needed.

SUPPORTING A HOME FOR DISPLAY

When a new home is to be displayed at a retail location, temporarily block and support the home. Set up homes with single block piers (maximum height per Table 9), metal piers or jack stands spaced no further apart than 12 feet o.c. beneath each I-beam. The tire and axle system may be used as one of these required supports, and the hitch jack may be used as another. Locate the first support no further than two feet from the rear end of the home (Figure 1). Place additional supports along the perimeter on either side of openings greater than four feet (i.e. sliding glass doors, bay windows, etc.). For 18' wide homes, perimeter supports must also be spaced no further than 12 feet o.c.

For multi section homes, locate additional supports along the marriage line under support columns. These locations will be marked by the manufacturer.

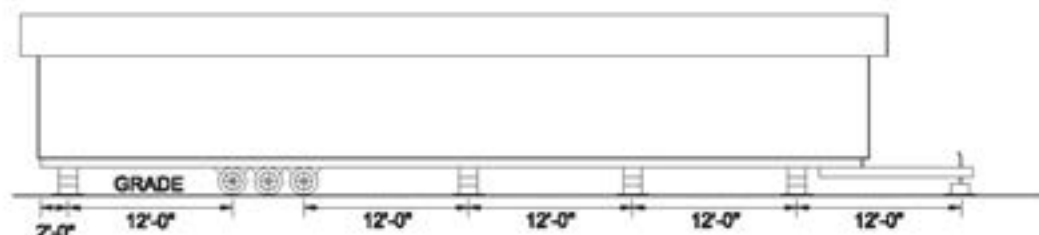


Figure 1. Supporting a home for display

For all homes, place footings below each support. Footings may be placed directly on the surface grade without excavation and may be ABS pads, 2 x 10 by 16 inch long pressure treated lumber or 16" x 16" by 4 inch thick concrete pads.

SUPPORTING A HOME FOR STORAGE

To prevent damage to homes being stored at the manufacturer's facility, model home center or the home site, but not on display (i.e. people shall not be permitted inside the home) for a period exceeding 30 days, locate supports below each I-beam no further than two feet from each end of the home and at the approximate center of the home length. For 18' wide homes, perimeter supports must also be spaced no further than 12 feet o.c.

Whether the home is being supported for display or storage the height of the home should be no higher than 48 inches as measured from the top of the ground to the bottom of the I-beam. In addition, it is extremely important that the roof/ridge vents are installed while the home is on display. Failure to install the roof/ridge vents may lead to significant damage to the roof and home.

Getting Started

This chapter covers a few steps that, taken now, will avoid problems later in the installation process.

Follow the Steps below:

- ▼ STEP 1. LOCATE THE DATA PLATE (p. 10)
- ▼ STEP 2. CONFIRM WIND ZONE (p. 10)
- ▼ STEP 3. CONFIRM THERMAL ZONE (p. 11)
- ▼ STEP 4. CONFIRM ROOF-LOAD ZONE (p. 13)
- ▼ STEP 5. CHECK LOCAL CODES AND SECURE PERMITS (p. 14)

STEP 1. LOCATE THE DATA PLATE

Locate the data plate inside the home (Figure 2), typically inside a kitchen cabinet door or on a wall panel or door face near the electrical panel, utility room or bedroom closet.



Figure 2. Sample data plate – shown as reference only, actual data plate may vary.

The information on the data plate will be used to verify that the home was designed for the proper location.

STEP 2. CONFIRM WIND ZONE

From Table 1, identify the wind zone for the home. Verify that the home conforms to the following rules and any special requirements determined by the LAHJ.

- No home may be located in a higher wind zone than that indicated on the data plate. (Example: a home designed for Wind Zone II cannot be placed in Wind Zone III.)
- A home may be located in a lower wind zone than that indicated on the data plate. (Example: a home designed for Wind Zone II can be placed in either Wind Zone II or I.) When a home is located in a lower wind zone than indicated on the data plate it may be installed per the requirements of the lower wind zone.
- Homes located within 1,500 feet of the coastline in Wind Zones II and III must be designed to withstand exposure 'D' conditions. This will be indicated on the data plate.

If the home does not conform to these rules, contact the manufacturer immediately.

TABLE 1. WIND ZONE BY LOCALITY

Wind Zone I	
All areas except those areas listed below as being within Wind Zone II or III	
Wind Zone II	
Alabama	Counties of Baldwin and Mobile
Florida	All counties except those listed below as within Wind Zone III
Georgia	Counties of Bryan, Camden, Chatham, Glynn, Liberty, McIntosh
Louisiana	Parishes of Acadia, Allen, Ascension, Assumption, Calcasieu, Cameron, East Baton Rouge, East Feliciana, Iberville, Iberia, Iberville, Jefferson Davis, Lafayette, Livingston, Pointe Coupee, St. Helena, St. James, St. John the Baptist, St. Landry, St. Martin, St. Tammany, Tangipahoa, Vermilion, Washington, West Baton Rouge, and West Feliciana
Maine	Counties of Hancock and Washington
Massachusetts	Counties of Barnstable, Bristol, Dukes, Nantucket, and Plymouth
Mississippi	Counties of George, Hancock, Harrison, Jackson, Pearl River, and Stone
North Carolina	Counties of Beaufort, Brunswick, Camden, Chowan, Columbus, Craven, Currituck, Jones, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrne II, and Washington
South Carolina	Counties of Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, Jasper, and Williamsburg
Texas	Counties of Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kennedy, Kleberg, Matagorda, Nueces, Orange, Refugio, San Patricio, and Willacy
Virginia	Cities of Chesapeake, Norfolk, Portsmouth, Princess Anne, and Virginia Beach
Wind Zone III	
Hawaii	Entire state
Alaska	Coastal regions (as determined by the 90 mph isobath on the AWSWCE7-88 map)
Florida	Counties of Broward, Charlotte, Collier, Dade, Franklin, Gulf, Hendry, Lee, Martin, Manatee, Monroe, Palm Beach, Pinellas, and Sarasota
Louisiana	Parishes of Jefferson, La Fourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. Mary, and Terrebonne
North Carolina	Counties of Carteret, Dare, and Hyde
Other	All regions of the U.S. Territories of American Samoa, Guam, Northern Mariana Islands, Puerto Rico, Trust Territory of the Pacific Islands, and the United States Virgin Islands



Figure 2A. Wind zone map

STEP 3. CONFIRM THERMAL ZONE

From Table 2, identify the thermal (UO) zone for the home. Verify that the home conforms to the following rules.

- No home may be located in an area with a higher thermal zone number than that indicated on the data plate. (Example: a home designed for Thermal Zone 2 cannot be placed in Thermal Zone 3.)

Getting Started

- A home may be located in a lower thermal zone than that indicated on the data plate. (Example: a home designed for Thermal Zone 2 may be placed in either Thermal Zone 2 or 1).
- In no case may a home designated for installation in the "Humid & Fringe Climate," as identified on the data plate, be located outside of this region (Table 2).

If the home does not conform to these rules, contact the manufacturer immediately.



Figure 3. Thermal (Uo) zone map



Figure 3A. Humid & fringe climate map

TABLE 2. HUMID AND FRINGE CLIMATE ZONES

Humid and Fringe Climate Zone	
Alabama	Counties of Baldwin, Barbour, Bibb, Blount, Choctaw, Clarke, Coffee, Conecuh, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Lowndes, Marengo, Mobile, Monroe, Montgomery, Pike, Washington, and Wilcox
Florida	All counties and localities
Georgia	Counties of Appling, Atkinson, Bacon, Baker, Ben Hill, Berrien, Brantley, Brooks, Bryan, Calhoun, Camden, Charlton, Chatham, Clay, Clinch, Coffee, Colquitt, Cook, Crisp, Decatur, Dougherty, Early, Echols, Effingham, Evans, Glynn, Gadsden, Irwin, Jeff Davis, Lanier, Lee, Liberty, Long, Lowndes, McIntosh, Miller, Mitchell, Pierce, Quitman, Randolph, Seminole, Tatnell, Teale, Thomas, Tift, Turner, Ware, Wayne, and Worth
Hawaii	All counties and localities
Louisiana	All counties and localities
Mississippi	Counties of Adams, Amite, Calhoun, Clarke, Copiah, Coultas, Forrest, Franklin, George, Greene, Hancock, Harrison, Hinds, Issaquena, Jackson, Jasper, Jefferson, Jones, Lamar, Lawrence, Lincoln, Madison, Pearl River, Perry, Pike, Rankin, Simpson, Smith, Stone, Walthall, Warren, Wayne, and Wilkinson
North Carolina	Counties of Brunswick, Carteret, Columbus, New Hanover, Onslow, and Pender
South Carolina	Counties of Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry and Jasper
Texas	Counties of Anderson, Angelina, Aransas, Atascosa, Austin, Bastrop, Bee, Bexar, Brazoria, Brazos, Brooks, Burleson, Caldwell, Calhoun, Cameron, Camp, Cass, Chambers, Cherokee, Colorado, Comal, De Witt, Dimmit, Duval, Falls, Fayette, Fort Bend, Franklin, Freestone, Frio, Galveston, Goliad, Gonzales, Gregg, Grimes, Guadalupe,

Hardin, Harris, Harrison, Hays, Henderson, Hidalgo, Hopkins, Houston, Jackson, Jasper, Jefferson, Jim Hogg, Jim Wells, Karnes, Kaufman, Kenedy, Kinney, Kleberg, La Salle, Lavaca, Lee, Leon, Liberty, Limestone, Live Oak, Madison, Marion, Matagorda, Maverick, McMullen, Medina, Milam, Montgomery, Morris, Nacogdoches, Navarro, Newton, Nueces, Orange, Pandia, Polk, Rains, Refugio, Robertson, Rusk, Sabine, San Augustine, San Jacinto, San Patricio, Shelby, Smith, Starr, Titus, Travis, Trinity, Tyler, Upshur, Uvalde, Val Verde, Van Zandt, Victoria, Walker, Waller, Washington, Webb, Wharton, Willacy, Williamson, Wilson, Wood, Zapata, and Zavala

STEP 4. CONFIRM ROOF LOAD ZONE

From Table 3, identify the Roof Load Zone for the home. Verify that the home conforms to the following rules.

- No home may be placed in an area with a higher roof load than that indicated on the data plate. (Example: a home designed for the South (20 psf) Roof Load Zone cannot be placed in the Middle (30 psf) Roof Load Zone).
- A home may be located in an area with a lower roof load than that indicated on the data plate. (Example: a home designed for the Middle (30 psf) Roof Load Zone may be placed in the South (20 psf) Roof Load Zone). When a home is located in an area with a lower roof load than indicated on the data plate it may be installed per the requirements of the lower roof load area.
- There are special high roof load areas (primarily in mountains) not shown on the map. Contact the LAHJ or SAA for information about these areas. The home's data plate will indicate if the home has been designed for one of these high roof load areas.
- Ramadas may be used in areas with roof live loads greater than 40 psf. Ramadas are to be self-supporting, except that any connection to the home must be for weatherproofing only.



Figure 3B. Roof (snow) load map

TABLE 3. ROOF LOADS BY LOCALITY

North (40 psf roof load)	
Alaska	All counties
Maine	Counties of Aroostook, Piscataquis, Somerset, Penobscot, Waldo, Knox, Hancock, Washington
Middle (30 psf roof load)	
Colorado	All counties
Idaho	All counties
Iowa	Counties of: Buena Vista, Butler, Calhoun, Cerro Gordo, Cherokee, Chickasaw, Clay, Dickinson, Emmet, Floyd, Franklin, Hamilton, Hancock, Hardin, Howard, Humboldt, Ida, Kossuth, Lyon, Mitchell, O'Brien, Osceola, Palo Alto, Plymouth, Pocahontas, Sac, Sioux, Webster, Winnebago, Worth, Wright
Maine	Counties of Androscoggin, Cumberland, Franklin, Kanabec, Lincoln, Oxford, Sagadahoc, York
Massachusetts	County of Essex
Michigan	Counties of Alger, Alcona, Alpena, Antrim, Baraga, Benzie, Charlevoix, Cheboygan, Chippewa, Crawford, Delta, Dickinson, Emmet, Gogebic, Grand Traverse, Houghton, Iron, Kalkaska, Keweenaw, Leelanau, Luce, Mackinac, Marquette, Menominee, Missaukee, Montmorency, Ogemaw, Ontonagon, Oscoda, Otsego, Presque Isle, Roscommon, Schoolcraft, Wexford
Minnesota	Counties of Aitkin, Anoka, Benton, Blue Earth, Brown, Cass, Carlton, Carver, Chippewa, Chisago, Cook, Cottonwood, Crow Wing, Dakota, Dodge, Douglas, Faribault, Fillmore, Freeborn, Goodhue, Grant, Hennepin, Hubbard, Itasca, Isanti, Jackson, Kandiyohi, Kanabec, Koochiching, Lac qui Parle, Lake, Le Sueur, Lincoln, Lyon, McLeod,

	Meeker, Morrison, Millie Lacs, Mower, Martin, Murray, Nicollet, Nobles, Olmsted, Pipestone, Pine, Pope, Ramsey, Redwood, Renville, Rice, Rock, St. Louis, Sibley, Scott, Steele, Sherburne, Swift, Stearns, Stevens, Todd, Wadena, Wight, Washington, Wabasha, Winona, Waseca, Watonwan, Yellow Medicine
Montana	All Counties
New Hampshire	All Counties
New York	Counties of Cayuga, Clinton, Essex, Erie, Franklin, Fulton, Genesee, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, St. Lawrence, Saratoga, Schenectady, Seneca, Warren, Washington, Wayne, Wyoming, Yates
South Dakota	Counties of Brookings, Clay, Codington, Deuel, Grant, Hamlin, Hanson, Hutchinson, Kingsbury, Lake, Lincoln, McCook, Miner, Minnehaha, Moody, Turner, Union, Yankton
Utah	All Counties
Vermont	Counties of Addison, Caledonia, Chittenden, Essex, Franklin, Grand Isle, Lamoille, Orange, Orleans, Rutland, Washington, Windsor
Wisconsin	Counties of Ashland, Bayfield, Barron, Buffalo, Burnett, Clark, Chippewa, Door, Douglas, Dunn, Eau Claire, Florence, Forest, Iron, Jackson, Langlade, Lincoln, Marathon, Marinette, Menominee, Oconto, Oneida, Pepin, Pierce, Polk, Price, Rusk, St. Croix, Sawyer, Taylor, Trempealeau, Vilas, Washburn
Wyoming	All Counties
South (20 psf roof load)	
Other	The states and counties not listed for the Middle or North roof load zone above are deemed to be within the South roof load zone.

Is the data plate present and the home placed in the appropriate wind, thermal and roof load zones?

- ▶ **YES**, go to **STEP 5, CHECK LOCAL CODES AND SECURE PERMITS**, (p. 14).
- ▶ **NO**, Stop installation activities and notify the home retailer.

STEP 5. CHECK LOCAL CODES AND SECURE PERMITS

Local regulations may set conditions for the siting and installation of a manufactured home. Consult the LAHJ, state manufactured housing association and the state SAA (See Resources, p. 5) for the specific local requirements, including:

- Building codes that may affect the construction of site built structures and infrastructure.
- Local requirements regulating the installation of manufactured homes.
- Setback requirements for property lines, streets, yards, and courts.
- Fire separation distances.
- Development covenants for the specific property.
- The locations of flood hazard areas and any special foundation requirements for homes installed in those areas.
- In some areas, building permits are required to install manufactured homes. Prior to making any alteration to the site and the home, contact the LAHJ to determine if plan approval and permits are required.



Areas subject to flooding.
The foundation specifications contained in this manual are NOT intended to address flood loads. If the home is located in the flood plain, consult a registered engineer.

- ▶ go to **Prepare the Site** (p. 15)

Prepare the Site

A properly prepared site is critical to a good quality installation and the long term structural stability of the home.

This chapter explains the process of planning the site, evaluating the soil, and preparing the site for construction of the home's support system.

Follow the Steps below:

- ▼ **STEP 1. PLAN SITE ACCESS** (p. 15)
- ▼ **STEP 2. DETERMINE HOME LOCATION AND LAYOUT** (p. 15)
- ▼ **STEP 3. CLEAR AND GRADE THE SITE** (p. 16)
- ▼ **STEP 4. DETERMINE SOIL CONDITIONS** (p. 16)
- ▼ **STEP 5. DETERMINE SOIL BEARING CAPACITY AND FROST LINE** (p. 17)
- ▼ **STEP 6. DETERMINE GROUND ANCHOR HOLDING CAPACITY** (p. 19)

STEP 1. PLAN SITE ACCESS

Planning the route to the site is typically the responsibility of the retailer or transportation company. Whoever is responsible must secure state permits from the states through which the home will pass.

In planning the route, avoid obstructions that might interfere with the passage of the home, such as low hanging wires and trees, low overpasses and bridges not suitable for the load. Contact the utility company if wires need to be moved. Do not allow branches, bushes or other foliage to scrape against the home as the home is moved to the site. Avoid ditches, berms, steep slopes and soft ground. Identify and fill any holes and soft spots into which the transporter's wheels may sink. Avoid moving over steep changes in grade (20 degrees or more).

If required, provide for home storage and staging areas on the site. Plan the delivery and staging of home sections and materials so that after all deliveries are complete, home sections and materials can be accessed for use and installed in the appropriate sequence. Orient home sections so they do not have to be rotated or excessively maneuvered during the installation process. Plan for temporary needs, such as dumpsters, portable toilets, crew parking, delivery vehicle drop-offs and concrete mixer deliveries.

Before moving the home to the site, inform the LAHJ and make sure the site is prepared and utilities are available.

STEP 2. DETERMINE HOME LOCATION AND LAYOUT

The home location may have already been determined by others. If not, plan the home location and layout in compliance with the regulations researched in **Getting Started, STEP 5. CHECK LOCAL CODES AND SECURE PERMITS** (p. 14). Contact utilities for locations of existing infrastructure, such as underground cables, pipes and electrical lines.

When planning the site improvements, consider the following:

- The home location should be level.
- Avoid contact with large trees, steep slopes, poorly drained areas and potential flood zones.
- Preserve trees and shrubs for shade, visual screens and windbreaks.



Site Preparation. Final responsibility for site preparation, including soil stability and frost heave control, lies with the installer. An improperly prepared site may result in the denial of a foundation-related warranty claim.



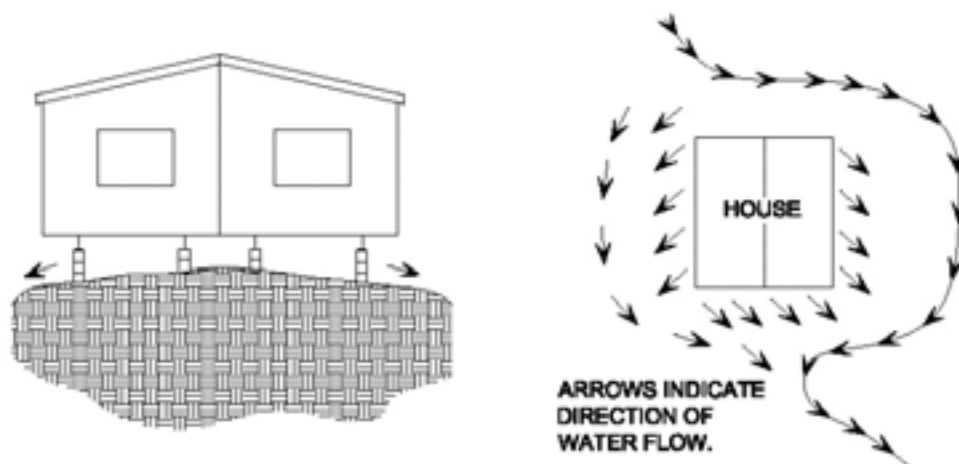
Fire separation. Comply with any LAHJ fire separation requirements or the requirements NFPA 501A, 2003 edition (Chapter 6).

- Plan the driveway, parking areas, septic, well, other structures and utility lines.
- Consider future additions, such as screen rooms, porches and awnings.
- Site the home away from natural water paths.

STEP 3. CLEAR AND GRADE THE SITE

Trim overhanging foliage (tree limbs, etc. that could cause damage to the home) considering future growth, potential storms, swaying in wind and snow/ice-weighted branches. All organic material such as vegetation, wood, roots, twigs, dead branches, grass, brush and wood scraps must be removed in areas where footings are to be placed. Remove any debris that could become termite infested from the site and surrounding area. Properly dispose of all items.

Crown the site (Figure 4) away from the foundation for the first ten feet with a minimum slope of 1/2 inch per foot. Where property lines, walls, slopes or other physical conditions prohibit this slope, provide the site with drains, swales or grading to drain water away from the structure. Any fill required to grade the site should be inorganic "controlled fill" applied in a maximum of four inch layers, compacted between each layer to at least 90% of its maximum relative density. Direct runoff away from the site using ditches and berms (Figure 5). If the home will have skirting, start grading from two feet in from the edge of the home.



Grade the ground so that water under porches, decks and recessed entries flows away from the home. If proper grading is not possible, use other methods such as a drain tile and automatic sump pump system to remove any water that may collect under the home.

The home is suitable for the installation of gutters and downspouts. Gutters and downspouts must be installed per the gutter and downspout manufacturer's installation instructions. When gutters and downspouts are installed, direct runoff away from the home.

STEP 4. DETERMINE SOIL CONDITIONS

Examine the soil type under the proposed home location to make sure it is suitable for placement of a home. The design of the home's support system, including footing/pier spacing and size, will in part be determined by the bearing capacity of the soil and, if ground anchors are used, by the soil's withdrawal strength.

The soil under every portion of the support system must meet the following criteria:

- The soil must be firm and undisturbed (not previously excavated) or fill com-



Site drainage. Moisture under the home can result in structural damage to the floor system, foundation, anchoring system and other parts of the home. Failure to provide adequate slope/drainage can result in moisture-related problems such as mold, mildew and erosion.

Figure 4. Crown the soil under the home to prevent water ponding

Figure 5. Direct runoff away from the home



Soil. Inadequate soil bearing capacity or a support system mismatched to the soil characteristics can result in excessive or differential

pacted to at least 90% of its maximum relative density). Uncompacted fill will settle over time, causing the home to shift and become unlevel.

- Fill must not contain large debris. This too will settle over time.
- The soil must not be comprised of organic clays or peat. Organic material can decay, causing settlement and also may harbor pests that can infest the home.
- A soil's bearing capacity can be greatly reduced when it is saturated with water. Note that water tables may vary with seasonal or climactic conditions. Consult a geologist or the LAHJ if you are unsure of the water table level.
- The soil must not be a highly expansive type. Expansive soils can expand when they become saturated with water, causing the home to shift and become unlevel. If soils are expansive contact a registered engineer, or registered architect to assist with the design of the foundation system.

Does the soil meet these criteria?

- ▶ **YES**, go to **STEP 5, DETERMINE SOIL BEARING CAPACITY AND FROST LINE**, (p. 17).
- ▶ **NO**, Consult a registered engineer, registered architect, or geologist to determine a suitable soil bearing capacity.

STEP 5. DETERMINE SOIL BEARING CAPACITY AND FROST LINE

The soil under a home must be capable of withstanding the loads imposed by the weight of the home, its support system and furnishings as well as any loads imposed by wind, snow or other climactic conditions.

SOIL BEARING CAPACITY

Determine the soil bearing capacity in pounds per square foot (psf) before designing a support system. The higher the capacity (psf), the more weight the soil can hold without unduly compressing. As the soil bearing capacity increases, footings can be reduced in size or spaced farther apart.

Use one or more of the following methods to determine the site's soil bearing capacity:

- **Test the soil.** Hire a registered geologist, registered engineer, or registered architect to determine the soil classification and maximum allowable soil bearing capacity by testing the soil in accordance with generally accepted engineering practice. In addition, the registered professional may designate a footing capacity (lbs) based on a site-specific soils evaluation and footing design.
- **Obtain soil records.** The local office of the U.S. Department of Agriculture's Natural Resources Conservation Service (www.soils.usda.gov) and/or the LAHJ may have test results and/or soil analyses on file for the area.
- **Conduct a pocket penetrometer test.** Use a pocket penetrometer to estimate allowable soil bearing capacity as follows:
 1. Select a location that will be under a footing.
 2. Clear a minimum area of one square foot to the depth of the bottom of the planned footing.
 3. Using the instructions provided with the pocket penetrometer, take at least five readings.
 4. Discard the high and low readings and average the remaining readings. Round this result down to the nearest soil bearing value shown in **Table 4**.
 5. Confirm that the rounded result matches the soil description in **Table 4**.
- **Determine soil bearing value by visual examination.** If one of the options above is not available, the values in **Table 4** can be used to establish soil bearing capacity by visual examination. This method provides lower capacity values than the options above. Accurate soil identification typically requires special training or expertise. An engineer or building code official may be able to assist in classifying the soil found on the site.

settlement of the home, which can cause the home to become unlevel, resulting in jammed doors and windows, cracks in finishes and ruptured plumbing connections.



Soil bearing capacity. Support systems on soils with bearing capacities less than 1,000 psf must be designed by a registered engineer or registered architect and approved by the LAHJ.

Limitations of Pocket penetrometers. Pocket penetrometers do not work on sand or gravel. Use to determine allowable pressure for these types of soils. If you encounter a layer of gravel, test the soil under the gravel. Do not put the penetrometer on stones larger than its tip as this will provide an inaccurate reading.

TABLE 4. SOIL BEARING CAPACITY BY SOIL TYPE

Soil Classification					
Classification Number	ASTM D 2487-00 or D 2488-00 (Incorporated by reference, see 3285.4)	Soil Description	Allowable Soil Bearing Pressure (psf) ¹	Blow Count ASTM D 1586-99	Torque Probe ² Value ⁴ (inch-pounds)
1	-	Rock or hard pan	4,000+		
2	GW, GP, SW, SP, GM, SM	Sandy gravel and gravel; very dense and/or cemented sands; coarse gravel/cobbles; pre-loaded silts, clays and coral	2,000	40+	More than 550
3	GC, SC, ML, CL	Sand; silty sand; clayey sand; silty gravel; medium dense coarse sands; sandy gravel; and very stiff silt, sand clays	1,500	24-39	351-550
4A	CG, MH ²	Loose to medium dense sands; firm to stiff clays and silts; alluvial fills	1,000	18-23	276 – 350
4B	CH, MH ²	Loose sands; firm clays; alluvial fills	1,000	12-17	175-275
5	OL, OH, PT	Uncompacted fill; peat; organic clays	Refer to 3285.202(e)	0-11	Less than 175

¹ The values provided in this table have not been adjusted for overburden pressure, embedment depth, water table height or settlement problems.

² For soils classified as CH or MH, without either torque probe values or blow count test results, selected anchors must be rated for a 4B soil.

³ The torque test probe is a device for measuring the torque value of soils to assist in evaluating the holding capacity of the soil in which the ground anchor is placed. The shaft must be of suitable length for the full depth of the ground anchor.

⁴ The torque value is a measure of the load resistance provided by the soil when subject to the turning or twisting force of the probe.

- **Use default capacity.** Use an allowable pressure of 1,500 psf, unless site-specific information requires the use of lower values based on soil classification and type according to Table 4.

Note that soil types may vary across a home site. In this case, the soil with the lowest bearing capacity should be assumed when designing the support system. Keep a record of the soil bearing capacity value; it will be used later to design the home's support system.

FROST LINE

Obtain the local design frost depth for footings from one of the following methods:

- The local authority having jurisdiction (LAHJ).
- Consult with a registered architect, registered engineer, or registered geologist.
- Use Figure 5A map.
- Use Table 4A with the site's Air Freezing Index (AFI).

TABLE 4A. DESIGN FROST DEPTH FOR FOOTINGS

Air-Freezing Index	Minimum Depth (in)	Air-Freezing Index	Minimum Depth (in)
50 or lower	3	2000	40
250	9	2500	45
350	12	3000	52
500	16	3500	57
1000	24	4000	62
1500	32	4250	65

The depth of interior pier footings may be taken as one half the depth required when interior footers are located within an enclosed space meeting all the following:

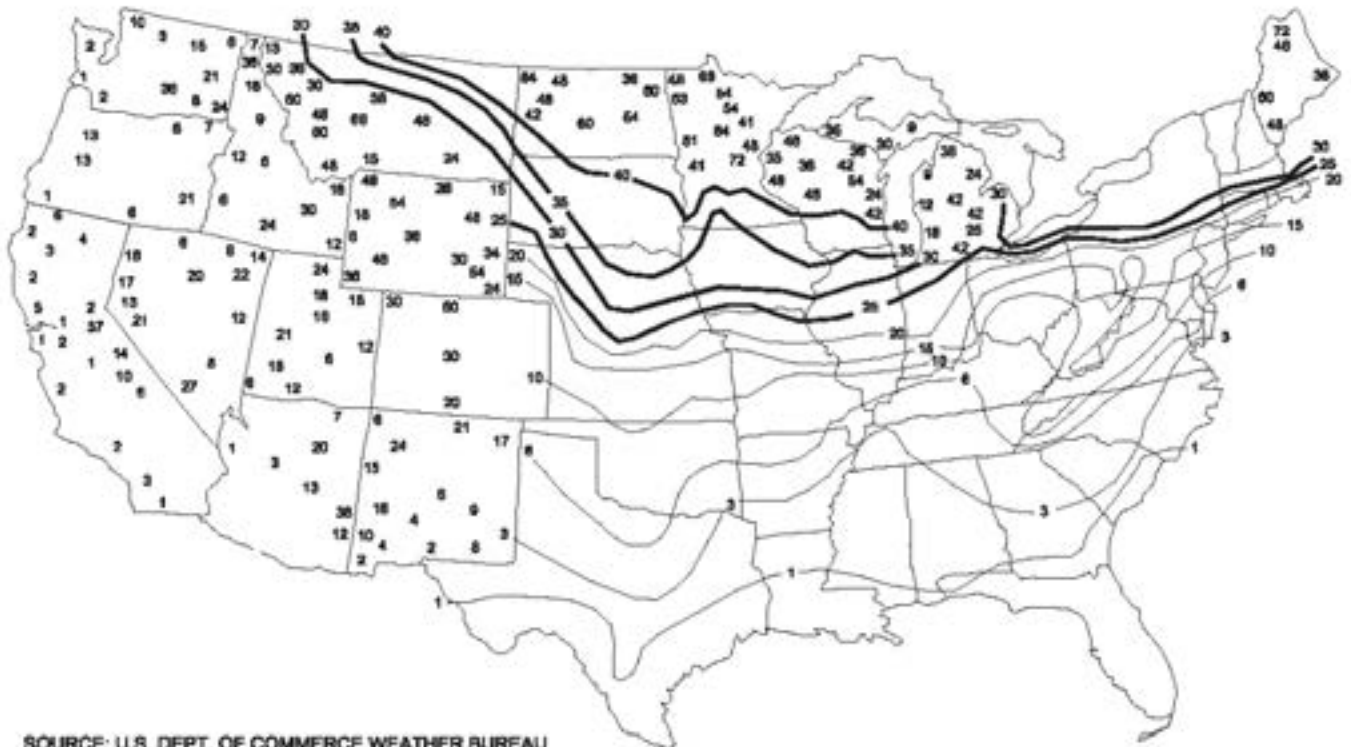
¹ All vents in skirting are capable of closing at outdoor temperatures below 40 degrees F.

² Skirting is insulated to a minimum R-5 when unadjusted frost depth is up to 45 inches and a minimum of R-10 when unadjusted frost depth exceeds 45 inches.

³ An approved ground vapor barrier is applied.



FROST PENETRATION MAP (AVERAGE DEPTH OF FROST PENETRATION - IN INCHES)



SOURCE: U.S. DEPT. OF COMMERCE WEATHER BUREAU

Figure 5A. Frost Penetration Map

Will this installation use auger-type ground anchors or concrete anchors?

- ▶ YES, go to **STEP 6, DETERMINE GROUND ANCHOR HOLDING CAPACITY**, (p. 19).
- ▶ NO, go to **Construct Foundation**, (p. 35).

STEP 6. DETERMINE GROUND ANCHOR HOLDING CAPACITY

If the anchor holding strength of the soil is unknown test the soil per the requirements of the anchor manufacturer's installation instructions. Concrete anchors that are listed and certified by a professional engineer to have a working load capacity of 3150 lbs may be used as a substitute for the ground anchors specified within this manual when installed in accordance with manufacturer's installation instructions.

What type of support system will this installation use?

- ▶ For pier and ground or concrete anchor, go to **Install Stabilization Systems**, (p. 74)
- ▶ For load bearing perimeter wall, go to **Construct Foundation**, (p. 35)



Torque Probe. If a torque probe is used, check with the utility companies for the location of underground cables or pipes to avoid contact with the probe shaft.

Install Footings

This chapter provides instructions for the design and construction of individual footings that transfer the load from a single pier to the ground. A footing and pier together (discussed in **Set the Home**) is referred to as a "support". A footing may also be designed to carry the load of multiple piers (often called "strip" footings). The design of strip footings is not covered in this manual. However, strip footings are acceptable if designed by a registered engineer or registered architect. The foundation systems described in this manual have not been designed for flood resistance.

Follow the Steps below:

- ▼ STEP 1. DESIGN POINT LOAD SUPPORTS (p. 20)
- ▼ STEP 2. DESIGN FRAME SUPPORTS (Homes Without Perimeter Blocking) (p. 23)
- ▼ STEP 3. DESIGN FRAME AND PERIMETER SUPPORTS (Homes With Perimeter Blocking) (p.25)
- ▼ STEP 4. SELECT FOOTING MATERIALS (p. 30)
- ▼ STEP 5. SIZE FOOTINGS (p. 31)
- ▼ STEP 6. INSTALL FOOTINGS (p. 33)

STEP 1. DESIGN POINT LOAD SUPPORTS

All homes will need supports, and therefore footings, under the frame, marriage line (for multi-section homes), exterior wall openings and other heavy point loads.

All pier locations required at the mating line, perimeter and any special pier support locations, as required by these instructions, will be identified from the factory by a pier tag, label, paint, or other means and must be visible after the home is installed. The pier designs, support loads, and footing construction shall be as indicated in the appropriate diagrams, tables, and instructions herein. Where perimeter piers are required along the exterior wall, alternate pier spacing may be used in lieu of the factory identified locations provided the instructions of this manual are satisfied in terms of allowable spacing, pier design, and footing size.

PLEASE NOTE: The manufacturer will not be responsible for damaged or removed pier tags. It is the responsibility of the installer to ensure that all piers are properly positioned in accordance with the tables & diagrams contained in these installation instructions.

Create a sketch of the home that includes the exterior walls, the frame I-beams and the marriage line(s), if a multi-section home. The sketch will be used in this chapter to locate each support, and note the size of the corresponding footing. **Figure 6** is an example of such a completed support plan.

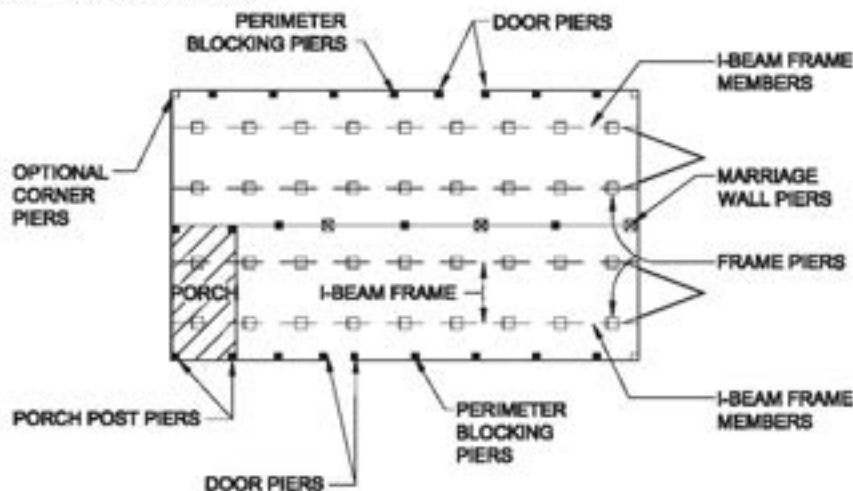


Figure 6. Typical point-load support locations

As the location and load for each support is determined, note it on the sketch. When selecting locations for supports, keep in mind that increasing the spacing between supports will increase the load on that support and the size of the required footing.

DETERMINE LOCATIONS

Point loads exist where a bearing/structural weight is concentrated and transferred to the foundation at a specific point. Locate a support under each point load, including the following examples:

- Exterior doors in side walls at both sides of each door (blocking is not required at exterior doors in end walls supported by the steel header).
- Other exterior wall openings four feet and greater at both sides of each opening (including multiple windows that total four feet wide or more without intermediate supports, even if individual windows are less than four feet).
- Marriage line openings four feet or greater at both sides of each opening.
- Locations where through-the-rim crossover ducts penetrate the rim joist at the marriage line (unless otherwise noted in supplemental documents provided with the home or unless the home is constructed with a perimeter frame system).
- Marriage line columns.
- Load-bearing porch posts.
- On each side of factory installed fireplaces when located on the exterior sidewalls or marriage walls (except when supported by the steel header).

Adjustable outriggers may only be used to replace piers below exterior door or window openings less than 48" and below factory installed fireplaces located on the exterior sidewalls or marriage walls. Adjustable outriggers may only be used at these locations when local codes permit the use of these devices and they are installed according to the manufacturer's installation instructions. Adjustable outriggers are not an acceptable replacement for perimeter supports on homes requiring perimeter blocking. Factory installed outriggers and cross-members may also replace piers below exterior door or window openings less than 48".

Mark the required point load support locations on the sketch. Supports are not required where the manufacturer has reinforced the floor (such as with additional outriggers or floor joists) and so noted in the documentation provided with the home.

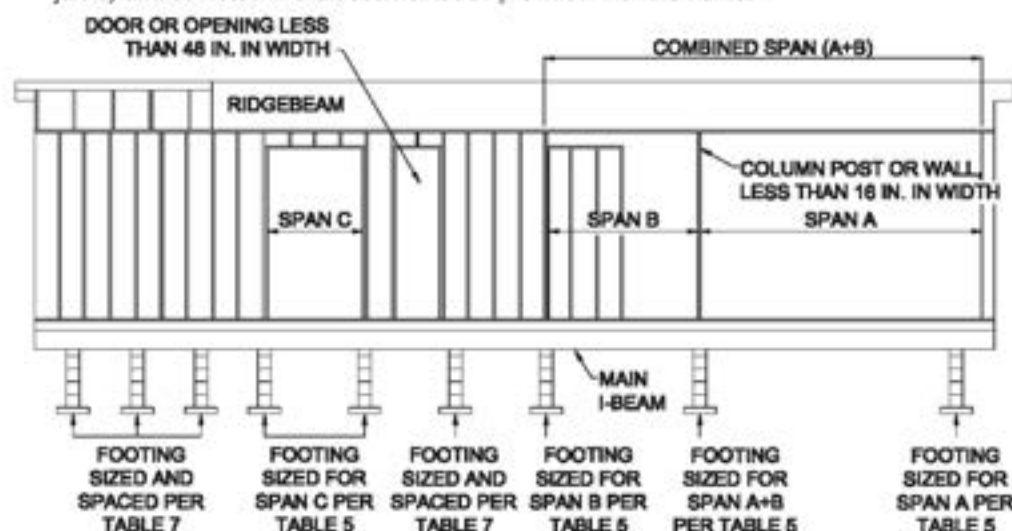


Figure 7. Typical point-load support locations along the marriage line.

CALCULATE LOADS

Use Tables 5-5c to determine the loads on point load supports (columns). For each support, find the table with the appropriate section width. Then, find the row with the appropriate roof load zone and the column corresponding to the span (see Figure 7 for guidance on determining spans — if a support is shared by spans on both sides, add the respective loads together to arrive at the total load under that point). The number in the intersecting cell is the load.

Note the required loads next to each point load support on the sketch.

TABLE 5. POINT LOAD ON FOOTINGS AT MARRIAGE LINE OPENINGS (LBS)

Roof Live Load (PSF)	20 ft Max. Home Width													
	Maximum Opening in Marriage Line (ft)													
	4	8	12	14	16	18	20	24	28	32	36	40	44	48
20	1000	1600	2200	2500	2800	3100	3400	4000	4600	5200	5800	6400	7000	7600
30	2000	2800	3600	4000	4400	4800	5200	6000	6800	7600	8400	9200	10000	10800
40	2400	3400	4400	4900	5400	5900	6400	7400	8400	9400	10400	11400	12400	13400
60	3200	4600	6000	6700	7400	8100	8800	10200	11600	13000	14400	15800	17200	18600
80	4000	5800	7600	8500	9400	10300	11200	13000	14800	16600	18400	20200	22000	23800
100	4800	7000	9200	10300	11400	12500	13600	15800	18000	20200	22400	24600	26800	29000
120	5600	8200	10800	12100	13400	14700	16000	18600	21200	23800	26400	29000	31600	34200

TABLE 5a. POINT LOAD ON FOOTINGS AT MARRIAGE LINE OPENINGS (LBS)

Roof Live Load (PSF)	24 ft Double Section /36 ft Triple Section Max. Home Width													
	Maximum Opening in Marriage Line (ft)													
	4	8	12	14	16	18	20	24	28	32	36	40	44	48
20	1120	1840	2560	2920	3280	3640	4000	4720	5440	6160	6880	7600	8320	9040
30	2320	3280	4240	4720	5200	5680	6160	7120	8080	9040	10000	10960	11920	12880
40	2800	4000	5200	5800	6400	7000	7600	8800	10000	11200	12400	13600	14800	16000
60	3760	5440	7120	7960	8800	9640	10480	12160	13840	15520	17200	18880	20560	22240
80	4720	6880	9040	10120	11200	12280	13360	15520	17680	19840	22000	24160	26320	28480
100	5680	8320	10960	12280	13600	14920	16240	18880	21520	24160	26800	29440	32080	34720
120	6640	9760	12880	14440	16000	17560	19120	22240	25360	28480	31600	34720	37840	40960

TABLE 5b. POINT LOAD ON FOOTINGS AT MARRIAGE LINE OPENINGS (LBS)

Roof Live Load (PSF)	28 ft Double Section /42 ft Triple Section Max. Home Width													
	Maximum Opening in Marriage Line (ft)													
	4	8	12	14	16	18	20	24	28	32	36	40	44	48
20	1240	2080	2920	3340	3760	4180	4600	5440	6280	7120	7960	8800	9640	10480
30	2640	3760	4880	5440	6000	6560	7120	8240	9360	10480	11600	12720	13840	14960
40	3200	4600	6000	6700	7400	8100	8800	10200	11600	13000	14400	15800	17200	18600
60	4320	6280	8240	9220	10200	11180	12160	14120	16080	18040	20000	21960	23920	25880
80	5440	7960	10480	11740	13000	14260	15520	18040	20560	23080	25600	28120	30640	33160
100	6560	9640	12720	14260	15800	17340	18880	21960	25040	28120	31200	34280	37360	40440
120	7680	11320	14960	16780	18600	20420	22240	25880	29520	33160	36800	40440	44080	47720



TABLE 5c. POINT LOAD ON FOOTINGS AT MARRIAGE LINE OPENINGS (LBS)

32 ft Double Section / 48 ft Triple Section Max. Home Width

Roof Live Load (PSF)	Maximum Opening in Marriage Line (ft)													
	4	8	12	14	16	18	20	24	28	32	36	40	44	48
20	1330	2260	3190	3655	4120	4585	5050	5980	6910	7840	8770	9700	10630	11560
30	2880	4120	5360	5980	6600	7220	7840	9080	10320	11560	12800	14040	15280	16520
40	3500	5050	6600	7375	8150	8925	9700	11250	12800	14350	15900	17450	19000	20550
60	4740	6910	9080	10165	11250	12335	13420	15590	17760	19930	22100	24270	26440	28610
80	5980	8770	11560	12955	14350	15745	17140	19930	22720	25510	28300	31090	33880	36670
100	7220	10630	14040	15745	17450	19155	20860	24270	27680	31090	34500	37910	41320	44730
120	8460	12490	16520	18535	20550	22565	24580	28610	32640	36670	40700	44730	48760	52790

Determine from the data plate and/or labels along the perimeter if the home requires perimeter blocking.

- ▶ If perimeter blocking is NOT required, go to **STEP 2, DESIGN FRAME SUPPORTS** (Homes Without Perimeter Blocking), (p. 23).
- ▶ If perimeter blocking is required, go to **STEP 3, DESIGN FRAME AND PERIMETER SUPPORTS** (Homes With Perimeter Blocking), (p. 25).

STEP 2. DESIGN FRAME SUPPORTS (Homes Without Perimeter Blocking)

DETERMINE LOCATIONS

All homes require regularly spaced supports along all main frame I-beams. Select spacing between supports and sketch them on the support plan. Keep in mind that frame supports under homes with 8" deep I-beams may be no more than eight feet apart. Those under homes with 10" or 12" deep I-beams may be no more than 10 feet apart. Generally, greater distances between supports will require larger footings. **Figure 8** shows typical frame support locations.



Spacing frame supports.

There must be a support pier located near the end of each I-beam such that there is no more than 24 inches as measured from the outside edge of the floor to the center of the pier.

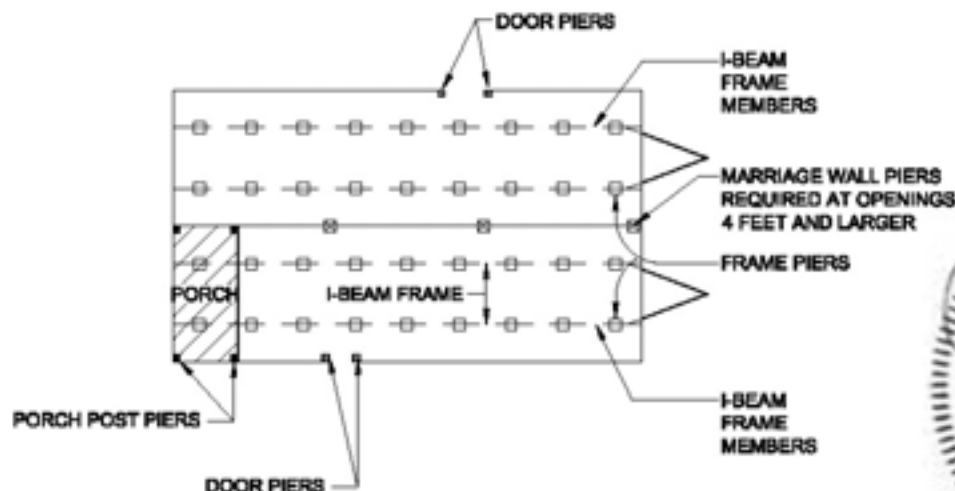


Figure 8. Typical support locations for homes not requiring regularly spaced perimeter supports



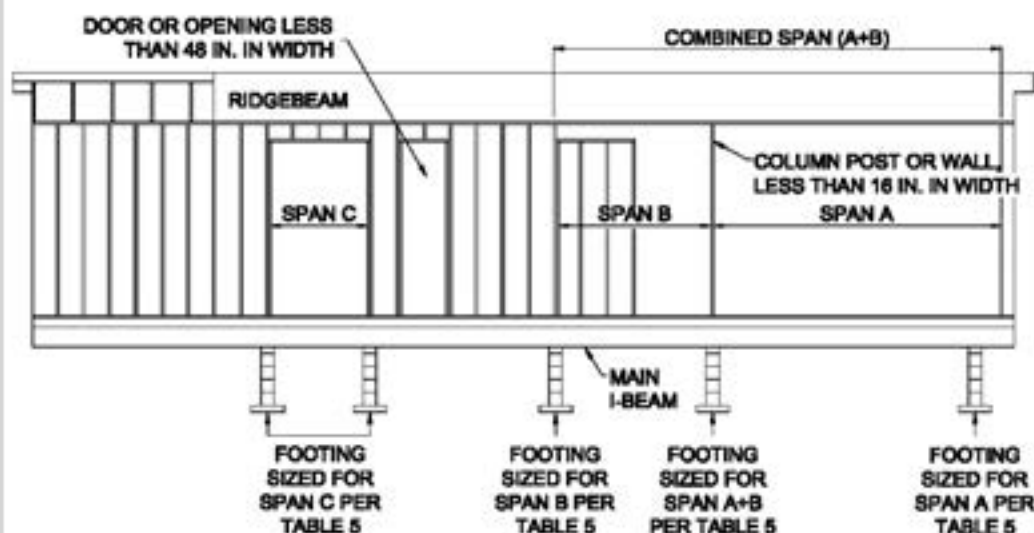


Figure 8A. Typical marriage line support locations for homes not requiring perimeter supports

CALCULATE LOADS

Use Tables 6-6c to determine the loads on frame supports. Find the chart with the appropriate sidewall eave overhang. Then, find the column with the appropriate roof load zone and section width. Find the row corresponding to the selected support spacing. The number in the intersecting cell is the load.

Loads on all frame supports can be assumed to be equal if support spacing is equal. However, if different support spacings are used then each support with a different spacing should be calculated separately.

Interpolation between values is permitted. Loads for piers installed at 5, 7, and 9 feet on-center can be estimated by adding the loads for the higher and lower spacing and dividing in half (eg. the load for piers installed at 7 feet on-center for a 16 wide with a 1-1/2" overhang in a 20 psf Roof Load Zone would be: 4510 lbs + 5666 lbs = 10176 lbs / 2 = 5088 lbs).

Note the location and load required of each support on the sketch.

(Width listed in each column of the following charts is the overall width of the home. Eg. 16 ft is a single section, 32 ft is a double section and 48 ft is a triple section).



TABLE 6. LOAD ON FRAME PIER FOOTINGS FOR HOMES NOT REQUIRING PERIMETER BLOCKING EXCEPT AT OPENINGS (LBS)

Roof Load Zone and Max. Home Width (1-1/2" Max. Sidewall Eave Overhang)

Pier Spacing	South (20 psf)					Middle (30 psf)					North (40 psf)				
	10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft
Up to 4'	2195	2519	2843	3140	3410	2400	2764	3128	3462	3765	2605	3009	3413	3783	4120
> 4' to 6'	3093	3579	4065	4510	4915	3400	3946	4492	4993	5448	3708	4314	4920	5475	5980
> 6' to 8'	3990	4638	5286	5666	6420	4400	5128	5856	6523	7130	4810	5618	6426	7167	7840
> 8' to 10'	4888	5698	6508	7250	7925	5400	6310	7220	8054	8813	5913	6923	7933	8858	9700

TABLE 6a. LOAD ON FRAME PIER FOOTINGS FOR HOMES NOT REQUIRING PERIMETER BLOCKING EXCEPT AT OPENINGS (LBS)

Roof Load Zone and Max. Home Width (6" Max. Sidewall Eave Overhang)

Pier Spacing	South (20 psf)					Middle (30 psf)					North (40 psf)				
	10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft
Up to 4'	2240	2564	2888	3185	3455	2460	2824	3188	3522	3825	2680	3084	3488	3858	4195
> 4' to 6'	3160	3646	4132	4578	4983	3490	4036	4582	5083	5538	3820	4426	5032	5588	6093
> 6' to 8'	4080	4728	5376	5750	6510	4520	5248	5976	6643	7250	4960	5768	6576	7317	7990
> 8' to 10'	5000	5810	6620	7363	8038	5550	6460	7370	8204	8963	6100	7110	8120	9046	9888

TABLE 6b. LOAD ON FRAME PIER FOOTINGS FOR HOMES NOT REQUIRING PERIMETER BLOCKING EXCEPT AT OPENINGS (LBS)

Roof Load Zone and Max. Home Width (12" Max. Sidewall Eave Overhang)

Pier Spacing	South (20 psf)				Middle (30 psf)				North (40 psf)			
	10/20 ft	12/24 ft	14/28/42 ft	16/32/48 ft	10/20 ft	12/24 ft	14/28/42 ft	16/32/48 ft	10/20 ft	12/24 ft	14/28/42 ft	16/32/48 ft
Up to 4'	2300	2624	2948	3191	2540	2904	3268	3541	2780	3184	3588	3891
> 4' to 6'	3250	3736	4222	4587	3610	4156	4702	5112	3970	4576	5182	5637
> 6' to 8'	4200	4948	5496	5757	4680	5408	6136	6682	5160	5968	6776	7382
> 8' to 10'	5150	5960	6770	7378	5750	6660	7570	8253	6350	7360	8370	9128

TABLE 6c. LOAD ON FRAME PIER FOOTINGS FOR HOMES NOT REQUIRING PERIMETER BLOCKING EXCEPT AT OPENINGS (LBS)

Roof Load Zone and Max. Home Width (24" Max. Sidewall Eave Overhang)

Pier Spacing	South (20 psf)				Middle (30 psf)				North (40 psf)			
	20 ft	24 ft	28/42 ft	32/48 ft	20 ft	24 ft	28/42 ft	32/48 ft	20 ft	24 ft	28/42 ft	32/48 ft
Up to 4'	2420	2744	3068	3311	2700	3064	3428	3701	2980	3384	3788	4091
> 4' to 6'	3430	3916	4402	4767	3850	4396	4942	5352	4270	4876	5482	5937
> 6' to 8'	4440	5088	5736	6222	5000	5728	6456	7002	5560	6368	7176	7782
> 8' to 10'	5450	6260	7070	7678	6150	7060	7970	8653	6850	7860	8870	9628

Calculate Loads

Use Table 6d to determine the loads on supports below openings in the sidewall when perimeter blocking is not required. Find the row with the appropriate opening span. Then, find the column with the appropriate floor width. The number in the intersecting cell is the load.

TABLE 6d. LOAD ON PIER FOOTINGS AT OPENINGS ALONG THE SIDEWALL (LBS)

Roof Load Zone and Max. Home Width (24" Max. Sidewall Eave Overhang)

Pier Spacing	South (20 psf)					Pier Spacing	South (20 psf)				
	10/20 ft	12/24 ft	14/28/42 ft	16/32/48 ft	18 ft		10/20 ft	12/24 ft	14/28/42 ft	16/32/48 ft	18 ft
Up to 3'	1025	1100	1175	1244	1306	>5' to 6'	1400	1520	1640	1750	1850
> 3' to 4'	1150	1240	1330	1413	1488	>6' to 8'	1650	1800	1950	2088	2213
> 4' to 5'	1275	1380	1485	1581	1669	>8' to 10'	1900	2080	2260	2425	2575
Pier Spacing	Middle (30 psf)					Pier Spacing	Middle (30 psf)				
	10/20 ft	12/24 ft	14/28/42 ft	16/32/48 ft	18 ft		10/20 ft	12/24 ft	14/28/42 ft	16/32/48 ft	18 ft
Up to 3'	1200	1300	1400	1492	1575	>5' to 6'	1680	1840	2000	2147	2280
> 3' to 4'	1360	1480	1600	1710	1810	>6' to 8'	2000	2200	2400	2583	2750
> 4' to 5'	1520	1660	1800	1928	2045	>8' to 10'	2320	2560	2800	3020	3220
Pier Spacing	North (40 psf)					Pier Spacing	North (40 psf)				
	10/20 ft	12/24 ft	14/28/42 ft	16/32/48 ft	18 ft		10/20 ft	12/24 ft	14/28/42 ft	16/32/48 ft	18 ft
Up to 3'	1375	1500	1625	1740	1844	>5' to 6'	1960	2160	2360	2543	2710
> 3' to 4'	1570	1720	1870	2008	2133	>6' to 8'	2350	2600	2850	3079	3288
> 4' to 5'	1765	1940	2115	2275	2421	>8' to 10'	2740	3040	3340	3615	3865

► go to **STEP 4. SELECT FOOTING MATERIALS** (p. 30)

STEP 3. DESIGN FRAME AND PERIMETER SUPPORTS (Homes With Perimeter Blocking)

DETERMINE LOCATIONS

Depending on design and location, some homes require regularly spaced perimeter supports along all of the sidewalls and marriage walls in addition to frame supports. If required, perimeter support locations will be identified by labels attached along the bottom of the sidewalls and marriagewalls and noted on the Data Plate. A pier support will be required at



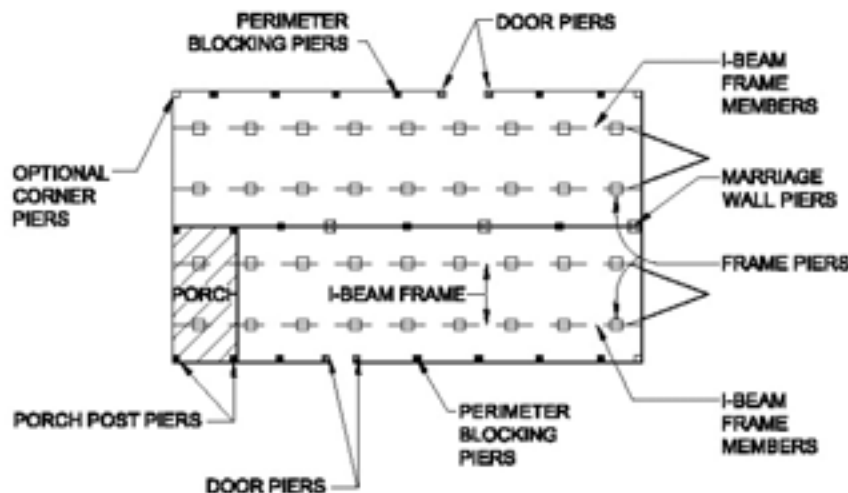
Spacing frame supports.
There must be a support

Install Footings

each of the label locations. Additionally, perimeter support locations may be identified by a white stripe or mark beneath the home on the bottom board material. Perimeter blocking supports must be placed no further than 8 feet on-center.

If required, perimeter supports are only needed on bearing walls. For 20 psf roof live load, perimeter support is only required at exterior doors and other openings 48" and larger, unless noted otherwise. Supports may be added at each corner of each endwall for leveling purposes, but are not required. Bearing walls are those walls that support the ends of roof trusses or rafters (typically sidewalls and marriage walls but not end walls of main units or sidewalls of tag units).

To minimize the number of required perimeter supports, space them evenly between point load supports as shown in Figure 9 and Figure 10 (but not under open spans). These figures identify typical support locations for homes requiring perimeter supports.



pier located near the end of each I-beam such that there is no more than 24 inches as measured from the outside edge of the floor to the center of the pier.

Figure 9. Typical support locations for homes requiring perimeter supports

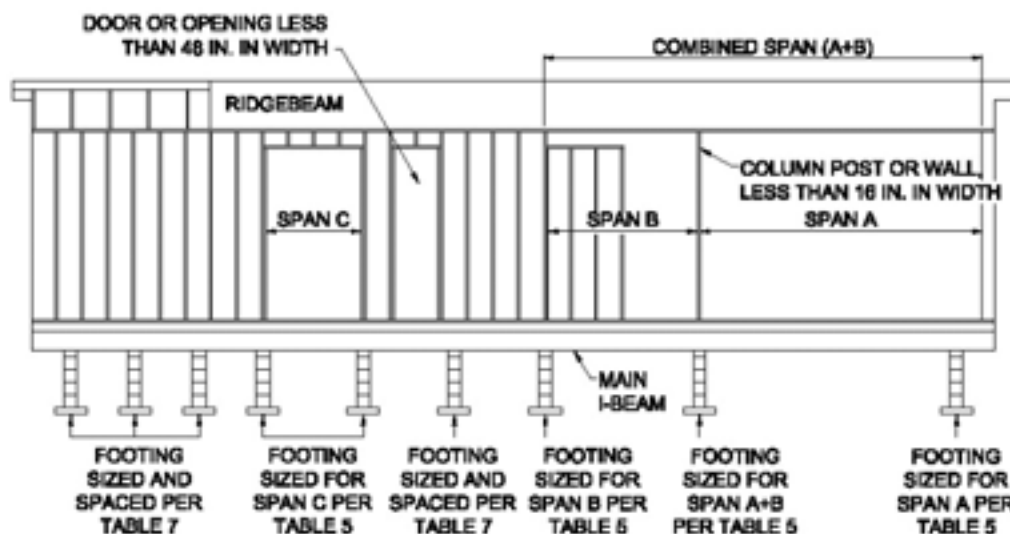


Figure 10. Typical marriage line support locations for homes requiring perimeter supports

CALCULATE LOADS

Use Tables 7-7c to determine the loads on frame and perimeter supports for homes requiring perimeter blocking. Find the chart with the appropriate sidewall eave overhang. Then, find the column with the appropriate roof load and section width. Find the group of rows corresponding to the selected support spacing. The values in the intersecting cells are the loads for the frame, perimeter and marriage line supports respectively.

Loads on supports of a given type (frame, perimeter or marriage) can be assumed to be equal if support spacing is equal. However, if different support spacings are used then each support with a different spacing should be calculated separately.

Loads for piers installed at 5, 7 and 9 feet on-center can be estimated by adding the loads



A perimeter support must be installed within 4 feet of column supports and the corner of the home when the home is designated for perimeter blocking. The loads listed in Tables 5 for homes greater than 20 psf roof load include

for the higher and lower spacing and dividing in half (eg. the load for frame piers

the additional 4 foot span.

installed at 7 feet on-center for a 16 wide with a 1-1/2" overhang in a 20 psf Roof Load Zone would be: 2823 lbs + 3630 lbs = 6453 lbs / 2 = 3227 lbs).

Note the location and load required of each support on the sketch.

(Width listed in each column of the following charts is the overall width of the home. Eg. 16 ft is a single section, 32 ft is a double section and 48 ft is a triple section).

TABLE 7. LOAD ON FRAME AND PERIMETER PIER FOOTINGS FOR HOMES REQUIRING PERIMETER BLOCKING (LBS)

Roof Load Zone and Max. Home Width (1-1/2" Max. Sidewall Eave Overhang)

Pier Spacing	Location	South (20 psf)					Middle (30 psf)					North (40 psf)					North (60 psf)				
		10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft
Up to 4'	Frame	1420	1624	1828	2015	2185	1420	1624	1828	2015	2185	1420	1624	1828	2015	2185	1420	1624	1828	2015	2185
Up to 4'	Sidewall	1175	1295	1415	1525	1625	1380	1540	1700	1847	1980	1585	1785	1985	2168	2335	1995	2275	2555	2812	3045
> 4' to 6'	Frame	1930	2236	2542	2823	3078	1930	2236	2542	2823	3078	1930	2236	2542	2823	3078	1930	2236	2542	2823	3078
> 4' to 6'	Sidewall	1563	1743	1923	2088	2238	1870	2110	2350	2570	2770	2178	2478	2778	3053	3303	2793	3213	3633	4018	4368
> 6' to 8'	Frame	2440	2848	3256	3630	3970	2440	2848	3256	3630	3970	2440	2848	3256	3630	3970	2440	2848	3256	3630	3970
> 6' to 8'	Sidewall	1950	2190	2430	2650	2850	2360	2680	3000	3293	3560	2770	3170	3570	3937	4270	3590	4150	4710	5223	5690
> 8' to 10'	Frame	2950	3460	3970	4438	4863	2950	3460	3970	4438	4863	2950	3460	3970	4438	4863	2950	3460	3970	4438	4863
Pier Spacing	Location	North (80 psf)					North (100 psf)					North (120 psf)									
		10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft					
Up to 4'	Frame	1420	1624	1828	2015	2185	1420	1624	1828	2015	2185	1420	1624	1828	2015	2185					
Up to 4'	Sidewall	2405	2765	3125	3455	3755	2815	3255	3695	4098	4465	3225	3745	4265	4742	5175					
> 4' to 6'	Frame	1930	2236	2542	2823	3078	1930	2236	2542	2823	3078	1930	2236	2542	2823	3078					
> 4' to 6'	Sidewall	3408	3948	4488	4983	5433	4023	4683	5343	5948	6498	4638	5418	6198	6913	7563					
> 6' to 8'	Frame	2440	2848	3256	3630	3970	2440	2848	3256	3630	3970	2440	2848	3256	3630	3970					
> 6' to 8'	Sidewall	4410	5130	5850	6510	7110	5230	6110	6990	7797	8530	6050	7090	8130	9083	9950					
> 8' to 10'	Frame	2950	3460	3970	4438	4863	2950	3460	3970	4438	4863	2950	3460	3970	4438	4863					



TABLE 7a. LOAD ON FRAME AND PERIMETER PIER FOOTINGS FOR HOMES REQUIRING PERIMETER BLOCKING (LBS)

Roof Load Zone and Max. Home Width (6" Max. Sidewall Eave Overhang)

Pier Spacing	Location	South (20 psf)					Middle (30 psf)					North (40 psf)					North (60 psf)				
		10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft
Up to 4'	Frame	1420	1624	1828	2015	2185	1420	1624	1828	2015	2185	1420	1624	1828	2015	2185	1420	1624	1828	2015	2185
Up to 4'	Sidewall	1220	1340	1460	1570	1670	1440	1600	1760	1907	2040	1660	1860	2060	2243	2410	2100	2380	2660	2917	3150
> 4' to 6'	Frame	1930	2236	2542	2823	3078	1930	2236	2542	2823	3078	1930	2236	2542	2823	3078	1930	2236	2542	2823	3078
> 4' to 6'	Sidewall	1630	1810	1990	2155	2305	1960	2200	2440	2660	2860	2290	2590	2890	3165	3415	2950	3370	3790	4175	4525
> 6' to 8'	Frame	2440	2848	3256	3630	3970	2440	2848	3256	3630	3970	2440	2848	3256	3630	3970	2440	2848	3256	3630	3970
> 6' to 8'	Sidewall	2040	2280	2520	2740	2940	2480	2800	3120	3413	3680	2920	3320	3720	4087	4420	3800	4360	4920	5433	5900
> 8' to 10'	Frame	2950	3460	3970	4438	4863	2950	3460	3970	4438	4863	2950	3460	3970	4438	4863	2950	3460	3970	4438	4863
Pier Spacing	Location	North (80 psf)					North (100 psf)					North (120 psf)									
		10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft	10 ft	12 ft	14 ft	16 ft	18 ft					
Up to 4'	Frame	1420	1624	1828	2015	2185	1420	1624	1828	2015	2185	1420	1624	1828	2015	2185					
Up to 4'	Sidewall	2540	2900	3260	3590	3890	2980	3420	3860	4263	4630	3420	3940	4460	4937	5370					
> 4' to 6'	Frame	1930	2236	2542	2823	3078	1930	2236	2542	2823	3078	1930	2236	2542	2823	3078					
> 4' to 6'	Sidewall	3610	4150	4690	5185	5635	4270	4930	5590	6195	6745	4930	5710	6490	7205	7855					
> 6' to 8'	Frame	2440	2848	3256	3630	3970	2440	2848	3256	3630	3970	2440	2848	3256	3630	3970					
> 6' to 8'	Sidewall	4680	5400	6120	6780	7380	5560	6440	7320	8127	8860	6440	7480	8520	9473	10340					
> 8' to 10'	Frame	2950	3460	3970	4438	4863	2950	3460	3970	4438	4863	2950	3460	3970	4438	4863					



TABLE 7b. LOAD ON FRAME AND PERIMETER PIER FOOTINGS FOR HOMES REQUIRING PERIMETER BLOCKING (LBS)

Roof Load Zone and Max. Home Width (12" Max. Sidewall Eave Overhang)

Pier Spacing	Location	South (20 psf)				Middle (30 psf)				North (40 psf)				North (60 psf)			
		20 ft	24/36 ft	28/42 ft	32/48 ft	20 ft	24/36 ft	28/42 ft	32/48 ft	20 ft	24/36 ft	28/42 ft	32/48 ft	20 ft	24/36 ft	28/42 ft	32/48 ft
Up to 4'	Frame	1420	1624	1828	1981	1420	1624	1828	1981	1420	1624	1828	1981	1420	1624	1828	1981
Up to 4'	Sidewall	1280	1400	1520	1610	1520	1680	1840	1960	1760	1960	2160	2310	2240	2520	2800	3010
Up to 4'	Marriagewall	1760	2000	2240	2420	2160	2480	2800	3040	2560	2960	3360	3660	3360	3920	4480	4900
> 4' to 6'	Frame	1930	2236	2542	2772	1930	2236	2542	2772	1930	2236	2542	2772	1930	2236	2542	2772
> 4' to 6'	Sidewall	1720	1900	2080	2215	2080	2320	2560	2740	2440	2740	3040	3265	3160	3580	4000	4315
> 4' to 6'	Marriagewall	2440	2800	3160	3430	3040	3520	4000	4360	3640	4240	4840	5290	4840	5680	6520	7150
> 6' to 8'	Frame	2440	2848	3256	3562	2440	2848	3256	3562	2440	2848	3256	3562	2440	2848	3256	3562
> 6' to 8'	Sidewall	2160	2400	2640	2820	2640	2960	3280	3520	3120	3520	3920	4220	4080	4640	5200	5620
> 6' to 8'	Marriagewall	3120	3600	4080	4440	3920	4560	5200	5680	4720	5520	6320	6920	6320	7440	8560	9400
> 8' to 10'	Frame	2950	3460	3970	4353	2950	3460	3970	4353	2950	3460	3970	4353	2950	3460	3970	4353
Pier Spacing	Location	North (80 psf)				North (100 psf)				North (120 psf)							
		20 ft	24 ft	28/42 ft	32/48 ft	20 ft	24 ft	28/42 ft	32/48 ft	20 ft	24 ft	28/42 ft	32/48 ft				
Up to 4'	Frame	1420	1624	1828	1981	1420	1624	1828	1981	1420	1624	1828	1981				
Up to 4'	Sidewall	2720	3080	3440	3710	3200	3640	4080	4410	3680	4200	4720	5110				
Up to 4'	Marriagewall	4160	4880	5600	6140	4960	5840	6720	7380	5760	6800	7840	8620				
> 4' to 6'	Frame	1930	2236	2542	2772	1930	2236	2542	2772	1930	2236	2542	2772				
> 4' to 6'	Sidewall	3880	4420	4960	5365	4600	5260	5920	6415	5320	6100	6880	7465				
> 4' to 6'	Marriagewall	6040	7120	8200	9010	7240	8560	9880	10870	8440	10000	11560	12730				
> 6' to 8'	Frame	2440	2848	3256	3562	2440	2848	3256	3562	2440	2848	3256	3562				
> 6' to 8'	Sidewall	5040	5760	6480	7020	6000	6880	7760	8420	6960	8000	9040	9820				
> 6' to 8'	Marriagewall	7920	9360	10800	11880	9520	11280	13040	14360	11120	13200	15280	16840				
> 8' to 10'	Frame	2950	3460	3970	4353	2950	3460	3970	4353	2950	3460	3970	4353				



TABLE 7c. LOAD ON FRAME AND PERIMETER PIER FOOTINGS FOR HOMES REQUIRING PERIMETER BLOCKING (LBS)

Roof Load Zone and Max. Home Width (24" Max. Sidewall Eave Overhang)

Pier Spacing	Location	South (20 psf)				Middle (30 psf)				North (40 psf)				North (60 psf)			
		20 ft	24/36 ft	28/42 ft	32/48 ft	20 ft	24/36 ft	28/42 ft	32/48 ft	20 ft	24/36 ft	28/42 ft	32/48 ft	20 ft	24/36 ft	28/42 ft	32/48 ft
Up to 4'	Frame	1420	1624	1828	1981	1420	1624	1828	1981	1420	1624	1828	1981	1420	1624	1828	1981
Up to 4'	Sidewall	1400	1520	1640	1730	1680	1840	2000	2120	1960	2160	2360	2510	2520	2800	3080	3290
Up to 4'	Marriagewall	1760	2000	2240	2420	2160	2480	2800	3040	2560	2960	3360	3660	3360	3920	4480	4900
> 4' to 6'	Frame	1930	2236	2542	2772	1930	2236	2542	2772	1930	2236	2542	2772	1930	2236	2542	2772
> 4' to 6'	Sidewall	1900	2080	2260	2395	2320	2560	2800	2980	2740	3040	3340	3565	3580	4000	4420	4735
> 4' to 6'	Marriagewall	2440	2800	3160	3430	3040	3520	4000	4360	3640	4240	4840	5290	4840	5680	6520	7150
> 6' to 8'	Frame	2440	2848	3256	3562	2440	2848	3256	3562	2440	2848	3256	3562	2440	2848	3256	3562
> 6' to 8'	Sidewall	2400	2640	2880	3060	2960	3280	3600	3840	3520	3920	4320	4620	4640	5200	5760	6180
> 6' to 8'	Marriagewall	3120	3600	4080	4440	3920	4560	5200	5680	4720	5520	6320	6920	6320	7440	8560	9400
> 8' to 10'	Frame	2950	3460	3970	4353	2950	3460	3970	4353	2950	3460	3970	4353	2950	3460	3970	4353
Pier Spacing	Location	North (80 psf)				North (100 psf)				North (120 psf)							
		20 ft	24 ft	28/42 ft	32/48 ft	20 ft	24 ft	28/42 ft	32/48 ft	20 ft	24 ft	28/42 ft	32/48 ft				
Up to 4'	Frame	1420	1624	1828	1981	1420	1624	1828	1981	1420	1624	1828	1981				
Up to 4'	Sidewall	3080	3440	3800	4070	3640	4080	4520	4850	4200	4720	5240	5630				
Up to 4'	Marriagewall	4160	4880	5600	6140	4960	5840	6720	7380	5760	6800	7840	8620				
> 4' to 6'	Frame	1930	2236	2542	2772	1930	2236	2542	2772	1930	2236	2542	2772				
> 4' to 6'	Sidewall	4420	4960	5500	5905	5260	5920	6580	7075	6100	6880	7660	8245				
> 4' to 6'	Marriagewall	6040	7120	8200	9010	7240	8560	9880	10870	8440	10000	11560	12730				
> 6' to 8'	Frame	2440	2848	3256	3562	2440	2848	3256	3562	2440	2848	3256	3562				
> 6' to 8'	Sidewall	5760	6480	7200	7740	6880	7760	8640	9300	8000	9040	10080	10860				
> 6' to 8'	Marriagewall	7920	9360	10800	11880	9520	11280	13040	14360	11120	13200	15280	16840				
> 8' to 10'	Frame	2950	3460	3970	4353	2950	3460	3970	4353	2950	3460	3970	4353				



STEP 4. SELECT FOOTING MATERIAL

Select one of the products and materials from **Table 8** for the footings.

TABLE 8. FOOTING MATERIALS

Material	Appropriate Use	Specification
Poured concrete	All soil types	Minimum 6" thick poured-in-place concrete pads, slabs, or ribbons with at least a 28 day compressive strength of 3,000 psi. Cast-in-place concrete footings may also require reinforcing steel based on acceptable engineering practice, the design loads, and site specific soil conditions.
Pre-cast concrete	All soil types	Minimum 4" thick nominal precast concrete pads meeting or exceeding ASTM C 90-02a, Standard Specification for Load Bearing Concrete Masonry Units, without reinforcement, with at least a 28 day compressive strength of 1,200 psi
ABS plastic	Per Pad Manufacturer's Instructions	Use in accordance with the pad manufacturer's instructions. Must be certified for use in the soil classification at the site, listed or labeled for the required load capacity. May be placed directly on soil or concrete.
Proprietary systems	Consult system manufacturer	Consult system manufacturer

Will footings be concrete?

- ▶ YES, go to **STEP 5, SIZE FOOTING**, (p. 31).
- ▶ NO, see footing system manufacturer's instructions, then go to **Set the Home** (p. 38).

STEP 5. SIZE FOOTINGS

Once the load on the footing and the soil bearing capacity are known, calculate the size of each footing as follows:

1. From **Table 9** determine if the pier is to be of single stack blocks (8 inch x16 inch) or double stack blocks (16 inch x 16 inch).
2. Locate the group of columns in **Table 10** with the soil bearing capacity determined in **Prepare the Site, STEP 5. DETERMINE SOIL BEARING CAPACITY AND FROST LINE** (p. 17). Use the next lowest value if the exact value does not appear.
3. Find the row corresponding to the pier capacity required by Tables 5, 6 or 7. Then, read across the table to determine the minimum required footing area for the corresponding pier capacity and soil bearing capacity.
4. The required footing size and pier capacity may be changed by selecting different support spacing.

TABLE 9. PIER CONFIGURATION

Pier Configuration	Height	Configuration	Maximum load (lbs)	
			Without Mortar	With Mortar
Single Stack	Less than 36 in *	Single stack blocks with long side perpendicular to frame I-beam or parallel to perimeter rail (rim joist)	6,500	7,680
Double Stack	67" Max.	Double, interlocked blocks	13,000	15,360
Triple Stack	67" Max.	Triple, interlocked blocks	19,500	23,034
Double Reinforced	108" Max. **	Double, interlocked blocks	NA	39,500

* Single stack piers may be constructed up to 54" max. height only when installed as perimeter and marriage line support piers.

** Cross reference maximum allowable pier height with maximum floor height listed in frame tiedown charts. If maximum height listed in frame tiedown charts is exceeded then designs must be provided by a registered professional engineer or registered architect.



TABLE 10. FOOTING DIMENSIONS

Pier Capacity (lbs)	Soil Bearing Capacity (PSF) Required Footing Area (square inches)						Round Footer Diameter
	1000	1500	2000	2500	3000	4000	
1000	144	128	128	128	128	128	1 8 i n c h
1200	173	128	128	128	128	128	
1400	202	134	128	128	128	128	
1600	230	154	128	128	128	128	
1800	259	173	130	128	128	128	
2000	288	192	144	128	128	128	
2200	317	211	158	128	128	128	
2400	346	230	173	138	128	128	
2600	374	250	187	150	128	128	
2800	403	269	202	161	134	128	
3000	432	288	216	173	144	128	
3100	446	298	223	179	149	128	
3200	461	307	230	184	154	128	
3300	475	317	238	190	158	128	
3400	490	326	245	196	163	128	
3500	504	336	252	202	168	128	
3600	518	346	259	207	173	130	
3700	533	355	266	213	178	133	
3800	547	365	274	219	182	137	
3900	562	374	281	225	187	140	
4000	576	384	288	230	192	144	
4100	590	394	295	236	197	148	
4200	605	403	302	242	202	151	
4300	619	413	310	248	206	155	
4400	634	422	317	253	211	158	
4500	648	432	324	259	216	162	
4600	662	442	331	265	221	166	
4700	677	451	338	271	226	169	
4800	691	461	346	276	230	173	
4900	706	470	353	282	235	176	
5000	720	480	360	288	240	180	
5200	749	499	374	300	250	187	
5400	778	518	389	311	259	194	
5600	806	538	403	323	269	202	
5800	835	557	418	334	278	209	
6000	864	576	432	346	288	216	
6200	893	595	446	357	298	223	
6400	922	614	461	369	307	230	
6600	950	634	475	380	317	238	
6800	979	653	490	392	326	245	
7000	1008	672	504	403	336	252	
7200	1037	691	518	415	346	259	2 4 i n c h
7400	1066	710	533	426	355	266	
7600	1094	730	547	438	365	274	
7800	1123	749	562	449	374	281	
8000	1152	768	576	461	384	288	
8500	1224	816	612	490	408	306	
9000	1296	864	648	518	432	324	
9500	1368	912	684	547	456	342	
10000	1440	960	720	576	480	360	
10500	1512	1008	756	605	504	378	
11000	1584	1056	792	634	528	396	
11500	1656	1104	828	662	552	414	
12000	1728	1152	864	691	576	432	3 0 i n
12500	1800	1200	900	720	600	450	
13000	1872	1248	936	749	624	468	
13500	1944	1296	972	778	648	486	
14000	2016	1344	1008	806	672	504	
14500	2088	1392	1044	835	696	522	
15000	2160	1440	1080	864	720	540	
15500	2232	1488	1116	893	744	558	
16000	2304	1536	1152	922	768	576	

Note:

To calculate a square or rectangular footer:

Length (in) x Width (in) = Area

Example:

16 in x 20 in = 320 sq. inches

To calculate a round footer:

$3.14 \times .25 \times \text{Diameter (in)} \times \text{Diameter (in)} = \text{Area}$

Example: For a 22" diameter footing

$3.14 \times .25 \times 22 \text{ in} \times 22 \text{ in} = 380 \text{ sq. inches}$



Design footings to comply with the following additional requirements:

- To keep footings directly under I-beams and other support points, size them slightly larger than the minimum required area to allow slight adjustment of the pier location during home installation.
- Design footings with a footing extension (projection beyond the base of the pier) no greater than the footing thickness (Figure 11). Increase footing thickness if necessary.

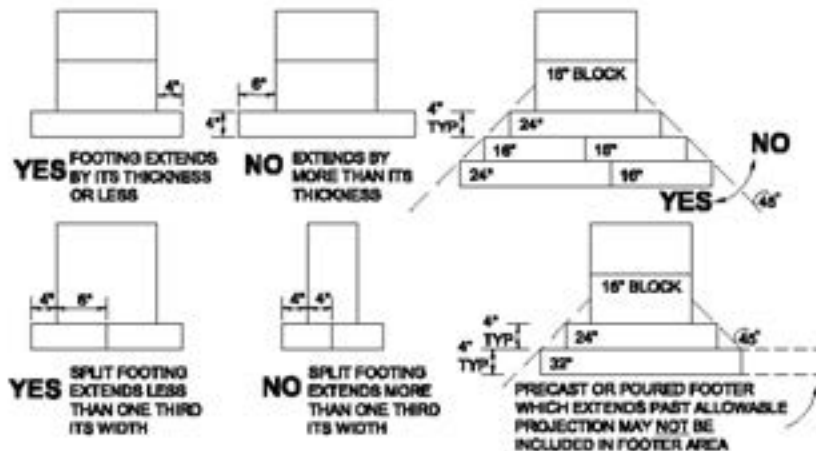


Figure 11. Maximum footing extensions

- The footing sizes shown are for square pads and are based on the surface area (square inches). Design non-square footings such that the area and thickness is equal to or greater than the area of the square footing shown in Table 10 and the distance from the edge of the pier to the edge of the footing is not more than the thickness of the footing. Footers may be either 4-inch precast or poured or a combination of both with a combined thickness complying with the requirements of Table 10A.

TABLE 10A. FOOTER THICKNESS

Poured in Place Footing for Single Stack Pier			Poured in Place Footing for Double Stack Pier		
Min. Footer Thickness (in)	Max Footer Dimension (in x in)	Max. Area (sq. in)	Min. Footer Thickness (in)	Max Footer Dimension (in x in)	Max. Area (sq. in)
6	28 x 20	560	6	28 x 28	784
8	32 x 24	768	8	32 x 32	1024
10	36 x 28	1008	10	36 x 36	1296
12	40 x 32	1280	12	40 x 40	1600
			14	44 x 44	1936
			16	48 x 48	2304



STEP 6. INSTALL FOOTINGS

Construct the footings as follows:

- Maintain the distance between adjacent piers to within 10% of the tabulated spacing and so the average distance between piers is equal to or less than the tabulated spacing.
- Whenever possible, place pier supports directly under the required locations. If plumbing, electrical or mechanical equipment interferes, place supports no more than 6 inches in either direction of the support point.
- Recess perimeter pier supports no more than 10 inches from the edge of the floor with added support as shown in Figure 12.



Placing Concrete anchors.
If anchors will be placed in concrete follow instructions in *Install Stabilizing System* (p. 74) to determine anchor layout. Either place anchors immediately after the concrete has been poured or drill them in after the concrete has set.

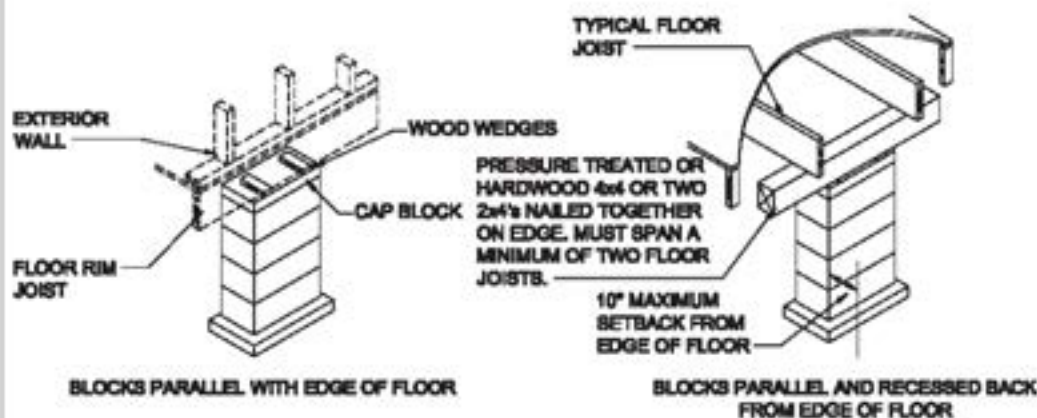


Figure 12. *Perimeter supports*

- If footings are rectangular, orient them so that the long side is perpendicular to the home's I-beam.
- Place the bottom of footings on undisturbed soil or fill compacted to at least 90% of its maximum relative density.
- In freezing climates protect footings from the effects of frost heave in accordance with any LAHJ requirements (see **Prepare the Site**, p. 15). Place the bottom of the footings below the frost line. Insulated foundations or other frost protection options are acceptable when designed by a registered engineer or registered architect. Monolithic slabs are allowed above frost depth when designed by a registered engineer or registered architect to resist the effects of frost heave. Anchorage requirements must be included with each registered engineer or registered architect design when the anchorage requirements listed in this manual cannot be accommodated. Prior to obtaining an alternative design contact the home building facility for available approved alternative designs or instructions for submitting an alternative design.
- Make sure the top surface of the footing is level, flat and smooth.



Excavation. If excavation is required, mark the footing locations on the ground with stakes before beginning to dig.

► go to **Set the Home** (p. 38)

Construct Foundation

(FOR HOMES WITH LOAD BEARING PERIMETER WALL)

This chapter provides guidelines and recommendations for the design and construction of a basement or crawlspace foundation using a load bearing perimeter wall. A load bearing perimeter wall foundation system uses a wall along the outer edge of the home to support the home's outside walls. This perimeter support works with interior supports such as piers, columns and cross beams that support the home's frame and, if multi-section, marriage line.

Follow the Steps below:

- ▼ **STEP 1. OBTAIN A FOUNDATION DESIGN** (p. 35)
- ▼ **STEP 2. EXCAVATE** (p. 35)
- ▼ **STEP 3. CONSTRUCT THE FOOTING OR SLAB** (p. 35)
- ▼ **STEP 4. CONSTRUCT THE PERIMETER WALL** (p. 35)
- ▼ **STEP 5. INSTALL INTERIOR SUPPORTS** (p. 37)
- ▼ **STEP 6. WATERPROOF FOUNDATION WALL** (p. 37)
- ▼ **STEP 7. BACKFILL AND GRADE** (p. 37)

STEP 1. OBTAIN A FOUNDATION DESIGN

If a load bearing perimeter wall foundation design has not been provided by the home manufacturer, it is the responsibility of the retailer and/or home owner to provide a design approved by an engineer or architect, licensed in the state where the home will be installed. The approved design must comply with the LAHJ regulations for foundation design, waterproofing and drainage, and the following:

- The foundation perimeter bearing wall must be supported with a concrete slab or continuous strip footing around the perimeter of the home. Interior piers must be supported by a slab or footings. If footings are used under interior piers, they may be designed as in **Design Frame and Perimeter Supports**, p. 25.
- Slabs must extend to the edges of the home. **IMPORTANT: Verify the dimensions of the actual floor width** (eg. a 28' wide home does not measure 28 feet in width).
- Footings and slabs must be protected from the effects of frost heave by extending the footings to or below the frost line or by using a frost protected shallow foundation design.

STEP 2. EXCAVATE

Excavate for the foundation, properly disposing of the earth that is not needed for backfill or site grading purposes.

STEP 3. CONSTRUCT THE FOOTINGS OR SLAB

Construct the foundation according to the approved design, including the perimeter foundation wall, drainage system, footing(s) and/or slab.

STEP 4. CONSTRUCT THE PERIMETER WALL

Unless the approved design requires otherwise, construct the perimeter wall with mortared and reinforced concrete blocks or reinforced poured-in-place concrete. Install reinforcement according to the approved design or LAHJ. Install ventilation and access openings according to the approved design, or if not specified, according to the requirements in **Complete Under the Home, STEP 3 INSTALL SKIRTING** (p. 113).



Using engineered designs.

This section is NOT intended to provide a complete design for a buildable foundation. A complete design must be obtained that is suitable for the local area and sealed by a professional engineer or registered architect, licensed in the state. Alternate foundation designs must be approved by the manufacturer and DAPIA. Prior to obtaining an alternative design contact the home building facility for available approved alternative designs or instructions for submitting an alternative design. The manufacturer is capable of providing limited model specific foundation designs upon request.

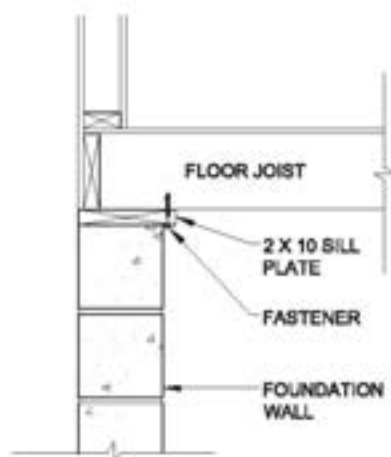
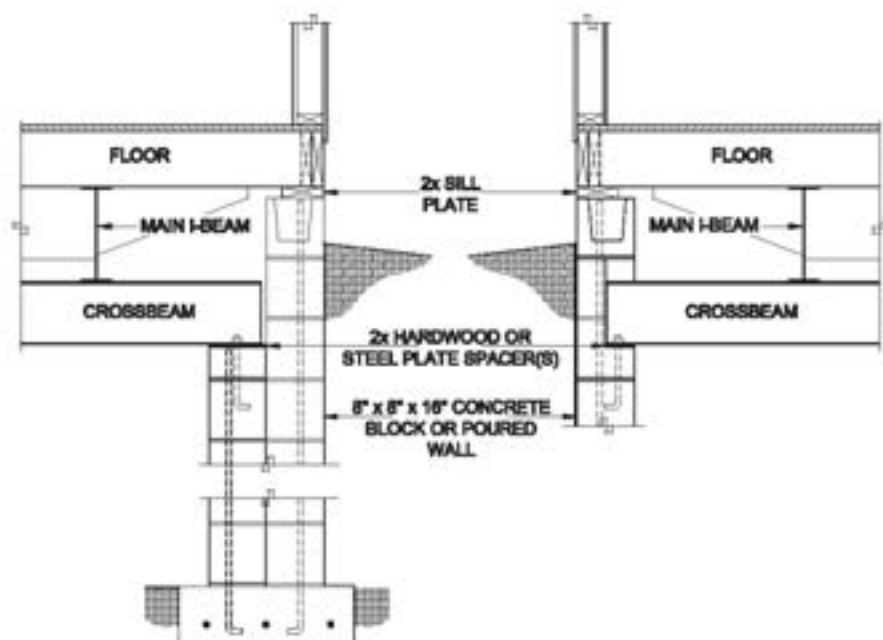
Foundation ready home.

Make sure that homes to be installed on a basement or a crawlspace have been ordered with a recessed frame or as a basement-ready frame system, where the

Where open slatted deck boards are used at recessed entries and porches, provisions must be made to ensure water is not permitted to drain into the area under the conditioned portion of the home. Any perimeter type skirting or foundation wall should be installed to follow the exterior of the wall of the home and permit the area beneath the porch to drain water away from the home.

When constructing pockets for a cross beam system, measure the beam depth and locate the pockets carefully. It is critical that the home's frame rests on top of the cross beam and the perimeter of the floor rests squarely on the foundation wall sill plate (Figure 13). Leave room for a two-inch nominal, hardwood spacer or steel plate spacer on top of the wall pockets (to prevent corrosion, the steel beams must not be in direct contact with concrete). Leave at least one inch for thermal expansion at the ends of the beams and maintain a minimum of two inches of bearing area for the beams in the pockets (yielding a minimum pocket depth of three inches).

Bolt a pressure treated wood sill plate (minimum 2 x 6) to the top of the foundation wall. If the home's siding cannot be nailed through, use a 2 x 10 sill plate that extends into the foundation 1-1/4 inches (Figure 14). The home can then be connected to the foundation by fastening the sill plate into the floor joists from below. Connect the home to the foundation according to the approved design (See Step 1).



frame is designed to avoid interference with the foundation wall.

Checking the water table.

For basements, check for a high water table. The water table may vary seasonally or based on weather conditions. A geologist can perform an algae test to determine the water table level. The foundation design must account for a high water table.

Level the wall. Make sure the foundation is level and straight with no more than a 1/4 inch vertical variation over the entire foundation and no more than 1/8 inch vertical variation over any two-foot length.

Check for Plates. When using a cross beam system, check and compensate for reinforcement plates that add thickness to the chassis beam at axle locations.

Figure 13. Cross beam installation

Figure 14. Connection using 2 x 10 sill plate

STEP 5. INSTALL INTERIOR SUPPORTS

Install piers, columns and cross beams to support the interior of the home according to the approved design.

STEP 6. DAMP PROOF FOUNDATION WALL

Damp or water proof foundation walls as necessary according to local jurisdiction requirements.

Is this a basement foundation?

- ▶ YES, go to **Set the Home**, (p. 38).
- ▶ NO, go to **STEP 7. BACKFILL AND GRADE**, (p. 37)

STEP 7. BACKFILL AND GRADE

Backfill against the foundation wall to the height of the damp proofing. Take care to not damage the drainage system. Grade the fill as per **Prepare the Site** (p. 15).

Does the approved foundation design call for ground anchors?

- ▶ YES, go to **Install Stabilizing Systems**, (p. 74).
- ▶ NO, go to **Set the Home**, (p. 38).

Footings heights. Pour footings to a height that will reduce the need to cut blocks or shim when building perimeter walls and piers.



Backfilling. Backfill against basement walls only after the home is connected to the foundation or the basement walls may deflect inward or collapse.

Set the Home

This chapter describes the process of installing the first section of the home (for single section homes this is the only section) onto the foundation.

Follow the Steps below:

- ▼ **STEP 1. PREPARE FOR SET** (p. 38)
- ▼ **STEP 2. POSITION HOME SECTION** (p. 38)
- ▼ **STEP 3. LIFT HOME** (p. 38)
- ▼ **STEP 4. CONSTRUCT PIERS** (p. 40)

STEP 1. PREPARE FOR SET

Before beginning the home set, complete the following:

- Confirm that the site is properly cleared and graded (see **Prepare the Site**, p. 15).
- Ensure that the footings are in place and properly located.
- Install any utilities that will be difficult to install (e.g. those below grade beneath the home) after the home is in place.
- Secure or remove from the home and properly store all ship loose items (refer to shipping documents for items shipped with the home).
- Inspect the home interior, exterior and all provided materials, appliances and equipment. Immediately report any damage or shortages to the manufacturer.

For perimeter bearing wall foundations:

- Check that the actual length and width of the home matches the foundation walls.
- Check that the two main diagonal measurements of the foundation are equal.
- Check that the foundation walls and other support points are within 1/4 inch of level overall and within 1/8 inch of level within any four foot distance.
- For multi-section homes, check that each pair of diagonal measurements for each portion of the foundation corresponding to a home section are equal.
- For multi-section homes, find the electrical bonding lugs on the front or rear outriggers. Reverse them to the inside of the outrigger so they will be accessible after the home is placed on the foundation walls.
- If using a cross beam system, remove the frame's shackle hanger if it will interfere with proper placement of the beam.

STEP 2. POSITION HOME SECTION

Position the home section in its final location (if possible, move the heaviest section of the home into place first). Then place materials needed to construct support piers near their final locations under the home as determined in **Install Footings**, (p. 20).

STEP 3. LIFT HOME

There are three primary methods available to place the home on the foundation: jacking, rolling and craning. Jacks, often with roller systems, are typically used for pier and anchor foundations; roller systems are commonly used for crawlspace foundations with load bearing perimeter walls; and cranes are most commonly used for basement foundations.

JACKS

If jacks are to be used, comply with all jacking safety precautions and the procedure below. Lifting the home with jacks involves potential risks and must be done with ut-



Clearances under the home. After the home is leveled, the resulting distance between the bottom of the entire chassis main frame beam and the ground must be no less than 12 inches.

Utilize proper cribbing. Homes weigh several tons. No one should be under the home (whether it is moving or stationary) unless proper cribbing is in place (**Figure 15**). Failure to utilize proper cribbing may result in serious injury or death.



Leveling During Jacking. Keep the home's floor as level as possible during jacking. Twisting or warping the floor can damage the structure and finishing. Use as many jacks as necessary to keep the floor flat and level.

most care and caution. Failure to follow jacking warnings and procedures may result in serious injury or death. Please read the Jacking Safety Precautions before lifting the home with jacks.

JACKING SAFETY PRECAUTIONS

- No one should be under the home's I-beams while the jacks are being operated or while the home is supported only on the jacks.
- Use jacks only for raising the home. Do not rely on the jacks to support the home.
- If possible, raise the home only on one side so that the other side is in contact with the ground. Leave the hitch connected to the vehicle or other stabilizing equipment.
- Obey all OSHA regulations.
- Make sure adequate safety cribbing (**Figure 15**) is in place whenever the home is placed on jacks.
- Use a minimum of two commercial quality jacks, each with a rating of at least 12 tons.
- Jack only on the main chassis I-beam, centering jacks directly under the beam.
- Do not jack on a seam (joint between flanges of twin I-beams).
- To distribute the concentrated loads from jacks to I-beam, place a minimum 3/8-inch thick steel plate, a C-channel, a 1½-inch thick hardwood block or a commercial jacking plate, between the main chassis I-beam and the jack head.
- Locate the jack base on firm ground. Never jack on freshly disturbed soil or where an underground sewer pipe may be located.
- Use a firm support under the jack base to prevent tipping or settling of the jack. A minimum 16" x 16" or larger wood or rigid fiberglass pad is recommended. Never use concrete blocks as a support for a jack.
- Never use jacks that are leaking or are in need of repair.

Follow the jacking sequence outlined below to avoid overstressing structural members:

1. **Block wheels.** Block the wheels so the house does not roll.
2. **Install cribbing.** Install safety cribbing (**Figure 15**)

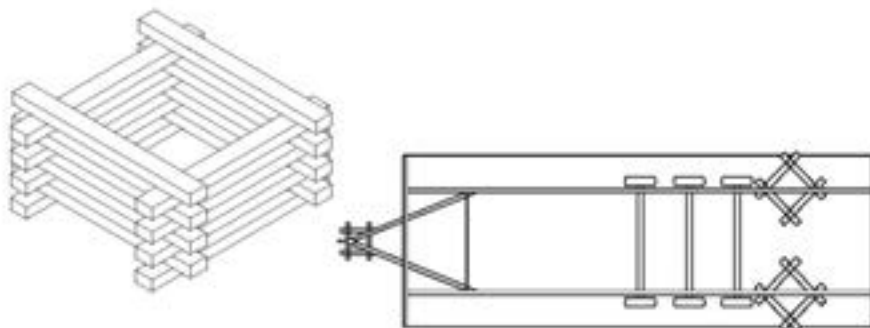


Figure 15. Stack 4" x 6" by 5' long timbers as shown to form safety timbers. Place safety timbers under home behind axle area and under hitch.

3. **Level lengthwise.** Locate one jack at the hitch and level the section lengthwise (such that the front and rear of the section are at the same height).
4. **Locate frame jacks.** Place a minimum of one jack in front of the first spring hanger and another just behind the last spring hanger of the I-beam on the side of the home that is lowest (making sure not to place jacks where the piers will go). Place jacks no more than 20 feet apart and no more than 20 feet from each end of the I-beam.
5. **Lift the home.** Operating the jacks simultaneously (or sequentially in very small increments), lift the home section until it is slightly higher than the final desired pier height.

ROLLER SYSTEMS

When using a roller system, comply with the equipment manufacturer's directions and the following sequence:

1. **Establish staging area.** Establish a staging area directly adjacent to one or both sides of the foundation.
2. **Setup rollers.** Set up the roller system according to the equipment manufacturer's directions.
3. **Fasten bump blocks.** Temporarily fasten wooden bump blocks on the sill plates at the ends of the foundation to stop the home from rolling at the desired location.
4. **Roll home.** Roll the home into place over the foundation.
5. **Remove bump blocks.** Remove the blocks before installing the next section of a multi-section home.

CRANES

When using a crane, follow these guidelines:

- Position the home section(s) and crane (taking the boom reach into consideration) such that they do not have to be repositioned during the set.
- Use enough properly sized straps to maintain balance of the home and to prevent damage to the structure.
- Place straps under walls or posts, including temporary posts used to support the opening. Do not position lifting straps under marriage wall openings.
- Use a properly sized spreader bar to maintain a vertical lift, to avoid placing compression forces on the eaves and to reduce any tendency to slip.
- Connect a rope to at least one point on the home so it can be controlled while aloft.
- Make provisions to retrieve the straps/cables after the home is set. If using a cradle system, notch the sill plate where the straps will fall. For a sling system, notch and reinforce the home's rim joist to keep the strap from slipping and allow the strap to be removed after the home is set.
- Always set the home section farthest from the crane first so that subsequent section(s) need not be lifted over previously set sections.

Have the interior foundation supports already been designed and installed as part of an approved load bearing perimeter wall foundation?

- ▶ **YES,** go to **Complete Multi-Section Set**, (p. 44) or go to **Connect Utilities**, (p. 95) for single section homes.
- ▶ **NO,** go to **STEP 4. CONSTRUCT PIERS**, (p. 40).

STEP 4. CONSTRUCT PIERS

For the side of the home section that is up on jacks, place piers on footings or pads following the home manufacturer's blocking plan (or tags). If no plan was provided, use the support plan developed in **Install Footings** (p. 20). Start at one end of the home section and work toward the other noting the required pier material specifications and procedure described below.

Construct piers so as to provide a stable foundation for the home using materials listed in the specifications box below and based on the location of the pier and its height as measured from the top of the footing, pad or grade to the top of the cap. The pier height can be measured from the lowest surrounding grade to the top of the cap when grade level is above the top of the footing. See **Table 12** for pier construction requirements.



No one should be under the home while it is suspended. Never put your hands between the home and the perimeter walls.



Designing piers. Incorrect size, location or spacing of piers may result in serious structural damage to the home. Install piers at all required locations. Failure to do so may lead to sagging floors, walls and roofs, and could void the home's warranty.

TABLE 11. PIER MATERIAL MINIMUM SPECIFICATIONS

Component	Specification
Concrete Block	Nominal dimensions of at least 8" x 8" x 16"; conforming to ASTM designation C90
Caps	Solid masonry (nominal 4" x 8" x 16" pre-cast concrete without reinforcement); treated or hardwood lumber (nominal 2" x 8" x 16"); or steel (minimum 1/2" thick, corrosion protected by a min. of a 10 mil coating of an exterior paint or equivalent)
Spacers	Hardwood plates no thicker than 2" nominal or 4" nominal concrete block used to fill vertical gaps.
Shims (also called wedges)	<u>When required</u> , nominal 4-inch by 6-inch by 1-inch (max. vertical height) wood shims used in pairs. Some states, counties, townships, and or municipalities may require the use of hardwood or treated lumber shims. Other listed shims may be used if installed in accordance with the listing (max load capacity).
Commercial metal or pre-cast concrete piers	Available in various sizes stamped with maximum load capacity and listed or labeled for the required vertical load capacity, and, where required by design, for the appropriate horizontal load capacity. Metal or other manufactured piers must be provided with protection against weather deterioration and corrosion at least equivalent to that provided by a coating of zinc on steel of .30 oz per sq. ft of surface coated. Manufactured pier heights must be selected so that the adjustable risers do not extend more than 2 inches.
Pressure treated wood	With a water borne preservative, in accordance with AWWA Standard U1-04 for Use Category 4B ground contact applications

TABLE 12. PIER CONSTRUCTION

Pier location	Height	Configuration	Maximum offset top to bottom	Maximum Load (lbs)	
				Without Mortar	With Mortar
Frame	Less than 36 in *	Single stack blocks with long side perpendicular to frame I-beam	½"	6,500	7,680
	Between 36 in and 67 in	Double, interlocked blocks	1"	13,000 lbs.	15,360
	Between 36 in and 67 in	Triple, interlocked blocks	1"	19,500 lbs.	23,034
	Between 68 in and 108 in	Double, interlocked, reinforced blocks	1"	NA	39,500
Perimeter	54 in or less **	Single stack blocks with long side parallel to perimeter rail (rim joist)	½"	6,500	7,680
Marriage line	54 in or less**	Single stack blocks with long side perpendicular to the marriage line	½"	6,500	7,680

* Single stack piers may be constructed up to 54" max. height only when installed as perimeter and marriage line support piers.

** Cross reference maximum allowable pier height with maximum allowable floor height listed in frame tiedown charts. If maximum height listed in frame tiedown charts is exceeded, then designs must be provided by a registered professional engineer or registered architect.

Maximum horizontal offset of ½" allowed for pier heights up to 36" and a 1" offset allowed for pier heights between 36" and 67".

- 1. Prepare footing surface.** Make sure the footing surface upon which the pier sits is flat and smooth. Before placing the pier on the footing, clean dirt, rocks or other material off the surface of the footing. If the footing surface is uneven, create a level, flat surface by mortaring on the first block (or manufactured pier base) or by placing the first block (or manufactured pier base) on a layer of premix dry sand mortar.
- 2. Stack blocks.** Stack concrete blocks with their hollow cells aligned vertically. When piers are constructed of blocks stacked side-by-side, orient each layer at right angles to the previous one (**Figure 16**) and plan blocks so that split caps will be perpendicular to the blocks they rest on and perpendicular to the main I-beam.



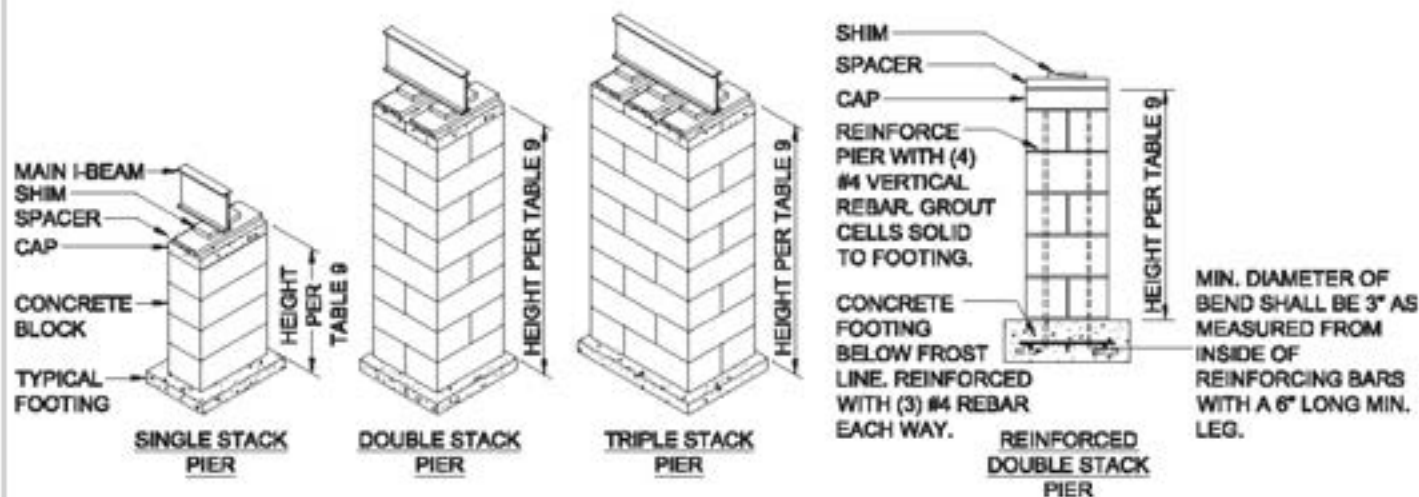


Figure 16. Frame pier construction.

3. **Cap piers.** Place a cap on hollow block piers to evenly distribute the structural load. Use caps the same length and width as the piers they rest upon. When using split caps on double-stacked block piers, install the caps with the long dimension perpendicular to the joint in the blocks below and perpendicular to the main I-beam.
4. **Install shims.** Use shims to level the home and fill any gaps between the base of the I-beam and the top of the pier cap. When required, always use shims in pairs (Figure 17). Drive them in tightly so they do not occupy more than one inch of vertical space. When the space to be shimmed is greater than one inch and less than the minimum thickness of available caps or concrete blocks, use hardwood dimensional lumber (two inches maximum thickness) or 4\"



Curing time of mortar.

Where wet mortar is used to construct or level piers, allowed it to cure to at least 80% of strength capacity (usually requiring 96 hours) before setting the home.

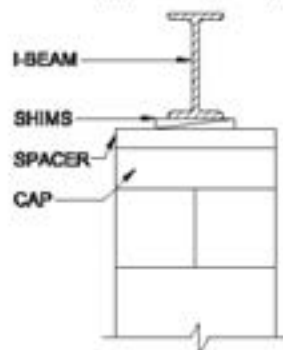


Figure 17. Correct shim placement



Dimensions of masonry perimeter walls. If using a masonry perimeter enclosure, calculate pier heights so that the enclosure can be built using standard unit dimensions (without cutting).

5. **Set up level.** Set up a water level with the fluid level at the desired height of the main piers. Carefully lower the side of the section down onto the leveled piers, adjusting the final height with shims.

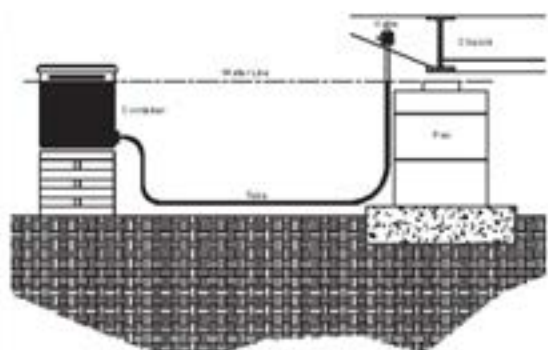
USING A WATER LEVEL

A water level is a standard device for leveling the home. The level consists of the following components:

- One container (five gallon bucket or one gallon jug).
- 150 feet of 1/2 inch diameter clear plastic tubing.
- Fittings for container to tubing.
- Valve for terminal end of tubing.
- Liquid for system: colored water in warm climates, windshield washing fluid in cold climates.



Level the home. The home is adequately leveled if there is no more than 1/4 inch difference between adjacent pier supports (frame or perimeter) and the exterior doors and windows of the home do



How to use a water level

- a. **Position level.** Position the level such that it can reach all piers.
 - b. **Place container.** Place the container so that the fluid in the container is at the same level as the desired level of the top of the supports under the home, allowing for any bracing below the level of the I-beams.
 - c. **Uncoil tubing.** Uncoil the tubing and fill with fluid, taking care not to introduce bubbles into the hose. Never allow anything to crimp or crush the tubing so as to impede the free flow of fluid.
 - d. **Bleed air.** Hold the valve below the level of the water container; open the valve to bleed out any air and close the valve.
 - e. **Establish height.** Locate the tubing adjacent to a pier that is set to the desired final height. Position the valve above the pier and open the valve. Move the water container up or down to where the water level is at the desired final height of the pier. Maintain the water container in that position and close the valve.
 - f. **Level piers.** Move the tubing to the next pier. Hold the valve above the pier and open it. Set the pier height to the level of the water in the tubing and close the valve. Repeat this step until all piers are at the same level.
 - g. **Note:** If water leaks out of the system while in use, you must reposition the reservoir and begin the process again.
6. **Complete the opposite side.** Jack the other side of the section up and install piers following the instructions above. At the completion of this step, the section should be level from front to rear and from side to side.
 7. **Install perimeter and marriage line piers.** Install perimeter piers and for multi-section homes, marriage line piers. Position marriage line piers to provide equal bearing for both mating sections.
 8. **Remove running gear.** Remove and store, recycle or properly dispose of the hitch, axles and wheels. These items are the property of the homeowner unless other contractual arrangements have been made.

Is this a single-section home?

- ▶ **YES,** go to **Connect Utilities**, (p. 95).
- ▶ **NO,** go to **Complete Multi-Section Set**, (p. 44).

not bind and can be properly operated. If differences in pier heights occur, drain lines should be inspected to correct reverse slope situations.

Water level operation. To operate the water level properly, both ends of the system must be open to the atmosphere and there must be approximately the same amount of fluid in the tubing at all times (within a few inches).

Complete Multi-Section Set

This chapter covers the preparation and installation of additional home sections, including the structural connections between units, raising and fastening hinged roofs and fastening the home to a load bearing perimeter wall foundation.

Follow the Steps below:

- ▼ STEP 1. INSTALL MARRIAGE LINE ANCHORS (p. 44)
- ▼ STEP 2. REMOVE PROTECTIVE SHIPPING MATERIALS (p. 44)
- ▼ STEP 3. COMPLETE HINGED ROOF (p. 44)
- ▼ STEP 4. REPAIR OR INSTALL MARRIAGE LINE GASKET (p. 45)
- ▼ STEP 5. POSITION ADDITIONAL HOME SECTIONS (p. 45)
- ▼ STEP 6. CONNECT FLOORS
- ▼ STEP 7. CONNECT ROOF
- ▼ STEP 8. CONNECT WALLS
- ▼ STEP 9. ATTACH TAG UNITS (p. 54)
- ▼ STEP 10. REMOVE TEMPORARY ITEMS (p. 55)
- ▼ STEP 11. FASTEN HOME TO FOUNDATION (p. 55)
- ▼ STEP 12. BACKFILL AND GRADE (p. 55)
- ▼ STEP 13. BUILD STAIRS (p. 55)

STEP 1. INSTALL MARRIAGE LINE ANCHORS

If the home is in Wind Zone II or III, install ground anchors along the marriage line now, before mating sections are joined see **Install Stabilizing System** (p. 74). After installing marriage line anchors return to this point in **Complete Multi-Section Set**.

STEP 2. REMOVE PROTECTIVE SHIPPING MATERIALS

Remove all shipping protection and associated fasteners from both home sections to be joined, including plastic used to close up the open sides during transportation. Do not remove the temporary supports holding up the ceilings at major openings. Wind wrap (such as Tyvek or other similar product) will be installed over the exterior wall OSB sheathing and under the shipping plastic. Be careful not to damage the wind wrap when removing the shipping plastic.

STEP 3. COMPLETE HINGED ROOF

If the home has a hinged roof that has been folded down for shipping, refer to **Appendix D** for hinged truss installation information.

Checklists for alternate construction. If the serial number (see the data plate or the chassis front cross member) has the letters "AC" before or after it, then the Alternate Construction on-site check list supplied with the home must be completed and returned to the home manufacturer in a timely manner. If the AC checklist relates to the roof, then failure to do so may require future disassembly of the roof and further inspections.

STEP 4. REPAIR OR INSTALL MARRIAGE LINE GASKET

A continuous, non-porous gasket creating a permanent air barrier will be installed on at least one side of the marriage line; along the floor, end walls and ceiling (and marriage lines for any tag units). The manufacturer has provided a marriage line gasket either installed on the home or shipped loose. If installed, inspect the gasket and repair any gaps or tears.

If not installed at the factory, install a continuous gasket between the home sections along the floor, end walls and ceiling.

For homes with through-the-rim crossover ducts (see **Connect Crossovers**, p.61) inspect and if necessary, repair gaskets around the rim joist duct openings using 3/4 inch thick fiberglass duct board or other material acceptable to the manufacturer. Ensure that duct openings are unobstructed.

STEP 5. POSITION ADDITIONAL HOME SECTIONS

Follow this procedure to install additional home sections:

1. **Remove obstructions.** Remove protruding nails and staples or anything else that will keep the home sections from fitting together snugly. If present, cut the temporary ceiling and floor plates at the edges of marriage line openings taking care not to damage ceiling or floor coverings or displace temporary marriage line support posts (these supports and the plates will be removed after the home sections have been structurally connected).
2. **Complete crossovers.** Before moving the two sections together, complete any crossover connections that require access from the open marriage line, including the attic duct connection (if present) and marriage wall interior electrical connections (see **Connect Crossovers**, p.61).
3. **Position section.** Position the section as closely as possible (ideally within six inches) and line up with the previously set section. If using a mechanical positioning system or crane, follow the system manufacturer's instructions or the crane operator's directions.
4. **Construct piers.** With the outside walls of the home aligned, construct the piers for the home section according to the instructions in **Set the Home** (p.38) before continuing to the steps below.
5. **Level section.** Lower the section onto the outside piers first, inside piers last. Before releasing the mechanical positioning system, check interior doorways and other openings for misalignments that may cause problems during trim-out. The floors should be flush, level and tight and the roof section should have little, if any, gap at the top of the marriage line. Use at least two come-alongs to pull the sections snugly together and use the water level or other leveling device to set all piers and shims.
6. **Shim gaps.** Shim any gaps up to one inch between structural elements with dimensional lumber. If any gaps exceed one inch, re-position the home to eliminate such gaps.

STEP 6. CONNECT FLOORS

Make floor structural connections according to the appropriate method described below. A sealing gasket shall be present between marriage line rim joists.

Alternate 1: Toed fasteners through bottom board

Make connections according to the fastener specifications in **Table 13** and **Figure 18** and the metal strap specifications that follow. Spacing indicated in **Table 13** is on-center, both sides of marriage line. Fasteners on each side of marriage line shall be staggered and offset by twice the spacing distance (**Figure 18A**). Repair any tears or holes in the bottom board after installation of fasteners.



Checking through-the-rim-ducts. Ensure that through-the-rim-duct connections are secure and tight after the home sections are together.



Mechanical positioning system. For a pier-set home, a mechanical positioning system (such as a roller system) will make the process easier and safer and be less likely to damage the home.

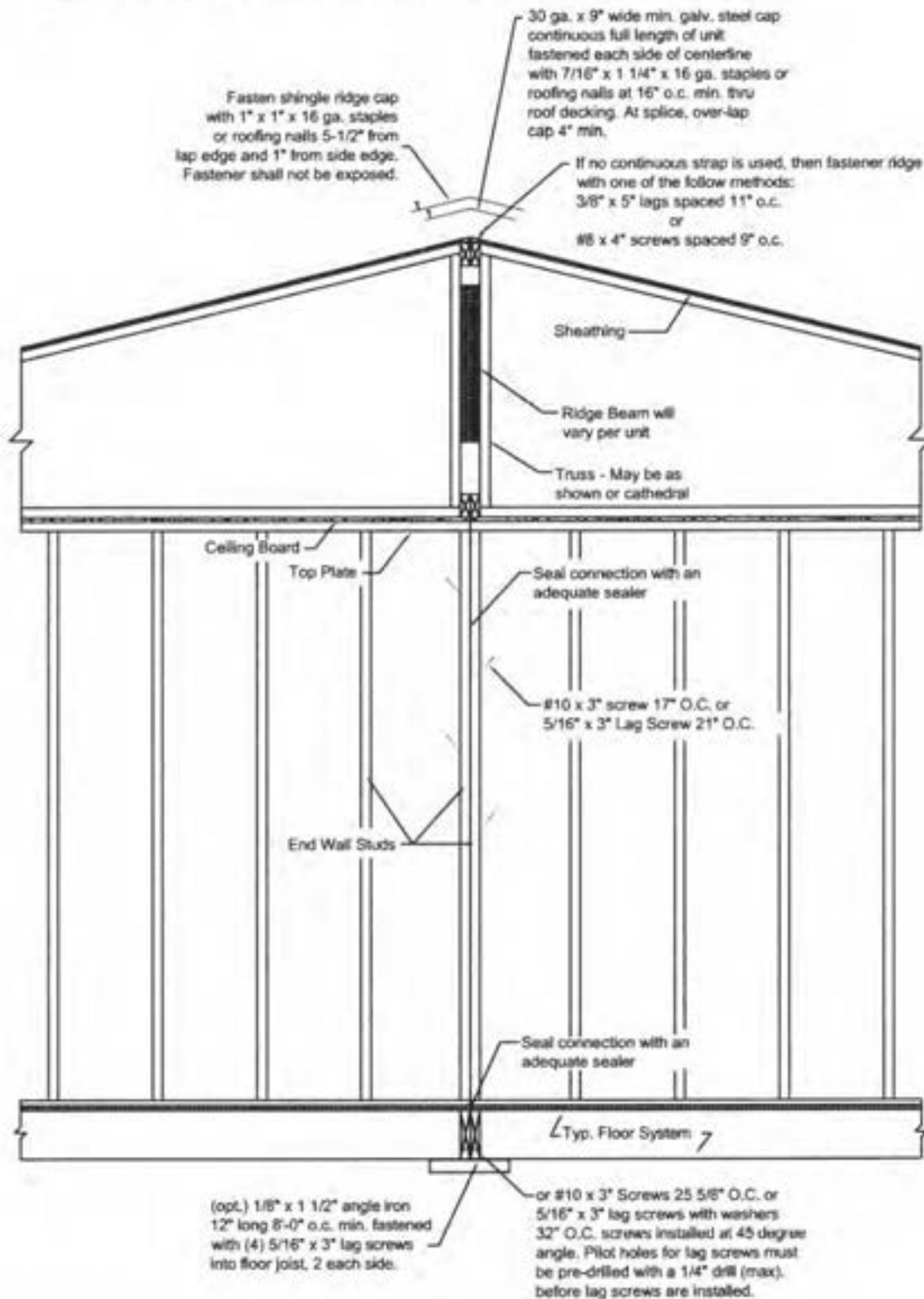


Safety. Remember to place safety timbers under home behind axle area and under hitch.



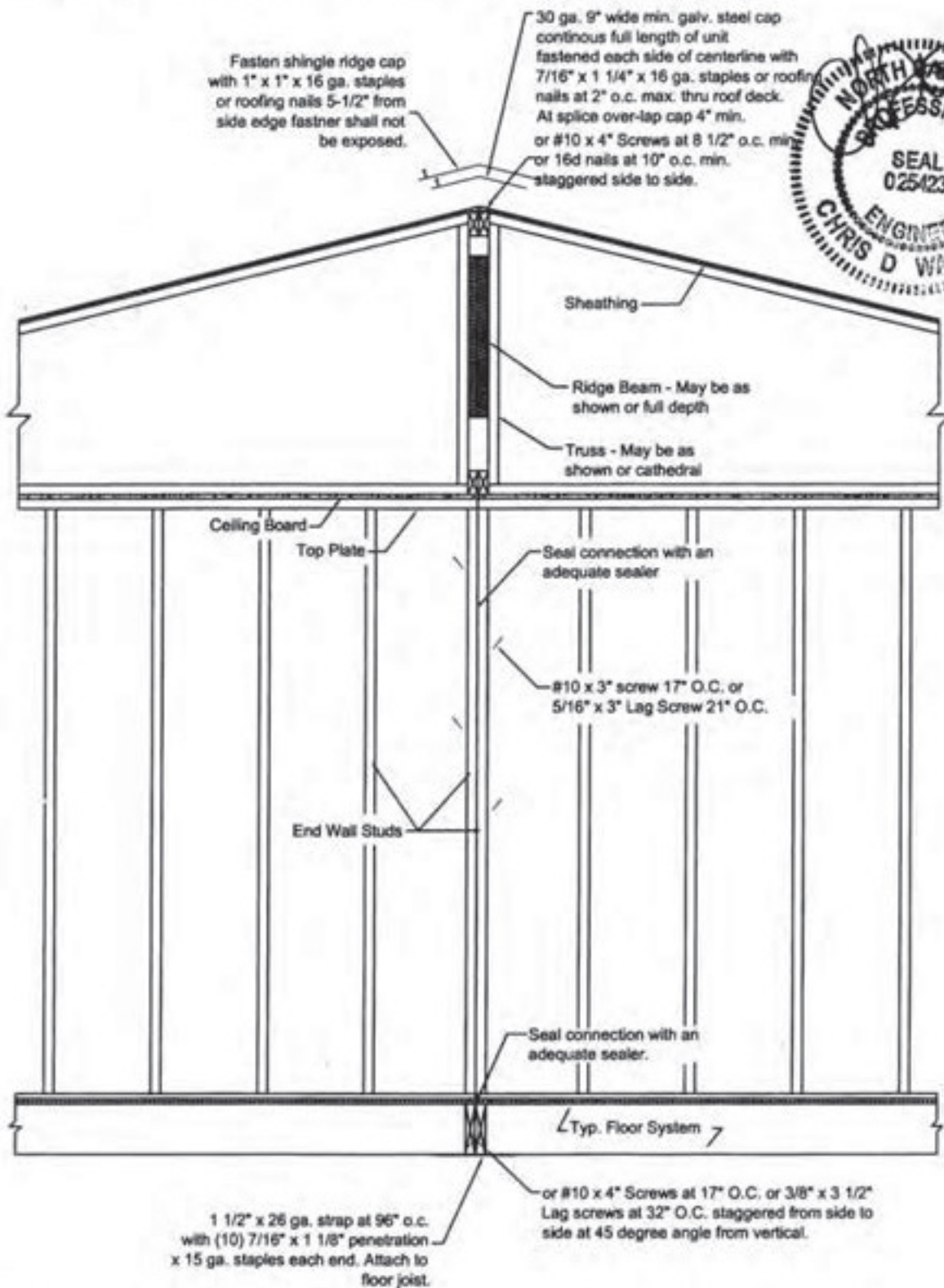
Sealing gaps. Prior to completion of the exterior close-up, gaps that do not exceed one inch are permitted between structural elements provided that the gaps are closed before completion of close-up, the home sections are in contact with each other; and the marriage gasket provides a proper seal.

Figure 5.4 - Double wide onsite fastening - wind zone 1



1. Bottom board not shown for clarity. Holes in bottom board must be patched with vinyl tape designed for repairing tears and holes.
2. A protective covering material (galvanized steel, polyethylene, or similar material) may have been installed on top of the shingle roof at the front of the home and along the forward face of any dormer. This material was installed to prevent shingles from blowing off during transit. Holes resulting from any fasteners used to secure this material to the roof shall be sealed with roofing cement.

Figure 5.5 - Double wide onsite fastening - Wind zone 2 and 3



1. Bottom board not shown for clarity. Holes in bottom board must be patched with vinyl tape designed for repairing tears and holes.
2. A protective covering material (galvanized steel, polyethylene, or similar material) may have been installed on top of the shingle roof at the front of the home and along the forward face of any dormer. This material was installed to prevent shingles from blowing off during transit. Holes resulting from any fasteners used to secure this material to the roof shall be sealed with roofing cement.

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Do additional sections (non tag) remain to be positioned?

- ▶ YES, go to STEP 1. INSTALL MARRIAGE LINE GROUND ANCHORS, (p. 44)
- ▶ NO, continue below.

Is there a tag unit?

- ▶ YES, go to STEP 9. ATTACH TAG UNITS (p. 54)
- ▶ NO, continue below.

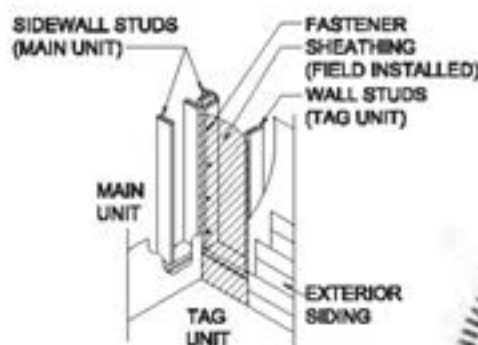
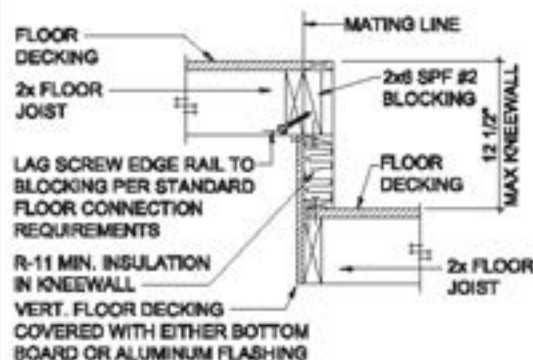
Is there a hinged roof?

- ▶ YES, go to STEP 3. COMPLETE HINGED ROOF, (p. 44)
- ▶ NO, go to STEP 9. ATTACH TAG UNITS, (p. 54)

STEP 9. ATTACH TAG UNITS

After the main unit has been set on its foundation, install all tag units according to the following procedure:

1. **Position and block the tag.** Position the tag unit as close to the main unit as possible at its intended location. Use a hitch jack to obtain approximate leveling and install pier supports according to **Set the Home, STEP 2. POSITION HOME SECTION** (p. 38). Determine whether the tag and main unit floors are designed to line up flush or are offset by a step and adjust the tag pier heights accordingly.
2. **Level the unit.** Using a water level (p.42), verify that the piers are level. The elevation of all points along the lower flange of the I-beam should be a no more than 3/8 inches from the desired height and should not deviate more than 3/4 inches overall.
3. **Connect floors.** If the floor of the tag unit is level with main unit floor, connect the floors together as described in **STEP 6. CONNECT FLOORS** (p. 45). If the floors are offset, use the connection detail shown in **Figure 21**.
4. **Connect walls.** Secure the tag unit walls to the main unit sidewall using #10 x 4" screws at 24 inches o.c. If pre-drilled holes are provided secure the tag unit walls to the main unit with 5/16" x 6" lag screws (see **Figure 22**). The sheathing shown in the detail may not be included by the manufacturer. If included, the sheathing over the last stud bay was tacked in place at the factory for easy removal at the site. Once the wall connections are complete, re-install the sheathing and complete the siding installation.



5. **Connect roofs.** Connect the tag unit roof to the main unit roof using #10 x 4" screws at 12" on-center (8" on-center in Wind Zone 3) or #8 x 4" screws at 8" on-center (5" on-center in Wind Zone 3) toe screwed through tag unit end truss top chord into each main unit dormer vertical structural member location (stud or truss). If full depth ridgebeam headers must be connected refer to **Connect Roofs**. See **Figure 23** for flush roof connections and **Figure 24** for roof connections with an offset greater than two inches. Roof connections with an offset less than two inches do not require screws.



Piers under tag units.

Some tag units have special piercing needs due to the roof and/or floor construction. These will be detailed in supplemental piercing plans supplied with the home. Note that tag unit end walls are typically load bearing rather than side walls.

Figure 21. Tag unit offset floor connection

Figure 22. Tag unit wall connection





Figure 23. Tag unit flush roof connection

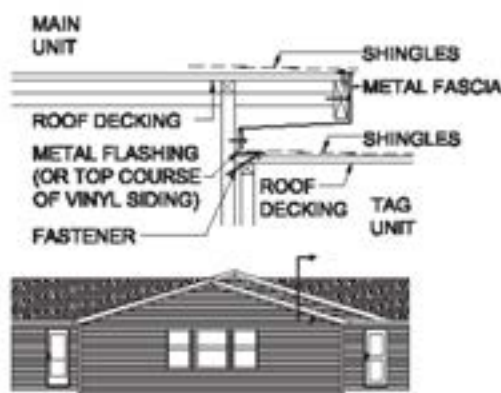


Figure 24. Tag unit offset roof connection

STEP 10. REMOVE TEMPORARY ITEMS

Once the home is properly supported and the marriage line connections are completed, remove the temporary ridge beam supports and wall/ceiling plates used to brace the ridge beam during shipment. Take care not to damage the ceiling.

Is the home supported on a load bearing perimeter wall?

- ▶ YES, go to **STEP 11. FASTEN HOME TO FOUNDATION**, (p. 55)
- ▶ NO, go to **Complete Roof and Exterior Walls** (p. 56).

STEP 11. FASTEN HOME TO FOUNDATION

Fasten the home to the foundation according to the fastening schedule provided in **Construct Foundation, STEP 1. OBTAIN A FOUNDATION DESIGN** (p.35).

Is the home supported on a basement foundation?

- ▶ YES, go to **STEP 12. BACKFILL AND GRADE**, (p. 55)
- ▶ NO, go to **Complete Roof and Exterior Walls** (p. 56).

STEP 12. BACKFILL AND GRADE

Backfill against the foundation wall to the height of the waterproofing, taking care to not damage the drainage system.

Grade the site as described in **Prepare the Site, STEP 3. CLEAR AND GRADE THE SITE** (p.16).

STEP 13. BUILD STAIRS

Construct the basement stairs in compliance with the local building code. Take care that adequate headroom is maintained under beams and that there is sufficient landing space at the bottom of the stairs.

- ▶ go to **Complete Roof and Exterior Walls** (p. 56).



When to backfill. Backfill against basement walls only after the home is connected to the foundation or the basement walls may deflect inward or collapse.

Cutting the chassis. Do not cut, notch, bend or alter in any manner beams, cross-members and other parts of the steel chassis.

Complete Roof and Exterior Walls

This chapter covers closing up and weatherproofing the home by completing the roofing and siding.

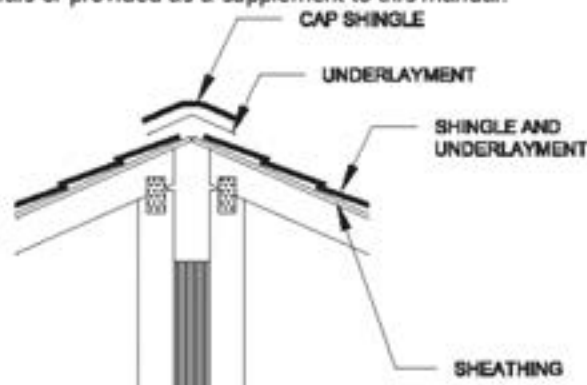
Follow the Steps below:

- ▼ **STEP 1. COMPLETE ROOF** (p.56)
- ▼ **STEP 2. COMPLETE TAG UNIT ROOF** (p.58)
- ▼ **STEP 3. COMPLETE SIDE WALLS** (p. 60)

STEP 1. COMPLETE ROOF

RIDGE CLOSEUP

For multi-section homes, the first step in completing the exterior is sealing the roof along the ridge line (Figure 25). For homes with asphalt shingles, follow the procedure below. For homes with metal or other roofing materials, follow the instructions that come with the roofing materials or provided as a supplement to this manual.



1. **Install underlayment.** Sheathing must be fastened with an 8d nail at 3 inches on-center along the edges and 3 inches on-center in the field. Seams of field-installed sheathing must be offset 16 inches from the seams on factory installed sheathing. Install 15# felt or equivalent continuously along the length of the ridge, covering all exposed sheathing and overlapping sheathing joints by at least five inches on each side. Fasten using 1" x 1" x 16 ga galvanized staples. For Wind Zones II and III, also apply a six inch wide strip of roofing cement along each side of ridge under the underlayment.
2. **Install shingles.** If shingles have been left off at the ridge line for site installation, install them now using 12 ga x 1-1/4" long, 3/8" diameter head roof nails. For Wind Zone I, fasten at 5/8 inch above each tab cutout slot and one at each end of the shingle one inch in from the edge (four fasteners for a three-tab shingle) (Figure 26). For Wind Zones II and III, use two fasteners 5/8 inch above and on either side of the tab slots and one at each end of the shingle one inch in from the edge (six fasteners for a three-tab shingle). Do not fasten through the shingle tar line.



* FASTENER LOCATIONS

3. **Install underlayment.** Install 15# felt or equivalent underlayment that is at least 10 inches wide continuously along the ridge. Fasten with 1" x 1" x 16 ga galvanized staples. For Wind Zones II and III, also apply a six inch wide strip of roofing ce-



Figure 25. Shingle installation closeup of ridge.



Weatherproofing. It is vitally important to close up the home quickly to protect the interior from damage due to inclement weather.

Removing shipping protection. Remove shipping protection from the roof prior to completing roofing. Seal all holes in shingles resulting from shipping protection removal. It is also recommended that the top layer of shingles be lifted and the sealant applied to any holes in the second layer of shingles. Refer to Warning on following page for acceptable types of sealants.

Figure 26. Shingle fastener locations for Wind Zone I (left) and Wind Zones II and III (right).

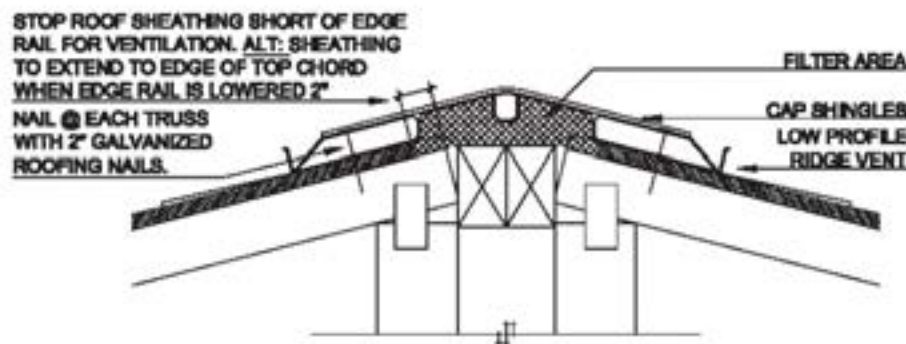
ment on both sides of the ridge under the underlayment.

4. **Install shingle cap.** Starting at the opposite end of the home from the prevailing wind, install ridge cap shingles provided by the manufacturer or use 12" x 12" shingles (36" shingles cut into three equal pieces) (Figure 27). Install using 12 ga x 1-1/4" long, 3/8" diameter head roofing nails spaced 5-5/8 inches from bottom edge and 1/2 inch to 1-1/2 inches in from both edges. Cover the exposed fasteners with tar or cement.

CUT SHINGLE INTO
THREE PIECES AS
SHOWN BY DOTTED LINE



5. **Ridge Vent.** For proper alignment – pre-nail through ridge vent holes at ends of each section. The felt paper underlayment should be folded back onto the roof decking and trimmed along the edge of the roof decking at the peak so that it does not obstruct the opening at the mate line. When using standard flat 3-tab shingles, caulking is not required under the flange of the ridge vent. Prior to applying vent to dimensional or architectural shingles on new construction, caulk between low areas of shingle and flange of vent. Before fastening vent, make sure filter is secured between shingles and vent. When installing vent in cold weather, leave an 1/8" gap between sections to allow for warm weather expansion.



HINGE ROOF CLOSE-UP

For homes with hinged roofs, complete roofing underlayment and shingles along the hinge line per the requirements listed in **Appendix D**.

COMPLETE TRIPLE SECTION ROOFS

Complete roofing along triple section home marriage lines according to one of the following methods based on the construction of the home.

Method 1: Dual ridge beams

1. **Install underlayment.** Fold down the underlayment of the outer section roof and apply a minimum six inch wide strip of roofing cement to the sheathing. Lay the underlayment of the outer section on top of the cement (see Best Practice tip for optional metal flashing). Then apply a minimum six inch wide strip of roofing cement to the outer section underlayment and fold down the center section roof underlayment over this cement.
2. **Install shingles.** Install missing row(s) of shingles, securing them per the shingle manufacturer's installation instructions (refer to the shingle wrapper).



Figure 27. Shingle cut into thirds

Installing a ridge vent. If a ridge vent is to be installed, follow the ridge vent manufacturer's instructions provided with the material or as an addendum to this manual in lieu of underlayment over ridge line and shingle cap.

Figure 28. Ridge vent installation



ACETOXY TYPE SILICONES ARE NOT TO BE USED. This type of silicone will weaken or melt asphalt shingles. The Alcoxy or Neutral Cure type silicones will not melt asphalt and are the proper silicones to be used in roof applications. All sealants used in shingle and roof applications, excluding underlayment securement, must be an Alcoxy or Neutral Cure type silicone OR meet the ASTM D 4586 standard. Asphalt/Asbestos based sealants, such as Black Tar, must meet the ASTM D 4586 standard. Shingle underlayment sealants are required in Wind Zone II and III applications and must meet the ASTM 3019 standard.

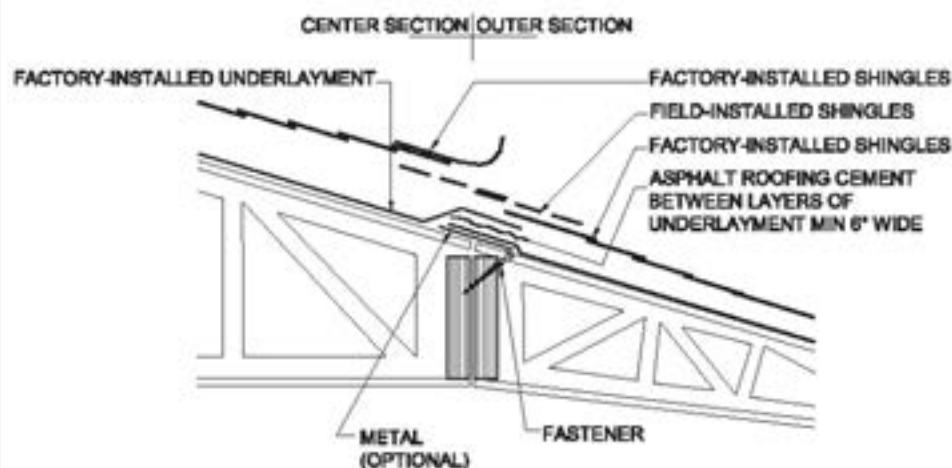


Figure 29. Triple section roof connection Method 1



Installing metal flashing. Install optional metal flashing over the roof decking before applying roofing cement. Fold back the underlayment and fasten 30 ga x 6" wide minimum galvanized metal with roofing nails or 16 ga x 1" crown staples of sufficient length to penetrate the roof sheathing. Space fasteners four inches o.c. or less near the edge of the metal. Overlap the metal by at least two inches at joints.

Method 2: Field installed sheathing

1. **Install underlayment.** Fold down the underlayment of the outer section roof and fold up the underlayment on the center section roof. Apply to the lower roof underlayment a minimum six inch wide strip of roofing cement centered on the sheathing joint. Cover with the shipped loose underlayment. Apply another minimum six inch wide strip of roofing cement to the ship loose underlayment centered on the upper roof sheathing joint.
2. **Install shingles.** Install missing row(s) of shingles per the shingle manufacturer's installation instructions (refer to the shingle wrapper).

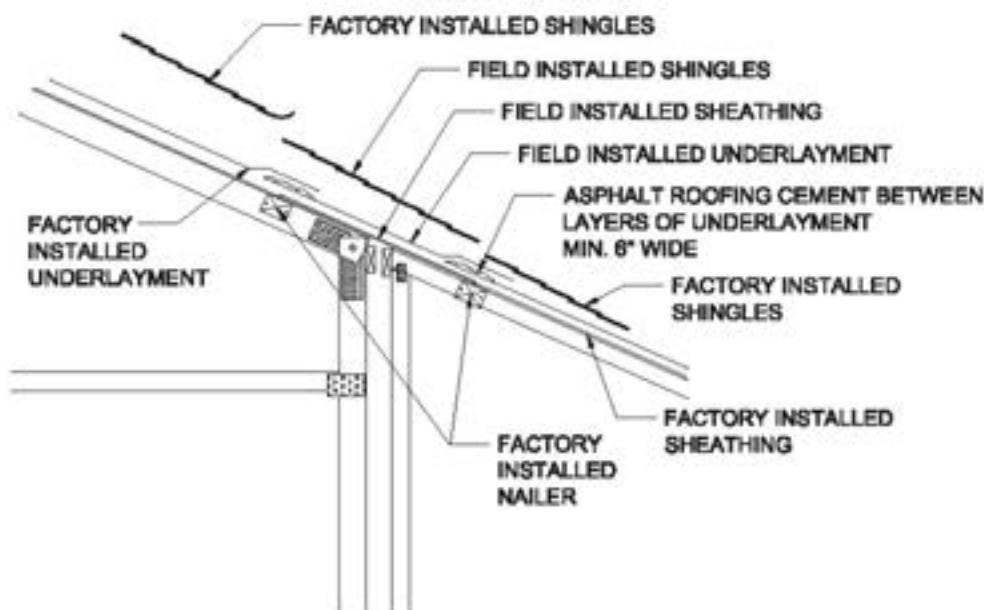


Figure 30. Triple section roof connection Method 2

STEP 2. COMPLETE TAG UNIT ROOF

If the home has a tag unit, complete roofing for this unit now. The process for completing the roof is different for flush and offset roofs. Follow the instructions in the appropriate section below.

FLUSH ROOFS

For flush roofs, complete roofing along the marriage line and at the valley line as follows (see Figure 31):

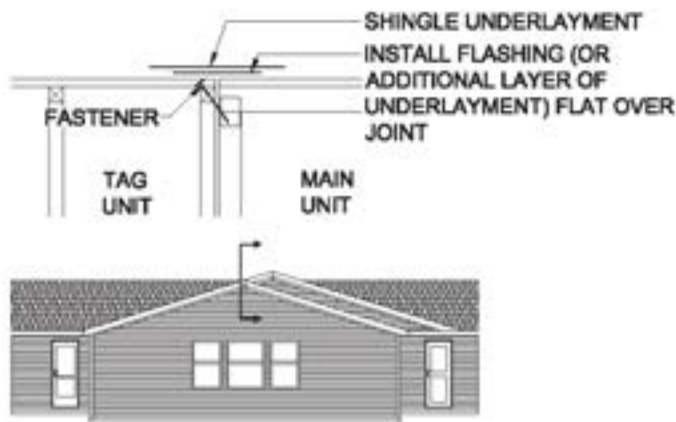


Figure 31. Tag unit flush roof connection

Marriage line

Method 1: Install metal flashing (minimum 30 ga x minimum 6" wide) over the joint between the main roof dormer and tag unit roof. Secure the flashing to the roof decks on both dormer and tag unit roofs with roofing nails or 16 ga staples with a one inch crown and long enough to fully penetrate the roof decks. Space fasteners maximum two inches o.c. near the edge of the flashing. Overlap seams in the metal by at least two inches. After flashing is complete, install shingles per shingle manufacturer instructions and ridge cap/vent according to **STEP 1. COMPLETE ROOF** (p. 56).

Method 2: Install two layers of roofing underlayment or equivalent over the joint between the main roof dormer and tag unit roof lapping the factory installed underlayment a minimum of six inches on each side and fully cemented at the laps. Install shingles per shingle manufacturer instructions and ridge cap/vent according to **STEP 1. COMPLETE ROOF** (p. 56).

Valley line

Along the bottom of the valley, shingles and one or more layers of roll roofing may need to be installed. If fastened to the roof at the factory, unroll the roofing, overlap the tag roof and trim the roofing to the roof edge. If shipped loose, install the roll roofing at the valley, lapping it under the factory installed roll roofing a minimum of 12 inches and fully cement the roofing at the lap. Complete shingles at the valley either by interweaving them or by trimming back approximately four inches from the valley line and fully cementing the exposed shingle edges. Fasteners must not be installed within 6" of the centerline of the valley.

OFFSET ROOFS

If there is a gap between the main unit dormer overhang and the tag unit roof of less than two inches, fold up the main unit dormer fascia, slide the underlayment and flashing from the tag unit roof behind the fascia, and bend the fascia back down and secure into sub fascia with metal screws (Figure 32).

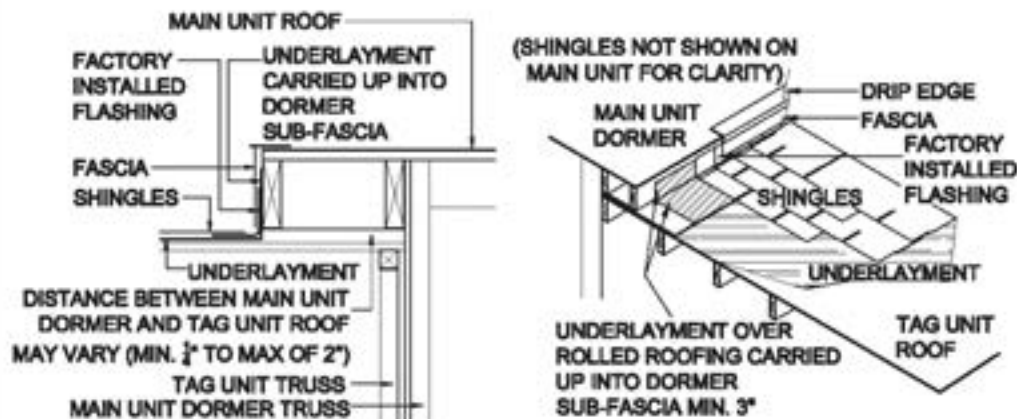


Figure 32. Tag unit roofing connection with less than two inch height difference

Complete Roof And Exterior Walls

If the gap between the main unit dormer overhang and the tag unit roof is two inches or more, bend up the inside corner trim at the dormer overhang and main unit sidewall, fold up the factory installed flashing on the tag unit roof, fold the inside corner trim back down and secure into dormer wall with metal screws (Figure 33).

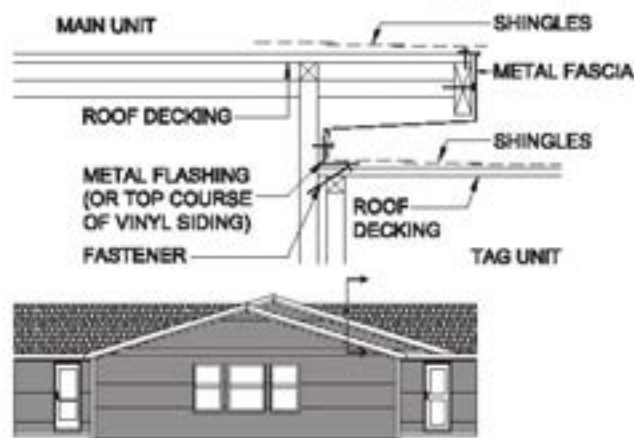


Figure 33. Tag unit offset roof connection

STEP 3. COMPLETE SIDE WALLS

Siding necessary to complete the exterior has been provided with the home. Follow the siding manufacturer's instructions (found on or with the packaging or as an addendum to this manual) and to complete the exterior siding as follows:

1. **Remove shipping protection.** Remove temporary shipping protection from walls.
2. **Complete crossovers.** Complete any crossover connections in the walls, including: electrical, stereo speaker, doorbell, telephone and intercom wires.
3. **Install siding.** Fasten siding only at stud locations, avoiding electrical wires that are present in the walls.
4. **Fasteners.** Fasteners must be installed as described in the manufacturer's installation instructions or DAPIA approved test reports for the siding.
5. **Install close-up strips.** If siding has been installed on the end walls at the factory, fasten close-up strips securely along both edges and seal the edges with a waterproof sealant.
6. **Install trim.** Install any matching trim required to complete the installation.
7. **Seal penetrations.** With a waterproof sealant, seal any penetrations in the siding that may have been caused by temporary shipping protection.



Covering the HUD label.
Do not cover the HUD label on the exterior of the home.

Removing shipping protection. Remove temporary shipping protection from walls before installing siding or serious moisture damage may result. Wind wrap (such as Tyvek or other similar product) will be installed over the exterior wall OSB sheathing and under the shipping plastic. Be careful not to damage the wind wrap when removing the shipping plastic.

► go to Connect Crossovers (p. 61).

Connect Crossovers

This chapter covers crossover connections between units of multi-section homes, including ducts and electrical, water, waste, gas, telephone and cable TV connections.

Follow the Steps below:

- ▼ **STEP 1. CONNECT DUCTS** (p. 61)
- ▼ **STEP 2. CONNECT ELECTRICAL CROSSEOVERS** (p. 64)
- ▼ **STEP 3. INSTALL ELECTRICAL BONDING** (p. 67)
- ▼ **STEP 4. CONNECT WATER LINES** (p. 67)
- ▼ **STEP 5. CONNECT DRAIN, WASTE AND VENT LINES** (p. 69)
- ▼ **STEP 6. CONNECT GAS LINES** (p. 70)
- ▼ **STEP 7. CONNECT TELEPHONE AND CABLE TV WIRING** (p. 71)

STEP 1. CONNECT DUCTS

There are three main types of duct crossover connections. Based on the location of the duct, follow the installation steps on the page indicated below:

- Under the floor (p. 61).
- In the roof cavity (p. 62).
- In floor, through-the-rim joist (p. 63)

To prevent air leakage, seal all ductwork connections, including duct collars using one or more of the following materials:

- Galvanized metal straps in combination with galvanized sheet metal screws.
- For rigid air ducts and connectors, tape and mastics listed to UL 181A.
- For flexible air ducts and connectors, tape and mastics listed to UL 181B.

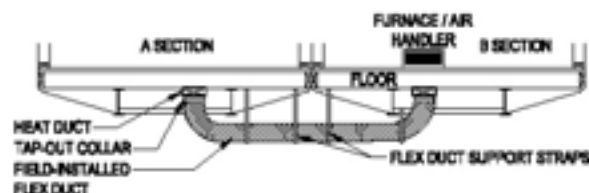
UNDER FLOOR FLEXIBLE Crossover DUCT

When heating or cooling equipment is installed in the home, the flexible crossover duct is provided by the manufacturer. In all cases the crossover duct must be listed for exterior use and should be wrapped with insulation of at least R-8 under a vapor barrier with a perm rating of not greater than one.

There are four common configurations of under floor crossover ducts depending on the number of home sections and the furnace/air handler location. See **Table 16** to locate the appropriate figure.

TABLE 16. UNDER FLOOR DUCT CONFIGURATIONS

Furnace location	Two home sections	Three home sections
Furnace over trunk duct	See Figure 34	See Figure 34B
Furnace offset from trunk duct	See Figure 34A	See Figure 34C



Qualified personnel. Use only qualified personnel to make crossover connections. Consult the LAHJ for licensing or any additional crossover connection requirements.

Access for service. Whenever possible maintain access to connection areas for future maintenance.

Make tight connections. Permanent, durable and tight crossover duct connections are critical to the proper performance of the home. Leaky ducts can result in severe moisture problems in the home, discomfort from rooms not receiving the proper amount of conditioned air and high utility bills from wasted heating and/or cooling energy.

Figure 34. Furnace over trunk duct, two home sections

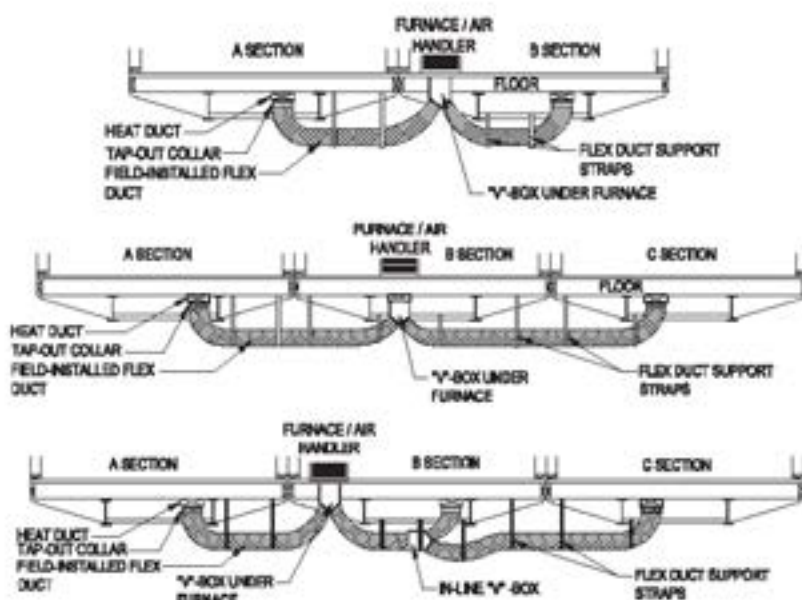


Figure 34A. Furnace offset from trunk duct, two home sections

Figure 34B. Furnace over trunk duct, three home sections

Figure 34C. Furnace offset from trunk duct, three home sections

For under floor flexible crossover ducts follow the steps below:

1. **Locate collars.** Locate the metal crossover collars (or V-box) connected to the main trunk duct (or furnace) under the home and remove temporary shipping protection.
2. **Install inner duct.** Apply mastic completely over inner liner and collar/V-box. Slide the crossover duct inner liner over the crossover collar/V-box as far as it will go. Install a large nylon zip tie over the inner liner just above the "ridge" around the crossover collar/V-box. Apply mastic completely over inner liner and collar/V-box.
3. **Connect duct insulation.** Bring the duct insulation up over the zip tie and above the home's bottom board into the floor cavity. Temporarily duct tape it against the base of the trunk duct/V-box.
4. **V-box Insulation.** Verify that the V-box has been insulated with R-8 minimum.
5. **Pull duct wrap.** Pull the crossover duct outer wrap over the top of the insulation and temporarily secure it to the trunk duct/V-box with duct tape.
6. **Install zip tie.** Feel for the nylon zip tie that was installed over the inner liner. Place another nylon zip tie just under the first one to permanently secure the crossover duct insulation and outer wrap, making sure all of the insulation is inside the outer wrap.
7. **Trim duct.** Trim the crossover duct to length such that the installed duct will be straight with no kinks or unnecessary bends.
8. **Connect other end.** Follow the same procedure (steps 1 through 5) to connect the opposite end of the crossover duct and any other crossover ducts.
9. **Seal joints.** Seal the joints between the bottom board and the crossover duct with bottom board repair tape.
10. **Support duct.** Support the crossover duct(s) above the ground using nylon or galvanized metal straps and saddles spaced every 48 inches o.c. or less. Choose straps at least 1/2 inch wider than the spacing of the metal spiral's encasing the crossover duct. Install the straps so they cannot slip between spirals. Secure metal straps with galvanized screws.

ROOF CAVITY CROSSOVER DUCT

For ducts installed in the roof cavity, follow the steps below:

1. **Access the duct.** Access the crossover location through an access panel in the ceiling or the open sides of the home before the sections are joined and remove any temporary shipping protection.
2. **Join ducts.** Using the provided flexible duct, join the distribution boxes in each section of the home as shown in **Figure 35**, cutting off any extra duct length to keep the duct as straight as possible. The duct must be joined in the center



Securing the crossover. Between Step 5 and Step 6, drill three or more 1/16 inch holes an equal distance around and just below the bottom edge of the nylon zip-tie. Install #12 pan head screws in these holes, through the flexible duct and into the metal crossover collar/V-box. The screw heads should be against the zip-tie.



Cover exposed metal.

Completely cover all exposed metal connectors with insulation. Apply sealants and tapes only to surfaces that are dry and free of dust, dirt, and grease.

Avoid ground contact. Installed crossover ducts must not be in contact with the ground.

Unobstructed airflow. Excess length, kinks and bends in the crossover duct will restrict airflow and degrade the home's HVAC system performance.

Compressed Duct. Support the duct without compressing the insulation and re-

with the provided connector.

3. **Fasten ducts.** At each connection point between ducts and distribution boxes or connectors, secure the inner duct liner with a nylon strap, apply mastic completely over the connection area, pull the duct insulation and outer liner over the connection area and secure them with a second nylon strap.
4. **Reinstall panel.** Reinstall and secure the access panel, if applicable.

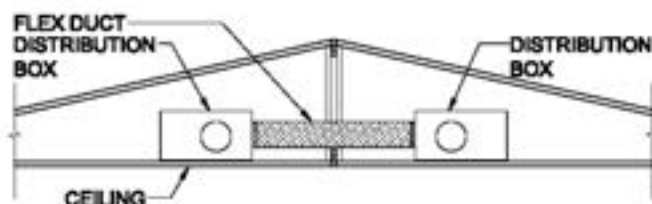


Figure 35. Duct crossover located in the roof cavity

IN THE FLOOR CROSSOVER DUCT

Where one or more crossover ducts are built into the home's floor system, connect them either through or under the rim joist depending on the design of the home.

Through the rim joist

With a through the rim joist design, the duct in each floor section terminates at an opening in the marriage line rim joist. Fixed through-the-rim crossovers employing a marriage line gasket such as in Figure 36 were completed in **Complete Multi-Section Set, STEP 4. REPAIR OR INSTALL MARRIAGE LINE GASKET** (p. 45) and require no additional work here. Connect other through-the-rim joist ducts using one of the following methods based on the design of the home.

Method 1: Metal or Duct board through rim joist without sleeve

Connect ducts that pass through the rim joist (Figure 36) as follows:

1. **Align Crossover duct locations.** Verify that when both halves of the home are installed that the crossover duct locations will align properly.
2. **Air tight Seal.** Verify that the gasket or duct board used to seal between both halves of the home is in good condition and will properly seal the duct system.
3. **Connect the Units.** Connect the floors using the procedure for connecting the floors (p. 45).

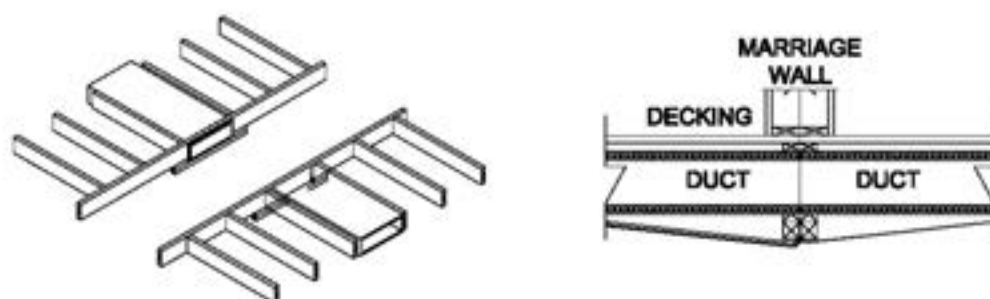


Figure 36. In-floor duct connection through the rim joist without metal sleeve

Method 2: Duct board with sleeve

Join duct board ducts with a metal sleeve as follows (Figure 37):

1. **Open bottom board.** On the section of the home with the furnace, cut the bottom board along the center line of the two floor joists on either side of the crossover duct starting at the marriage line and extending approximately three feet toward the center of the section.
2. **Open duct.** Create an opening in the duct by cutting the duct board as shown in Figure 37.
3. **Insert sleeve.** Insert the provided metal sleeve, centering it on the marriage line joint.
4. **Seal duct.** Close the bottom of the duct and seal it with tape specially made for that purpose (may be provided).
5. **Seal floor.** Replace the floor insulation to its original position and seal the bottom board tightly with tape specially made for that purpose.

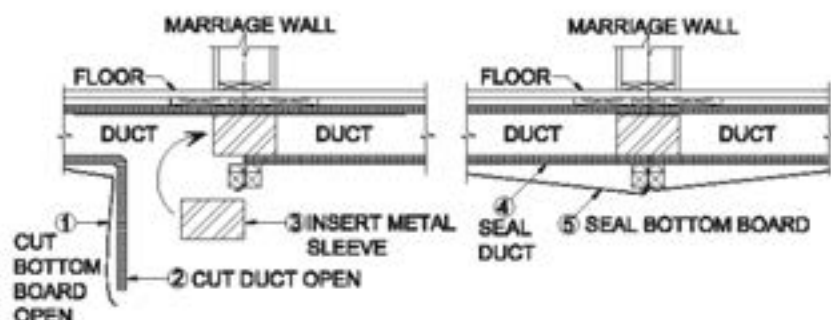


Figure 37. In-floor duct with crossover using metal sleeve

STEP 2. CONNECT ELECTRICAL CROSSOVERS

Multi-section homes may have one or more electrical crossovers located in the wall(s) and/or floor(s) along the marriage line(s).

JOINING WIRES

Two types of connections may be present at these locations—snap connectors and junction boxes. Identify matching circuits if multiple circuits exist at a single crossover location. These will be coded for identification. Connect snap connectors according to the connector manufacturer's installation instructions, including fastener requirements.

Connect wires in junction boxes as follows (Figure 38):

Pull wires. Pull circuit wires into the junction box, sliding them through a romex connector and secure snugly. (Figure 38) Do not over-tighten.

1. **Strip wires.** Remove the outer jacket that holds the circuit wires together providing a minimum of four inches of free wire in the box.
2. **Connect wires.** Connect wires together matching like colors, using appropriately sized wire nuts. Use the ground wire to ground the junction box and/or cover plate(s), if metal. Junction boxes may contain single or multiple 15 or 20 amp circuits, or a single 240 volt appliance circuit.
3. **Replace cover.** Reposition the junction box cover and secure using machine (not sheet metal) screws.



Use qualified electricians.

All electrical work must be performed by a qualified electrician and comply with the 2005 NEC.

Disconnect power. Turn off power to the home before making connections.

Proper use of GFCI circuits. Ensure Ground Fault Circuit Interrupted (GFCI) circuits are connected to the proper GFCI protected circuits from the power supply.

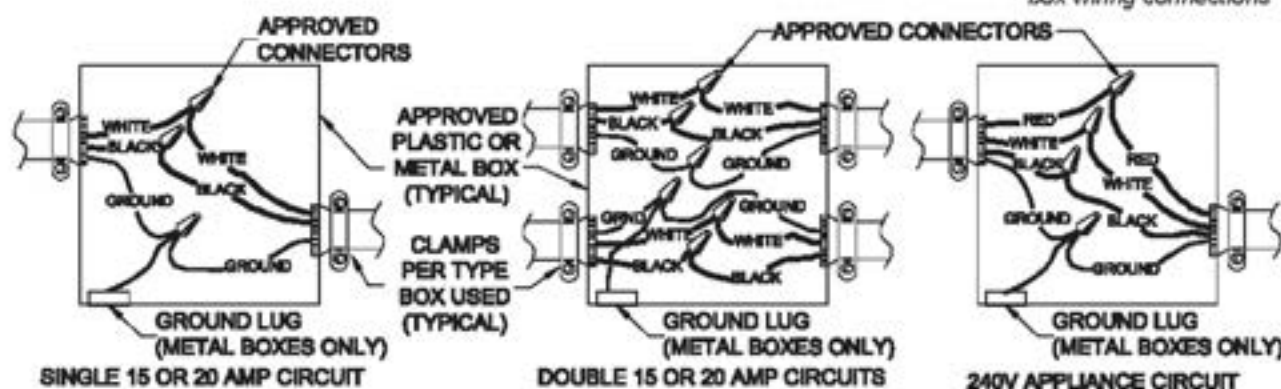


Figure 38. Types of junction box wiring connections

FLOOR CROSSOVER

When making electrical connection(s) in the floor, use one of the wiring options described below:

Method 1: Access panel

1. **Access wires.** Find the crossover location(s) and remove the access panel(s) if attached. If access panel openings are not provided, cut through bottom board to expose the wiring (Figure 39).
2. **Route wires.** Pass the wires through predrilled holes or notches in the rim joist or if there is a single bumped-out access panel as in Figure 40, then connect under the rim joists.
3. **Connect wires.** Connect wires via a junction box or snap-connector(s) as described above.
4. **Secure wires.** Secure wires with staples to adjacent joists or studs within eight inches of junction box or snap-connector(s).
5. **Install smash plates.** For notched perimeter joists, install steel wire protectors (smash plates).
6. **Seal bottom board.** Replace insulation and re-install access panels and/or seal the bottom board with tape specially made for that purpose (may be provided). The access panel(s) may be temporarily installed near the crossover location or shipped loose with the home.



Using snap connectors.

Do not use oversized nails or drive nail heads into snap connectors. Some connectors are designed for one-time use only – a new connector must be used if they become separated.

Protect cables. Cover all cables with conduit or other suitable weather-resistant and protective material.

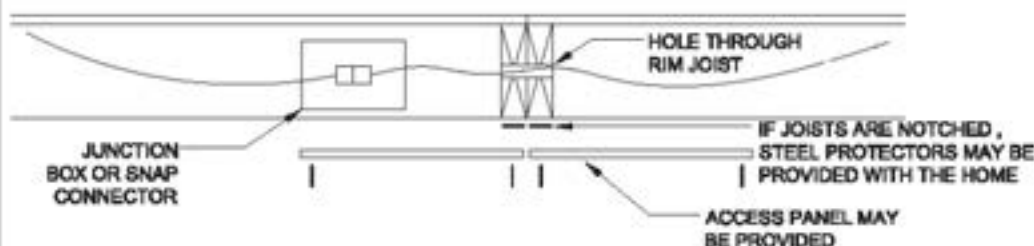


Figure 39. Electrical crossover floor wires with flush access panels

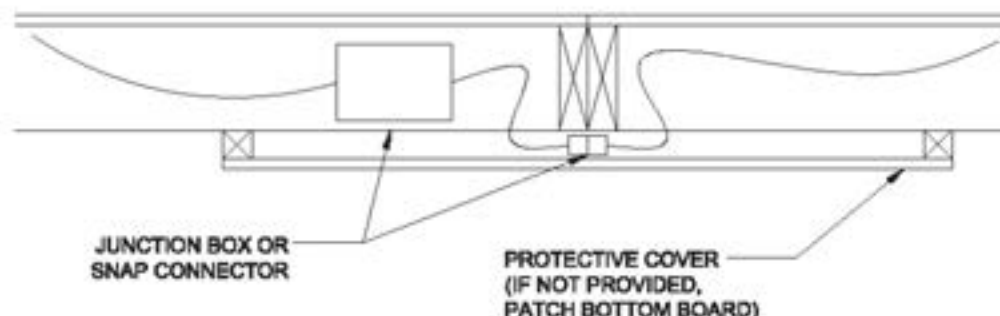


Figure 40. Floor electrical crossover wires with bumped-out access panel

Method 2: Junction box with conduit

1. **Access boxes.** If junction boxes are not exposed, access them inside the floor by cutting the bottom board or by removing the access panel(s). Remove the junction box covers.
2. **Connect wires.** If wire is coiled inside one junction box, insert it into flexible conduit and pass it under the rim joists to the opposing box and make the connection as described above. If no coiled wire is provided, install conduit with wire making connections in both boxes (Figure 40).
3. **Cover boxes.** Replace and secure covers on junction boxes.
4. **Seal floor.** Replace any displaced insulation and replace access panel or seal the bottom board with tape specially made for that purpose (may be provided).

Variation to Method 2: A junction box may be installed only on one side with the other side containing conduit behind an access panel. Bring the conduit to other side and make one connection in the junction box.

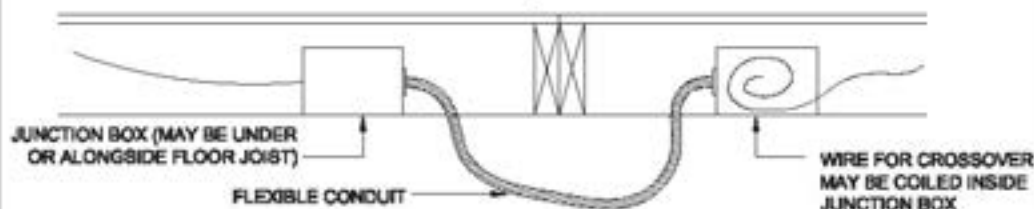
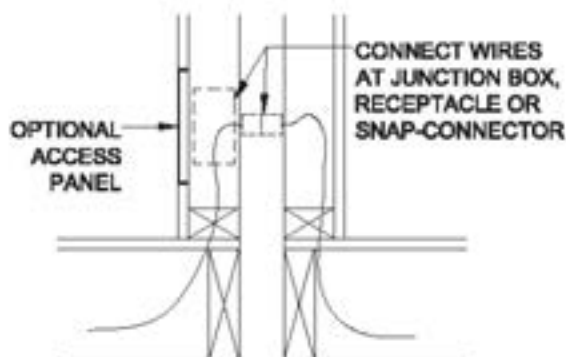


Figure 41. Under the rim joist electrical crossover connection with conduit

WALL CROSSOVERS

Connect electrical, phone, cable television and stereo speaker wires in marriage walls and/or partition and end walls.

If access panels into the marriage walls are not provided, then the connection should have been made prior to bringing the home sections together. If access panels are provided in marriage, end or partition walls, remove the panels, join the wires as described above using the provided snap-connector, junction box or at a receptacle, and re-attach the access panel (Figure 42 for marriage walls and Figure 43 for partitions and end walls).



Avoid damaging crossover wires. Carefully fold marriage wall crossover wires so they stay within a single bay and are not sandwiched between studs when the sections are pulled together.

Figure 42. Inside marriage wall crossover connection

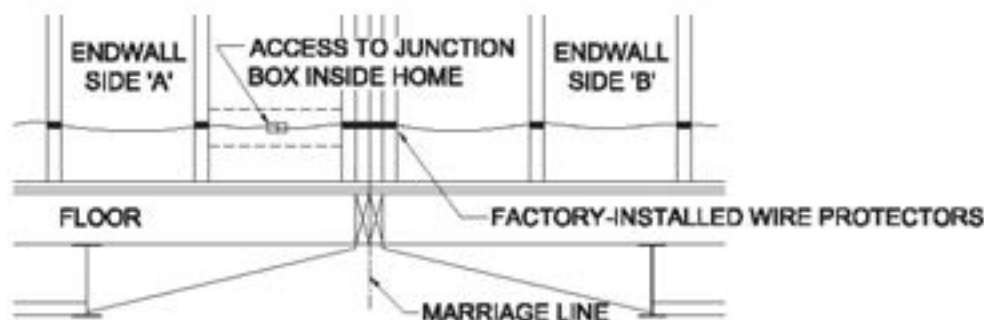
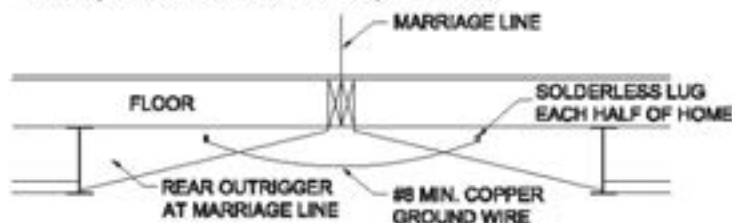


Figure 43. Inside partition or end wall electrical crossover connection

STEP 3. INSTALL ELECTRICAL BONDING

To ensure all metal parts are effectively grounded, electrically bond all chassis together as follows (Figure 44):

1. **Find lugs.** Determine if solderless ground lugs are provided on the front or rear frame outriggers or headers.
2. **Attach wire.** If lugs are provided, uncoil the bonding wire (#8 minimum bare copper wire) from one side of the home and connect it to the lug provided on the opposing side using a paint penetrating star washer, tighten the set screw firmly on the wire and repeat for any additional home sections. Torque the set screw per the manufacturer's requirements.



3. **Attach strap.** If ground lugs and copper wire are not provided, attach the provided four inch bonding strap to each pair of adjacent chassis with two #8 x 3/4" self-tapping metal screws (one screw each side).

STEP 4. CONNECT WATER LINES

Connect water lines inside the floor through access panels or below the bottom board as follows:

WATER LINES ACCESSED THROUGH PANELS

1. **Remove panels.** Remove access panels from each home section.
2. **Remove caps.** Remove shipping caps from ends of water lines, if present.
3. **Pull lines.** Pull water lines through holes in rim joist or attach shipped loose flex connectors, if applicable (Figure 45).
4. **Connect pipes.** Connect threaded water lines using flexible pipe or a rigid connector line (if provided) and connector fittings (do not use lubricants or sealants).
5. **Test.** Test connections for leaks.
6. **Seal floor.** Securely replace insulation and access panels.

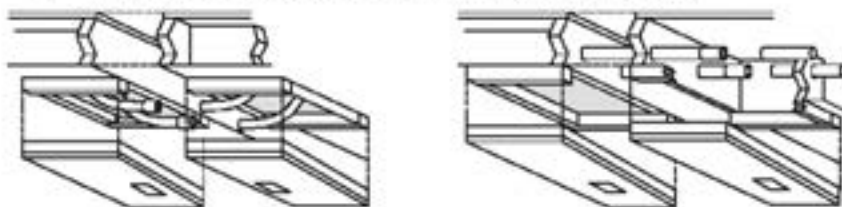


Figure 44. Electrical bonding of multi-section homes



Applying cement. Follow cement manufacturer's instructions with respect to application and drying time. Allow cement to fully cure before filling pipes with water.

Figure 45. Water line crossover with access panels



Choosing cement type. Use the proper cement for water lines as it may differ from the cement used for the DWV system.

WATER LINES DROPPED BELOW BOTTOM BOARD

1. **Remove caps.** Remove protective shipping caps from ends of pipes and make sure pipe ends are clean and smooth.
2. **Connect pipes.** Connect threaded water lines using flexible pipe or a rigid connector line (if provided) and connector fittings (do not use lubricants or sealants) (Figure 46).
3. **Test.** Test connections for leaks.
4. **Protect pipes.** Wrap water lines with insulation and bottom board shipped loose with home or otherwise protect to prevent freezing. Tape bottom board using tape specially made for that purpose (may be provided) and staple with 7/16" x 1/2" staples at four inches o.c. around bottom board using a divergent (stitch) stapler or equivalent. Generally, only insulation is necessary to protect water supply lines from freezing when the home is skirted. Some homeowners may desire to protect their water supply lines with a heat tape. This tape must be approved for manufactured home use by a nationally recognized testing agency and be installed in compliance with manufacturer's instructions. An electrical outlet has been provided under the home for the heat tape. This outlet is protected by a Ground Fault Circuit Interrupter and should not be used for any other purpose.

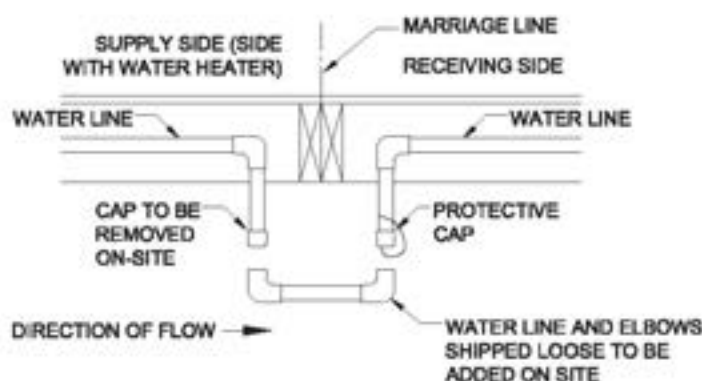
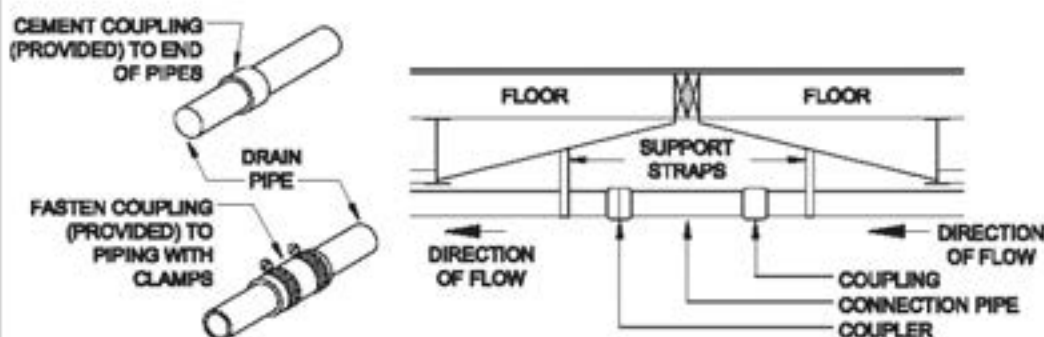


Figure 46. Water line crossover through bottom board

STEP 5. CONNECT DRAIN, WASTE AND VENT LINES

Complete portions of the drain, waste and vent (DWV) system that are below the floor as follows:

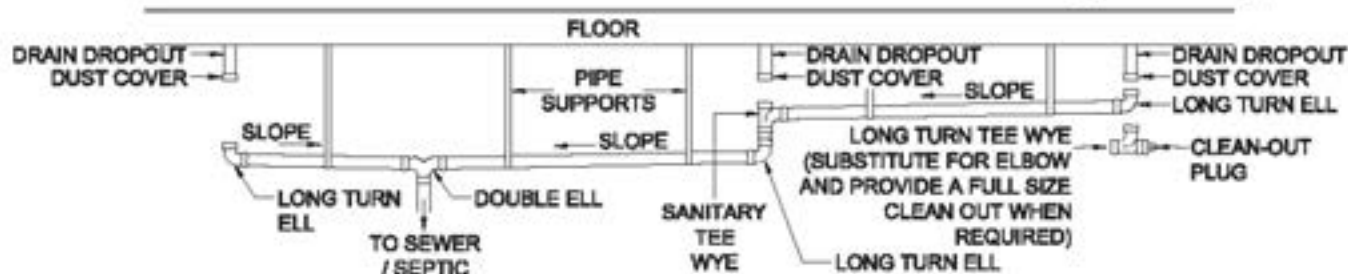
1. **Remove caps.** Remove shipping covers from pipes extending through the bottom board; inspect pipes and fittings and clean them of dirt, obstructions and burrs.
2. **Assemble pipes.** Using the drain schematic drawing provided with the home, begin assembling the DWV system starting at the location farthest from the sewer/septic connection and working towards the outlet, fastening the pipe with cement or adjustable screw-clamp connectors, if provided (Figure 47). As the system is assembled, support the piping with temporary blocking. Unless otherwise noted on the schematic diagram, provide a minimum 1/4 inch per foot slope towards the sewer/septic using a plumber's level. Where a slope of 1/4 inch per foot cannot be maintained, use a minimum slope of 1/8 inch per foot and install of a full-size clean-out at the uppermost point of the run (Figure 48).



Providing required clearances. Provide the drain outlet with a minimum clearance of three inches in any direction from all parts of the structure or any appurtenances and with not less than 18 inches unrestricted clearance directly in front of the drain outlet. Provide any cleanouts with a minimum clearance of 12 inches directly in front of its opening.

Figure 47. Drain crossover connection

Figure 48. DWV system



3. **Test.** After all drain lines have been connected, conduct a two-part leakage test on the completed drainage system as follows:
 - Part 1. With all fixtures connected, and all tub and shower drains plugged, fill the system with water to the rim of the toilet bowl through a higher fixture. Release all trapped air, replace tub and shower plugs, backfill fixtures, and allow the system to stand at least 15 minutes. Check for leaks. Drain the system. If leaks are found, repair and retest.
 - Part 2. Plug all fixtures, sinks, showers, and tubs and fill with water. Release the water in all fixtures simultaneously to obtain the maximum possible drain piping flow. As water is draining, check for leaks. If any are found, repair and retest.
4. **Connect to outlet.** Connect the main drain line to the site sewer/septic hook-up, using an approved elastomer coupling or by other methods acceptable to the LAHJ (Figure 49).



Choosing glues. Use only solvents and glues compatible with the pipe (ABS or PVC). Follow manufacturer's instructions.

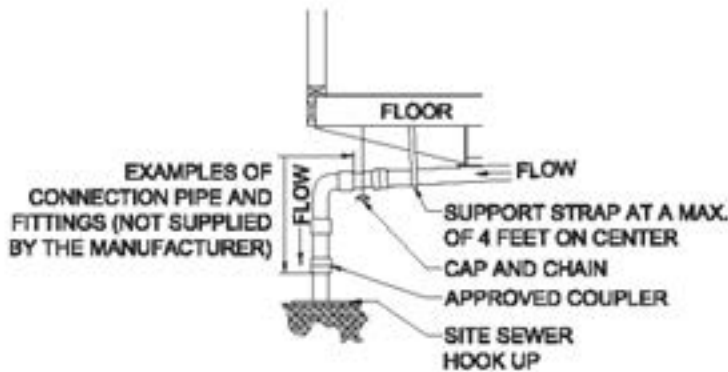


Figure 49. DWV connection to sewer/septic

5. Install supports. Install permanent drain line supports at a distance of four feet o.c. or less (see Figure 50). Alternate DWV pipe support may be used if approved by the local authority having jurisdiction.

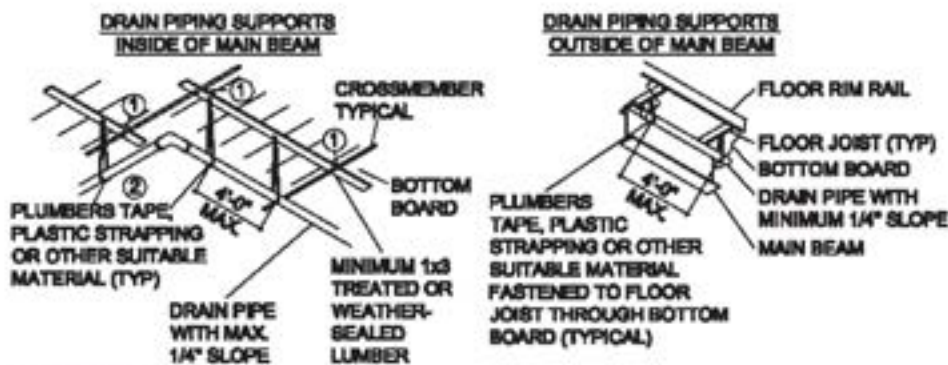


Figure 50. DWV pipe support options



Protect pipes from freezing. If the home is to be left unheated in cold weather, pour antifreeze solution into all drain traps, including sinks, tubs and toilets. Be sure that the antifreeze is safe for the fixtures and P-traps.

Installing quick disconnect fittings. Do not use tools, lubricants or sealants with quick disconnect fittings.

Gas test precautions. Do not connect to gas service until tests described in Connect Utilities have been successfully completed.

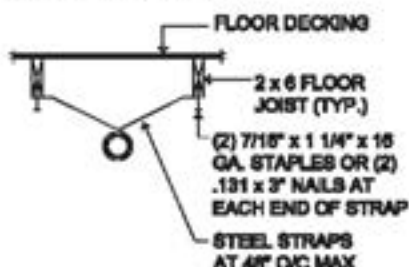
PROCEDURE:

- 1) ADD MINIMUM 1x3 LUMBER BETWEEN FRAME CROSSMEMBERS DIRECTLY ABOVE DRAIN PIPING BY PUSHING UP ON THE BOTTOM BOARD AND RESTING THE LUMBER ON TOP OR INSIDE OF THE CROSSMEMBER LEG AS SHOWN.
- 2) WRAP SUPPORT STRAPPING AROUND PIPING AND 1x FRAMING MATERIAL. FASTEN STRAPPING TO SUPPORT AS SHOWN BELOW.
- 3) OTHER METHODS TO PROVIDE SUPPORT MAY BE USED TO MAINTAIN MIN. PIPE SLOPE REQUIREMENTS WITH THE APPROVAL OF THE LOCAL AUTHORITY HAVING JURISDICTION.
- 4) LUMBER MATERIAL TO BE PROTECTED FROM MOISTURE.

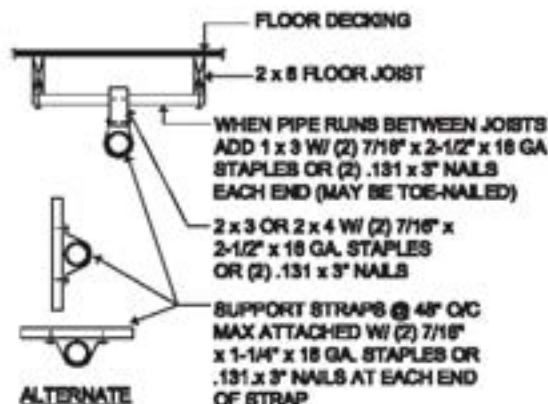
CAUTION

ELECTRICAL WIRING MAY BE SECURED TO WIDE FACE OF FLOOR JOISTS THAT ARE OUTSIDE OF THE MAIN BEAM. MAKE SURE FASTENERS SECURING STRAPPING PENETRATE BOTTOM EDGE OF JOISTS TO ELIMINATE POSSIBLE ELECTRICAL SHORTS.

STRAPPING MAY ALSO BE INSTALLED DIRECTLY TO THE STEEL CHASSIS WITH SELF-TAPPING SCREWS.



ADD ADDITIONAL STRAP WITHIN 12\"/>



ADD ADDITIONAL BLOCK WITHIN 24\"/>

6. Insulate. Replace all insulation and repair any tears or openings in bottom board.

STEP 6. CONNECT GAS LINES

The gas crossover connection may use quick disconnect fittings or threaded connectors. Find the connection location below the floor at the marriage line and gather the connectors (they may be shipped loose if not present under the home).

For quick disconnect fittings (Figure 51), remove any dust caps and then with one hand, pull back on the quick disconnect device, snap it over the quick disconnect adaptor and release it to complete the connection.

For threaded connectors, remove the black cap and nipple (or any other plugs, such as a black iron plug) from both the supply and receiving sides and screw the connector onto the supply and return pipes as necessary.

Check for leaks before connecting to gas service (see **Connect Utilities, STEP 3. CONNECT GAS SERVICE**, p. 100).

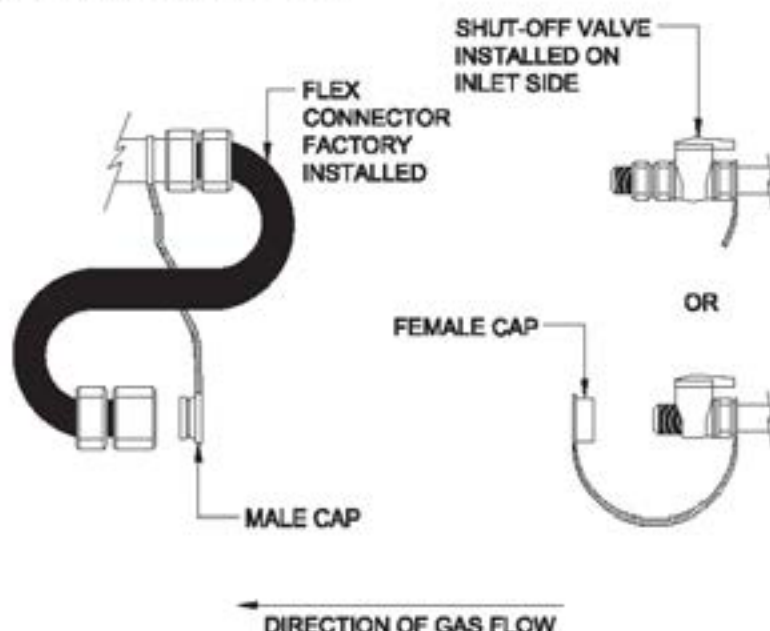


Figure 51. Gas crossover connection



Gas Crossover. A quick disconnect may be installed on the gas line crossover, but it may not replace the shut-off valve. A shut-off valve is required on the inlet side of the gas line crossover.



Installing wiring. When installing telephone and cable television wires, do not damage electrical wires, plumbing lines or ducts. Serious personal injury or death could result from damage to electrical wires.

STEP 7. CONNECT TELEPHONE AND CABLE TV WIRING

Install telephone and cable television wiring in accordance with the requirements of the LAHJ, the NEC and NFPA No. 70-2005. When making crossover connections or installing telephone or cable television wires, do not run them in the same raceway as, or in close proximity to, high voltage electrical conductors or cables.

Wires should only be installed by trained professionals.

► go to **Complete the Interior** (p. 72)

Complete the Interior

This chapter covers the completion of the home's interior finishes including finishing walls, ceilings, flooring, trim and miscellaneous items.

Follow the Steps below:

- ▼ **STEP 1. ALIGN MARRIAGE WALLS** (p. 72)
- ▼ **STEP 2. FINISH GYPSUM BOARD** (p. 72)
- ▼ **STEP 3. COMPLETE CARPET** (p. 72)
- ▼ **STEP 4. COMPLETE TRIM** (p. 73)
- ▼ **STEP 5. INSTALL SHIP LOOSE ITEMS** (p. 73)

STEP 1. ALIGN MARRIAGE WALLS

Align and secure walls at marriage line openings as follows:

1. **Align walls.** Align walls and clamp in place.
2. **Fasten walls.** Secure clamped walls together with metal straps or long screws so they do not move when the clamps are removed. Insert wood wedges in gaps between walls, and glue and screw to create a tight connection.
3. **Fill gaps.** Fill any remaining gaps with wood or sheathing material.

Does the home require patching and finishing gypsum board walls or ceilings?

- ▶ **YES,** go to **STEP 2. FINISH GYPSUM BOARD**, (p. 72)
- ▶ **NO,** go to **STEP 3. COMPLETE CARPET**, (p. 72)

STEP 2. FINISH GYPSUM BOARD

Finish all unfinished gypsum board walls and ceilings as follows:

1. **Install panels.** Install ship loose gypsum panels using a 1/4 inch diameter bead of polyvinyl acetate (PVA) adhesive on all framing members and minimum 1-1/2 inch long drywall screws, nails or staples at six inches o.c. along panel edges and 12 inches o.c. in the field into framing members. Adhesive is not required when installing gypsum pieces used for trim or close-up materials.
2. **Mud seams.** Mud and tape all seams and corners, filling all fastener depressions. Follow mud manufacturer's directions.
3. **Paint.** When the final coat of mud is dry, sand, prime and paint all unfinished gypsum board to match existing paint color and finish texture.

STEP 3. COMPLETE CARPET

Install and seam ship loose or rolled carpet as follows:

1. **Prepare floor.** Clean the floor of all dirt and debris and smooth the floor deck at the marriage line seams as necessary to ensure a level and smooth surface.
2. **Lay pad.** Lay down the carpet pad, if provided. Seal seams with pad tape. Staple pad to floor about 6 inches from the seam.
3. **Preparing carpet for cutting.** Do not release stay nails. Let the carpet sec-



Fastening gypsum. When attaching gypsum board, depress, but do not break the paper face with the fastener. Breaking the paper will weaken the connection.

Using alternative materials. Obtain the home manufacturer's approval before using interior finish materials other than those provided with the home.



Installing carpet. Only experienced carpet installers should install carpet. Failure to follow the carpet manufacturer's directions

tions overlap. Using NON STAINING CHALK, snap a line on the top edge across the length of the seam. Make sure the line overlaps both sides of the carpet.

4. **Making the guide cuts.** Make 1 inch long cuts through BOTH pieces of carpet every 2 feet.
5. **Making the seam cut.** Flip the carpet edges face down. Place a straight edge on the backing lined up with the guide cuts. Cut the carpet along this line. Repeat for each piece of carpet.
6. **Sealing the seam.** Using liquid latex carpet sealer or specifically designed hot glue sticks (for carpet sealing) apply a thin bead of the sealer to the raw edges of both sides of the carpet. Carpet seam sealers contain an ultraviolet marker that glows when exposed to a blacklight.
7. **Starting the seam.** Set the seaming iron to 2 or 3. Center the seaming tape under the pieces of carpet. Place the iron on the seaming tape. Leave it in place until the adhesive softens. When the adhesive has softened the iron will slide easily, but there will be no smoke.
8. **Completing the seam.** Slide the iron until its back edge slightly overlaps the place where its front edge was. Press the edges of the carpet together in the softened adhesive. Roll the Seam Tractor over the section to further press the backing into the adhesive. The Seam Tractor should be of the solid roller type, as a Star Wheeled Tractor can damage the hot carpet fibers. Place the NON-HEAT-CONDUCTIVE (plastic or wood) weight over the completed seam. Check the next section of the seaming tape to see that it has softened. If so, repeat this step until all seams have been completed. Continue moving the weight as you move.
9. **Blending the seam.** Roll the seam tractor slightly across the seam to blend the carpet fibers. Carpet should be cool before tractoring.
10. **Keep scraps.** Retain reasonable size carpet scraps to protect carpet and flooring during move-in.

STEP 4. COMPLETE TRIM

Using fine gauge wire staples or pin nails install ship loose molding and wainscot paneling to finish trimming out ceilings, marriage line walls, front and rear end walls and passageway doors where necessary.

STEP 5. INSTALL SHIP LOOSE ITEMS

Remove all strapping, blocking and packaging from appliances, windows and doors. Install any drapes, mini-blinds, mirrors, door stops, closet shelves and hardware per the product manufacturer's installation instructions.

Proceed based on the foundation type:

- ▶ Pier and ground anchor, go to Install Stabilizing Systems, (p. 74)
- ▶ Load bearing perimeter wall, go to Connect Utilities (p. 95).

may void the carpet warranty.



Stagger seams.

Stagger all seams. For example, locate the carpet pad seam three inches to left of marriage line and the carpet seam three inches to right of marriage line.



Carpet Manufacturers will not warranty their product if carpet seam sealer is not used at the seam.

Install Stabilizing Systems

This chapter covers the design and installation of the stabilizing system which secures the home against lateral and upward forces caused by wind. The system covered here uses earth (or ground) anchors and steel straps connected to the home's longitudinal steel beams and/or exterior walls. Stabilizer plates may also be used to prevent the anchor head from moving laterally in the ground. An anchor, strap and stabilizer plate (if used) together are referred to as a tie down.

Follow the Steps below:

- ▼ **STEP 1. DETERMINE ANCHOR LOCATIONS** (p. 74)
- ▼ **STEP 2. DETERMINE TIEDOWN CONFIGURATION** (p. 89)
- ▼ **STEP 3. SELECT ANCHORS** (p. 89)
- ▼ **STEP 4. INSTALL ANCHORS** (p. 90)
- ▼ **STEP 5. INSTALL STRAPS** (p. 91)
- ▼ **STEP 6. TIGHTEN AND ADJUST STRAPS** (p. 94)

STEP 1. DETERMINE ANCHOR LOCATIONS

Create a sketch of the home plan showing the exterior walls, marriage line(s) (if any) and frame I-beams (this will be similar to the base sketch created in **Install Footings**, page 20).

See **Table 17** for a list of anchor locations, types and where they are required. Page numbers where the requirements are provided are noted in the last column.

As each anchor location is determined, mark it on the sketch, noting important dimensions such as spacing between anchors. When complete, this will be the home's tie down plan **Figure 52** and **Figure 53**.

TABLE 17. ANCHOR LOCATION TYPES

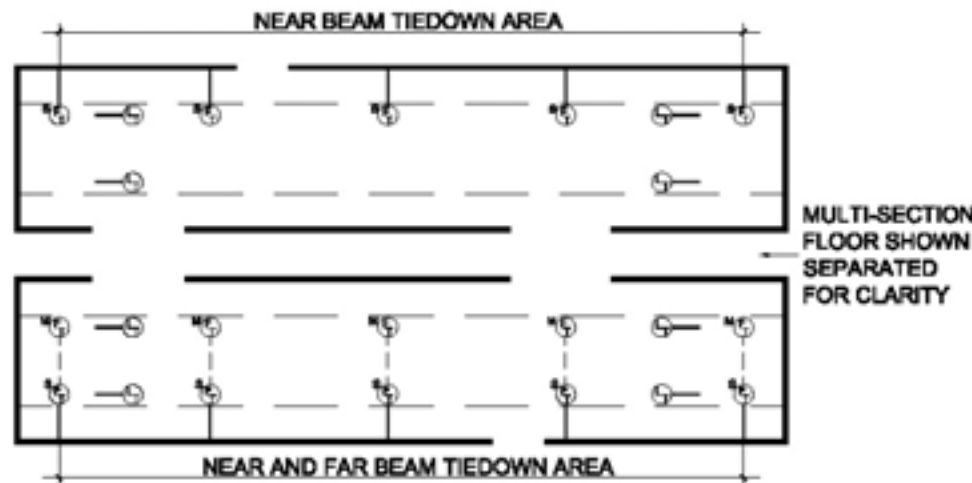
Location	Type	Wind Zone I	Wind Zones II and III	See page
Sidewall	Frame	Yes	Yes	75
	Vertical	No	Yes	87
Longitudinal	Frame	Yes	Yes	87
	Vertical	No	No	-
Marriage line	Vertical	No	Yes	89
Tag Unit	Frame	Yes	Yes	89
	Vertical	No	Yes	-
Porch Post	Vertical	Yes	Yes	89
Offset Unit		Yes	Yes	89

¹ Install marriage line anchors prior to moving the home over the top of the anchor locations and then return to Set the Home or Complete Multi Section Set respectively.



Need for a stabilizing system. The home must be secured against the wind by the use of an anchor assembly or an alternative foundation system. Where site or other conditions prohibit the use of the manufacturer's instructions, a registered engineer or registered architect must design the stabilizing system. Alternate foundation designs must be approved by the manufacturer and DAPIA. Refer to page 8 for directions for obtaining available approved designs.

Figure 52 and Figure 53 illustrate typical anchor locations for a double section home in Wind Zone I and Wind Zones II and III respectively.



FRAME TIEDOWNS MAY BE SECURED TO BOTH NEAR AND FAR BEAMS (WIND ZONE 1 ONLY) OR EITHER NEAR OR FAR BEAMS (WIND ZONE 2 AND 3) AS REQUIRED BY TABLES 18, 19 AND 20.

Flood and seismic forces.

The stabilizing system requirements in this chapter do not consider flood or seismic loads and are not intended for use in flood or seismic hazard areas. In those areas a registered engineer or registered architect must design the stabilizing system. Alternate foundation designs must be approved by the manufacturer and DAPIA.

Figure 52. Typical anchor locations for a double section home in Wind Zone I

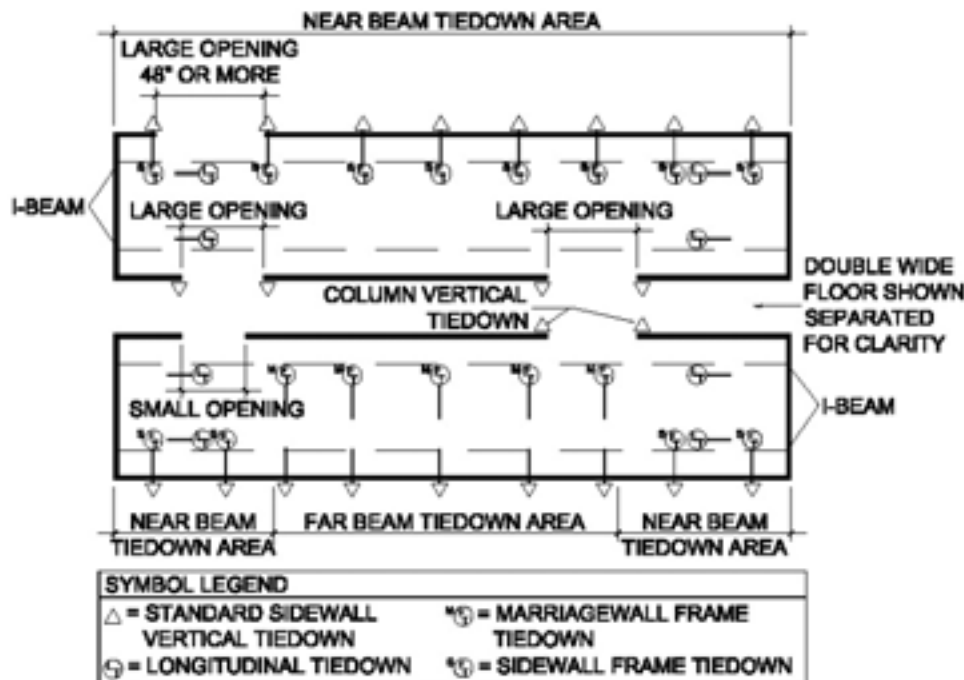


Figure 53. Typical anchor locations for a double section home in Wind Zones II or III

SIDEWALL FRAME ANCHORS

Use Tables 18, 19 and 20 to determine the spacing between anchors for Wind Zones I, II and III, respectively. Spacing requirements will vary depending on the type of home (single or multi-section), the slope of the roof, the width of the floor for each section, the sidewall height, I-beam spacing and the height from the ground to the strap attachment point. Determine the values for the home. Using the table for the appropriate wind zone, determine the column and row that corresponds to the characteristics of the home. The value on the tables is the maximum distance between anchors. **Keep in mind that sidewall frame tie downs must be located no more than two feet from each end of home.**



Maximum spacing requirements. The LAHJ may have anchor spacing requirements that supercede the values provided in this manual.

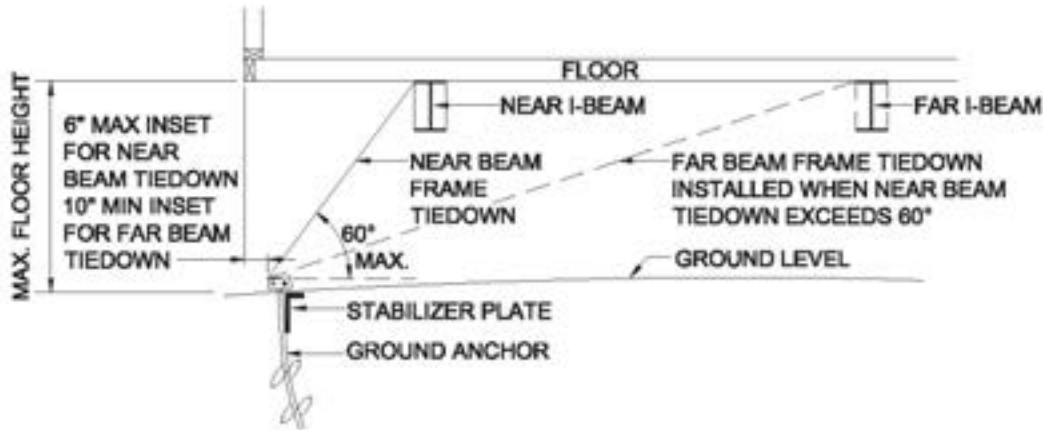
FRAME TIEDOWN SPACING

Wind Zone 1 Tiedown Spacing		Page No.
Table 18	Single Section Roof Pitch 4.36/12 Max.	78
Table 18a	Multi Section Roof Pitch 4.36/12 Max.	78
Table 18b	Triple Section Roof Pitch 4.36/12 Max.	79
Wind Zone 1 Tiedown Spacing – High Pitch Truss		
Table 18c	Multi Section Roof Pitch 5/12 Max.	79
Table 18d	Triple Section Roof Pitch 5/12 Max.	80
Table 18e	Multi Section Roof Pitch 6/12 Max.	80
Table 18f	Triple Section Roof Pitch 6/12 Max.	80
Table 18g	Multi Section Roof Pitch 7/12 Max.	81
Table 18h	Triple Section Roof Pitch 7/12 Max.	81
Wind Zone 2 Near I-Beam Tiedown Spacing		
Table 19	Single Section Roof Pitch 4.36/12 Max.	82
Table 19a	Multi Section Roof Pitch 4.36/12 Max.	82
Wind Zone 2 Far I-Beam Tiedown Spacing		
Table 19b	Single Section Roof Pitch 4.36/12 Max.	83
Table 19c	Multi Section Roof Pitch 4.36/12 Max.	83
Wind Zone 2 Near I-Beam Tiedown Spacing – High Pitch Truss		
Table 19d	Multi Section Roof Pitch 5/12 Max.	84
Wind Zone 2 Far I-Beam Tiedown Spacing – High Pitch Truss		
Table 19e	Multi Section Roof Pitch 5/12 Max.	84
Table 19f	Multi Section Roof Pitch 6/12 Max.	84
Table 19g	Multi Section Roof Pitch 7/12 Max.	85
Wind Zone 3 Near I-Beam Tiedown Spacing		
Table 20	Single Section Roof Pitch 4.36/12 Max.	85
Table 20a	Multi Section Roof Pitch 4.36/12 Max.	85
Wind Zone 3 Far I-Beam Tiedown Spacing		
Table 20b	Single Section Roof Pitch 4.36/12 Max.	86
Table 20c	Multi Section Roof Pitch 4.36/12 Max.	86

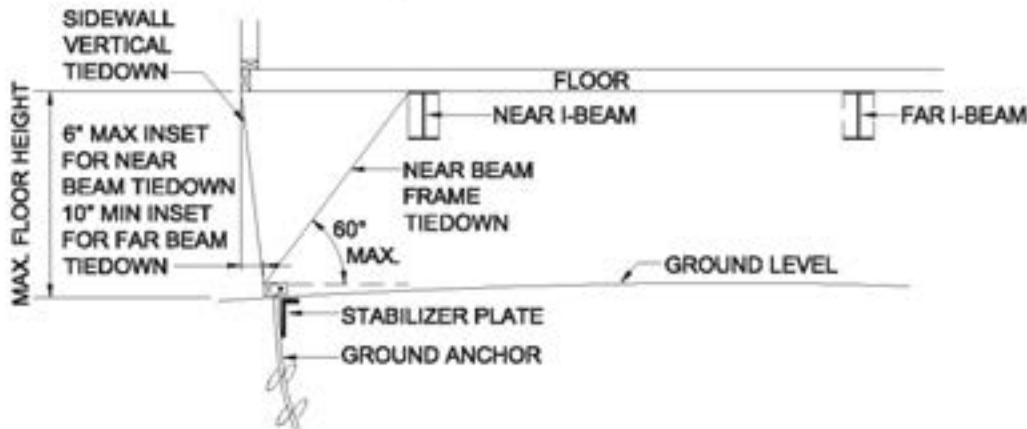
TIEDOWN LIMITATIONS AND SPECIFICATIONS

- Anchors shall be certified for site conditions including soil type for design capacity of 3150 lbs. with resistant pull load applied at a minimum 30 degree angle from horizontal.
- Anchors may be inset from the edge of the sidewall 6" maximum for a near beam set and 10" minimum for a far beam set.
- The floor widths listed in the following charts include the following ranges of widths:
 - 10 Wide = 120"
 - 12 Wide = 136" – 144"
 - 14 Wide = 156" – 168"
 - 16 Wide = 180" – 190"
 - 18 Wide = 204" – 210"
 - 20 Wide = 120"
 - 24 Wide = 136" – 144"
 - 28 Wide = 156" – 168"
 - 32 Wide = 178" – 186"
- The maximum overhang allowed for a single section is 6" and the maximum overhang allowed for a multi section is 24".
- The following frame tiedown charts list the maximum floor height measured from the top of the grade to the connection point of the tiedown strap to the I-beam. Cross reference the maximum allowable pier height (Table 9 and Table 12) with maximum allowable floor height listed in the frame tiedown charts. If maximum height listed in frame tiedown charts is exceeded, then designs must be provided by a registered professional engineer or registered architect.
- **Contact the manufacturer if the home you are attempting to set has a floor width, I-beam spacing, wall height or roof pitch that is not shown in any of the following charts (or listed as NA).**
- The " * " listed after any tiedown spacing signifies that a 60 degree angle has been exceeded and an additional strap must be added to the far beam.
- Ground anchors must not be spaced closer than the minimum spacing permitted by the listing or certification. Verify that sidewall vertical tiedown bracket spacing meets the requirements for Wind Zone 2 & 3 homes. Bracket spacing may be increased or additional brackets may be added as required.

Figures 54

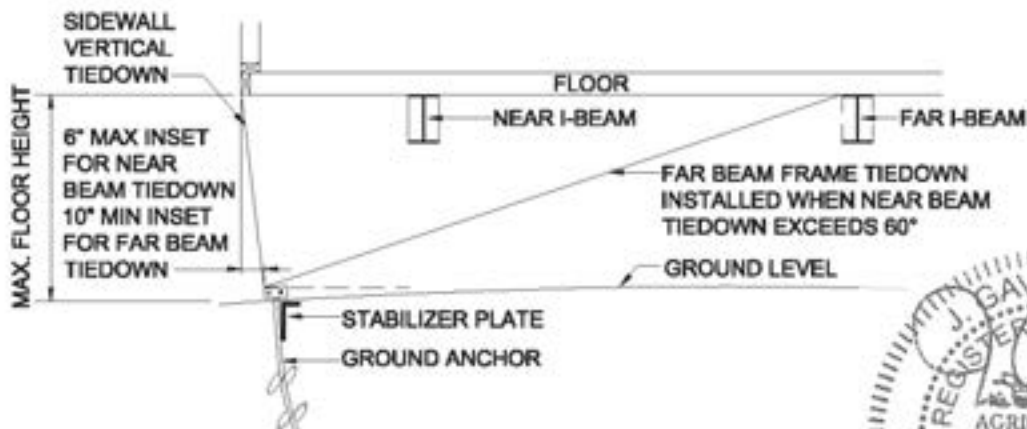


Wind Zone 1 Frame Tiedown: When the angle of the near beam frame tiedown strap exceeds 60 degrees the far beam frame tiedown strap is installed in addition to the near beam strap.



Wind Zone 2 & 3 Near Beam Frame Tiedown

When the angle of the near beam frame tiedown strap exceeds 60 degrees the tiedown strap must be installed to the far beam frame as shown below.



Wind Zone 2 & 3 Far Beam Frame Tiedown



TABLE 18. SINGLE SECTION - WIND ZONE 1 FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 4.36/12

Max. Wall Height	Max. Floor Height	10 ft Max. Width		12 ft Max. Width		14 ft Max. Width			16 ft Max. Width		18 ft Max. Width
		I-Beam Spacing		I-Beam Spacing		I-Beam Spacing			I-Beam Spacing		I-Beam Spacing
		95.5"	99.5"	95.5"	99.5"	95.5"	99.5"	112"	95.5"	99.5"	
7 ft	25"	6'-0"	4'-0"	12'-6"	11'-0"	12'-0"	12'-0"	12'-0"	12'-0"	12'-0"	
	48"	NA	NA	7'-0"	6'-0"	11'-8"	11'-0"	8'-4"	12'-0"	12'-0"	
	67"	NA	NA	NA	NA	6'-0"	5'-6"	4'-0"	8'-4"	8'-0"	6'-8"
	80"										9'-8"

Install Stabilizing Systems

TABLE 18b. MULTI SECTION - WIND ZONE 1 FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 4.36/12

Max. Wall Height	Max. Floor Height	36 ft Max. Width		42 ft Max. Width		48 ft Max. Width	
		I-Beam Spacing		I-Beam Spacing		I-Beam Spacing	
		95.5"-99.5"		95.5"-99.5"		95.5"-99.5"	
7 ft	25"	12'-0"		12'-0"		12'-0"	
	48"	12'-0"		12'-0"		12'-0"	
	67"	9'-4"		9'-0"		9'-0"	
	80"	9'-4"		9'-0"		9'-0"	
8 ft	25"	12'-0"		12'-0"		12'-0"	
	48"	12'-0"		12'-0"		12'-0"	
	67"	8'-4"		8'-0"		7'-8"	
	80"	8'-4"		8'-0"		8'-0"	
9 ft	25"	12'-0"		12'-0"		12'-0"	
	48"	12'-0"		12'-0"		12'-0"	
	67"	7'-6"		7'-4"		7'-4"	
	80"	7'-6"		7'-4"		7'-4"	
10 ft	25"	12'-0"		12'-0"		12'-0"	
	48"	12'-0"		12'-0"		12'-0"	
	67"	6'-8"		6'-8"		6'-8"	
	80"	6'-8"		6'-8"		6'-8"	

TABLE 18c. MULTI SECTION - WIND ZONE 1 FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 5/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width		24 ft Max. Width			28 ft Max. Width		32 ft Max. Width	
		I-Beam Spacing		I-Beam Spacing			I-Beam Spacing		I-Beam Spacing	
		79.5"	95.5"-99.5"	79.5"	95.5"-99.5"	112"	95.5"-99.5"	112"	95.5"-99.5"	112"
8 ft	25"	12'-0"	12'-0"	11'-0"	12'-0"	12'-0"	10'-4"	8'-0"	11'-8"	11'-4"
	48"	10'-8"	10'-0"	11'-6"	11'-0"	10'-8"	11'-8"	11'-8"	8'-4"	12'-0"
	67"	5'-8"	5'-0"	6'-0"	5'-8"	5'-6"	6'-4"	6'-0"	6'-6"	6'-6"
	80"	5'-0"	4'-6"	5'-6"	5'-0"	4'-8"	5'-8"	5'-6"	6'-0"	5'-8"
9 ft	25"	11'-4"	12'-0"	10'-0"	11'-0"	12'-0"	9'-0"	7'-4"	10'-6"	10'-0"
	48"	9'-8"	9'-0"	10'-4"	10'-0"	9'-8"	10'-8"	10'-6"	7'-6"	10'-8"
	67"	5'-4"	4'-8"	5'-8"	5'-6"	5'-0"	5'-8"	5'-8"	6'-0"	6'-0"
	80"	4'-8"	4'-0"	5'-0"	4'-8"	4'-6"	5'-8"	5'-0"	5'-8"	5'-6"
10 ft	25"	9'-0"	11'-0"	9'-0"	9'-0"	9'-8"	8'-4"	6'-8"	9'-8"	9'-4"
	48"	8'-8"	8'-4"	9'-6"	9'-0"	8'-8"	9'-4"	9'-6"	6'-8"	10'-0"
	67"	5'-0"	4'-6"	5'-4"	5'-0"	4'-8"	5'-6"	5'-4"	5'-8"	5'-8"
	80"	4'-4"	4'-0"	4'-8"	4'-6"	4'-4"	5'-0"	4'-8"	5'-4"	5'-0"

The " " listed after an additional strap must be added to the far beam.

The " " listed after an additional strap must be added to the far beam.



TABLE 18b. MULTI SECTION - WIND ZONE 1 FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 4.36/12

Max. Wall Height	Max. Floor Height	36 ft Max. Width I-Beam Spacing 95.5"-99.5"	42 ft Max. Width I-Beam Spacing 95.5"-99.5"	48 ft Max. Width I-Beam Spacing 95.5"-99.5"
7 ft	25"	12'-0"	12'-0"	12'-0"
	48"	12'-0"	12'-0"	12'-0"
	67"	9'-4"	9'-0"	9'-0"
	80"	9'-4"	9'-0"	9'-0"
8 ft	25"	12'-0"	12'-0"	12'-0"
	48"	12'-0"	12'-0"	12'-0"
	67"	8'-4"	8'-0"	7'-8"
	80"	8'-4"	8'-0"	8'-0"
9 ft	25"	12'-0"	12'-0"	12'-0"
	48"	12'-0"	12'-0"	12'-0"
	67"	7'-6"	7'-4"	7'-4"
	80"	7'-6"	7'-4"	7'-4"
10 ft	25"	12'-0"	12'-0"	12'-0"
	48"	12'-0"	12'-0"	12'-0"
	67"	6'-8"	6'-8"	6'-8"
	80"	6'-8"	6'-8"	6'-8"

TABLE 18c. MULTI SECTION - WIND ZONE 1 FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 5/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width I-Beam Spacing		24 ft Max. Width I-Beam Spacing			28 ft Max. Width I-Beam Spacing		32 ft Max. Width I-Beam Spacing	
		79.5"	95.5"-99.5"	79.5"	95.5"-99.5"	112"	95.5"-99.5"	112"	95.5"-99.5"	112"
8 ft	25"	12'-0"	12'-0"	11'-0"	12'-0"	12'-0"	10'-4"	8'-0"	11'-8"	11'-4"
	48"	10'-8"	10'-0"	11'-6"	11'-0"	10'-8"	11'-8"	11'-8"	8'-4"	12'-0"
	67"	5'-8"	5'-0"	6'-0"	5'-8"	5'-6"	6'-4"	6'-0"	6'-6"	6'-6"
	80"	5'-0"	4'-6"	5'-6"	5'-0"	4'-8"	5'-8"	5'-6"	6'-0"	5'-8"
9 ft	25"	11'-4"	12'-0"	10'-0"	11'-0"	12'-0"	9'-0"	7'-4"	10'-6"	10'-0"
	48"	9'-8"	9'-0"	10'-4"	10'-0"	9'-8"	10'-8"	10'-6"	7'-6"	10'-8"
	67"	5'-4"	4'-8"	5'-8"	5'-6"	5'-0"	5'-8"	5'-8"	6'-0"	6'-0"
	80"	4'-8"	4'-0"	5'-0"	4'-8"	4'-6"	5'-4"	5'-0"	5'-8"	5'-6"
10 ft	25"	9'-0"	11'-0"	9'-0"	9'-0"	9'-8"	8'-4"	6'-8"	9'-8"	9'-4"
	48"	8'-8"	8'-4"	9'-6"	9'-0"	8'-8"	9'-4"	9'-6"	6'-8"	10'-0"
	67"	5'-0"	4'-6"	5'-4"	5'-0"	4'-8"	5'-6"	5'-4"	5'-8"	5'-8"
	80"	4'-4"	4'-0"	4'-8"	4'-6"	4'-4"	5'-0"	4'-8"	5'-4"	5'-0"



The "*" listed after any tiedown spacing signifies that a 60 degree angle has been exceeded and an additional strap must be added to the far beam.

TABLE 18d. MULTI SECTION - WIND ZONE 1 FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 5/12

Max. Wall Height	Max. Floor Height	36 ft Max. Width I-Beam Spacing 95.5"-99.5"	42 ft Max. Width I-Beam Spacing 95.5"-99.5"	48 ft Max. Width I-Beam Spacing 95.5"-99.5"
8 ft	25"	12'-0"	10'-0"	11'-6"
	48"	11'-8"	12'-0"	8'-0"
	67"	5'-4"	5'-6"	5'-8"
	80"	4'-8"	5'-0"	5'-0"
9 ft	25"	12'-0"	9'-0"	10'-4"
	48"	10'-8"	11'-0"	7'-4"
	67"	5'-0"	5'-4"	5'-4"
	80"	4'-6"	4'-8"	4'-8"
10 ft	25"	11'-8"	8'-0"	9'-6"
	48"	9'-8"	10'-0"	6'-8"
	67"	4'-8"	5'-0"	5'-0"
	80"	4'-0"	4'-6"	4'-8"

TABLE 18e. MULTI SECTION - WIND ZONE 1 FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 6/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width I-Beam Spacing		24 ft Max. Width I-Beam Spacing		28 ft Max. Width I-Beam Spacing	32 ft Max. Width I-Beam Spacing
		79.5"	95.5"-99.5"	79.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"
8 ft	25"	11'-8"	12'-0"	10'-0"	11'-4"	9'-0"	10'-4"
	48"	9'-8"	9'-4"	10'-6"	10'-0"	10'-8"	7'-4"
	67"	5'-4"	4'-4"	5'-8"	5'-6"	5'-8"	6'-0"
	80"	4'-8"	4'-4"	5'-0"	4'-8"	5'-4"	5'-6"
9 ft	25"	9'-6"	11'-0"	9'-0"	9'-4"	8'-0"	9'-6"
	48"	9'-0"	8'-4"	9'-6"	9'-0"	9'-8"	6'-8"
	67"	5'-0"	4'-5"	5'-4"	5'-0"	5'-6"	5'-8"
	80"	4'-4"	4'-0"	4'-8"	4'-8"	5'-0"	5'-0"
10 ft	25"	7'-8"	9'-6"	8'-4"	7'-8"	7'-6"	8'-8"
	48"	8'-8"	7'-8"	8'-8"	8'-4"	8'-8"	6'-0"
	67"	4'-8"	4'-4"	5'-0"	4'-8"	5'-0"	5'-6"
	80"	4'-0"	NA	4'-6"	4'-6"	4'-8"	5'-0"

TABLE 18f. MULTI SECTION - WIND ZONE 1 FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 6/12

Max. Wall Height	Max. Floor Height	36 ft Max. Width I-Beam Spacing 95.5"-99.5"	42 ft Max. Width I-Beam Spacing 95.5"-99.5"	48 ft Max. Width I-Beam Spacing 95.5"-99.5"
8 ft	25"	12'-0"	8'-4"	9'-8"
	48"	10'-0"	10'-0"	6'-8"
	67"	4'-8"	5'-0"	5'-0"
	80"	4'-4"	4'-6"	4'-8"
9 ft	25"	11'-0"	7'-8"	8'-8"
	48"	9'-4"	9'-6"	6'-4"
	67"	4'-8"	4'-8"	4'-8"
	80"	4'-0"	4'-4"	4'-6"
10 ft	25"	10'-4"	7'-0"	8'-0"
	48"	8'-6"	8'-8"	5'-8"
	67"	4'-4"	4'-8"	4'-8"
	80"	4'-0"	4'-0"	4'-4"



The "*" listed after any tiedown spacing signifies that a 60 degree angle has been exceeded and an additional strap must be added to the far beam.

TABLE 18g. MULTI SECTION - WIND ZONE 1 FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 7/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width I-Beam Spacing		24 ft Max. Width I-Beam Spacing		28 ft Max. Width I-Beam Spacing		32 ft Max. Width I-Beam Spacing	
		79.5"	95.5"-99.5"	79.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"
8 ft	25"	9'-8"	11'-4"	9'-0"	9'-6"	8'-0"		9'-4"	
	48"	9'-0"	8'-6"	9'-6"	9'-0"	9'-6"		6'-8"	
	67"	5'-0"	4'-8"	5'-4"	5'-0"	5'-6"		5'-8"	
	80"	4'-6"	4'-0"	4'-8"	4'-6"	5'-0"		5'-0"	
9 ft	25"	8'-0"	9'-8"	8'-4"	7'-8"	7'-6"		8'-6"	
	48"	8'-4"	7'-8"	8'-8"	8'-6"	8'-8"		6'-0"	
	67"	4'-8"	4'-4"	5'-0"	4'-8"	5'-0"		5'-4"	
	80"	4'-0"	NA	4'-6"	4'-0"	4'-8"		4'-8"	
10 ft	25"	6'-8"	8'-0"	7'-8"	6'-8"	7'-0"		8'-0"	
	48"	7'-8"	7'-0"	8'-0"	7'-8"	8'-0"		5'-8"	
	67"	4'-6"	4'-0"	4'-8"	4'-6"	4'-8"		5'-0"	
	80"	NA	NA	4'-4"	4'-0"	4'-4"		4'-8"	

TABLE 18h. MULTI SECTION - WIND ZONE 1 FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 7/12

Max. Wall Height	Max. Floor Height	36 ft Max. Width I-Beam Spacing		42 ft Max. Width I-Beam Spacing		48 ft Max. Width I-Beam Spacing	
		95.5"-99.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"
8 ft	25"	10'-8"		7'-4"		8'-4"	
	48"	9'-0"		9'-0"		5'-8"	
	67"	4'-6"		4'-8"		4'-8"	
	80"	4'-0"		4'-0"		4'-4"	
9 ft	25"	10'-0"		6'-8"		7'-8"	
	48"	8'-0"		8'-4"		5'-6"	
	67"	4'-4"		4'-6"		4'-6"	
	80"	NA		4'-0"		4'-0"	
10 ft	25"	9'-0"		6'-4"		7'-0"	
	48"	7'-8"		7'-8"		5'-0"	
	67"	4'-0"		4'-4"		4'-4"	
	80"	NA		NA		4'-0"	



The "*" listed after any tiedown spacing signifies that a 60 degree angle has been exceeded and an additional strap must be added to the far beam.

TABLE 19. SINGLE SECTION - WIND ZONE 2 NEAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 4.36/12

Max. Wall Height	Max. Floor Height	10 ft Max. Width I-Beam Spacing		12 ft Max. Width I-Beam Spacing		14 ft Max. Width I-Beam Spacing		16 ft Max. Width I-Beam Spacing		18 ft Max. Width I-Beam Spacing
		79.5"	95.5"-99.5"	95.5"	99.5"	95.5"	99.5"	95.5"	99.5"	99.5"
7 ft	25"	NA	NA	4'-4"	4'-0"	6'-8"	7'-0"	8'-0"	8'-0"	8'-0"
	48"	NA	NA	NA	NA	4'-0"	4'-6"	6'-0"	5'-8"	7'-0"
	67"	NA	NA	NA	NA	NA	NA	4'-8"	4'-6"	5'-8"
	80"	NA	NA	NA	NA	NA	NA	NA	NA	5'-0"
8 ft	25"	NA	NA	NA	NA	6'-0"	6'-0"	7'-0"	7'-0"	7'-0"
	48"	NA	NA	NA	NA	4'-0"	4'-0"	5'-4"	5'-0"	6'-0"
	67"	NA	NA	NA	NA	NA	NA	4'-0"	4'-0"	5'-0"
	80"	NA	NA	NA	NA	NA	NA	NA	NA	4'-6"
9 ft	25"	NA	NA	NA	NA	5'-8"	5'-4"	6'-0"	6'-0"	6'-4"
	48"	NA	NA	NA	NA	NA	NA	4'-8"	4'-8"	5'-6"
	67"	NA	NA	NA	NA	NA	NA	4'-0"	NA	4'-6"
	80"	NA	NA	NA	NA	NA	NA	NA	NA	4'-0"
10 ft	25"	NA	NA	NA	NA	5'-0"	4'-8"	5'-6"	5'-6"	5'-8"
	48"	NA	NA	NA	NA	NA	NA	4'-4"	4'-4"	5'-0"
	67"	NA	NA	NA	NA	NA	NA	NA	NA	4'-0"
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 19a. MULTI SECTION - WIND ZONE 2 NEAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 4.36/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width I-Beam Spacing		24 ft Max. Width I-Beam Spacing			28 ft Max. Width I-Beam Spacing		32 ft Max. Width I-Beam Spacing	
		79.5"	95.5"-99.5"	79.5"	95.5"	99.5"	95.5"	99.5"	95.5"	99.5"
7 ft	25"	5'-0"	NA	6'-8"	5'-0"	4'-4"	7'-0"	6'-8"	7'-8"	7'-8"
	48"	NA	NA	4'-0"	NA	NA	4'-6"	4'-0"	6'-4"	5'-8"
	67"	NA	NA	NA	NA	NA	NA	NA	5'-0"	4'-6"
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA
8 ft	25"	4'-4"	NA	6'-0"	4'-4"	NA	6'-4"	6'-0"	7'-0"	7'-0"
	48"	NA	NA	NA	NA	NA	4'-0"	NA	5'-4"	5'-0"
	67"	NA	NA	NA	NA	NA	NA	NA	4'-0"	4'-0"
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA
9 ft	25"	4'-0"	NA	5'-4"	4'-0"	NA	5'-8"	5'-4"	6'-6"	6'-6"
	48"	NA	NA	NA	NA	NA	NA	NA	4'-8"	4'-6"
	67"	NA	NA	NA	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA
10 ft	25"	NA	NA	4'-8"	NA	NA	5'-0"	4'-8"	6'-0"	5'-8"
	48"	NA	NA	NA	NA	NA	NA	NA	4'-4"	4'-0"
	67"	NA	NA	NA	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA



TABLE 19b. SINGLE SECTION - WIND ZONE 2 FAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 4.36/12

Max. Wall Height	Max. Floor Height	10 ft Max. Width I-Beam Spacing		12 ft Max. Width I-Beam Spacing	14 ft Max. Width I-Beam Spacing	16 ft Max. Width I-Beam Spacing	18 ft Max. Width I-Beam Spacing
		79.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"	99.5"
7 ft	25"	5'-8"	5'-8"	5'-8"	6'-0"	6'-0"	6'-0"
	48"	5'-8"	5'-8"	5'-8"	6'-0"	6'-0"	6'-0"
	67"	5'-6"	5'-8"	5'-8"	6'-0"	6'-0"	6'-0"
	80"	5'-6"	5'-8"	5'-8"	6'-0"	6'-0"	6'-0"
8 ft	25"	4'-8"	4'-8"	4'-8"	5'-0"	5'-0"	5'-4"
	48"	4'-8"	4'-8"	4'-8"	5'-0"	5'-0"	5'-4"
	67"	4'-8"	4'-8"	4'-8"	5'-0"	5'-0"	5'-4"
	80"	4'-6"	4'-8"	4'-8"	5'-0"	5'-0"	5'-4"
9 ft	25"	4'-0"	4'-0"	4'-0"	4'-4"	4'-6"	4'-8"
	48"	4'-0"	4'-0"	4'-0"	4'-4"	4'-6"	4'-8"
	67"	4'-0"	4'-0"	4'-0"	4'-4"	4'-6"	4'-8"
	80"	NA	4'-0"	4'-0"	4'-4"	4'-6"	4'-8"
10 ft	25"	NA	NA	NA	NA	NA	4'-0"
	48"	NA	NA	NA	NA	NA	4'-0"
	67"	NA	NA	NA	NA	NA	4'-0"
	80"	NA	NA	NA	NA	NA	4'-0"

TABLE 19c. MULTI SECTION - WIND ZONE 2 FAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 4.36/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width I-Beam Spacing		24 ft Max. Width I-Beam Spacing		28 ft Max. Width I-Beam Spacing	32 ft Max. Width I-Beam Spacing
		79.5"	95.5"-99.5"	79.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"
7 ft	25"	8'-4"	8'-0"	7'-6"	7'-0"	6'-0"	5'-8"
	48"	7'-8"	7'-8"	7'-8"	7'-8"	7'-8"	6'-8"
	67"	7'-6"	7'-6"	7'-6"	7'-6"	7'-6"	7'-4"
	80"	7'-4"	7'-4"	7'-4"	7'-4"	7'-4"	7'-0"
8 ft	25"	7'-6"	7'-4"	7'-0"	6'-6"	5'-8"	5'-6"
	48"	7'-0"	7'-0"	7'-0"	7'-0"	7'-0"	6'-8"
	67"	6'-8"	6'-8"	6'-8"	6'-8"	6'-8"	6'-8"
	80"	6'-6"	6'-6"	6'-6"	6'-8"	6'-8"	6'-6"
9 ft	25"	6'-8"	6'-8"	6'-6"	6'-0"	5'-6"	5'-0"
	48"	6'-4"	6'-4"	6'-4"	6'-4"	6'-4"	6'-4"
	67"	6'-0"	6'-0"	6'-0"	6'-0"	6'-0"	6'-0"
	80"	5'-8"	5'-8"	6'-0"	6'-0"	6'-0"	6'-0"
10 ft	25"	6'-0"	6'-0"	6'-0"	5'-8"	5'-0"	5'-0"
	48"	5'-8"	5'-8"	5'-8"	5'-8"	5'-6"	5'-8"
	67"	5'-6"	5'-6"	5'-6"	5'-8"	5'-8"	5'-8"
	80"	5'-4"	5'-4"	5'-4"	5'-6"	5'-6"	5'-6"



TABLE 19d. MULTI SECTION - WIND ZONE 2 NEAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 5/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width I-Beam Spacing		24 ft Max. Width I-Beam Spacing		28 ft Max. Width I-Beam Spacing		32 ft Max. Width I-Beam Spacing	
		79.5"	95.5"-99.5"	95.5"	99.5"	95.5"	99.5"	95.5"	99.5"
8 ft	25"	NA	NA	NA	NA	NA	NA	4'-0"	4'-0"
	48"	NA	NA	NA	NA	NA	NA	NA	NA
	67"	NA	NA	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA	NA	NA
9 ft	25"	NA	NA	NA	NA	NA	NA	NA	NA
	48"	NA	NA	NA	NA	NA	NA	NA	NA
	67"	NA	NA	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA	NA	NA
10 ft	25"	NA	NA	NA	NA	NA	NA	NA	NA
	48"	NA	NA	NA	NA	NA	NA	NA	NA
	67"	NA	NA	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 19e. MULTI SECTION - WIND ZONE 2 FAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 5/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width I-Beam Spacing		24 ft Max. Width I-Beam Spacing		28 ft Max. Width I-Beam Spacing		32 ft Max. Width I-Beam Spacing	
		79.5"-99.5"		95.5"-99.5"		95.5"-99.5"		95.5"-99.5"	
8 ft	25"	4'-8"		4'-4"		4'-0"		NA	
	48"	4'-8"		4'-6"		4'-0"		4'-0"	
	67"	4'-4"		4'-4"		4'-0"		4'-0"	
	80"	4'-4"		4'-0"		4'-0"		NA	
9 ft	25"	4'-0"		4'-0"		NA		NA	
	48"	4'-4"		4'-0"		4'-0"		NA	
	67"	4'-0"		4'-0"		NA		NA	
	80"	4'-0"		NA		NA		NA	
10 ft	25"	NA		NA		NA		NA	
	48"	4'-0"		NA		NA		NA	
	67"	NA		NA		NA		NA	
	80"	NA		NA		NA		NA	

TABLE 19f. MULTI SECTION - WIND ZONE 2 FAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 6/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width I-Beam Spacing		24 ft Max. Width I-Beam Spacing		28 ft Max. Width I-Beam Spacing		32 ft Max. Width I-Beam Spacing	
		79.5"-99.5"		95.5"-99.5"		95.5"-99.5"		95.5"-99.5"	
8 ft	25"	4'-4"		4'-0"		NA		NA	
	48"	4'-4"		4'-0"		4'-0"		NA	
	67"	4'-0"		4'-0"		NA		NA	
	80"	4'-0"		NA		NA		NA	
9 ft	25"	NA		NA		NA		NA	
	48"	4'-0"		NA		NA		NA	
	67"	NA		NA		NA		NA	
	80"	NA		NA		NA		NA	





TABLE 19g. MULTI SECTION - WIND ZONE 2 FAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 7/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width I-Beam Spacing 79.5"-99.5"	24 ft Max. Width I-Beam Spacing 95.5"-99.5"	28 ft Max. Width I-Beam Spacing 95.5"-99.5"	32 ft Max. Width I-Beam Spacing 95.5"-99.5"
8 ft	25"	4'-0"	NA	NA	NA
	48"	4'-0"	NA	NA	NA
	67"	NA	NA	NA	NA
	80"	NA	NA	NA	NA

TABLE 20. SINGLE SECTION - WIND ZONE 3 NEAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 4.36/12

Max. Wall Height	Max. Floor Height	10 ft Max. Width I-Beam Spacing		12 ft Max. Width I-Beam Spacing		14 ft Max. Width I-Beam Spacing		16 ft Max. Width I-Beam Spacing		18 ft Max. Width I-Beam Spacing
		79.5"	95.5"-99.5"	95.5"	99.5"	95.5"	99.5"	95.5"	99.5"	99.5"
7 ft	25"	NA	NA	4'-0"	NA	5'-8"	5'-6"	6'-6"	6'-6"	6'-6"
	48"	NA	NA	NA	NA	NA	NA	5'-0"	4'-8"	5'-8"
	67"	NA	NA	NA	NA	NA	NA	4'-0"	NA	4'-8"
	80"	NA	NA	NA	NA	NA	NA	NA	NA	4'-0"
8 ft	25"	NA	NA	NA	NA	5'-0"	5'-0"	5'-8"	5'-8"	5'-8"
	48"	NA	NA	NA	NA	NA	NA	4'-6"	4'-4"	5'-0"
	67"	NA	NA	NA	NA	NA	NA	NA	NA	4'-0"
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA
9 ft	25"	NA	NA	NA	NA	4'-8"	4'-6"	5'-0"	5'-0"	5'-0"
	48"	NA	NA	NA	NA	NA	NA	4'-0"	4'-0"	4'-8"
	67"	NA	NA	NA	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA
10 ft	25"	NA	NA	NA	NA	4'-0"	4'-0"	4'-6"	4'-6"	4'-8"
	48"	NA	NA	NA	NA	NA	NA	NA	NA	4'-0"
	67"	NA	NA	NA	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 20a. MULTI SECTION - WIND ZONE 3 NEAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 4.36/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width I-Beam Spacing		24 ft Max. Width I-Beam Spacing			28 ft Max. Width I-Beam Spacing		32 ft Max. Width I-Beam Spacing	
		79.5"	95.5"-99.5"	79.5"	95.5"	99.5"	95.5"	99.5"	95.5"	99.5"
7 ft	25"	4'-0"	NA	5'-6"	4'-0"	NA	5'-8"	5'-6"	6'-4"	6'-0"
	48"	NA	NA	NA	NA	NA	NA	NA	5'-0"	4'-8"
	67"	NA	NA	NA	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA
8 ft	25"	NA	NA	5'-0"	NA	NA	5'-0"	5'-0"	5'-8"	5'-8"
	48"	NA	NA	NA	NA	NA	NA	NA	4'-4"	4'-0"
	67"	NA	NA	NA	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA
9 ft	25"	NA	NA	4'-6"	NA	NA	4'-8"	4'-6"	5'-0"	5'-0"
	48"	NA	NA	NA	NA	NA	NA	NA	4'-0"	4'-0"
	67"	NA	NA	NA	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA
10 ft	25"	NA	NA	4'-0"	NA	NA	4'-0"	4'-0"	4'-8"	4'-8"
	48"	NA	NA	NA	NA	NA	NA	NA	NA	NA
	67"	NA	NA	NA	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 20b. SINGLE SECTION - WIND ZONE 3 FAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 4.36/12

Max. Wall Height	Max. Floor Height	10 ft Max. Width I-Beam Spacing		12 ft Max. Width I-Beam Spacing	14 ft Max. Width I-Beam Spacing	16 ft Max. Width I-Beam Spacing	18 ft Max. Width I-Beam Spacing
		79.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"	99.5"
7 ft	25"	4'-0"	4'-4"	4'-6"	4'-8"	4'-8"	4'-8"
	48"	4'-0"	4'-4"	4'-6"	4'-8"	4'-8"	4'-8"
	67"	4'-0"	4'-4"	4'-6"	4'-8"	4'-8"	4'-8"
	80"	4'-0"	4'-4"	4'-6"	4'-8"	4'-8"	4'-8"
8 ft	25"	NA	NA	NA	4'-0"	4'-0"	4'-0"
	48"	NA	NA	NA	4'-0"	4'-0"	4'-0"
	67"	NA	NA	NA	4'-0"	4'-0"	4'-0"
	80"	NA	NA	NA	4'-0"	4'-0"	4'-0"
9 ft	25"	NA	NA	NA	NA	NA	NA
	48"	NA	NA	NA	NA	NA	NA
	67"	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA
10 ft	25"	NA	NA	NA	NA	NA	NA
	48"	NA	NA	NA	NA	NA	NA
	67"	NA	NA	NA	NA	NA	NA
	80"	NA	NA	NA	NA	NA	NA

TABLE 20c. MULTI SECTION - WIND ZONE 3 FAR I-BEAM FRAME TIEDOWN SPACING (FT) - MAX. ROOF PITCH 4.36/12

Max. Wall Height	Max. Floor Height	20 ft Max. Width I-Beam Spacing		24 ft Max. Width I-Beam Spacing		28 ft Max. Width I-Beam Spacing	32 ft Max. Width I-Beam Spacing
		79.5"	95.5"-99.5"	79.5"	95.5"-99.5"	95.5"-99.5"	95.5"-99.5"
7 ft	25"	5'-8"	4'-8"	5'-0"	4'-8"	4'-4"	4'-0"
	48"	6'-0"	6'-0"	6'-0"	6'-0"	5'-0"	4'-8"
	67"	6'-0"	6'-0"	6'-0"	6'-0"	5'-8"	5'-4"
	80"	5'-8"	5'-8"	5'-8"	5'-8"	5'-8"	5'-8"
8 ft	25"	5'-4"	4'-6"	4'-8"	4'-6"	4'-0"	NA
	48"	5'-8"	5'-8"	5'-8"	5'-8"	5'-0"	4'-6"
	67"	5'-4"	5'-4"	5'-4"	5'-4"	5'-4"	5'-4"
	80"	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"
9 ft	25"	4'-8"	4'-4"	4'-6"	4'-4"	NA	NA
	48"	5'-0"	5'-0"	5'-0"	5'-0"	4'-8"	4'-4"
	67"	4'-8"	4'-8"	4'-8"	4'-8"	4'-8"	4'-8"
	80"	4'-8"	4'-8"	4'-8"	4'-8"	4'-8"	4'-8"
10 ft	25"	4'-6"	4'-0"	4'-0"	4'-0"	NA	NA
	48"	4'-8"	4'-8"	4'-8"	4'-8"	4'-6"	4'-0"
	67"	4'-4"	4'-6"	4'-6"	4'-6"	4'-6"	4'-6"
	80"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"



SIDEWALL VERTICAL ANCHORS

Homes designed for Wind Zones II and III also require vertical tie downs along the sidewalls (Figure 63). The vertical tie down brackets will be factory installed. Vertical and frame sidewall tie downs may connect to one double-headed anchor or each to its own dedicated anchor per the spacing requirements listed in Tables 19 and 20. If additional brackets are required to be added or existing brackets are required to be relocated due to interferences or site conditions, install Mastercraft #5705 or steel angle brackets and straps as shown in Figure 63.

LONGITUDINAL FRAME ANCHORS

Use Table 21 to determine the number of longitudinal frame anchors required at each end of the home. The longitudinal frame anchors may be factory installed, site installed or connected to a crossmember within 3" of the main I-beam.

NOTE:

Friction is assumed to contribute to the resistance in the longitudinal direction when piers are no more than 64" high. Friction from a single block pier is assumed for piers less than 44" high. Friction from a double block pier is assumed for piers between 44" and 64" high.



TABLE 21. WIND ZONE 1 LONGITUDINAL FRAME TIEDOWN QUANTITIES (QUANTITY EACH END OF HOME)

Max. Roof Pitch	Max. Pier Height	Single Section (18 ft Max. Floor Width)								Multi Section (32 ft Max. Floor Width)								Triple Section (48 ft Max. Floor Width)							
		Minimum Unit Lengths								Minimum Unit Lengths								Minimum Unit Lengths							
		36'	42'	48'	54'	60'	66'	72'	80'	36'	42'	48'	54'	60'	66'	72'	80'	36'	42'	48'	54'	60'	66'	72'	80'
4.36	24"	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3	2	1	0	0	0	0	0
	36"	1	1	1	1	1	0	0	0	3	2	2	1	1	1	0	0	4	4	3	3	2	2	1	1
	44"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	52"	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0
	64"	1	1	1	1	0	0	0	0	2	2	1	1	1	0	0	0	4	3	3	2	1	1	0	0
7	24"									3	2	1	0	0	0	0	0	4	3	2	1	1	0	0	0
	36"									4	3	2	2	2	1	1	1	6	5	4	4	3	3	2	2
	44"									2	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0
	52"									2	1	0	0	0	0	0	0	3	2	1	0	0	0	0	0
	64"									3	2	2	2	1	1	0	0	5	4	4	3	3	2	1	1

PIER HEIGHT GREATER THAN 64" - WIND ZONE 1 LONGITUDINAL FRAME TIEDOWN QUANTITIES (QUANTITY EACH END OF HOME)

Max. Wall Height	Max. Roof Pitch	Max. Home Width										
		Single Section					Multi Section				Triple	
		10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	24 ft	28 ft	32 ft	36 ft	48 ft
7 ft	4.36	1	2	2	2	2	3	3	4	4	5	6
7.5 ft	4.36	1	2	2	2	2	3	3	4	4	5	7
8 ft	4.36	2	2	2	2	2	3	3	4	4	5	7
	5	NA	NA	NA	NA	NA	3	3	4	4	5	7
	6	NA	NA	NA	NA	NA	3	3	4	5	5	8
	7	NA	NA	NA	NA	NA	3	4	4	5	6	8
9 ft	4.36	2	2	2	2	3	3	3	4	5	5	7
	5	NA	NA	NA	NA	NA	3	4	4	5	6	8
	6	NA	NA	NA	NA	NA	3	4	4	5	6	8
	7	NA	NA	NA	NA	NA	3	4	5	5	6	9
10 ft	4.36	2	2	2	3	3	3	4	4	5	6	8
	5	NA	NA	NA	NA	NA	3	4	4	5	6	8
	6	NA	NA	NA	NA	NA	3	4	5	5	6	9
	7	NA	NA	NA	NA	NA	3	4	5	6	6	9

TABLE 22. WIND ZONE 2 LONGITUDINAL FRAME TIEDOWN QUANTITIES (EACH END OF HOME)

Max. Wall Height	Max. Roof Pitch	Max. Home Width										
		Single Section					Multi Section				Triple	
		10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	24 ft	28 ft	32 ft	36 ft	48 ft
7 ft	3	2	2	3	3	3	4	5	5	6	8	9
	4.36	2	2	3	3	3	4	5	6	7	9	10
7.5 ft	3	2	2	3	3	3	4	5	6	6	9	10
	4.36	2	3	3	3	4	4	5	6	7	9	11
8 ft	3	2	3	3	3	4	4	5	6	7	9	10
	4.36	2	3	3	3	4	4	5	6	7	10	11
	5	NA	NA	NA	NA	NA	4	5	6	7	10	12
	6	NA	NA	NA	NA	NA	5	6	7	8	11	12
	7	NA	NA	NA	NA	NA	5	6	7	8	12	13
9 ft	3	2	3	3	4	4	4	5	6	7	10	11
	4.36	2	3	3	4	4	5	6	7	8	11	12
	5	NA	NA	NA	NA	NA	5	6	7	8	11	13
	6	NA	NA	NA	NA	NA	5	6	7	8	12	13
	7	NA	NA	NA	NA	NA	5	6	7	9	12	14
10 ft	3	3	3	3	4	4	5	6	7	8	10	12
	4.36	3	3	4	4	4	5	6	7	8	11	13
	5	NA	NA	NA	NA	NA	5	6	7	9	12	13
	6	NA	NA	NA	NA	NA	5	6	8	9	12	14
	7	NA	NA	NA	NA	NA	5	7	8	9	13	15

TABLE 23. WIND ZONE 3 LONGITUDINAL FRAME TIEDOWN QUANTITIES (EACH END OF HOME)

Max. Wall Height	Max. Roof Pitch	Max. Home Width										
		Single Section					Multi Section				Triple	
		10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	24 ft	28 ft	32 ft	36 ft	48 ft
7 ft	3	2	3	3	4	4	4	5	6	7	10	11
	4.36	2	3	3	4	4	5	6	7	8	11	12
7.5 ft	3	2	3	3	4	4	5	6	7	8	10	12
	4.36	3	3	3	4	4	5	6	7	8	11	13
8 ft	3	3	3	3	4	4	5	6	7	8	11	12
	4.36	3	3	4	4	4	5	6	7	9	12	13
	5	NA	NA	NA	NA	NA	5	6	8	9	12	14
	6	NA	NA	NA	NA	NA	5	7	8	9	13	15
	7	NA	NA	NA	NA	NA	6	7	8	10	14	16
9 ft	3	3	3	4	4	5	5	6	8	9	12	13
	4.36	3	3	4	4	5	6	7	8	9	13	14
	5	NA	NA	NA	NA	NA	6	7	8	9	13	15
	6	NA	NA	NA	NA	NA	6	7	9	10	14	16
	7	NA	NA	NA	NA	NA	6	7	9	10	15	17
10 ft	3	3	4	4	5	5	6	7	8	9	13	14
	4.36	3	4	4	5	5	6	7	9	10	14	15
	5	NA	NA	NA	NA	NA	6	7	9	10	14	16
	6	NA	NA	NA	NA	NA	6	8	9	11	15	17
	7	NA	NA	NA	NA	NA	6	8	10	11	16	18



MARRIAGE LINE VERTICAL ANCHORS (WIND ZONES II AND III ONLY)

In Wind Zones II and III, marriage line anchors are required at each column along the marriage wall.

There may be manufacturer-installed brackets indicating required tie down locations (may be identified by tags or paint). If brackets are not present, then an alternative acceptable connection method, such as steel angles (provided by the manufacturer) must be used (**Figure 63**). If necessary to avoid interference with piers, the tie down location may be offset horizontally from the column by a maximum of 12 inches.

TAG UNIT FRAME AND VERTICAL ANCHORS

Tag unit anchoring is not covered in this manual. The required anchoring details will accompany homes with tag units.

PORCH POST ANCHORS

Each post that requires an anchor will have a tiedown bracket attached from the factory and be designated by a pier label. Homes with roof pitches of 4.36/12 or less do not require frame tiedowns below a full width endwall porch. Required frame and vertical tiedowns in Wind Zone 2 and 3 may begin on-center spacing at the corner porch post/endwall location. This will also satisfy the Sidewall Frame Anchor requirement of locating one "no more than two feet from each end of home" stated on page 75. Homes with roof pitches above 4.36/12 must also contain frame tiedowns below endwall porches and can be combined with vertical tiedown brackets at porch posts.

OFFSET UNIT ANCHORS

Anchors installed on offset units will be installed per the standard tiedown charts unless otherwise instructed by details that accompany the home.

STEP 2. DETERMINE TIEDOWN CONFIGURATION

Tiedown spacings have been provided when the tie down strap is connected to the near I-beam and/or when the strap is connected to the far I-beam.

STEP 3. SELECT ANCHORS

Use the torque probe results from **Prepare the Site, STEP 6. DETERMINE GROUND ANCHOR HOLDING CAPACITY** (p. 19) and the anchor manufacturer instructions select the type and length of anchor to use. The installed ground anchor size (length) must be listed (i.e. approved) for the soil class.

Make sure the anchor is of sufficient length such that the top of the helix is below the frost line. Select a shaft diameter sufficient to resist excessive torsion, "ring-off" (when the helix or anchor head separates from shaft) or shaft splitting. Consult the anchor supplier for guidance.

Review all of **STEP 4. INSTALL ANCHORS** (p. 90) and **STEP 5. INSTALL STRAPS** (p. 91) before making final anchor selections to determine when single headed vs. double headed anchors should be used. Follow the specifications in **Table 24** when selecting stabilizing system components.

TABLE 24. ANCHOR TYPES

Anchor type	Anchor (soil) class
Helix soil anchor	2, 3, 4A
Rock anchor	1 (for use in solid rock only)
Concrete anchor	Concrete ONLY



When to install marriage line anchors. Anchors along the marriage line must be installed prior to the second half of a multi-section home being set.



TABLE 25. ANCHOR SYSTEM MATERIALS SPECIFICATIONS

Component	Specification
Anchors	Anchors must be tested and listed to resist a minimum ultimate load of 4,725 lbs and a minimum allowable working load of 3,150 lbs or ultimate and corresponding working load limited by soil conditions and anchor length. The working load is the maximum load the designer can use. Ground anchors must be provided with protection against weather deterioration and corrosion at least equivalent to that provided by a coating of zinc on steel of not less than 0.030 oz per sq ft of surface coated.
Straps	Straps must be minimum 1-1/4" x 0.035" zinc-coated (0.030 oz per sq ft) steel strapping conforming to ASTM D3953-97, Type 1, Grade 1, Finish B with a minimum allowable working load capacity of 3,150 lbs and a minimum ultimate load of 4,725 lbs. Slit or cut edges of zinc-coated strapping do not need to be zinc coated.
Stabilizer plates	The size and type of stabilizer plate, if required by the ground anchor manufacturer, will be specified in the anchor manufacturer's instructions. Stabilizer plates must be provided with protection against weather deterioration and corrosion at least equivalent to that provided by a coating of zinc on steel of not less than 0.30 oz per sq ft of surface coated. Alternatively, ABS stabilizer plates may be used when listed and certified for such use.

STEP 4. INSTALL ANCHORS

Before beginning anchor installation, check for obstructions under the home such as piers and frame members that may interfere with the tie down strapping. Check with utility companies to determine the location of underground utilities, such as electrical and phone lines, and water, sewer and gas pipes, that may be buried in potential anchor locations. Also check for homeowner-installed wires and pipes, such as those connecting exterior lighting or sheds to the home. These must also be avoided.

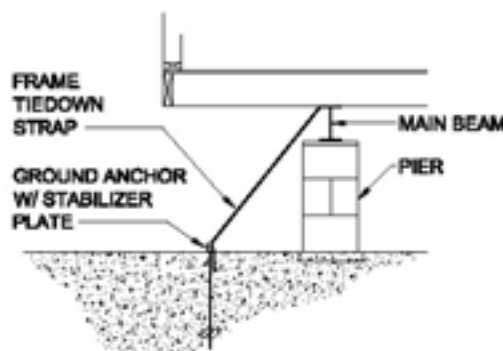
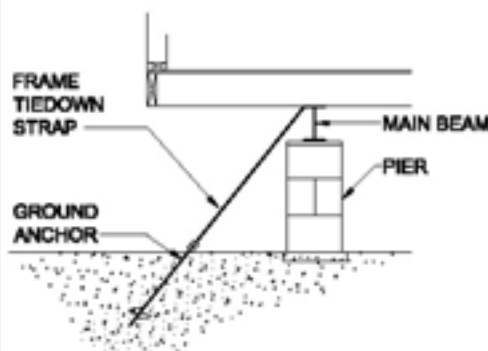
FRAME ANCHORS

Frame anchors can be installed in two ways, in-line and against a stabilizer plate. The two methods are discussed below:

In-Line Configuration

The in-line configuration (Figure 55) for homes can be used in Wind Zone I only. Typically, in-line anchors are used under high homes where the anchors can be installed from under the home after the home is set. In-line anchors can also be installed before the home is set, however precisely aligning the anchor with the home both vertically and horizontally is difficult. Using swivel connectors for the strap to beam connection can provide some horizontal flexibility.

To install in-line frame anchors, drive the anchor into the ground at an angle and location such that a straight line can be drawn from the tip of the anchor through the anchor head and to the connection point on the I-beam (Figure 55).



Stabilizer Plate Configuration

Stabilizer plate configurations (Figure 57) are suitable for homes in all wind zones. Anchors may be installed after the home is set. A stabilizer device, typically an ABS or metal plate, is used to prevent the top of the anchor from slicing through the soil when the load is applied. Stabilizer plates are available in a variety of widths. Choose the widest plate that can be driven into the soil to maximize resistance to movement. The LAHJ may have stabilizer plate requirements.



Grading area around anchors. Anchor heads should not rest in sunken spots. Grade the ground so that water does not collect around anchor heads, but runs away from the anchor and out from under the home. Do not bury anchor heads.

Figure 55. In-line anchor configuration

Figure 56. Stabilizer plate configuration



Anchor alignment. Properly aligning the anchor is critical to performance.

Install anchors with stabilizer plates as follows:

1. **Measure.** To determine the stabilizer plate location, measure from the top of the I-beam to the ground directly under it and then use the same measurement directly away from that point under the beam (**Figure 57**). The anchor and plate must be under the home, but within six inches of the exterior wall for a near beam set and ten inches minimum from the exterior wall for a far beam set. Be careful not to place in a location that will interfere with skirting.

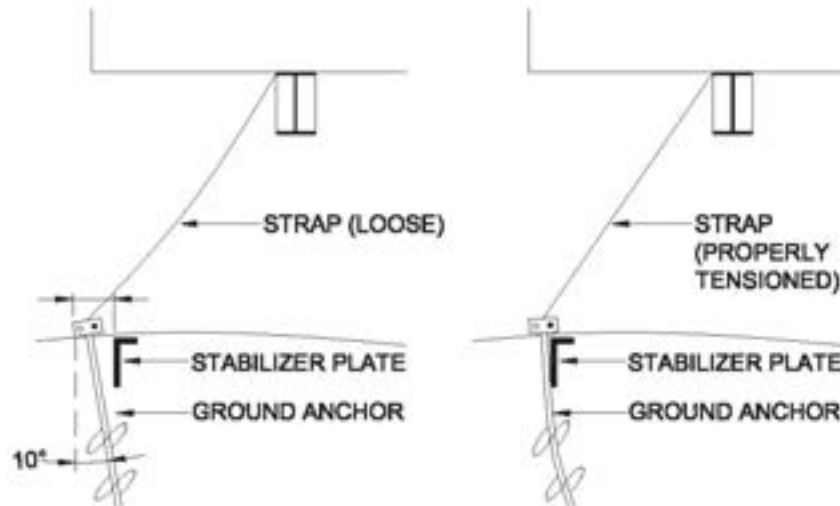


Figure 57. Determining anchor and stabilizer plate location

2. **Install anchor.** To assure that the anchor attachment point will end up at the stabilizer plate, start the anchor insertion approximately 12 inches back from the desired location if using a 48 inch long anchor, or approximately 16 inches if using a 60 inch long anchor. Install the anchor at about 10 degrees off vertical, with the head tilted away from the home. Install the anchor to a depth of approximately one half its length.
3. **Drive stabilizer plate.** Drive the stabilizer plate into the ground to its full depth at the point determined in Step 1.
4. **Complete anchor installation.** Screw the anchor the rest of the way into the ground. The finished anchor must be installed to its full depth. When the anchor strap is properly tensioned it will pull the anchor head and shaft into the stabilizer plate.

VERTICAL ANCHORS

To install vertical anchors, screw the anchor into the ground directly under the strap attachment point on the home until the bottom of the anchor head is flush with the ground or no more than one inch above grade.

STEP 5. INSTALL STRAPS

Follow the instructions below to connect straps from the home to sidewall frame, end wall frame and vertical anchors.

Always protect straps at sharp corners including around I-beams with radius clips or other methods (**Figure 58**). Radius clips may be fabricated from galvanized steel strap formed to fit around corners.

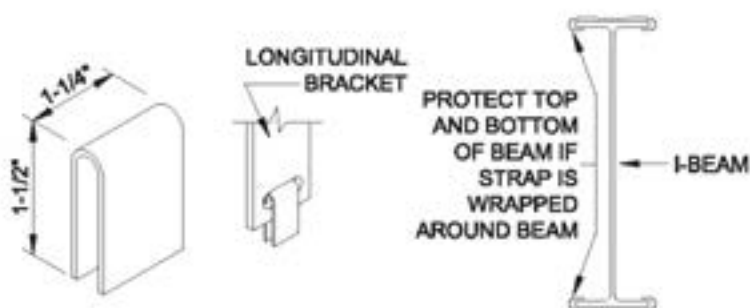


Figure 58. Radius clips

SPLICING STRAPS

Splicing may be required when a pre-cut strap is of insufficient length. Splices must be made by overlapping the straps by 12 inches, applying one splice clip from above and the other from below; use a crimping tool to tightly seal the splice clips (Figure 59). Do not run any portion of the splice through an anchor head bolt.

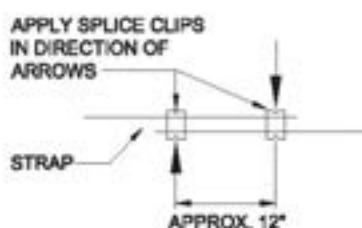


Figure 59. Tie down strap splice

FRAME ANCHORS

Install straps to frame anchors as follows:

1. **Connect strap to home.** Connect one end of the strap to the top of the I-beam using approved buckles or clips (swivel or hook clip preferred). When frame ties are connected to the bottom of the beam it must be within 3" of a crossmember.

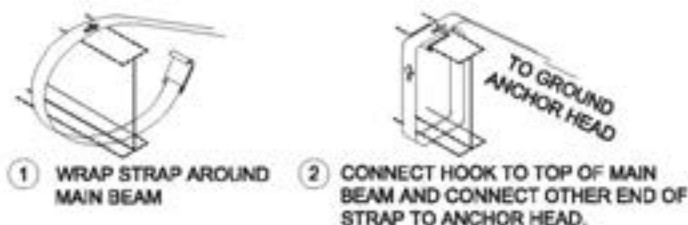


Figure 60. Strap to beam connection

2. **Connect strap to anchor.** Connect the other end of the strap to the split bolt in the anchor. Leave enough strap length to be able to make three complete turns, or minimum required per manufacturer's installation instructions, around the bolt before it becomes tight (approximately 2-1/2 inches per turn or 13 inches total). Fewer than three turns, or required per manufacturer's installation instructions, and the strap may not hold onto the bolt when force is applied. Conversely, too many turns may not fit within the U-channel of the anchor head. Follow the procedure outlined in Figure 61.

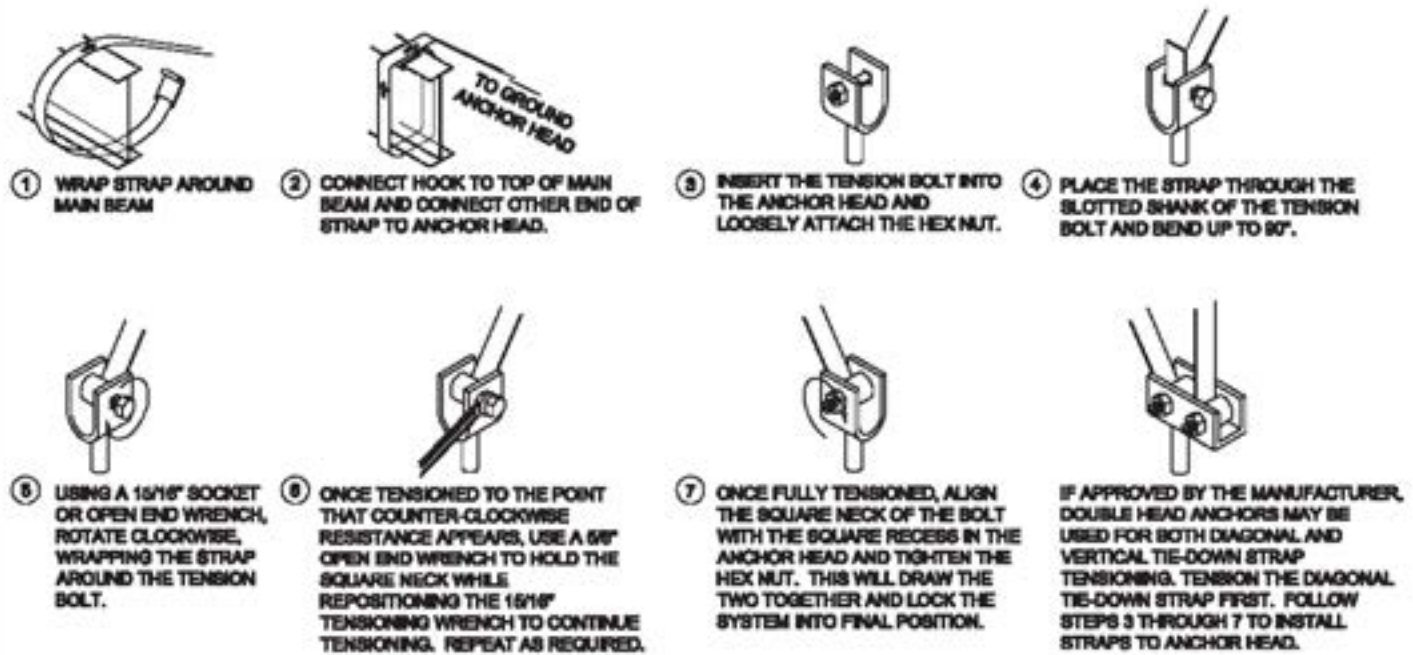
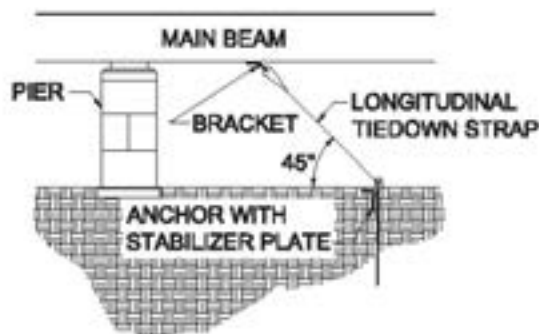


Figure 61. Procedure for connecting the strap to frame and anchor

3. **Pretension anchor.** For anchors with stabilizer plates, pretension the anchor by pulling it up to the stabilizer plate using the strap and take-up bolt to move the anchor head. Continue pulling the strap until the plate moves a small amount (about 1/2 inch). This is called packing the plate and it will yield the strongest resistance (the bottom of the anchor head should be a maximum one inch above the top of the stabilizer plate).

LONGITUDINAL FRAME ANCHORS

Attach straps to the bracket welded by the manufacturer to the frame (Figure 62). If no brackets have been installed, use approved beam clamps designed specifically for this purpose, available from anchor suppliers or connect the strap to a spring hanger or a crossmember (within 3" of the main I-beam). Connect straps to anchors following same procedure as for sidewall frame anchors. Protection of the strap at sharp corners must be provided (p.91).



Anchor head location. As the anchor is pulled up to meet the stabilizer plate, the head of the anchor will rise. In its final position, the bottom of the anchor head should be no more than 1/4 inch above the top of the stabilizer plate.

Figure 62. Longitudinal frame anchor attachment method

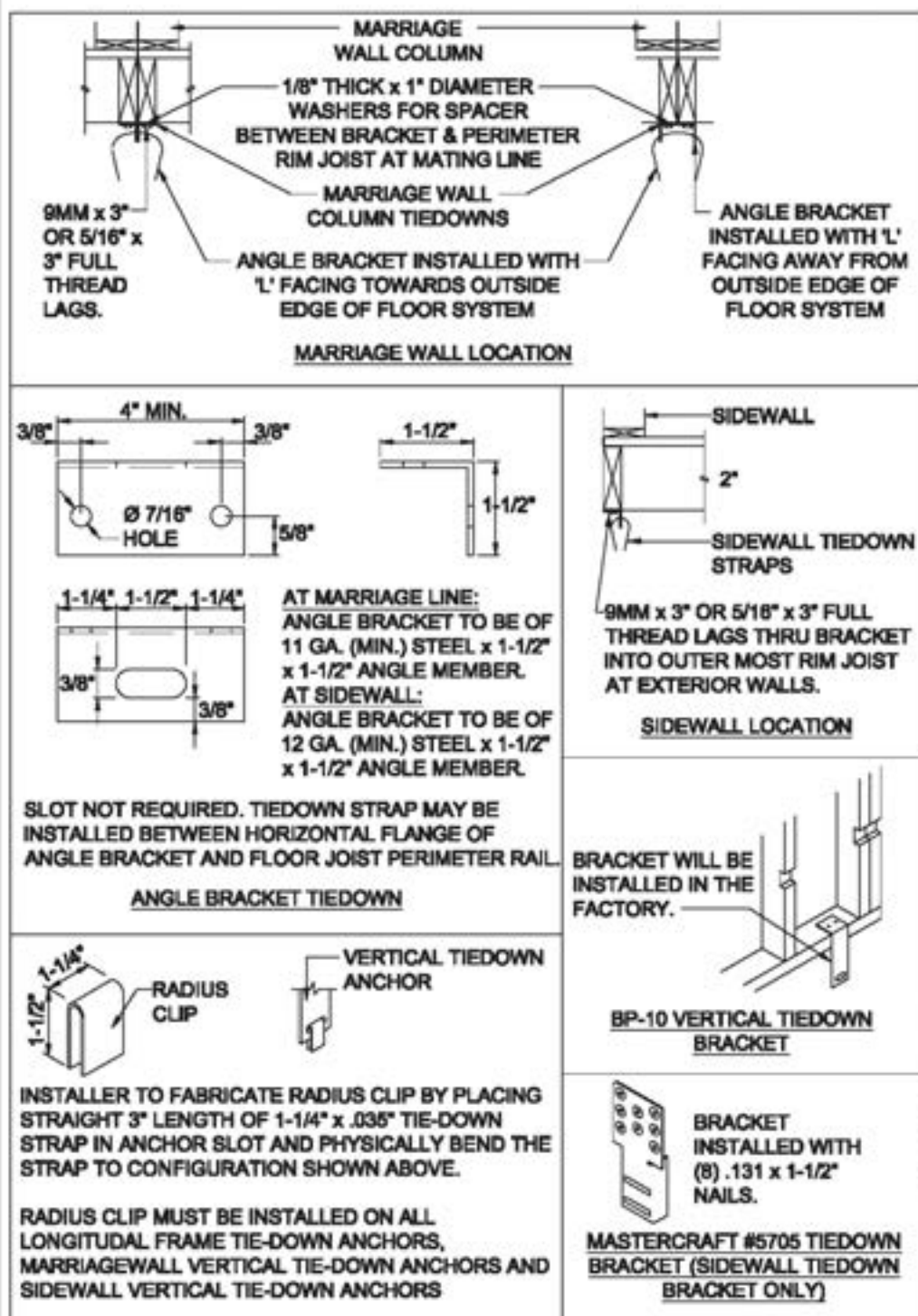


Figure 63. Sidewall and marriage line vertical tie down connections.

STEP 6. TIGHTEN AND ADJUST STRAPS

After all anchors have been installed and pre-tensioned, recheck all anchor straps to assure that they are tight and that the anchor shafts have remained in contact with the stabilizer plates. Do not over tension straps.

► go to **Connect Utilities** (p. 95)



Connect Utilities

This chapter contains procedures and requirements for the connection and testing of utility hook-ups. Responsibility for making utility connections varies by location. Consult the LAHJ and the utility before connecting the home to any utilities.

Follow the Steps below:

- ▼ STEP 1. CONNECT ELECTRICAL SERVICE (p. 95)
- ▼ STEP 2. CONNECT WATER SERVICE (p. 98)
- ▼ STEP 3. CONNECT GAS SERVICE (p. 100)
- ▼ STEP 4. CONNECT OIL SERVICE (p. 102)

STEP 1. CONNECT ELECTRICAL SERVICE

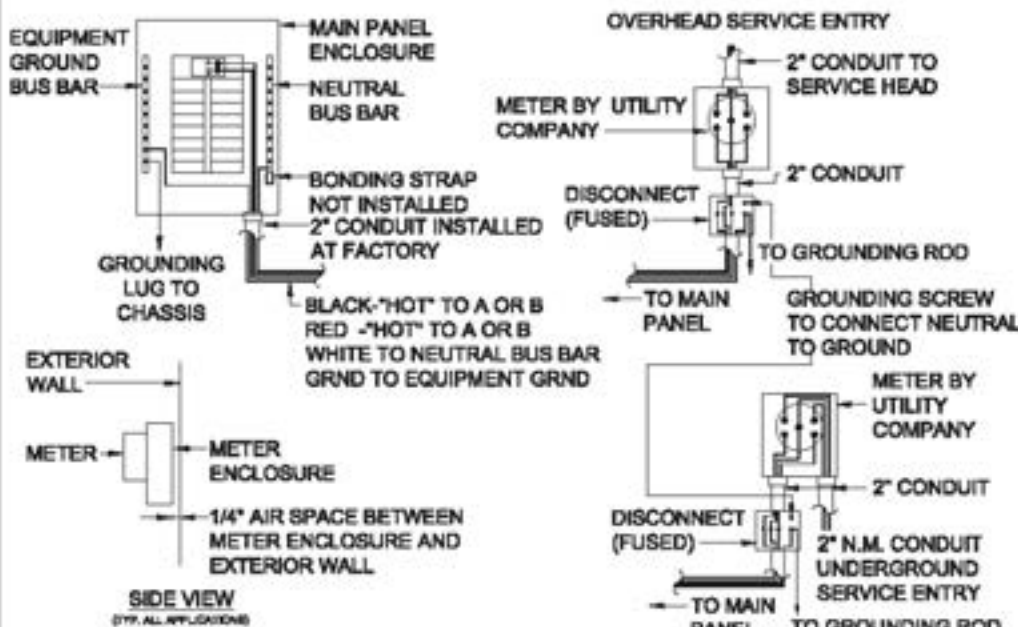
The home is designed for connection to an electrical wiring system rated at 120/240 volt AC. Service connection requirements depend on whether the meter will be installed on a post or pole or mounted on the home more than 6 feet from the circuit breaker panel. It is recommended that this connection be performed by a licensed electrician.

METER MOUNTED ON POST OR POLE (OR MOUNTED ON THE HOME MORE THAN 6 FEET FROM THE CIRCUIT BREAKER PANEL)

Feeder Wire and Equipment Sizes

The feeder must contain four continuous insulated, color-coded, feeder conductors, with one used as the equipment grounding conductor (Figure 64). The current rating (in amperes) of the home can be found on the tag located on the outside next to the feeder or service entrance, and on the electrical distribution panel. Using this information, determine the required feeder wire size from Table 26. These sizes are based on an ambient temperature of 86 degrees Fahrenheit and do not take voltage drop into consideration.

Acceptable conductor types are: RHH, RHW, RHW-2, THHN, THHW, THW, THW2, THWN, THWN-2, XHHW, XHHW-2, SE, USE, and USE-2.



Special precautions when installing electrical service. Installation of the electric power to the home can cause exposure to live electrical circuits. The neutral conductor must not be grounded in the distribution panel board. Exposure to live electrical circuits or improper grounding of the conductor in the panel board may result in severe shock or possible electrocution. A qualified installer must make the connections for the electric power.

Figure 64. Electrical feeder connection when meter is on a post or pole or mounted on the home more than 6 feet from the circuit breaker panel.



Power supply. 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 electricity costs.

TABLE 26. ELECTRICAL FEEDER WIRE AND EQUIPMENT SIZES FOR COPPER CONDUCTORS

Main Breaker Size in Panel Box (AMPS)	Max. Neutral Feeder Load (AMPS)	Junction box size	Minimum Size Raceway Conduit Diameter (in)	Conductors			
				Red & Black (Power) (Cu)	White (Neutral) (Cu)	Green (Grounding) (Cu)	Bare Ground (Cu)
50	35	NA	1	#4 AWG	#8 AWG	#10 AWG	#8
100	70	10 x 10 x 4	1-1/4	#4 AWG	#4 AWG	#8 AWG	#8
125	88	10 x 10 x 4	1-1/4	#2 AWG	#3 AWG	#6 AWG	#8
150	105	10 x 12 x 4	1-1/2	#1 AWG	#2 AWG	#6 AWG	#6
200	140	10 x 16 x 4	2	2/0 AWG	1/0 AWG	#6 AWG	#4
225	158	10 x 16 x 4	2	3/0 AWG	2/0 AWG	#4 AWG	#4
400	280	10 x 24 x 4	3	400 kcmil	300 kcmil	#3 AWG	1/0



Grounding the electrical system. Do not provide electrical power until the grounding electrode is installed and connected. When the meter base is not on the house never use the neutral conductor of the feeder cable as a ground wire. Do not ground the neutral bar in the electrical distribution panel.

Grounding

The home must be properly grounded to protect the occupants. The only safe and approved method of grounding the home is through an electrically-isolated grounding bar in the home's distribution panel board. This grounds all non-current-carrying metal parts to the electrical system in the home at a single point. The ground conductor of the power supply feeder cable in turn connects the grounding bar to a good electrical ground back through the power supply system. Therefore, for 120/240 volt service a four wire power supply feeder cable is required. It is important to:

- Isolate (insulate) grounded circuit conductor (neutral or white wire) from the grounding conductors (green wires) and from equipment enclosures and other grounded parts.
- Isolate (insulate) the neutral circuit terminals in the distribution panel board and in ranges, clothes dryers, and counter-mounted cooking units from the equipment enclosure.

Feeder Connections

Feeder connections are made from above or from below the home as follows:

- From above—mast weatherhead feeder. The routing, connection, and support of the service drop must meet local codes. Homes equipped this way contain all necessary conduits to the electrical distribution panel. However, the four feeder conductors (not provided with the home) are installed on site. If the masthead is located above the roof overhang, allow a minimum clearance of eight feet above all roof points that the conductors pass over. There are two exceptions to this rule: (1) The vertical clearance may be reduced to three feet if the roof has a minimum slope of 4 in 12; and (2) The vertical clearance may be reduced to 18 inches if no more than four feet of service-drop conductors pass above the roof overhang, and if they terminate at a through-the-roof raceway or approved support. A minimum clearance must also be provided from the final grade to the service-drop conductors. This measurement may vary from 10 feet to 18 feet, depending on the types of traffic anticipated below the service drop (refer to the NEC). 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.
- From below—underside junction box feeder. A section of conduit is factory installed through the floor cavity. Connect to that conduit with approved fittings and conduit (not provided with the home) to the point where the service entrance cable enters the crawl space. Install properly-sized service entrance conductors from the main power supply to the panel board. Depending on the location of the main panelboard inside the home, or the point at which the



Prior to energizing the home, turn off the water heater until it is completely filled with water.

service entrance conductors enter the crawl space, a separate service disconnect may be required. Refer to **Table 26** for the conductor and junction box requirements. The installer must provide the supply connection including the four feeder conductors, junction box and conduit connectors. Protect conductors emerging from the ground from a minimum of 18 inches below grade to eight feet above grade, or to the point of entrance to the home. The distance measured from the top surface of a buried cable, conduit, or raceway to the finished grade must meet the minimum burial requirements outlined in the NEC. Use a moisture-proof bushing at the end of the conduit from which the buried cable emerges.

METER MOUNTED ON HOME WITHIN 6 FEET OF CIRCUIT BREAKER PANEL

If the meter is mounted on the home, the following requirements apply (refer to **Figure 65**):

- Use straps to support any conduit. Do not use the meter base equipment for support.
- Use exterior equipment and enclosures listed as weatherproof and entrance conductors listed for wet locations.
- The grounding bar may be installed separate from the neutral bar for purposes of testing the electrical system.
- The grounding bar may be isolated during the electrical check and re-attached, after the tests are completed.
- Check with the local electrical utility to verify meter base requirements and locations and distances for the main panel and meter box.
- The field installed meter base enclosure must be installed in accordance with its listing. Fasten securely to exterior wall studs and provide for a weather tight seal.
- All field work must be done by a licensed electrician or other person approved by the LAHJ.
- Check the local code for any requirements regarding the location of the meter base.

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

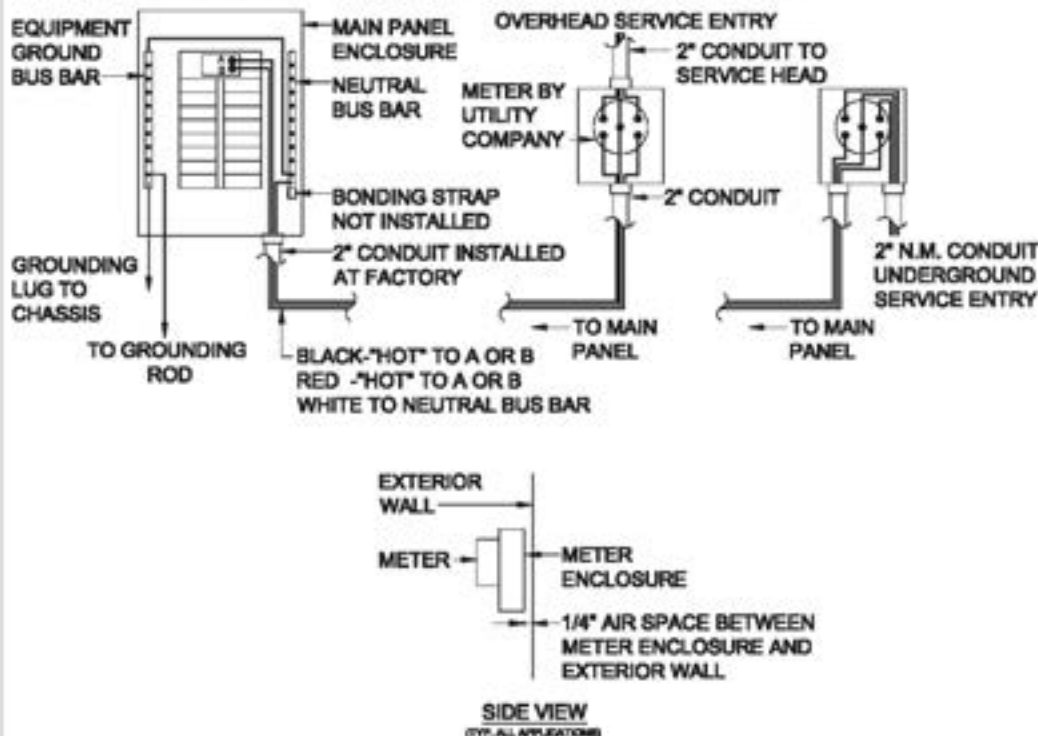


Figure 65. Meter base wiring when the meter is on the home within 6 feet of Circuit Breaker Panel.

When a factory installed service meter base is provided on a home, a grounding electrode conductor and a ground wire must be installed according to the following specifications:

1. Grounding wire to be #6 minimum bare copper provided by the manufacturer. If manufacturer provides a minimum 1/2 inch EMT or conduit raceway, the #6 minimum bare copper wire is provided by the retailer for installation.
2. The clamp connecting the grounding wire to the electrode shall be suitable for direct burial and located flush or below ground level.
3. Use a 5/8 inch diameter by eight foot long iron electrode for grounding. Larger sizes may be required by LAHJ.
4. Drive the electrode to a depth of not less than eight feet so that at least eight feet of the electrode is in contact with the soil.
5. When rock is encountered, the electrode may be driven at an angle not to exceed 45 degrees from vertical or buried in a trench that is at least 2-1/2 feet deep.

TESTING

After your home has been completely assembled and all accessories installed, it should be tested to ensure that no damage occurred during transit and that all electrical connections were properly performed (**TEST ELECTRICAL SYSTEM** pg. 111). **These tests should be performed by qualified personnel familiar with the local codes and required test procedures.**

STEP 2. CONNECT WATER SERVICE

CONNECTION

To connect the home's water system to the water source, identify the water inlet located under the home (usually below the water heater compartment or utility room) and follow the procedure described below (refer to **Figure 66**):

1. **Flush pipe.** Flush field installed water piping free of all debris prior to connection to the home's water inlet.
2. **Clean threads.** Ensure that pipe threads are clean.
3. **Install pressure-reducing valve.** If the local water supply exceeds 80 psi install a pressure-reducing valve.
4. **Connect valve.** Install a main shut-off valve between the water supply source and the home in an accessible location underneath or adjacent to the home. Select a full flow gate or ball shutoff valve, or equivalent valve. To prevent the possibility of fresh water contamination, install an anti-siphon valve on all field installed exterior faucets.

Maximum water pressure.
The water system for the home was designed for a maximum inlet pressure of 80 psi.

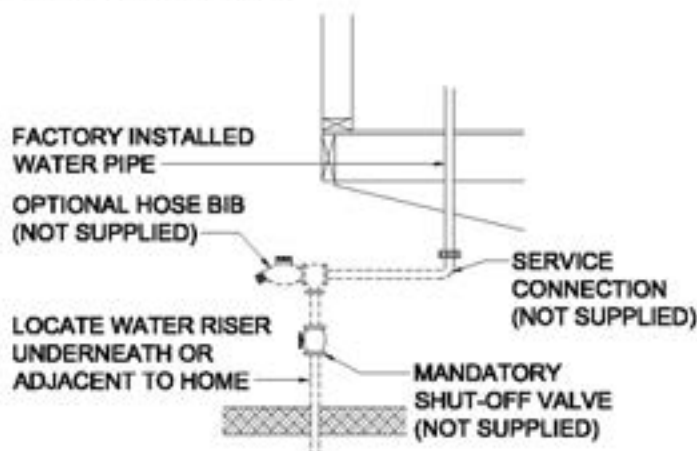
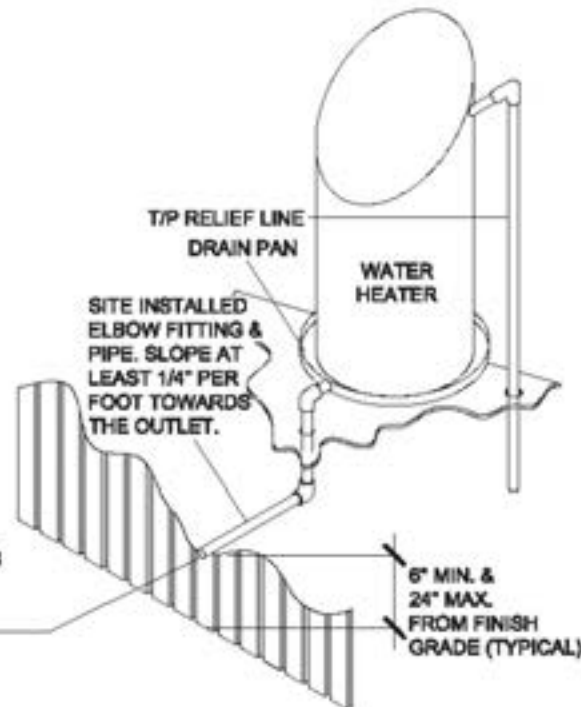


Figure 66. Water system connection

5. **Install water heater discharge drain.** Inspect the drain opening on the water heater to ensure that it is clear of any obstruction. Drain pipe cannot connect with the DWV line.

Install water heater drip pan and drain. Assure that the drain for the water heater drip pan does not terminate under the home. Using the materials provided and the accompanying instructions run a drain line from the water heater drip pan through the wall or floor to the exterior of the crawl space. Terminate the line between six and 24 inches above grade. (Figure 67). Make the termination point rodent proof.



WATER HEATER DRAIN PAN DRAIN LINES MUST TERMINATE OUTSIDE THE HOME. RODENT SCREEN MUST BE INSTALLED AT THE END OF THE DRAIN PAN DRAIN LINE. THE TEMPERATURE AND PRESSURE RELIEF LINE SHALL NOT BE CONNECTED TO THE DRAIN PAN DRAIN LINE AND MAY DISCHARGE BENEATH THE HOME.

6. **Insulate.** In areas subject to freezing temperatures, protect with insulation or heat tape pipes, valves and pressure reducers that are exposed to the outdoors; and pipes in water heater compartments with non-insulated doors. Connect heat tape to the electrical outlet under the home near the water supply inlet. Heat tape must not be installed on the DWV pipe. Electrical outlet provided under the home must only be used for the heat tape connection because it is GFCI protected.

TESTING

After connecting the water lines check the water system for leaks using one of the procedures described below. Before testing, close all water faucets, spigots, and toilet-tank float valves.

Hydrostatic (preferred):

1. **Bypass water heater.** Bypass the water heater by disconnecting the hot outlet and cold inlet water lines from the water heater and joining them together. This will protect the hot water tank from damage and protect those involved in the test from possible injury.
2. **Pressurize system.** Connect a hydrostatic pump, valve and gauge. Pressurize



Using check valves. Verify that a check valve has been installed on the water inlet to prevent water system drainage in the event of a loss of water pressure from the source. Such pressure loss could cause the water heater to drain, exposing the heating elements of electric water heaters causing them to fail.

Figure 67. Water heater drip pan and drain



Selecting heat tape. Use only pipe heating cable (tape) listed for manufactured homes, and install it in accordance with the cable (tape) manufacturer installation instructions.

Testing water lines. Only use pneumatic (air) testing when hydrostatic testing is not practical. Air under pressure is explosive. Exercise extreme caution and notify all site personnel of the test. Wear protective eyewear and take precau-

the system with water at 100 psi, and then isolate it from the pressure source. Bleed all air from the highest and farthest points in the system.

3. **Hold pressure.** Monitor the pressure for at least 15 minutes.
4. **Fix leaks.** If the pressure drops below 100 psi, locate and correct any leaks by cutting out and discarding bad pipe sections or joints and installing new pipe or joints with couplings.
5. **Repeat.** Repeat the test until all leaks have been eliminated.
6. **Restore connections.** Reconnect the water heater and the water supply.

Pneumatic:

1. **Bypass water heater.** Bypass the water heater by disconnecting the hot outlet and cold inlet water lines from the water heater and joining them together. This will protect the hot water tank from damage and protect those involved in the test from possible injury.
2. **Pressurize system.** Connect an air pump and pressure gauge to the water inlet, pressurize the system to 100 psi and isolate the pressure source from the system.
3. **Hold pressure.** Monitor the pressure for at least 15 minutes. If the pressure drops below 100 psi, locate any leaks by applying soapy water to the connections and looking for bubbles.
4. **Fix leaks.** Correct any leaks by cutting out and discarding bad pipe sections or joints and installing new pipe or joints with couplings.
5. **Retest.** Repeat the procedure until all leaks have been eliminated.
6. **Restore connections.** Reconnect the water heater and the water supply.

FREEZE PROTECTION FOR UNOCCUPIED HOMES

If the home is to be left unheated in cold weather. Protect water lines from freezing as follows:

1. **Disconnect supply.** Turn off the water supply and disconnect the water supply inlet.
2. **Drain water heater.** Turn off the water heater; if necessary, attach a hose to the valve to direct water away from under the home, open the drain valve and drain the tank completely.
3. **Drain faucets.** Open all faucets throughout the home (including the laundry area if plumbed, and any exterior faucets) and let them drain completely.
4. **Drain toilets.** Flush toilets and drain water tanks completely.
5. **Close faucets.** Close all water faucets with the exception of one.
6. **Connect compressor.** Connect a maximum of 30 psi air supply to the water inlet connection using a low pressure compressor.
7. **Open faucets.** With the air supply on the system, open one faucet at a time throughout the home.
8. **Disconnect compressor.** After the entire system has been drained of all water, disconnect the air supply and close the water inlet valve.
9. **Pour anti-freeze.** Pour an RV antifreeze solution into all drain traps, including sinks, tubs and toilets. Be sure that the antifreeze is safe for the fixtures and P-traps.

STEP 3. CONNECT GAS SERVICE CONNECTION

If the home uses natural or liquid petroleum gas (LPG, also known as propane) for water or space heating, cooking or other appliances, follow the procedure described below:

1. **Inspect vents.** Assure that all exhaust vents on gas-fired equipment are securely connected and that roof jacks and stacks have not come loose during transit and they are properly installed.
2. **Review appliance instructions.** Review each appliance manufacturer's in-

structions to prevent impact damage to the system while the test is in progress. Do not pneumatically test CPVC systems. Pneumatically test Flow Guard Gold systems only at low pressure levels (20 psi or less).

Pressurizing water lines.

When pressurizing the water system, connect the pump to a location above a closed shut-off valve so as not to introduce pressure into the municipal water supply.



Anti-Scald Valves. Anti-Scald valves have been installed on all tubs, tub/showers and showers in the home. The valves are preset by the valve manufacturer to about 105°F (41°C). After the water lines have been flushed, the outlet temperature at each tub, tub/shower and shower must be tested to ensure that it does not exceed 120°F (49°C). Water should run for at least one minute on the hottest setting before taking the temperature reading. Some customer's may desire temperatures higher than 105°F (41°C). Temperature may be adjusted using the instructions provided with the valve. In no case should the temperature exceed 120°F (49°C) as this may result in serious bodily harm and/or death.



Installing gas lines. Only qualified professionals may connect and test gas service.

structions before the home is connected to the gas supply. Most gas appliances are typically configured to operate on natural gas. If the gas supply will be LPG, consult the appliance manufacturer's instructions to determine what changes need to be made. For homes located above 3,000 feet, appliances may require a different orifice.

3. **Remove cap.** Remove the protective cap from home inlet pipe and install a full flow shut-off valve at the supply inlet (Figure 68).
4. **Install regulator.** The gas piping system is designed for a pressure that is at least seven inches of water column (4 oz. per sq in or 0.25 psi) but not more than 14 inches of water column (8 oz. per sq in or 0.5 psi). If gas from any supply source exceeds, or could exceed this pressure, install a regulator if required by the LAHJ.
5. **Connect supply.** Using matching threaded fittings connect the gas supply to the inlet side of the shut-off valve.
6. **Close valves.** Close all valves at appliances prior to opening the main supply valve.

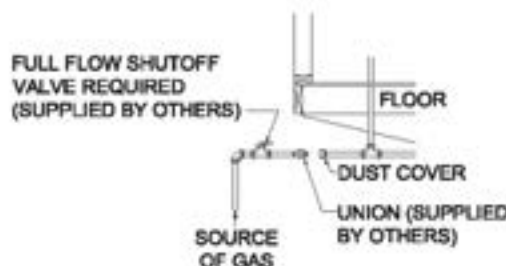


Figure 68. Gas service connection

TESTING

Test the gas piping system in the following two ways: 1) piping only and 2) entire system. Consult with the LAHJ for any additional testing or start-up requirements.

Before testing begins, the temperature of the ambient air and the piping should be approximately the same. Conduct the tests when and where air temperatures will remain constant.

Piping only test (all appliances isolated)

1. **Isolate appliances.** Isolate all appliances from the system by closing all appliance shut-off valves.
2. **Attach gauge.** Attach to the home's gas inlet a mercury manometer or slope gauge calibrated in increments of not more than 1/10 lb.
3. **Pressurize system.** Using an air compressor, pressurize the system with compressed air to three psi and isolate the pressure source from the system.
4. **Monitor pressure.** Monitor the pressure for at least 10 minutes.
5. **Check for leaks.** If pressure drops below three psi, check for leaks by applying a non-corrosive, ammonia-free gas leak detection fluid to the joints at all valves, appliance connections and crossover connections (do not use dish washing detergents, soap or other household chemicals). If bubbles form, tighten the connection and recheck.
6. **Repair leaks.** If leaks persist, replace defective pipes or fittings with sound material and retest.
7. **Release pressure.** Release pressure and open all appliance shut-off valves.
8. **Rinse connections.** Thoroughly rinse all tested connections with water to remove leak detection fluid.

Entire system test (with appliances)

1. **Close appliances.** Close all gas equipment controls and pilot light valves according to the individual gas equipment manufacturer's instructions.
2. **Open valves.** Assure that gas shut-off valves for all gas equipment are in the open position.
3. **Attach gauge.** Attach to the home's gas inlet a pressure gauge calibrated in ounces.

4. **Pressurize system.** Pressurize the system with compressed air to six to eight ounces (3/8 to 1/2 psi, or 10 to 14 inches of water column).
5. **Check for leaks.** Check for leaks as described above in step 5 of the Piping only test. Replace defective pipes or fittings with sound material and re-test.
6. **Rinse connections.** Thoroughly rinse all tested connections with water to remove leak detection fluid.

GAS APPLIANCE START-UP

Open the shut-off valve for each appliance and adjust the burners according to the appliance manufacturer's instructions. Verify that the furnace and water heater thermostats are operating properly and set them to the desired temperatures.

STEP 4. CONNECT OIL SERVICE

Homes that are equipped with oil burning furnaces must have oil supply piping installed and tested on site by a qualified professional in accordance with NFPA 31, Standard for the Installation of Oil Burning Equipment, 2001 or the requirements of the LAHJ, whichever is more stringent. The home manufacturer does not supply oil piping or tanks.

OIL CONNECTION

Consult the furnace manufacturer's instructions for proper pipe sizing and installation procedures. Where piping is run through the bottom of the home, ensure all holes in the bottom board are sealed tight with foam, mastic, and/or tape specially made for that purpose and made rodent proof.

When equipping the home with an oil storage tank, comply with the following:

- Install the pipe with a gradual slope toward the fill end or drain plug (if so equipped) to facilitate pumping or draining of water and sludge.
- Provide a readily accessible approved manual shut-off valve at the outlet, installed to close against the supply.
- Equip the tank with an approved oil filter or strainer located downstream from the tank shut-off valve. Use a filter or strainer containing a sump with a drain to trap water.
- Equip under ground tanks with a filler neck extending one foot above grade and a minimum 1-1/4 inch diameter vent pipe extending at least two feet above grade.
- Locate the tank to be accessible for service and inspection, and safe from fire and other hazards.
- If the tank is located inside a compartment of the home, provide ventilation at the bottom of the compartment to permit diffusion of vapors. If the tank is fixed to the home, provide for filling and draining from the outside.
- Insulate interior tanks from the structural members of the home. Provide tanks so installed with an outside fill and vent pipe and an approved liquid level gauge.
- Install tanks that feed vaporizing type oil furnaces so that oil flows by gravity. To achieve efficient gravity flow, make sure that the bottom of the tank is at least 18 inches above the furnace oil control level.
- Tanks for gun type oil furnaces (these furnaces include a fuel pump) may be installed above or below ground.

OIL SYSTEM TESTING

Before operating the system, fill the tank to capacity with the fuel to be burned and visually check all joints in the system for leakage. Replace (do not repair) parts that leak.



Fill gas water heaters. Before lighting the pilot on a gas powered water heater, fill the tank with water. Failure to do so could damage the water heater.



Testing oil tanks. All oil storage tank and piping installations and tests must meet all applicable local regulations and should be made only by experienced, qualified personnel.

► go to Prepare Appliances and Equipment (p. 103)

Prepare Appliances and Equipment

This chapter provides instructions for installing and/or preparing appliances and other equipment. While the items below can be completed in any order, the last item, **TEST ELECTRICAL SYSTEM**, must be done last.

Follow the Steps below:

- ▼ **INSTALL AIR CONDITIONER OR HEAT PUMP** (p. 103)
- ▼ **PREPARE HEATING SYSTEM** (p. 104)
- ▼ **INSTALL REMOTE HEATING AND COOLING EQUIPMENT** (p. 104)
- ▼ **PREPARE WHOLE HOUSE VENTILATION SYSTEM** (p. 105)
- ▼ **PREPARE CLOTHES DRYER** (p. 105)
- ▼ **PREPARE SMOKE ALARMS** (p. 106)
- ▼ **PREPARE FIREPLACES** (p. 107)
- ▼ **PREPARE KITCHEN AND BATH APPLIANCES / FIXTURES** (p. 108)
- ▼ **INSTALL EXTERIOR LIGHTING** (p. 109)
- ▼ **INSTALL CEILING FANS AND LIGHTING** (p. 109)
- ▼ **TEST ELECTRICAL SYSTEM** (p. 111)

INSTALL AIR CONDITIONER OR HEAT PUMP (if applicable)

CENTRAL UNITS

Install split system or unitary central air conditioners and/or heat pumps as follows:

1. **Check suitability.** Check the home's Comfort Cooling Certificate (may be included with the data plate) to confirm that the home is suitable for installation of central air. If so, note the air distribution system's rated duct capacity (BTU/hr), any equipment sizing guidance provided by the manufacturer and information provided to calculate the home's heat gain.
2. **Select equipment.** Select equipment with a rated heating capacity (BTU/hr) not exceeding the maximum indicated on the home's data plate and a rated cooling capacity sized in accordance with Chapter 28 of the 1997 ASHRAE Handbook of Fundamentals or ACCA Manual J, Residential Cooling Load, 8th edition. Information necessary to calculate the heat gain of the home is located on the Data Plate. Sizing recommendations may also be obtained by utilizing the Manufactured Housing Research Alliance Cooling Equipment Sizing Guidelines available at www.mhrahome.org (Located in **Appendix B**). Choose equipment with a minimum circuit amperage (found on the equipment rating plate) no greater than the branch circuit rating of the exterior air conditioning receptacle (indicated on the adjacent tag), if present.
3. **Install A-coil.** When installing a cooling A-coil in a down-flow furnace that incorporates a fresh air intake duct, position the duct in the furnace cavity according to the furnace manufacturer's instructions (**Figure 69**). For electric down-flow furnaces, trim the whole house ventilation duct as needed to allow installation of the A-coil and secure the duct to the wall of the compartment or to the top of the A-coil. Do not restrict the flex duct opening, allow the duct insulation to contact the A-coil, or allow the duct to become kinked, restricted or configured to form a trap.



Use listed appliances. All applicable appliances must be listed or certified by a nationally recognized testing agency for the application for which the unit is intended and installed in accordance with the terms of its listing or certification.

Properly sizing equipment. Oversized cooling equipment can lower energy efficiency, reduce comfort, shorten equipment life and may cause moisture problems in the home (including potentially damaging the home's structure). Sizing guidance is provided by the Manufactured Housing Research Alliance Cooling Equipment Sizing Guidelines available at www.mhrahome.org.

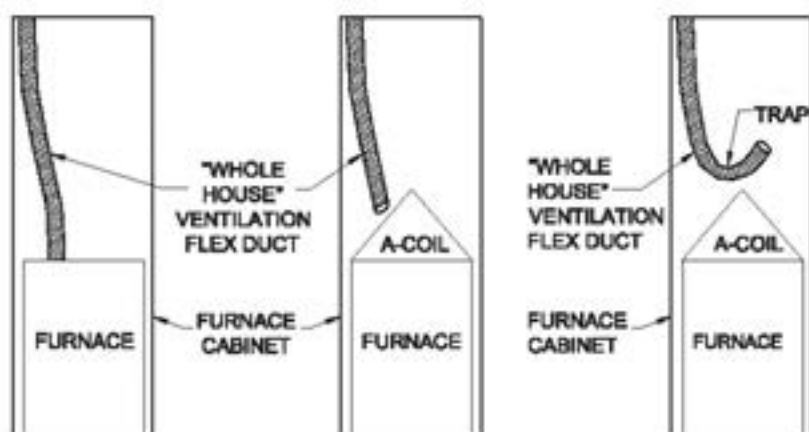


Figure 69. Whole house ventilation flex duct in an electric down-flow furnace. From left to right: as prepared in the factory; proper installation with A-coil; improper installation with A-coil



Selecting A-coils. Use only A-coil units compatible and listed for use with the furnace in the home and installed in accordance with the furnace manufacturer's instructions.

4. **Connect to Power.** Connect cooling equipment to the power supply in accordance with all manufacturer's instructions and local codes.
5. **Direct Runoff.** Direct condensate runoff from cooling equipment away from the home and so that it does not collect under the home.

PREPARE HEATING SYSTEM

If the home does not contain a factory installed heating appliance, install a remote heating appliance according to **INSTALL REMOTE HEATING AND COOLING EQUIPMENT**, p. 104. Prepare fuel-burning heating systems included with the home as follows:

1. **Inspect for damage.** Inspect the furnace and report any damage to the home manufacturer.
2. **High altitude.** If the home is located more than 2,000 feet above sea level or as indicated in the furnace manufacturer's instructions, derate gas furnaces 4% for each 1,000 feet above sea level. This work must be done by a qualified (and in some jurisdictions, licensed) technician.
3. **Convert for LP gas.** If LP gas (propane) will be used, convert the appliance from natural gas to LP gas use. Conversion must be made by a qualified and (if required by the LAHJ) licensed technician.
4. **Install intake air pipe.** Consult the appliance manufacturer's instructions for maximum allowable pipe run length, requirements for air dampers, locations relative to expected snow levels (check with the LAHJ for expected snow levels), acceptable materials, pipe supports, and pipe termination requirements.
5. **Install flue.** For combustion appliances, install the flue roof cap and stack assembly as described in the manufacturer's installation instructions.

INSTALL REMOTE HEATING AND COOLING EQUIPMENT

Install remote units in compliance with all heating and cooling equipment requirements in this chapter above and the following:

1. **Locate connections to the home.** Find the manufacturer-installed connectors, labels or tags under the home indicating the required connection points for supply and return air. If connectors are not provided nor location indicated, select a supply duct location such that there are approximately equal numbers of supply registers forward and rear of the connection point. It is recommended that the exterior heating and/or cooling equipment be centrally located on the back side of the home.
2. **Install ducts.** Install the appropriate supply and return ducts (not provided) between the remote unit and the home (Figure 71), making connections according to the instructions for crossover ducts in **Connect Crossovers** (p. 61).
3. **Install dampers.** If installing a remote cooling unit in a home with a factory installed furnace, install dampers between the furnace and the home's air duct system, and between the remote unit and the home's air duct system to prevent warm air in heating mode from escaping to the remote cooling unit and vice versa.
4. **Connect wiring.** Install a thermostat containing a fan switch. Connect utilities in accordance with all manufacturer's instructions and local codes. Wiring shall be

Installing flue stacks with a hinged roof. If flue stack components are installed above the finish roof line (as is often the case with hinged roofs), an Alternative Construction letter is normally required along with a follow-up inspection. Contact the factory for guidance.

Venting appliances to the outside. Vent to the exterior of the home all combustion appliances except ranges and ovens.

Selecting ducts. Exterior ductwork for remote units must be provided by the installer or HVAC contractor. Ducts must be approved for exterior installation and should be wrapped with insulation of at least R-8 under a vapor barrier with a perm rating of not greater than one. (For ENERGY STAR homes, the R-value must be at least that specified on the manufacturer's ENERGY STAR Site Installation Checklist—a minimum of R-8.)

per the installation instructions provided by the manufacturer.

5. **Seal penetrations.** Repair or replace all floor insulation disturbed during the duct installation and seal holes in the bottom board using foam, mastic or tape specially made for that purpose.

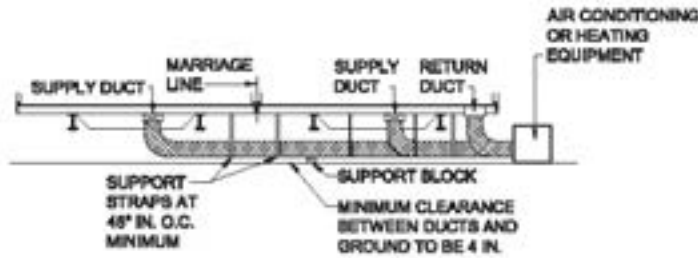


Figure 71. Ducts connecting exterior heating and/or cooling equipment to the home



Compressed Duct. Support the duct without compressing the insulation and restricting airflow.

PREPARE WHOLE HOUSE VENTILATION SYSTEM

Prepare the whole-house ventilation system according to the ventilation system manufacturer's instructions. Confirm that any fresh air intake ducts extend to the exterior and do not draw air from the crawlspace under the home. Do not allow any fresh air ventilation intake ducts to become kinked or restricted, forming a trap.

PREPARE CLOTHES DRYER

DRYER VENTS

If the home includes a clothes dryer, the components for ventilating the dryer are included with the home (but not necessarily installed) and a vent opening has been roughed in either in the wall or floor. (If a dryer is not installed, seal all dryer vent openings).

Run the dryer vent to the outside through the exterior wall or through the floor to a point beyond the perimeter of the home, using materials approved by the clothes dryer manufacturer (see Figure 72).

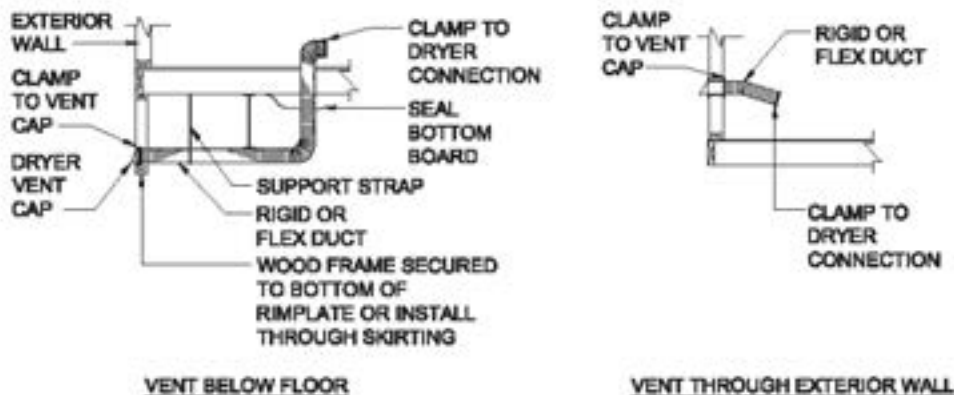


Choosing pipe lengths.

The appliance manufacturer may designate the length of the pipe run based on the pipe diameter and the number of turns in the pipe run.

Venting exhaust systems.

Exhaust vents must extend to the home's exterior through skirting. Termination of the dryer exhaust underneath the home can cause condensation and moisture damage to the home. Lint and dust accumulation can ignite, causing a fire.



VENT BELOW FLOOR

VENT THROUGH EXTERIOR WALL

Install the vent as follows:

1. **Remove temporary caps.** Remove any temporary seals and duct caps from the vent rough openings.
2. **Install ductwork.** Install ductwork using clamps (do not use screws or other fasteners that penetrate into the duct) and support the duct with metal straps connected to the floor joists or chassis at two feet o.c. or less. Ensure duct connections are internally overlapped to prevent inhibiting the flow of air and thereby causing lint accumulation.



Avoid damaging structural elements. Do not cut or otherwise damage structural elements such as floor joists or wall studs for the installation of the dryer exhaust system.

3. **Install cap and damper.** Install an approved dryer vent cap with damper on the exterior termination of the duct. If the vent terminates at skirting, secure the cap to framing or skirting with sheet metal screws and seal edges with caulk or sealant. If the vent terminates through a wall, apply a bead of sealant to the back of the cap around the opening and secure with sheet metal screws to metal, hardboard or fiber cement siding or with wood screws to a mount block for vinyl siding.
4. **Seal opening.** Seal openings inside and outside of the home including at the floor, interior walls, siding and skirting (with caulk) and at the bottom board using foam, mastic and/or tape specially made for that purpose.

GAS DRYERS

If the home was not fitted for a gas dryer, installing one requires substantial alteration to the home. Gas supply piping and adequate venting must be provided as specified by the dryer manufacturer and installed by a trained professional. Do not cut major structural elements to accommodate a gas dryer.

PREPARE SMOKE ALARMS

The home has several factory installed smoke alarms that are wired to a 120 volt circuit. If the home was designed for placement on a basement, an additional alarm is provided for installation at a pre-wired location under the home. Connect the basement smoke alarm and test all alarms as follows:

1. **Check circuit.** Ensure that the batteries are installed and the electrical power to the home is activated and that the smoke alarm circuit is on.
2. **Test alarms.** Press the "test" button on the alarm and hold for 5 seconds (or until the alarm sounds). When the alarm begins to sound, release and confirm that each alarm in the home is sounding. Replace (with the same brand as those installed elsewhere in the home) any alarms that do not sound and retest.
3. **Disconnect AC.** With the AC current disconnected and batteries installed, test for DC operation following the same procedure as shown in step 1.

Both steps 1 and 2 above must be conducted on each alarm installed in the home. If any alarm fails to sound during the test, turn off the power at the main panel box and check the wiring. Make any necessary repairs and conduct a complete re-test. Repeat if necessary until all alarms are functioning properly.

Gas. Ventilation components that may be included with the home for an electric dryer may not be acceptable for gas dryers. Consult the gas dryer manufacturer instructions.



Installing ducts.

Keep ductwork straight and smooth as possible without excess slack. Slope it slightly downward towards the exterior to facilitate moisture drainage.

PREPARE FIREPLACES

Install chimneys, chimney flashing and roofing, fireplace combustion air inlets and hearths according to the manufacturer's instructions and the procedures described below.

CHIMNEYS

Fireplace and wood stoves may require on-site installation of additional sections of approved chimney pipe, a spark arrestor and a rain cap assembly. Follow the manufacturer's instructions and the procedures described below:

1. **Remove coverings.** Remove protective materials covering the roof flashing and any foreign material from the installed part of the chimney.
2. **Install chimney pipe.** Assemble and seal the chimney per the fireplace or wood stove manufacturer's installation instructions and if there is a conflict between the instructions and the figure, follow the instructions. To assure sufficient draft for proper operation, extend the chimney at least three feet above the highest point where it penetrates the roof and at least two feet higher than any surface within 10 feet of the chimney (Figure 73). Use additional section(s) of chimney pipe (not provided) if required by local code or if the site has obstructions within 10 feet of the chimney.

Fireplaces and wood stoves not provided by the home manufacturer, including chimneys and air inlets for fireplaces and wood stoves must be listed for use with manufactured homes and must be installed in accordance with their listings.

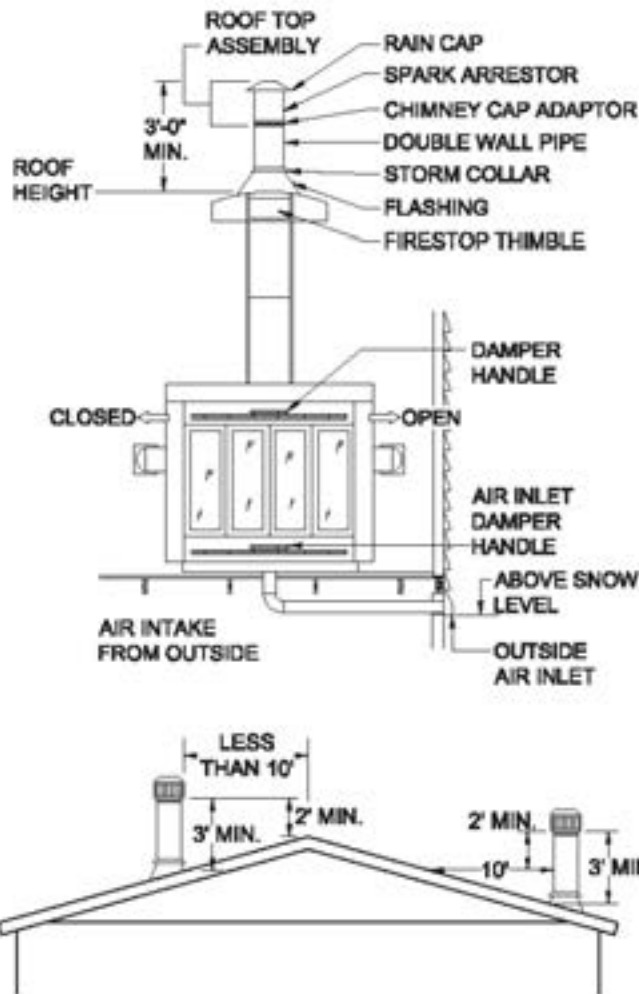


Figure 73. Chimney and combustion air intake duct installation



Selecting the appropriate flue. Wood fireplaces use larger diameter flues than gas fireplaces. Make sure flue matches the appliance type. Gas fireplaces cannot burn wood because the flue is too small and smoke will back up into the home.

Figure 74. Chimney clearance

3. **Install shingles.** Install shingles up to the edge of the flue cut-out in the roof

Prepare Appliances and Equipment

deck. Secure shingles installed under the roof flashing with asphalt cement.

4. **Install flashing.** Place flashing over pipe section and shingles and set in asphalt cement. Secure flashing to roof deck at top two corners with roofing nails.
5. **Complete shingles.** Cut shingles in successive courses to fit around the pipe and embed them in asphalt cement where they overlap the flashing. Secure shingles with roofing nails through flashing and apply asphalt cement over nail heads. The completed installation should appear as shown in Figure 75, with the lower part of the flange overlapping the lower shingles and the side and upper shingles overlapping the flange.

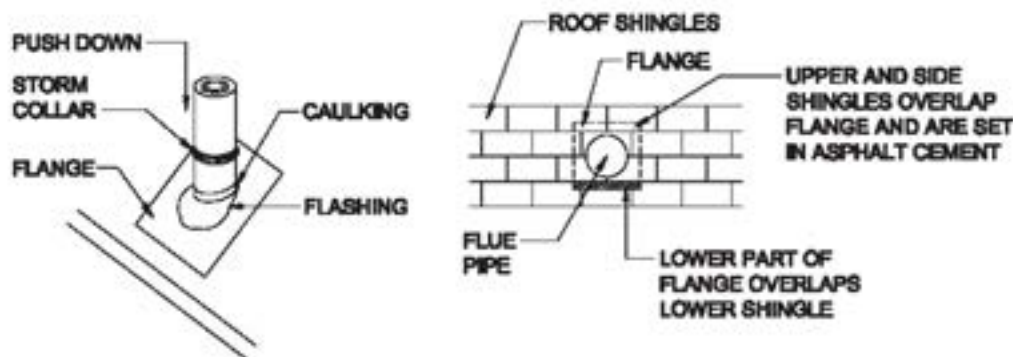


Figure 75. Roof flashing and shingle installation around chimney

COMBUSTION AIR INLETS

Combustion air inlets provide combustion air through the floor or an exterior wall to a combustion appliance. If installed through an exterior wall, no further site installation is required. If through the floor, extend the duct from its point just below the floor to the outside. Locate the outside air inlet above expected snow levels (contact the LAHJ for snow levels).

Follow the fireplace manufacturer's instructions (typically in the fireplace/stove or with the chimney parts).

PREPARE KITCHEN AND BATH APPLIANCES / FIXTURES

Install kitchen and bath appliances according to the manufacturer's instructions and the procedures described for each appliance below.

COOKING APPLIANCES

If the home is provided with a range, cook top and/or grill containing its own exhaust system that penetrates the floor, complete the exhaust system as follows:

1. Remove covers. Remove the cover on the factory installed exhaust pipe protruding from beneath the floor near the appliance.
2. Install termination fitting. Secure the provided termination fitting at the outside edge of the floor.
3. Install duct. Use the provided flexible metallic duct to connect the elbow protruding from the floor and the termination fitting. Refer to the manufacturer's installation instructions for guidance on supporting the duct and making the connections.

SITE-INSTALLED GAS APPLIANCES

Install only appliances with a Btu capacity equivalent to or less than the capacity of the factory-installed piping and at the location of a factory-installed gas riser.

REFRIGERATOR

Prepare the refrigerator as follows:

- Remove straps, blocks or other securement devices used for shipping and patch any resulting marks on floors or walls.
- If the refrigerator has an icemaker, check water lines for leaks upon installation and a few days later to make sure no leaks have developed.



Installing exhaust ducts.
Route exhaust ducts so they do not terminate beneath the home.

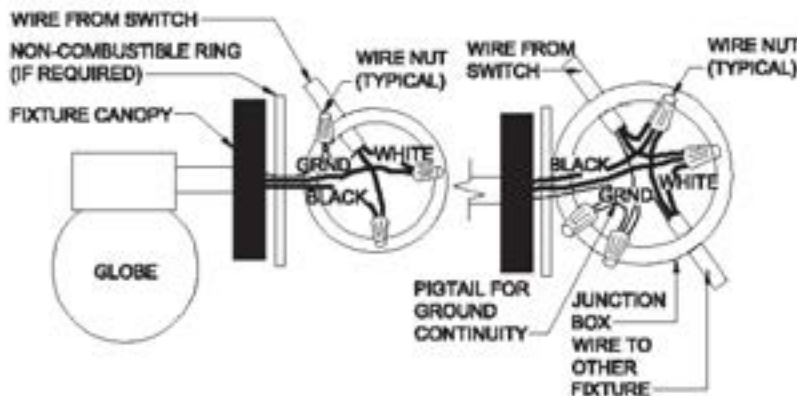
SITE-INSTALLED APPLIANCES AND FIXTURES

If sinks, tubs, showers or other fixtures or appliances are to be site-installed, follow the manufacturer's installation instructions. Use only products listed for use in manufactured homes and follow all applicable local codes.

INSTALL EXTERIOR LIGHTING

Install exterior lighting according to **Figure 76** and the following:

1. **Remove cover.** Remove the screws and cover from electrical junction box.
2. **Install flash ring.** Place the non-combustible flash ring over the junction box.
3. **Connect wires.** Connect fixture wires to house wires in the box, black to black, white to white and equipment ground to equipment ground, using listed wire connectors. Push wires into the box.
4. **Connect fixtures.** Connect the fixture to the junction box or strap using screws provided with the light fixture.
5. **Weatherproof.** Weatherproof/caulk around the base of the fixture, leaving a small gap in the caulking on the bottom to permit drainage of water that may accumulate.
6. **Complete installation.** Install bulb and globe on the fixture and verify proper operation.



INSTALL CEILING FANS/LIGHTS

Install ceiling fans no closer than 36 inches, measured from the tip of the fan blade to the nearest side of the smoke alarm and with the trailing edges of the blades at least six feet-four inches above the finished floor. Comply with all unit manufacturer's instructions and the requirements below.

CEILING FAN/LIGHT MOUNTED TO FACTORY INSTALLED ELECTRICAL BOX IN CEILING

Before installing the unit, make sure that adequate structural bracing is present in the ceiling. If uncertain, check with the manufacturer. Follow the fan or light manufacturer's instructions to connect the unit and complete the wiring. If the instructions are not available, connect the wiring as shown in **Figure 77**.



Lighting installation. A qualified electrician should install lighting. Before connecting lighting, disconnect power to the lighting circuit. Ground all exterior light fixtures.

Using a non-combustible ring. Install a non-combustible ring completely covering any combustible surfaces the fixtures may be mounted on (e.g. hard-board, clad wood and vinyl siding), or when ceiling material is exposed between the light fixture canopy and the junction box.

Figure 76. Exterior lighting connection



Installing ceiling fans. A qualified electrician should install lighting and fans. Before connecting the ceiling fan or light, disconnect power to the fan wires. Any unit installed outside of the home (such as in a porch ceiling) shall be listed for wet locations.

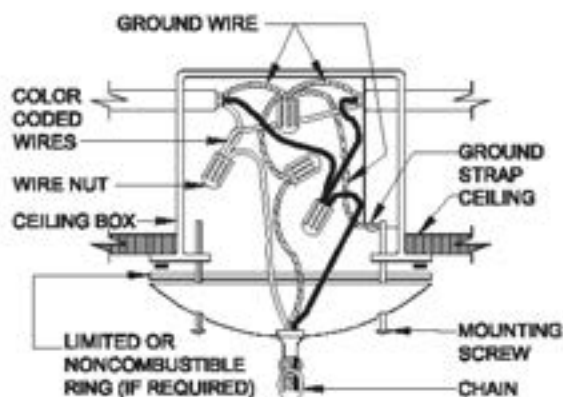
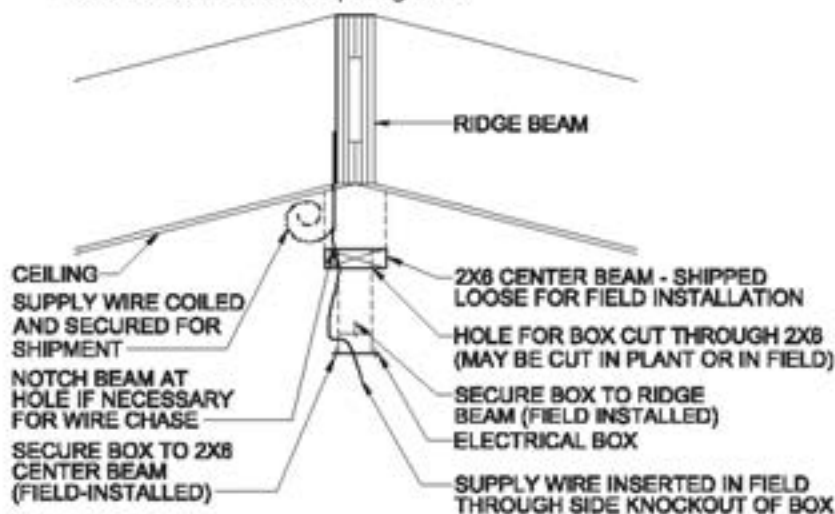


Figure 77. Wiring for a ceiling fan or chain-hung light fixture with a maximum weight of 35 lbs

CEILING FAN/LIGHT MOUNTED ON SITE-INSTALLED DECORATIVE BEAM

Where the electrical box will be mounted in a site-installed decorative center beam attached to the ridge beam, connect the fixture as follows (see Figure 78):

1. **Cut hole.** If the decorative beam (shipped loose) does not contain a precut hole for the electrical box, cut a hole with a diameter approximately 1/4 inch larger than the box's using a hole saw. Align the hole with the supply wire location and center on the beam.
2. **Install box.** Install the box in the hole and secure the flange (plastic boxes only) to the decorative beam with four #6 x 1" screws.
3. **Insert wire.** Insert the ceiling wire through a knock out hole in the side of the electrical box. It may be necessary to cut a notch in the top of the decorative beam (on the supply wire side of the center beam hole) allowing the supply wire to be inserted into the electrical box without binding against the beam during installation. Leave approximately four inches of wire free in the box.
4. **Attach beam.** Secure the decorative beam in place over the center line joint, checking that the supply wire is not pinched or penetrated by beam fasteners. Secure the electrical box to the ridge beam with #8 x 2 1/2" wood screws through the two holes in the top of the box.
5. **Strip wires.** Strip about 3/4 inch of insulation from the white and black conductor ends of the supply wire.
6. **Position ring.** Position the non-combustible flash ring (provided) over the electrical box so that the finished surface (adjacent to electrical box), which is to be covered by the fan canopy, is not exposed.
7. **Install and wire unit.** Follow the unit manufacturer's installation instructions for mounting the fan/light assembly to the box and for electrical wiring. Use provided electrical connectors for splicing wire.



Choosing ceiling fan junction boxes. Connect ceiling fans only to junction boxes listed and marked for ceiling fan application in accordance with Article 314.27(b) of 2005 NEC. Always ground metal junction boxes.

Selecting fan weight. Do not use any ceiling fans or light fixtures that exceed the weight rating of the box (35 lbs unless otherwise noted).

Grounding electrical devices. Ground fans/lights using a fixture-grounding device or a fixture-grounding wire as specified in the manufacturer's instructions.

Figure 78. Ceiling fan/light mounted to flush ridge beam

TEST ELECTRICAL SYSTEM

After completion of all electrical wiring and connections, including crossovers, appliances, lights, and ceiling fans, inspect and test the electrical system as follows:

1. **Fill water heater.** Fill water heater before turning on power to the home or switching on the circuit breaker.
2. **Test continuity.** Before turning on the electrical power to the home, conduct an electrical continuity test to ensure that exposed metallic parts of the home and the chassis are effectively bonded.
3. **Test operation.** After turning on the electrical power to the home, conduct operational tests of all devices to demonstrate that they are connected and in working order.
4. **Test polarity.** After turning on the electrical power to the home, conduct electrical polarity checks to determine that connections of electrical equipment installed or completed during installation have been made properly. Visual verification is an acceptable electrical polarity check for these on-site connections.

► go to **Complete Exterior Work** (p. 112)

Complete Exterior Work

This chapter covers sealing the bottom board, installing the ground cover and skirting, preparing wind protection shutters and completing site built structures.

Follow the Steps below:

- ▼ **STEP 1. REPAIR AND SEAL BOTTOM BOARD** (p. 112)
- ▼ **STEP 2. INSTALL GROUND MOISTURE RETARDER** (p. 112)
- ▼ **STEP 3. INSTALL SKIRTING** (p. 113)
- ▼ **STEP 4. ASSEMBLE OPTIONAL WIND PROTECTION SHUTTERS** (p. 114)
- ▼ **STEP 5. COMPLETE SITE BUILT STRUCTURES** (p. 114)

STEP 1. REPAIR AND SEAL BOTTOM BOARD

Tears and openings in the bottom board can result from transportation or installation activities. Inspect for holes and gaps in the entire bottom board, especially areas around service penetrations, crossover connections, pipe and duct hangers, foundation elements and the perimeter of the floor. Using approved materials appropriate for the type of repair, repair the bottom board wherever torn or loosened as follows:

1. **Insulate.** Replace any missing insulation prior to closure and repair of the bottom board, paying particular attention to insulation gaps that may have been created at P-traps.
2. **Repair large openings.** Repair large openings with a durable patch made of bottom board fabric or other compatible material and fastened with vinyl bottom board tape held in place by fasteners installed with a divergent stapler. Seal the edges around patches with foam or mastic. For large openings, install a rigid backer board behind the bottom board to provide a fastening substrate for the patch.
3. **Repair small openings.** Repair small gaps and tears with vinyl bottom board tape, patches, adhesive/mastic or foam sealant.

Alternate materials may be used to repair and seal the bottom board provided they are appropriate for the type of repair and installed per the manufacturer's installation instructions.

STEP 2. INSTALL GROUND MOISTURE RETARDER

If the space under the home is to be enclosed with skirting or other materials, a ground moisture retarder of a minimum six mil thick polyethylene sheeting or equivalent must be installed covering the ground under the home. Moisture retarders are not required in arid regions (less than 15 inches of rainfall annually) with dry soil conditions. If on-grade (surface) footings are used, install the ground moisture retarder prior to placing the footings, or install it around the footings after all other work under the home is complete.

Install the ground moisture retarder as follows:

1. **Apply sheeting.** Unroll the ground moisture overlapping joints in the sheeting a minimum of 12 inches and covering the entire area under the home except for areas under recessed entries, decks and porches.
2. **Repair tears.** Repair any large voids or tears in the retarder by patching with like material, maintaining a minimum 12 inch overlap, secured with tape or adhesive. Repair small voids and tears with tape, adhesive or per manufacturer's installation instructions.



Sealing bottom boards. A continuous and sealed bottom board is critical for home performance, energy efficiency, protection against moisture problems, prevention of pipe freezing and protection against insects and rodents.

Bottom board sealing methods. Tapes shall never be used alone to repair a large opening in the bottom board. Divergent staples or mastic must be used in tandem with tape to prevent future tear off.

Fastening vinyl siding. Do not install fasteners directly into vinyl siding. Allow for siding thermal expansion by pre-drilling minimum 1/2 inch diameter fastener holes or fastening skirting to a ledger under the home (see Best Practice tip).

STEP 3. SKIRTING (IF USED)

Skirting is any structural or non-structural perimeter crawlspace enclosure. Complete site built structures (see **STEP 5. COMPLETE SITE BUILT STRUCTURES**, p.114) that abut the home (such as porches, attached garages and steps) prior to installing skirting.

TABLE 27. SKIRTING AND VENTILATION SPECIFICATIONS

Component	Specification
Skirting	Skirting must be of weather-resistant materials or provided with protection against weather deterioration at least equivalent to that provided by a coating of zinc on steel of not less than 0.30 oz per sq ft of surface coated. Skirting made from wood or wood products and used within six inches of the ground need to be made of materials naturally resistant to decay and termite infestation or pressure treated.
Vents	Ventilation openings must be covered for their full height and width with a perforated (1/4 inch maximum opening in any dimension) corrosion and weather resistant covering that is designed to prevent the entry of rodents. In areas subject to freezing, the coverings for the ventilation openings must have an operable damper, permitting them to be in the open or closed position depending on the weather.

To design and install skirting, comply with the skirting manufacturer's instructions (if provided) and the following:

1. **Configure skirting.** Run the skirting along the perimeter of the home's heated, conditioned space. Do not enclose with skirting areas under recessed entries, porches or decks (whether constructed as part of the home or added on site) unless skirting is of the fully vented type and installed so as to allow water to freely flow out from under the home.
2. **Fasten skirting.** Attach it to the home in a manner that prevents water from being trapped between the siding or trim and the skirting. Allow for frost heave when installing skirting in areas subject to frost.
3. **Provide ventilation.** Unless the skirting has integral ventilation openings that meet the following ventilation requirements, install equally sized ventilation openings on at least two opposite sides of the foundation. Size ventilation area to equal at least one square foot for each 150 square feet of under-floor area (or for each 1,500 square feet if a ground moisture retarder is installed according to **STEP 2. INSTALL GROUND MOISTURE RETARDER**, p. 112). The ventilation area must be the net free area of the foundation vent, not the area of the foundation opening. Place vents as high above the ground as practical.

TABLE 28 FOUNDATION VENTILATION
One Square Foot of Vent per 150 Square Feet of Under-Floor Area

Total Home Sq. Feet	Sq. Feet of Vents Required	Total Home Sq. Feet	Sq. Feet of Vents Required	Total Home Sq. Feet	Sq. Feet of Vents Required	Total Home Sq. Feet	Sq. Feet of Vents Required	Total Home Sq. Feet	Sq. Feet of Vents Required
500	3.33	1000	6.67	1500	10.00	2000	13.33	2500	16.67
600	4.00	1100	7.33	1600	10.67	2100	14.00	2600	17.33
700	4.67	1200	8.00	1700	11.33	2200	14.67	2700	18.00
800	5.33	1300	8.67	1800	12.00	2300	15.33	2800	18.67
900	6.00	1400	9.33	1900	12.67	2400	16.00	2900	19.33

4. **Install access.** Provide an access opening not less than 18 inches wide and 24 inches high (minimum 3 square feet in area) and located so that any utility connections located under the home are accessible.
5. **Extend vents, drains and inlets.** Run appliance exhaust vents, combustion air inlets and air conditioner condensation drains through the skirting to the outside and terminate each as instructed in the sections of this manual corre-

Attaching vinyl skirting. Attach skirting to the home, but allow for contraction and expansion characteristics of the skirting material.



Avoid backfilling against skirting. Do not backfill against non-structural skirting.

sponding to each appliance.

STEP 4. ASSEMBLE OPTIONAL WIND PROTECTION SHUTTERS

If desired, prepare temporary protective window covers for use during severe wind storms and hurricanes according to **Appendix C**.

STEP 5. COMPLETE SITE BUILT STRUCTURES

Install site built structures such as steps, landings, garages, awnings, carports, breezeways, porches, decks, railings, sheds and utility rooms according to manufacturer's instructions (if any), in compliance with all local regulations including fire separation and electrical requirements, and according to the following:

- Do not obstruct any of the egress windows or the two required exit doors from the home.
- The addition must be entirely self-supported and cannot rely on the home for support (superficial connections are acceptable). The home's structural system is not designed to support the extra loads imposed by the addition.
- Do not damage the integrity of the home's structural or weatherproofing system. Seal any weatherproofing connections between the site built structure and the home and flash any roof connections.
- The home's structural system may not be cut or altered in any way. A registered engineer or architect shall approve any alterations or changes.
- Utilize only GFCI outlets for site built structures.
- Install and test smoke alarms in any site built structures according to local code.
- All joints between the home and the addition must be properly sealed so they are watertight.
- The home's mechanical system has been designed for the home itself and does not consider the heating or cooling of the addition.
- The addition must meet all local codes, including site work and fire separation requirements. The manufacturer does not accept any responsibility for the addition's design.
- The home with an addition must be in conformance with the HUD Manufactured Housing Code, such as exiting, light and vent, etc. The addition must be approved by the jurisdiction having authority.
- Site work shall be consistent with the objectives of site grading as described in **Prepare the Site** (p.15).
- The manufacturer will not honor the warranty for any problem that relates to the construction of the addition (leak problems, etc).

A dormer roof can be installed on the home to match the pitch of the addition's roof. The shingles below the dormer must be removed and the dormer must be vented properly. The dormer weight, including the weight of the existing home's roof sheathing, shall be no more than 8 psf and distributed uniformly over the roof trusses of the home. Connections may be made to attach the dormer to the home, but not be used to support the roof loads of the addition. The dormer shall be shingled, flashed and sealed properly to prevent leaks (follow shingle manufacturer's instructions and ARMA guidelines for shingle valley applications).

The manufacturer is providing the above information as an accommodation only and without consideration. Accordingly, by this letter the manufacturer extends no warranties or representation either expressed or implied with regard to the recommendations herein.

► go to **Prepare Home for Occupancy** (p. 115).

Prepare Home for Occupancy

Follow these steps for final inspection and completion of the home.

Follow the Steps below:

- ▼ **STEP 1. VERIFY ALTERNATIVE CONSTRUCTION (A/C) INSPECTION** (p. 115)
- ▼ **STEP 2. COMPLETE INSPECTION CHECKLIST** (p. 115)
- ▼ **STEP 3. COMPLETE ENERGY STAR CHECKLIST** (p. 115)
- ▼ **STEP 4. CLEAN THE HOME** (p. 115)

STEP 1. VERIFY ALTERNATIVE CONSTRUCTION (A/C) INSPECTION

A home designated as an AC home will contain the letters "AC" in the serial number located on the data plate. Verifying the AC inspection is the responsibility of the retailer. The installation is not complete until the alternative construction inspection has been passed and all applicable documentation completed and returned to the plant.

STEP 2. COMPLETE INSPECTION CHECKLIST

After all previous steps have been accomplished, inspect the home to verify that it has been completely and properly installed using the checklist starting on p. 116. Installer must also certify that the installation is in compliance with either the manufacturer's instructions or with an alternative design in compliance with 3285.2(c). Arrange for an inspection by the appropriate LAHJ, if required.

Correct any deficiencies found, if possible, or if not possible, inform the retailer or manufacturer immediately.

STEP 3. COMPLETE ENERGY STAR CHECKLIST

For ENERGY STAR qualified homes (check with the retailer or manufacturer), this step is to be completed by the manufacturer's designated representative.

The manufacturer's representative must complete the Energy Star Site Installation Checklist, obtain signatures on the ENERGY STAR label, and return the completed ENERGY STAR Site Installation Checklist to the manufacturing plant.

STEP 4. CLEAN THE HOME

Remove and properly dispose of all installation-generated dust, debris and packaging materials from the home and the surrounding property. Ensure that the home is in "move-in" condition.

Installation is Complete

FOUNDATION SUPPORT

- Footings properly sized and constructed for the soil conditions
- Pier spacing per data plate and applicable table and roof load zone
- Piers properly constructed and vertical
- Perimeter blocking installed (if required)
- Piers at each side of openings 48" or larger
- Piers beneath all outside exterior doors (except when located in end wall)
- Center line piers installed at columns
- Shims in place and tight

ANCHORS

- Approved anchors are used
- Proper anchors installed based on soil conditions
- Anchors are installed at correct angles
- Anchor spacing and installation correct
- Longitudinal ties installed (if required)
- Anchor straps are tensioned

UNDER THE HOME

- Moisture retarder installed
- The ground under and around the home has been properly graded to prevent water from collecting or flowing beneath the home
- HVAC ducts are supported off the ground and connected tightly to collars at all ends
- Fireplace combustion air intake free and unrestricted
- No holes or tears in bottom board
- Skirting (if used) has been installed per manufacturer's instructions with proper venting and provision for frost heave
- Skirting has been attached in a manner that does not cause water to be trapped between the siding and trim and cannot be forced up into the wall cavity
- Dryer vent, range/cook top exhaust, water heater temperature and pressure overflow pipe and AC condensate drain installed to perimeter of crawl space

EXTERIOR

- Shingled roofs are free of visible damage and serious defects and there are no missing or loose shingles
- Shingle close-up and ridge cap have been completed per applicable details
- All hold down straps on shingled roofs have been removed and holes have been properly sealed
- Penetrations at roof stacks, vents and chimneys have been properly sealed
- Siding and trim is free of gaps, voids, missing fasteners, damage and serious defects. All seams are sealed and hardboard edges are sealed.
- Drip edge and fascia is properly installed and free of damage and serious defects
- Gutters and downspouts are installed properly such that water is diverted away from the home
- Trees and bushes have been trimmed to prevent brushing against the home in windy conditions or under snow loads
- The HUD label is exposed, intact and legible
- The exterior of the home and immediate surroundings is clean, clear of con-

struction materials, dust and debris

INTERIOR

- Ceilings, walls and floor coverings are free from damage and serious defects
- Carpeting is properly stretched and seamed
- All trim and molding is installed properly and free of damage and defects
- All cabinets, countertops, plumbing fixtures, appliances, furnishings and window coverings are free of damage or serious defects
- All cabinet doors and drawers work properly
- All interior and exterior doors and windows open, close and latch properly
- One window in each bedroom meets emergency egress requirements, has operating instruction labels on it and operates properly
- All temporary shipping hardware has been removed
- Floors are level
- The data plate is intact and legible
- Smoke alarms have been tested
- The interior of the home is clean, clear of materials, dust and debris

WATER AND DRAIN SYSTEMS

- Crossover and service connection and splices have been properly made with correct materials
- Water and drain lines are insulated or otherwise protected from freezing
- Pipe supports are installed and properly spaced
- Proper slope has been maintained on all drain lines
- All necessary inspections and tests have been performed
- All sinks, basins, tubs and toilets operate properly
- All hot and cold water lines are properly connected to fixtures, dispense water as labeled and operate properly
- Tub, tub/shower and shower outlets have been verified to ensure the outlet water temperature does not exceed 120°F (49°C)

ELECTRICAL SYSTEMS

- The panel amperage matches the connection to the home
- The home has been properly grounded
- The main power supply has been properly connected and tested by a licensed electrician
- Continuity test has been conducted
- Polarity test has been conducted
- Operational test has been conducted
- All electrical crossovers have been connected
- All receptacles, switches and light fixtures operate properly
- Ground fault circuit interrupters operate properly
- All exterior lights have been properly installed

GAS/FUEL OIL SYSTEMS

- The gas system pressure test has been conducted
- Connections between units are properly made with access as required
- The main fuel line has been properly connected and tested by a qualified technician

APPLIANCE OPERATING AND VENTING

- All appliances are working properly

Complete Installation Checklist

- Appliance venting is in accordance with the manufacturer's instructions
- Fresh air intakes are properly installed
- Whole house, kitchen and bath exhaust fan operation are correct
- Fireplace chimney stack extension and roof cap have been installed in accordance with the manufacturer's instructions
- Air conditioner/heat pump is sized properly
- Air conditioner condensate line is properly trapped and terminates outside of the skirting

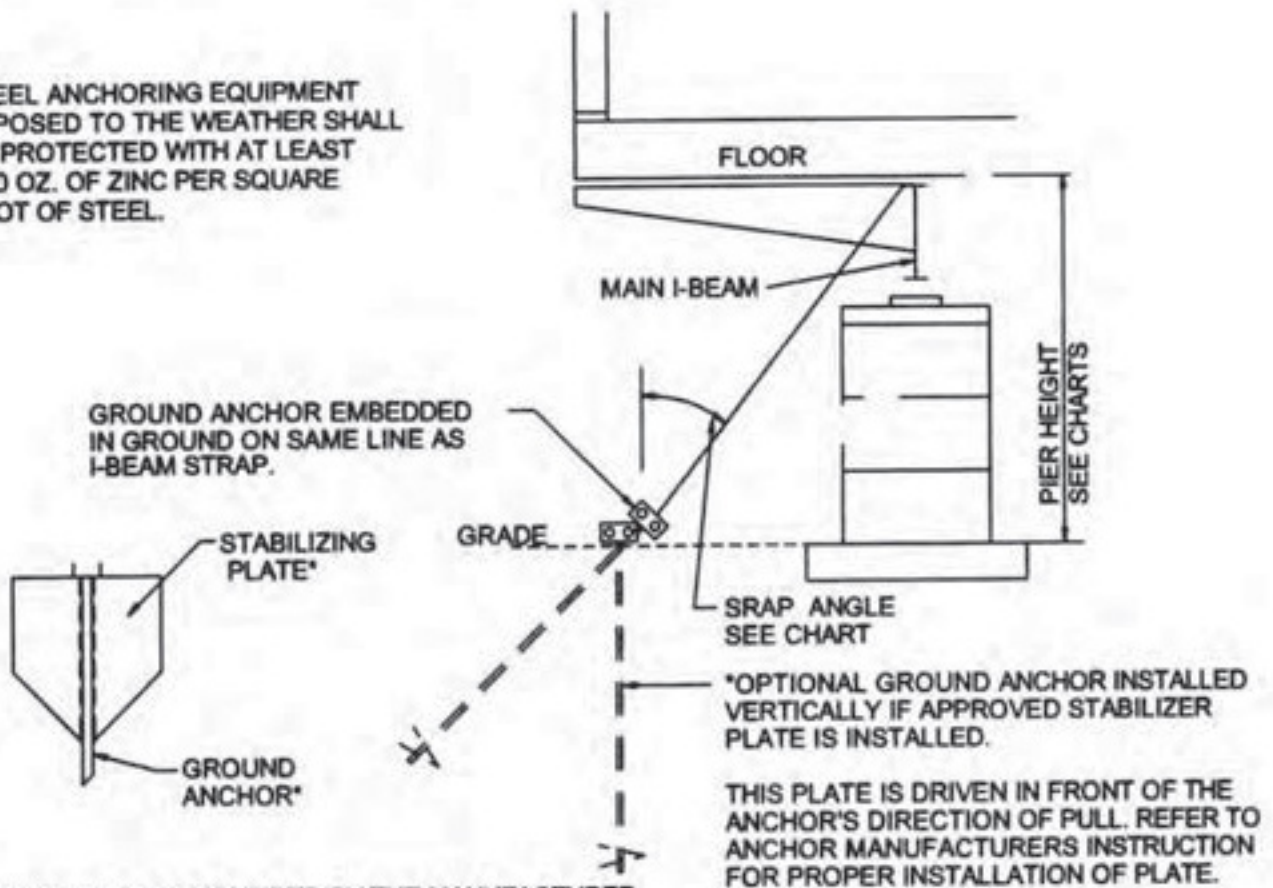
MISCELLANEOUS

- Installation/anchoring certificates or seals have been issued and installed (if required)
- Owner's and operation manuals are available for all appliances
- This installation manual is left with home
- Marriage line gasket has been installed and inspected

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STEEL ANCHORING EQUIPMENT EXPOSED TO THE WEATHER SHALL BE PROTECTED WITH AT LEAST 0.30 OZ. OF ZINC PER SQUARE FOOT OF STEEL.



*NOT INSTALLED NOR PROVIDED BY THE MANUFACTURER

NOTE: If anchoring system is not installed as shown a registered engineer shall be consulted for an acceptable design.

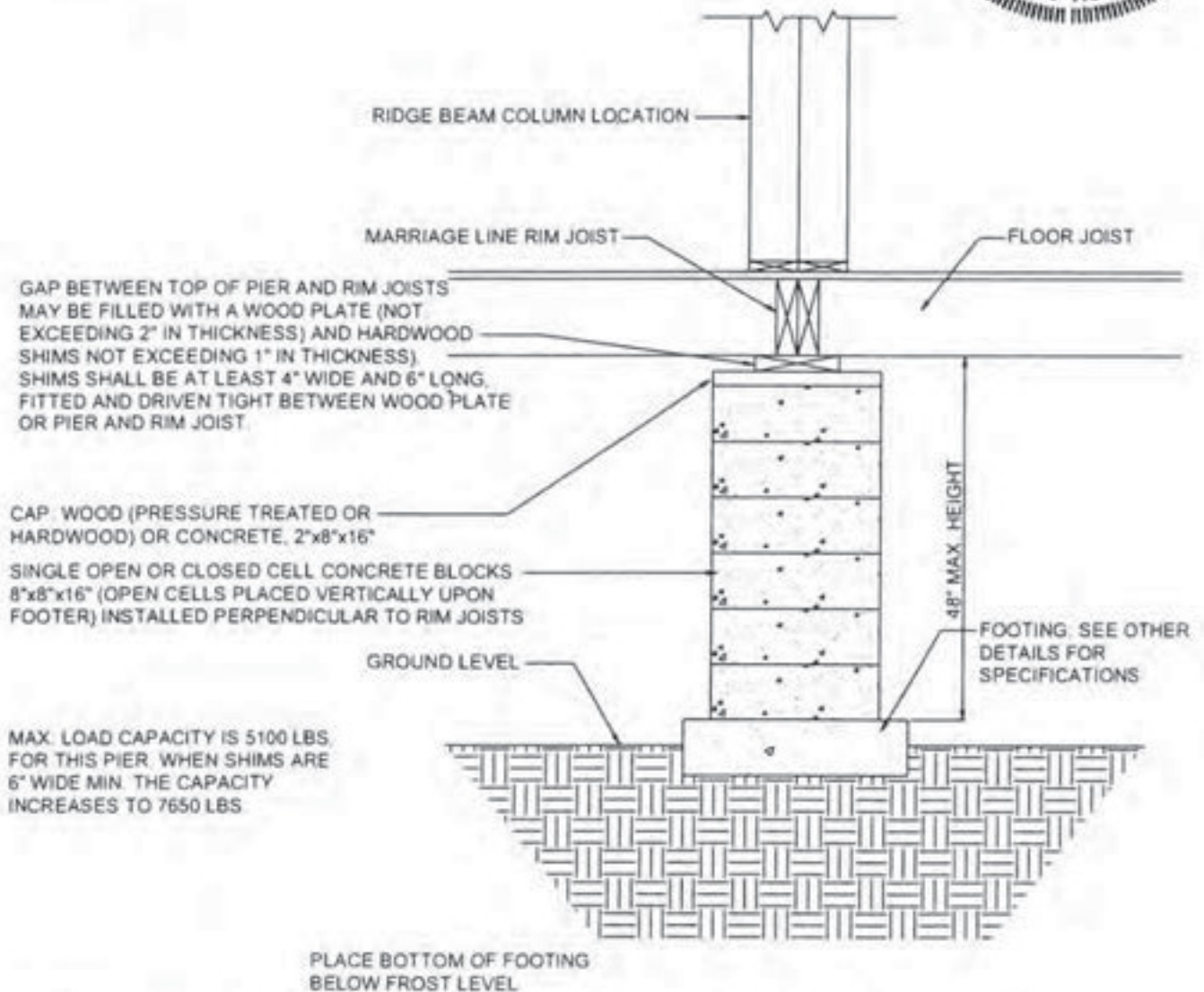
1. All tie down straps shall be 1 1/4" x .035 galvanized steel conforming to ASTM standard (D3953-91) specification for, strapping, flat steel and seal with an ultimate load capacity of 4725 lbs.
2. Ground anchors shall be capable of resisting a tensile load of 3150 lbs. per strap.
3. Tiedowns must start no more than 2'-0" from each end of unit (i.e. open 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.
4. Install the frame tie down straps on the outermost I-Beam of the home using the spacing shown in this manual.
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. See Chapter 11 for Minute Man Anchor installation instructions.
7. Tie down straps must be tightened alternately on opposite sides of the home or the home may be pulled off it's supports.
8. Over the roof tie downs (i.e. park straps) are not required and shall not be used in lieu of frame tiedowns. (May be used in addition to frame ties). Optional over the roof tie down straps may be installed by the manufacturer. Location to be as close to the ends as possible, but not greater than 8'-0". Over the roof tie down strap material must be of the same material as the required tie down straps. (See note 1 above). Optional over the roof tie down straps and required tie down straps can attach to the same anchor provided the anchor is designed to withstand the combined forces and installed in a manner that the design requires.



TYPICAL RIDGE BEAM SUPPORT COLUMN PIER - WIND ZONE 1

NOTE:

- 1 THIS DETAIL IS ALSO APPLICABLE TO BLOCKING INSTALLED AT SIDEWALL RIM JOIST LOCATIONS.
- 2 UNIT STABILITY IS MAINTAINED BY MEANS OF SINGLE STACKED PIERS NO HIGHER THAN 36" LOCATED UNDER THE MAIN I-BEAMS OR DOUBLE STACKED PIERS WITH A MAXIMUM HEIGHT OF 80".



PIERS ARE REQUIRED AT ALL COLUMN LOCATIONS 4'-0" AND WIDER, DENOTED BY PAINT ON BOTTOM BOARD OF HOME.

TIE DOWN SPACING CHART - WIND ZONE 1

NEAR BEAM ANCHOR SYSTEM

Single Double	Unit Width	Overall Width	I-Beam Spacing	Over- Hang	Wall Height	Max. Roof Pitch	Wind Zone	ANCHOR ATTACHMENT HEIGHT			
								Spacing Anchor Angle	MAN. HGT	Spacing Anchor Angle	MAN. HGT
Single	160"	160"	99.5	3"	84"	4.34	1	10'-0" 32 Deg.	38"	8'-0" 25 Deg.	51"
Single	160"	160"	99.5	3"	96"	4.34	1	10'-0" 37 Deg.	32"	8'-0" 29 Deg.	44"
Single	180"	180"	99.5	3"	84"	4.34	1	10'-0" 32 Deg.	54"	8'-0" 25 Deg.	72"
Single	180"	180"	99.5	3"	96"	4.34	1	10'-0" 39 Deg.	43"	8'-0" 30 Deg.	60"
Double	142"	284"	99.5	12"	96"	4.34	1	7'-0" 25 Deg.	32"	5'-0" 20 Deg.	48"
Double	160"	320"	99.5	12"	96"	4.34	1	8'-0" 30 Deg.	42"	6'-0" 22 Deg.	60"
Double	180"	360"	99.5	12"	96"	4.34	1	10'-0" 39 Deg.	43"	8'-0" 30 Deg.	60"
Double	160"	320"	99.5	12"	108"	4.34	1	8'-0" 34 Deg.	36"	6'-0" 25 Deg.	52"
Double	180"	360"	99.5	12"	108"	4.34	1	10'-0" 44 Deg.	36"	8'-0" 34 Deg.	52"

WIND ZONE 1 TIE DOWN SYSTEM NOTES:

1. Frame tie down shall be installed to properly secure the home.
2. Reserved
3. Reserved
4. When anchors are not installed at the angle specified in the table a stabilizer plate must be installed in accordance with the anchor manufacture's instructions.
5. Frame tie downs and anchors are not supplied by CAVALIER HOMES.
6. When required vertical tie straps and or brackets are supplied by CAVALIER HOMES. Anchors and end treatments are to be supplied by others.
7. Frame ties shall be capable of resisting an ultimate tension load of 4725 lbs and are to be installed per the manufacture's installation instructions.
8. Steel anchoring equipment exposed to the weather shall be protected with at least 0.30 oz. of zinc per square foot of steel.
9. Design based on unit width, I-Beam spacing and a maximum side wall height shown.
10. Reserved
11. Frame tie downs are positioned at crossmember location (within 3") when attachment point is at the bottom of the chassis.
12. Anchors to be certified by a professional engineer, architect or 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.
13. Ground anchors to be embedded below the frost line and be at least 12" above the water table. Anchors to be installed to their full depth and are not to extend beyond the side wall of the home.
14. Ground anchors to be rated for 1.5 x anchor capacity or an ultimate load of 4725 lbs.
15. Strapping to be certified by a registered professional engineer, architect or approved testing laboratory to resist these specified forces in accordance with testing procedures in ASTM standards specification D3593-91.
16. Shearwall anchor and strap are required at beam opposite shearwall attachment, see details this section.
17. Minimum pier height shall be 18" and maximum pier height per table for tie spacing.



TIE DOWN SPACING CHART - WIND ZONE 1

NEAR BEAM ANCHOR SYSTEM

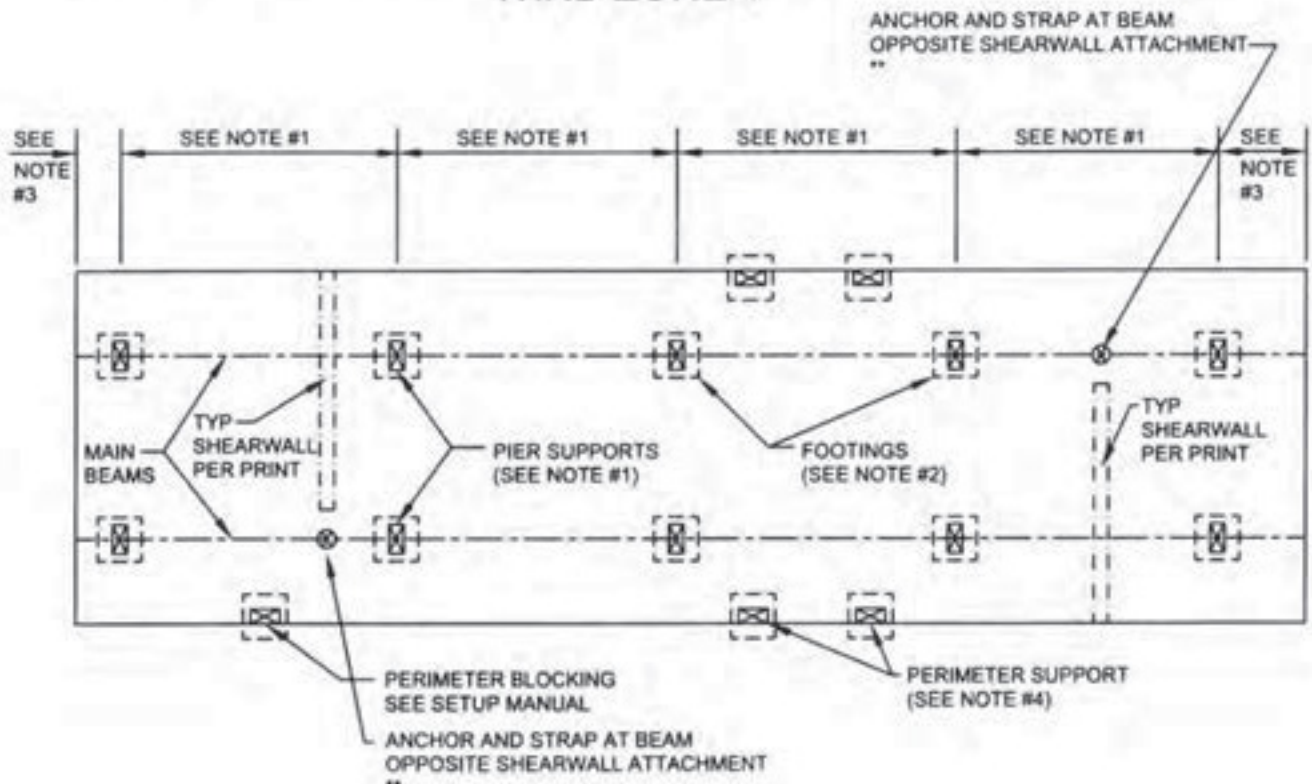
Single Double	Unit Width	Overall Width	I-Beam Spacing	Over- Hang	Wall Height	Max. Roof Pitch	Wind Zone	ANCHOR ATTACHMENT HEIGHT	
								Spacing/ Anchor Angle	MAX. HGT
Double	160"	320"	99.5	12"	96"	6.9	1	4'-0"/30 Deg.	44"
Double	180"	360"	99.5	12"	96"	6.9	1	4'-9"/38 Deg.	44"
Double	160"	320"	99.5	12"	108"	6.9	1	4'-0"/31 Deg.	40"
Double	180"	360"	99.5	12"	108"	6.9	1	5'-0"/42 Deg.	38"

WIND ZONE 1 TIE DOWN SYSTEM NOTES:

1. Frame tie down shall be installed to properly secure the home.
2. Reserved
3. Reserved
4. When anchors are not installed at the angle specified in the table a stabilizer plate must be installed in accordance with the anchor manufacturer's instructions.
5. Frame tie downs and anchors are not supplied by CAVALIER HOMES.
6. When required vertical tie straps and/or brackets are supplied by CAVALIER HOMES, Anchors and end treatments are to be supplied by others.
7. Frame ties shall be capable of resisting an ultimate tension load of 4725 lbs and are to be installed per the manufacturer's installation instructions.
8. Steel anchoring equipment exposed to the weather shall be protected with at least 0.30 oz. of zinc per square foot of steel.
10. Design based on unit width, I-Beam spacing and a maximum side wall height shown.
10. Reserved
11. Frame tie downs are positioned at crossmember location (within 3") when attachment point is at the bottom of the chases.
12. Anchors to be certified by a professional engineer, architect or 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.
13. Ground anchors to be embedded below the frost line and be at least 12" above the water table. Anchors to be installed to their full depth and are not to extend beyond the side wall of the home.
14. Ground anchors to be rated for 1.5 x anchor capacity or an ultimate load of 4725 lbs.
15. Strapping to be certified by a registered professional engineer, architect or approved testing laboratory to resist these specified forces in accordance with testing procedures in ASTM standards specification D3593-91.
16. Shearwall anchor and strap are required at beam opposite shearwall attachment, see details this section.
17. Minimum pier height shall be 18" and maximum pier height per table for tie spac



TYPICAL BLOCKING LAYOUT FOR SINGLE-SECTION HOMES WIND ZONE 1



NOTES:

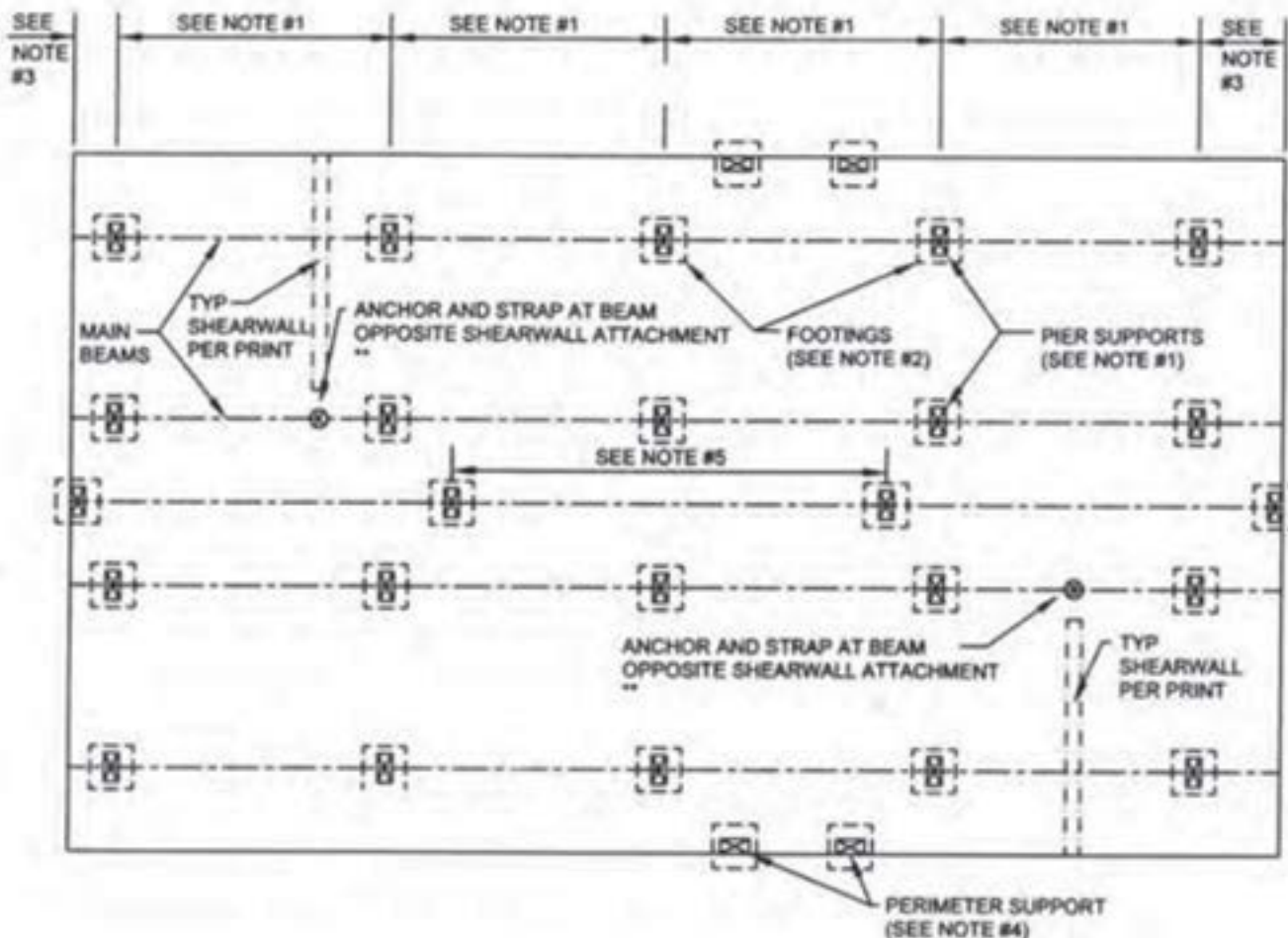
1. SEE SETUP MANUAL FOR REQUIRED PIER CAPACITY AND SPACING.
2. SEE SETUP MANUAL FOR FOOTING REQUIREMENTS.
3. PIERS SHALL BE LOCATED AT A MAXIMUM OF 2 FEET FROM BOTH ENDS.
4. PIERS SHALL BE LOCATED AT EACH SIDE OF ALL PERIMETER OPENINGS (4) FEET OR WIDER IN WIDTH. THIS WILL INCLUDE DOORS, WINDOWS, RECESSED ENTRIES, PORCHES, ETC.
5. PIERS SHALL BE INSTALLED AT EACH INTERIOR SHEARWALL LOCATION AS IDENTIFIED BY PRINT PROVIDED WITH HOME.

** REFER TO MANUFACTURER'S FLOOR PLAN (PROVIDED) OR IDENTIFYING TAGS OR PAINT FOR SHEARWALL LOCATIONS. THESE ANCHORS MUST BE INSTALLED IN ACCORDANCE WITH THEIR LISTING.



TYPICAL BLOCKING LAYOUT FOR MULTI-SECTION HOMES

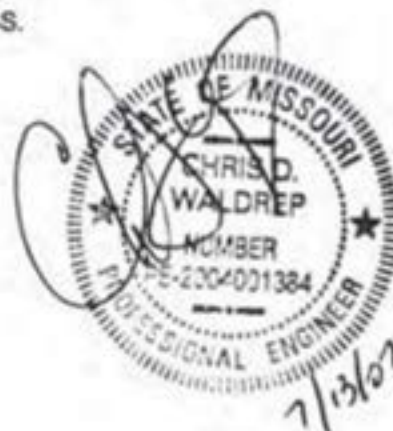
WIND ZONE 1













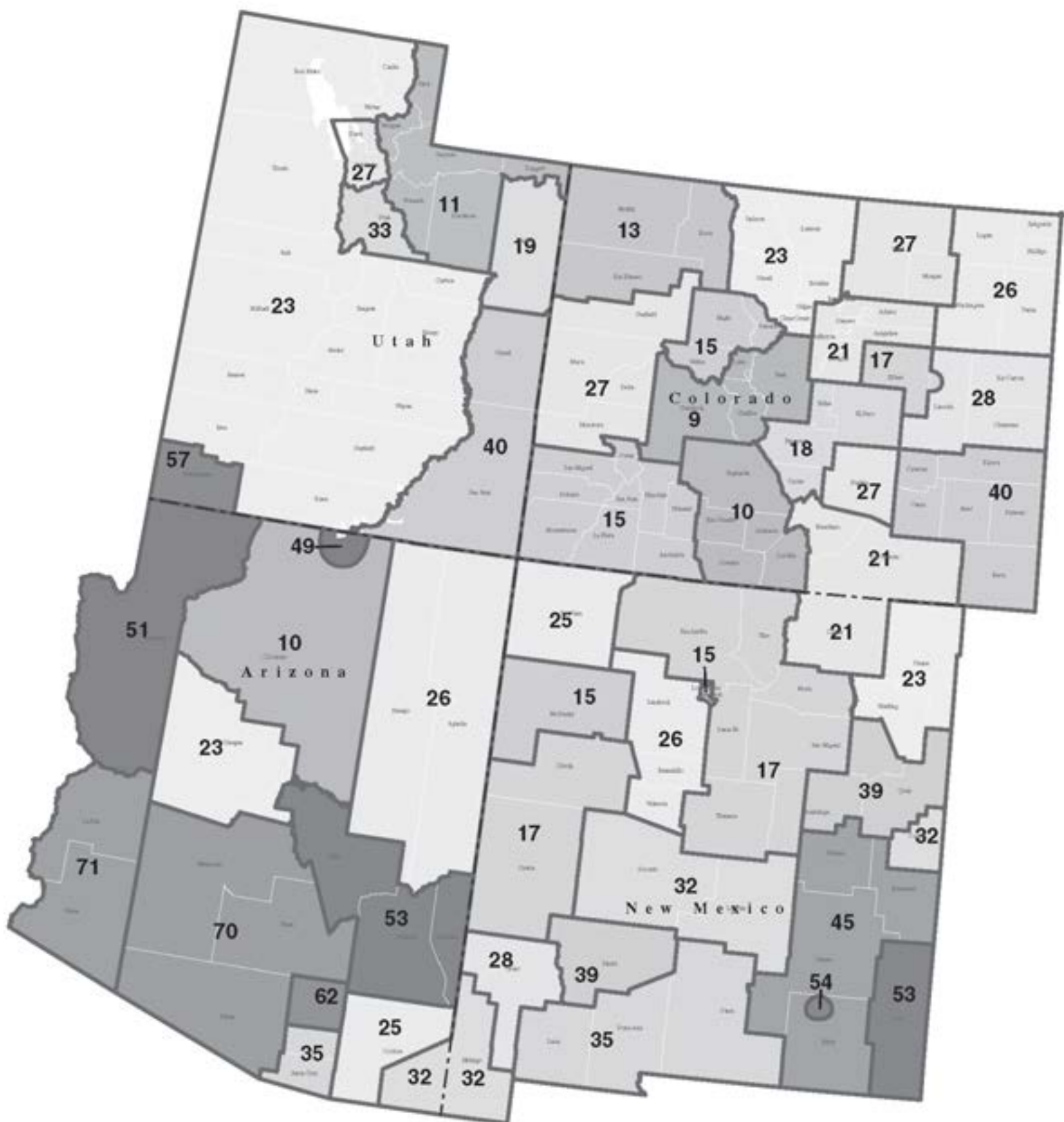
NOTES:

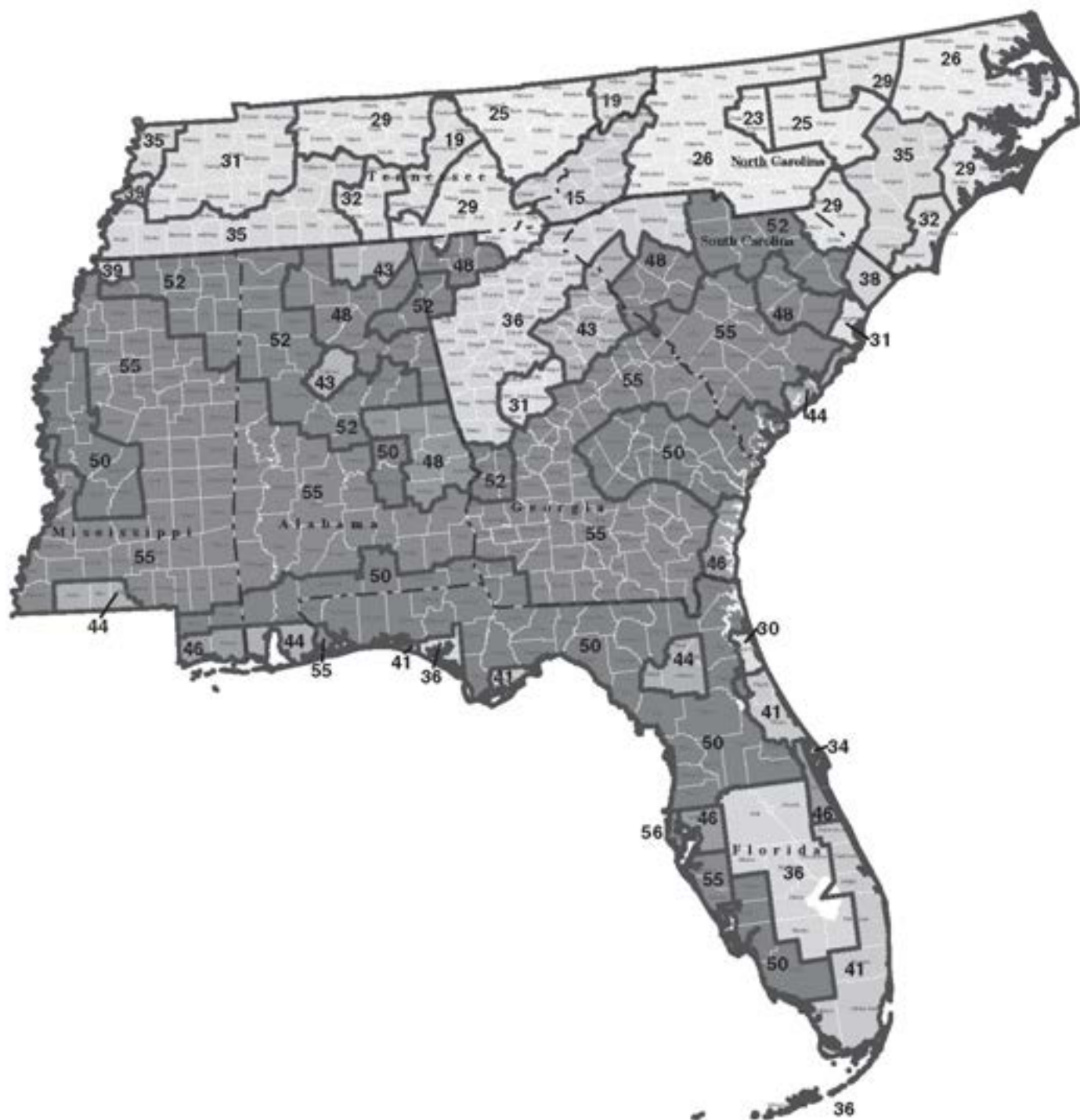
1. SEE SETUP MANUAL FOR REQUIRED PIER CAPACITY AND SPACING.
2. SEE SETUP MANUAL FOR FOOTING REQUIREMENTS.
3. PIERS SHALL BE LOCATED AT A MAXIMUM OF 2 FEET FROM BOTH ENDS.
4. PIERS SHALL BE LOCATED AT EACH SIDE OF ALL PERIMETER OPENINGS (4) FEET OR WIDER IN WIDTH. THIS WILL INCLUDE DOORS, WINDOWS, RECESSED ENTRIES, PORCHES, ETC.
5. SEE SETUP MANUAL FOR PIER CAPACITIES AT MARRIAGE LINE OPENINGS.

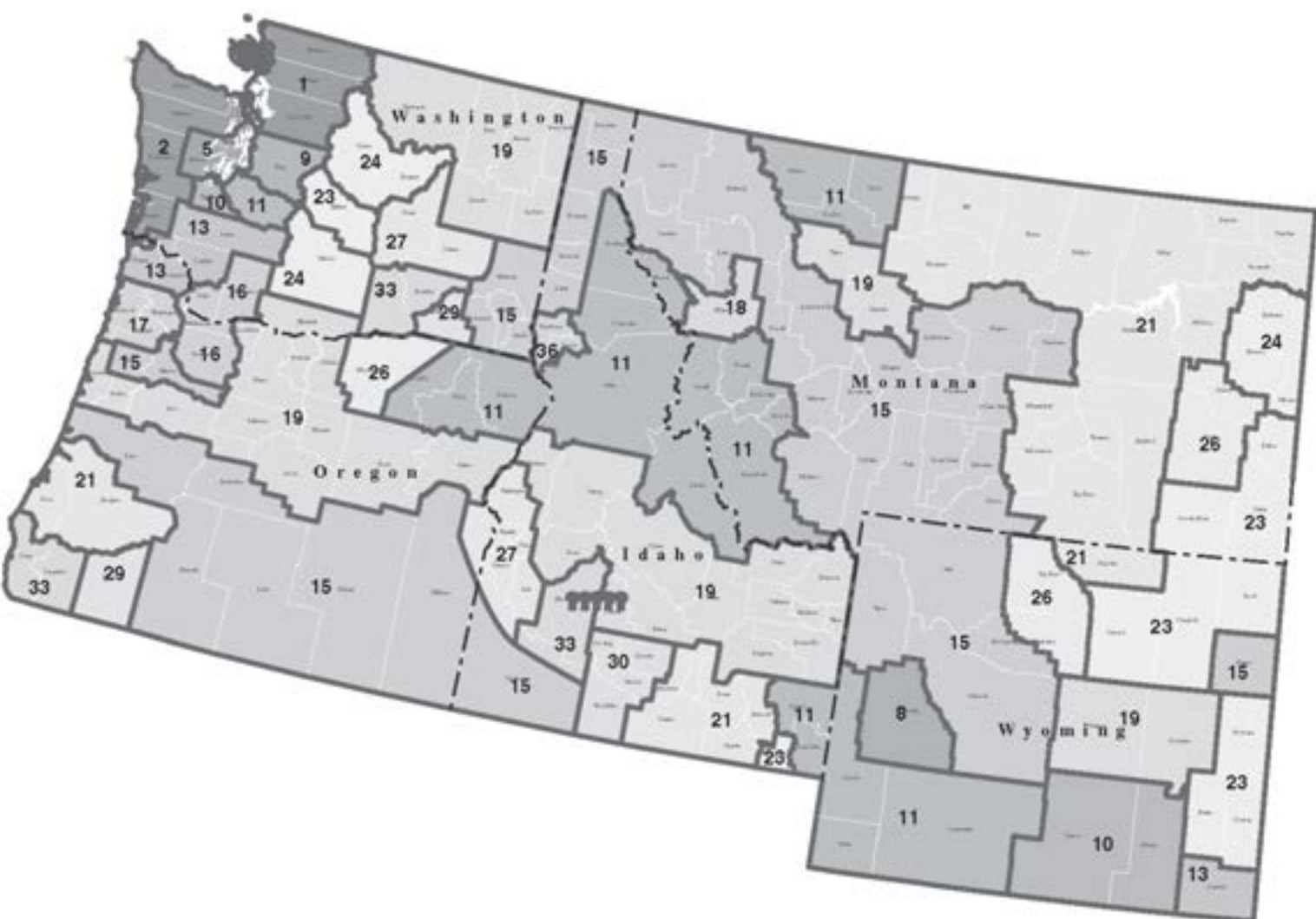
** REFER TO MANUFACTURER'S FLOOR PLAN (PROVIDED) OR IDENTIFYING TAGS OR PAINT FOR SHEARWALL LOCATIONS. THESE ANCHORS MUST BE INSTALLED IN ACCORDANCE WITH THEIR LISTING.

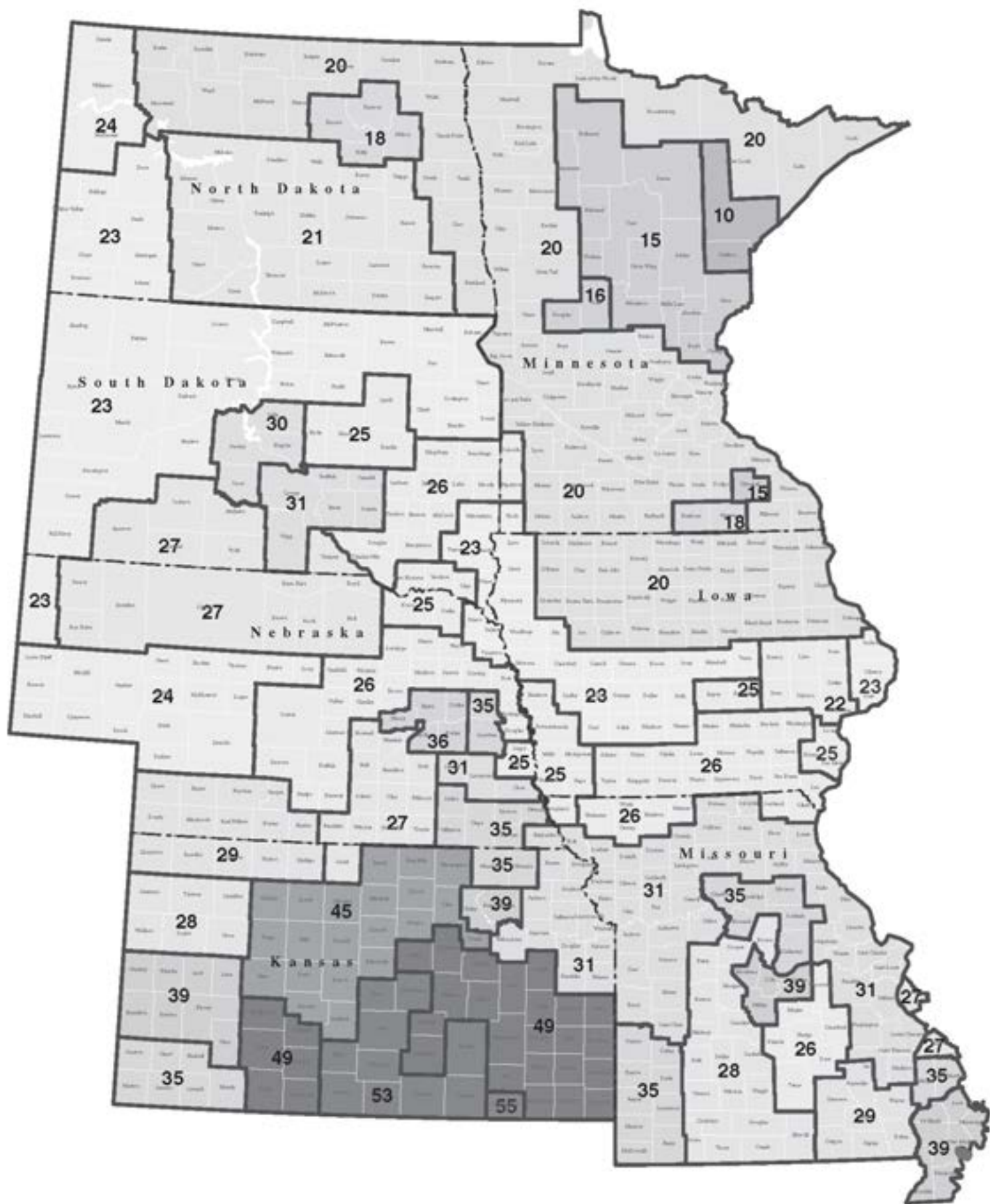


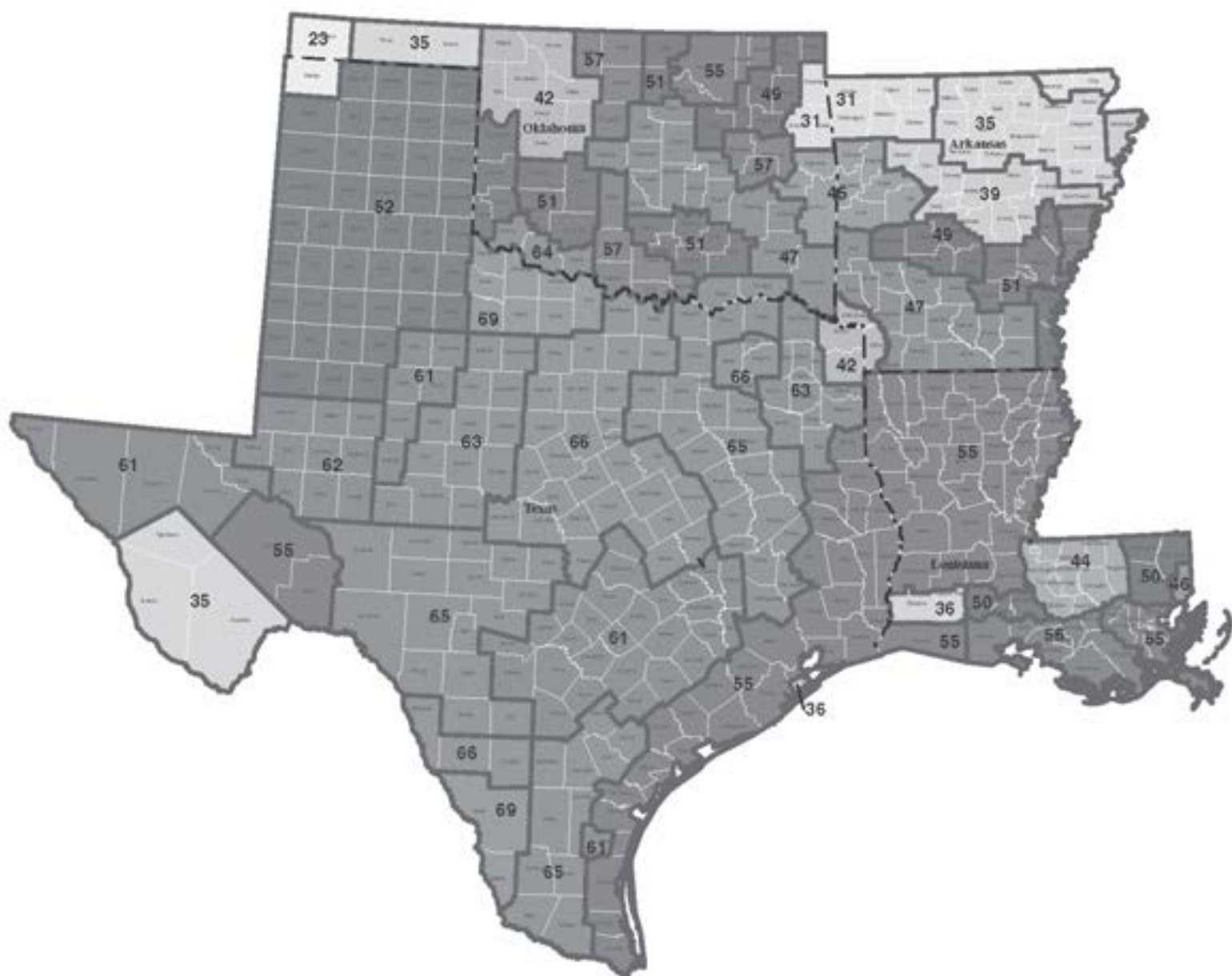
Floor Area (square feet)	Up to 840	841 to 1,120	1,121 to 1,280	1,281 to 1,440	1,441 to 1,680	1,681 to 1,960	1,961 to 2,240	2,241 to 2,520	2,521 to 2,760	2,761 to 3,000
Sizing Group	 HUD	 HUD	 HUD	 HUD	 HUD	 HUD	 HUD	 HUD	 HUD	 HUD
1	1 1	1 1	1.5 1.5	1.5 1.5	1.5 1.5	2 2	2 2	2 2	2 2.5	2.5 2.5
2	1 1	1.5 1	1.5 1.5	1.5 1.5	1.5 1.5	2 2	2 2	2.5 2	2.5 2.5	2.5 2.5
3	1 1	1 1	1.5 1.5	1.5 1.5	1.5 1.5	2 2	2 2	2 2.5	2.5 2.5	2.5 2.5
4	1 1	1.5 1.5	1.5 1.5	1.5 1.5	2 1.5	2 2	2 2	2.5 2	2.5 2.5	2.5 2.5
5	1 1	1.5 1.5	1.5 1.5	1.5 1.5	1.5 1.5	2 2	2 2	2 2.5	2.5 2.5	2.5 2.5
6	1 1	1.5 1.5	1.5 1.5	1.5 1.5	2 1.5	2 2	2 2	2.5 2.5	2.5 2.5	2.5 2.5
7	1 1	1 1.5	1.5 1.5	1.5 1.5	1.5 2	2 2	2 2	2 2.5	2.5 2.5	2.5 3
8	1 1	1.5 1.5	1.5 1.5	1.5 1.5	2 2	2 2	2.5 2	2.5 2.5	2.5 2.5	3 3
9	1 1	1.5 1.5	1.5 1.5	1.5 1.5	2 2	2 2	2.5 2.5	2.5 2.5	2.5 3	2.5 3
10	1 1	1.5 1.5	1.5 1.5	1.5 2	2 2	2 2	2.5 2.5	2.5 2.5	3 3	3 3
11	1 1.5	1.5 1.5	1.5 1.5	1.5 2	2 2	2 2.5	2.5 2.5	2.5 3	3 3	3 3.5
12	1.5 1.5	1.5 1.5	1.5 1.5	2 2	2 2	2.5 2.5	2.5 2.5	2.5 3	3 3	3 3.5
13	1 1.5	1.5 1.5	1.5 2	2 2	2 2	2 2.5	2.5 2.5	2.5 3	3 3	3 3.5
14	1.5 1.5	1.5 1.5	1.5 2	2 2	2 2	2.5 2.5	2.5 2.5	3 3	3 3	3 3.5
15	1.5 1.5	1.5 1.5	1.5 2	2 2	2 2.5	2.5 2.5	2.5 3	3 3	3 3.5	3 3.5
16	1.5 1.5	1.5 2	2 2	2 2	2 2.5	2.5 2.5	2.5 3	3 3	3 3.5	3 4
17	1.5 1.5	1.5 2	1.5 2	2 2	2 2.5	2.5 2.5	2.5 3	3 3.5	3 3.5	3 4
18	1.5 1.5	1.5 2	2 2	2 2	2 2.5	2.5 2.5	3 3	3 3.5	3 3.5	3.5 4
19	1.5 1.5	1.5 2	2 2	2 2	2 2.5	2.5 3	3 3	3 3.5	3 3.5	3.5 4
20	1.5 1.5	1.5 2	2 2	2 2	2.5 2.5	2.5 3	3 3	3 3.5	3 4	3.5 4
21	1.5 1.5	1.5 2	2 2	2 2.5	2 2.5	2.5 3	3 3	3 3.5	3 4	3.5 4
22	1.5 1.5	1.5 2	2 2	2 2.5	2.5 2.5	2.5 3	3 3.5	3 3.5	3.5 4	3.5 4
23	1.5 1.5	2 2	2 2	2 2.5	2.5 2.5	2.5 3	3 3.5	3 3.5	3.5 4	3.5 4.5
24	1.5 1.5	1.5 2	2 2	2 2.5	2.5 2.5	2.5 3	3 3.5	3 4	3.5 4	3.5 4.5
25	1.5 1.5	2 2	2 2.5	2 2.5	2.5 3	2.5 3	3 3.5	3 4	3.5 4	3.5 4.5
26	1.5 1.5	2 2	2 2.5	2 2.5	2.5 3	2.5 3	3 3.5	3 4	3.5 4.5	3.5 4.5
27	1.5 2	2 2	2 2.5	2 2.5	2.5 3	3 3	3 3.5	3.5 4	3.5 4.5	3.5 5
28	1.5 2	2 2	2 2.5	2 2.5	2.5 3	2.5 3.5	3 4	3.5 4	3.5 4.5	3.5 5
29	1.5 2	2 2	2 2.5	2 2.5	2.5 3	3 3.5	3 4	3.5 4	3.5 4.5	3.5 5
30	1.5 2	2 2	2 2.5	2.5 2.5	2.5 3	3 3.5	3.5 4	3.5 4	3.5 4.5	4 5
31	1.5 2	2 2.5	2 2.5	2.5 2.5	2.5 3	3 3.5	3 4	3.5 4	3.5 4.5	4 5
32	1.5 2	2 2.5	2 2.5	2 2.5	2.5 3	3 3.5	3 4	3.5 4.5	3.5 4.5	3.5 5
33	1.5 2	2 2.5	2 2.5	2 2.5	2.5 3	3 3.5	3 4	3.5 4.5	3.5 4.5	4 5
34	1.5 2	2 2.5	2.5 2.5	2.5 2.5	2.5 3	3 3.5	3.5 4	3.5 4.5	3.5 4.5	4 5
35	1.5 2	2 2.5	2 2.5	2.5 3	2.5 3	3 3.5	3.5 4	3.5 4.5	3.5 5	4 5
36	1.5 2	2 2.5	2 2.5	2 3	2.5 3	2.5 3.5	3 4	3 4.5	3.5 5	3.5 5.5
37	1.5 2	2 2.5	2.5 2.5	2.5 3	3 3	3 3.5	3.5 4	3.5 4.5	4 5	4 5.5
38	1.5 2	2 2.5	2 2.5	2 3	2.5 3.5	3 3.5	3 4	3.5 4.5	3.5 5	3.5 5.5
39	1.5 2	2 2.5	2 2.5	2.5 3	2.5 3.5	3 3.5	3.5 4	3.5 4.5	3.5 5	4 5.5
40	1.5 2	2 2.5	2 2.5	2.5 3	2.5 3.5	3 3.5	3.5 4	3.5 4.5	4 5	4 5.5
41	2 2	2 2.5	2.5 2.5	2.5 3	3 3.5	3 3.5	3.5 4	4 4.5	4 5	4 5.5
42	2 2	2.5 2.5	2.5 2.5	2.5 3	3 3.5	3.5 3.5	4 4	4 4.5	4 5	4.5 5.5
43	1.5 2	2 2.5	2 2.5	2 3	2.5 3.5	3 4	3 4.5	3.5 4.5	3.5 5	3.5 5.5
44	1.5 2	2 2.5	2.5 2.5	2.5 3	3 3.5	3 4	3.5 4.5	4 4.5	4 5	4 5.5
45	1.5 2	2 2.5	2.5 3	2.5 3	2.5 3.5	3 4	3.5 4.5	3.5 4.5	4 5	4 5.5
46	2 2	2 2.5	2.5 3	2.5 3	3 3.5	3.5 4	4 4.5	4 4.5	4 5	4 5.5
47	2 2	2.5 2.5	2.5 3	2.5 3	3 3.5	3.5 4	4 4.5	4 4.5	4.5 5	4.5 5.5
48	1.5 2	2 2.5	2 3	2.5 3	2.5 3.5	3 4	3 4.5	3.5 5	3.5 5.5	3.5 5.5
49	1.5 2	2 2.5	2.5 3	2.5 3	3 3.5	3 4	3.5 4.5	3.5 5	4 5.5	4 5.5
50	2 2	2 2.5	2.5 3	2.5 3	3 3.5	3.5 4	3.5 4.5	4 5	4 5.5	4 5.5
51	2 2	2.5 2.5	2.5 3	2.5 3	3 3.5	3.5 4	4 4.5	4 5	4.5 5.5	4.5 5.5
52	1.5 2	2 2.5	2 3	2.5 3	2.5 3.5	3 4	3.5 4.5	3.5 5	3.5 5.5	4 6
53	1.5 2	2 2.5	2.5 3	2.5 3	2.5 3.5	3 4	3.5 4.5	3.5 5	4 5.5	4 6
54	1.5 2	2 2.5	2.5 3	2.5 3	3 3.5	3 4	3.5 4.5	4 5	4 5.5	4 6
55	2 2	2.5 2.5	2.5 3	2.5 3	3 3.5	3.5 4	4 4.5	4 5	4 5.5	4.5 6
56	2 2	2.5 2.5	2.5 3	3 3	3 3.5	3.5 4	4 4.5	4 5	4.5 5.5	4.5 6
57	2 2	2.5 2.5	2.5 3	3 3	3.5 3.5	3.5 4	4 4.5	4.5 5	4.5 5.5	5 6
58	1.5 2	2 2.5	2 3	2.5 3.5	2.5 3.5	3 4	3.5 4.5	3.5 5	3.5 5.5	4 6
59	2 2	2 3	2.5 3	2.5 3.5	3 3.5	3 4	3.5 4.5	4 5	4 5.5	4 6
60	2 2	2.5 3	2.5 3	3 3.5	3.5 3.5	3.5 4	4 4.5	4.5 5	4.5 5.5	5 6
61	2 2	2.5 3	2.5 3	2.5 3.5	3 4	3.5 4.5	4 5	4 5.5	4.5 6	4.5 6.5
62	1.5 2.5	2 3	2.5 3	2.5 3.5	3 4	3 4.5	3.5 5	4 5.5	4 6	4.5 6.5
63	2 2.5	2.5 3	2.5 3	2.5 3.5	3 4	3.5 4.5	4 5	4 5.5	4.5 6	4.5 6.5
64	2 2.5	2.5 3	3 3	3 3.5	3.5 4	4 4.5	4.5 5	4.5 5.5	5 6	5 6.5
65	2 2.5	2.5 3	2.5 3.5	3 3.5	3.5 4	3.5 4.5	4 5	4.5 5.5	4.5 6	5 7
66	2 2.5	2.5 3	3 3.5	3 3.5	3.5 4	4 4.5	4.5 5.5	4.5 6	4.5 6.5	5 7
67	2 2.5	3 3	3 3.5	3 3.5	3.5 4	4 4.5	4.5 5.5	5 6	5 6.5	5.5 7
68	2.5 2.5	3 3	3 3.5	3.5 3.5	4 4.5	4.5 5	5 5.5	5 6	5.5 6.5	5.5 7
69	2 2.5	2.5 3	3 3.5	3 4	3.5 4.5	4 5	4.5 5.5	4.5 6	5 6.5	5 7
70	2.5 3	3 3.5	3.5 4	3.5 4	4 4.5	4.5 5.5	5 6	5.5 6.5	5.5 7	6 8
71	2.5 3	3 3.5	3.5 4	3.5 4.5	4 5	4.5 5.5	5.5 6	5.5 7	5.5 7.5	6 8













TIE DOWN SPACING CHART – WIND ZONE 1

For units with 95.5" I-beam spacing

NEAR BEAM ANCHOR SYSTEM

Single Double	Unit Width	Overall Width	I-Beam Spacing	Over- Hang	Wall Hght	Max. Roof Pitch	Wind Zone	Spacing/ Anchor Angle	Max. Hght
Double	160"	320"	95.5	12"	96"	6.9	1	4'-0"/25-30 Deg	47"
Double	180"	360"	95.5	12"	96"	6.9	1	5'-0"/35-40 Deg	44"
Double	160"	320"	95.5	12"	108"	6.9	1	4'-0"/30-35 Deg	44"
Double	180"	360"	95.5	12"	108"	6.9	1	5'-0"/40-45 Deg	40"

WIND ZONE 1 TIE DOWN SYSTEM NOTES:

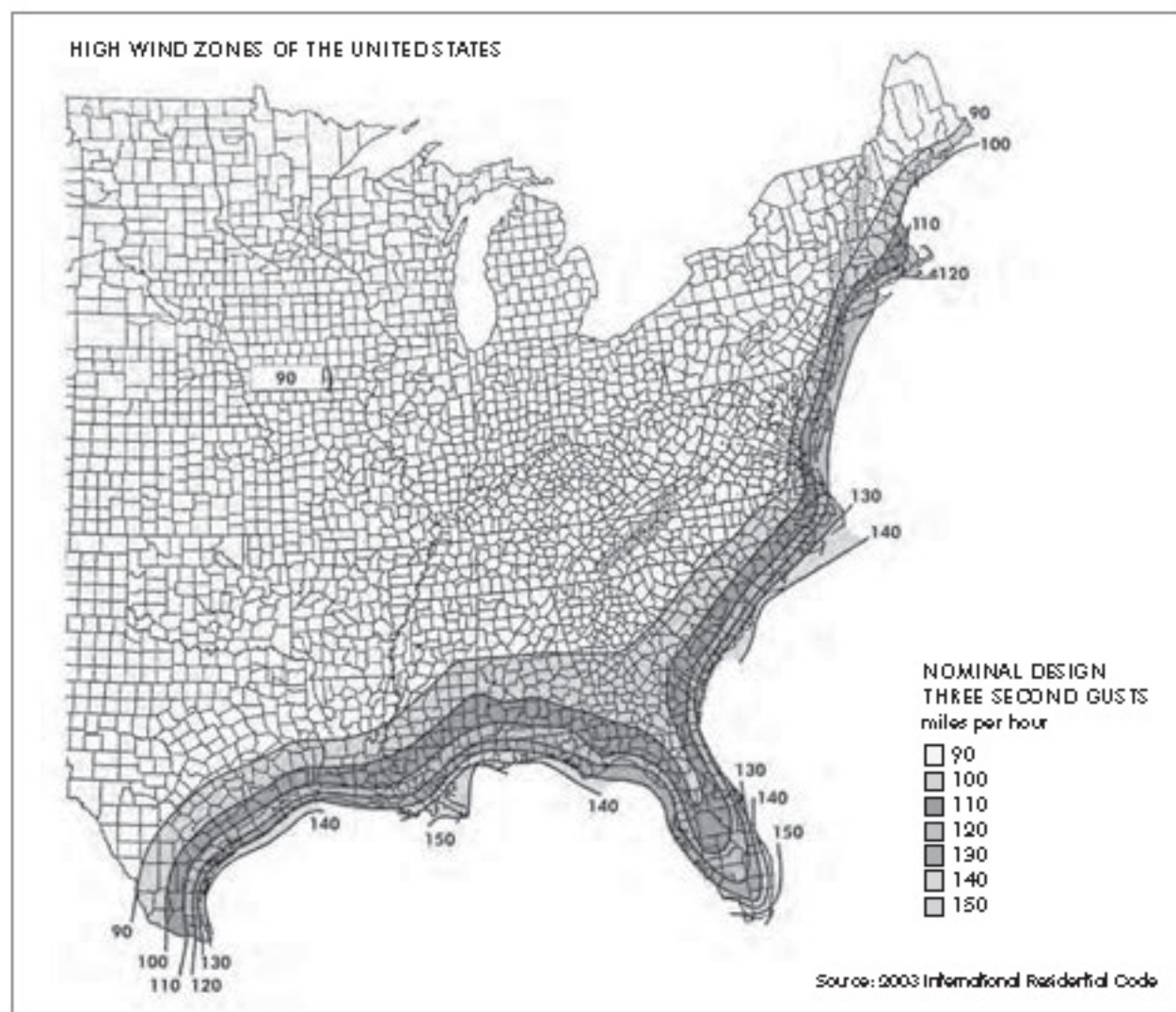
1. Frame tie down shall be installed to properly secure the home.
2. See also I-A-1 for anchor installation requirements.
3. Reserved
4. When anchors are not installed at the angle specified in the table a stabilizer plate must be installed in accordance with the anchor manufacturer's instructions.
5. Frame tie downs and anchors are not supplied by CAVALIER HOMES.
6. When required vertical tie straps and/or brackets are supplied by CAVALIER HOMES. Anchors and end treatments are to be supplied by others.
7. Frame ties shall be capable of resisting an ultimate tension load of 4725 lbs. And are to be installed per the manufacturer's installation instructions.
8. Steel anchoring equipment exposed to the weather shall be protected with at least 0.30 oz. of zinc per square foot of surface coated.
9. Design based on unit width, I-Beam spacing and a maximum side wall height shown.
10. Reserved.
11. Frame tie downs are positioned at crossmember location (within 3") when attachment point is at the bottom of the chassis.
12. Anchors to be certified by a professional engineer, architect or 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.
13. Ground anchors to be embedded below the frost line and be at least 12" above the water table. Anchors to be installed to their full depth and stabilizer plates installed to provide added resistance to overturning & sliding forces.
14. Ground anchors to be rated for 1.5 x the allowable working load or an ultimate load of 4725 lbs.
15. Anchoring equipment to be certified by a registered professional engineer, architect or approved testing laboratory to resist these specified forces in accordance with testing procedures in ASTM standards specification D3953-91.
16. Shearwall anchor and strap are required at beam opposite shearwall attachment. See details this section.
17. Minimum distance from grade to bottom of floor shall be 24" and maximum pier height per table for tie spacing.



HURRICANE SHUTTER DESIGNS



One of the best ways to protect a home from damage in windstorms is to install shutters over all large windows and glass doors. Shutters protect doors and windows from windborne objects. They also prevent damage caused by sudden pressure changes when a window or door is broken.

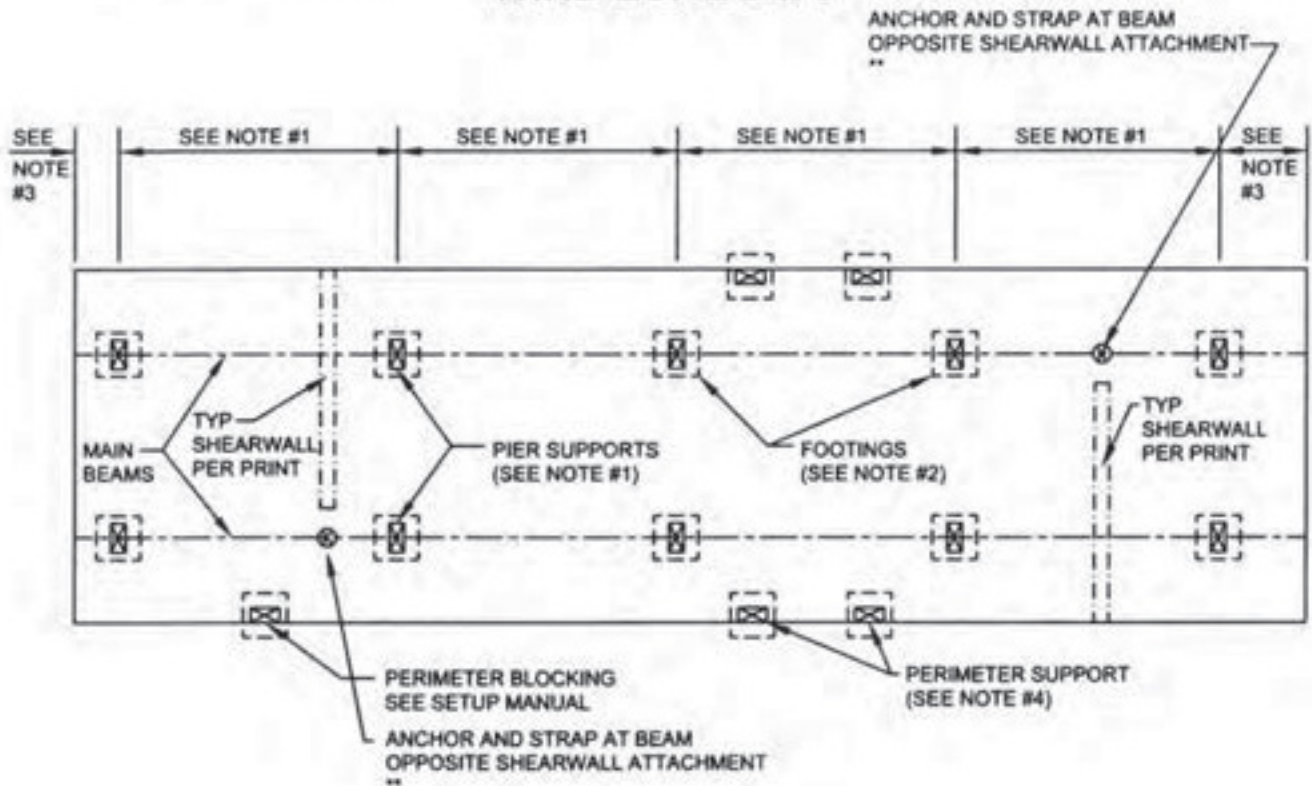


TIEDOWN SYSTEM
GENERAL NOTES
WIND ZONES 1, 2 AND 3
B-2

1. Frame tie-downs shall be installed to properly secure the home.
2. Except as indicated in the chart with a specified vertical tie load, vertical ties are not required for Wind Zone 1 with properly spaced and installed frame tie-downs. When installed, vertical ties may be secured to the same ground anchors as the frame tie-downs. When required, the vertical ties are installed by Cavalier Home Builders at the spacing required for frame ties and for the load specified under "Vertical Tie Load" column.
3. For Wind Zones 2 and 3 vertical ties are required at each frame tie-down location. Vertical ties may be secured to the same ground anchor as the frame tie-downs when a double headed anchor is capable of resisting the combined loading. Wind Zone 3 chart is to be used for homes installed in Wind Zone 2.
4. When anchors are not installed at the angle specified in the tables a stabilizer plate must be installed in accordance with the anchor manufacturer's instructions.
5. Frame tie-downs and anchors are not supplied by Cavalier Home Builders.
6. Vertical tie-down brackets are supplied by Cavalier Home Builders and secured along the sidewall to resist the vertical tie load specified at the spacing specified. Anchors, straps and end treatments are to be supplied by others.
7. Ground anchors and frame ties shall be capable of resisting an ultimate load of 4725# and are to be installed per the manufacturer's installation instructions, but are not to extend beyond the sidewall of the home.
8. Steel anchoring equipment exposed to the weather shall be protected with at least 0.30 oz. of zinc per square foot of steel per side.
9. Anchors shall be certified for site 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.
10. Ground anchors shall be embedded below the frost line and at least 12" above the water table.
11. Ground anchors shall be installed to their full depth and stabilizer plates should be installed to provide added resistance to overturning or sliding forces.
12. Anchoring equipment shall be certified by a Registered Professional Engineer or Architect to resist these specified forces in accordance with testing procedures in ASTM Standard Specification D3953-97, "Standard Specification For Strapping, Flat Steel and Seals".
13. Strapping to be Type 1, Finish B, Grade 1 steel strapping, $\frac{1}{4}$ " wide and 0.035" in thickness, certified by a Registered Professional Engineer or Architect as conforming with ASTM Standard Specification D3953-97, "Standard Specification For Strapping, Flat Steel and Seals".
14. Longitudinal tie-downs are installed on brackets welded to I-beams at each end. The approved bracket must be attached to the I-beam per certified test reports and details therein or the longitudinal tie-down straps may be looped around a $\frac{3}{8}$ " diameter bolt inserted in the chassis axle spring hangers.
15. In addition to the vertical and frame tie-downs discussed on this page vertical tie-downs may be required at shearwall locations and at marriage wall column locations. See applicable sections of the Installation Instructions Manual for specific information.
16. Design is based on I-beams spaced at $\frac{1}{2}$ " center to center and centered in unit width. Anchor head may be located a maximum of 6" inside the outside edge of the sidewall. The "Pier Height" indicated in Wind Zones 2 and 3 tables is the vertical distance from the anchor head to the top of the I-beam when diagonal comes off the top and to the bottom of the I-beam when it comes off the bottom.
17. Ground anchors must not be spaced closer than the minimum spacing permitted by the listing or certification. See anchor manufacturer's installation instructions.



TYPICAL BLOCKING LAYOUT FOR SINGLE-SECTION HOMES WIND ZONE 2 & 3



NOTES:

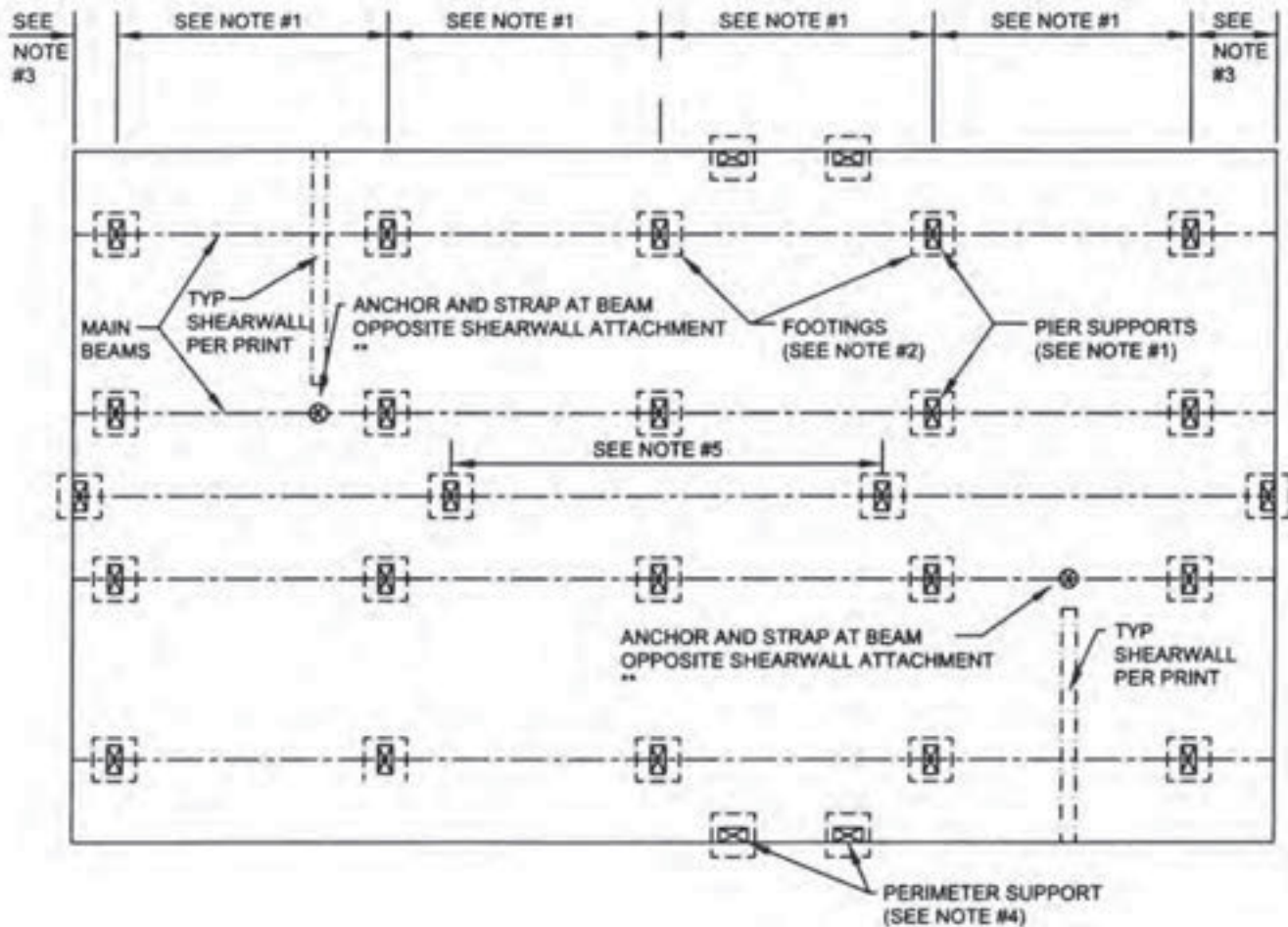
1. SEE SETUP MANUAL FOR REQUIRED PIER CAPACITY AND SPACING.
2. SEE SETUP MANUAL FOR FOOTING REQUIREMENTS.
3. PIERS SHALL BE LOCATED AT A MAXIMUM OF 2 FEET FROM BOTH ENDS.
4. PIERS SHALL BE LOCATED AT EACH SIDE OF ALL PERIMETER OPENINGS (4) FEET OR WIDER IN WIDTH. THIS WILL INCLUDE DOORS, WINDOWS, RECESSED ENTRIES, PORCHES, ETC.
5. PIERS SHALL BE INSTALLED AT EACH INTERIOR SHEARWALL LOCATION AS IDENTIFIED BY PRINT PROVIDED WITH HOME.

** REFER TO MANUFACTURER'S FLOOR PLAN (PROVIDED) OR IDENTIFYING TAGS OR PAINT FOR SHEARWALL LOCATIONS. THESE ANCHORS MUST BE INSTALLED IN ACCORDANCE WITH THEIR LISTING.



TYPICAL BLOCKING LAYOUT FOR MULTI-SECTION HOMES

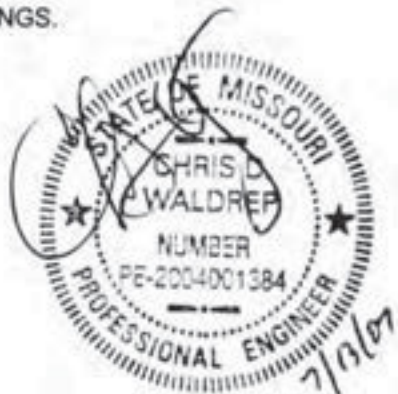
WIND ZONE 2 & 3



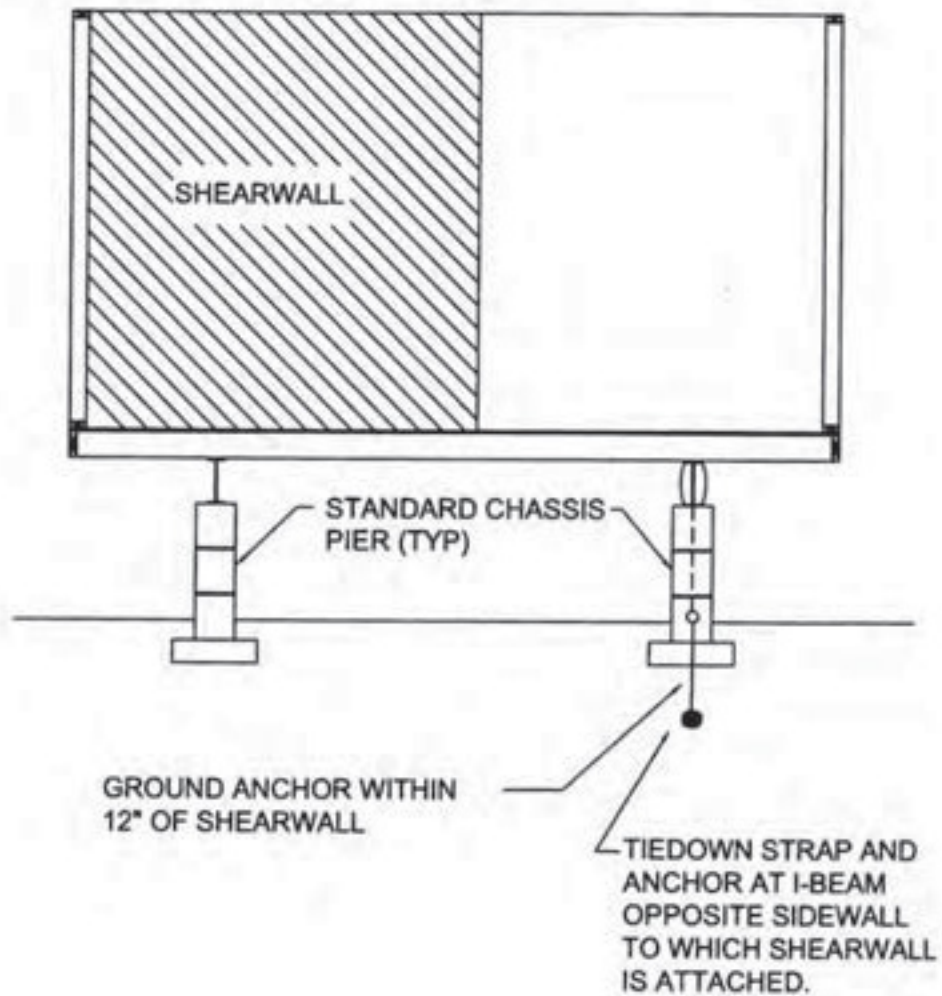
NOTES:

1. SEE SETUP MANUAL FOR REQUIRED PIER CAPACITY AND SPACING.
2. SEE SETUP MANUAL FOR FOOTING REQUIREMENTS.
3. PIERS SHALL BE LOCATED AT A MAXIMUM OF 2 FEET FROM BOTH ENDS.
4. PIERS SHALL BE LOCATED AT EACH SIDE OF ALL PERIMETER OPENINGS (4) FEET OR WIDER IN WIDTH. THIS WILL INCLUDE DOORS, WINDOWS, RECESSED ENTRIES, PORCHES, ETC.
5. SEE SETUP MANUAL FOR PIER CAPACITIES AT MARRIAGE LINE OPENINGS.

** REFER TO MANUFACTURER'S FLOOR PLAN (PROVIDED) OR IDENTIFYING TAGS OR PAINT FOR SHEARWALL LOCATIONS. THESE ANCHORS MUST BE INSTALLED IN ACCORDANCE WITH THEIR LISTING.



TYPICAL SHEARWALL TIEDOWN INSTALLATION WIND ZONE 2 & 3

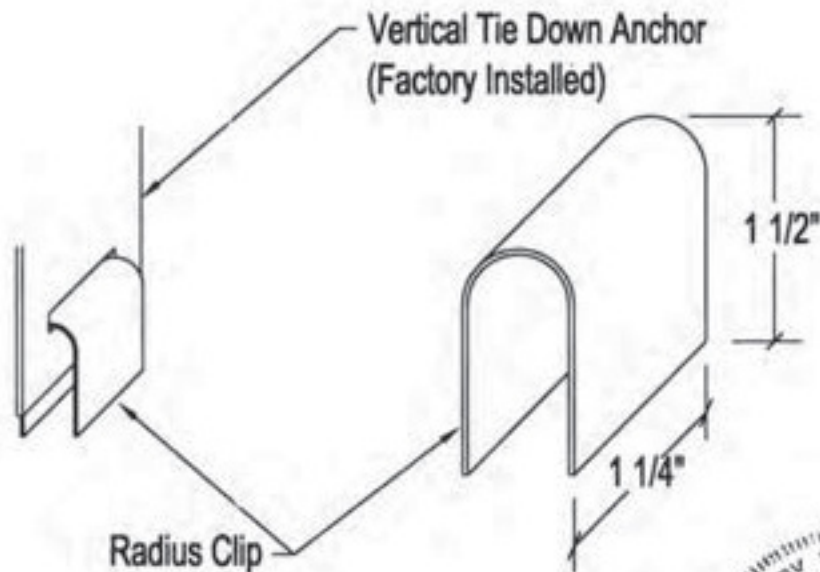


NOTES:

1. SHEARWALL LOCATIONS ARE IDENTIFIED BY FACTORY INSTALLED TAGS OR YELLOW PAINT.



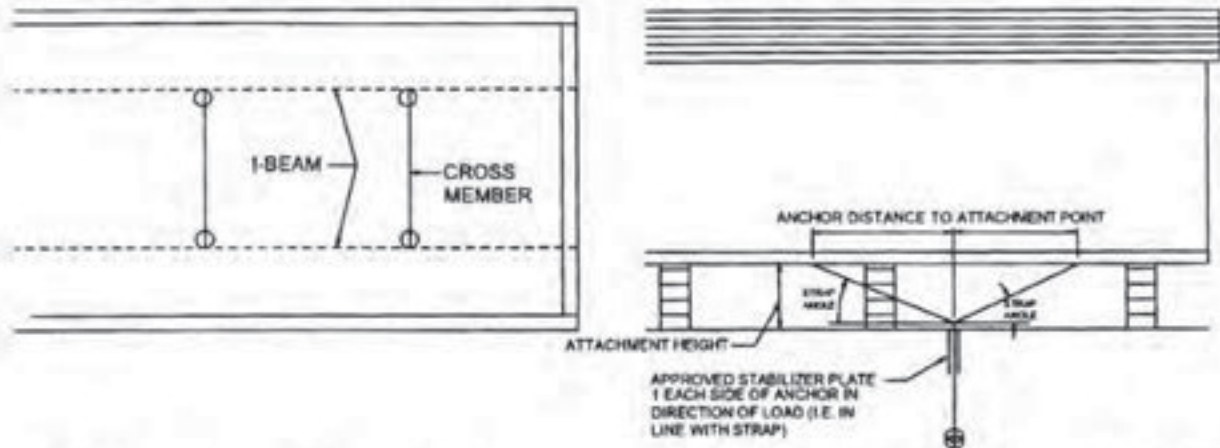
Tie Down Radius Clip



General Notes:

- 1) Radius Clip must be installed on all Longitudinal Frame Tie Down Anchors, Marriage Wall Vertical Tie Down Anchors, and Shear Wall Vertical Anchors (only).
- 2) Installer to fabricate Radius Clip by placing straight 3" length of 1 1/4" x .035" Tie Down Strap in Anchor slot and manually bending the strap to the configuration shown.

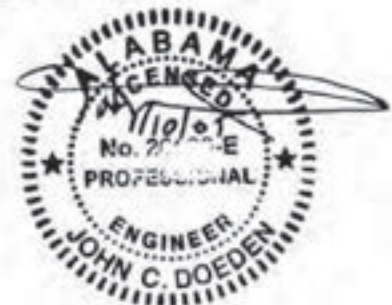
LONGITUDINAL TIE DOWN WIND ZONE 2 & 3



DOUBLE HEADED ANCHOR (MIN. 2 STRAPS PER ANCHOR AS SHOWN): LOCATE ANYWHERE ALONG UNIT LENGTH. QUANTITY PER CHART PER UNIT (ANCHOR AND STRAP MIN. 3150 LBS. WORKING LOAD). ATTACH STRAPS TO CROSSMEMBERS WITH LISTED CRIMP CONNECTORS. (STRAP TO BE LOCATED A MAXIMUM OF 3" FROM UNIT I-BEAM) NOTE: WHEN SINGLE HEADED ANCHOR IS USED QTY. SHOWN IS PER EACH END OF UNIT. OTHER APPROVED METHODS OF LONGITUDINAL ANCHORING MAY BE USED AS LONG AS THEY ARE APPROVED FOR THE APPLIED LOADS AND CONDITIONS PRESENT.

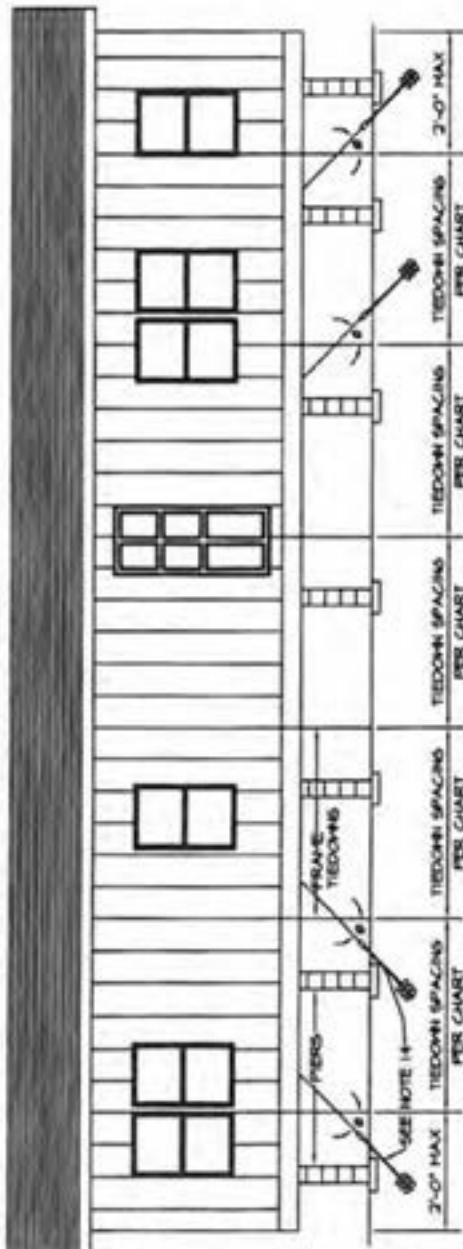
UNIT WIDTH/ROOF PITCH/WALL HEIGHT	WIND ZONE 2							WIND ZONE 3						
	DIAG. STRAP ANGLE							DIAG. STRAP ANGLE						
160" UNIT WIDTH AND 4.34/12 ROOF PITCH/84" WALL HGT.	2	2	2	2	2	3	3	2	2	2	3	3	3	3
160" UNIT WIDTH AND 4.34/12 ROOF PITCH/96" WALL HGT.	2	2	2	2	3	3	3	3	3	3	3	3	3	3
180" UNIT WIDTH AND 4.34/12 ROOF PITCH/84" WALL HGT.	2	2	2	2	3	3	3	3	3	3	3	3	3	4
180" UNIT WIDTH AND 4.34/12 ROOF PITCH/96" WALL HGT.	2	2	2	3	3	3	3	3	3	3	3	4	4	4
284" UNIT WIDTH AND 4.34/12 ROOF PITCH/96" WALL HGT.	4	4	4	4	5	5	5	4	5	5	5	5	6	6
320" UNIT WIDTH AND 4.34/12 ROOF PITCH/96" WALL HGT.	4	5	5	5	5	6	6	5	6	6	6	7	7	7
320" UNIT WIDTH AND 6.9/12 ROOF PITCH/96" WALL HGT.	5	5	5	6	6	6	7	6	6	6	7	7	8	8
360" UNIT WIDTH AND 4.34/12 ROOF PITCH/96" WALL HGT.	5	5	6	6	6	7	7	6	6	7	7	8	8	8
380" UNIT WIDTH AND 6.9/12 ROOF PITCH/96" WALL HGT.	6	6	6	7	7	8	8	7	7	8	8	9	10	10
320" UNIT WIDTH AND 4.34/12 ROOF PITCH/108" WALL HGT.	4	5	5	5	6	6	6	5	5	6	6	7	7	8
360" UNIT WIDTH AND 4.34/12 ROOF PITCH/108" WALL HGT.	5	5	6	6	6	7	7	6	6	7	7	8	8	9

ATTACHMENT HEIGHT	DISTANCE FROM ANCHOR TO POINT OF ATTACHMENT						
	20 DEG	25 DEG	30 DEG	35 DEG	40 DEG	45 DEG	50 DEG
24"	84"	91"	97"	104"	111"	118"	125"
32"	88"	95"	102"	109"	116"	123"	130"
40"	110"	118"	125"	132"	139"	146"	153"
48"	132"	140"	147"	154"	161"	168"	175"
56"	154"	162"	169"	176"	183"	190"	197"
64"	176"	184"	191"	198"	205"	212"	219"

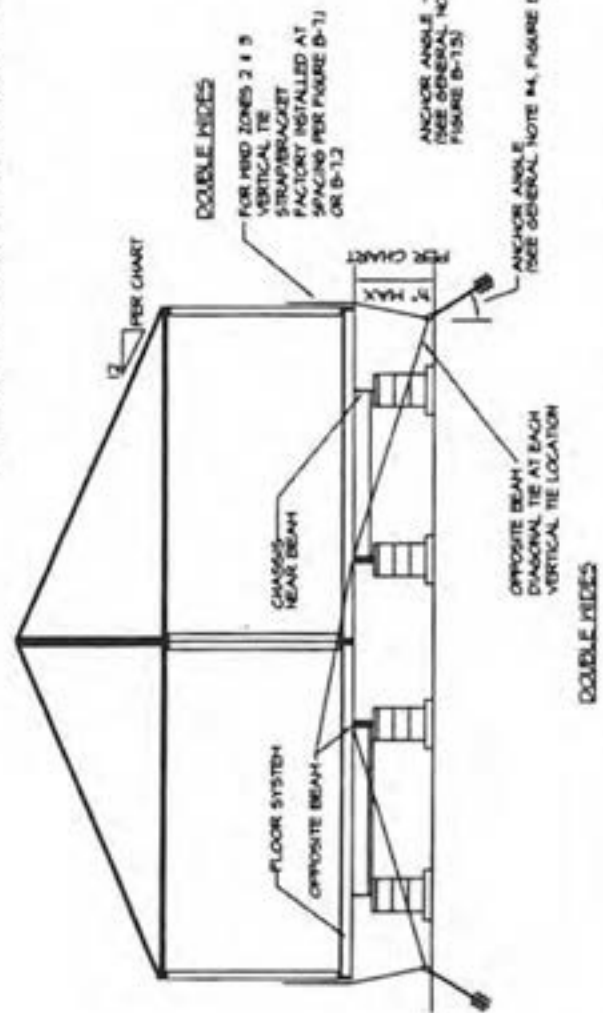


TIEDOWN SYSTEM
TYPICAL DETAILS
WIND ZONE 2 AND 3

TYPICAL SIDE ELEVATION SHOWING TIEDOWN SPACINGS



TYPICAL CROSS SECTIONS SHOWING TIEDOWNS





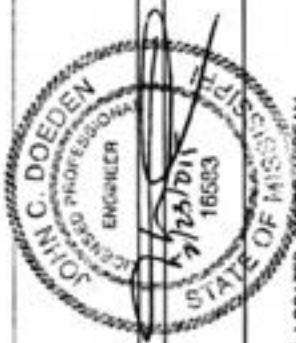
**TIEDOWN SYSTEM
CHARTS
WIND ZONE 2**

WIND ZONE 2 TIE DOWN REQUIREMENTS CHART

FLOOR WIDTH	EAVE WIDTH	ROOF SLOPE	SIDEWALL HEIGHT	FRAME TIEDOWNS				VERTICAL TIE LOAD (LBS)	LONGITUDINAL TIEDOWNS		NOTES
				TIEDOWN SPACING	HATCH VERTICAL DISTANCE	ANCHOR ANGLE	NEAR OR OPPOSITE PAR BEAM		HATCH QUANTITY EACH END EACH SECTION	STRAP ANGLE	
160' SINGLE SECTION	9' MAX	20 Deg Max	46'	8'-0"	30"	45-50	OPPOSITE	1305	3	33-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
				6'-8"	62"	40-45	OPPOSITE	1150	3	33-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
160' SINGLE SECTION	9' MAX	20 Deg Max	108'	6'-8"	39"	45-50	OPPOSITE	1370	3	37-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
				8'-0"	52"	50-55	OPPOSITE	1340	3	39-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
160' SINGLE SECTION	9' MAX	20 Deg Max	46'	6'-8"	64"	40-45	OPPOSITE	1100	3	39-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
				6'-8"	43"	45-50	OPPOSITE	1315	4	31-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
160' DOUBLE SECTION	12' MAX	20 Deg Max	46'	6'-8"	60"	40-45	OPPOSITE	1240	3	38-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
				6'-8"	40"	45-50	OPPOSITE	1340	3	42-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
160' DOUBLE SECTION	12' MAX	20 Deg Max	46'	6'-8"	62"	40-45	OPPOSITE	1285	3	45-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
				6'-8"	40"	45-50	OPPOSITE	1340	3	50-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
160' DOUBLE SECTION	12' MAX	6:12 Max	46'	5'-4"	54"	40-45	OPPOSITE	1410	3	42-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
				5'-4"	39"	40-45	OPPOSITE	1540	3	46-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
160' DOUBLE SECTION	12' MAX	6:12 Max	46'	5'-4"	52"	40-45	OPPOSITE	1560	3	50-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS
				5'-4"	37"	40-45	OPPOSITE	1660	4	39-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAMS

NOTES:
1. WHEN CONTENTS OF BELLY WILL INTERFERE WITH TAUT INSTALLATION OF DIAGONAL TIE FOR ANY POSSIBLE VERTICAL DISTANCE A CROSS-MEMBER MUST BE AT THE VERTICAL TIE LOCATIONS (FACTORY INSTALLED).
2. SEE NOTES, FIGURE B-7.5 FOR TIEDOWN SYSTEM

**TIEDOWN SYSTEM
CHARTS
WIND ZONE 3**

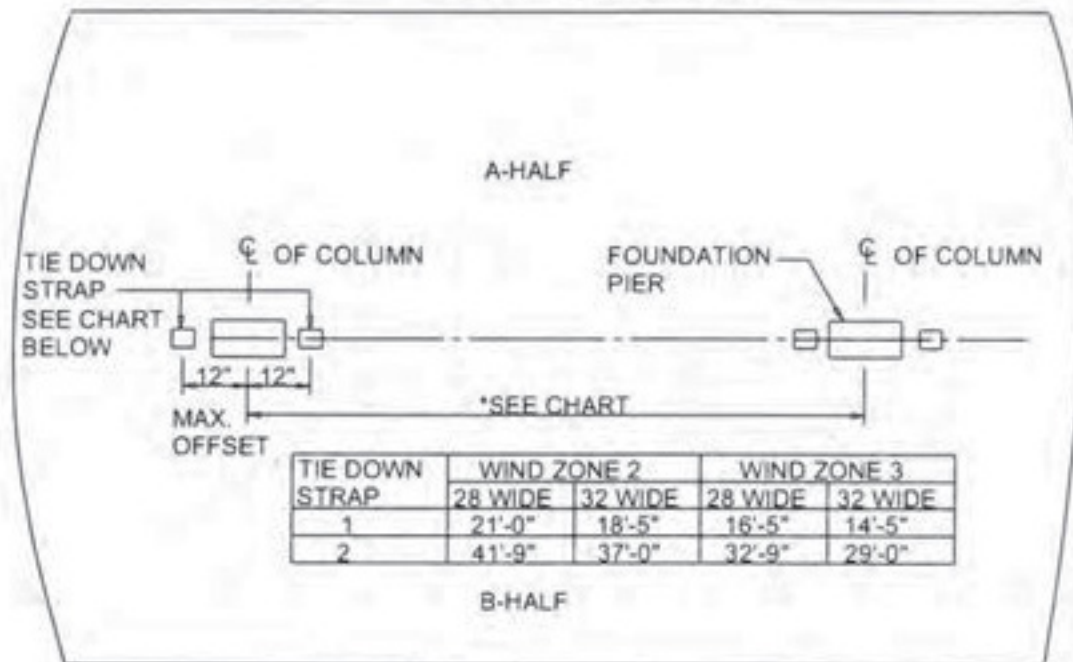
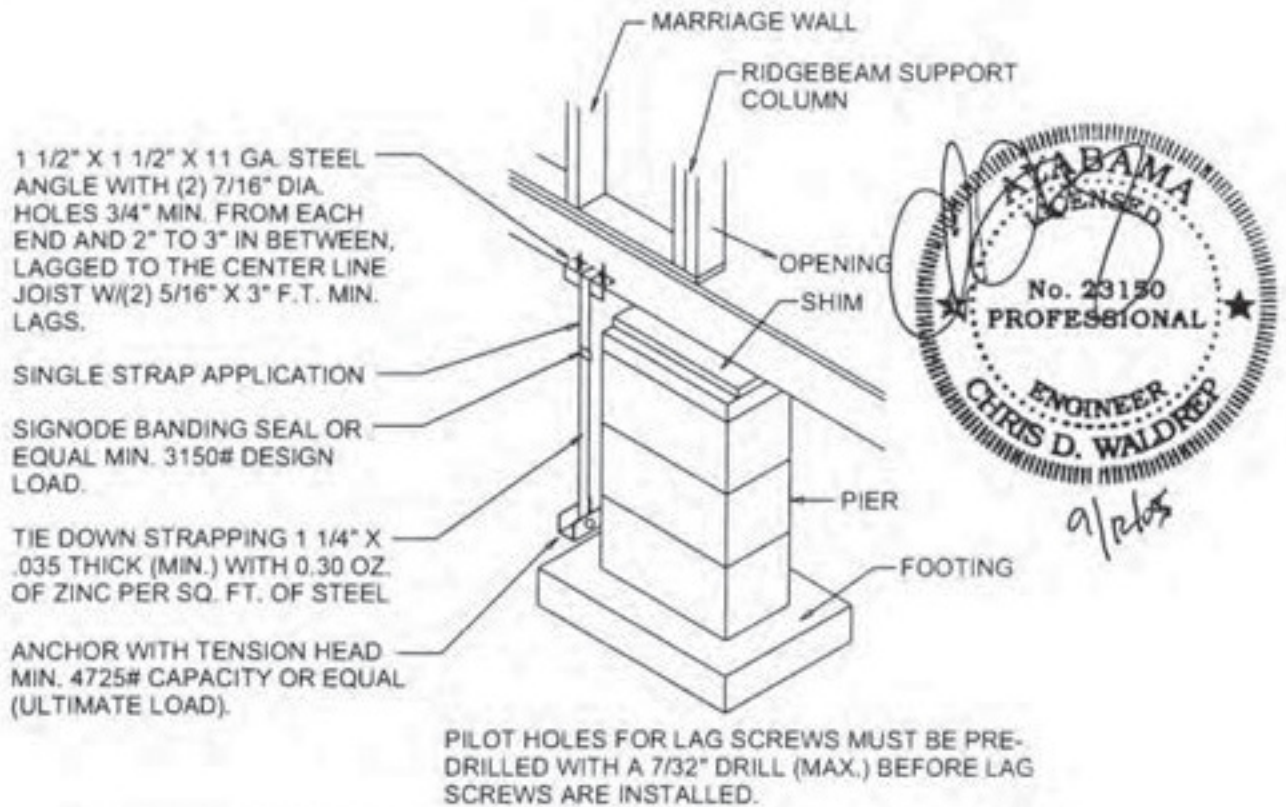


WIND ZONE 3 TIE DOWN REQUIREMENTS CHART

FLOOR WIDTH	EAVE WIDTH	ROOF SLOPE	SIDEWALL HEIGHT	FRAME TIEDOWNS				LONGITUDINAL TIEDOWNS			NOTES
				TIEDOWN SPACING	MAXIMUM VERTICAL DISTANCE	ANCHOR ANGLE	NEAR OR OPPOSITE (FAR) BEAM	VERTICAL TIE LOAD (LBS)	MINIMUM QUANTITY EACH SECTION	STRAP ANGLE	
180" SINGLE SECTION	3" MAX	20 Deg Max	96"	5'-4"	64"	40-45	OPPOSITE	1205	3	41-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM
			108"	5'-4"	42"	40-50	OPPOSITE	1425	4	33-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM
			96"	5'-4"	46"	40-50	OPPOSITE	1375	4	34-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM
			108"	5'-4"	47"	40-50	OPPOSITE	1370	4	38-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM
180" DOUBLE SECTION	12" MAX	20 Deg Max	96"	5'-4"	58"	40-45	OPPOSITE	1400	4	34-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM
			108"	5'-4"	39"	40-50	OPPOSITE	1510	4	37-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM
			96"	5'-4"	58"	40-45	OPPOSITE	1470	4	40-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM
			108"	5'-4"	39"	40-50	OPPOSITE	1570	4	44-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM
180" DOUBLE SECTION	12" MAX	6/12 Max	96"	4'-0"	64"	35-40	OPPOSITE	1450	4	37-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM
			108"	4'-0"	54"	35-40	OPPOSITE	1540	4	40-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM
			96"	4'-0"	64"	35-40	OPPOSITE	1525	4	44-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM
			108"	4'-0"	52"	35-40	OPPOSITE	1605	4	49-60	LOOSE CLIP LAGS LOCATED INSIDE I-BEAM

NOTES:
1. WHEN CONTENTS OF BELLY WILL INTERFERE WITH TAUT INSTALLATION OF DIAGONAL TIE FOR ANY POSSIBLE VERTICAL DISTANCE A CROSSMEMBER MUST BE AT THE VERTICAL TIE LOCATIONS (FACTORY INSTALLED).
2. SEE NOTES, FIGURE B-7.5 FOR TIEDOWN SYSTEM

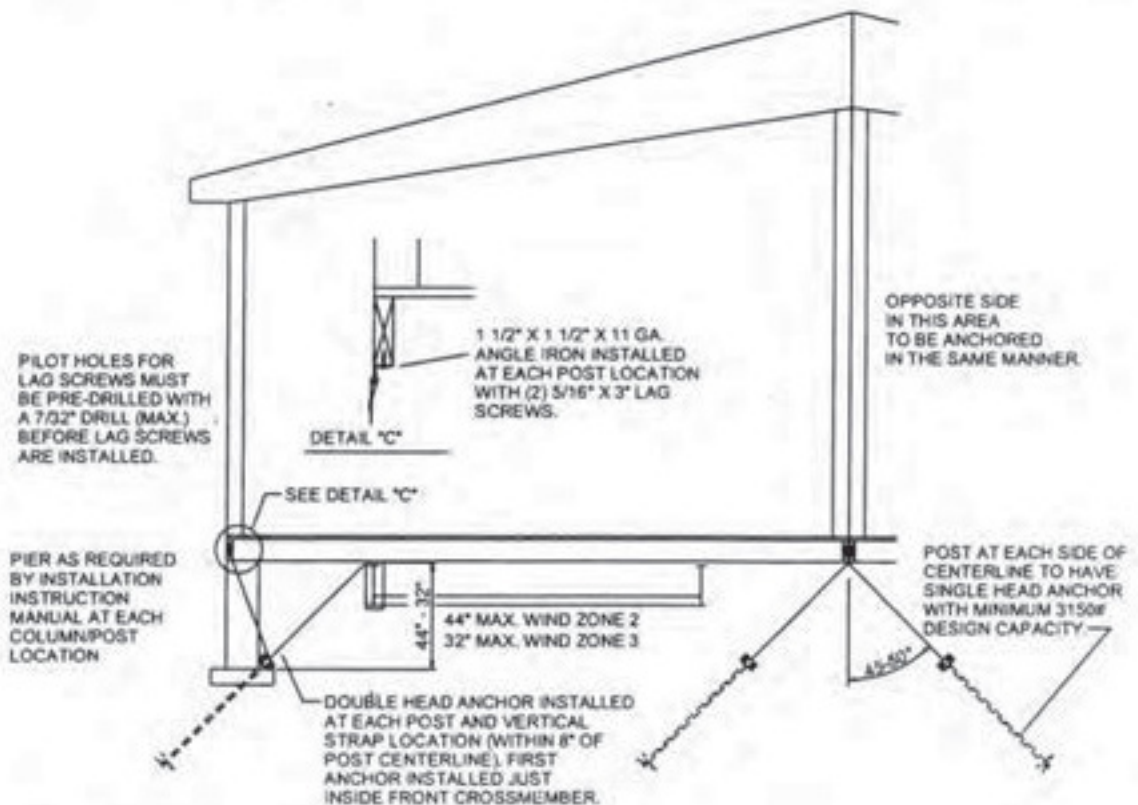
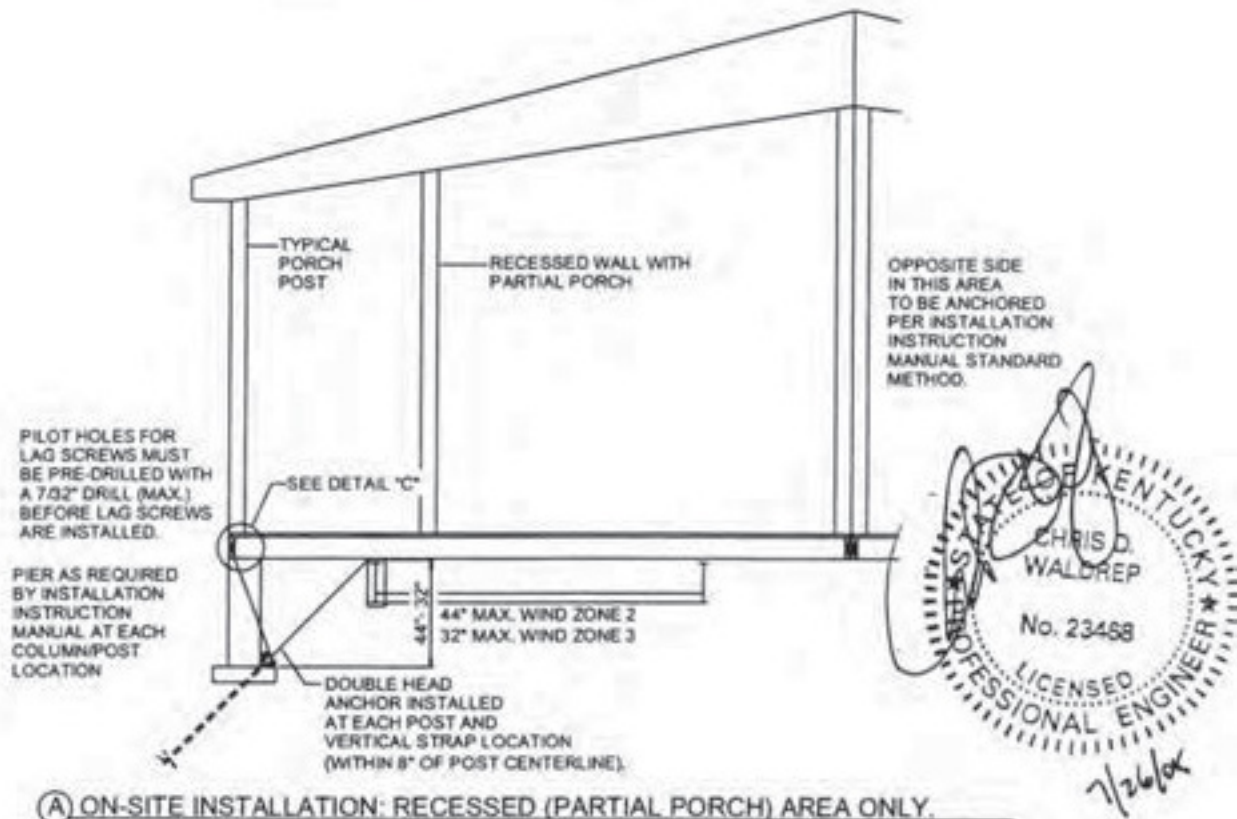
Ridgebeam column tie down and support pier - Wind Zone 2 and 3



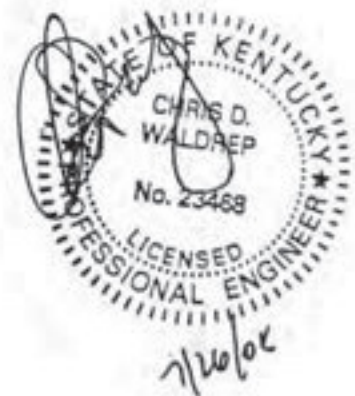
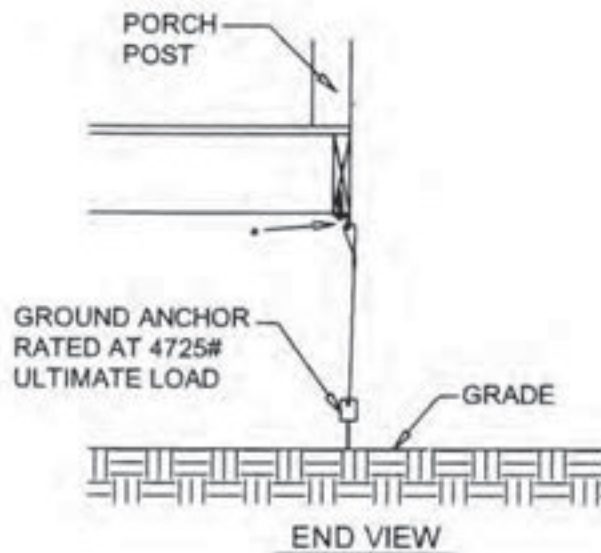
Angle (bracket) and lags are supplied by manufacture, tie down strap and accessories are not provided by nor installed by manufacturer.

Tie downs and piers are required at all column locations 4'-0" and wider, denoted by paint on bottom of home, when tie down strap are required on each half at same location, both straps may connect to one double header anchor. This detail shall not replace any other tie down details.

RECESSED PORCH TIE-DOWN INSTALLATION - WIND ZONE 2 AND 3

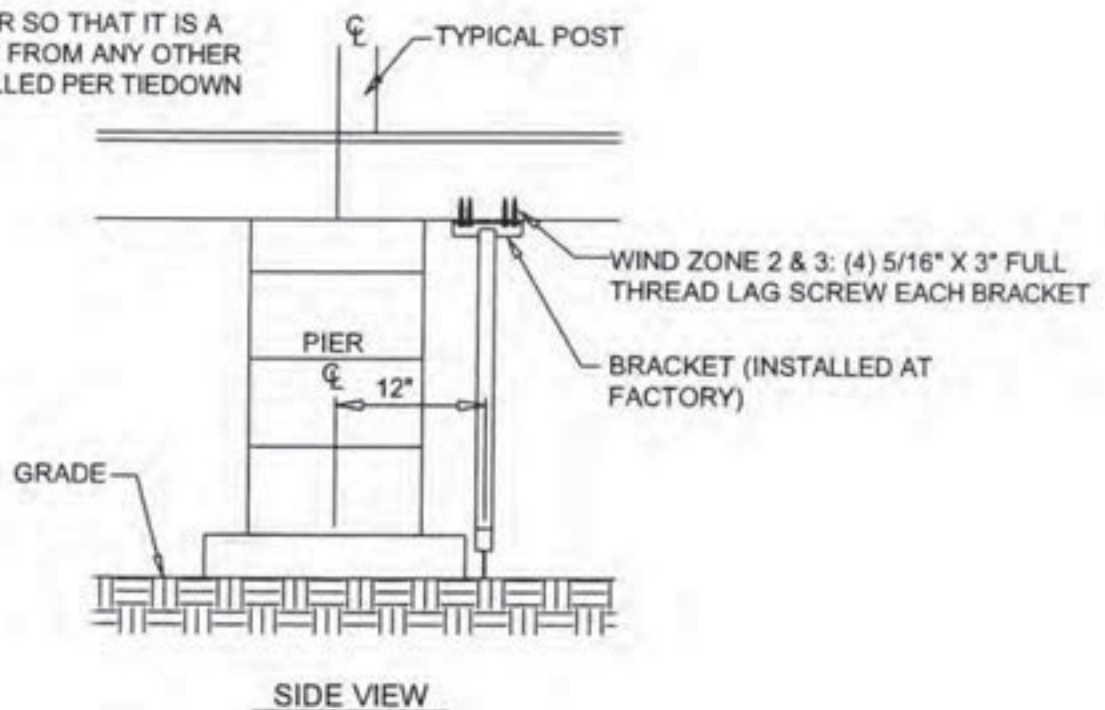


PORCH TIEDOWN - WIND ZONE 2 AND 3

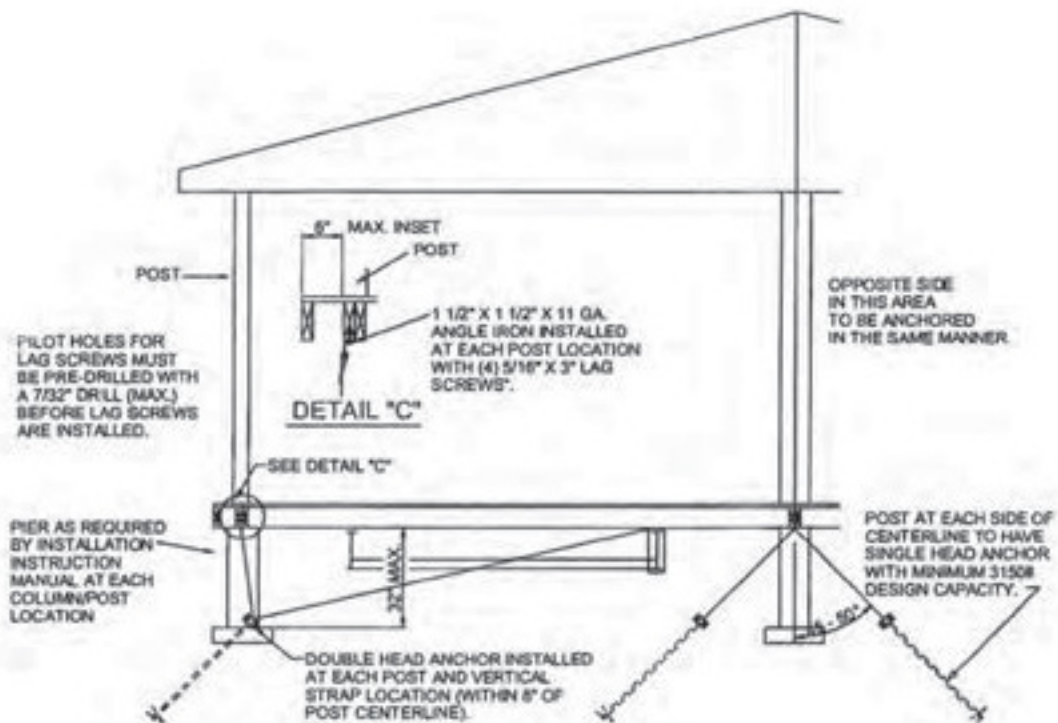


* PROTECTION SHALL BE PROVIDED AT SHARP CORNERS AT POINT OF LOAD ON STRAP.

INSTALL ANCHOR SO THAT IT IS A MINIMUM OF 48" FROM ANY OTHER ANCHOR INSTALLED PER TIEDOWN CHARTS.



RECESSED PORCH TIE-DOWN INSTALLATION - WIND ZONE 2 & 3



ON-SITE INSTALLATION: FULL WIDTH PORCH.

*BRACKET AND LEGS INSTALLED AT THE FACTORY 8" MAX. FROM POST. ALTERNATE APPROVED BRACKET MAY BE USED IN ACCORDANCE WITH LOCAL CODES. REQUIRED CAPACITY = 1350# WIND ZONE 2, 1500# WIND ZONE 3.

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Official stamp: **CAROLINA**, **22277**

TIE DOWN SPACING CHART – WIND ZONE 1

For units with 95.5" I-beam spacing

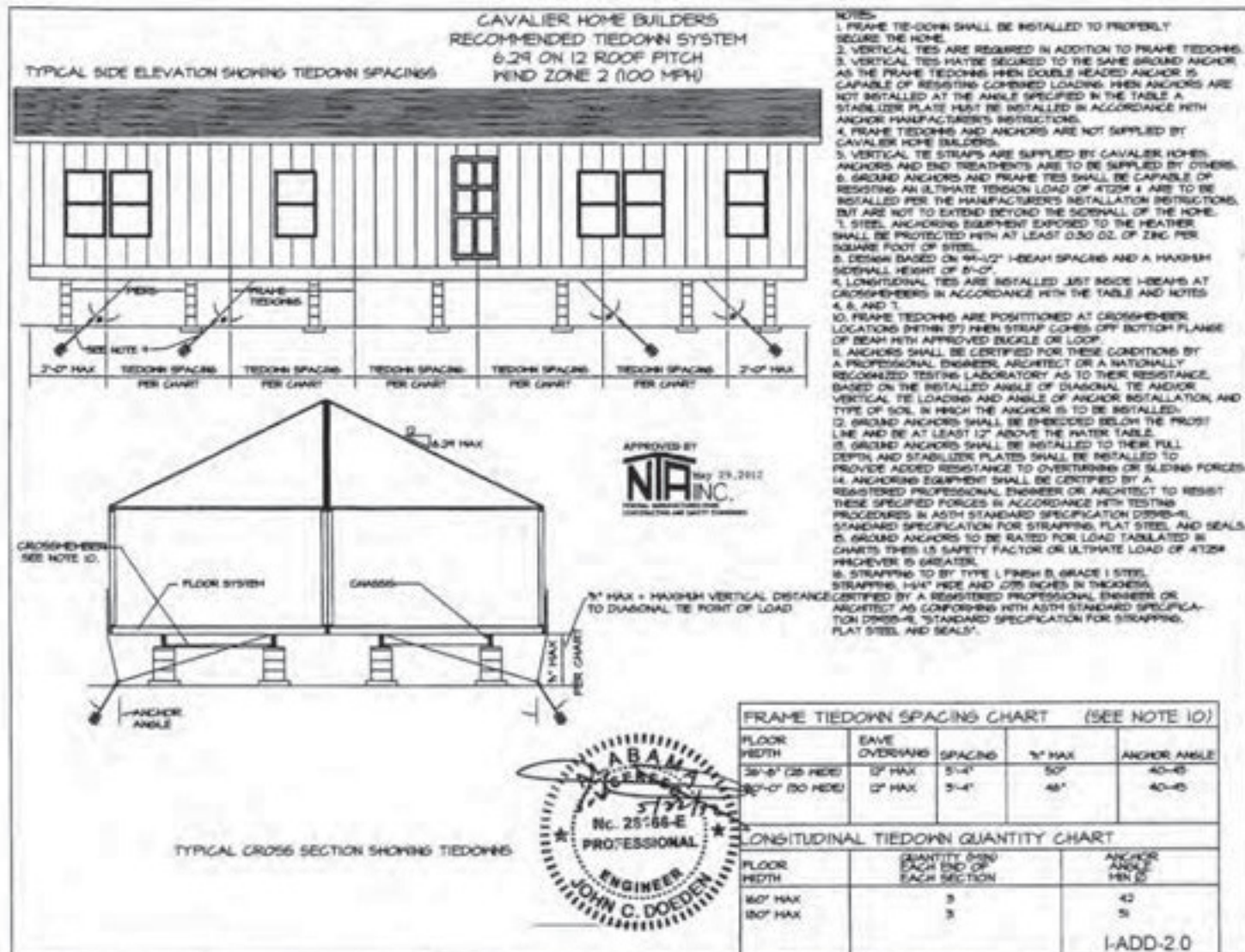
NEAR BEAM ANCHOR SYSTEM

Single Double	Unit Width	Overall Width	I-Beam Spacing	Over- Hang	Wall Height	Max. Roof Pitch	Wind Zone	Anchor attachment height	
								Spacing/ Anchor Angle	Max. Hght
Single	160"	160"	95.5	3"	84"	4.34	1	4'-0"/20-25 Deg	62"
Single	160"	160"	95.5	3"	84"	4.34	1	4'-0"/20-25 Deg	40"
Single	160"	160"	95.5	3"	96"	4.34	1	4'-0"/20-25 Deg	45"
Single	160"	160"	95.5	3"	96"	4.34	1	4'-0"/25-30 Deg	32"
Single	164"	164"	95.5	12"	96"	4.34	1	4'-0"/25-30 Deg	34"
Single	180"	180"	95.5	12"	84"	4.34	1	5'-4"/25-30 Deg	49"
Single	180"	180"	95.5	12"	84"	4.34	1	4'-0"/25-30 Deg	55"
Single	180"	180"	95.5	12"	96"	4.34	1	4'-0"/20-25 Deg	62"
Double	180"	180"	95.5	12"	96"	4.34	1	4'-0"/25-30 Deg	44"
Double	142"	284"	95.5	12"	96"	4.34	1	6'-8"/40-45 Deg	62"
Double	142"	284"	95.5	12"	96"	4.34	1	5'-4"/40-45 Deg	60"
Double	160"	320"	95.5	12"	96"	4.34	1	6'-8"/40-45 Deg	64"
Double	160"	320"	95.5	12"	96"	4.34	1	5'-4"/40-45 Deg	62"
Double	180"	360"	95.5	12"	96"	4.34	1	6'-8"/40-45 Deg	68"
Double	180"	360"	95.5	12"	96"	4.34	1	5'-4"/40-45 Deg	65"
Double	160"	320"	95.5	12"	108"	4.34	1	6'-8"/45-50 Deg	44"
Double	160"	320"	95.5	12"	108"	4.34	1	5'-4"/45-50 Deg	42"
Double	180"	360"	95.5	12"	108"	4.34	1	6'-8"/45-50 Deg	46"
Double	180"	360"	95.5	12"	108"	4.34	1	5'-4"/45-50 Deg	44"

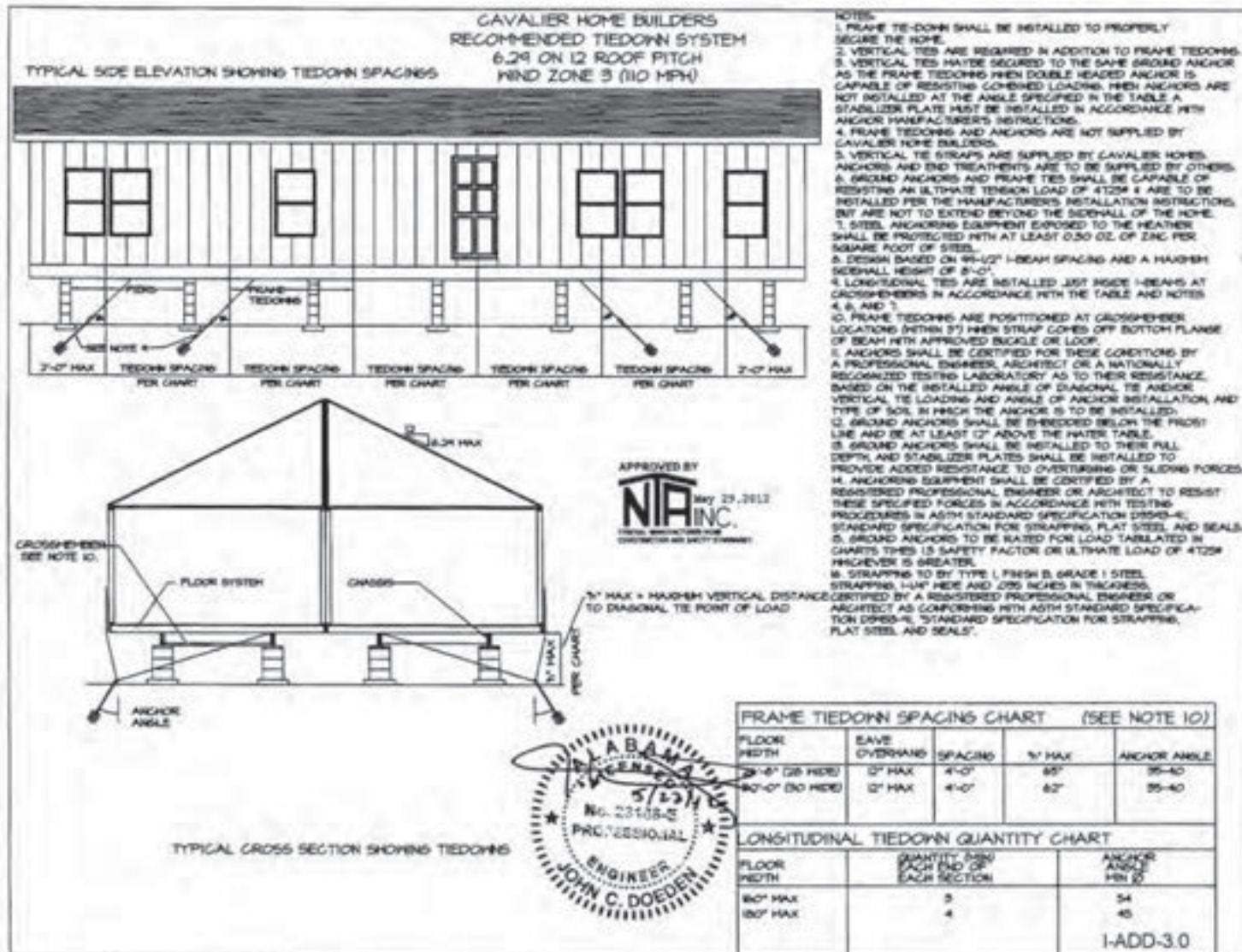


WIND ZONE 1 TIE DOWN SYSTEM NOTES:

1. Frame tie down shall be installed to properly secure the home.
2. See also I-A-1 for anchor installation requirements.
3. Reserved
4. When anchors are not installed at the angle specified in the table a stabilizer plate must be installed in accordance with the anchor manufacturer's instructions.
5. Frame tie downs and anchors are not supplied by CAVALIER HOMES.
6. When required vertical tie straps and/or brackets are supplied by CAVALIER HOMES. Anchors and end treatments are to be supplied by others.
7. Frame ties shall be capable of resisting an ultimate tension load of 4725 lbs. And are to be installed per the manufacturer's installation instructions.
8. Steel anchoring equipment exposed to the weather shall be protected with at least 0.30 oz. of zinc per square foot of surface coated.
9. Design based on unit width, I-Beam spacing and a maximum side wall height shown.
10. Reserved.
11. Frame tie downs are positioned at crossmember location (within 3") when attachment point is at the bottom of the chassis.
12. Anchors to be certified by a professional engineer, architect or 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.
13. Ground anchors to be embedded below the frost line and be at least 12" above the water table. Anchors to be installed to their full depth and stabilizer plates installed to provide added resistance to overturning & sliding forces.
14. Ground anchors to be rated for 1.5 x the allowable working load or an ultimate load of 4725 lbs.
15. Anchoring equipment to be certified by a registered professional engineer, architect or approved testing laboratory to resist these specified forces in accordance with testing procedures in ASTM standards specification D3953-91.
16. Shearwall anchor and strap are required at beam opposite shearwall attachment. See details this section.
17. Minimum distance from grade to bottom of floor shall be 24" and maximum pier height per table for tie spacing.



B-13



B-14

APPROVED BY
NIA INC.
May 29, 2012
MEMBER, NATIONAL ASSOCIATION OF BUILDERS

CAVALIER HOME BUILDERS
ADDISON, AL

- FOR USE IN WIND ZONES II AND III
- OTHER BRACKET DESIGNS ARE ALSO ACCEPTABLE PROVIDED LISTED CAPACITY MEETS OR EXCEEDS THE MINIMUM VALUES SPECIFIED ON THIS SHEET. ALTERNATE BRACKETS TO BE INSTALLED PER MF6'S INSTRUCTIONS.
- USE TIE DOWN ENGINEERING "SIDEHALL SHIVEL STRAP ASSEMBLY", PART NO. 5483TA FOR UP TO 1800# DESIGN LOAD CAPACITY OR "SHIVEL L TIE PLATE ASSEMBLY", PART NO. 5483LA FOR UP TO 2350# DESIGN CAPACITY.
- WHEN LAG WASHERS ARE WELDED TO I-BEAM FLANGE, LAGS MAY BE INSTALLED ON EITHER SIDE OF I-BEAM

UNIT WIDTH	I-BEAM SPACING	SIDEHALL HEIGHT	ROOF SLOPE	WIND ZONE	SPACING	REQUIRED DESIGN LOAD CAPACITY	REQUIRED ULTIMATE LOAD CAPACITY
160" DOUBLE	48 1/2"	96"	6:12 MAX	I	5'-4"	1500#	2250#
160" DOUBLE	48 1/2"	96"	6:12 MAX	II	5'-4"	1500#	2250#
160" DOUBLE	48 1/2"	96"	6:12 MAX	III	4'-0"	1500#	2250#
160" DOUBLE	48 1/2"	96"	6:12 MAX	II	4'-0"	1500#	2250#

THIS DOCUMENT HAS BEEN PREPARED BY
HOUSING DESIGN GROUP
1000 Northwood Drive
Enterprise, AL 36034

DESIGNED BY: **E. ULLMAN** DCCB
CHECKED BY: **E. ULLMAN** DCCB
DRAWING NO: **I-ADD-4.0**

REVISIONS

NO.	DATE	DESCRIPTION

Appendix C - Minute Man Anchor Installation Manual

The FMHCSS requires manufacturers to include a tie-down system in their installation manual. The entire Minute Man system is included in this manual. However, due to unique design and/or construction methods used by the manufacturer other details are included to supplement the Minute Man information and are identified as the manufacturer.

There may be conflicting information between the "generic" Minute Man and the manufacturer details. In all cases the manufacturer details are to be followed and supersede any of the Minute Man details.

The following information applies to homes being sited within WIND ZONE 1, 2 & 3. Please verify the appropriate Wind Zone and carefully review the appropriate information.

Any Minute Man details that utilize the words "should" or "recommended" must be considered a REQUIRED reference.

Some Minute Man details illustrate the ground anchor to be installed vertically. The manufacturer details must supersede and be followed which indicate the ground anchors to be installed diagonally.

Anchors to be provided with protection against weather deterioration and corrosion at least equivalent to that provided by a coating of zinc on steel of not less than 0.30 oz./ft.2 of surface coating.

To Our Customers:

This Product and Installation Manual is provided, as a source of reference and product information.

Minute-Man Anchors, Inc., Having pioneered anchoring for the manufactured home industry, continues in our efforts to provide new and innovative products. In so doing, we are committed to the highest quality materials, workmanship and total customer satisfaction.

If you are a longtime Minute-Man customer, "thank you" for your continued trust and patronage. If you are a new customer, "welcome!" We look forward toward serving you in this ever growing industry.

Questions?

Regardless of your level of association with the Manufactured Housing market, if you have questions or we may be of service, please contact our office.

1-800-438-7277

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ANCHOR INSTALLATION

CAUTION: The installation of anchors with a drive machine is a two person operation.

MACHINE INSTALLATION

In this method, the anchor is turned to full depth into the ground by an anchor drive machine.

1.  Attach anchor to machine.
2.  Placed anchor in proper position in line with strap and machine.
3.  Anchor should be installed at a slight angle as shown to assure head being positioned behind future skirting.

There are two basic methods of installing anchors, each equally effective in properly securing manufactured homes to the ground.

Warning: Before ground anchor installation, determine that the anchor locations around home will not be close to any underground electrical cables, water lines or sewer piping. Failure to determine the location of electrical cables may result in serious personal injury.

MANUAL INSTALLATION

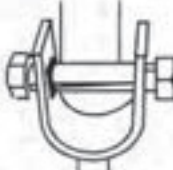



A hole is dug to a depth of approximately two feet in the proper position as explained under machine installation.



After the hole is dug to 24" depth, the anchor is turned into the ground by hand, using a rod or length of pipe for leverage.

After anchor is installed full depth, earth is repacked, six inches at a time.

PROPER TENSIONING OF STRAP TO ANCHOR HEAD

1.  Insert bolt into head; attach nut loosely. Insert strap in slot of 5/8" bolt, or until strap is flush with far side of bolt.
2.  Bend strap 90° and take at least three complete turns on bolt until strap is taut.
3.  Bolt is turned with 15/16" socket wrench, or adjustable wrench, on hex head. With square hole in anchor head, hold bolt under tension while repositioning wrench: Place open-end wrench on 5/8" square shoulders of bolt. Align square shoulders of bolt with square hole in anchor head.
4.  Holding hex head of bolt in position, tighten nut to draw square shoulders into square hole. Shoulders are now in locking position; continue to tighten nut. Tensioning device is now in locked, secure position.

Note: The tensioning bolt can be inserted in the head from either side.

Notice: In areas of severe cold weather, where possible damage could occur from frost heave, the homeowner should be prepared to adjust tension on the straps to take up slack.

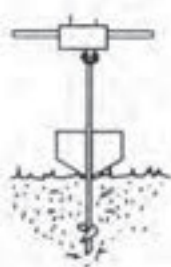
MINUTE MAN ANCHORS, INC.

INSTRUCTION FOR USING MINUTE MAN STABILIZING DEVICE

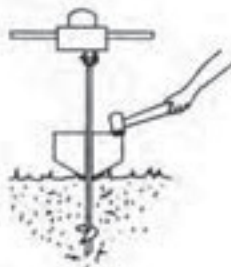
Minute Man stabilizing devices are designed for use with Minute Man anchors and intended to laterally restrict movement of the anchor through the soil.



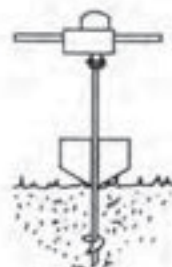
1. Install the anchor into the ground leaving 12" - 18" of the shaft exposed.



2. Place the stabilizing device next to the shaft in the direction of pull.



3. Drive the stabilizing device into the ground.



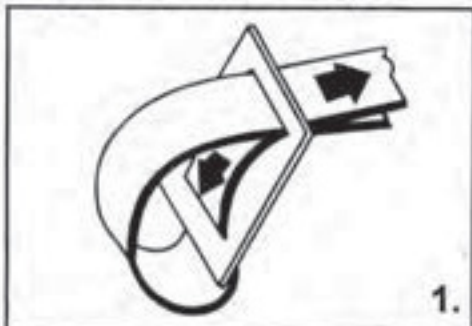
4. The anchor is then turned in the rest of the way into the soil until the head of the anchor is flush with the stabilizing device.



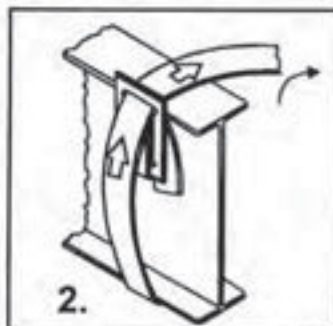
5. As the frame tie is tightened the anchor will be pre-loaded against the stabilizing device preventing lateral movement of anchor through the soil.

FRAME TIE INSTALLATION INSTRUCTIONS

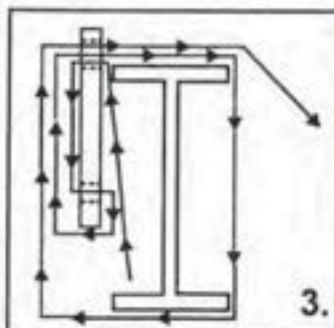
Frame Tie With Buckle



1.



2.



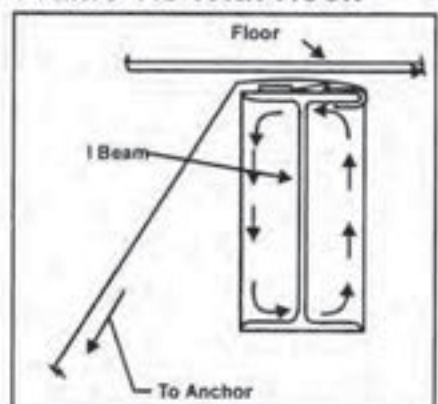
3.

Thread sufficient length of frame tie strap through buckle as shown.

Next, thread long end of strap between frame and floor of home. Bring strap through buckle as shown in diagram and fasten to anchor head.

Diagram showing strap in position around frame and through buckle. It is important to remove all slack from system.

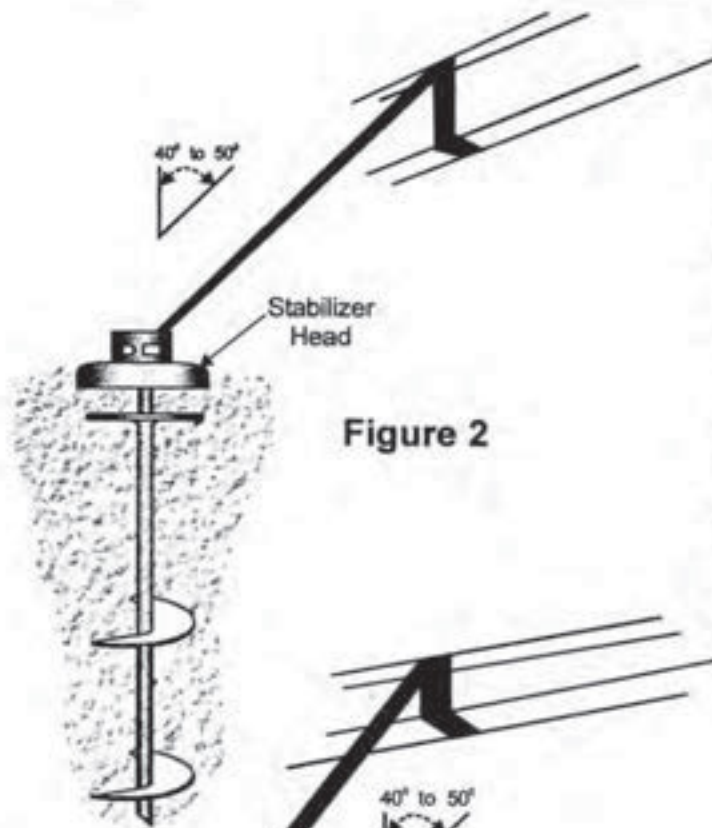
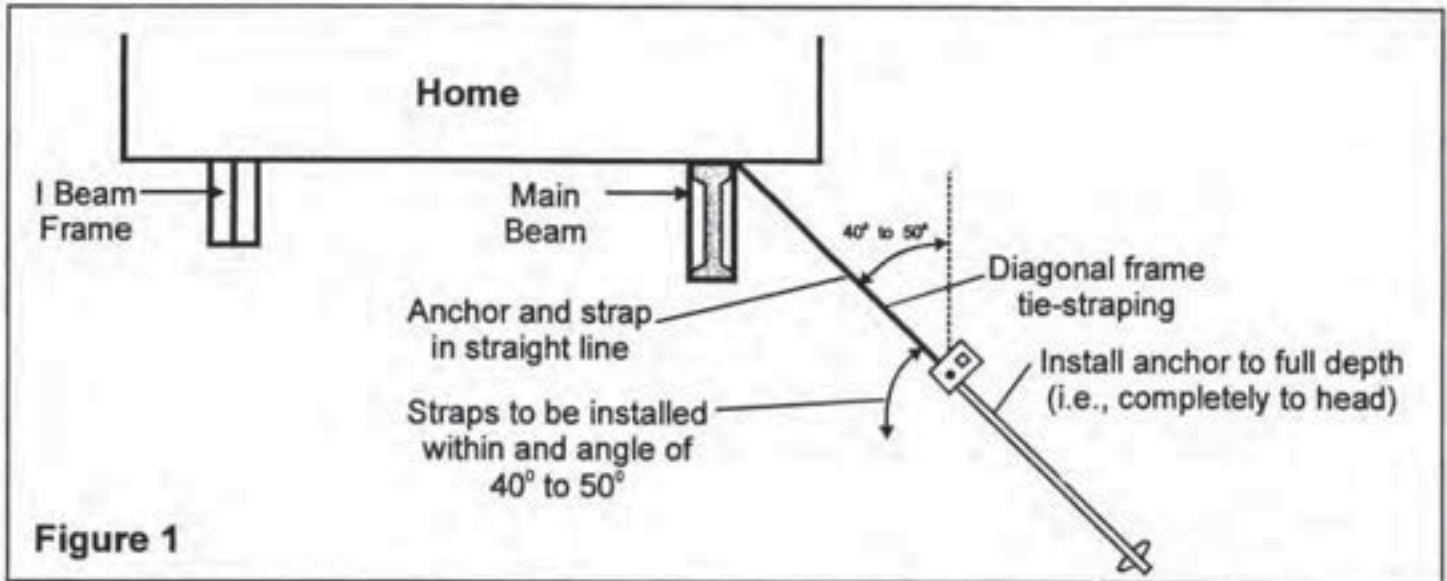
Frame Tie With Hook



Enlarged View of Frame Beam

Attach Frame Clamp (Hook) inside top flange of home frame. Place strap between frame and home as shown in sketch. Pull strap tight and attach to anchor tension head.

PROPERLY INSTALLED AND CONNECTED GROUND ANCHOR AND FRAME CONNECTION

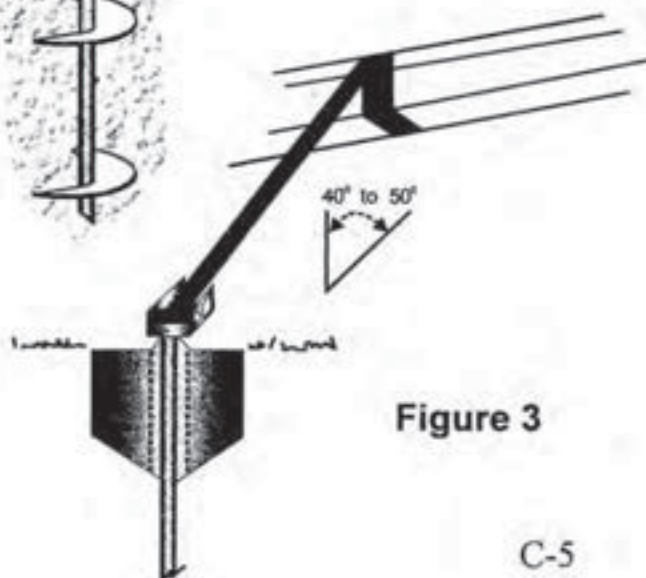


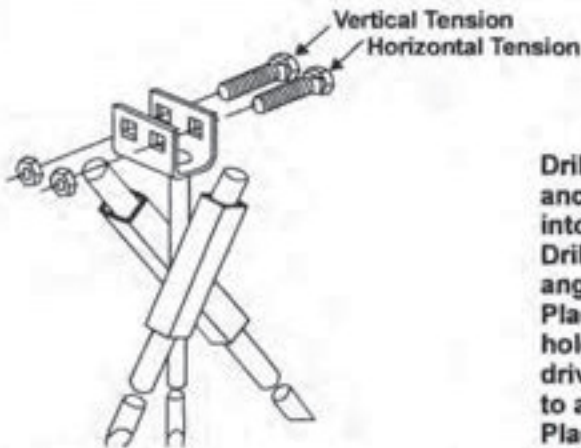
For those homes which are designed to require only diagonal frame ties, the anchor is to be installed in line with the ties.

Figure 1. When the load on the anchor is not applied in line with the long axis of the anchor, the magnitude and effect of the horizontal movement of the anchor head is to be investigated.

Another accepted way to limit lateral deflection is by use of a tested and approved Metal Stabilizing Device.

Figure 2 and 3. In **Figure 2**, the Stabilizer is a part of the anchor. In **Figure 3**, the plate is driven in front of the anchor's direction of pull and will act to minimize the anchor rod deflection.





**Installation
Instructions
for
Cross Drive
Rock Anchor**

INSTALLATION INSTRUCTIONS

Drill 5/8" diameter hole 5 1/2" deep, in center of anchor location, for pilot stud. Insert pilot stud into hole.

Drill two - 3/4" diameter holes in rock at 45 degree angles, using anchor head as a locating guide.

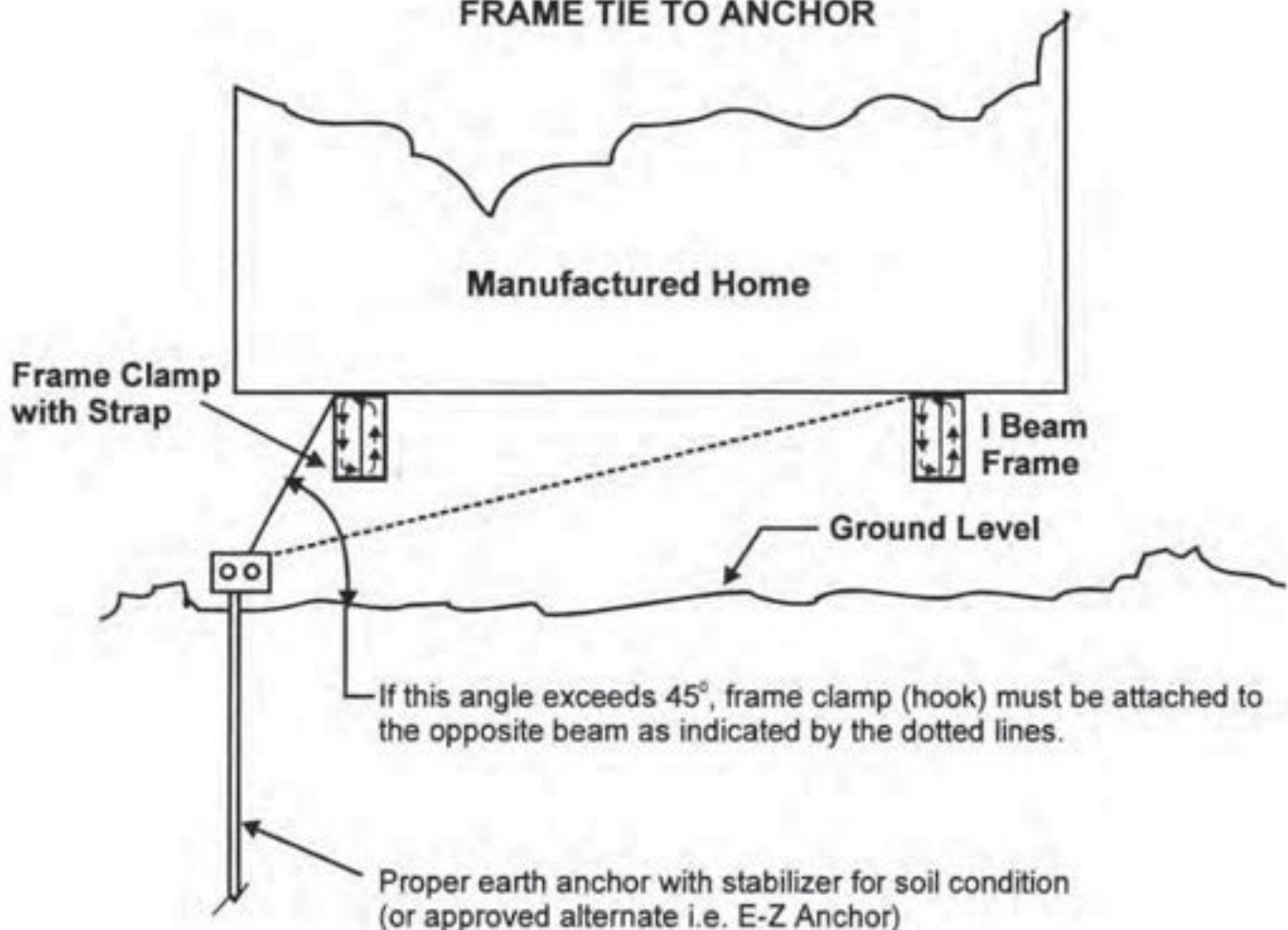
Place rod through top of (1) square tube and into hole. Drive rod to desired depth. (Rod must be driven into rock at least 80% of its length in order to achieve minimum allowable pullout resistance.)

Place second rod through top of remaining tube.

Drive rod to desired depth to lock.

Maximum pullout resistance is developed when anchor head is low as possible and ground surface is solid rock. Distance from square tubing to rock surface should not exceed 1".

FRAME TIE TO ANCHOR



EZ ANCHOR WITH VERTICAL STABILIZER INSTALLATION INSTRUCTIONS

Note: With machine installation, a Minute-Man adapter designed to fit both the anchor head and drive machine shaft is available. Installers do not need additional or special equipment for E-Z Anchor Installation.

1. MACHINE INSTALLATION

Using a drive machine, turn the anchor into the ground so that the **vertical stabilizer** is approximately 2" below ground level and the stabilizer head is 1/4" to 1/2" below ground level.

For the E-Z Anchor/Stabilizer to achieve full potential install the anchor **vertically**. See Figure A.

Note: A slightly greater angle may be used to start anchor to avoid contact with the home and straightened as anchor is ground set. The splitbolt is inserted, strap is fastened, and tightening adjustment made.

Caution: The installation of anchors with a drive machine is a two person operation.

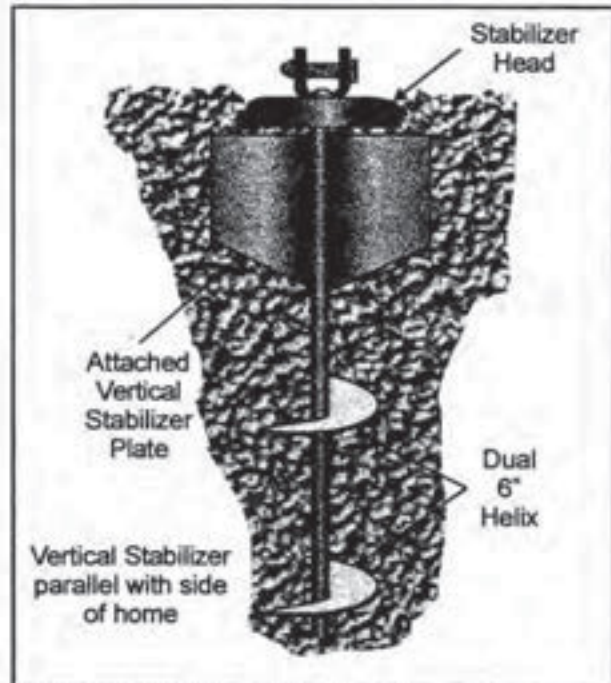


Figure A *Note: Before insertion, make sure vertical stabilizer is parallel with direction of pull.*

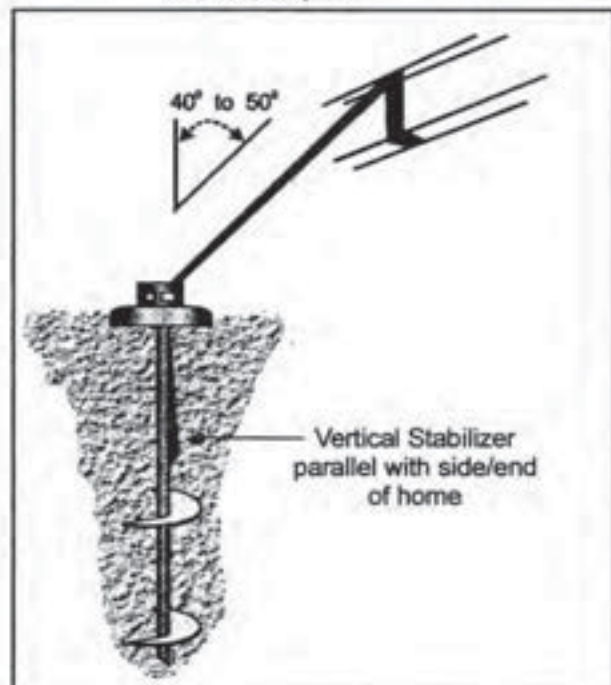
MINUTE MAN EZ ANCHOR WITH VERTICAL STABILIZER

MODEL: MMA 6650 EZDH W/STABILIZER

Stabilizer pulled into ground by anchor installation - no sledge hammer needed

2. STANDARDS OF INSTALLATION

- E-Z Anchors and all components are to be installed per manufacturer's instructions.
- E-Z Anchors are approved for designated Soil Class 4-A.
- Consult manufactured home set up instructions for number of frame tie downs, over the roof tie downs, and tie down spacing.

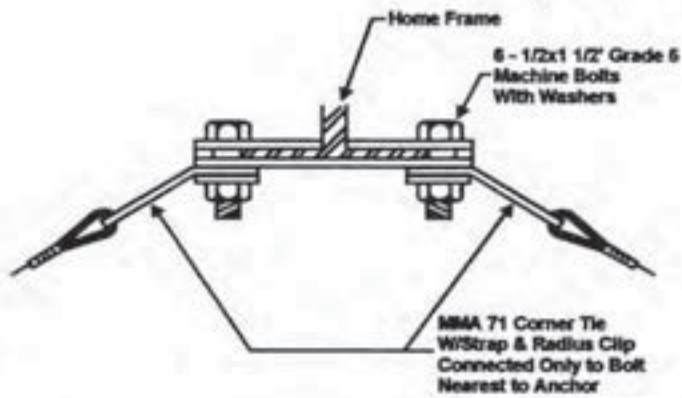


FLORIDA APPROVED

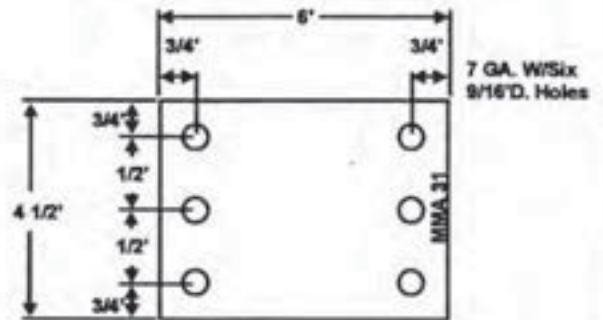
For additional information, copies of engineering test(s) and report,
Contact Minute-Man Anchors, Inc. (Revised: November 1998)



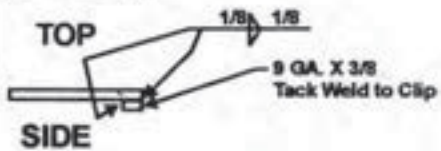
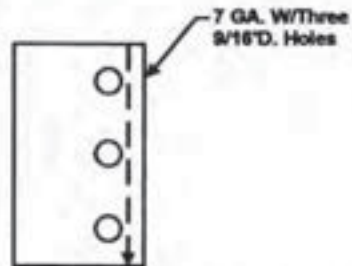
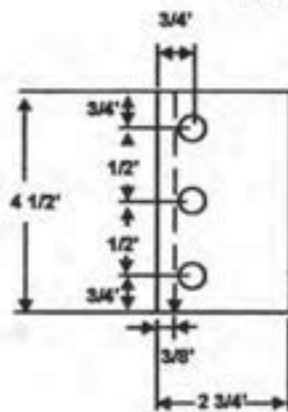
LONGITUDINAL FRAME TIE AND CLAMP (Florida Approved)



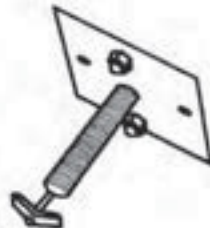
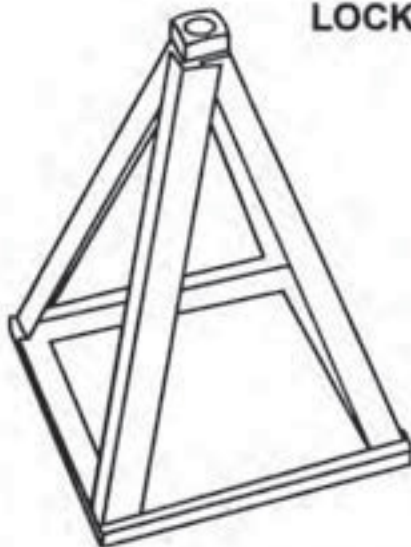
MMA 31 ASSEMBLY UNIT



TOP



LOCKING HEAD HEAVY DUTY PIER



MDP-16	16" DELUXE PIER
MDP-20	20" DELUXE PIER
MDP-24	24" DELUXE PIER
MDP-28	28" DELUXE PIER
MDP-32	32" DELUXE PIER

Available painted or hot dip galvanized

LOCKING FRAME CLAMP II MMA-33 ASSEMBLED UNIT

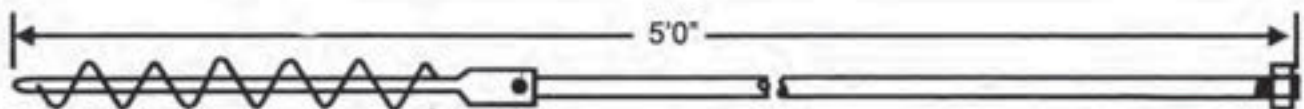
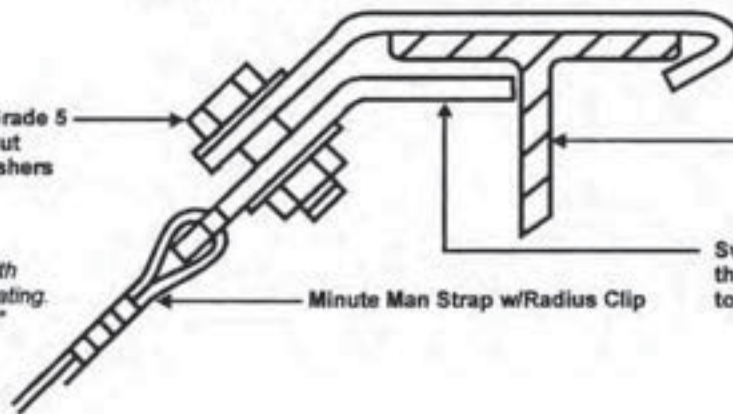
$\frac{1}{2}$ x 1" Grade 5
Bolt & Nut
with Washers

Home Frame

Note: Galv. Or Painted with
Black Water Resistant Coating.
All Dimensions +/- 0.0625"

Minute Man Strap w/Radius Clip

Swivel Clip must not vary more
than 10 Deg. from Perpendicular
to Beam.



EARTH PROBE



WRENCH ADAPTER



600 lb. In. TORQUE WRENCH

FLORIDA APPROVED

Pocket Penetrometer Kits Available





SOIL CLASSIFICATION CHART

Soil Class	Soil Description	Blow Count (ASTM D1586)	Test Probe Value	Recommended Minute Man Anchor
1	Sound hard rock	NA	NA	Cross Drive or Rock Anchor
2(a)	Very dense &/or cemented sands, coarse gravel and cobbles, caliche, preloaded silts, and clays.	40-up	551 lb. in. Up	4430DH 650DH 4430 EZDH 636 EZDH 24 BA
2(b)	Coral	40-up	551 lb. in. up	4430 DH 650DH 24 BH
3	Medium dense coarse sands, sandy gravels, very stiff silts, and clays.	24-39	351 to 550 lb in.	4430 DH 4430 EZDH 636 EZDH 650DH
4(a)	Loose to medium dense sands, firm to stiff clays and silts alluvial fill.	18-23,3	276 to 350 lb. in.	650DH 6650 EZVDH Fla.
4(b)	VERY loose to medium dense sands, firm to stiff clays and silts, alluvial fill.	12-17	175 to 275 lbs. in	1060DH

Remember: Each state, county or municipality may require a specific anchor from the groups shown for each soil classification. Check local regulations first.

Note: Many anchors are designed for particular soil condition(s) and are unacceptable for use in other type soils. We have listed the soils for which each anchor is designed and approved. Soil classifications are taken from the "standard for the installation on mobile homes". Each anchor listed meets ANSI A225.1 and ASTM D3953.91 codes.



E-Z ANCHOR INSTALLATION METHOD

Note: With machine installation, a Minute-Man adapter designed to fit both the anchor head and drive machine shaft is available. Installers do not need additional or special equipment for E-Z Anchor installation.

1. MACHINE INSTALLATION

The drive machine is started and the anchor is turned into the ground to a point where the top (stabilizer head plate) is flush with or slightly below ground level. This assures that the E-Z Anchor Stabilizer will be at its required installation position. **See Figure A.**

To achieve full potential, install the E-Z Anchor vertically. A 10° deviation from vertical is acceptable. **See Figure A.**

Note: A slightly greater angle may be used to start anchor to avoid contact with the home and straightened as anchor is ground set. The splitbolt is inserted, strap is fastened, and tightening adjustment made.

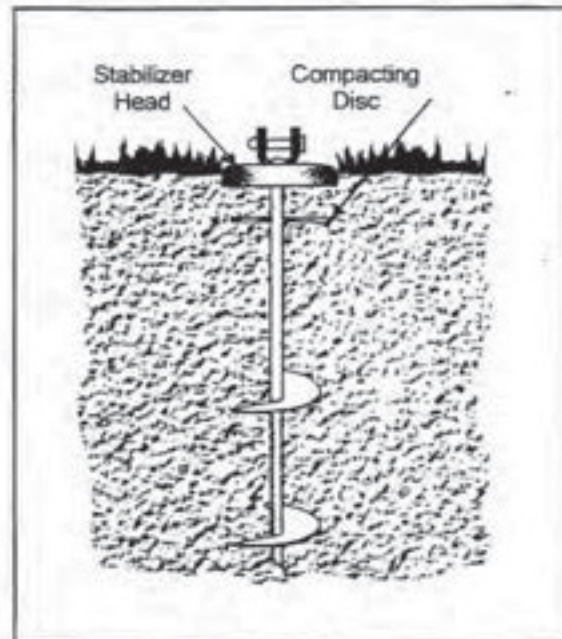


Figure A

2. STANDARDS FOR INSTALLATION

- E-Z Anchors and all components are to be installed per manufacturer's instructions.
- E-Z Anchors are approved for designated Soil Class III.
- E-Z Anchor working load capacity is 3,150 pounds for a single tie or the load of (2) ties combined which is 40 to 50 degrees from vertical. **See Figure B.**
- Consult manufactured home set up instructions for number of frame tie downs, over the roof tie downs and tie down spacing.
- Proper site preparation required removal of grass and sod prior to installation.

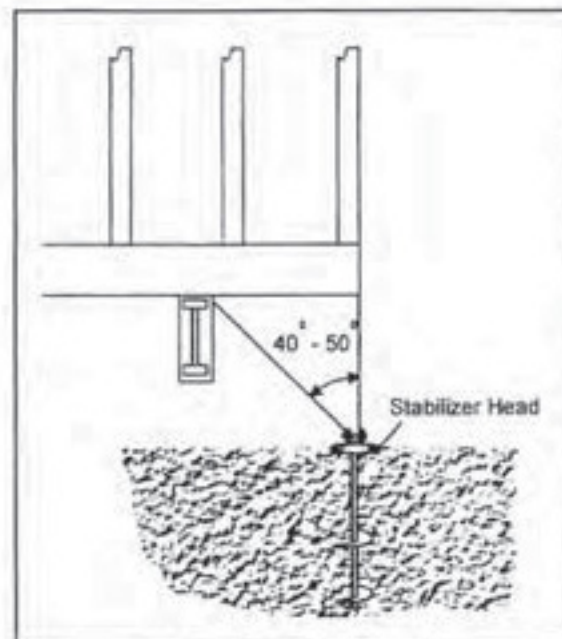


Figure B

For additional information, copies of engineering test(s) and report, Contact Minute-Man Anchors, Inc. (Revised: November 1998)

Following is a list of Minute-Man Anchors with a minimum holding power of 4,725 pounds (2143 kg.).

MARK	MODEL	DESCRIPTION	USE IN SOIL TYPE
MMA-2	650-DH 5/8"	6" DISC, 50" ANCHOR	2,3,4
MMA-4	650-DH 3/4	6" DISC, 50" ANCHOR	2,3,4
MMA-38	650-DH 11/16	6" DISC, 50" ANCHOR	2,3,4
MMA-40	636-DH 5/8	6" DISC, 36" ANCHOR	2,3,4
MMA-28	636-DH 3/4	6" DISC, 36" ANCHOR	2,3,4
MMA-30	4430-DH 5/8	DOUBLE 4" DISC, 30" ANCHOR	2
MMA-36	4430-DH 11/16	DOUBLE 4" DISC, 30" ANCHOR	2
MMA-6	4430-DH 3/4	DOUBLE 4" DISC, 30" ANCHOR	2
MMA-35	36-XDH	36" CROSS DRIVE ANCHOR	1
MMA-8	48-XDH	48" CROSS DRIVE ANCHOR	1
MMA-71	1060-DH 3/4	10" DISC, 60" ANCHOR	4b (Fla.)
MMA-50	4442-DH 5/8	DOUBLE 4" DISC, 42" ANCHOR	2,3,4
MMA-52	4636-DH 3/4	4" & 6" DISC, 36" ANCHOR	2,3,4
MMA-54	4450-DH 11/16	DOUBLE 4" DISC, 50" ANCHOR	2,3,4
MMA-55	4450-DH 3/4	DOUBLE 4" DISC, 50" ANCHOR	2,3,4
MMA-92	4430-EZDH 3/4	DOUBLE 4" DISC, 30" EZ ANCHOR	2,3
MMA-94	636-EZDH 3/4	6" DISC, 36" EZ ANCHOR	2,3
MMA-95	660-EZDH 3/4	6" DISC, 60" EZ ANCHOR	2,3
MMA-96	650-EZDH 3/4	6" DISC, 50" EZ ANCHOR	2,3,4
MMA-98	650 EZVDH 3/4	DOUBLE 6" DISC, VERT. STABILIZER	2,3,4A (Fla.)
MMA-18	THDH	DOUBLE HEAD TENSION DEVICE	SLAB
MMA-18	THDHL	DH TENSION DEVICE W/LAG	SLAB
MMA-10	36-DH	CORAL ANCHOR	CORAL
MMA-12	210-DH	CONCRETE ANCHOR	SLAB
MMA-14	210-PDH	WET CONCRETE ANCHOR	SLAB
MMA-42	210-JDH	SWIVEL HEAD WET CONCRETE ANCHOR	SLAB
MMA-BR	24 BA	BARB ROCK ANCHOR	1
MMA-22	100-DH	DOUBLE HEAD TENSION ADAPTER	
MMA-SDA2		STABILIZER	
MMA-SD2		STABILIZER	FLA.
MMA-29	FCIW/S	FRAME CLAMP II W/STRAP	
MMA-29	FCIW/S	FRAME CLAMP I W/STRAP	
MMA-31	FRAME TIE	LONGITUDINAL FRAME TIE	FLA.

MARK	MODEL	DESCRIPTION	USE IN SOIL TYPE
MMA-32	BUC/WS	BUCKLE W/STRAP	FLA.
MMA-33	FCII (LOCKING)	LOCKING FRAME CLAMP II	
MMA-71	CT/WS	CORNER TIE W/STRAP	FLA.
MMA-71	CT/WS	CORNER TIE II W/STRAP	
MMA	SBN	STRAP BOLT & NUT	
MMA-25	22 BUCKLE	DOUBLE SLOT BUCKLE	
MMA-32	SS BUCKLE	SINGLE SLOT BUCKLE	
	44RB	4X4" ROOF BRACKET	
	66 RB	6X6" ROOF BRACKET	
	POCKET PENETROMETER	POCKET PENETROMETER	
	SOIL TEST PROBE	SOIL TEST PROBE	
	PERIMETER JACK JACKING PLATE	PERIMETER JACK I BEAM JACKING PLATE	
MMP-6	6" PIER	STANDARD MOBILE HOME PIER	
MMP-8	8" PIER	STANDARD MOBILE HOME PIER	
MMP-10	10" PIER	STANDARD MOBILE HOME PIER	
MMP-12	12" PIER	STANDARD MOBILE HOME PIER	
MMP-14	14" PIER	STANDARD MOBILE HOME PIER	
MMP-16	16" PIER	STANDARD MOBILE HOME PIER	
MMP-18	18" PIER	STANDARD MOBILE HOME PIER	
MMP-20	20" PIER	STANDARD MOBILE HOME PIER	
MMP-22	22" PIER	STANDARD MOBILE HOME PIER	
MMP-24	24" PIER	STANDARD MOBILE HOME PIER	
MMP-26	26" PIER	STANDARD MOBILE HOME PIER	
MMP-28	28" PIER	STANDARD MOBILE HOME PIER	
MMP-30	30" PIER	STANDARD MOBILE HOME PIER	
MDP-16	16" DELUXE PIER	LOCKING HEAD HEAVY DUTY PIER	FLA.
MDP-20	20" DELUXE PIER	LOCKING HEAD HEAVY DUTY PIER	FLA.
MDP-24	24" DELUXE PIER	LOCKING HEAD HEAVY DUTY PIER	FLA.
MDP-28	28" DELUXE PIER	LOCKING HEAD HEAVY DUTY PIER	FLA.
MDP-32	32" DELUXE PIER	LOCKING HEAD HEAVY DUTY PIER	FLA.



ROD M. HUDGINS, JR. P.E.

P.O. BOX 5070

ASHEVILLE, N.C. 28813-5070

Phone (828) 274-9244 Fax (828) 274-9525

ROD M. HUDGINS, JR. P.E. - PRINCIPAL

DENNIS R. PONDER - ASSOCIATE

December 21, 1998

Minute Man Anchors, Inc.
305 West King Street
East Flat Rock, North Carolina 28726

Dear Sir:

I have analyzed design drawing, physical testing reports and installation instructions for the Minute Man products listed as follows:

650 DH 5/8	4430 DH 5/8	36 XDH	THDH
650 DH 11/16	4430 DH 11/16	48 XDH	THDHLS
650 DH 3/4	4430 DH 3/4	36 DH	
		24 BA	FCI W/S
636 DH 5/8	4442 DH 5/8	210 DH	FCII W/S
636 DH 3/4		210 PDH	BUC W/S
	4450 DH 11/16	210 JDH	SBN
4636 DH 3/4	4450 DH 3/4	100 DH	MMASD2
			MMASDA2
4430 EZDH 3/4		CT/WS CORNER TIE II	
636 EZDH 3/4			
650 EZDH 3/4		MMA 31 LONGITUDINAL FRAME TIE	
660 EZDH 3/4		MMA 33 LOCKING FRAME CLAMP II	
6650 EZDH 3/4 W/ VERT. STABILIZER			

My analysis of the physical test reports define the breaking strength of each of these anchors and their components to be in excess of 5,000 pounds. The strapping meets Federal Specification QQ-S-781H for Type I, Class B, Grade I Strapping. The strapping also meets with ANSI 225.1 standards and ASTM D3953-91 standards. The strapping is 1 1/4 x .035 minimum, hot dip galvanized steel.

On file are testing reports of the direct withdrawal strength of these anchors. These test evaluate the anchorage strength of Minute Men Anchors installed resisting an axial and 45 degree angle applied withdrawal load. For the anchors listed on pages 10 and 11, the average holding power meets and / or exceeds the required minimum of 4,725 pounds, when installed in accordance with manufacturer instructions in the soil types and class shown.



DESIGN WIND-LOAD ZONES:



Design Wind-Load Zones:			
Standard Wind	Zone I	15 psf Horizontal	9 psf uplift*
Hurricane	Zone II	+39 psf Horizontal	27 psf uplift
Hurricane	Zone III	+47 psf Horizontal	32 psf uplift
			*net uplift
Note: psf: pounds per square foot			

Notes

Note: Prior to installation, refer to any local, state and federal regulations, to assure proper compliance.

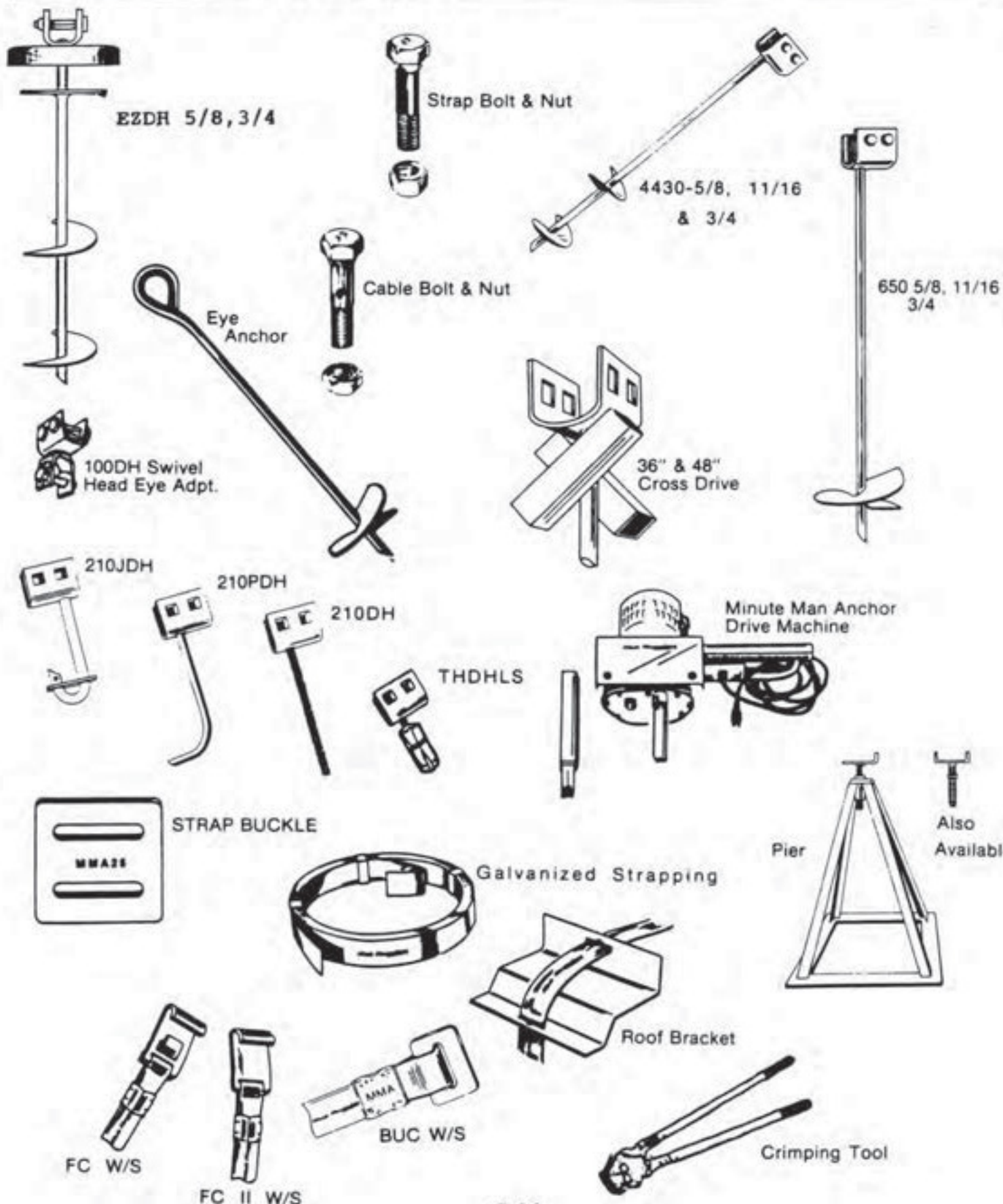
Soil test probe the anchor location in order to match the soil classification with the proper anchor.

Minute Man[®] anchors,™

Anchor • Drive Anchors • Anchor Kits • Anchor Drive Machines • Strapping
Mobile Home Piers • Entrance Steps • Platforms • Decks

Minute Man anchors

All anchors are "DH" type for use with either one or two tension bolts. Anchors are priced without tension bolt and nut—they must be ordered separately. Tension bolts and nuts will be packed separately from anchors.



C-16

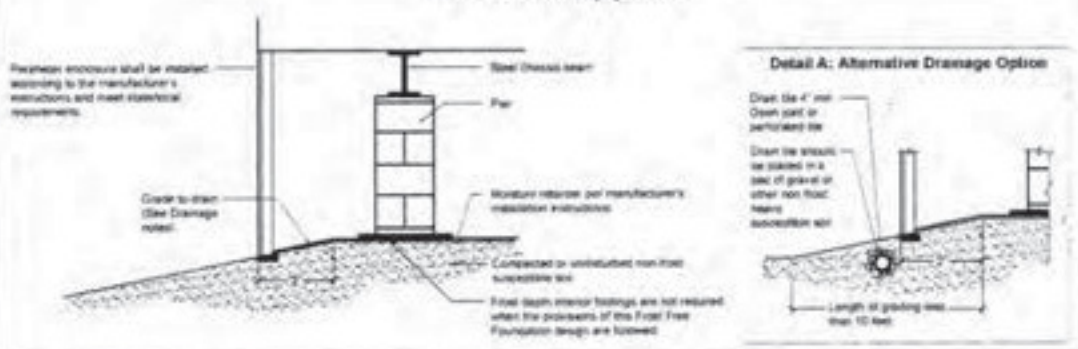
305 West King Street • East Flat Rock, North Carolina 28726 • Telephone 828/692-0256

Manufactured Home Frost Free Foundation® Design

Notes

- General**
- This design addresses moisture control and frost protection aspects of the foundation only, and is intended to supplement the manufacturer's CARMA-approved installation manual. All other aspects and requirements of the manufacturer's installation manual shall be strictly complied with.
 - This design meets the requirements of 24 CFR Part 328, Model Manufactured Home Installation Standards, First Rule (October 2007).
 - This general design is subject to meeting site specific conditions as noted, and is not intended for all locations.
 - Verification of relevant site conditions is subject to acceptance of the local authority having jurisdiction.
- Drainage**
- All drainage shall be diverted away from the home and grading must slope a minimum of 1/4-inch per foot away from the foundation for a distance of 10 feet. Where site conditions do not allow the grade to slope for a distance 10 feet, a drain tile may be installed, sloping away and terminating at more than 10 feet from the home (see Detail A).
- Flood and seismic**
- This design does not address flood hazard and seismic issues. If required by local authorities, a design that specifically addresses flood and seismic loads must be used. Check with manufacturer for flood and seismic design considerations for home.
- Soil**
- Footings shall be placed on undisturbed soil or fill compacted to 90 percent at maximum relative density. To minimize the chances of frost action due to subsurface ground water, installers shall ensure the ground water table during the winter season is below the frost-free line using means or methods acceptable to the local authority having jurisdiction. If ground water depth is determined to be above the frost-free depth, the Frost Free Foundation design cannot be used.
- Perimeter enclosure**
- A perimeter enclosure is required meeting requirements provided by the manufacturer's installation manual. Any perimeter enclosure terminating above the frost line must be designed so as not to transfer loads due to frost heave to the home.
- Perimeter support options**
- For homes requiring perimeter support, the perimeter shall have supports in locations and load bearing capacity as required by the manufacturer. These supports may consist of:
- A means to transfer the load to the ground under the home through a perimeter support assembly (see Option 1). At places where the pier is only used to stabilize the engineered perimeter support assembly, a single vertical DRU is acceptable, or
 - A frost depth protected pier at the perimeter (see Option 2) (any system within 18 inches of the perimeter wall that is supported by the ground must meet local frost depth requirements), or
 - A beam-based adjustable outrigger, as approved by the manufacturer, or
 - Any other system of support approved by the manufacturer.

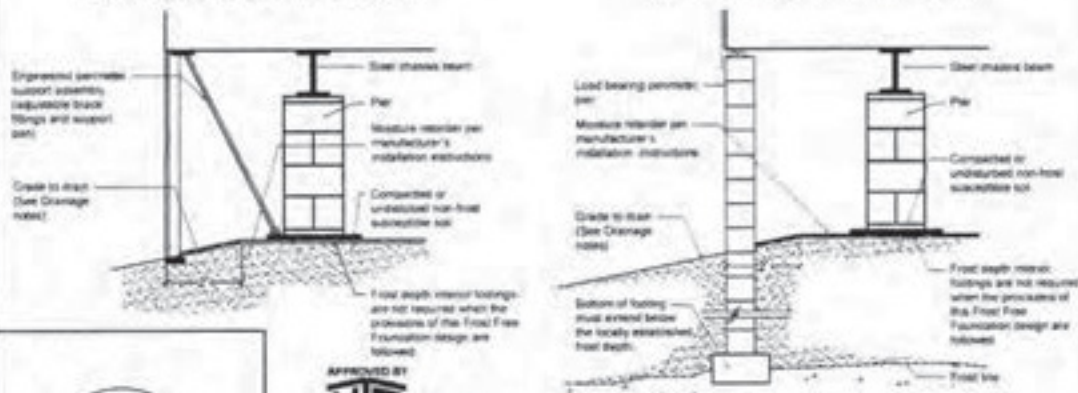
Interior Support



Perimeter Support

Option 1: Perimeter Load Transfer Support

Option 2: Masonry Block Perimeter Support



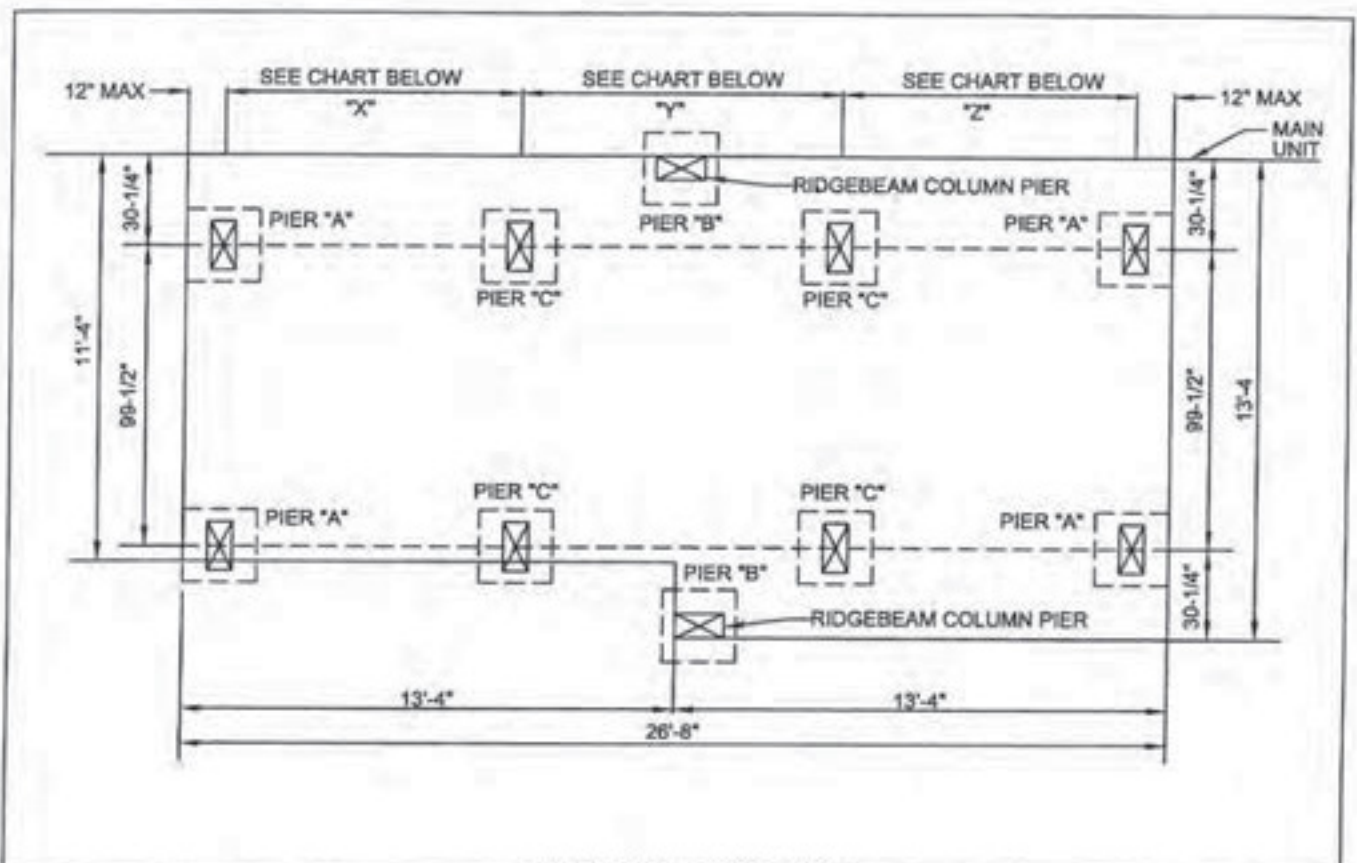
Ref. TR-224.1 thru 224.10

DESIGN BY:
Hayman Engineering
Springfield, MO
(417) 831-5550
www.haymanengineering.com
engineer@haymanengineering.com

Frost Free Foundation Design Copyright© 2010 Systems Building Research Alliance. This design is the property of the Systems Building Research Alliance and cannot be used without written authorization. The technical basis for the design is provided in "A Frost Free Foundation (FFF): an Alternative Shallow Frost Protected Foundation Design for Manufactured Homes". For further information, visit SBRA on the web at: www.researchalliance.org/pages/frostfreefoundation.htm. THIS DESIGN IS EXCLUSIVELY FOR USE WITH NEW HOMES BUILT BY CAVALIER HOMES. USE WITH HOMES BUILT BY OTHER COMPANIES IS STRICTLY PROHIBITED. I-C-17

C-17

Appendix D – Pier blocking layout – Tag section



PIER LOAD CHART 13'-8" WIDTH

ROOF LIVE LOAD	PIER "B"	4'-0"		6'-0"		8'-0"		10'-0"		12'-0"	
		PIER "A"	PIER "C"	PIER "A"	PIER "C"	PIER "A"	PIER "C"	PIER "A"	PIER "C"	PIER "A"	PIER "C"
SOUTH (20 PSF)	3470#	3170#	1735#	3500#	2400#	3835#	3070#	4170#	3735#	4500#	4400#

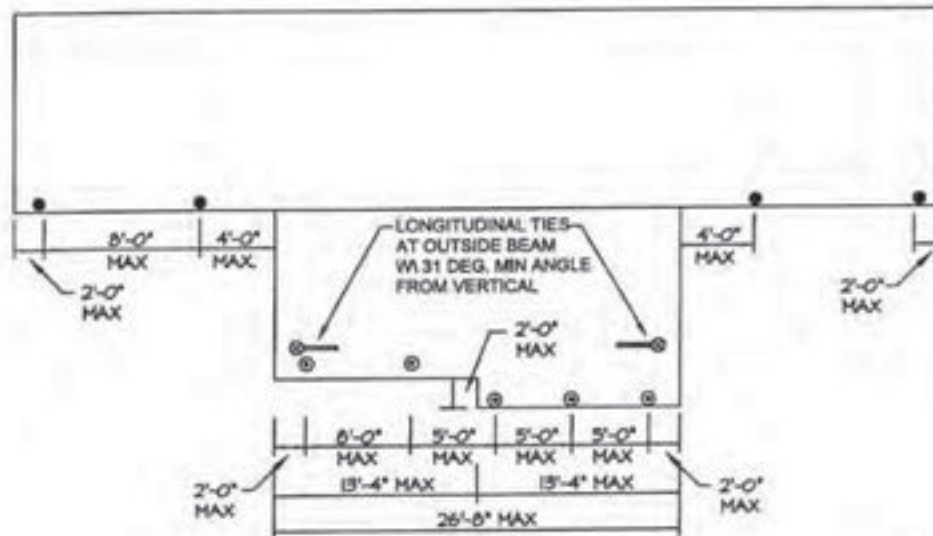
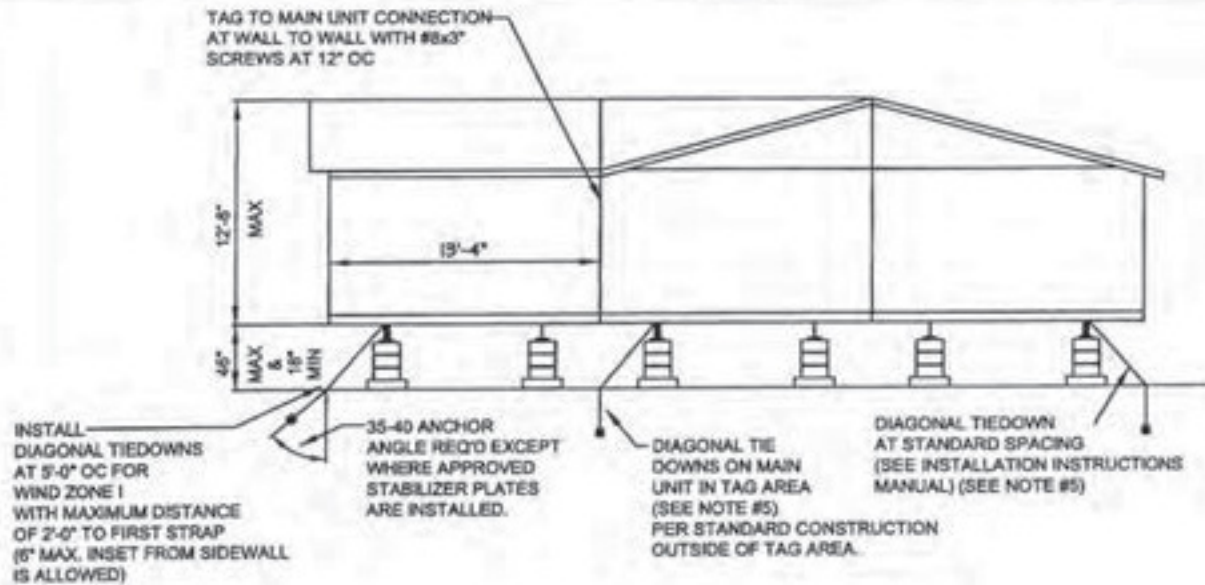
SPACING PIER "A" = "X" OR "Z"
 SPACING PIER "C" = ("X" + "Y") / 2
 OR ("Z" + "Y") / 2

NOTES:

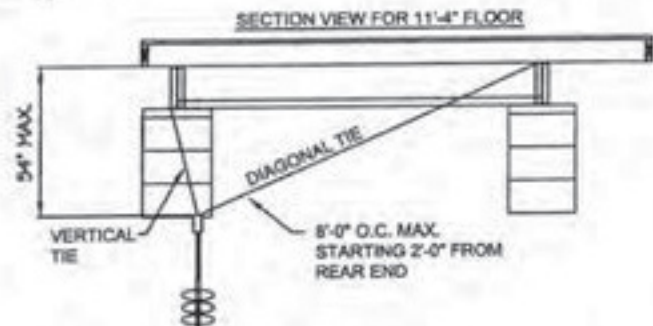
- NOTES:
1. MAXIMUM PIER SPACING FOR 8" I-BEAM IS 10'-0" AND 10" OR 12" I-BEAMS IS 12'-0".
 2. IN ADDITION TO THOSE PIERS SHOWN, PIERS SHALL BE LOCATED ON EACH SIDE OF ALL PERIMETER OPENINGS (4) FEET OR GREATER IN WIDTH. THIS INCLUDES DOORS, WINDOWS, RECESSED ENTRIES, PORCHES, ETC.
 3. FOR MAIN UNIT PIERS, SEE APPLICABLE SECTIONS OF THIS INSTALLATION INSTRUCTIONS MANUAL.
 4. DESIGNED FOR 10 PSF ROOF DEAD LOAD.
 5. MAXIMUM EAVE AND GABLE OVERHANG WIDTH IS 12".



FIGURE
PIER BLOCKING LAYOUT
TAG SECTION



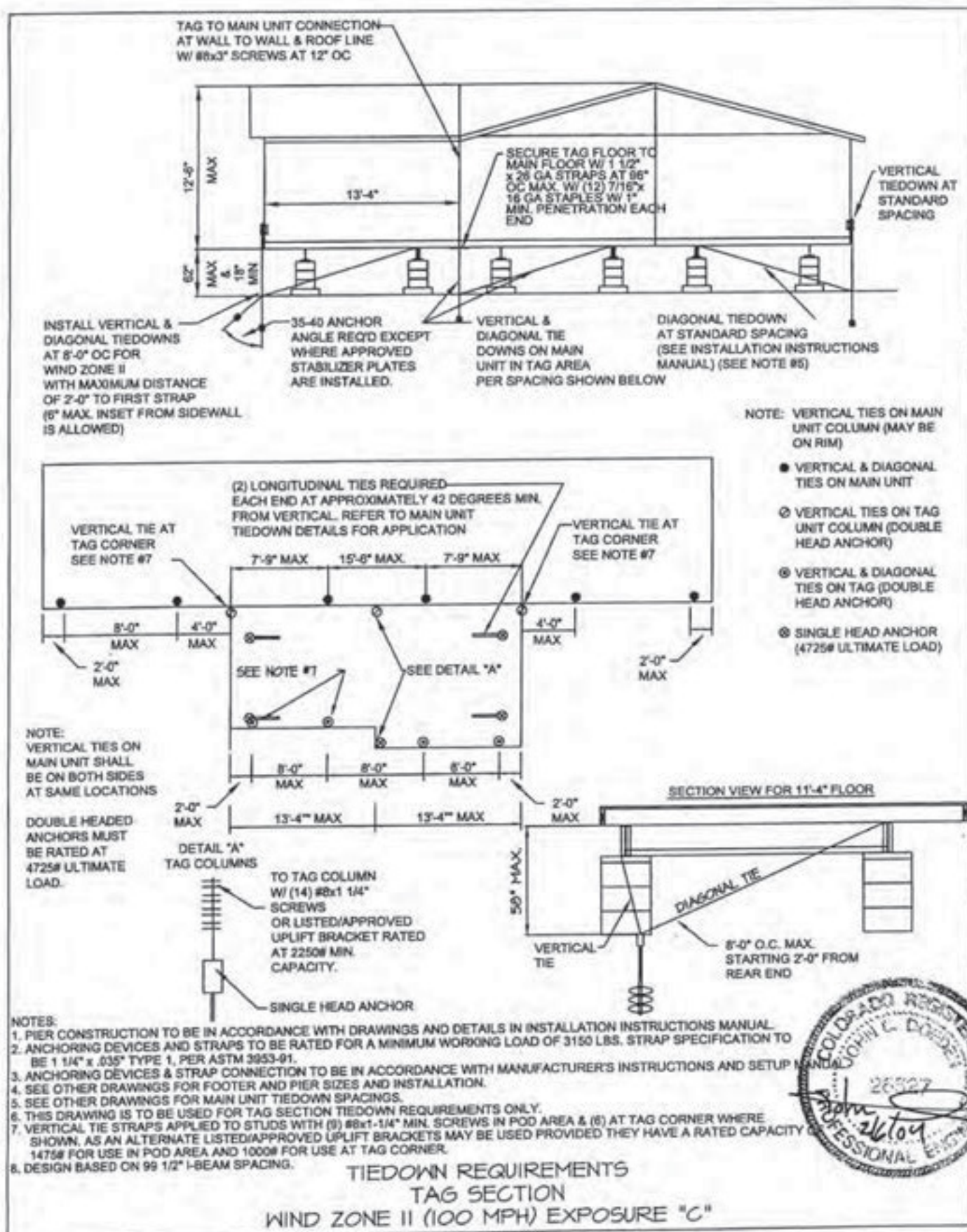
- DIAGONAL TIES ON MAIN UNIT
- ⊙ DIAGONAL TIES ON TAG



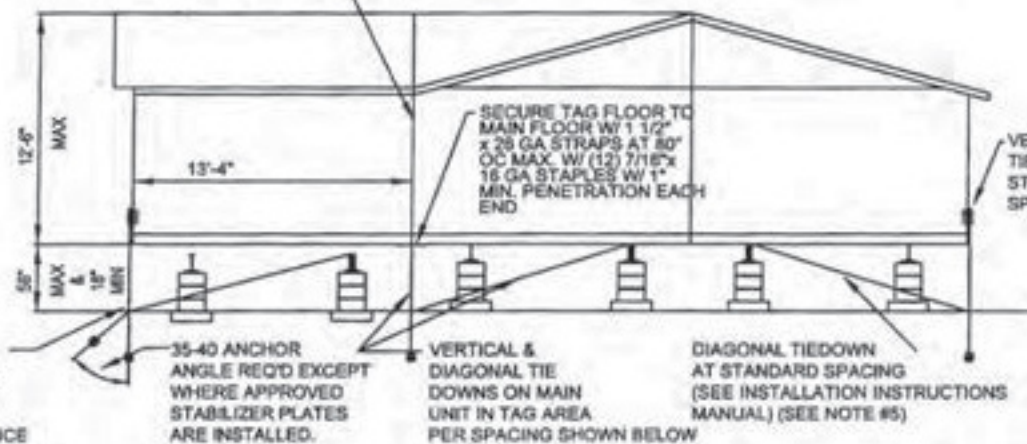
NOTES:

1. PIER CONSTRUCTION TO BE IN ACCORDANCE WITH DRAWINGS AND DETAILS IN INSTALLATION INSTRUCTIONS MANUAL.
2. ANCHORING DEVICES AND STRAPS TO BE RATED FOR A MINIMUM WORKING LOAD OF 3150 LBS. STRAP SPECIFICATION TO BE 1 1/4" x .035" TYPE 1, PER ASTM 3953-91.
3. ANCHORING DEVICES & STRAP CONNECTION TO BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS & SETUP MANUAL.
4. SEE OTHER DRAWINGS FOR FOOTER AND PIER SIZES AND INSTALLATION.
5. SEE OTHER DRAWINGS FOR MAIN UNIT TIEDOWN SPACINGS.
6. THIS DRAWING IS TO BE USED FOR TAG SECTION TIEDOWN REQUIREMENTS ONLY.
7. VERTICAL TIE STRAPS ARE NOT REQUIRED.
8. DESIGN BASED ON 99 1/2" I-BEAM SPACING.

TIEDOWN REQUIREMENTS TAG SECTION WIND ZONE I (15 PSF LATERAL)



TAG TO MAIN UNIT CONNECTION
AT WALL TO WALL & ROOF LINE
W/ #8x3" SCREWS AT 12" OC



INSTALL VERTICAL & DIAGONAL TIEDOWNS AT 8'-0" OC FOR WIND ZONE III WITH MAXIMUM DISTANCE OF 2'-0" TO FIRST STRAP (6" MAX. INSET FROM SIDEWALL IS ALLOWED)

35-40 ANCHOR
ANGLE REQ'D EXCEPT WHERE APPROVED STABILIZER PLATES ARE INSTALLED.

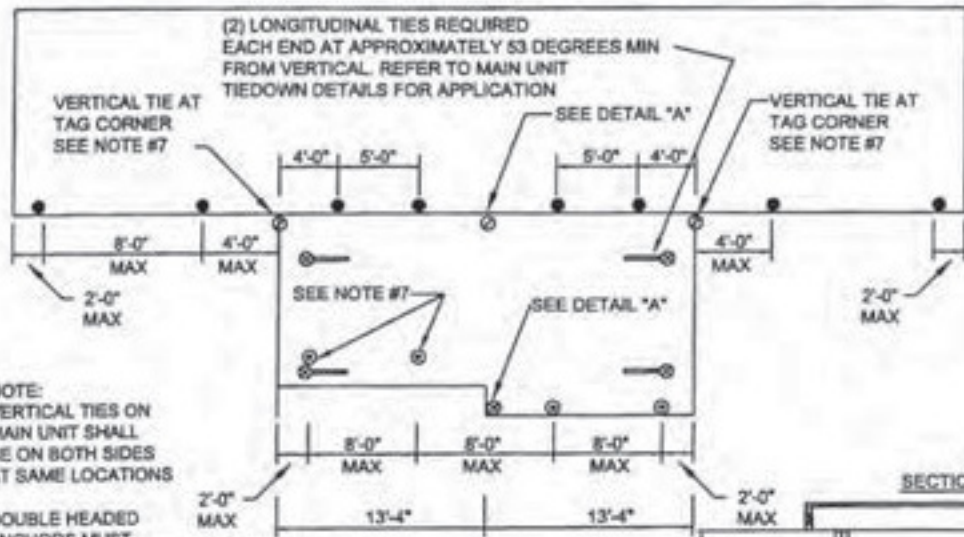
VERTICAL & DIAGONAL TIE DOWNS ON MAIN UNIT IN TAG AREA PER SPACING SHOWN BELOW

DIAGONAL TIEDOWN AT STANDARD SPACING (SEE INSTALLATION INSTRUCTIONS MANUAL) (SEE NOTE #5)

VERTICAL TIEDOWN AT STANDARD SPACING

NOTE: VERTICAL TIES ON MAIN UNIT COLUMN (MAY BE ON RIM)

- VERTICAL & DIAGONAL TIES ON MAIN UNIT
- ⊗ VERTICAL TIES ON TAG UNIT COLUMN (DOUBLE HEAD ANCHOR)
- ⊗ VERTICAL & DIAGONAL TIES ON TAG (DOUBLE HEAD ANCHOR)
- ⊗ SINGLE HEAD ANCHOR (4725# ULTIMATE LOAD)



(2) LONGITUDINAL TIES REQUIRED EACH END AT APPROXIMATELY 53 DEGREES MIN FROM VERTICAL. REFER TO MAIN UNIT TIEDOWN DETAILS FOR APPLICATION

VERTICAL TIE AT TAG CORNER SEE NOTE #7

VERTICAL TIE AT TAG CORNER SEE NOTE #7

SEE NOTE #7

SEE DETAIL "A"

NOTE: VERTICAL TIES ON MAIN UNIT SHALL BE ON BOTH SIDES AT SAME LOCATIONS

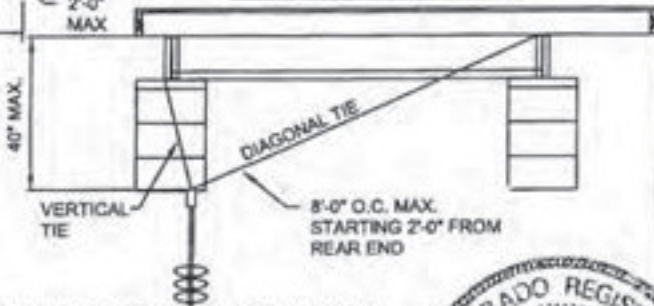
DOUBLE HEADED ANCHORS MUST BE RATED AT 4725# ULTIMATE LOAD.

DETAIL "A" TAG COLUMNS

TO TAG COLUMN W/ (18) #8x1 1/4" SCREWS OR LISTED/APPROVED UPLIFT BRACKET RATED AT 2250# MIN. CAPACITY.

SINGLE HEAD ANCHOR

SECTION VIEW FOR 11'-4" FLOOR

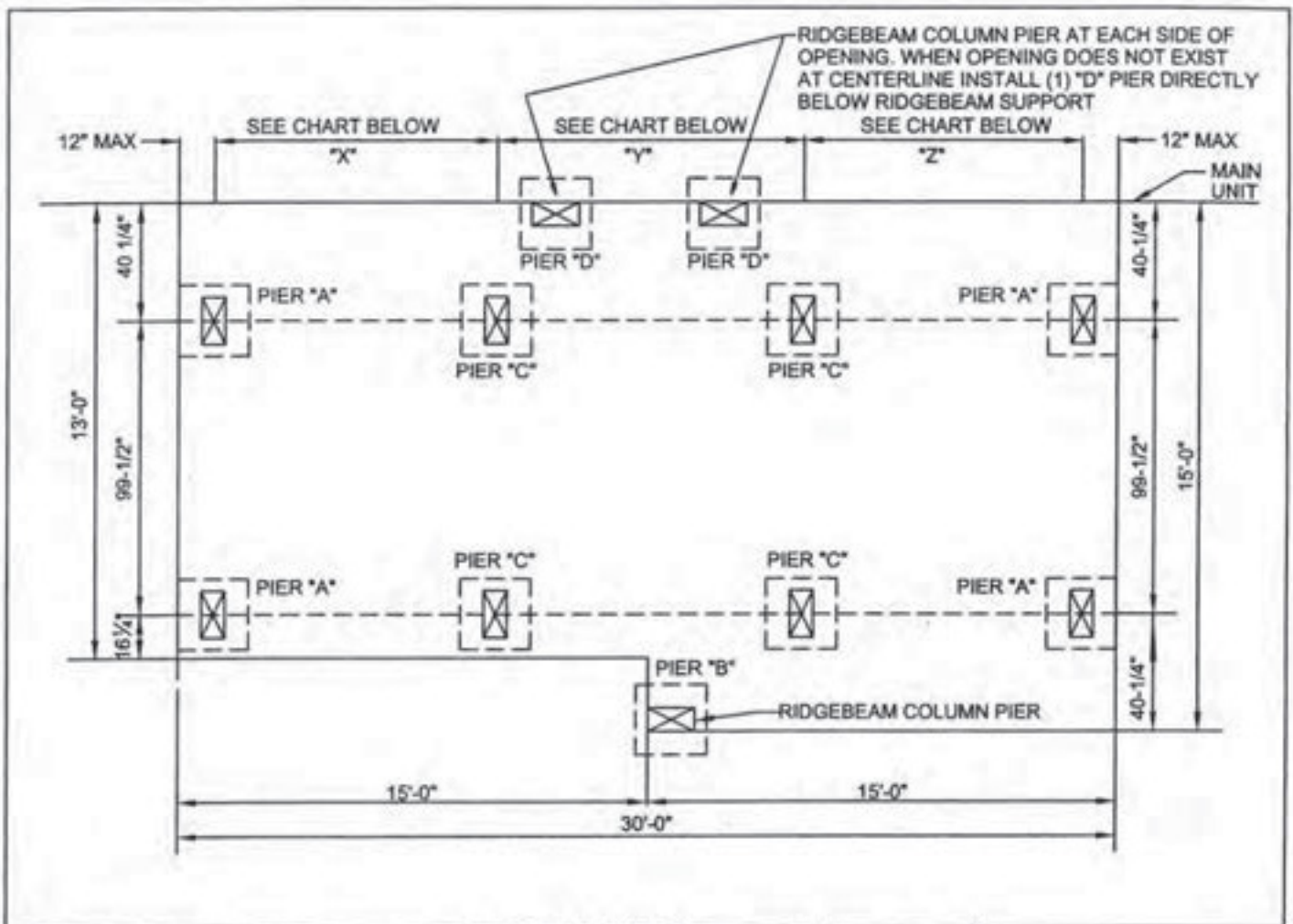


NOTES:

1. PIER CONSTRUCTION TO BE IN ACCORDANCE WITH DRAWINGS AND DETAILS IN INSTALLATION INSTRUCTIONS MANUAL.
2. ANCHORING DEVICES AND STRAPS TO BE RATED FOR A MINIMUM WORKING LOAD OF 3150 LBS. STRAP SPECIFICATION TO BE 1 1/4" x .035" TYPE 1, PER ASTM 3953-91.
3. ANCHORING DEVICES & STRAP CONNECTION TO BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND SETUP MANUAL.
4. SEE OTHER DRAWINGS FOR FOOTER AND PIER SIZES AND INSTALLATION.
5. SEE OTHER DRAWINGS FOR MAIN UNIT TIEDOWN SPACINGS.
6. THIS DRAWING IS TO BE USED FOR TAG SECTION TIEDOWN REQUIREMENTS ONLY.
7. VERTICAL TIE STRAPS APPLIED TO STUDS WITH (11) #8x1-1/4" MIN. SCREWS IN POD AREA & (6) AT TAG CORNER WHERE SHOWN. AS AN ALTERNATE LISTED/APPROVED UPLIFT BRACKETS MAY BE USED PROVIDED THEY HAVE A RATED CAPACITY OF 1475# FOR USE IN POD AREA AND 1000# FOR USE AT TAG CORNER.
8. DESIGN BASED ON 99 1/2" I-BEAM SPACING.

TIEDOWN REQUIREMENTS TAG SECTION WIND ZONE III (110 MPH) EXPOSURE "C"





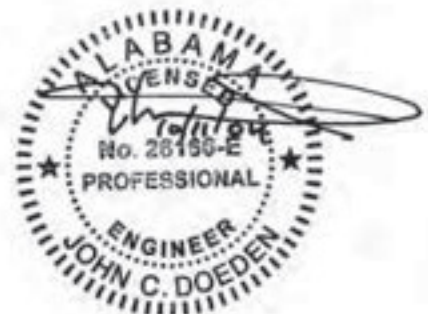
PIER LOAD CHART

ROOF LIVE LOAD	PIER "B"	PIER "D"	4'-0"		6'-0"		8'-0"		10'-0"		12'-0"	
			PIER "A"	PIER "C"	PIER "A"	PIER "C"	PIER "A"	PIER "C"	PIER "A"	PIER "C"	PIER "A"	PIER "C"
SOUTH (20 PSF)	4225#	4225#	3680#	1870#	4045#	2605#	4415#	3340#	4780#	4075#	5150#	4810#

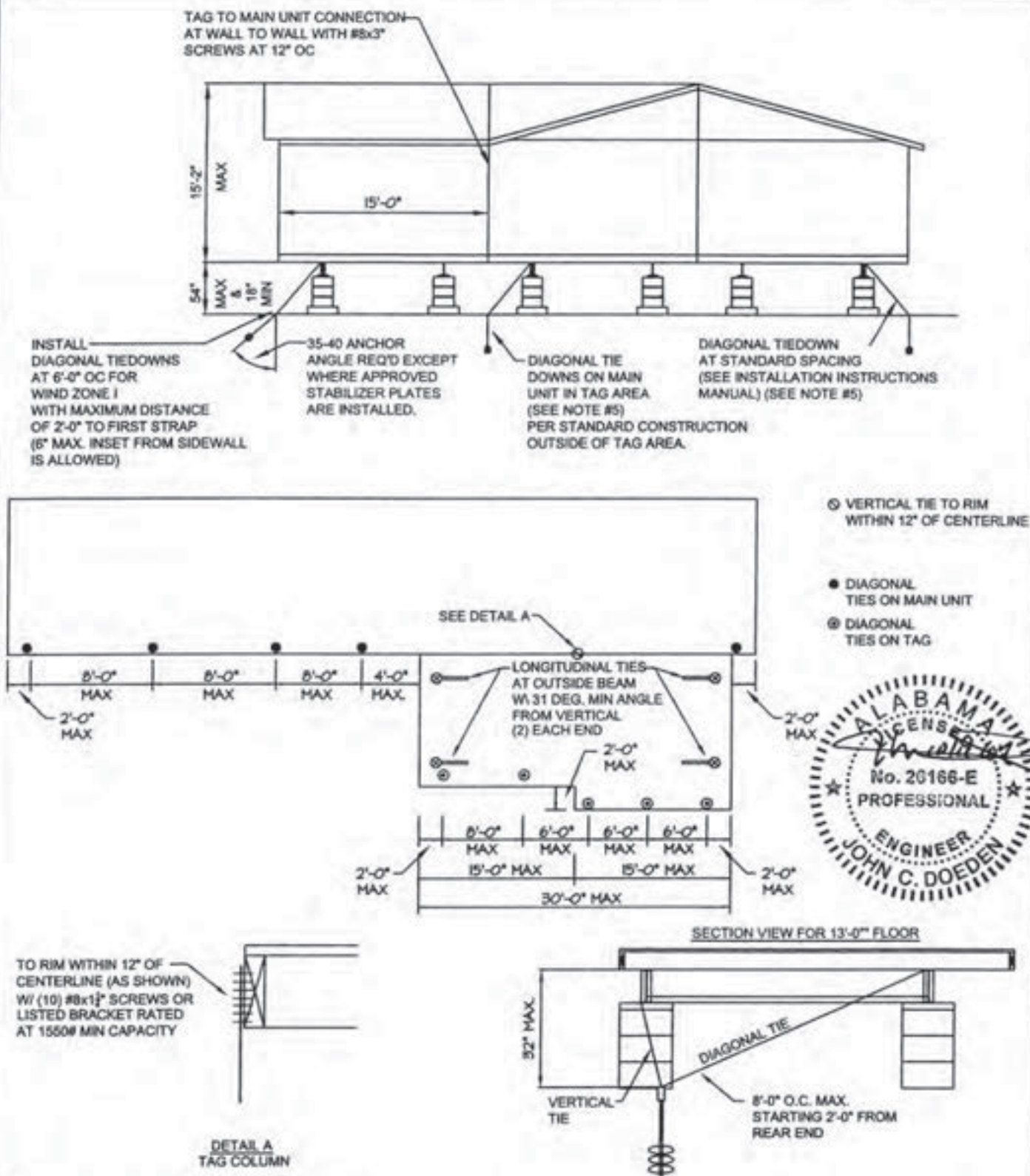
SPACING PIER "A" = "X" OR "Z"
 SPACING PIER "C" = ("X" + "Y") / 2
 OR ("Z" + "Y") / 2

NOTES:

1. MAXIMUM PIER SPACING FOR 8" I-BEAM IS 10'-0" AND 10" OR 12" I-BEAMS IS 12'-0".
2. IN ADDITION TO THOSE PIERS SHOWN, PIERS SHALL BE LOCATED ON EACH SIDE OF ALL PERIMETER OPENINGS (4) FEET OR GREATER IN WIDTH. THIS INCLUDES DOORS, WINDOWS, RECESSED ENTRIES, PORCHES, ETC.
3. FOR MAIN UNIT PIERS, SEE APPLICABLE SECTIONS OF THIS INSTALLATION INSTRUCTIONS MANUAL.
4. DESIGNED FOR 10 PSF ROOF DEAD LOAD.
5. MAXIMUM EAVE AND GABLE OVERHANG WIDTH IS 12".



PIER BLOCKING LAYOUT
TAG SECTION

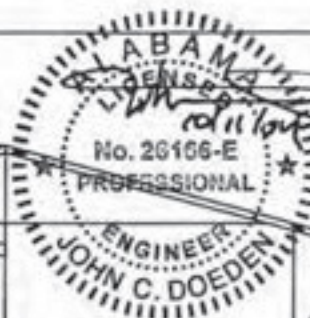


NOTES:

1. PIER CONSTRUCTION TO BE IN ACCORDANCE WITH DRAWINGS AND DETAILS IN INSTALLATION INSTRUCTIONS MANUAL.
2. ANCHORING DEVICES AND STRAPS TO BE RATED FOR A MINIMUM WORKING LOAD OF 3150 LBS. STRAP SPECIFICATION TO BE 1 1/4" x .035" TYPE 1, PER ASTM 3953-91.
3. ANCHORING DEVICES & STRAP CONNECTION TO BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS & SETUP MANUAL.
4. SEE OTHER DRAWINGS FOR FOOTER AND PIER SIZES AND INSTALLATION.
5. SEE OTHER DRAWINGS FOR MAIN UNIT TIEDOWN SPACINGS.
6. THIS DRAWING IS TO BE USED FOR TAG SECTION TIEDOWN REQUIREMENTS ONLY.
7. VERTICAL TIE STRAPS ARE NOT REQUIRED.
8. DESIGN BASED ON 99 1/2" I-BEAM SPACING.
9. 108" SIDEWALL HEIGHT.
10. 20 DEGREE MAX. ROOF SLOPE.

TIEDOWN REQUIREMENTS
TAG SECTION
WIND ZONE I (15 PSF LATERAL)

TAG TO MAIN UNIT CONNECTION
AT WALL TO WALL & ROOF LINE
W/ #8x3" SCREWS AT 12" OC



INSTALL VERTICAL &
DIAGONAL TIEDOWNS
AT 5'-4" OC FOR
WIND ZONE II
WITH MAXIMUM DISTANCE
OF 2'-0" TO FIRST STRAP
(6" MAX. INSET FROM SIDEWALL
IS ALLOWED)

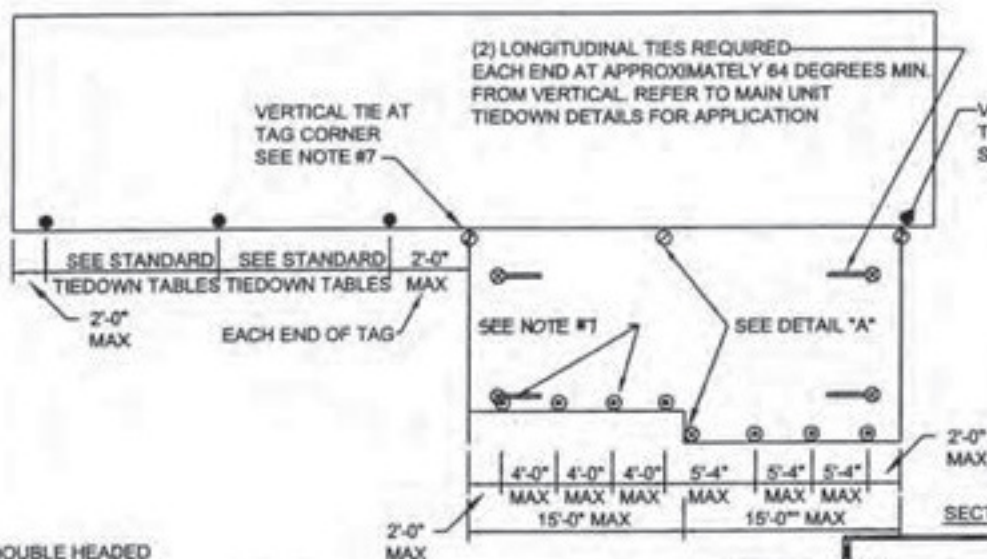
40-45 ANCHOR
ANGLE REQ'D EXCEPT
WHERE APPROVED
STABILIZER PLATES
ARE INSTALLED.

DIAGONAL TIEDOWN
AT STANDARD SPACING
(SEE INSTALLATION INSTRUCTIONS
MANUAL) (SEE NOTE #5)

VERTICAL
TIEDOWN AT
STANDARD
SPACING

NOTE: VERTICAL TIES ON MAIN
UNIT COLUMN (MAY BE
ON RIM)

- VERTICAL & DIAGONAL
TIES ON MAIN UNIT
- ② VERTICAL TIES ON TAG
UNIT COLUMN (DOUBLE
HEAD ANCHOR)
- ⊙ VERTICAL & DIAGONAL
TIES ON TAG (DOUBLE
HEAD ANCHOR)
- ⊙ SINGLE HEAD ANCHOR
(4725# ULTIMATE LOAD)



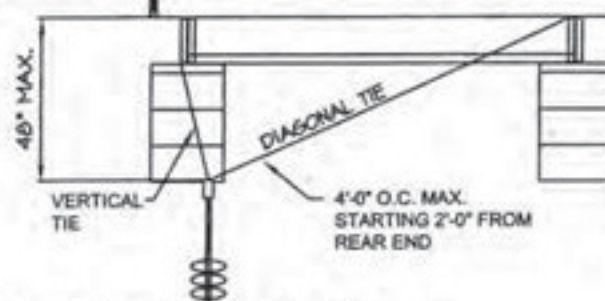
DOUBLE HEADED
ANCHORS MUST
BE RATED AT
4725# ULTIMATE
LOAD.

DETAIL "A"
TAG COLUMNS

TO TAG FLOOR RIM
WITHIN 12" OF TAG CENTERLINE
W/ (15) #8x1 1/4"
SCREWS
OR LISTED/APPROVED
UPLIFT BRACKET RATED
AT 2475# MIN. CAPACITY
MAY REPLACE ONE @ TIE

SINGLE HEAD ANCHOR

SECTION VIEW FOR 13'-0" FLOOR



- NOTES:
1. PIER CONSTRUCTION TO BE IN ACCORDANCE WITH DRAWINGS AND DETAILS IN INSTALLATION INSTRUCTIONS MANUAL.
 2. ANCHORING DEVICES AND STRAPS TO BE RATED FOR A MINIMUM WORKING LOAD OF 3150 LBS. STRAP SPECIFICATION TO BE 1 1/4" x .035" TYPE 1, PER ASTM 3953-91.
 3. ANCHORING DEVICES & STRAP CONNECTION TO BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND SETUP MANUAL.
 4. SEE OTHER DRAWINGS FOR FOOTER AND PIER SIZES AND INSTALLATION.
 5. SEE OTHER DRAWINGS FOR MAIN UNIT TIEDOWN SPACINGS.
 6. THIS DRAWING IS TO BE USED FOR TAG SECTION TIEDOWN REQUIREMENTS ONLY.
 7. VERTICAL TIE STRAPS APPLIED TO STUDS WITH (9) #8x1-1/4" MIN. SCREWS IN POD AREA & (6) AT TAG CORNER WHERE SHOWN. AS AN ALTERNATE LISTED/APPROVED UPLIFT BRACKETS MAY BE USED PROVIDED THEY HAVE A RATED CAPACITY OF 1475# FOR USE IN POD AREA AND 1000# FOR USE AT TAG CORNER.
 8. DESIGN BASED ON 99 1/2" I-BEAM SPACING.
 9. 108" SIDEWALL HEIGHT
 10. 20 DEGREE MAX ROOF SLOPE.

TIEDOWN REQUIREMENTS TAG SECTION WIND ZONE II (100 MPH) EXPOSURE "C"

TAG TO MAIN UNIT CONNECTION
AT WALL TO WALL & ROOF LINE
W/ #8x3" SCREWS AT 12" OC

15'-2"
MAX
48"
MAX &
18" MIN

15'-0"

SECURE TAG FLOOR TO
MAIN FLOOR W/ 1 1/2"
x 28 GA STRAPS AT 64"
OC MAX. W/ (10) 7/16"x
16 GA STAPLES W/ 1"
MIN. PENETRATION EACH
END



VERTICAL
TIEDOWN AT
STANDARD
SPACING

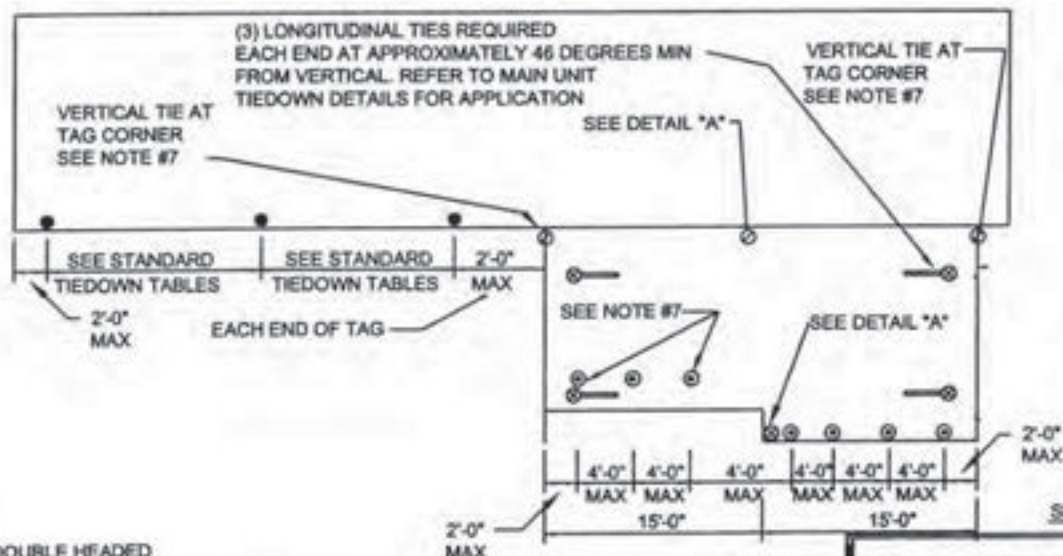
INSTALL VERTICAL &
DIAGONAL TIEDOWNS
AT 4'-0" OC FOR
WIND ZONE III
WITH MAXIMUM DISTANCE
OF 2'-0" TO FIRST STRAP
(6" MAX. INSET FROM SIDEWALL
IS ALLOWED)

40-45 ANCHOR
ANGLE REQ'D EXCEPT
WHERE APPROVED
STABILIZER PLATES
ARE INSTALLED.

DIAGONAL TIEDOWN
AT STANDARD SPACING
(SEE INSTALLATION INSTRUCTIONS
MANUAL) (SEE NOTE #5)

NOTE: VERTICAL TIES ON MAIN
UNIT COLUMN (MAY BE
ON RIM)

- VERTICAL & DIAGONAL
TIES ON MAIN UNIT
- ⊙ VERTICAL TIES ON TAG
UNIT COLUMN (DOUBLE
HEAD ANCHOR)
- ⊙ VERTICAL & DIAGONAL
TIES ON TAG (DOUBLE
HEAD ANCHOR)
- ⊙ SINGLE HEAD ANCHOR
(4725# ULTIMATE LOAD)

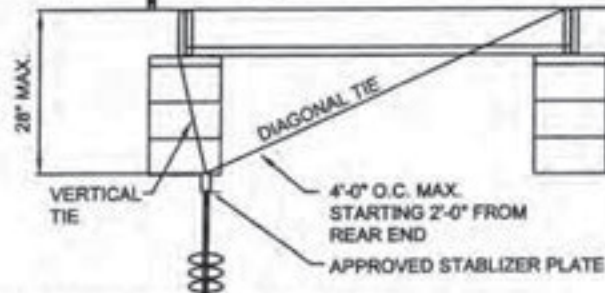


DOUBLE HEADED
ANCHORS MUST
BE RATED AT
4725# ULTIMATE
LOAD.

DETAIL "A"
TAG COLUMNS

TO TAG FLOOR RIM
WITHIN 12" OF TAG CENTERLINE
W/ (19) #8x1 1/4"
SCREWS
OR LISTED/APPROVED
UPLIFT BRACKET RATED
AT 3150# MIN. CAPACITY
MAY REPLACE ONE ⊙ TIE

SINGLE HEAD ANCHOR

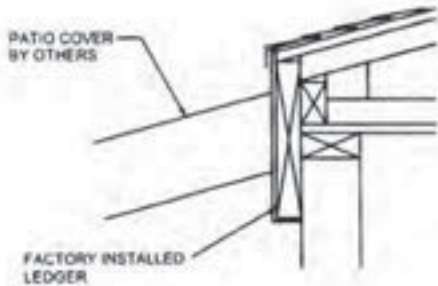


NOTES:

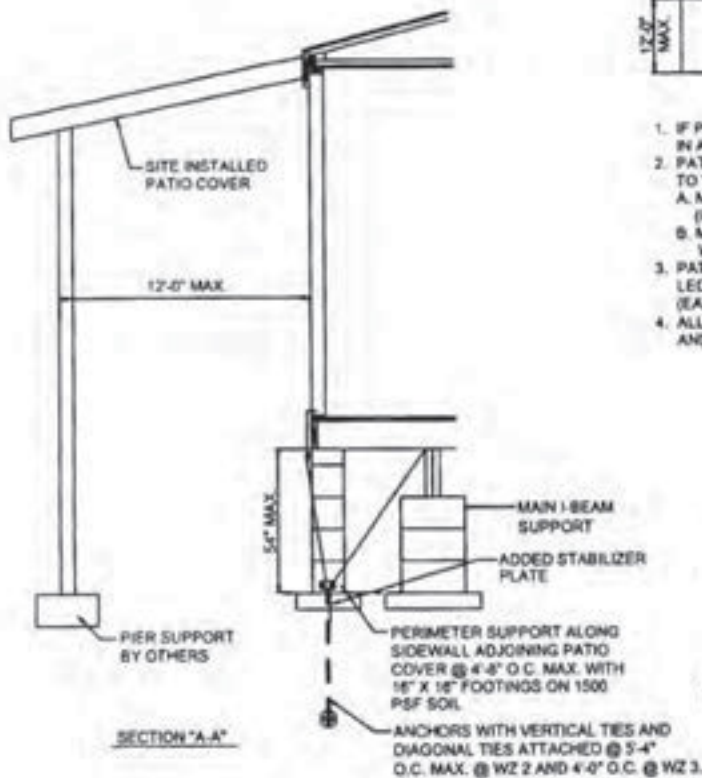
1. PIER CONSTRUCTION TO BE IN ACCORDANCE WITH DRAWINGS AND DETAILS IN INSTALLATION INSTRUCTIONS MANUAL.
2. ANCHORING DEVICES AND STRAPS TO BE RATED FOR A MINIMUM WORKING LOAD OF 3150 LBS. STRAP SPECIFICATION TO BE 1 1/4" x .035" TYPE 1, PER ASTM 3953-91.
3. ANCHORING DEVICES & STRAP CONNECTION TO BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND SETUP MANUAL.
4. SEE OTHER DRAWINGS FOR FOOTER AND PIER SIZES AND INSTALLATION.
5. SEE OTHER DRAWINGS FOR MAIN UNIT TIEDOWN SPACINGS.
6. THIS DRAWING IS TO BE USED FOR TAG SECTION TIEDOWN REQUIREMENTS ONLY.
7. VERTICAL TIE STRAPS APPLIED TO STUDS WITH (11) #8x1-1/4" MIN. SCREWS IN POD AREA & (6) AT TAG CORNER WHERE SHOWN. AS AN ALTERNATE LISTED/APPROVED UPLIFT BRACKETS MAY BE USED PROVIDED THEY HAVE A RATED CAPACITY OF 1475# FOR USE IN POD AREA AND 1000# FOR USE AT TAG CORNER.
8. DESIGN BASED ON 99 1/2" I-BEAM SPACING.
9. 108" SIDEWALL HEIGHT.
10. 20 DEGREE MAX ROOF SLOPE.

TIEDOWN REQUIREMENTS TAG SECTION WIND ZONE III (110 MPH) EXPOSURE "C"

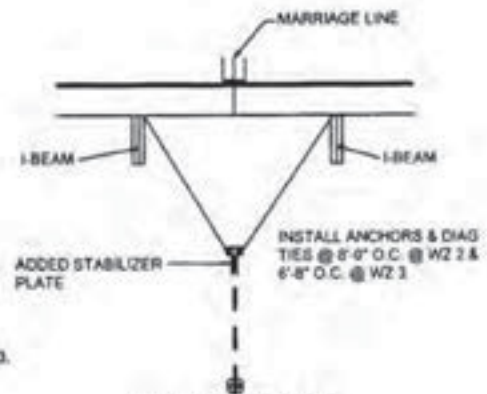
SITE INSTALLATION PATIO COVER WIND ZONE 1, 2 & 3



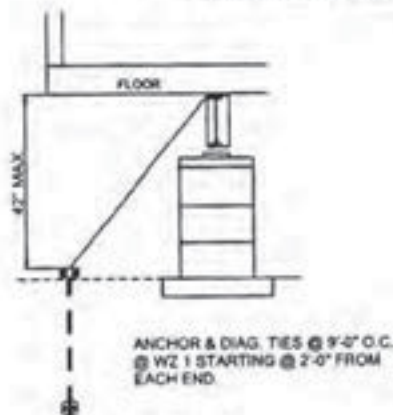
1. IF PATIO COVER IS INSTALLED, THE HOME MUST BE LOCATED IN A 20 PSF ROOF LIVE LOAD ZONE ONLY.
2. PATIO COVER DESIGN AND CONSTRUCTION MUST CONFORM TO THE FOLLOWING SPECIFICATIONS:
 - A. MAXIMUM GRAVITY LOAD TO HOME: 168 PLF (INCLUDES LIVE AND DEAD LOAD)
 - B. MAXIMUM UPLIFT LOAD TRIBUTARY TO HOME: 425 PLF FOR WIND ZONE 2, 568 PLF FOR WIND ZONE 3.
3. PATIO COVER SHALL BE FASTENED TO THE FACTORY INSTALLED LEDGER. CONNECTION TO ANY OTHER PORTION OF THE HOME (EAVE OR FASCIA) IS NOT PERMITTED.
4. ALL ON SITE CONSTRUCTION MUST MEET LOCAL BUILDING CODE AND IS SUBJECT TO LOCAL JURISDICTION.



WIND ZONE 2 & 3

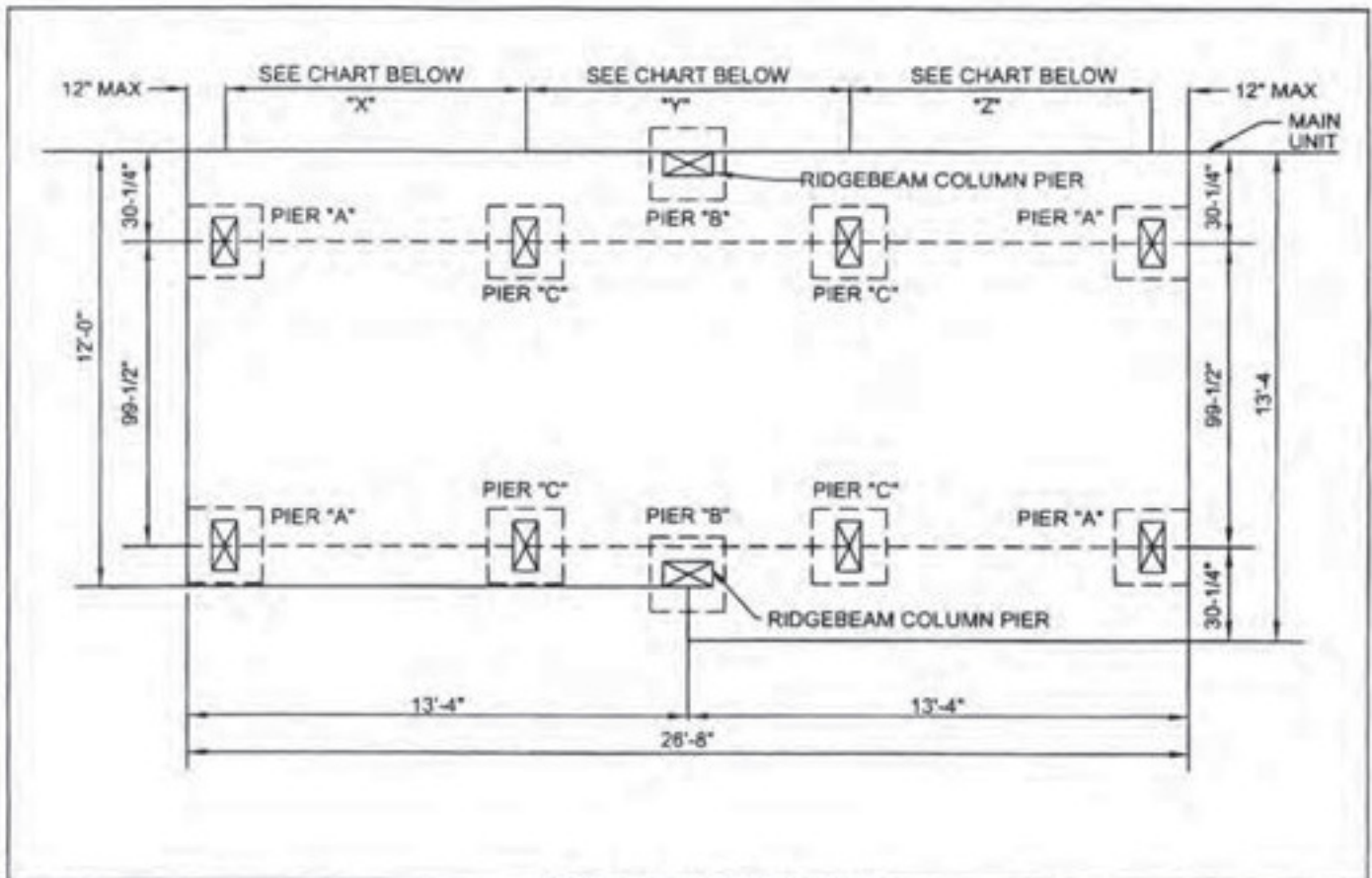


WIND ZONE 2 & 3



WIND ZONE 1





PIER LOAD CHART 13'-8" WIDTH											
ROOF LIVE LOAD	PIER "B"	4'-0"		6'-0"		8'-0"		10'-0"		12'-0"	
		PIER "A"	PIER "C"	PIER "A"	PIER "C"	PIER "A"	PIER "C"	PIER "A"	PIER "C"	PIER "A"	PIER "C"
SOUTH (20 PSF)	3470#	3170#	1735#	3500#	2400#	3835#	3070#	4170#	3735#	4500#	4400#

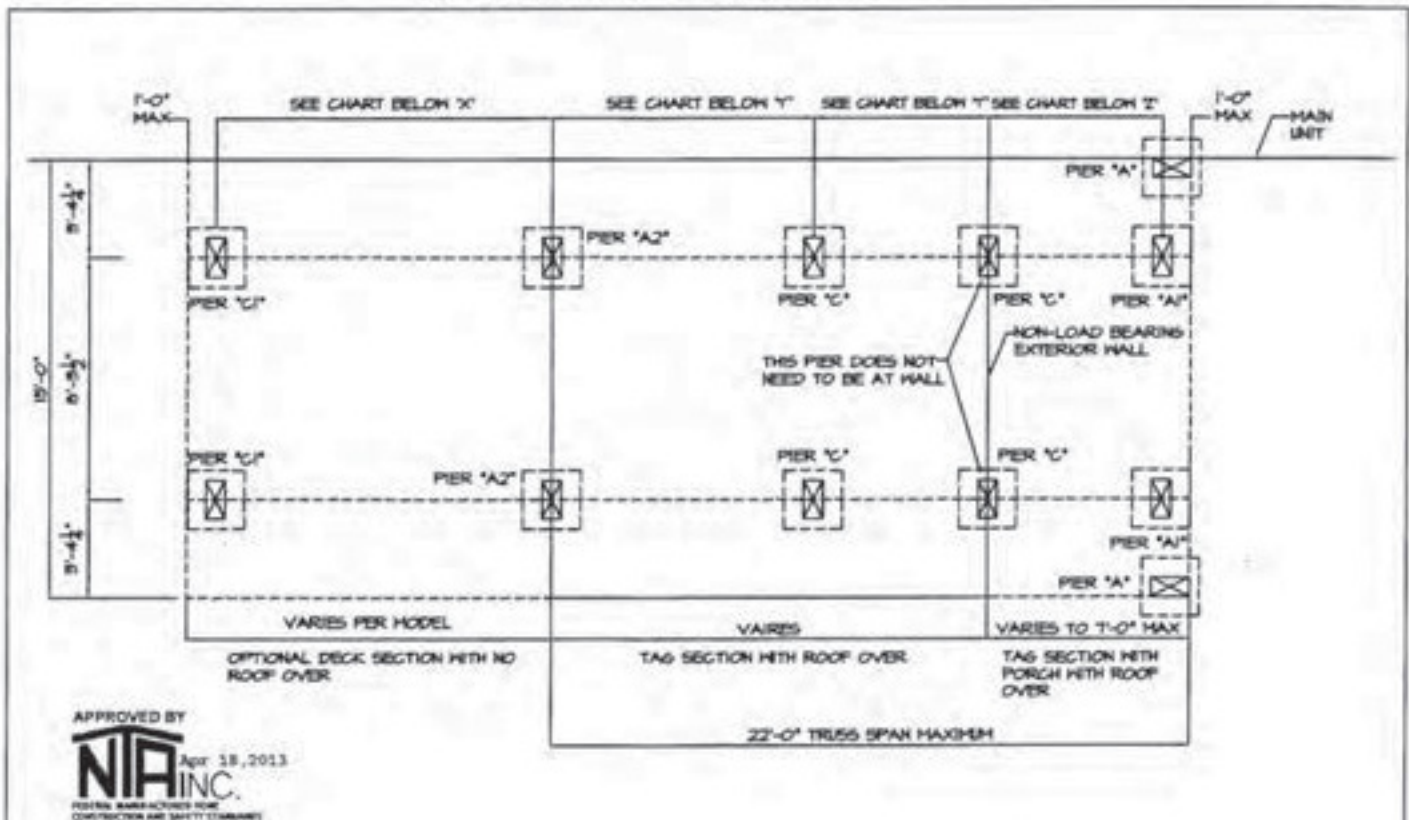
SPACING PIER "A" = "X" OR "Z"
 SPACING PIER "C" = ("X" + "Y") / 2
 OR ("Z" + "Y") / 2

- NOTES:
1. MAXIMUM PIER SPACING FOR 8" I-BEAM IS 10'-0" AND 10" OR 12" I-BEAMS IS 12'-0".
 2. IN ADDITION TO THOSE PIERS SHOWN, PIERS SHALL BE LOCATED ON EACH SIDE OF ALL PERIMETER OPENINGS (4) FEET OR GREATER IN WIDTH. THIS INCLUDES DOORS, WINDOWS, RECESSED ENTRIES, PORCHES, ETC.
 3. FOR MAIN UNIT PIERS, SEE APPLICABLE SECTIONS OF THIS INSTALLATION INSTRUCTIONS MANUAL.
 4. DESIGNED FOR 10 PSF ROOF DEAD LOAD.
 5. MAXIMUM EAVE AND GABLE OVERHANG WIDTH IS 12".



FIGURE
 PIER BLOCKING LAYOUT
 TAG SECTION
 D-11

CAVALIER HOME BUILDERS



PIER LOAD CHART

ROOF LIVE LOAD	FLOOR WIDTH	PIER "A"	4'-0"		6'-0"		8'-0"		10'-0"	
			PIER "A1"	PIER "A2"	PIER "A1"	PIER "A2"	PIER "A1"	PIER "A2"	PIER "A1"	PIER "A2"
			PIER "C1"	PIER "C2"	PIER "C1"	PIER "C2"	PIER "C1"	PIER "C2"	PIER "C1"	PIER "C2"
SOUTH (20 PSF)	180"	830#	4630#	1810#	4980#	2515#	5333#	3220#	5685#	3425#
		PIER "A2" =	5150#		5855#		6560#		7265#	
		PIER "C1" =	1260#		1610#		1965#		2315#	

NOTES:

1. MAXIMUM PIER SPACING FOR 8" I-BEAM IS 8'-0" AND FOR 10" OR 12" I-BEAMS IS 10'-0".
2. SEE FOOTING SIZING TABLE FOR FOOTING DESIGN REQUIREMENTS.
3. IN ADDITION TO THOSE PIERS SHOWN, PIERS SHALL BE LOCATED ON EACH SIDE OF ALL PERIMETER OPENINGS (4) FEET OR GREATER IN WIDTH. THIS INCLUDES DOORS, WINDOWS, RECESSED ENTRIES, PORCHES, ETC.
4. FOR MAIN UNIT PIERS, SEE APPLICABLE SECTIONS OF INSTALLATION INSTRUCTIONS MANUAL.
5. SEE INSTALLATION INSTRUCTIONS MANUAL FOR INFORMATION NOT CONTAINED ON THIS DRAWING.
6. SEE INSTALLATION INSTRUCTIONS MANUAL FOR PIER HEIGHT LIMITATIONS.
7. DESIGNED FOR 10 PSF ROOF DEAD LOAD.
8. MAXIMUM EAVE WIDTH IS 6" AND GABLE OVERHANG WIDTH IS 12".
9. FLASHING AT MAIN UNIT IN PORCH AREA PER OTHER DETAILS.

SPACING PIER "A1" = "X" OR "Z"

SPACING PIER "C1" = ("X" + "Y") / 2

OR ("Z" + "Y") / 2

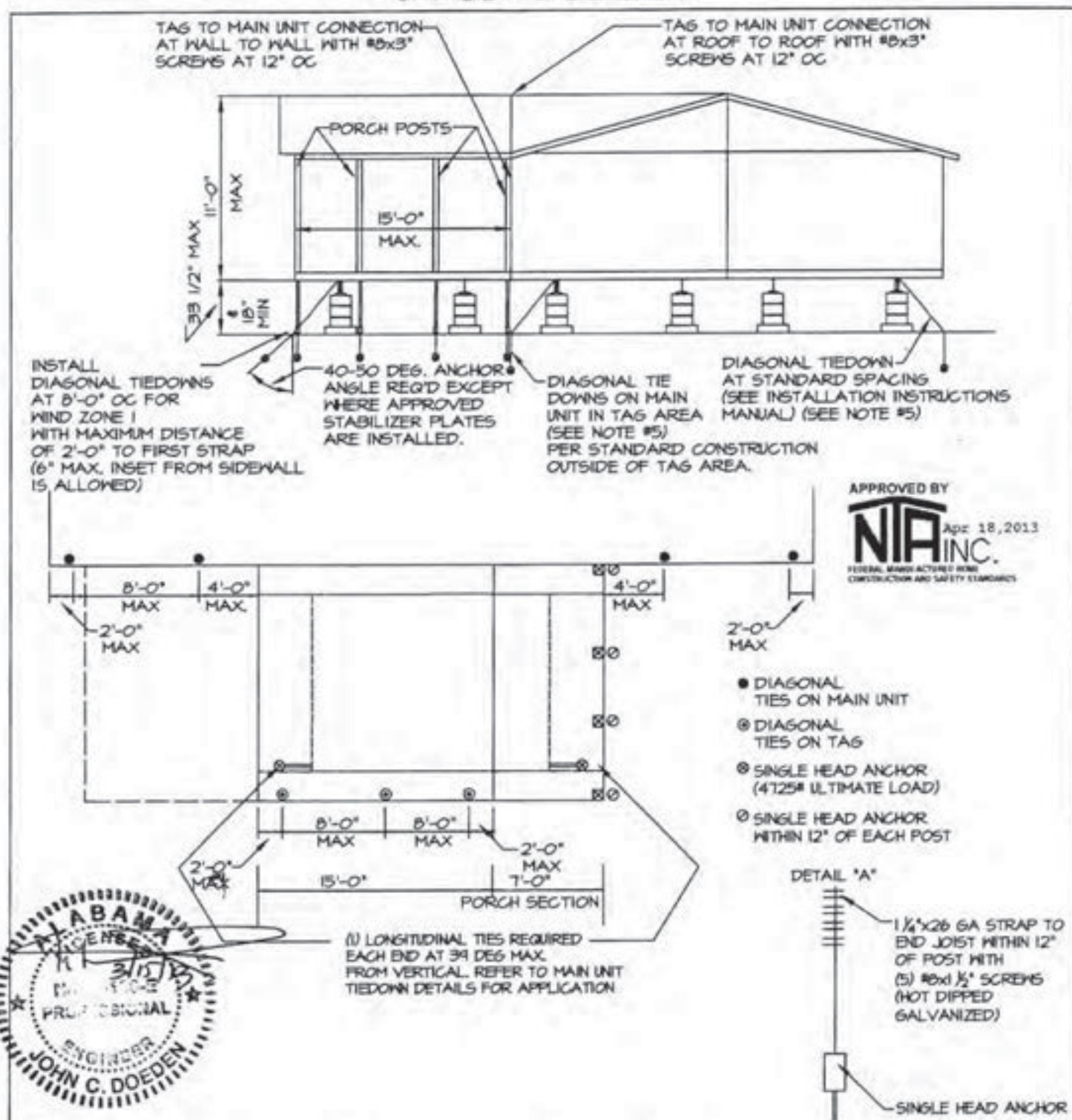


Ref. CA-I-31

D-12
PIER LAYOUT
SINGLE WIDE TAG SECTION

I-D-12

CAVALIER HOME BUILDERS



NOTES:

1. PIER CONSTRUCTION TO BE IN ACCORDANCE WITH ANSI A225.1 "MANUFACTURED HOME INSTALLATIONS".
2. ANCHORING DEVICES AND STRAPS TO BE RATED FOR A MINIMUM WORKING LOAD OF 3150 LBS. STRAP SPECIFICATION TO BE 1 1/4" x .035" TYPE I, PER ASTM 3453-91.
3. ANCHORING DEVICES & STRAP CONNECTION TO BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND SETUP MANUAL.
4. SEE OTHER DRAWINGS FOR FOOTER AND PIER SIZES AND INSTALLATION.
5. SEE OTHER DRAWINGS FOR MAIN UNIT TIEDOWN SPACINGS.
6. THIS DRAWING IS TO BE USED FOR SINGLE WIDE TAG SECTION TIEDOWN REQUIREMENTS ONLY.
7. VERTICAL TIE STRAPS ARE NOT REQUIRED.
8. DESIGN BASED ON 99 1/2" I-BEAM SPACING & 96" MAXIMUM ENDWALL HEIGHT & 20 DEG. MAX. ROOF PITCH & 6" MAX EAVE

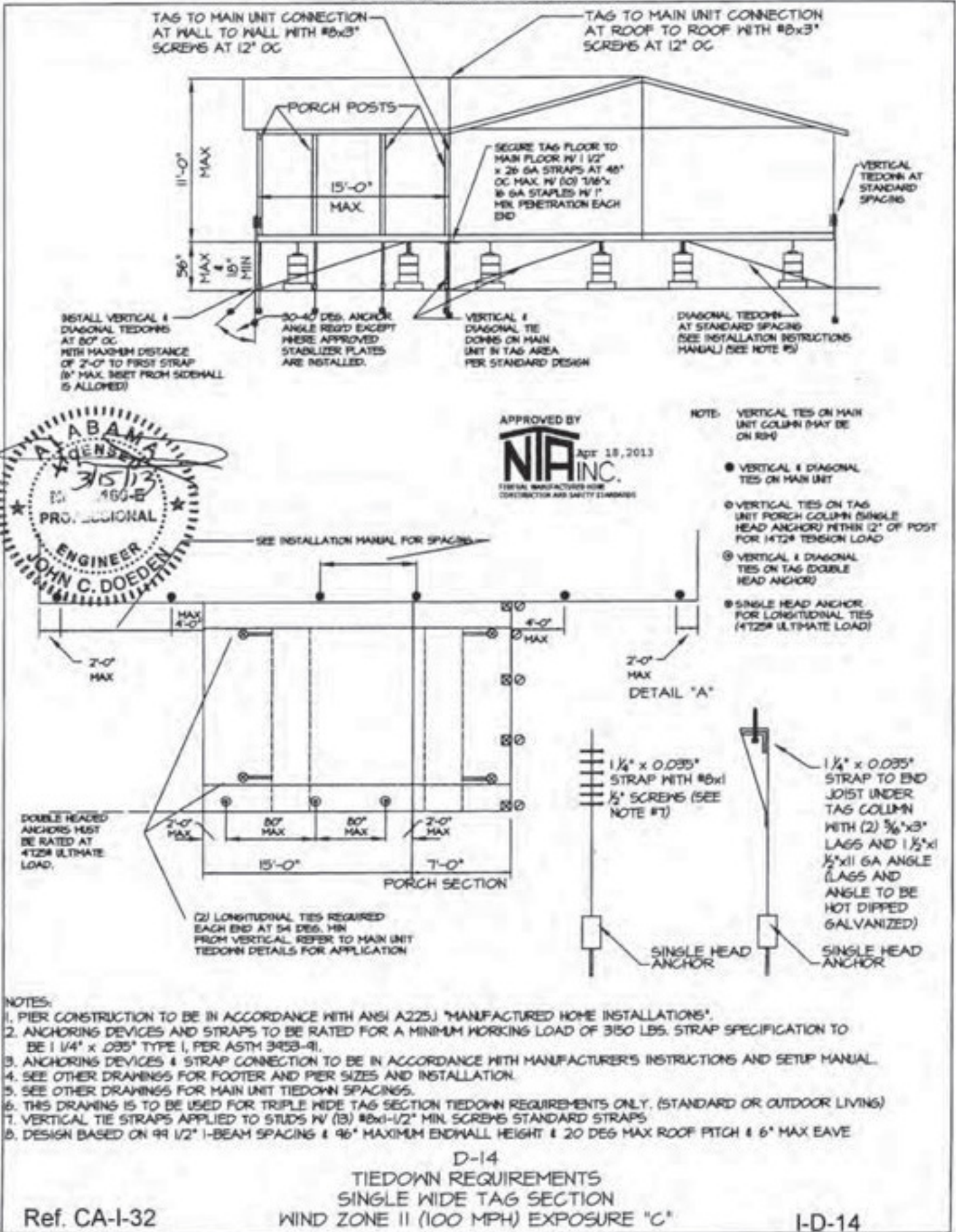
D-13

TIEDOWN REQUIREMENTS
SINGLE WIDE TAG SECTION
WIND ZONE I (15 PSF LATERAL)

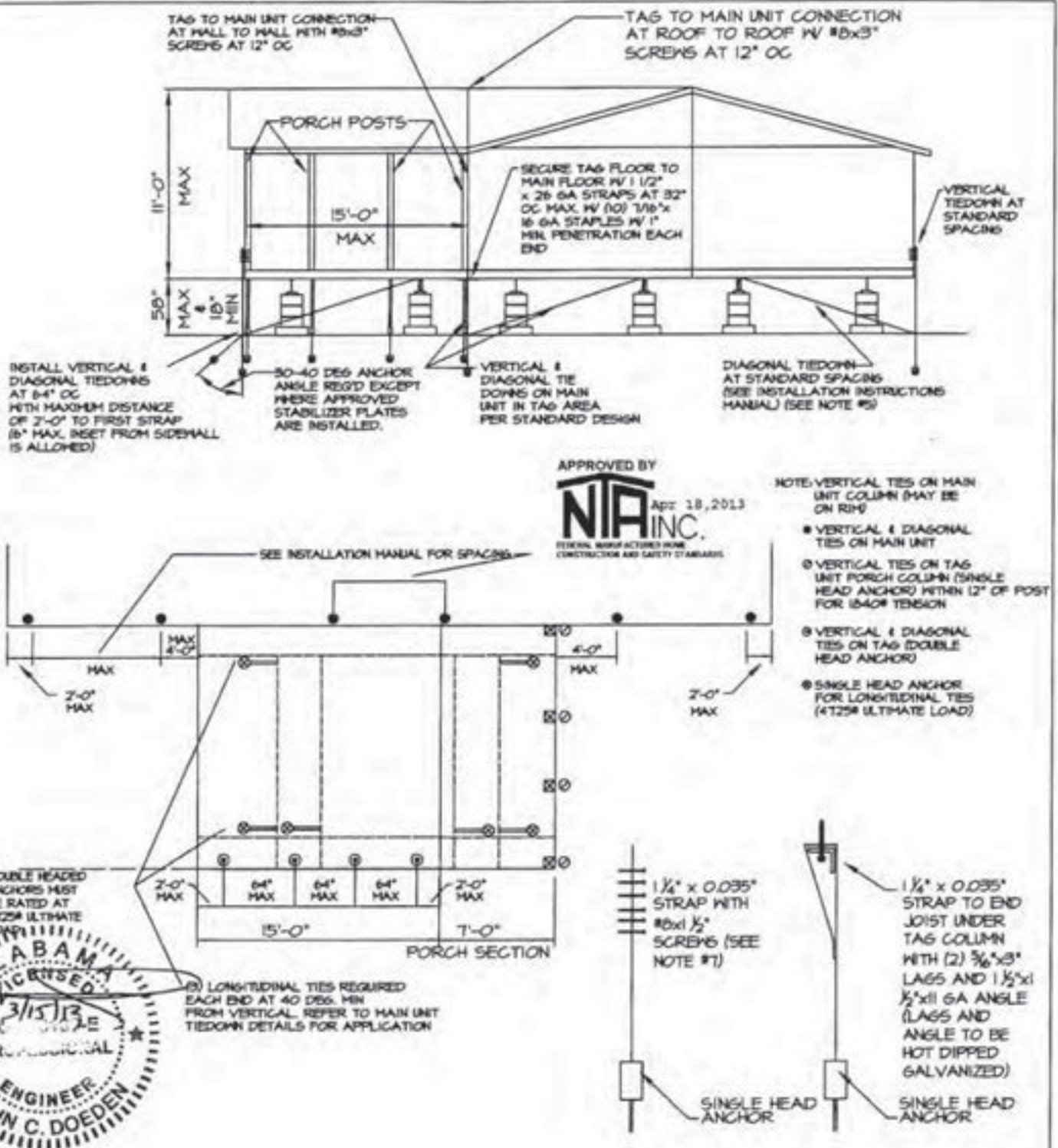
Ref. CA-I-32

I-D-13

CAVALIER HOME BUILDERS



CAVALIER HOME BUILDERS



NOTES:

1. PIER CONSTRUCTION TO BE IN ACCORDANCE WITH ANSI A225.1 "MANUFACTURED HOME INSTALLATIONS".
2. ANCHORING DEVICES AND STRAPS TO BE RATED FOR A MINIMUM WORKING LOAD OF 3150 LBS. STRAP SPECIFICATION TO BE 1 1/4" x .035" TYPE I, PER ASTM 3163-01.
3. ANCHORING DEVICES & STRAP CONNECTION TO BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND SETUP MANUAL.
4. SEE OTHER DRAWINGS FOR FOOTER AND PIER SIZES AND INSTALLATION.
5. SEE OTHER DRAWINGS FOR MAIN UNIT TIEDOWN SPACINGS.
6. THIS DRAWING IS TO BE USED FOR TRIPLE WIDE TAG SECTION TIEDOWN REQUIREMENTS ONLY (STANDARD OR OUTDOOR LIVING).
7. VERTICAL TIE STRAPS APPLIED TO STUDS WITH (14) #6x1-1/2" MIN. SCREWS AT STANDARD TIE LOCATIONS.
8. DESIGN BASED ON 9' 1/2" I-BEAM SPACING & 9'6" MAXIMUM ENDWALL HEIGHT & 20 DEG. MAX. ROOF PITCH & 6" MAX EAVE.

D-15

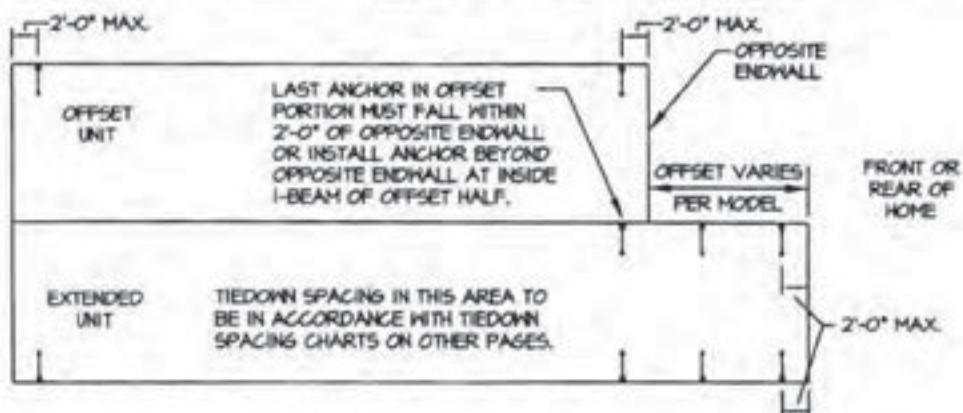
TIEDOWN REQUIREMENTS
SINGLE WIDE TAG SECTION

Ref. CA-I-32

WIND ZONE III (110 MPH) EXPOSURE 'C' (20 DEGREE MAX. SLOPE)

I-D-15

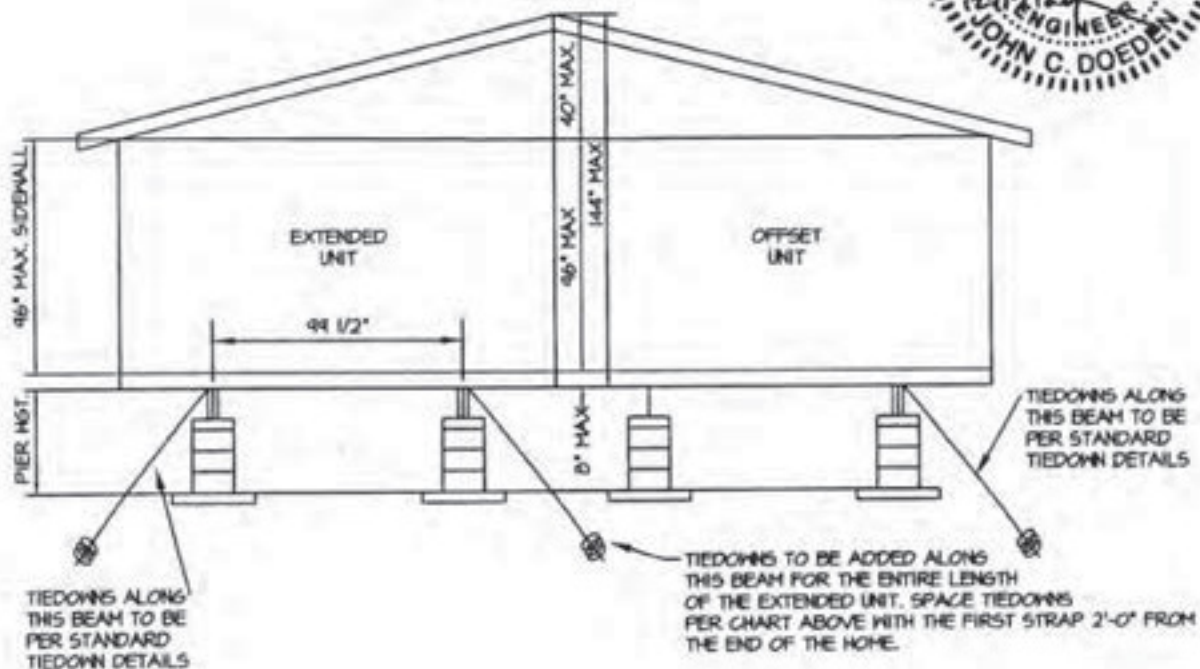
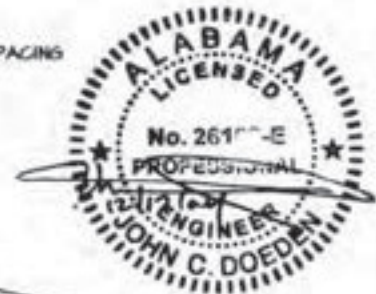
CAVALIER HOME BUILDERS



1. ALL INFORMATION CONTAINED IN INSTALLATION INSTRUCTIONS MANUAL REGARDING TIEDOWNS, STRAPS, DEVICES, ETC. ARE APPLICABLE TO THIS DRAWING.
2. SEE OTHER SECTIONS OF THE INSTALLATION INSTRUCTIONS MANUAL FOR FOOTING AND PIER REQUIREMENTS.
3. THIS DETAIL IS APPLICABLE TO UNITS WHICH HAVE A MINIMUM FLOOR WIDTH OF 142" WITH 3" MAXIMUM EAVE AND 160" WITH A MAXIMUM EAVE OVERHANGS OF 12". THE BEAM SPACING IS TO BE 49 1/2" AND THE BEAM DEPTH IS 12" MAXIMUM.
4. PIER HEIGHT LIMITATIONS:

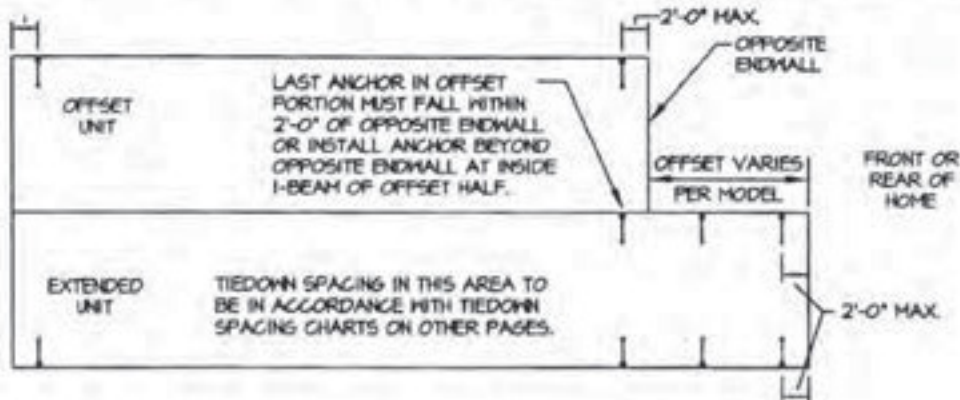
142" FLOOR	160" FLOOR
MIN = 24"	MIN = 24"
MAX = 32"	MAX = 40"
5'-0" OC	6'-0" OC

 MAXIMUM ON CENTER ANCHOR SPACING
 ANY PIERS NOT MEETING THIS RANGE OF VALUES SHOULD BE DESIGNED BY A PROFESSIONAL ENGINEER.
5. DESIGNED FOR WIND ZONE I (15 PSF LATERAL)



OFF-SET HOME TIEDOWN ADDENDUM
WIND ZONE I

CAVALIER HOME BUILDERS

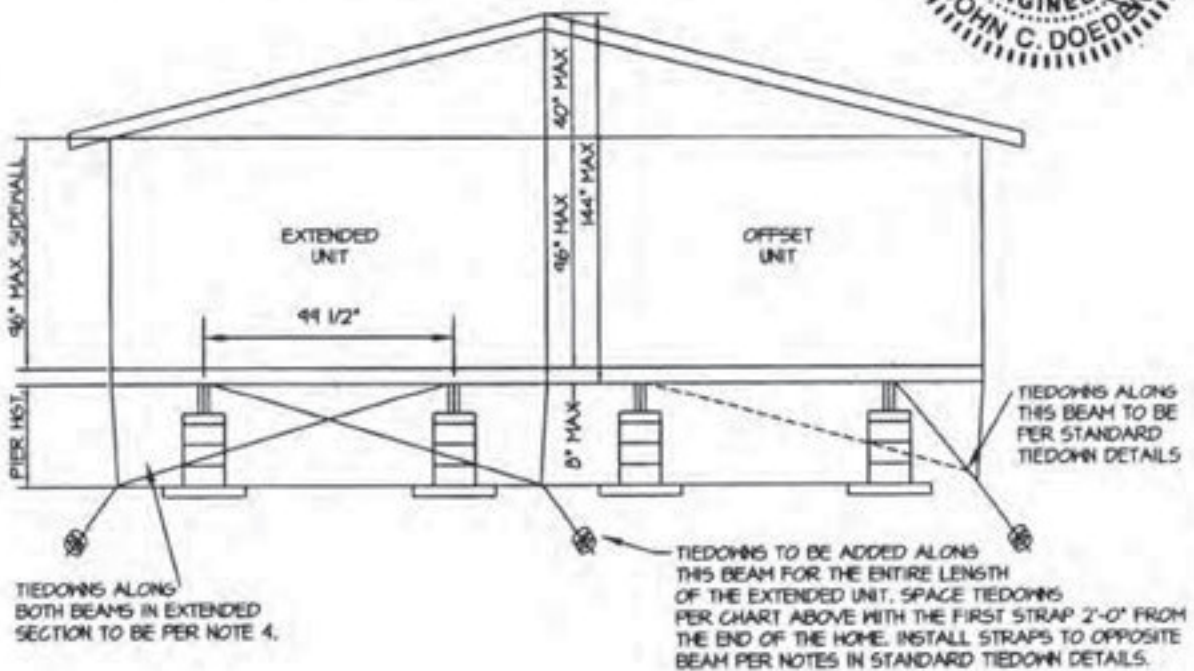
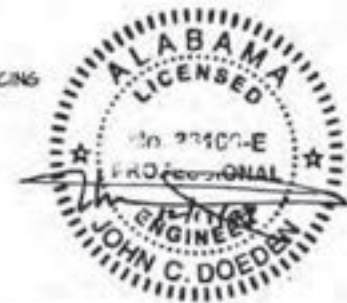


1. ALL INFORMATION CONTAINED IN INSTALLATION INSTRUCTIONS MANUAL REGARDING TIEDOWNS, STRAPS, DEVICES, ETC. ARE APPLICABLE TO THIS DRAWING.
2. SEE OTHER SECTIONS OF THE INSTALLATION INSTRUCTIONS MANUAL FOR FOOTING AND PIER REQUIREMENTS.
3. THIS DETAIL IS APPLICABLE TO UNITS WHICH HAVE A MINIMUM FLOOR WIDTH OF 142" WITH 3" MAX. EAVE OR 160" WITH A MAXIMUM EAVE OVERHANG OF 12". THE BEAM SPACING IS TO BE 49 1/2" AND THE BEAM DEPTH IS 12" MAXIMUM.
4. PIER HEIGHT LIMITATIONS:

142" FLOOR	160" FLOOR
MIN = 24"	MIN = 24"
MAX = 44"	MAX = 48"
5'-4" OC	5'-4" OC

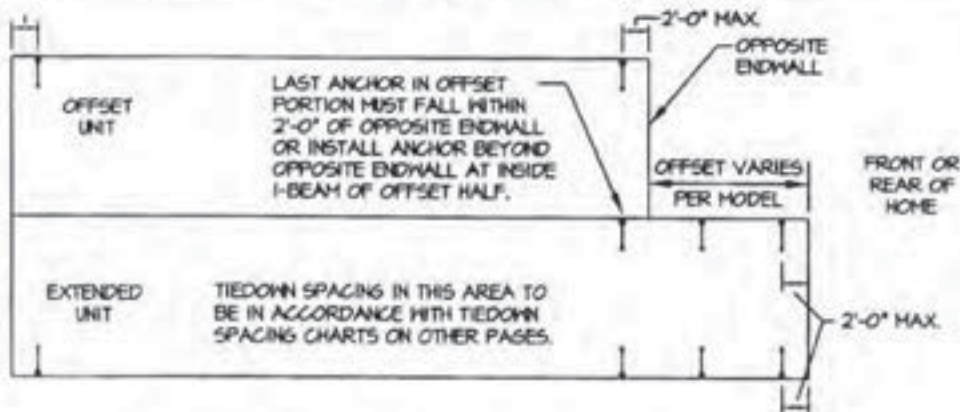
MAXIMUM ON CENTER ANCHOR SPACING

ANY PIERS NOT MEETING THIS RANGE OF VALUES SHOULD BE DESIGNED BY A PROFESSIONAL ENGINEER.
5. DESIGNED FOR WIND ZONE II (100 MPH)



OFF-SET HOME TIEDOWN ADDENDUM WIND ZONE II

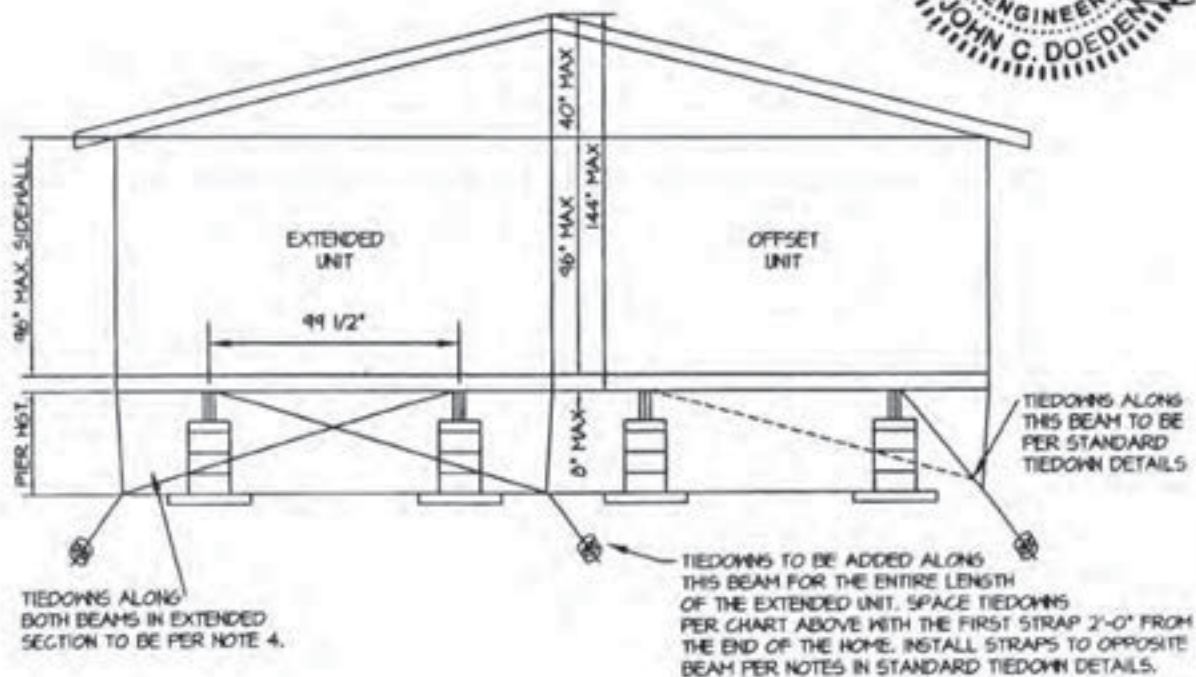
CAVALIER HOME BUILDERS



1. ALL INFORMATION CONTAINED IN INSTALLATION INSTRUCTIONS MANUAL REGARDING TIEDOWNS, STRAPS, DEVICES, ETC. ARE APPLICABLE TO THIS DRAWING.
2. SEE OTHER SECTIONS OF THE INSTALLATION INSTRUCTIONS MANUAL FOR FOOTING AND PIER REQUIREMENTS.
3. THIS DETAIL IS APPLICABLE TO UNITS WHICH HAVE A MINIMUM FLOOR WIDTH OF 142" WITH 3" MAX. EAVE OR 160" WITH A MAXIMUM EAVE OVERHANG OF 12". THE BEAM SPACING IS TO BE 41 1/2" AND THE BEAM DEPTH IS 12" MAXIMUM.
4. PIER HEIGHT LIMITATIONS:

142" FLOOR	160" FLOOR
MIN = 24"	MIN = 24"
MAX = 32"	MAX = 60"
4'-0" OC	4'-0" OC

MAXIMUM ON CENTER ANCHOR SPACING
 ANY PIERS NOT MEETING THIS RANGE OF VALUES SHOULD BE DESIGNED BY A PROFESSIONAL ENGINEER.
5. DESIGNED FOR WIND ZONE III (110 MPH)



OFF-SET HOME TIEDOWN ADDENDUM
WIND ZONE III

<p>GENERAL NOTES:</p> <ol style="list-style-type: none"> 1. THIS FOUNDATION HAS BEEN DESIGNED FOR SITES WITH AN ALLOWABLE SOIL BEARING CAPACITY OF 2000 PSF. MINIMUM DESIGN OF PERIMETER WALL IS BASED ON ANSI A225.11 "MANUFACTURED HOME INSTALLATIONS". 2. FOUNDATIONS TO BE CONSTRUCTED ON SOIL WITH A LOWER BEARING CAPACITY SHALL BE DESIGNED IN ACCORDANCE WITH ACCEPTED ENGINEERING PRACTICE BY A LICENSED ENGINEER TO LOCAL CONDITIONS AND CODES. 3. CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS TO BE 3000 PSI MINIMUM. 4. REINFORCING STEEL SPECIFIED TO BE GRADE 60 BARS MEETING ASTM A615, A618 AND A617. 5. FOUNDATION WALL MAY BE POURED CONCRETE 8" THICK, REINFORCED WITH #4 REBAR AT 12" OC VERTICAL AND #5 REBAR AT 18" OC HORIZONTAL. 6. UNIT COLUMN SUPPORTS (SEE MODEL PLAN) MUST BE SUPPORTED BY A PIER AND FOOTING AS REQUIRED IN THE INSTALLATION INSTRUCTIONS MANUAL. 7. THESE SPECIFICATIONS ARE TYPICAL. LOCAL CODES MAY CONTAIN ADDITIONAL REQUIREMENTS. 8. FOUNDATION WALL STEMS MAY BE CONCRETE OR CONCRETE BLOCK. 9. CONCRETE BLOCK SHALL CONFORM TO ASTM C-90. 10. IN CONCRETE BLOCK STEM WALLS A MINIMUM OF (2) #4 REBARS ARE TO BE INSTALLED IN BLOCK WITH MUD SILL ANCHORS, FULLY GROUT EACH CELL CONTAINING REBAR. 11. ALL LUMBER IN CONTACT WITH CONCRETE SHALL BE OF PRESSURE TREATED TYPE OR OF SPECIES APPROVED FOR USE IN DIRECT CONTACT WITH CONCRETE. 12. THE INSTALLATION SITE MUST BE GRADED SO THAT WATER DRAINAGE IS AWAY FROM STRUCTURE AND DOES NOT ACCUMULATE UNDER THE HOME. 13. BACK FILL ADJACENT TO THE WALL SHALL NOT BE PLACED UNTIL THE WALL HAS SUFFICIENT STRENGTH OR HAS BEEN BRACED TO PREVENT DAMAGE. 14. MINIMUM FOUNDATION VENTILATION REQUIREMENTS: <ol style="list-style-type: none"> A. 16" x 24" ACCESS CRAWL SPACE TO UNDER FLOOR AREA B. 1 1/2 SQUARE FEET OF VENTILATION PER 25 LINEAL FEET OF FOUNDATION WALL C. COVER VENT OPENINGS WITH CORROSION-RESISTANT WIRE MESH NOT LESS THAN 1/8" NOR MORE THAN 1/2" IN ANY DIRECTION. 	<p>GENERAL NOTES:</p> <ol style="list-style-type: none"> 15. DAMP PROOFING OF CONCRETE OR MASONRY WALLS TO BE IN ACCORDANCE WITH LOCAL CODES. IN THE ABSENCE OF CODE REQUIREMENTS THE FOLLOWING SHALL APPLY: <ol style="list-style-type: none"> A. EXTERIOR FOUNDATION WALLS OF MASONRY CONSTRUCTION ENCLOSING BASEMENTS SHALL BE DAMP PROOFED BY APPLYING NOT LESS THAN 3/8" OF PORTLAND CEMENT FARGING TO THE WALL FROM THE FOOTING TO THE FINISH GRADE. THE FARGING SHALL BE COVERED WITH A COAT OF APPROVED BITUMINOUS MATERIAL APPLIED AT THE RECOMMENDED RATE. B. FOUNDATION WALLS OF CONCRETE CONSTRUCTION ENCLOSING BASEMENTS SHALL BE DAMP PROOFED BY APPLYING A COAT OF APPROVED BITUMINOUS MATERIAL TO THE WALL FROM THE FOOTING TO THE FINISH GRADE AT THE RECOMMENDED RATE. C. FOUNDATION WALLS OF HABITABLE ROOMS LOCATED BELOW GRADE SHALL BE WATER PROOFED WITH MEMBRANES EXTENDING FROM THE EDGE OF THE FOOTING TO THE FINISH GRADE LINE. THE MEMBRANE SHALL CONSIST OF EITHER 2-PLY HOT MOPPED FELT, 6-MIL POLYETHYLENE, 55-POUND ROLL ROOFING OR EQUIVALENT MATERIAL. THE LAP IN THE MEMBRANE SHALL BE SEALED AND FIRMLY AFFIXED TO THE WALL. D. FOUNDATION WALLS MAY BE DAMP PROOFED OR WATER PROOFED USING MATERIALS AND METHODS OF CONSTRUCTION OTHER THAN COVERED IN THIS SECTION WHEN APPROVED BY THE LOCAL BUILDING OFFICIAL. 16. DRAINS SHALL BE PROVIDED AROUND FOUNDATIONS ENCLOSING HABITABLE OR USEABLE SPACES LOCATED BELOW GRADE AND WHICH ARE SUBJECT TO GROUND WATER CONDITIONS. DRAINS SHALL BE INSTALLED AT OR BELOW THE AREA TO BE PROTECTED, AND SHALL DISCHARGE BY GRAVITY OR MECHANICAL MEANS INTO AN APPROVED DRAINAGE SYSTEM. 17. THE TOP OF OPEN JOINTS OF DRAIN TILES SHALL BE PROTECTED WITH STRIPS OF BUILDING PAPER AND THE DRAINAGE TILES SHALL BE PLACED ON 2 INCHES OF WASHED GRAVEL OR CRUSHED ROCK ONE SIZE LARGER THAN THE TILE JOINT OPENING OR PERFORATION AND COVERED WITH NOT LESS THAN 6 INCHES OF THE SAME MATERIAL. 18. THE DESIGNS ON THIS AND FOLLOWING SHEETS ARE APPLICABLE TO HORIZONTAL WIND LOADS OF 15 PSF MAXIMUM AND UNITS WHICH HAVE A MAXIMUM WIDTH OF 27'-8" AND 31'-4". MINIMUM I-BEAM SPACING IS 9@ 1/2". 19. THE DESIGNS ON THIS AND FOLLOWING SHEETS ARE APPLICABLE TO SEISMIC ZONES 0, 1 AND 2. 20. THIS FOUNDATION DESIGN IS NOT FOR INSTALLATION ON A FLOOD PLAIN. WHEN INSTALLING CRAWLSPACE OR BASEMENT IN AN AREA WITH SOILS HAVING POOR DRAINAGE, CONSIDERATION SHOULD BE GIVEN TO METHODS OF ELIMINATING ACCUMULATION OF WATER IN THE CRAWLSPACE OR BASEMENT, SUCH AS THE USE OF SUMP PUMP(S). INSTALLATION OF SUMP PUMPS TO BE IN ACCORDANCE WITH LOCAL CODE REQUIREMENTS. 21. WHEN HOME IS SECURED TO SILL PLATE (2x8 #2 SYP, PRESSURE TREATED) PER METHOD 1, 2 OR 3 AS SHOWN IN FIGURE 2.2, NORMAL TIEDOWNS WITH ANCHORS ARE NOT REQUIRED.
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FIGURE 2.0
FOUNDATION NOTES AND CHARTS
PAGE 1 OF 3

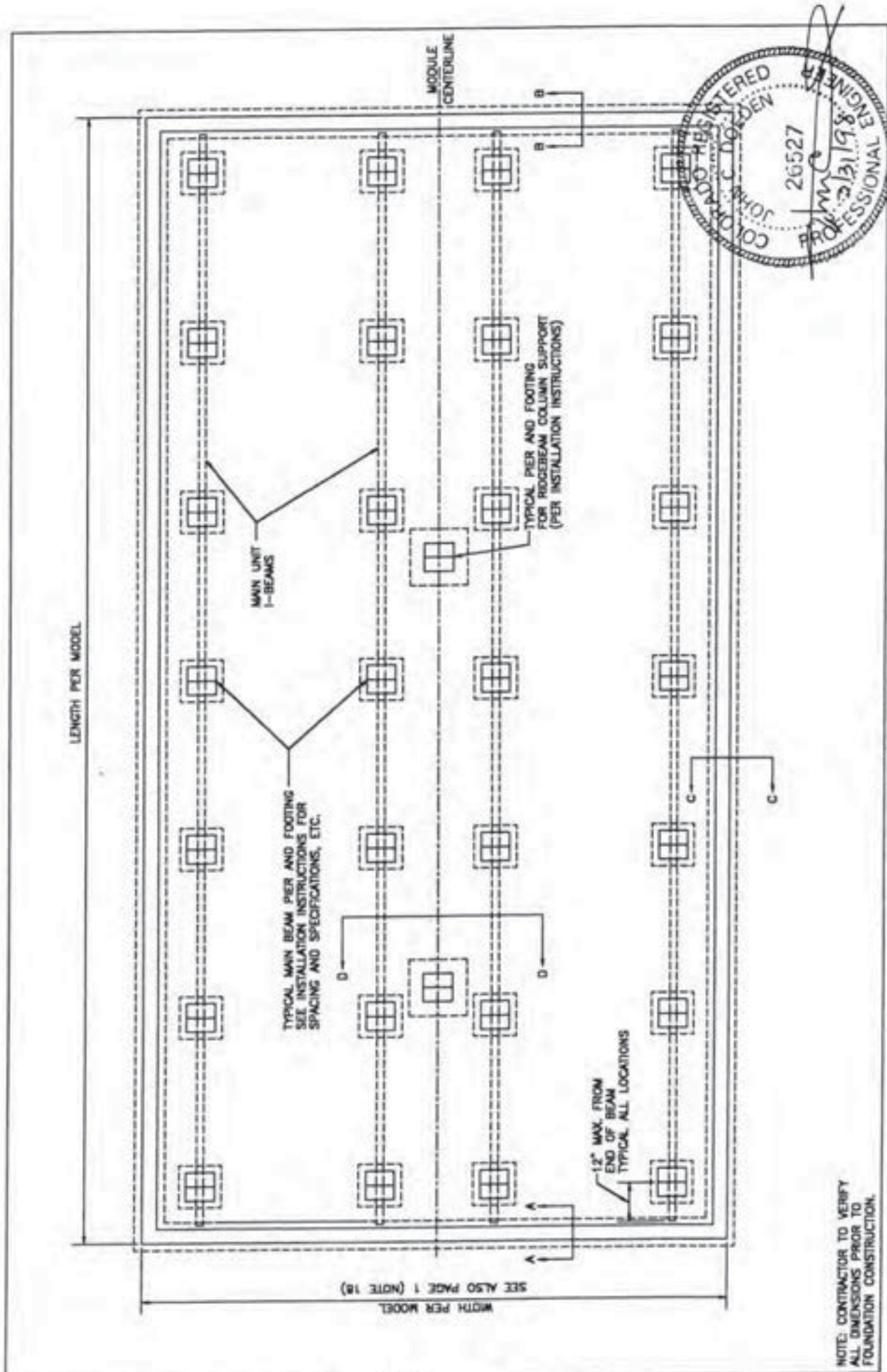


FIGURE 2.1
TYPICAL FOUNDATION (CRAWLSPACE) PLAN
PAGE 2 OF 3

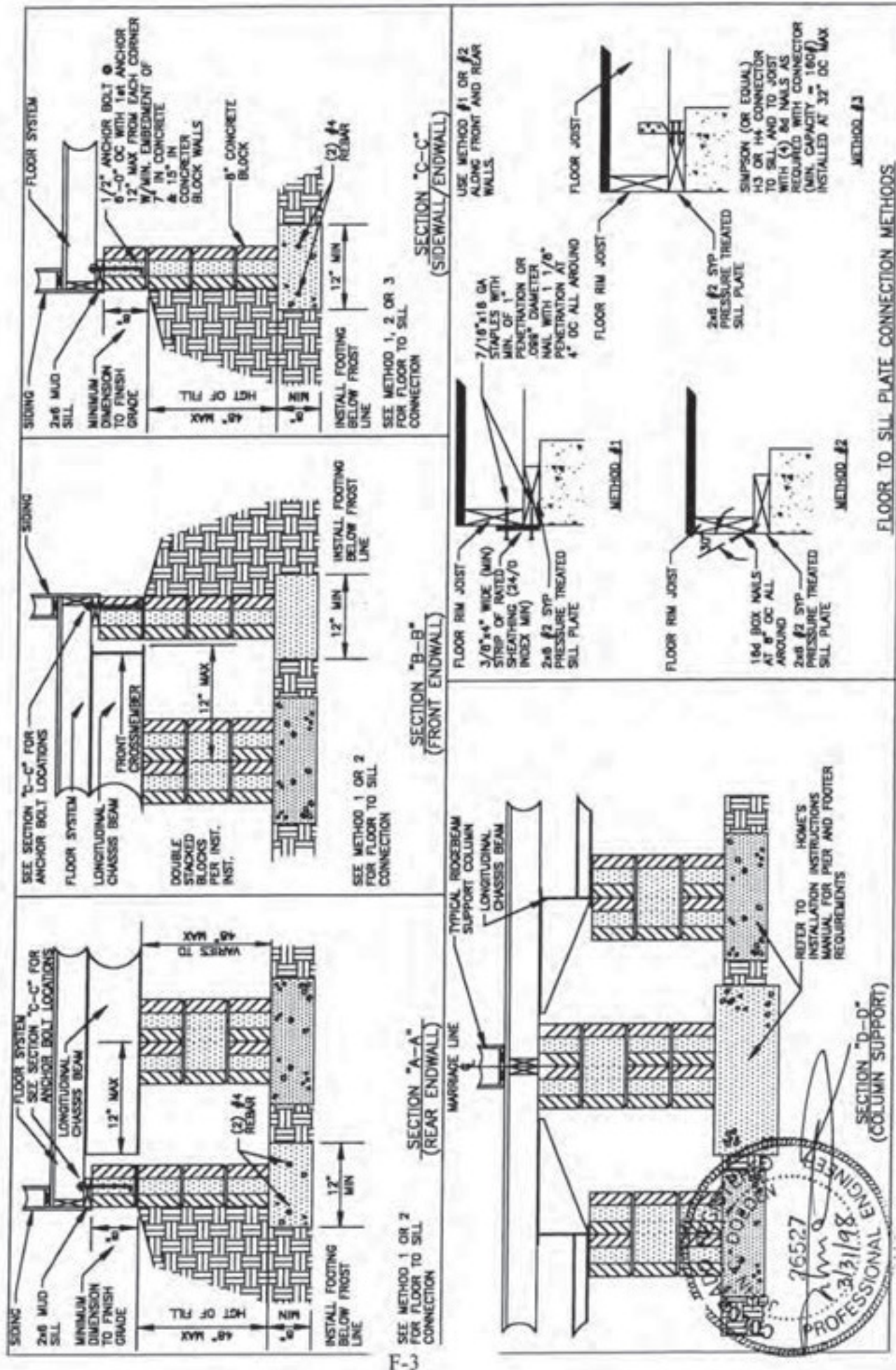


FIGURE 2.2
CRAWLSPACE DETAILS
PAGE 3 OF 3

Appendix G- Perimeter foundation (Basement)

<p>GENERAL NOTES:</p> <ol style="list-style-type: none"> 1. THIS FOUNDATION HAS BEEN DESIGNED FOR SITES WITH AN ALLOWABLE SOIL BEARING CAPACITY OF 2000 PSF MINIMUM. 2. FOUNDATIONS TO BE CONSTRUCTED ON SOIL WITH A LOWER BEARING CAPACITY SHALL BE DESIGNED IN ACCORDANCE WITH ACCEPTED ENGINEERING PRACTICE BY A LICENSED ENGINEER TO LOCAL CONDITIONS AND CODES. 3. CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS TO BE 3000 PSI MINIMUM. 4. REINFORCING STEEL SPECIFIED TO BE GRADE 60 BARS MEETING ASTM A615, A616 AND A617. 5. FOUNDATION WALL MAY BE POURED CONCRETE 8" THICK, REINFORCED WITH #4 REBAR AT 12" OC VERTICAL AND #3 REBAR AT 18" OC HORIZONTAL. 6. UNIT COLUMN SUPPORTS (SEE MODEL PLAN) MUST BE SUPPORTED BY A PIER AND FOOTING AS REQUIRED IN THE INSTALLATION INSTRUCTIONS MANUAL. 7. CROSSBEAMS ARE CONTINUOUS FULL WIDTH OF UNIT AND FIELD WELDED TO EACH MAIN BEAM AND SECURED AT PLASTER PER DETAILS. SEE CHART FOR REQUIRED SIZES. 8. MAIN BEAMS ARE SECURED AT EACH END IN PLASTER PER DETAILS. WHEN CENTERLINE BEAM IS INSTALLED PLASTER MUST ALSO BE INSTALLED FOR END SUPPORT. SEE CHART FOR REQUIREMENTS. 9. THESE SPECIFICATIONS ARE TYPICAL. LOCAL CODES MAY CONTAIN ADDITIONAL REQUIREMENTS. 10. FOUNDATION WALL STEMS MAY BE CONCRETE OR CONCRETE BLOCK. 11. CONCRETE BLOCK SHALL CONFORM TO ASTM C-90. 12. IN CONCRETE BLOCK STEM WALLS A MINIMUM OF (2) #4 REBARS ARE TO BE INSTALLED IN BLOCK WITH MAID SILL ANCHORS. FULLY GROUT EACH CELL CONTAINING REBAR. 13. ALL LUMBER IN CONTACT WITH CONCRETE SHALL BE OF PRESSURE TREATED TYPE OR OF SPECIES APPROVED FOR USE IN DIRECT CONTACT WITH CONCRETE. 14. THE INSTALLATION SITE MUST BE GRADED SO THAT WATER DRAINAGE IS AWAY FROM STRUCTURE AND DOES NOT ACCUMULATE UNDER THE HOME. 15. BACK FILL ADJACENT TO THE WALL SHALL NOT BE PLACED UNTIL THE WALL HAS SUFFICIENT STRENGTH OR HAS BEEN BRACED TO PREVENT DAMAGE. 16. I-BEAM SPICE TO OCCUR OVER SUPPORTS. USE 10" x 4" x 4" SPICE PLATE WELDED OR (2) 1/2" DIAMETER BOLTS EACH SIDE OF SPICE. 17. WHEN CENTERLINE BEAM IS INSTALLED IT MUST BE CONTINUOUS FOR THE FULL LENGTH OF THE UNIT AND FIELD WELDED TO EACH CROSSBEAM AND SECURED AT EACH END AT POCKET OR PLASTER PER DETAILS. (30 PSF ROOF LIVE LOAD ONLY. CROSSBEAMS WITH CENTERLINE BEAM INSTALLED MAY BE W6x18x4 OR W6x13x4). 	<p>GENERAL NOTES:</p> <ol style="list-style-type: none"> 18. DAMP PROOFING OF CONCRETE OR MASONRY WALLS TO BE IN ACCORDANCE WITH LOCAL CODES. IN THE ABSENCE OF CODE REQUIREMENTS THE FOLLOWING SHALL APPLY. A. EXTERIOR FOUNDATION WALLS OF MASONRY CONSTRUCTION ENCLOSING BASEMENTS SHALL BE DAMP PROOFED BY APPLYING NOT LESS THAN 3/8" OF PORTLAND CEMENT PAINTING TO THE WALL FROM THE FOOTING TO THE FINISH GRADE. THE PAINTING SHALL BE COVERED WITH A COAT OF APPROVED BITUMINOUS MATERIAL APPLIED AT THE RECOMMENDED RATE. EXTERIOR FOUNDATION WALLS OF CONCRETE CONSTRUCTION ENCLOSING BASEMENTS SHALL BE DAMP PROOFED BY APPLYING A COAT OF APPROVED BITUMINOUS MATERIAL TO THE WALL FROM THE FOOTING TO THE FINISH GRADE AT THE RECOMMENDED RATE. B. FOUNDATION WALLS OF HABITABLE ROOMS LOCATED BELOW GRADE SHALL BE WATER PROOFED WITH MEMBRANES EXTENDING FROM THE EDGE OF THE FOOTING TO THE FINISH GRADE LINE. THE MEMBRANE SHALL CONSIST OF EITHER 2-PLY HOT MOFTED FELT & MIL. POLYETHYLENE OR 55-POUND ROLL ROOFING OR EQUIVALENT MATERIAL. THE LAP IN THE MEMBRANE SHALL BE SEALED AND FIRMLY AFFIXED TO THE WALL. C. FOUNDATION WALLS MAY BE DAMP PROOFED OR WATER PROOFED USING MATERIALS AND METHODS OF CONSTRUCTION OTHER THAN COVERED IN THIS SECTION WHEN APPROVED BY THE LOCAL BUILDING OFFICIAL. 19. DRAINS SHALL BE PROVIDED AROUND FOUNDATIONS ENCLOSING HABITABLE OR USABLE SPACES LOCATED BELOW GRADE AND WHICH ARE SUBJECT TO GROUND WATER CONDITIONS. DRAINS SHALL BE INSTALLED AT OR BELOW THE AREA TO BE PROTECTED, AND SHALL DISCHARGE BY GRAVITY OR MECHANICAL MEANS INTO AN APPROVED DRAINAGE SYSTEM. 20. THE TOP OF OPEN JOINTS OF DRAIN TILES SHALL BE PROTECTED WITH STRIPS OF BUILDING PAPER AND THE DRAINAGE TILES SHALL BE PLACED ON 2 INCHES OF WASHED GRAVEL OR CRUSHED ROCK ONE SIZE LARGER THAN THE TILE JOINT OPENING OR PERFORATION AND COVERED WITH NOT LESS THAN 3 INCHES OF THE SAME MATERIAL. 21. THE DESIGN ON THIS AND FOLLOWING SHEETS ARE APPLICABLE TO HORIZONTAL WIND LOADS OF 15 PSF MAXIMUM AND UNITS WHICH HAVE A MAXIMUM WIDTH OF 3'-4". MAXIMUM BEAM SPACING IS 19'-10". 22. THE DESIGN ON THIS AND FOLLOWING SHEETS ARE APPLICABLE TO SEISMIC ZONES 1 AND 2. 23. THIS FOUNDATION DESIGN IS NOT FOR INSTALLATION ON A FLOOD PLAIN. WHEN INSTALLING BASEMENT IN AN AREA WITH SOILS HAVING POOR DRAINAGE, CONSIDERATION SHOULD BE GIVEN TO METHODS OF ELIMINATING ACCUMULATION OF WATER IN THE BASEMENT. SUCH AS THE USE OF SUMP PUMPS/SL INSTALLATION OF SUMP PUMPS TO BE IN ACCORDANCE WITH LOCAL CODE REQUIREMENTS. 24. MAXIMUM LENGTH OF 3" STANDARD STEEL PIPE COLUMN TO BE 11'-0". 25. THIS FOUNDATION DESIGN DOES NOT PERMIT THE USE OF INTERIOR SHEARWALLS. HOMES MUST BE DESIGNED WITH END SHEARWALLS ONLY.
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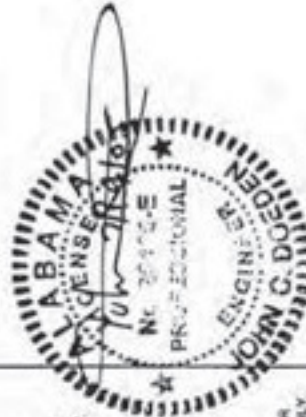


FIGURE 1.0
FOUNDATION NOTES AND CHARTS
PAGE 1 OF 3

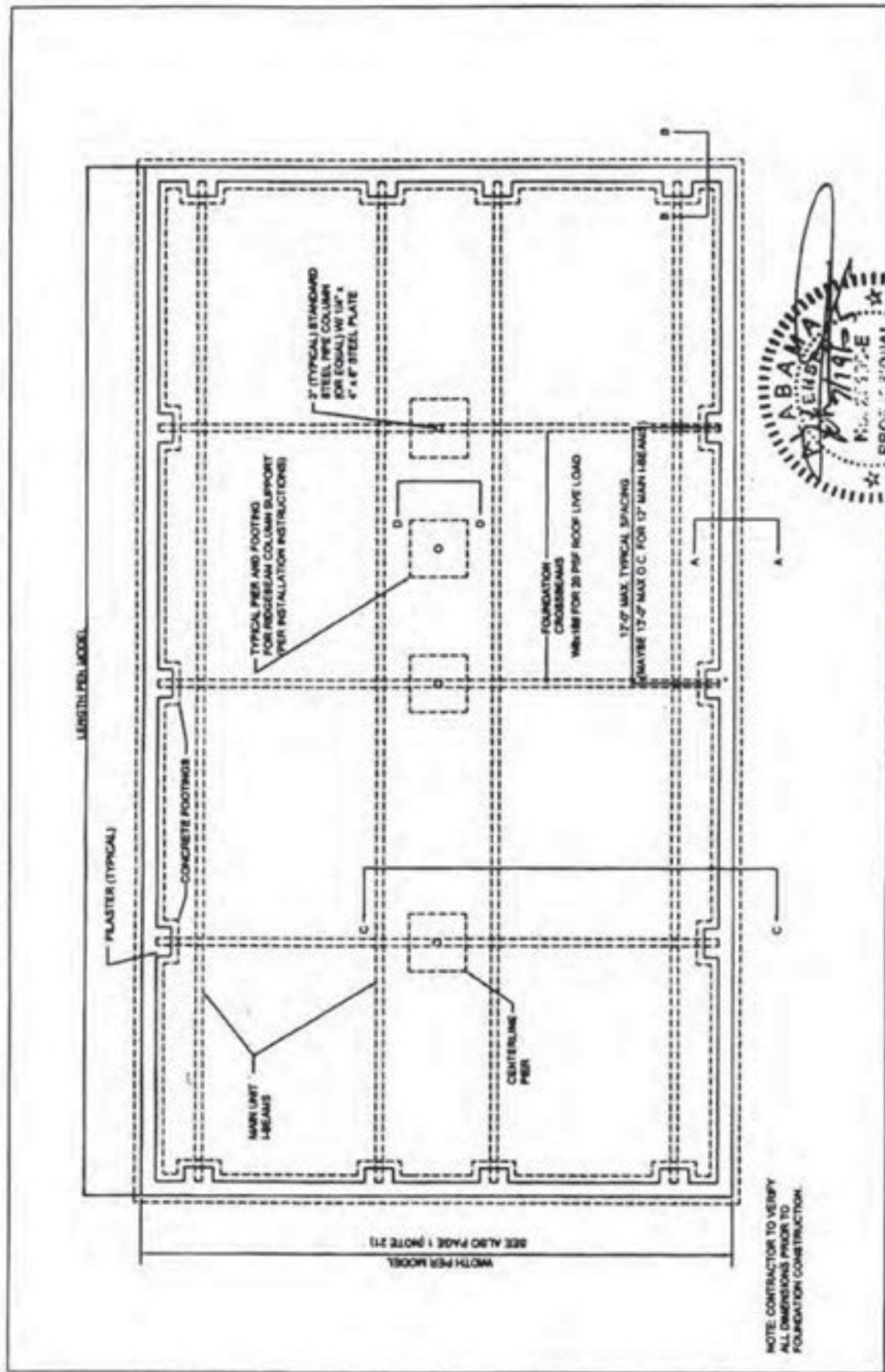


FIGURE 1.1
TYPICAL FOUNDATION (BASEMENT) PLAN
PAGE 2 OF 3

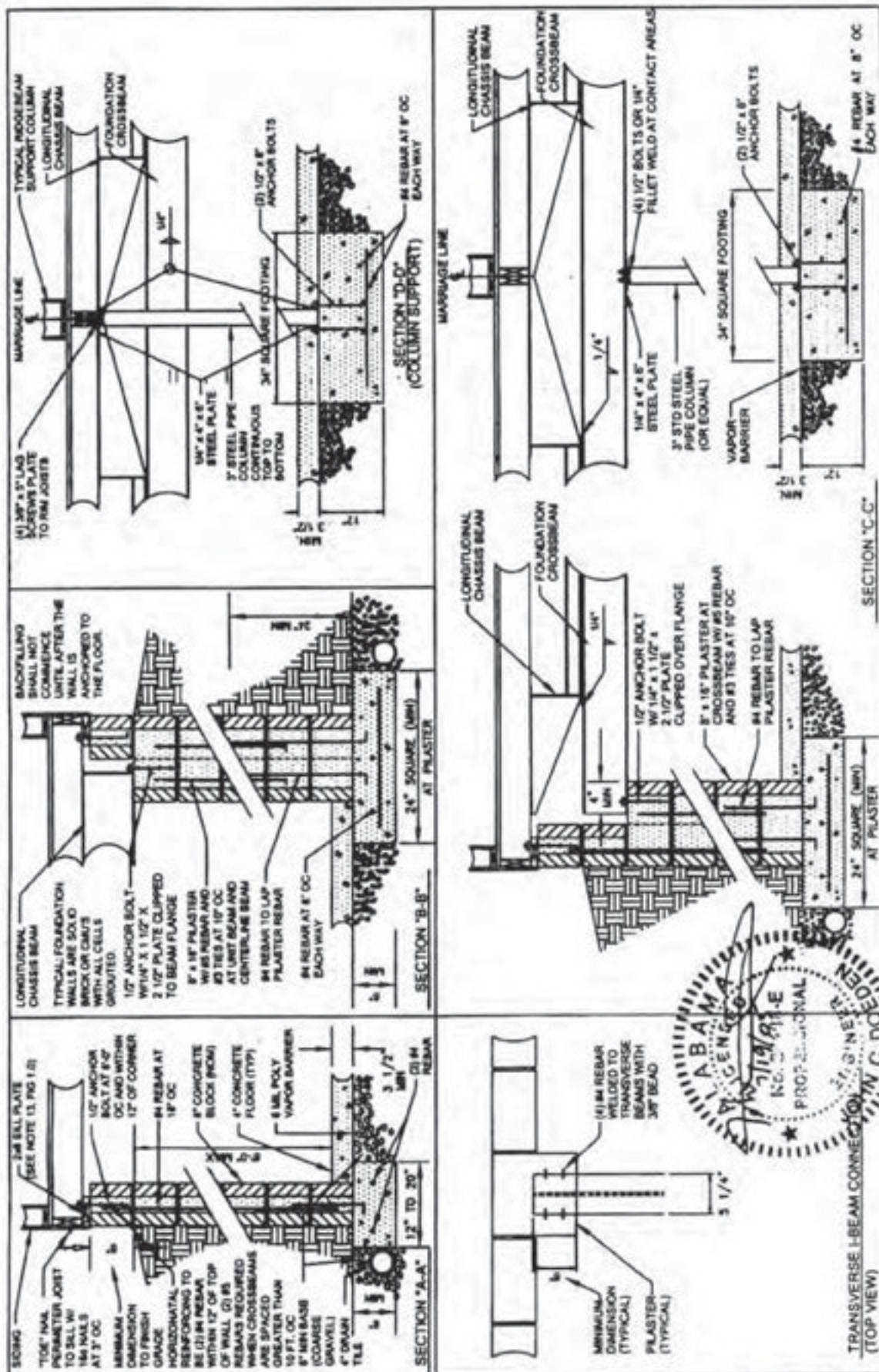


FIGURE 1.2
 BASEMENT DETAILS
 PAGE 3 OF 3

GENERAL NOTES:

1. THIS FOUNDATION HAS BEEN DESIGNED FOR SITES WITH AN ALLOWABLE SOIL BEARING CAPACITY OF 2000 PSF MINIMUM.
2. FOUNDATIONS TO BE CONSTRUCTED ON SOIL WITH A LOWER BEARING CAPACITY SHALL BE DESIGNED IN ACCORDANCE WITH ACCEPTED ENGINEERING PRACTICE BY A LICENSED ENGINEER TO LOCAL CONDITIONS AND CODES.
3. CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS TO BE 3000 PSI MINIMUM.
4. REINFORCING STEEL SPECIFIED TO BE GRADE 60 BARS MEETING ASTM A615, A616 AND A617.
5. FOUNDATION WALL MAY BE POURED PLAIN CONCRETE 8" THICK.
6. UNIT COLUMN SUPPORTS (SEE MODEL PLAN) MUST BE SUPPORTED BY A PIER AND FOOTING AS REQUIRED IN THE INSTALLATION INSTRUCTIONS MANUAL.
7. MAIN BEAMS ARE SECURED TO WALL AT EACH END.
8. THESE SPECIFICATIONS ARE TYPICAL. LOCAL CODES MAY CONTAIN ADDITIONAL REQUIREMENTS.
9. FOUNDATION WALL STEMS MAY BE CONCRETE OR CONCRETE BLOCK.
10. CONCRETE BLOCK SHALL CONFORM TO ASTM C-90.
11. IN CONCRETE BLOCK STEM WALLS A MINIMUM OF (2) #4 REBARS ARE TO BE INSTALLED IN BLOCK WITH MUJ SILL ANCHORS, FULLY GROUT EACH CELL CONTAINING REBAR.
12. ALL LUMBER IN CONTACT WITH CONCRETE SHALL BE OF PRESSURE TREATED TYPE OR OF SPECIES APPROVED FOR USE IN DIRECT CONTACT WITH CONCRETE.
13. THE INSTALLATION SITE MUST BE GRADED SO THAT WATER DRAINAGE IS AWAY FROM STRUCTURE AND DOES NOT ACCUMULATE UNDER THE HOME.
14. MAX UNBALANCED BACKFILL SHALL BE 5 FEET AND SHALL NOT BE PLACED UNTIL THE WALL HAS SUFFICIENT STRENGTH OR HAS BEEN BRACED TO PREVENT DAMAGE.
15. DAMP PROOFING OF CONCRETE OR MASONRY WALLS TO BE IN ACCORDANCE WITH LOCAL CODES. IN THE ABSENCE OF CODE REQUIREMENTS THE FOLLOWING SHALL APPLY:
 - A. EXTERIOR FOUNDATION WALLS OF MASONRY CONSTRUCTION ENCLOSING BASEMENTS SHALL BE DAMP PROOFED BY APPLYING NOT LESS THAN 3/8" OF PORTLAND CEMENT PARGING TO THE WALL FROM THE FOOTING TO THE FINISH GRADE. THE PARGING SHALL BE COVERED WITH A COAT OF APPROVED BITUMINOUS MATERIAL APPLIED AT THE RECOMMENDED RATE. EXTERIOR FOUNDATION WALLS OF CONCRETE CONSTRUCTION ENCLOSING BASEMENTS SHALL BE DAMP PROOFED BY APPLYING A COAT OF APPROVED BITUMINOUS MATERIAL TO THE WALL FROM THE FOOTING TO THE FINISH GRADE AT THE RECOMMENDED RATE.

- B. FOUNDATION WALLS OF HABITABLE ROOMS LOCATED BELOW GRADE SHALL BE WATER PROOFED WITH MEMBRANES EXTENDING FROM THE EDGE OF THE FOOTING TO THE FINISH GRADE LINE. THE MEMBRANE SHALL CONSIST OF EITHER 2-PLY HOT MOPPED FELT, 6-MIL POLYVINYL CHLORIDE, 55-POUND ROLL ROOFING OR EQUIVALENT MATERIAL. THE LAP IN THE MEMBRANE SHALL BE SEALED AND FIRMLY AFFIXED TO THE WALL.
- C. FOUNDATION WALLS MAY BE DAMP PROOFED OR WATER PROOFED USING MATERIALS AND METHODS OF CONSTRUCTION OTHER THAN COVERED IN THIS SECTION WHEN APPROVED BY THE LOCAL BUILDING OFFICIAL.
16. DRAINS SHALL BE PROVIDED AROUND FOUNDATIONS ENCLOSING HABITABLE OR USEABLE SPACES LOCATED BELOW GRADE AND WHICH ARE SUBJECT TO GROUND WATER CONDITIONS. DRAINS SHALL BE INSTALLED AT OR BELOW THE AREA TO BE PROTECTED, AND SHALL DISCHARGE BY GRAVITY OR MECHANICAL MEANS INTO AN APPROVE DRAINAGE SYSTEM.
17. THE TOP OF OPEN JOINTS OF DRAIN TILES SHALL BE PROTECTED WITH STRIPS OF BUILDING PAPER AND THE DRAINAGE TILES SHALL BE PLACED ON 2 INCHES OF WASHED GRAVEL OR CRUSHED ROCK ONE SIEVE SIZE LARGER THAN THE TILE JOINT OPENING OR PERFORATION AND COVERED WITH NOT LESS THAN 5 INCHES OF THE SAME MATERIAL.
18. THE DESIGN OF THIS AND FOLLOWING SHEETS ARE APPLICABLE TO HORIZONTAL WIND LOADS OF 15 PSF MAXIMUM AND UNITS WHICH HAVE A MAXIMUM WIDTH OF 30'-0". MINIMUM I-BEAM SPACING IS 8'-0".
19. THE DESIGNS ON THIS AND FOLLOWING SHEETS ARE APPLICABLE TO SEISMIC ZONES O, 1 AND 2.
20. THIS FOUNDATION DESIGN IS NOT FOR INSTALLATION ON A FLOOD PLAIN. WHEN INSTALLING BASEMENT IN AN AREA WITH SOILS HAVING POOR DRAINAGE, CONSIDERATION SHOULD BE GIVEN TO METHODS OF ELIMINATING ACCUMULATION OF WATER IN THE BASEMENT. SUCH AS THE USE OF SUMP PUMP(S). INSTALLATION OF SUMP PUMPS TO BE IN ACCORDANCE WITH LOCAL CODE REQUIREMENTS.
21. MAXIMUM LENGTH OF 3" STANDARD STEEL PIPE COLUMN TO BE 8'-0" AND EXTEND FROM FLOOR TO BEAMS.
22. THIS FOUNDATION DESIGN DOES NOT PERMIT THE USE OF INTERIOR SHEARWALLS. HOMES MUST BE DESIGNED WITH END SHEARWALLS ONLY.
23. MORTAR TYPE FOR MASONRY WALLS TO BE TYPE M OR S AND BE LAID IN RUNNING BOND.

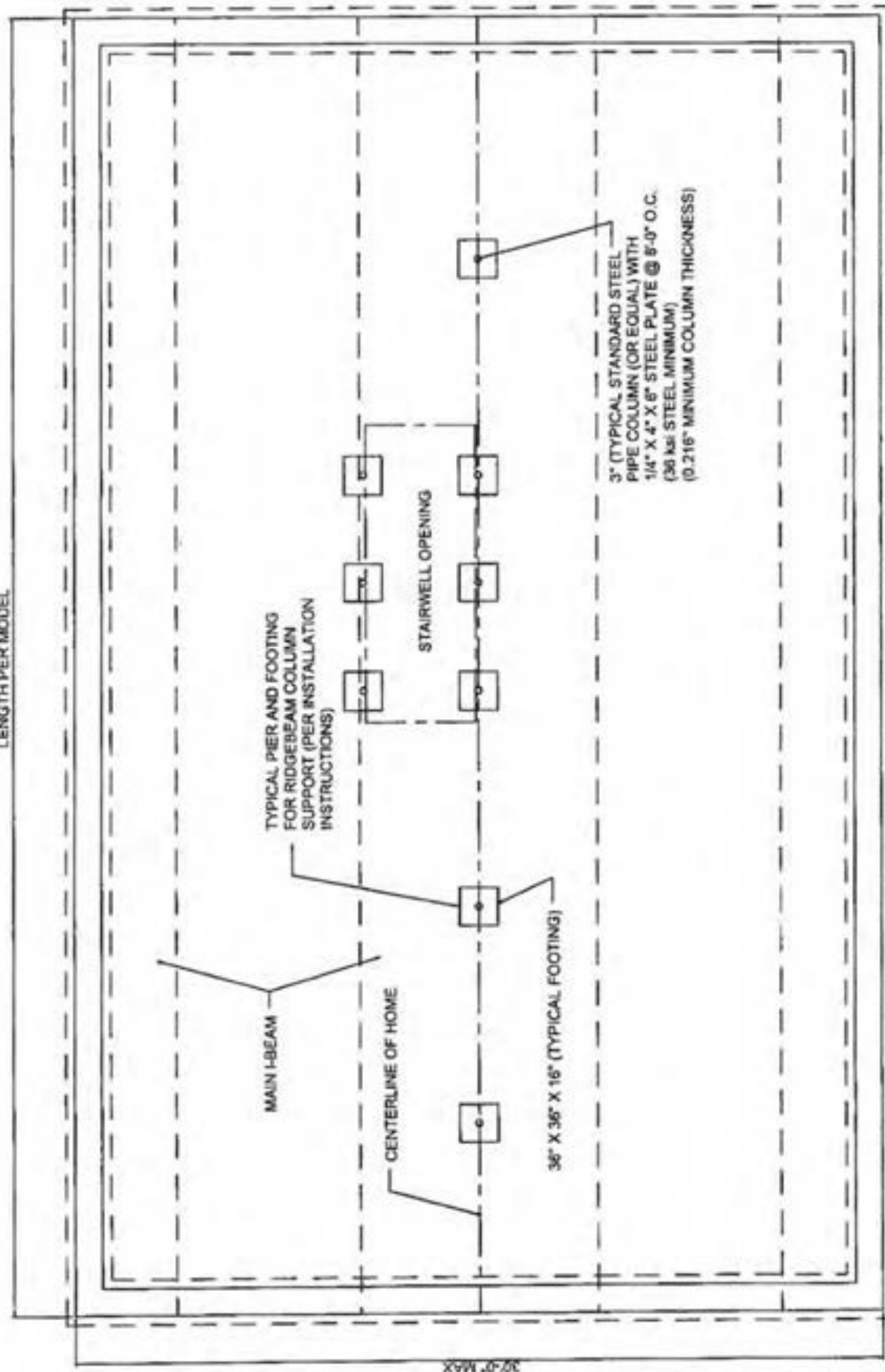
APPROVED BY

NTA INC.
APR 24, 2008
FEDERAL MANUFACTURING HOME
CONSTRUCTION AND SAFETY STANDARDS



FIGURE 2.0
TYPICAL FOUNDATION (CLEAR SPAN BASEMENT PLAN)
PAGE 1 OF 3

LENGTH PER MODEL



APPROVED BY

NTA INC.
 FISHKILL, MASSACHUSETTS HOME
 CONSTRUCTION AND SAFETY STANDARDS

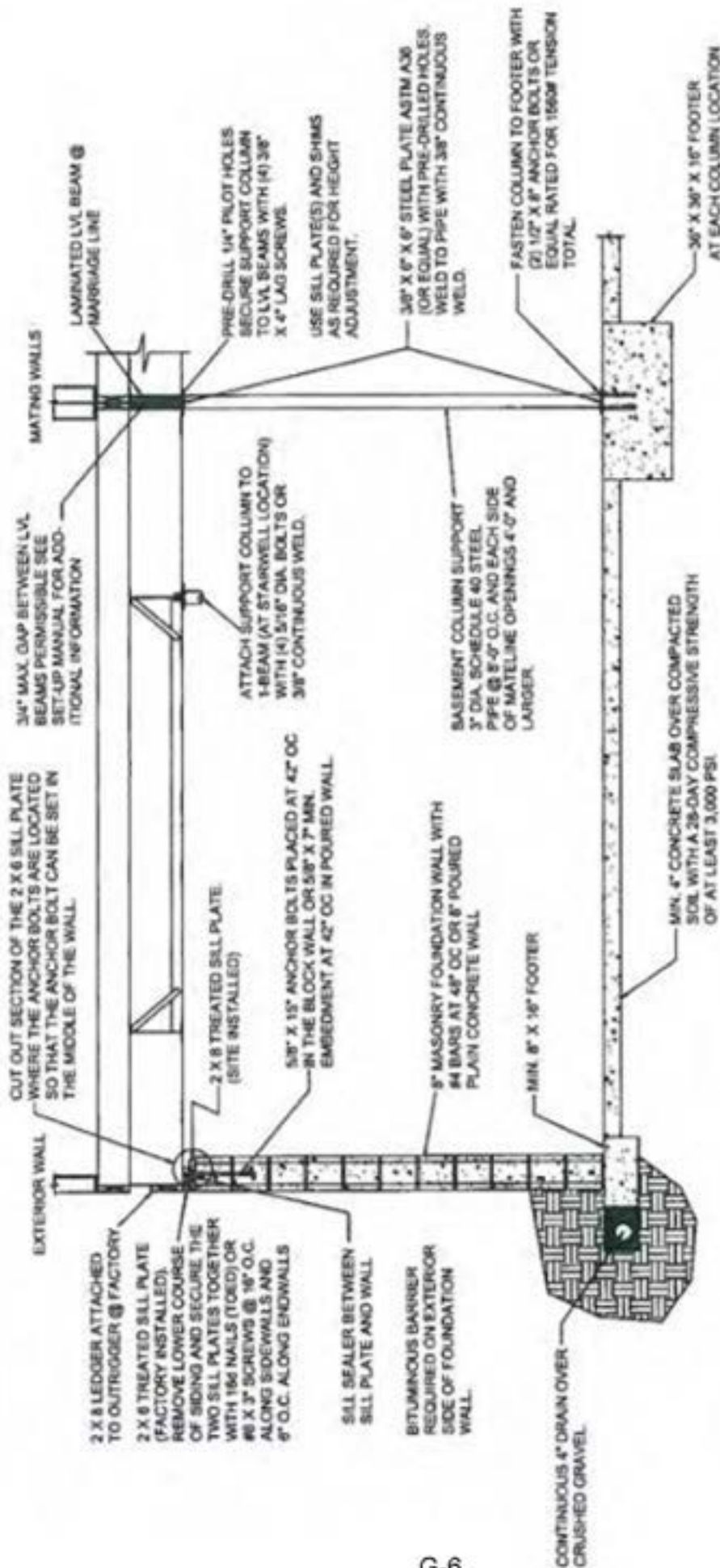
Apr 24, 2008

FIGURE 2.1
TYPICAL FOUNDATION (CLEAR SPAN BASEMENT PLAN)
PAGE 2 OF 3

NOTE: CONTRACTOR TO VERIFY
 ALL DIMENSIONS PRIOR TO
 FOUNDATION CONSTRUCTION



THE RISE AND RUN OF THE STAIRS MUST ACCOMMODATE A HEADROOM CLEARANCE OF 6'-8" WITH A MAX. STAIRWELL OPENING OF 10'-9 1/2". CHECK YOUR STATE AND LOCAL CODES FOR RULES THAT APPLY TO THE CONSTRUCTION OF STAIRWELLS TO INSURE PROPER CLEARANCES.



G-6

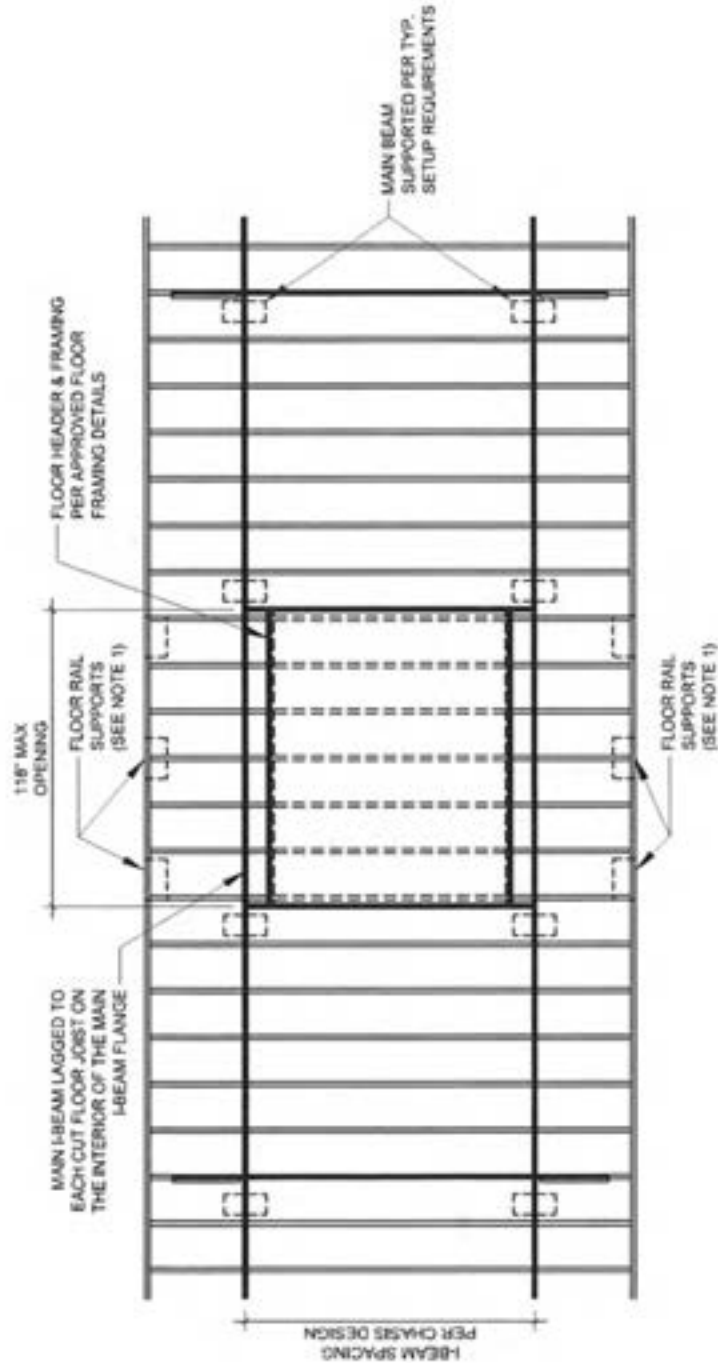
2000 PSF MIN. SOIL BEARING CAPACITY
96" MAX WALL HEIGHT
5 FOOT MAX UNBALANCED BACKFILL

MAX. FLOOR LOAD 40 PSF.
MAX. ROOF LOAD 20 PSF.



FIGURE 2.2
TYPICAL FOUNDATION (CLEAR SPAN BASEMENT PLAN)
PAGE 3 OF 3

APPROVED BY
NTA INC.
APR 24, 2008
FEDERAL, STATE, AND LOCAL
CONSTRUCTION AND SAFETY STANDARDS



NOTES:

1. FLOOR SYSTEM MUST BE SUPPORTED IN THE FLOOR OPENING OR FRAMED PLUG AREA ALONG THE SIDEWALL AND MATELINE AT 8' OC, MAXIMUM.
2. STAIRS IF PROVIDED MUST BE SELF-SUPPORTED AND DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH LOCAL BUILDING CODES.
3. THE HOME FLOOR FRAMING AND CHASSIS MEMBERS SHALL NOT BE CUT OR OTHERWISE ALTERED IN THE FIELD.
4. GUARDRAILS AND HANDRAILS MUST BE DESIGNED AND INSTALLED IN ACCORDANCE WITH LOCAL CODES.

WIND ZONE APPROVAL

WIND ZONE I ONLY

ROOF LOADS

ALL

APPROVED BY

NTA INC.
JUN 06, 2016
FEDERAL MANUFACTURING GROUP
CONSTRUCTION AND SAFETY STANDARDS

THIRD PARTY SEAL

TITLE: BASEMENT READY METHOD 'B' SUPPORT

DRAWN BY: JW

DATE: 4/28/2016

REVIEWED BY:

LAST REVISED: 5/31/2016

CHECKED BY: NTA

CALC REF: CA-FL-190.00 - 190.13

clayton
home building group

SHEET:

1. THIS SUPPORTING DESIGN IS APPLICABLE FOR USE ON BASEMENT READY HOMES WITH FLOOR FRAMING PER APPROVED METHOD C FLOOR FRAMING DESIGNS.
2. PIERS SHALL BE PROVIDED TO SUPPORT MATTING FLOOR RIM RAILS AT 4' OC. MAXIMUM WITHIN BASEMENT READY FLOOR FRAMING REGARDLESS IF FLOOR PLUG IS REMOVED ON-SITE.
3. STAIR OPENING SHALL NOT BE LOCATED ALONG EXTERIOR SIDEWALLS.
4. ANCHORING PER DESIGN OR ALTERNATE JACK POST TO BE DESIGNED BY OTHERS FOR AREA HOME IS BEING INSTALLED.
5. LAG CUT JOIST TO INSIDE OR OUTSIDE FLANGE OF 75MM LAG. FRAME CLIP MAY BE USED.
6. HOME FLOOR FRAMING AND CHASSIS MEMBERS SHALL NOT BE CUT OR OTHERWISE ALTERED.
7. STAIRS IF PROVIDED MUST BE SELF SUPPORTED AND DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH LOCAL CODES.
8. STAIRS, GUARDRAILS AND HANDRAILS MUST BE DESIGNED AND INSTALLED IN ACCORDANCE WITH ALL LOCAL CODES.



WIND ZONE APPROVAL	ROOF LOADS
WIND ZONE I ONLY	ALL

1330 JOURNAL OF CLIMATE

TITLE: BASEMENT READY METHOD 'C' SUPPORT

DRAWN BY:	JW	DATE:	4/25/2016
REVIEWED BY:		LAST REVISED:	5/31/2016
CHECKED BY:	NTA	CALC REF:	CA.F-100.00 - 100.10

SHEET:

home building group

only on!

Clayton home building group - Basement Ready Checklist

Plant #: _____ S/N: _____

Basement Ready design location : A- Split across mating line ; B- In belly between chassis beams; or C- outrigger area (single floor)

Instructions to Retailer/Builder: All items on this form must be completed /verified. All items under "field" must be initialed by you or your representative or indicated as "NA" for not applicable. When all items have been finalized, form must be returned to the home manufacturer. It is the responsibility of the retailer/builder to ensure that home setup is in conformance with applicable building codes. Clayton home building group has designed and constructed the home in our facility to meet the Manufactured Home Construction and Safety Standard; and this checklist has been provided to assist the retailer/builder to ensure the home is not taken out of conformance with the standards on-site.

CATEGORY/ ACTIVITY	DESCRIPTION	ITEM CHECK	
		PLANT	FIELD
FACTORY BASEMENT READY DESIGN CHECKS	RETAILER SHALL PROVIDE CLAYTON HOME BUILDING GROUP, AT TIME OF ORDER, EXACT LOCATION AND DIMENSIONS OF BASEMENT ACCESS OPENING TO ENSURE COMPLIANCE WITH ALL LOCAL BUILDING CODE REQUIREMENTS. LOCATION AND DIMENSION OF ACCESS SHALL COMPLY WITH DAPIA APPROVED DETAILS.		
	ASSURE LOCATION AND SIZE OF BASEMENT ACCESS OPENING REQUESTED COMPLIES WITH DAPIA APPROVED FRAMING DETAILS.		
	THESE INSTRUCTIONS AND APPLICABLE PLUG FRAMING AND SUPPORT DETAILS HAVE BEEN PROVIDED TO RETAILER/OWNER AND VERIFY THEIR AGREEMENT TO COMPLY WITH ALL REQUIREMENTS PRIOR TO PRODUCTION. NOTE: "BASEMENT READY" ON SALES CONTRACT AND ATTACH COPY OF THESE INSTRUCTIONS & APPLICABLE DETAILS.		
	ENSURE STAIR OPENING IS NOT LOCATED ALONG AN EXTERIOR WALL.		
	PROVIDE RETAILER/ OWNER WITH SETUP MANUAL, MODEL SPECIFIC SUPPORT DIAGRAM, AND APPLICABLE BASEMENT READY FOUNDATION AND ANCHORING DETAILS.		
	ENSURE THAT UTILITIES, FLOOR DUCTS, ETC. ARE RELOCATED AS NECESSARY TO AVOID INTERFERENCE WITH ACCESS OPENING FRAMING.		
	ENSURE MODEL PLAN INDICATES FACTORY INSTALLED LIGHT OVER STAIRWAY AND COORESPONDING 3WAY LIGHTING CONTROL SWITCH AND UNDER FLOOR J-BOX FOR SITE COMPLETION OF LIGHTING SWITCH AT FOOT OF STAIRS.		
	ENSURE MODEL PLAN INDICATES UNDER FLOOR J-BOX FOR ON-SITE INSTALLED BASEMENT SMOKE ALARM.		
FACTORY BASEMENT READY CONSTRUCTION	FLOOR FRAMING AND PLUG CONSTRUCTED AND FASTENED IN ACCORDANCE WITH DAPIA APPROVED FRAMING DETAILS.		
	LIGHT OVER STAIRS WITH 3-WAY SWITH AND IN FLOOR J-BOX INSTALLED.		
	INSTALLED FLOOR J-BOX AND SMOKE ALARM WIRING.		
	FLOOR PLUG INSULATED WITH EQUIVALENT R-VALUE AS COORESPONDING FLOOR SPACE.		
	STAIR PLUG AND J-BOX HAVE BEEN CLEARLY IDENTIFIED UNDER HOME		

Revised 5/31/2016

APPROVED BY

 Jun 06, 2016
 FEDERAL MANUFACTURED HOME
 CONSTRUCTION AND SAFETY STANDARDS

CATEGORY/ ACTIVITY	DESCRIPTION	ITEM CHECK	
		PLANT	FIELD
ON-SITE BASEMENT READY SUPPORT OR BASEMENT AND STAIR CONSTRUCTION	FOUNDATION SUPPORT AT THE STAIR PLUG OR BASEMENT STAIR AREA HAS BEEN PROVIDED IN ACCORDANCE WITH INSTALLATION INSTRUCTIONS AND FOUNDATION LAYOUT PROVIDED WITH THE HOME.		
	BASEMENT, FOUNDATION, STAIRS, ECT. HAS BE DESIGNED BY A PROFESSIONAL ENGINEER OR ARCHITECT AND CONSTRUCTED IN ACCORDANCE WITH ALL LOCAL CODES.		
	MANUFACTURED HOME'S ELECTRICAL, MECHANICAL, AND PLUMBING SYSTEMS HAVE NOT BE TAPPED INTO OR ALTERED IN ANY WAY. THE HOMES FLOOR FRAMING AND CHASSIS MEMBERS SHALL NOT BE CUT OR OTHERWISE ALTERED IN THE FIELD		
	GUARDRAILS AND HANDRAILS AT THE BASEMENT ACCESS LOCATION HAVE BEEN INSTALLED ON SITE IN ACCORDANCE WITH LOCAL CODES		
	STAIR CONSTRUCTION (TREAD/RUN, CLEARANCES-WIDTH & HEADROOM, LANDINGS, FIRE PROTECTION, ECT.) AT BASEMENT ACCESS COMPLY WITH LOCAL CODES. STAIRS ARE INDEPENDENTLY SUPPORTED AND DO NOT RELY ON THE MANUFACTURED HOME FOR SUPPORT.		
	BASEMENT HAS BEEN DESIGNED AND CONSTRUCTED SUCH THAT PROPER FIRE SEPERATION, LIGHTING, SMOKE DETECTORS, EXIT AND EMERGENCY ESCAPE, THERMAL ENVELOPE, HEATING AND VENTILATION REQUIREMENTS ARE IN ACCORDANCE WITH ALL LOACALLY ADOPTED BUILDING CODES.		
	3-WAY LIGHT SWITCH HAS BEEN INSTALLED AT FOOT OF STAIRS AND CONNECTED TO FACTORY INSTALLED WIRING AT PROVIDE J-BOX.		
	SMOKE ALARM HAS BEEN INSTALLED AT FOOT OF STAIRS AND CONNECTED TO FACTORY INSTALLED WIRING AT PROVIDED J-BOX AND TESTED.		
	WALLS HAVE BEEN CONSTRUCTED AND INSULATED WITH EQUIVALENT R-VALUE AS FACTORY BUILT HOMES EXTERIOR WALLS (SEE ENERGY CERTIFICATE) AND AN EXTERIOR WEATHER TIGHT DOOR HAS BEEN INSTALLED TO ENCLOSE STAIRWAY AND SEPARATE FACTORY BUILD HOME SPACE FROM BASEMENT OR CRAWL SPACE.		

THIS FORM SHALL BE COMPLETED BY INDIVIDUAL OR ENTITY COMPLETING THE HOME INSTALLATION AND SHALL BE RETURNED TO HOME MANUFACTURER AND MAINTAINED WITH MFG. HOME FILE.

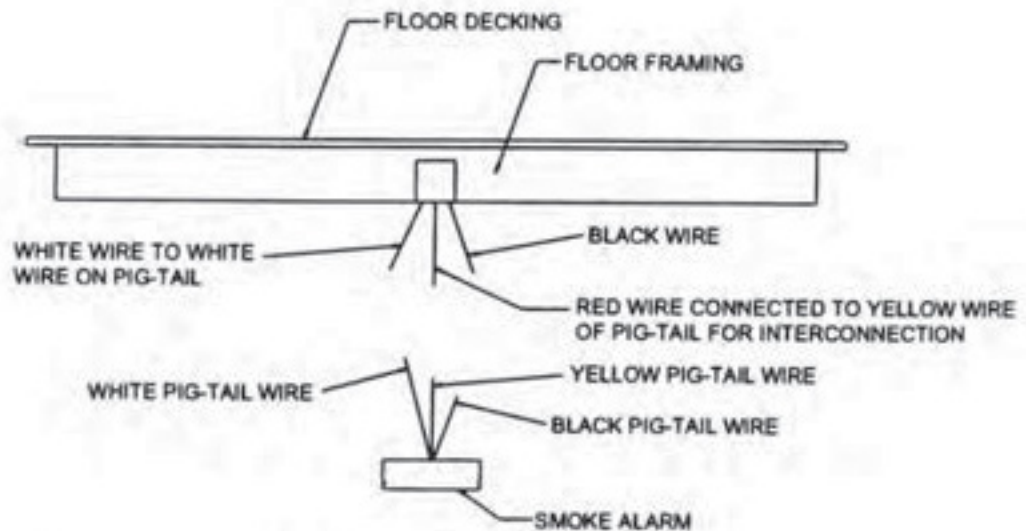
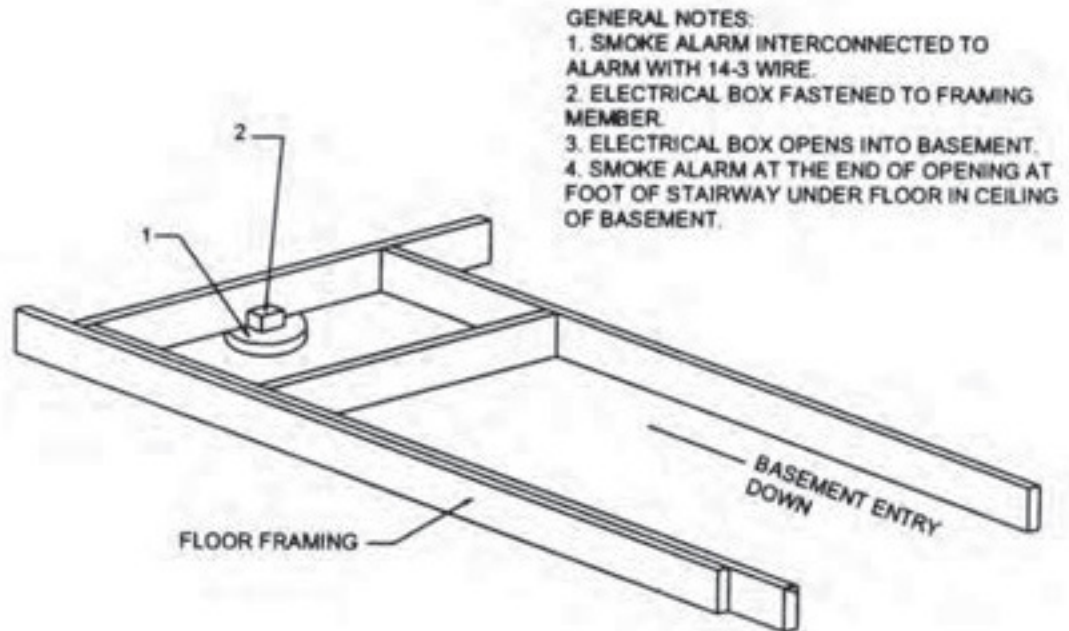
DATE INSPECTION COMPLETED: _____

ON-SITE CONSTRUCTION WORK INSPECTED BY: _____

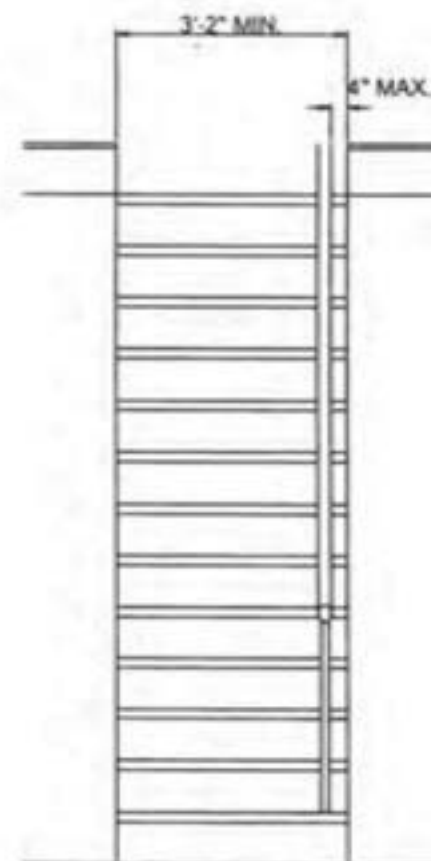
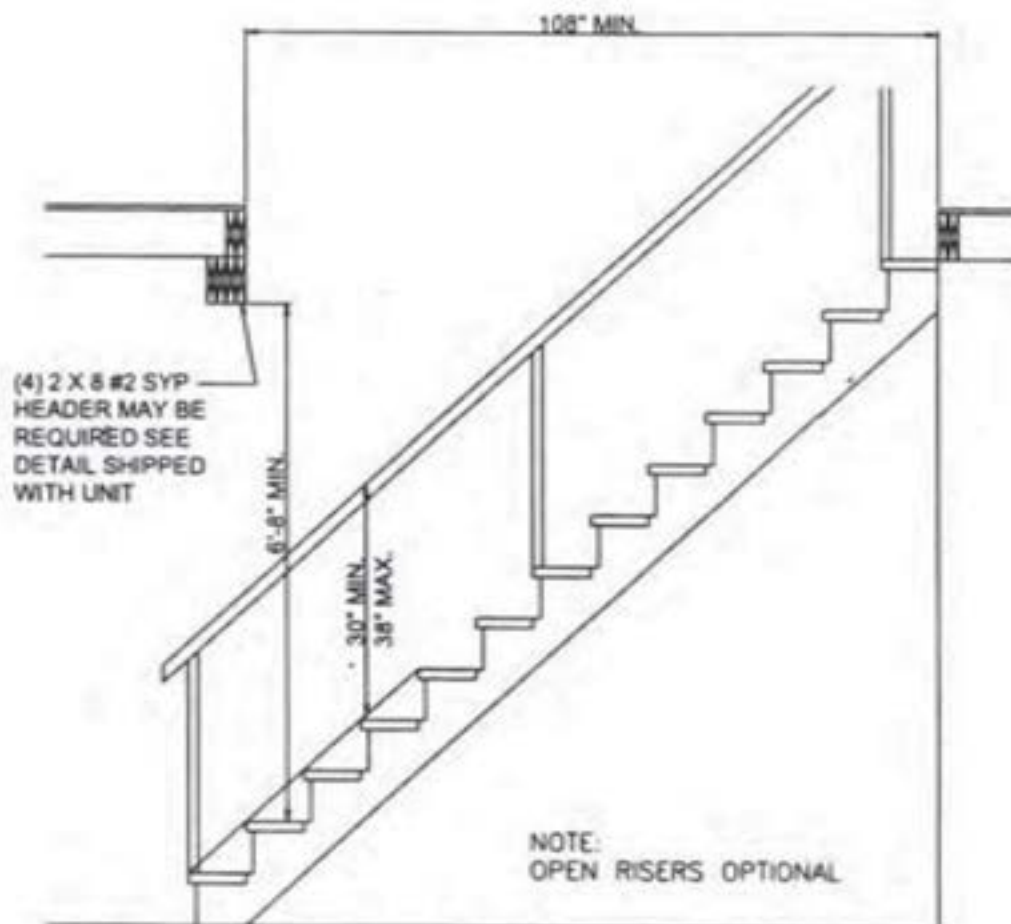
PLEASE RETURN TO: _____

APPROVED BY
NIA INC. Jun 06, 2016
FEDERAL MANUFACTURED HOME
CONSTRUCTION AND SAFETY STANDARDS

Appendix H - Smoke alarm installation (Basement)



THE SMOKE ALARM MUST BE INSTALLED AND WIRED BEFORE THE SMOKE ALARM SYSTEM IS TESTED ON SITE.



NOTE:
THIS RECOMMENDED STAIRWELL DESIGN IS NOT COVERED BY THE HUD MANUFACTURED HOUSING STANDARDS AND THEREFORE NOT COVERED BY THIS DAPIA APPROVAL. REFER TO THE LOCAL BUILDING CODES.

GENERAL NOTES:

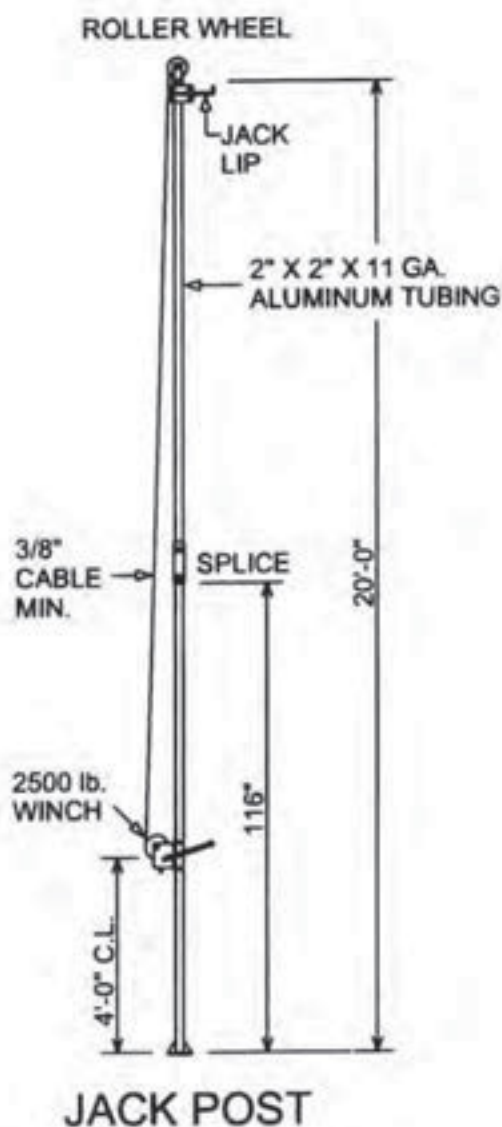
1. DESIGN IS APPLICABLE TO UNITS HAVING END SHEARWALLS ONLY.
2. DESIGN FOR MAXIMUM ROOF SLOPE OF 20 DEGREES.
3. DESIGN FOR WIND ZONE 1 ONLY.

APPENDIX J - JACKING PROCEDURES FOR HINGED ROOF

Set one section of home on site. Bring the other section of home to within approximately 4'-0" of the first section. Caution should be taken not to enter the roof cavity during the jacking procedure. Position the jacks vertically to prevent the jack foot from kicking out or sliding.

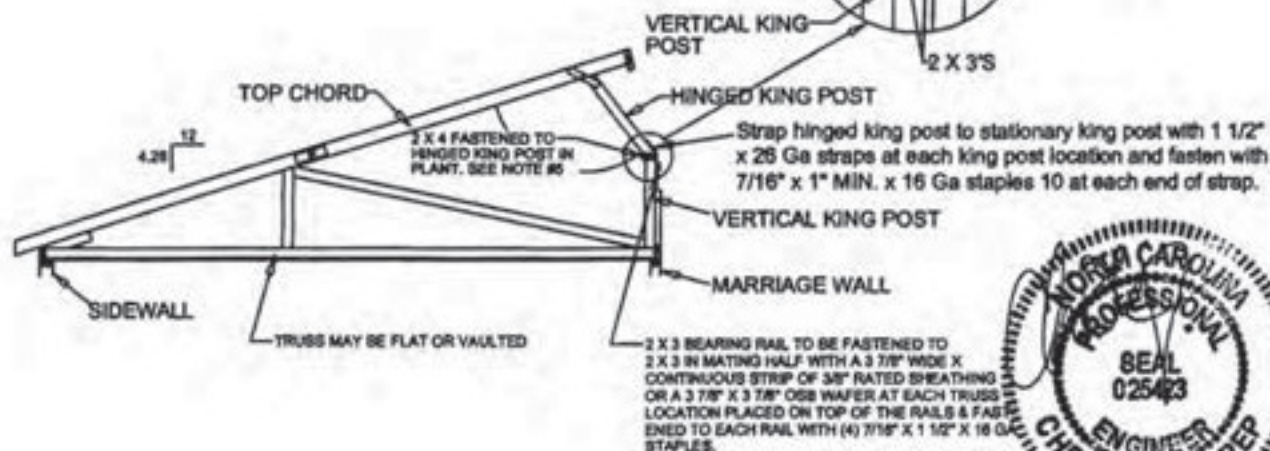
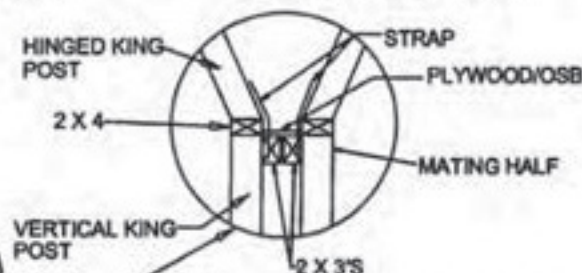
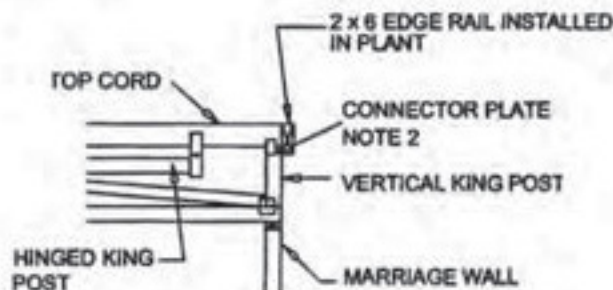
Remove shipping plastic and roof transportation securing straps. Position the jacks not over 10'-0" from each end and approximately 16'-0" apart down the marriage wall carefully raising jacks at each location so the jack lip catches roof edge rail, evenly lift roof so no racking occurs. Racking of any sort during the jacking process will probable damage the roof. It is the contractors and/or set-up crews responsibility to check the home for damage before and after installation. If damage exists prior to the installation, the manufacturer is to be notified. Any damage reported after installation (not reported earlier) will be the contractors and/or set-up crews responsibility. Roof racking should be corrected by the set-up crew.

NOTE: See appropriate pages for your exact set-up whether the home has a 5/12 or a 7/12 roof pitch.



5/12 (NOMINAL) ON SITE HINGED TRUSS SET-UP WITH SINGLE 2 X 4 @ KING POST WIND ZONE 1, 2 & 3

1. Remove close up material (strips, plastic, and fasteners) from marriage wall and end of home.
2. Remove connector plates that hold the truss top cord to the vertical post of the truss.
3. Use jacks provided by dealer or the setup crew to lift the roof to an upright position.
4. Jack the roof into an upright position, raising it evenly so as not to jack any section higher than another, allowing hinged king post to swing down.
5. Pull hinged king post with 2 x 4 tight to rest on vertical king post.
6. Fasten down thru 2 x 4 that fastened to the hinged king post into the top of the vertical king post with (4) .131 x 3 PD nails (2) on each side of king post.



7. The ridge assembly sections are to be placed in the void between the two halves, they should be fastened together through the 2 X 4 into the 2 X 6 w/ 8/6 x 3" screws, .131 X 3 PD nails or 7/16" x 2 1/2" - 15 ga staples @ 24" o.c.

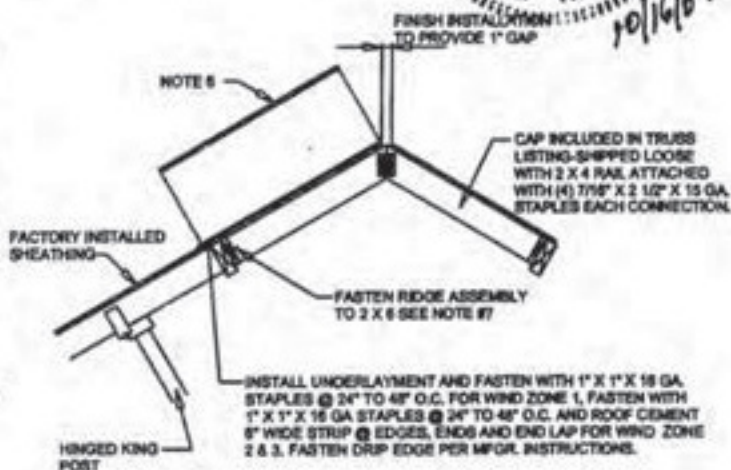
8. Cut roof sheathing to fit starting from edge of sheathing as shown and fasten to truss top chord and to ridge assembly framing (including rail) w/ 7/16" x 1 1/2" - 16 ga. staples at 4" o.c. doubled at wind zone 2 & 3. max. unit length = 72" for wind zone 2 units (for longer units use 7/16" x 1 1/2" - 15 ga. staples doubled @ 4" o.c.)

9. Install metal ridge cap, shingles and shingle ridge cap per set-up manual.

10. See page J-4 for endwall knee wall installation and close up.

11. Remove strip of plastic or felt located under the row of shingles at the hinge area to allow that row of shingles to seal down to the row below.

12. See other set-up procedures in the installation and set-up manual for instructions on connecting the halves together.

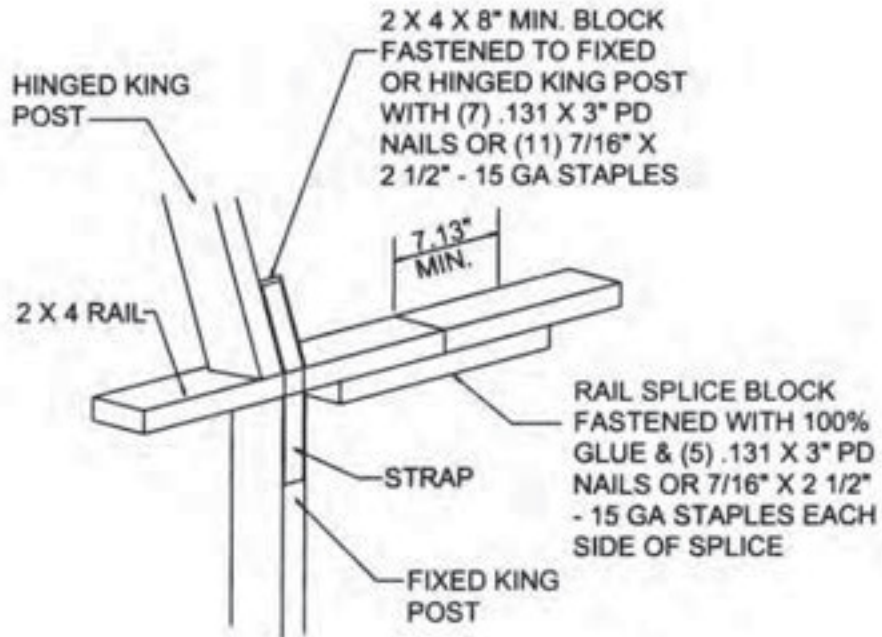


APPROVED BY

NIA INC.
Revised
Oct 17, 2007
FEDERAL MANUFACTURED HOME
CONSTRUCTION AND SAFETY STANDARDS

UPLIFT STRAP BLOCK & SPLICE BLOCK - HINGED TRUSS

WIND ZONE 1, 2 & 3

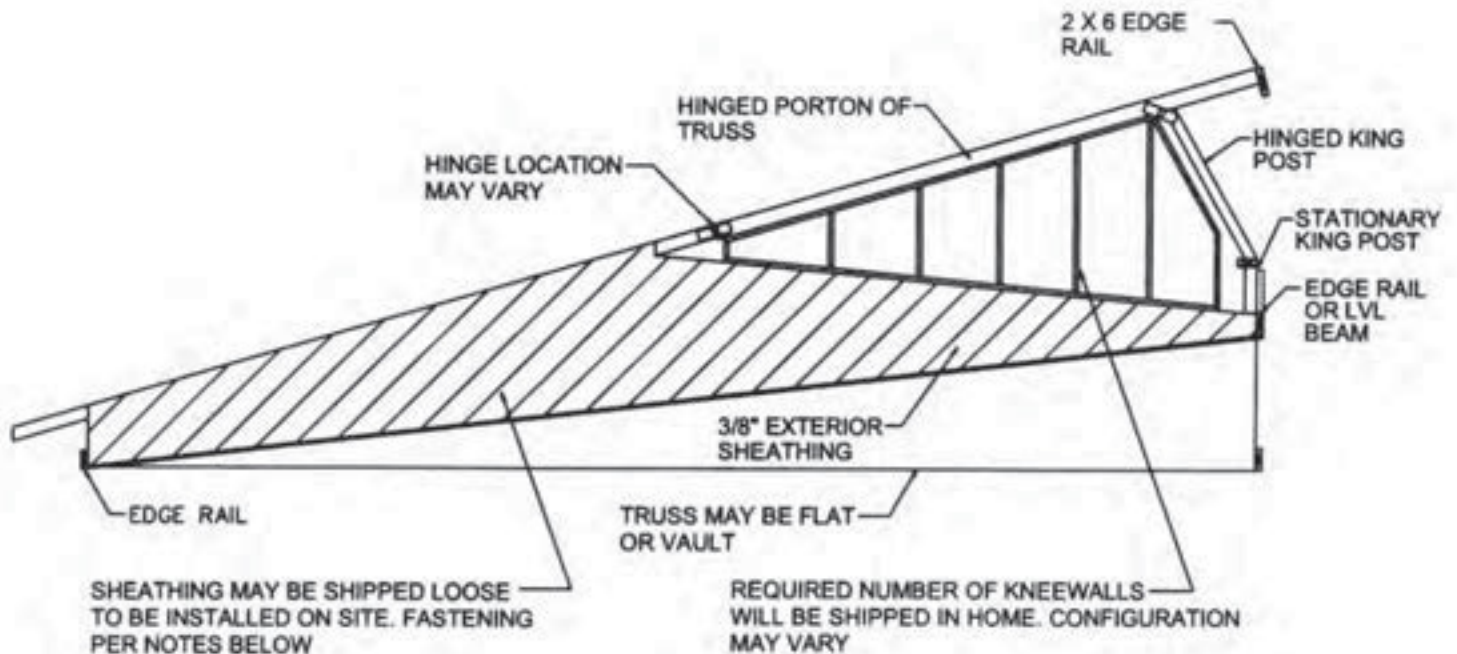


BLOCK FOR USE WHEN HINGED KING POST DOES NOT ALIGN WITH FIXED KING POST, STRAP NEEDS TO BE LOCATED ON BLOCK, AND IT MAY BE ON EITHER SIDE OF KING POST OR ON TOP OR BOTTOM OF 2 X 4 RAIL. (2 X 3 BEARING RAIL NOT SHOWN FOR CLARITY)

BLOCK AND RAIL SPLICE BLOCK TO BE MIN. #3 SPF.



5/12 (NOMINAL) ON SITE KNEE WALL INSTALLATION & CLOSE UP



WIND ZONE 1, 2 & 3:

EXTERIOR ENDWALL KNEEWALLS:

After roof has been secured in place install a kneewall as shown above on each half at the gable end of each home. Fasten kneewalls to truss top & diagonal chords with .131 x 3" PD nails at 8" o.c. Cut 3/8" osb or plywood to fit void area and secure to kneewall with 7/16" x 1 1/2" - 15 ga. staples at 2" o.c. (edge and infield) all zones.

INTERIOR SHEARWALL KNEEWALL(S)

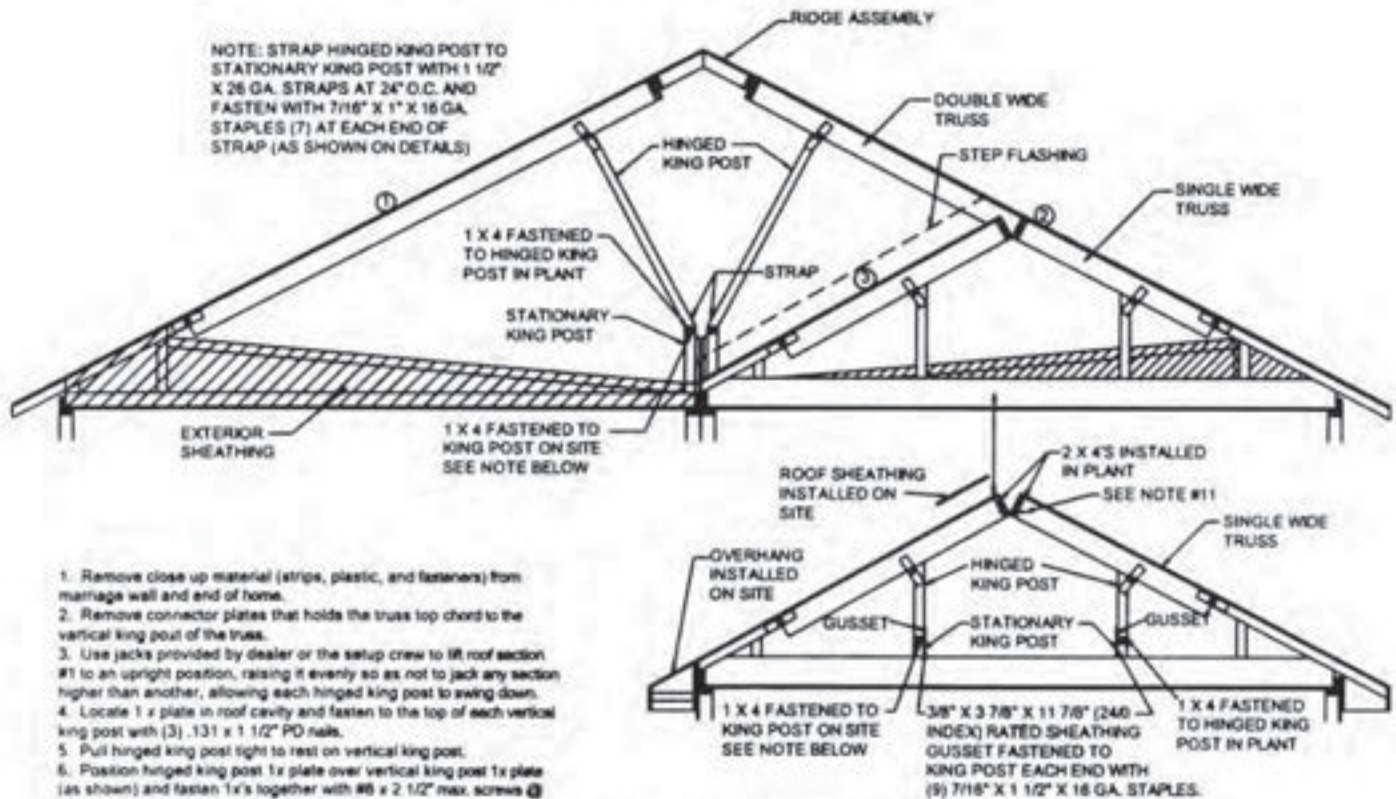
Locate interior shearwall(s) if applicable and install a kneewall in the truss above the shearwall and fasten to truss top & diagonal chords with .131 x 3" PD nails at 3" o.c. Cut 3/8" osb or plywood to fit void area and secure to both sides of kneewall with 7/16" x 1 1/2" - 15 ga. staples at 2" o.c. (edge and infield) all zones.

Adjust shingles at hinged portion of roof if necessary. Finish vinyl exterior siding per manufacturer instructions.

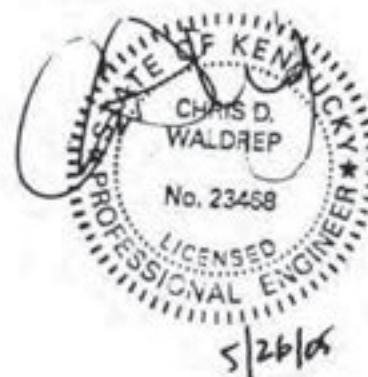


ON SITE HINGED TRUSS SET-UP FOR TRIPLE WIDE AND END LOADER UNITS

WIND ZONE 1, 2 AND 3

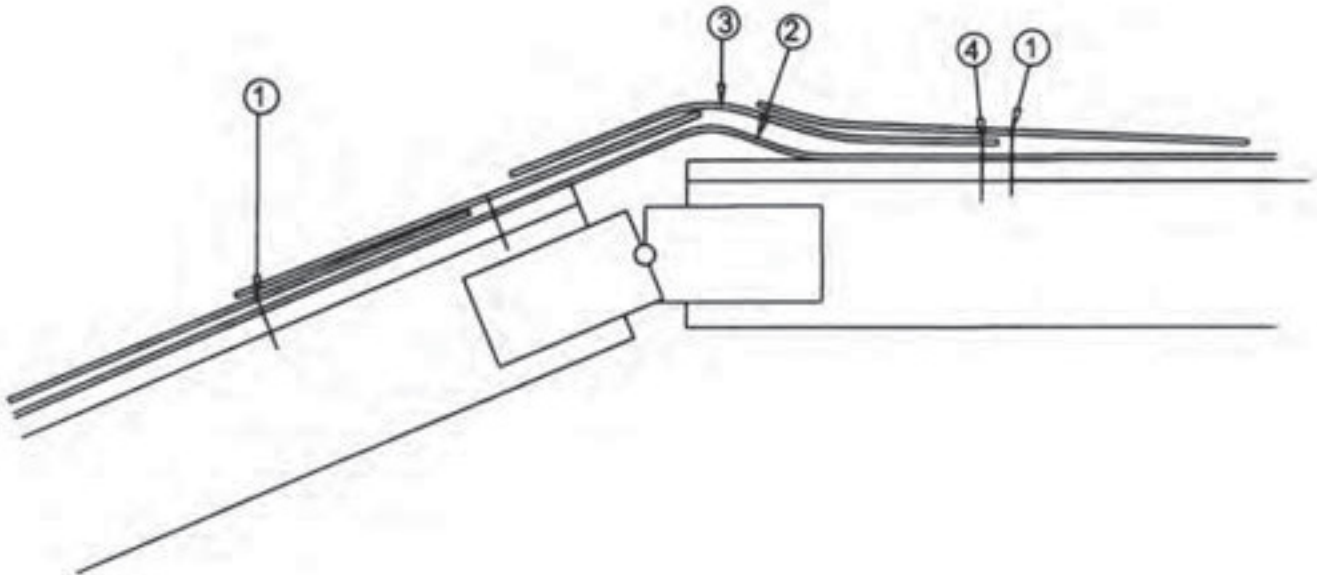


1. Remove close up material (strips, plastic, and fasteners) from mamage wall and end of home.
2. Remove connector plates that holds the truss top chord to the vertical king post of the truss.
3. Use jacks provided by dealer or the setup crew to lift roof section #1 to an upright position, raising it evenly so as not to jack any section higher than another, allowing each hinged king post to swing down.
4. Locate 1 x plate in roof cavity and fasten to the top of each vertical king post with (3) .131 x 1 1/2\" PD nails.
5. Pull hinged king post tight to rest on vertical king post.
6. Position hinged king post 1x plate over vertical king post 1x plate (as shown) and fasten 1x's together with #8 x 2 1/2\" max. screws @ 12\" o.c. or 120 x 2\" PD nails @ 5 1/2\" o.c.
7. Raise roof section #2 along with right side of the single wide roof section and secure into place same as with roof section #1.
8. Place the ridge assembly section into place between the two halves, and fastened together through the 2x4 into the 2x6 on each side with #8 x 2 1/2\" screws at 12\" o.c.
9. Cut roof sheathing to fit starting from edge of cap as shown and fasten to framing members and to ridge assembly framing with 7/16\" x 1 1/2\" - 16 ga. staples at 4\" o.c. or 6d nails at 6\" o.c.
10. See page A1-6.5.1 for endwall kneewall installation and close up.
11. Raise roof section #3 into position, locate 1x plate in roof cavity and fasten to the top of each vertical king post with (3) .131 x 1 1/2\" PD nails. Lower hinged king post and position hinged king post 1x plate over vertical king post 1x plate and fasten together with #8 x 2 1/2\" screws @ 12\" o.c. or 120 x 2\" PD nails at 5 1/2\" o.c. Fasten 2 x 4 ridge members together with #8 x 4\" screws @ 16\" o.c. max.
12. Install shingles, step flashing and shingle cap or ridge vent on the ridge assembly. Remove strip of plastic or felt located under the row of shingle at the hinge area to allow that row of shingles to seal down to the row below.
13. See other set-up procedures in the installation and set-up manual for instructions on connecting the halves to gether.



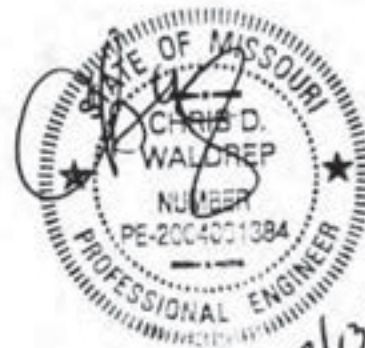
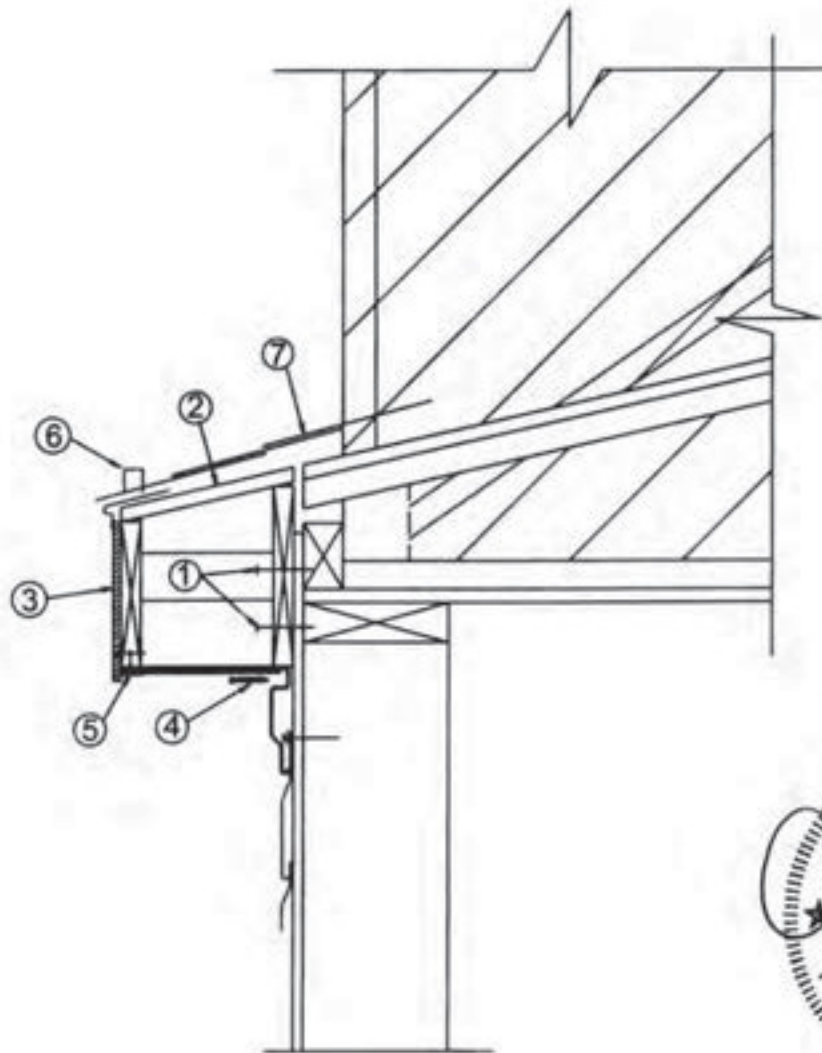
Shingle & Underlayment at Roof Hinge

- 1). STANDARD SHINGLE FASTENING, SEE SHINGLE FASTENING INSTRUCTIONS
- 2). UNDERLAYMENT.
- 3). SHINGLE OVERLAPPING THE HINGE JOINT, THIS SHINGLE MUST BE FASTENED PER SHINGLE FASTENING INSTRUCTIONS AFTER ROOF IS ERECTED.
- 4). STAPLES THROUGH THE TOP EDGE OF THE OVERLAPPING SHINGLE.



THIS PAGE TO BE SHIPPED WITH HOME
WITH HINGED TRUSS SYSTEM.

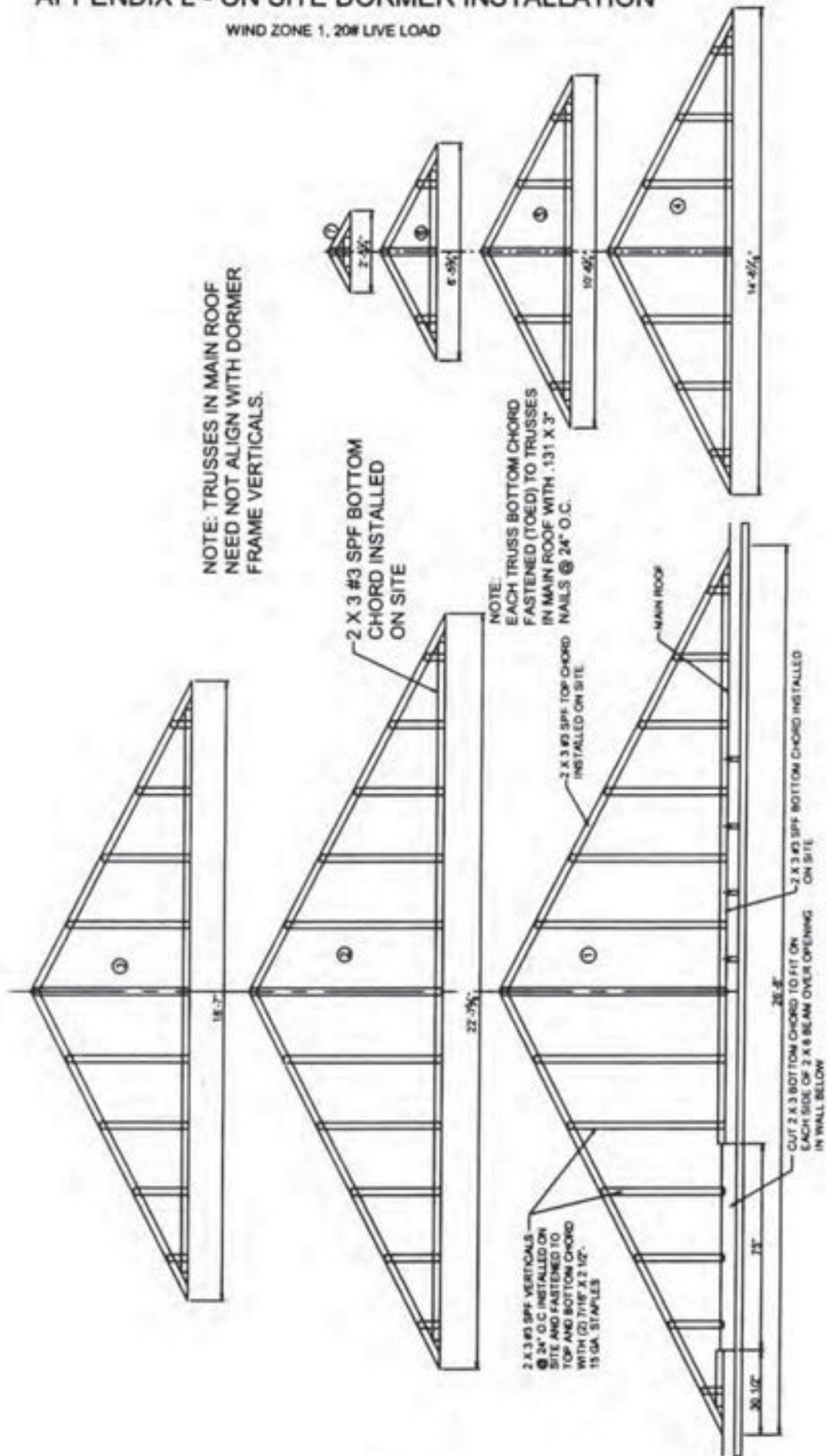
APPENDIX K - SHIP LOOSE OVERHANG INSTALLATION AT SET-UP WIND ZONE 1, 2 AND 3



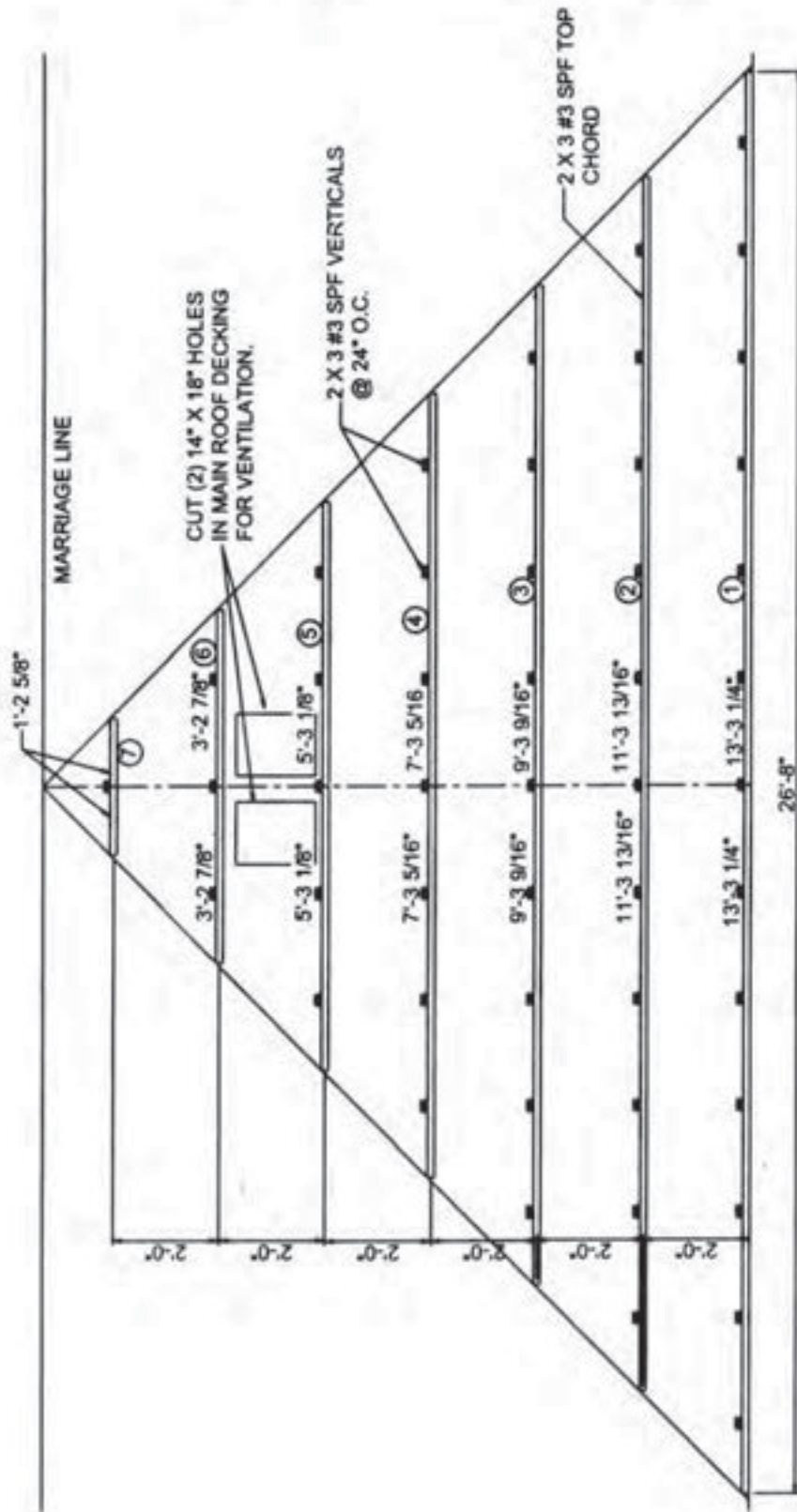
1. OVERHANG FASTENED TO TOP PLATE AND EDGE RAIL ON SITE
W/#8 X 3" SCREWS @ 16" O.C. (2 ROWS)
2. SHEATHING FASTENED AROUND PERIMETER OF OVERHANG WITH
7/16" X 16 GA. X 1" PENETRATION STAPLE @ 2 3/4" O.C.
3. FASCIA FASTENED TO 1 X 6 WITH (1) 2 1/2" X 7d NAILS @ 16" O.C.
STAGGERED.
4. VINYL CROWN TO STUDS WITH 1 1/4" METAL SCREW @ 48" O.C.
5. SOFFIT MATERIAL AND 3" L BAR FASTENED TO 1 X WITH (1) 3/4" X 18 GA.
STAPLE @ 24" O.C.
6. SHINGLE DRIP EDGE TO DECKING WITH 1" X 3/4" X 16 GA. STAPLES OR
.120 X 1" NAILS @ 8" TO 10" O.C.
7. INSTALL AND FASTENED SHINGLES PER SHINGLE INSTRUCTIONS IN SET-
UP MANUAL.

APPENDIX L - ON SITE DORMER INSTALLATION

WIND ZONE 1, 20# LIVE LOAD



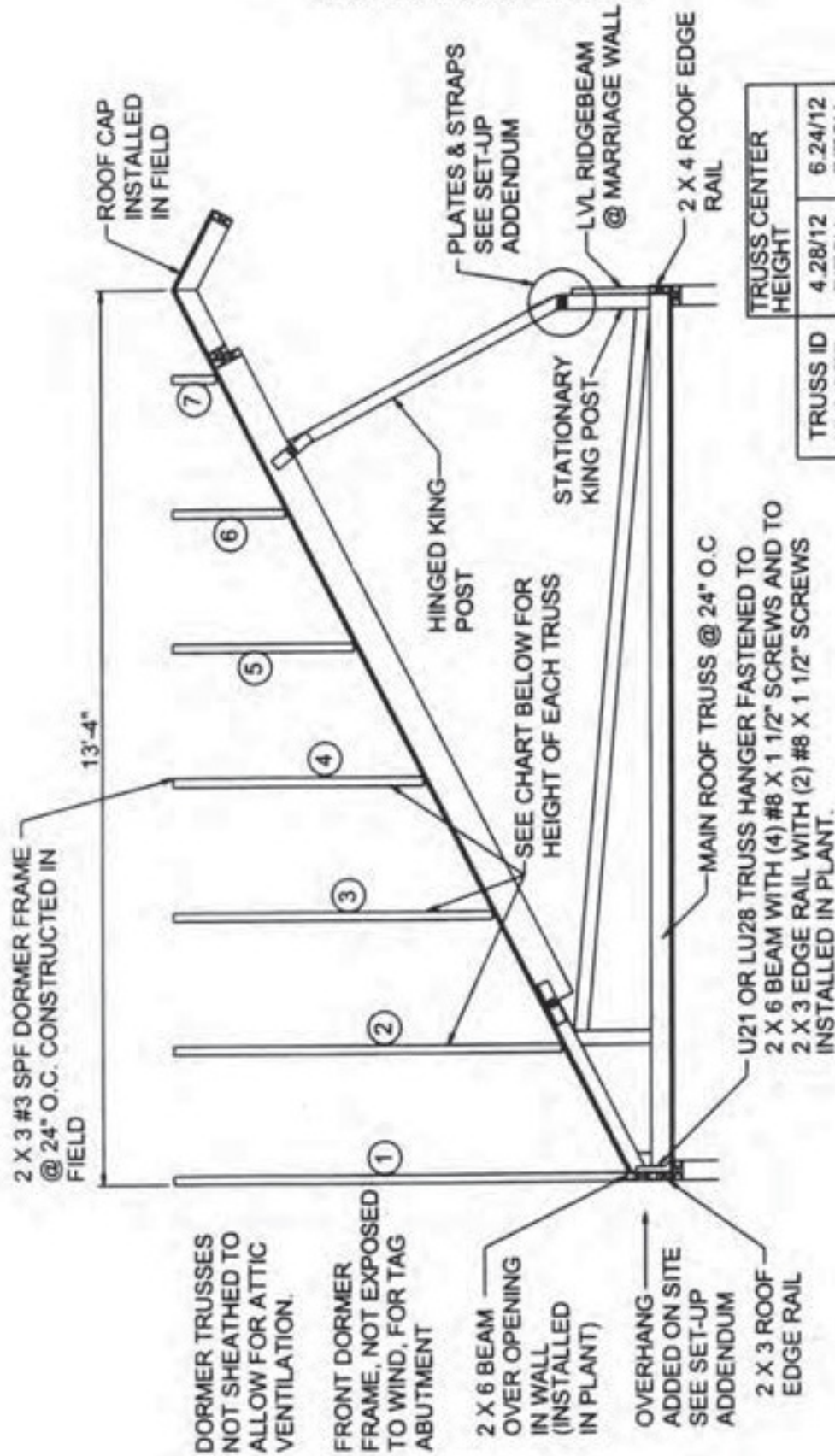
ON SITE DORMER INSTALLATION



1. MAKE SURE ALL SHINGLES ARE REMOVED FROM DORMER FOOT PRINT AREA BEFORE SETTING DORMER IN PLACE.
2. ROOF TRUSSES @ 24" O.C. FOR WIND ZONE 1, 20# LIVE LOAD.
3. INSTALL ROOF SHEATHING TO FRAMING WITH 7/16" X 1" PENERATION 16 GA. STAPLES @ 6" O.C.
4. INSTALL VALLEY FLASHING AND SHINGLES PER MANUFACTURER'S INSTRUCTIONS.

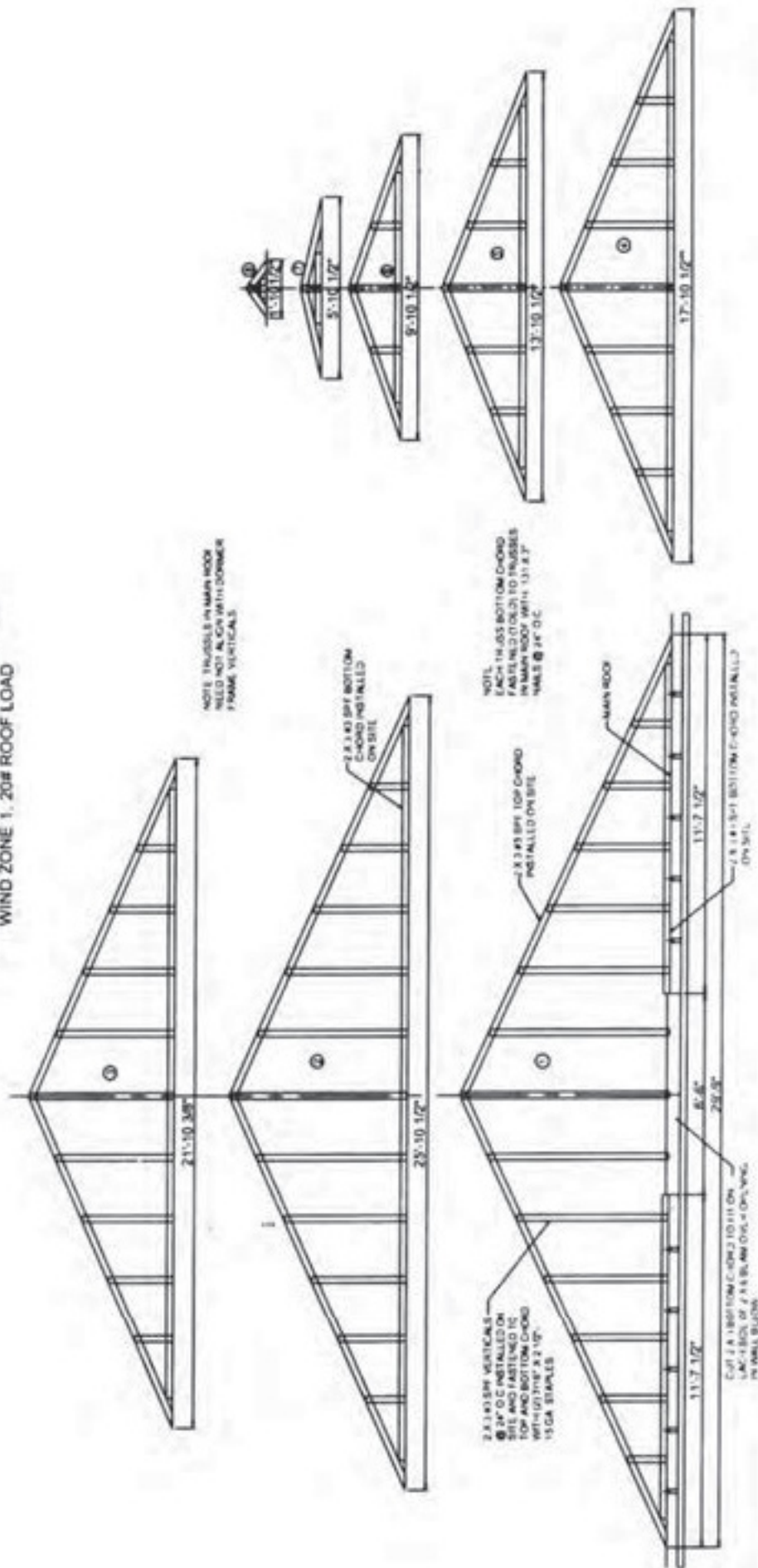
ON SITE DORMER INSTALLATION

WIND ZONE 1, 20# LIVE LOAD



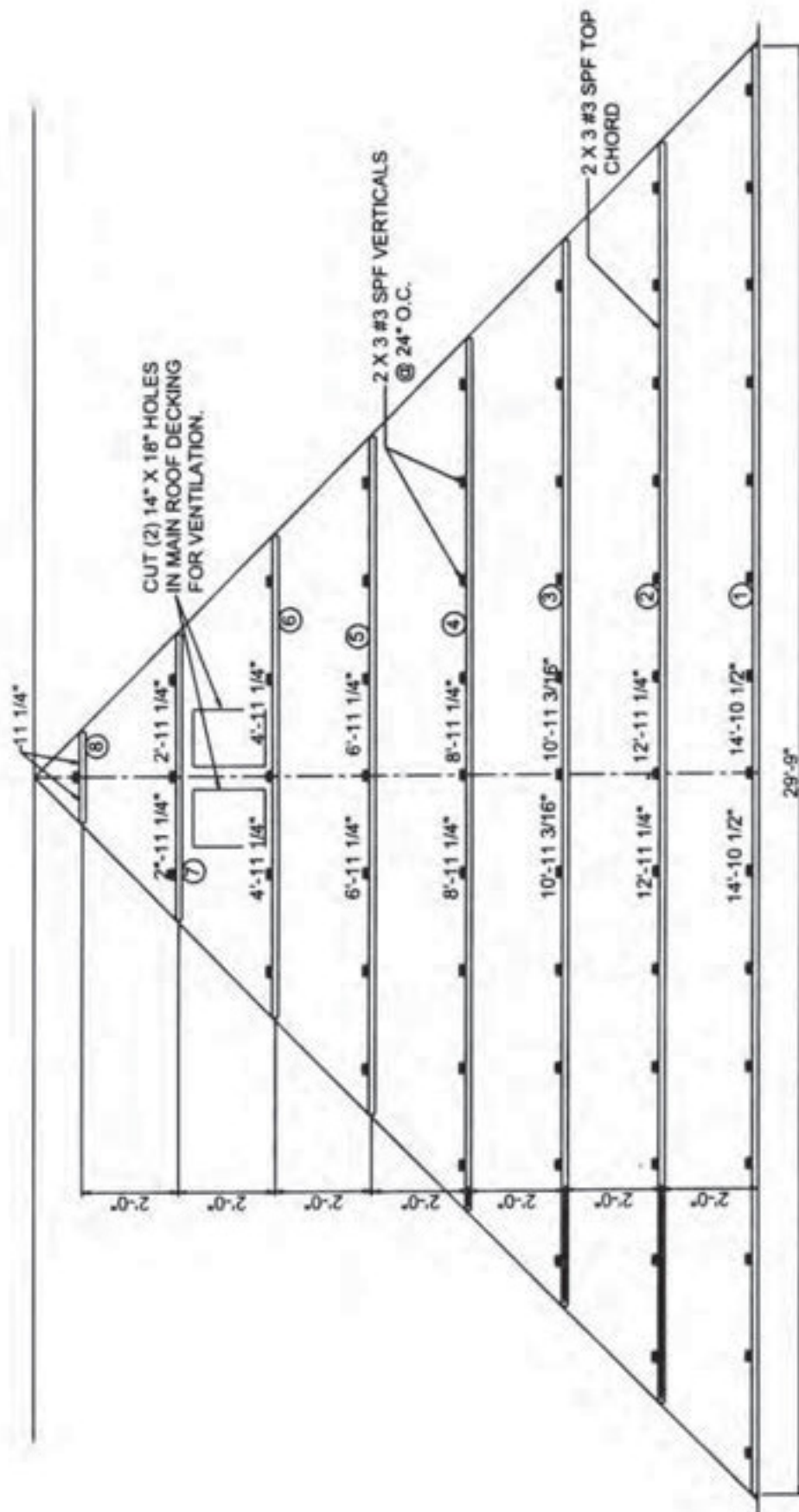
TRUSS ID NUMBER	TRUSS CENTER HEIGHT	PITCH	PITCH
1	57 3/4"	4.28/12	6.24/12
2	48 1/2"	57 3/4"	81 5/8"
3	39 7/8"	48 1/2"	69 5/8"
4	31 3/8"	39 7/8"	57 1/8"
5	22 13/16"	31 3/8"	44 15/16"
6	14 1/4"	22 13/16"	32 9/16"
7	5 11/16"	14 1/4"	20 3/16"
		5 11/16"	7 7/8"

ON SITE DORMER INSTALLATION WIND ZONE 1, 20# ROOF LOAD



ON SITE DORMER INSTALLATION

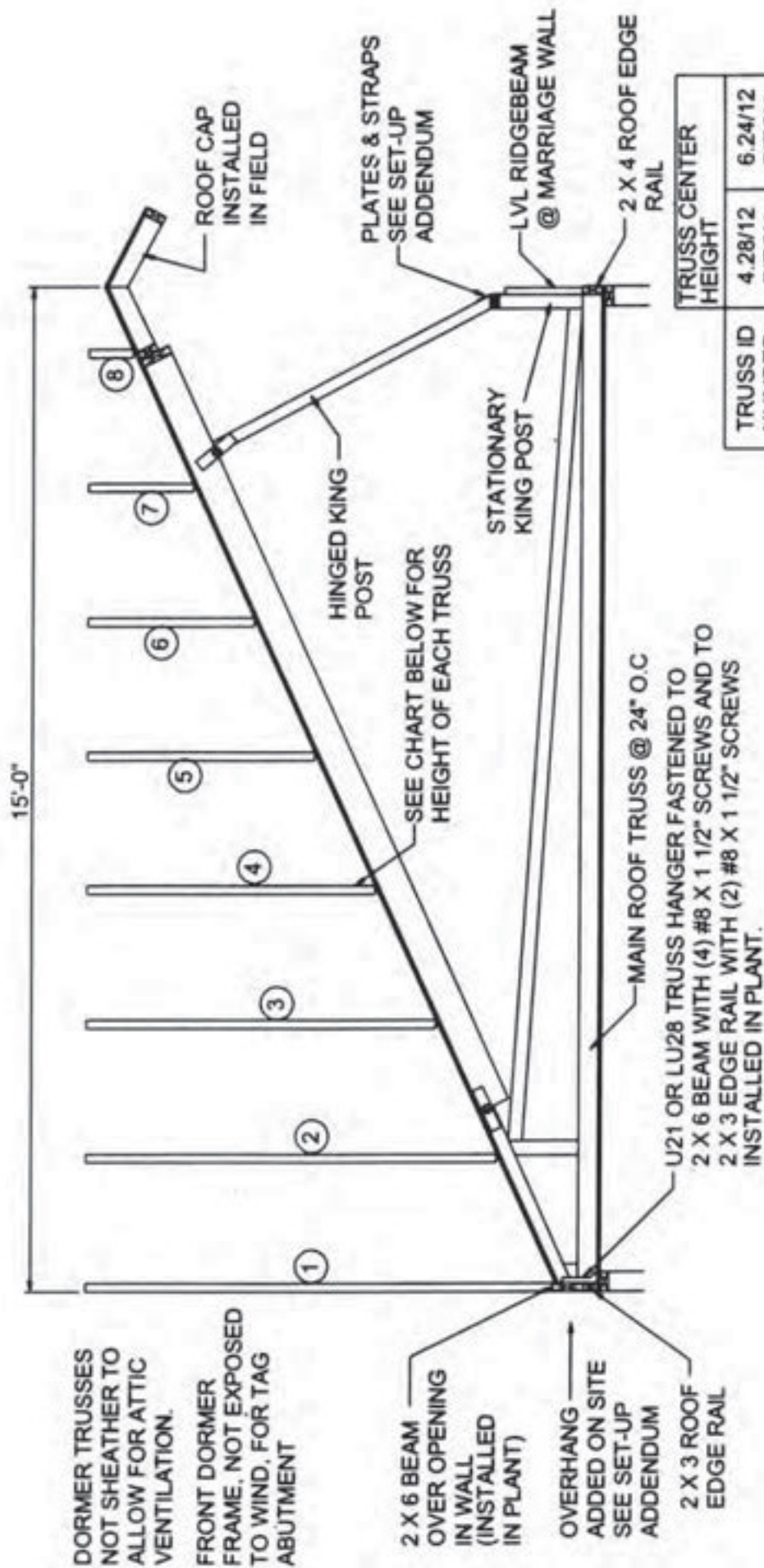
WIND ZONE 1, 20# ROOF LOAD



1. MAKE SURE ALL SHINGLES ARE REMOVED FROM DORMER FOOT PRINT AREA BEFORE SETTING DORMER IN PLACE.
2. ROOF TRUSSES @ 24" O.C. FOR WIND ZONE 1, 20# LIVE LOAD.
3. INSTALL ROOF SHEATHING TO FRAMING WITH 7/16" X 1" PENTERATION 16 GA. STAPLES @ 6" O.C.
4. INSTALL VALLEY FLASHING AND SHINGLES PER MANUFACTURER'S INSTRUCTIONS.

ON SITE DORMER INSTALLATION

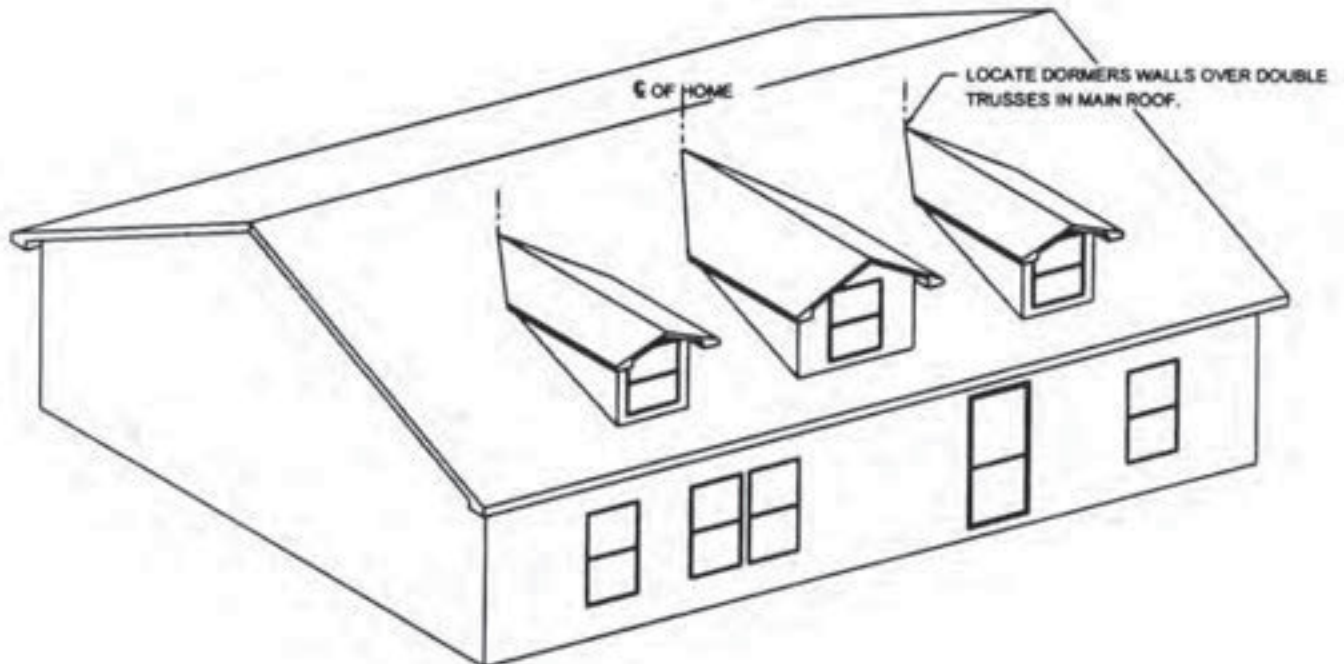
WIND ZONE 1, 20# LIVE LOAD



TRUSS ID NUMBER	TRUSS CENTER HEIGHT	4.28/12 PITCH	6.24/12 PITCH
1	55 9/16"	91 1/4"	
2	48 5/16"	79 3/8"	
3	40 13/16"	67"	
4	33 3/8"	54 13/16"	
5	25 7/8"	42 9/16"	
6	18 7/16"	30 5/16"	
7	10 15/16"	18"	
8	3 1/2"	5 3/4"	

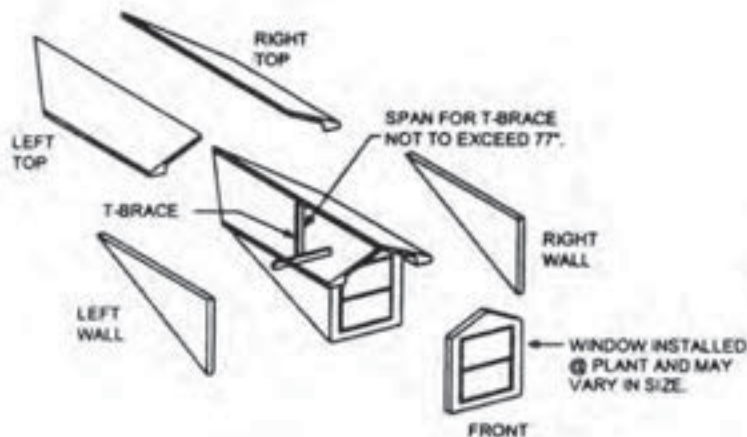
ON SITE INSTALLATION INSTRUCTIONS FOR GABLE ROOF DORMER

WIND ZONE 1

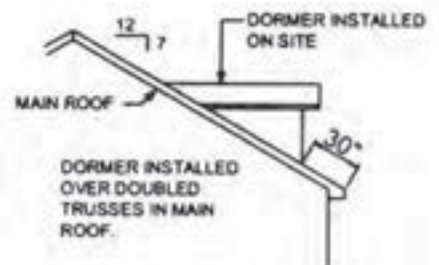


TYPICAL DORMER LAYOUT

1. LOCATE AND UNPACK THREE DORMER ASSEMBLY, ONE 72" DORMER AND TWO 43 3/4" DORMERS SHOWN BELOW THAT WERE SHIPPED WITH YOUR HOME.
2. LOCATE DOUBLE TRUSSES IN MAIN ROOF. DOUBLE TRUSSES MAY BE VIEWED FROM MARRIAGE SIDE OF HOME. A DRAWING SHOWING LOCATION OF TRUSSES WILL BE SHIPPED WITH YOUR HOME. INSTALL DORMER SIDE WALLS OVER DOUBLE TRUSSES IN MAIN ROOF. COMPLETE DORMER ASSEMBLY PER DETAIL BELOW, AND FASTEN EACH PART TOGETHER PER PAGE L-8.
3. WEAVE SHINGLES AT VALLEY OF DORMER AND MAIN ROOF. THIS WILL REQUIRE SOME SHINGLES ON MAIN ROOF TO BE PULLED BACK FOR THE WEAVE. CAP RIDGE OF DORMER WITH SHINGLES. REFER TO DETAIL ON PAGE L-8.
4. PULL SHINGLES BACK AT WALLS AND INSTALL FLASHING UNDER SHINGLES AND ABOVE UNDERLAYMENT.
5. INSTALL EXTERIOR SIDING AND TRIM PER MANUFACTURER INSTRUCTION SHIPPED WITH HOME.



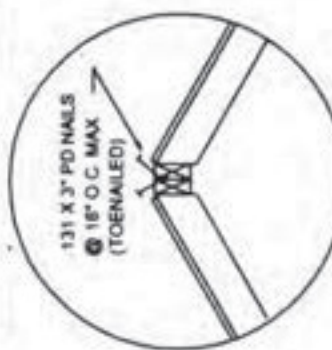
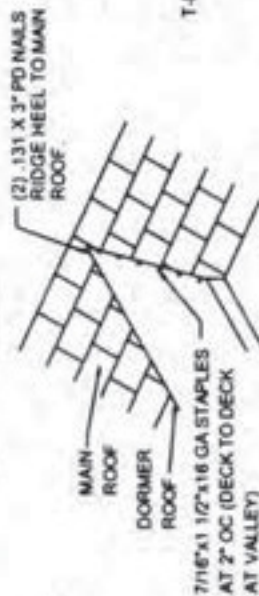
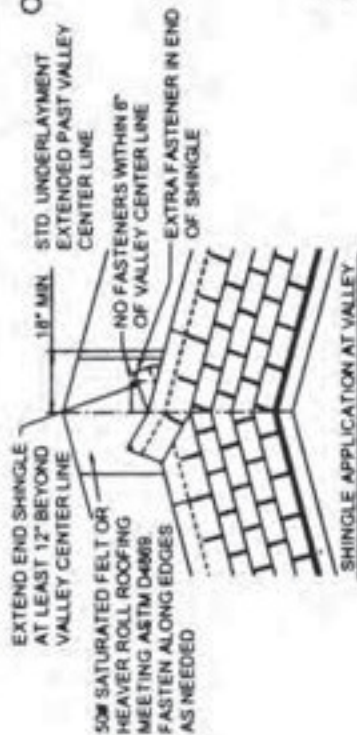
DORMER ASSEMBLY



DORMER LOCATION

ON SITE INSTALLATION INSTRUCTIONS FOR GABLE ROOF DORMER

WIND ZONE 1



ROOF TO ROOF @ CENTER

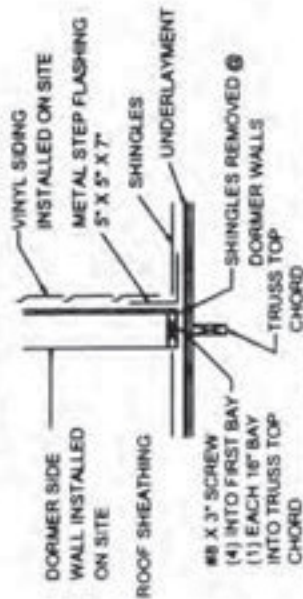
(2) #8 X 4\"/>

INSTALL RIDGE VENT
ON SITE SEE PAGE
L-9

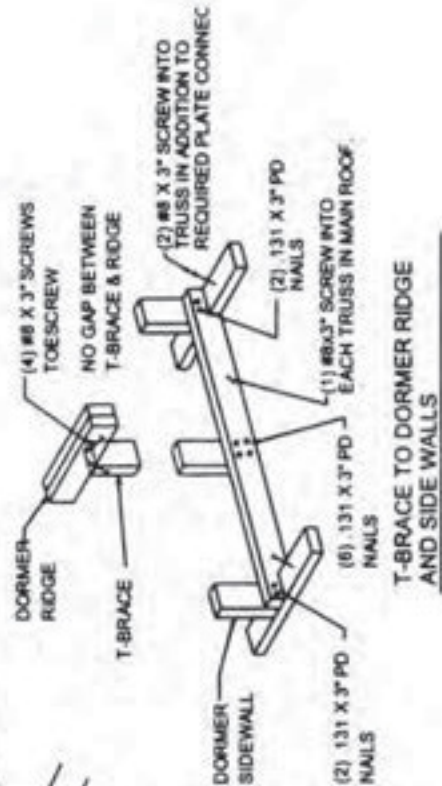
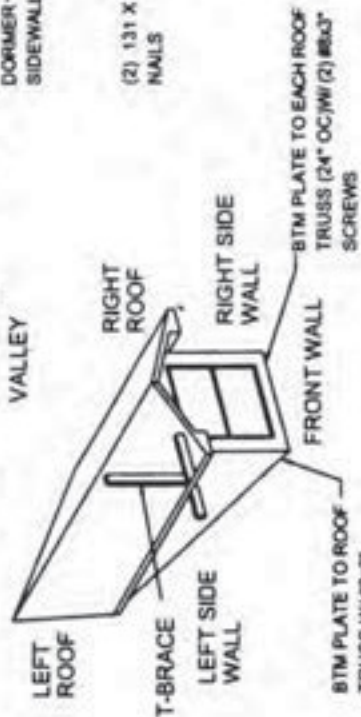


FRONT WALL TO SIDE WALL

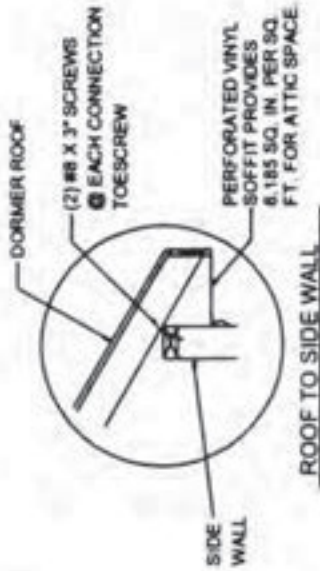
ROOF TO FRONT WALL



FLASHING @ DORMER WALLS



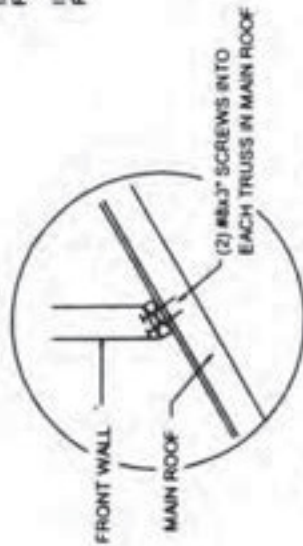
T-BRACE TO DORMER RIDGE AND SIDE WALLS



ROOF TO SIDE WALL

NOTES:
INSTALL STEP FLASHING, SHINGLES @ VALLEY OF MAIN
ROOF AND DORMER ROOF.

INSTALL VINYL PERFORATED SOFFIT AND VINYL SIDING
PER VINYL MANUFACTURER INSTRUCTIONS.



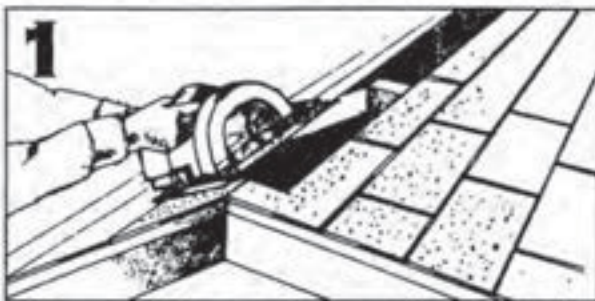
FRONT WALL TO MAIN ROOF

APPLICATION INSTRUCTIONS

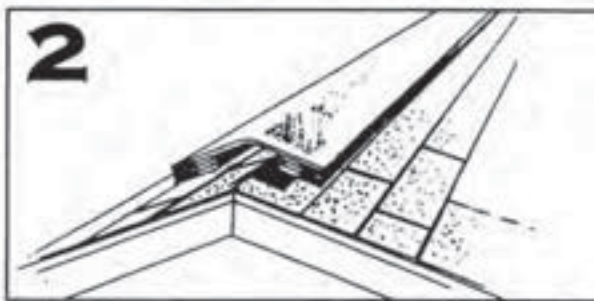
Trimline® ridge vents are tested and covered by one or more of the following U.S. patents: 4,803,813; 5,094,041; 5,304,095; and 5,331,783 and patents pending. These are attractive options for residential roof ventilation. Manufactured from tough, durable corrugated plastic, these vents can handle the severe cold of northern climates and the heat from the southern climates. The optional wind deflector is recommended to prevent moisture damage in areas where high winds with rain or snow can cause moisture infiltration.

Ridge Preparation for Installation

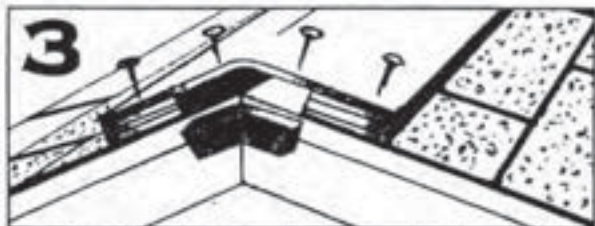
The amount of ventilation is controlled by the length of slot cut along the roof ridge. Remember, for a very attractive roof line, it is recommended that the Rigid Roll Ridge® Vent be installed along the entire ridge of the roof.



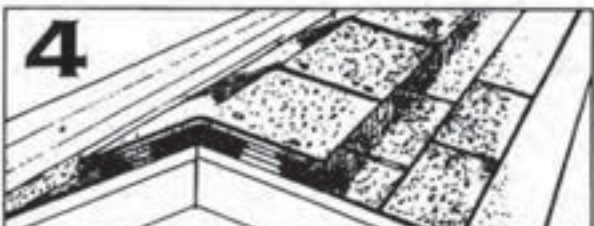
1. The slot may be pre-cut on a new roof before or after shingle installation or as in a retrofit, the slot can be cut from the pre-shingled roof using a circular saw with a carbide tip blade. (Protective eye goggles should be worn during this process). Cut a 1-1/2" slot (3/4" on each side of ridge) along the ridge(s). For a roof with a center beam, a 3" slot should be cut (1-1/2" on each side of ridge). A minimum of 6" must be left uncut on each end of the ridge. Once the slot is cut and any overlapping shingles covering the ridge are trimmed and removed, the ridge is ready for vent installation.



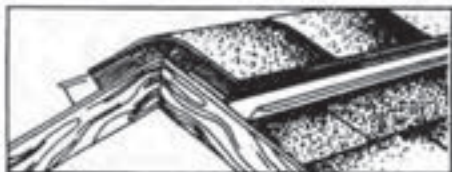
2. Place the Trimline vent (or roll out the Rigid Roll), routed side down along entire length of slot, covering the 6" minimum uncut ridge on both ends. Multiple lengths of vent can be joined by butting them tightly together.



3. Pull apart a pre-cut section of the foam endcap. Using construction adhesive or sealant caulk, insert the endcap into the end of the vent. (See illustration #3). Using four 2" galvanized roofing nails, attach vent to the roof deck by driving a nail in each of the two corners on both ends of the vent. If the 96" or longer vent is being installed, drive two additional nails, one on each side of the vent, spaced every 4 ft. On the ends of the ridge, drive two nails through the vent and foam endcap to hold foam in place. For the fastest installation, it is recommended that a coil nail gun be used to install the low profile 5/8" thick ridge vents.



4. After the vents have been installed, cut ridge shingles, pre-form, and nail with roofing nails in a common overlapping pattern. Nails should be approximately 5" apart and long enough to penetrate the wood roof deck at least 1/2 inch. Repeat this procedure until vents have been installed over all roof ridges. It is important when installing this vent that you maintain the pitch of the roof. The vent has been installed properly if the bottom of the vent is flat on the roof and the peak is slightly rounded.



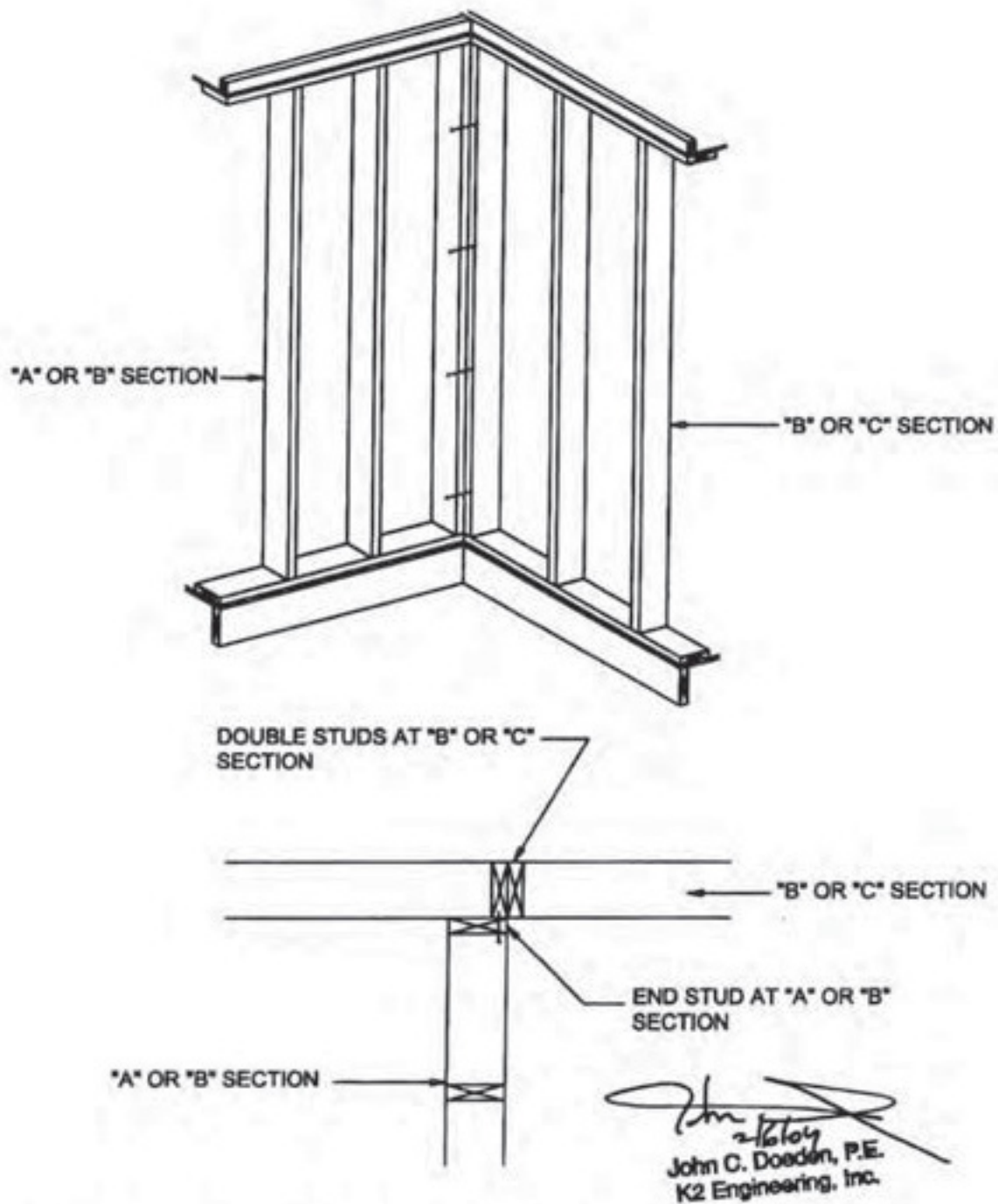
*Optional Wind Deflector

If the optional wind deflector is being installed, slide deflector between the vent and the roof shingle until the edge of the two placement notches align with edge of vent. Drive two additional 2" roofing nails on each side of vent to hold the deflector in place. If the 96" or longer vent is being installed, repeat this process along the entire length of the vent.

*Trimline offers an optional wind deflector. In areas of high wind accompanied by rain or snow, installation of the wind deflector is recommended to prevent moisture infiltration. Manufactured from aluminum, this baffle will not rust, and, if desired, may be painted to match the color of the shingle or trim of the house.

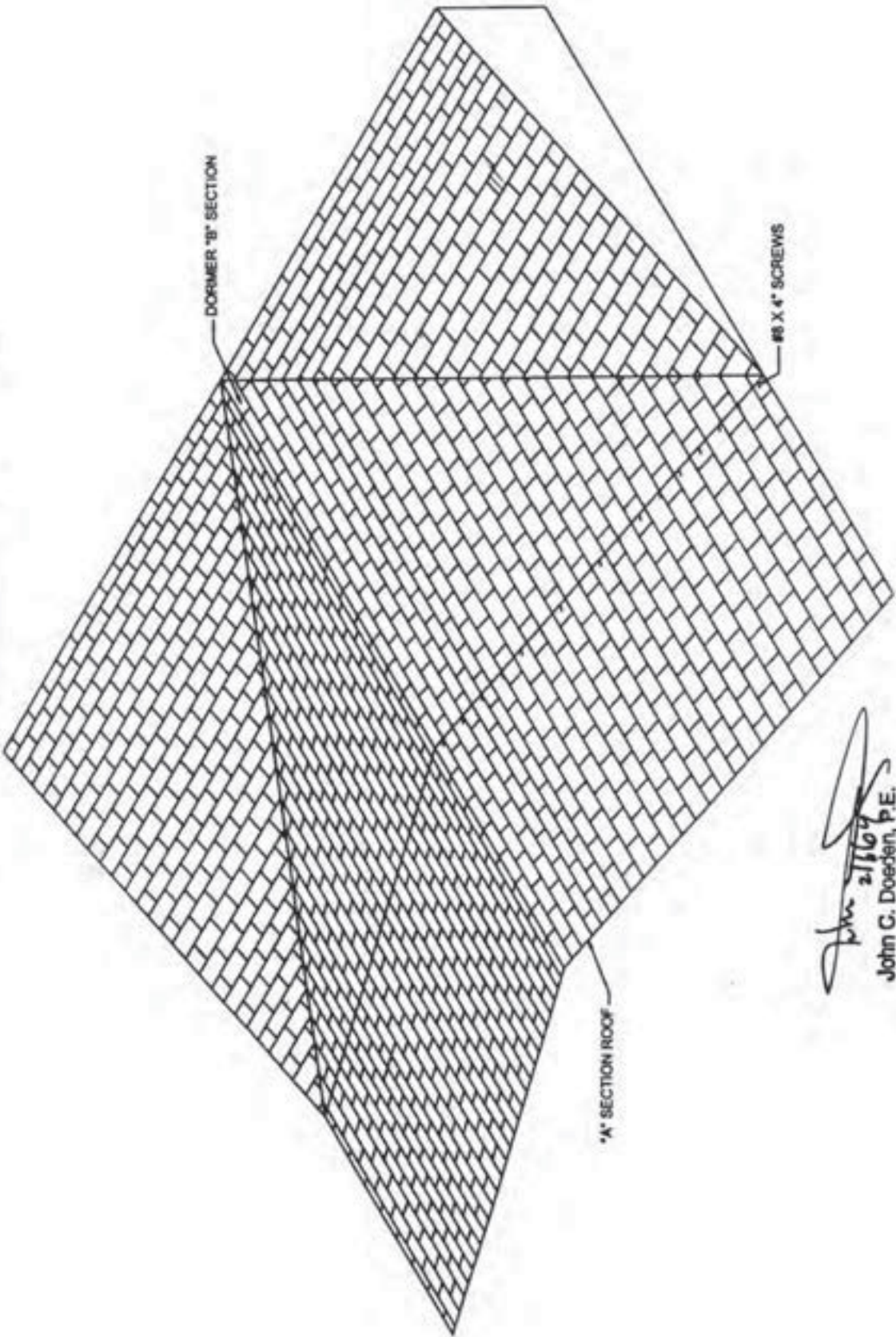
Trimline Ridge Vents when used with wind deflectors, are Dade County, Florida approved to withstand wind speeds up to 110 MPH with rainfall of 8.8" per hour with NO RAIN INFILTRATION. Without wind deflectors, the vent had leakage at 50 MPH wind speed with 8.8" per hour rainfall, the lowest wind speed tested on a 3/12 pitch roof. Testing was done by Construction Research Laboratory of Miami, Florida, which is accredited by the AAMA, ICBO, Metro Dade County, City of Los Angeles and the State of New York, Division of Housing and Community Renewal.

WALL TO WALL CONNECTION - WIND ZONE 1, 2 AND 3



FASTEN "A" OR "B" SECTION TO "B" OR "C" SECTION WITH #8 X 3" SCREWS @ 12" O.C. OR 5/16" X 3" LAG SCREWS @ 32" O.C. (MAYBE TOED).

ROOF TO ROOF CONNECTION - WIND ZONE 1, 2 AND 3

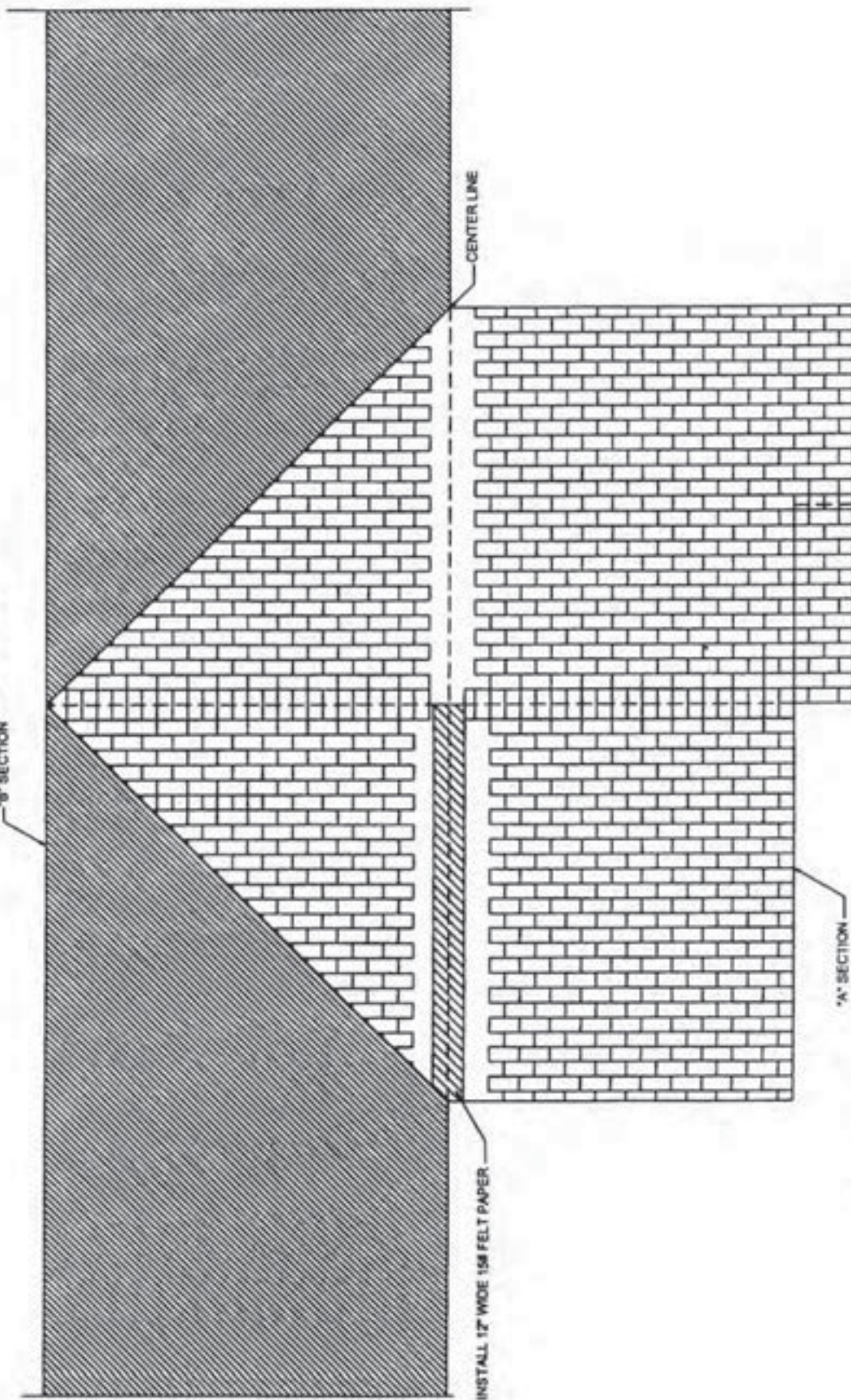


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John C. Doeden, P.E.
K2 Engineering, Inc.

FASTEN "A" SECTION ROOF TO "B" SECTION ROOF WITH 1/2" X 4" SCREWS (TOED) @ 11" O.C. FOR WIND ZONE 1, 9" O.C. FOR WIND ZONE 2 AND 7" O.C. FOR WIND ZONE 3. SEE SET-UP MANUAL FOR RIDGE CAP INSTALLATION.

TRIPLE WIDE ROOF FINISH AT SET-UP
WIND ZONE 1, 2 AND 3

"B" SECTION



INSTALL 12" WIDE 15# FELT PAPER

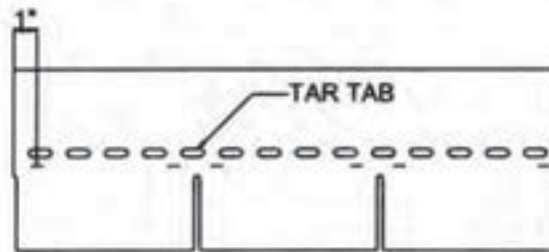
"A" SECTION

1. REMOVE SHINGLES AT CENTER LINE OF "A" AND "B" SECTIONS.
2. APPLY FELT BY CENTERING OVER JUNCTION OF "A" AND "B" SECTION. FASTEN AT 4" O.C. WITH STAPLES OR ROOFING NAILS.
3. APPLY SHINGLES STARTING AT BOTTOM AND WORKING TO PEAK. (4) FASTENERS PER SHINGLE PER MANUFACTURER INSTALLATION INSTRUCTIONS FOR WIND ZONE 1 AND (6) FASTENERS FOR WIND ZONE 2 AND 3.
4. SEE SET-UP MANUAL FOR RIDGE CAP INSTALLATION.

John C. Doeden, Inc.
John C. Doeden, Inc.
K2 Engineering, Inc.

SHINGLE INSTALLATION

SHINGLE FASTENING 2" TO 3" AT GABLE ENDS AND DORMER ENDS.

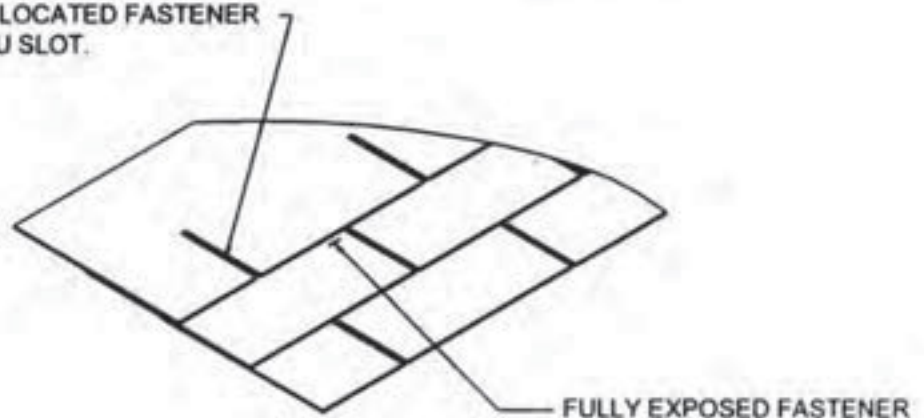


INSTRUCTIONS FOR STAPLING ASPHALT SHINGLES

1. ALL FASTENERS ARE TO BE ZINC COATED (HOT DIPPED, MECHANICALLY OR ELECTRICALLY DEPOSITED)
2. ALL FASTENERS ARE TO BE DRIVEN WITH PNEUMATIC STAPLERS.
3. STAPLES SHALL BE MINIMUM 16 GAGE WITH MINIMUM 15/16" CROWN WIDTH AND OF SUFFICIENT LENGTH TO PENETRATE 3/4" INTO WOOD DECK OR THROUGH SHEATHING.
4. FOUR FASTENERS ARE REQUIRED FOR EACH SHINGLE IN WIND ZONE I WITH 6 FASTENERS REQUIRED FOR WIND ZONE II & III.
5. ON SHINGLES WITH NORMAL 5 INCH EXPOSURE, FASTENERS SHALL BE DRIVEN AS FOLLOWS:
 - 5 5/8" UP FROM THE BOTTOM EDGE.
 - WITH NO FASTENER LEG CLOSER THAN 1" FROM THE EDGE OF THE SHINGLE.
 - WITH THE CROWN PARALLEL TO THE LENGTH OF THE SHINGLE.
 - POSITION FASTENER 1 TO 1 3/4" FROM EACH END AND 1 FASTENER ON EACH SIDE OF EACH CUTOUT.
6. FOR SHINGLES WITH OTHER EXPOSURES, FOLLOW THE MANUFACTURER'S INSTRUCTIONS.
7. FASTENERS MUST BE DRIVEN WITH GUN ACCURATELY ADJUSTED TO INSURE THAT THE ENTIRE CROWN BEARS TIGHTLY AGAINST THE SHINGLE BUT DOES NOT CUT THE SHINGLE SURFACE.

REPAIR METHOD FOR INCORRECTLY INSTALLED FASTENER.

INCORRECTLY LOCATED FASTENER
EXPOSED THRU SLOT.



REPAIR METHOD:

1. LIFT SHINGLE AS NEEDED TO ALLOW ACCESS AND REPAIR OF EXPOSED FASTENER.
2. COVER EXPOSED FASTENER(S) WITH MINIMUM 2" x 1" SPOT OF ROOF CEMENT. THIS METHOD MAY ALSO BE USED ON FASTENER THAT HAVE BEEN INSTALLED IN TAR TABS.
3. RESEAL LIFTED SHINGLES WITH MINIMUM 1/2" x 1" SPOTS OF ROOF CEMENT AT MAXIMUM 4" O.C.
4. WHEN FASTENERS ARE FULLY EXPOSED, SEAL AS IN #2.

Blue Nailed Drywall Finishing Procedures**First Coat** (Flat joints, Inside corners, Fasteners, Bead & Trim)**Step 1** (Flat joints)

Fiberglass Mesh Tape (fig. 1) apply tape centered over the joints and press in place using a 4"-5" joint knife. Apply compound over the tape using sufficient pressure to force the compound through the tape into firm contact with the gypsum board. **Paper Tape** (fig. 2) start with butt joints. Apply an even, thin coat of joint compound for the length of the joint with a 5" finishing knife. Center and lightly press tape into wet joint compound with fingers. Draw 5" knife firmly along joint to tightly embed tape. Be sure there is sufficient joint compound under tape to prevent blistering of the tape. While embedding the tape, (fig 3) remove excess joint compound from edge and apply as a thin coat over the tape. To finish tapered joints, follow same steps as butt joints. Tape should overlap tape applied to butt joints (fig. 4).



Fig. 1



Fig. 2



Fig. 3



Fig. 4

Step 2 (Inside corners)

Fiberglass Mesh Tape (fig. 5) fold the tape in half lengthwise and push the tape into the corner; unfold against the drywall and press in place using an inside-corner trowel. Apply joint compound as in step 1 (fig. 6).

Caution: It is difficult to fold fiberglass tape to achieve a straight interior corner. The use of paper tape in corners is recommended. **Paper Tape** (fig. 7) Use a 5" joint finishing knife to apply thin layer of joint compound on both sides of corner. Extend compound slightly beyond area to be covered by tape. Fold tape along center crease and lightly press into position with your fingers. Tightly embed tape as with other joints (fig. 8).



Fig. 5



Fig. 6



Fig. 7



Fig. 8

Step 3 (Fasteners)

For each fastener depression, apply joint compound with 5" knife. Holding the blade almost flush with the panel, draw the joint compound across a fastener head and the dimple surrounding it (fig. 9). Then raise the knife blade to a more upright position and scrape off excess with a second stroke at a right angle to the first stroke. Compound should be level with panel surface (fig. 10). **Tip:** To determine if fasteners are properly seated prior to finishing, draw clean knife over each fastener. If metallic ring occurs, drive fastener below surface, being careful not to break paper (fig. 11).



Fig. 9



Fig. 10



Fig. 11

Step 4 (Bead and Trim)

Paper-Faced Metal Corner Bead and Trim (Tape On) To apply follow step 2 (paper tape). After inside corner is applied, using a 6" taping knife, apply a coat of joint compound to both sides of the corner. Keep this coat as smooth as possible, feathering it out 5"-6" on each side. Let dry. Sand sides lightly where necessary (fig. 12).

Appendix O — Drywall Finishing

Metal Corner Bead and Trim apply joint compound with 8" knife onto one flange of corner bead. Work down the entire length of the bead. Hold knife at 45 degree angle and smooth compound - one edge of knife riding the metal, the other on the surface of the panel. Compound should extend onto panel a minimum of 4". Repeat application for other flange (fig. 13). Tip: After filling first flange, the metal corner edge may have some lumps of joint compound. To remove, run 8" blade up the bead while also moving it to the side (fig. 14).



Fig. 12



Fig. 13



Fig. 14

Important: Allow the first coat to set completely and to dry as much as possible before proceeding to second coat.

Second Coat (Flat joints, Inside corners, Fasteners, Bead & Trim)

Step 5 (Flat joints and Fasteners)

Scrape off bumps, ridges, and other imperfections with knife. Be careful not to damage surface of the gypsum board. Apply lightweight joint compound to tapered joints using an 8" knife the length of the joint (fig. 15). Apply pressure to knife edge farthest from the joint and lift the other edge just slightly above the surface. Draw knife down the joint. Repeat for the opposite edge. This technique is called feathering. Joint compound should extend beyond first coat for a total width of 7" or 8". Apply a 7"-8" coat of joint compound to each side of butt joints and feather. Compound should extend beyond first coat for a total minimum width of 14" (fig. 16). Apply a second coat to fasteners in the same manner as first coat (fig. 17).



Fig. 15



Fig. 16



Fig. 17

Step 6 (Inside Corner and Outside Bead and Trim)

Apply lightweight joint compound on one side of inside corner using a 5" knife for the length of the corner. Scrape off any compound that laps onto the second side. Feather out beyond first coat and allow to dry. After first side is dry, apply compound on the other side of inside corner and feather (fig. 18). Apply second coat of lightweight joint compound to outside bead and trim with 8" knife, feathering slightly beyond first coat (fig. 19).



Fig. 18



Fig. 19

Important: Allow the second coat to set completely and to dry as much as possible before proceeding to third coat.

Third Coat (Flat joints, Inside corners, Fasteners, Bead & Trim)

Step 7 (Flat joints, Fasteners, Inside corners & Outside Bead & Trim)

Apply a thin finishing coat of lightweight joint compound with a 12" knife to the flat joints and a 5" knife to the fastener heads. Press knife firmly so joint compound fills depressions but does not significantly add to thickness. Feather edges at least 2" beyond second coat (fig. 20). Before applying the final coat, check to see if tapered joints are level with surface. Hold the 10" blade across the joint, straight out from the wall. If the blade can be rocked across the joint, the joint is crowned. It must be hidden by feathering the final coat out as far as possible (fig. 21). When applying earlier coats, minor depressions and grooves were not a problem. However, **Do Not** leave any during the application of this final coat or they will mar the finished surface (fig. 22). Apply third coat of lightweight joint compound to outside corners and metal trim with 10" knife, feathering slightly beyond second coat (fig. 23).



Fig. 20



Fig. 21



Fig. 22



Fig. 23

Final Steps (Sanding, Storage & Cleanup, Priming & Painting)

Step 8 (Sanding)

Allow third coat to dry. **Dry Sanding**, lightly sand imperfections in finished joints, corners and over fastener heads. Carefully remove sanding dust with damp sponge (fig. 24). **Tip:** use a fine-grit sand screen in a tool designed for drywall sanding so you don't dig into the joint compound. Avoid roughening the surface paper when sanding. If you do roughen it by accident, repair the damage by applying a little joint compound with a 5" knife. **Wet Sanding**, when only minimal sanding is needed, try wet sanding with a sponge. It eliminates dust and does not scuff the surface paper. Use a small-celled polyurethane sponge similar in appearance to carpet padding. Saturate sponge and wring to prevent dripping. Rub joints to remove high spots, using as few strokes as possible. Clean the sponge frequently during use (fig. 25).



Fig. 24



Fig. 25

Step 9 (Storage & Cleanup)

Before storing unused joint compound, clean sides and lid of container so no dried compound falls into mixture. Level joint compound surface with knife and cover container tightly. If storing for a long time, cover surface of joint compound with approximately 1/2" of clean water and cover container. **Do Not** store in direct sunlight or where freezing conditions may occur. Pour off water before using stored joint compound. Clean tools with warm, soapy water.

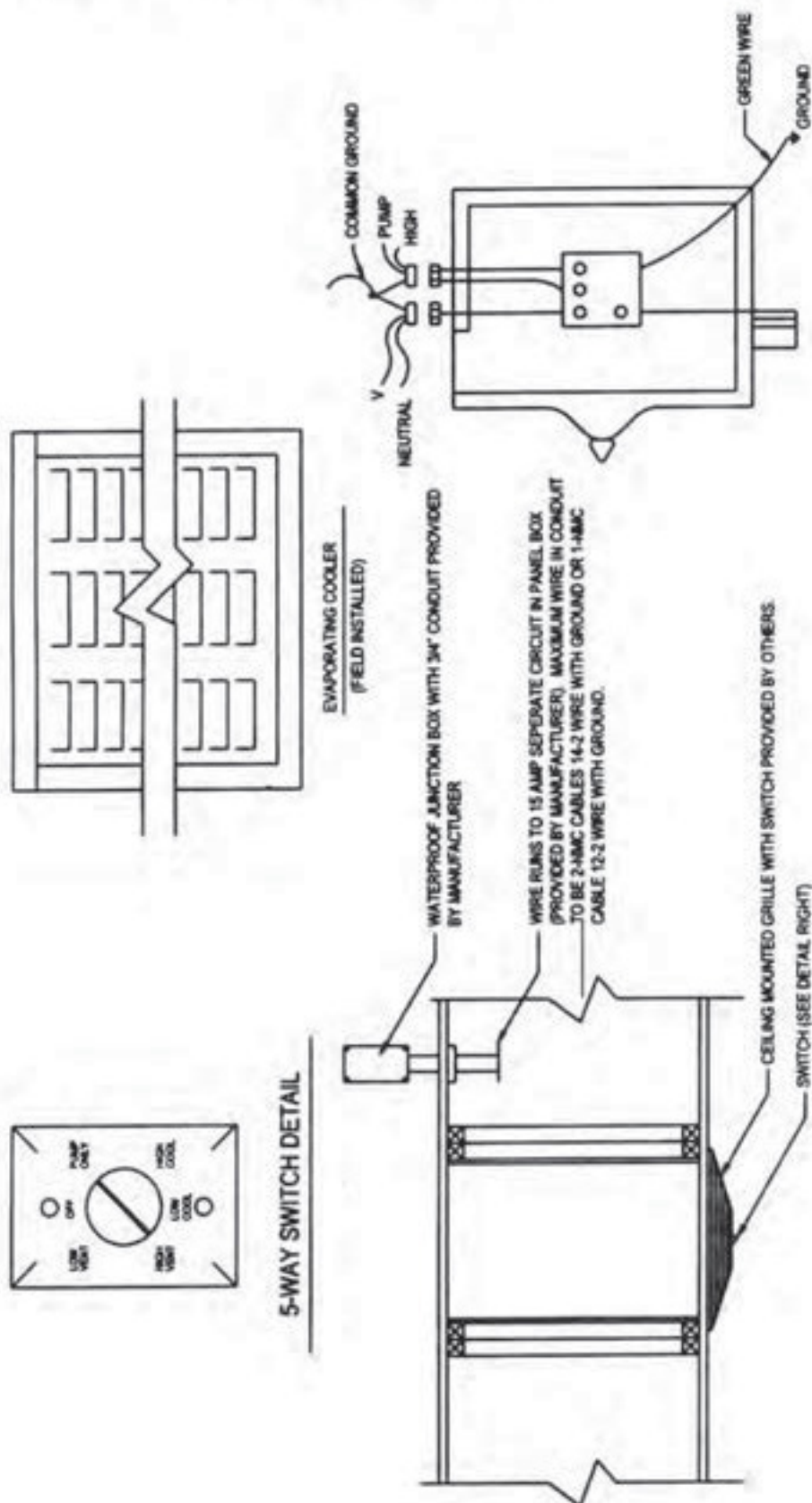
Step 10 (Priming & Painting)

Prior to painting, apply a flat latex paint as a prime coat. Follow the manufacturer's recommendations. For best results, use airless spray equipment. Closely follow equipment manufacturer's instructions and all safety precautions. After prime coat is dry, apply a good quality interior paint. Follow the recommendations on the container.

Tips for Successful Finishing

- Drywall should be clean of foreign material (such as drywall dust) prior to application of tape and joint compound. Tape and joint compound applied over dusty surfaces will not adhere adequately to the drywall paper. This can result in joint cracking and tape delamination.
- Mix joint compound according to bag and/or pail directions. Joint compound consistency greatly affects the joint strength of the finished system. Overthinning of the joint compound can cause joint cracking.
- The set time of the joint compound is affected by mix consistency, mixing time, and water temperature. A loose initial mix of the joint compound and/or the use of cold water will lengthen set time. A heavier initial mix and/or the use of hot water will shorten the joint compound set time. Excessive drill-mixing of joint compounds will also reduce the set time.
- Push joint compound through mesh tape. Inadequate contact of the compound to the drywall surface will result in cracking of the joint or delamination of tape from the drywall.
- Joint compound should be allowed to set prior to force drying with fans or heaters. Force drying of the joint compound prior to set will result in strength loss, delayed shrinkage, and starved appearance at the joint.
- Keep application tools clean. Small pieces of dry compound can dislodge from the tools and prevent smooth application of the compound.
- Keep mixing equipment clean. Set compound from previous batches of material will accelerate the setting action of the new batch. This will reduce working time available and can lead to wasted material.

Appendix P - Evaporating cooler installation



NOTES:

1. AT THE MANUFACTURERS OPTION, A 1/4" DIAMETER MINIMUM COPPER OR POLYBUTYLENE TUBING OR EQUIVALENT, WATER LINE WITH SHUT-OFF VALVE MAY BE PROVIDED. THE WATER LINE SHALL TERMINATE IN THE SHAFT AREA AND 12" OF WATER LINE SHALL BE PROVIDED FOR COOLER HOOK-UP. THE SHUT-OFF VALVE SHALL BE LOCATED IN THE WATER HEATER COMPARTMENT.
2. THE EVAPORATIVE COOLER SHALL BE INSTALLED PER THE COOLER MANUFACTURER INSTALLATION INSTRUCTIONS
3. THE EVAPORATIVE COOLER MUST BE LOCATED A MINIMUM 3 FEET FROM ANY VENT OR SMOKE DETECTOR.



Design 1

SHUTTERS FOR WOOD-FRAME BUILDINGS

One of the best ways to protect a home from damage in wind storms is to install shutters over all large windows and glass doors. Shutters protect doors and windows from wind-borne objects. They also prevent damage caused by sudden pressure changes when a window or door is broken.

This design guide from APA – The Engineered Wood Association describes how to construct structural panel shutters for attachment to wood-frame buildings. It also includes basic design considerations for all structural panel shutters. Additional designs from APA provide details for shutters that can be attached to masonry or concrete block buildings.

Design Considerations

General

Most building codes currently do not include provisions for storm shutters. For those codes that do, or have had provisions in the past, the design requirements for these shutters generally call for a deflection of less than the shutter span (in inches) divided by 30 (for instance, a 40-inch span should not bend more than

40/30 = 1.33 inches when the wind blows). They also should bend less than 2 inches maximum and should remain at least one inch away from the window when under full wind force.

The easiest designs are those that simply cover the opening with a wood structural panel. In wood-frame construction, panels can be nailed over the openings when a

hurricane approaches. Buildings made with concrete blocks, however, require advance preparation.

In some cases, stiffeners may be necessary to limit deflection of the shutter against the glass. Stiffeners function best if the 2 x 4s are on the outside of the shutter and oriented with the narrow edge against the shutter.

TABLE 1

MAXIMUM SPAN WITHOUT STIFFENERS

APA Panel Span Rating	Approximate Weight (lb./ft. ²)	Maximum Shutter Span	Approximate Deflection (in.) at 120 mph Design Wind Speed at 15-ft. Height
32/16	1.5	30	0.5
40/20	2	36	0.5
48/24	2.4	48	0.9
48 oc	3.6	72	1.5

TABLE 2

ESTIMATED DEFLECTION AT 120 MPH DESIGN WIND SPEED AT 15-FT. HEIGHT FOR SHUTTERS WITH 2 X 4s AT 16 INCHES o.c.

APA Panel Span Rating	Approximate Weight (lb./ft. ²)	Shutter Span (in.)							
		24	36	48	60	72	84	96	
32/16	2.5	0.2	0.2	0.3	0.4	0.5	0.8	-	
40/20	2.9	0.1	0.1	0.2	0.2	0.4	0.7	1.1	
48/24	3.4	-	-	0.1	0.2	0.3	0.6	1.0	
48 oc	4.6	-	-	0.1	0.1	0.3	0.5	0.9	

This APA hurricane shutter design is based on pressures associated with a design fastest-mile wind speed of 120 mph. Building codes are currently being reviewed for possible changes. Before constructing shutters, therefore, it is important to check with your local building department for an update on current code requirements.

A P A

The Engineered Wood Association

Q-1

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Note: The shutter design shown herein will provide significant protection from hurricane-force winds. This publication contains recommendations to serve as a guide only. It does not include all possible shutter, anchor and fastening systems, and the installer must adjust all dimensions to compensate for particular installations and hardware used. These shutter designs by no means represent all possible workable designs and can always be upgraded to provide even greater margins of safety and protection. All shutter designs herein are intended to be temporary, and mounted and removed from outside the building. All designs are based on wind pressure capacities only.

While the design wind pressures used are based on ASCE 7-95, the building owner/installer must still carefully evaluate each system and then, if necessary, make any modifications consistent with good design and building practices.

Steps to Constructing Shutters

1. Review Tables 1 and 2 in the Design Considerations section to determine if stiffeners are needed. Attach stiffener as shown in Figure 2.
2. Cut APA wood structural panels with adequate edge overlap to receive nails. Orient long panel axis (strength axis) of the panel as shown in Figure 2.
3. Use a long brad or finishing nail to locate the framing behind the wood siding. The nails used to attach the shims and the shutters must hit the framing to be fully effective.
4. Nail shims to the framing with 12d nails. Use 16d nails for shims over 3/4 inch thick. For spans up to 5 feet, space the nails 6 inches o.c. at each shim. For spans over 5 feet, space nails 4 inches o.c. at each shim. (Figures 3a and 3b)
5. Attach the shutters with double-headed nails for ease of later removal. (Figures 3a and 3b) Use 12d nails for shutters up to 3/4 inch thick and 16d nails for shutters over 3/4 inch thick. For spans up to 5 feet, space the nails 6 inches o.c. at each end of the shutter panel. For spans over 5 feet, space nails

FIGURE 1

SHUTTER STIFFENER ATTACHMENT - IF REQUIRED

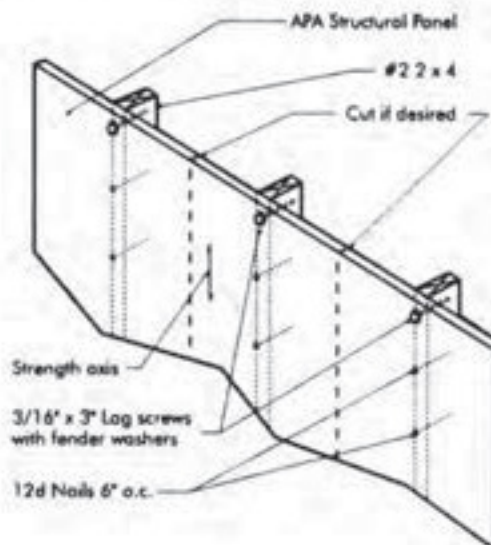


FIGURE 2

SHUTTER ATTACHMENT - VIEW FROM OUTSIDE

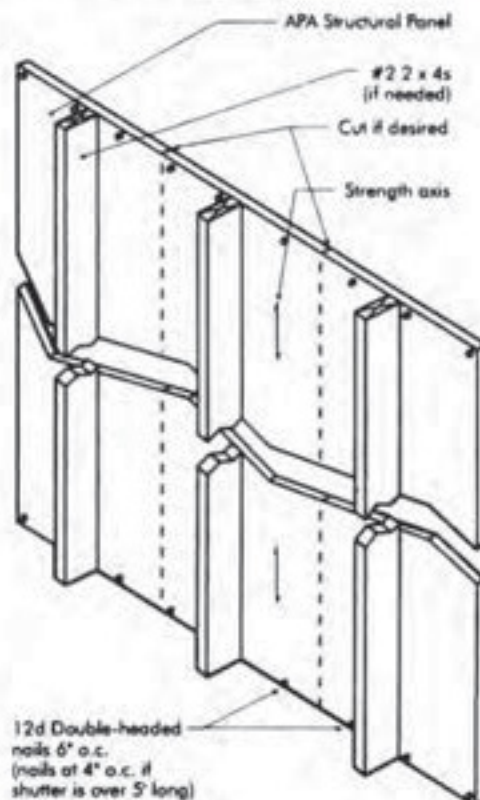


FIGURE 3A

SHUTTER ATTACHMENT – TOP

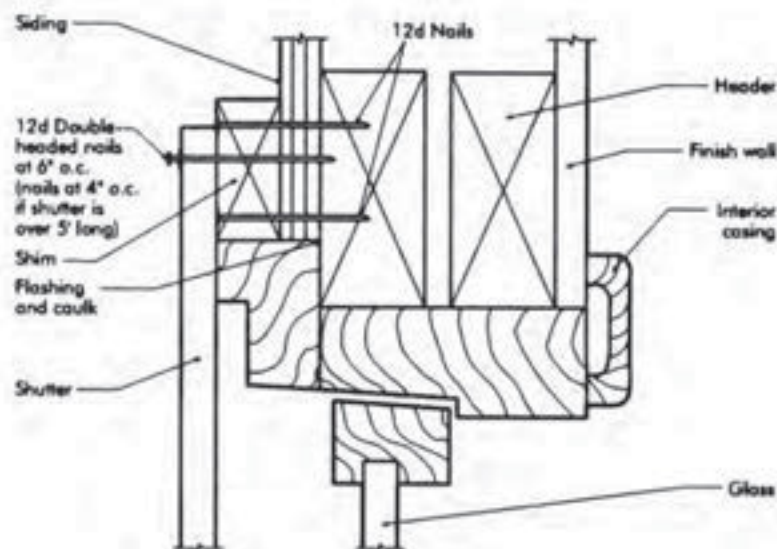
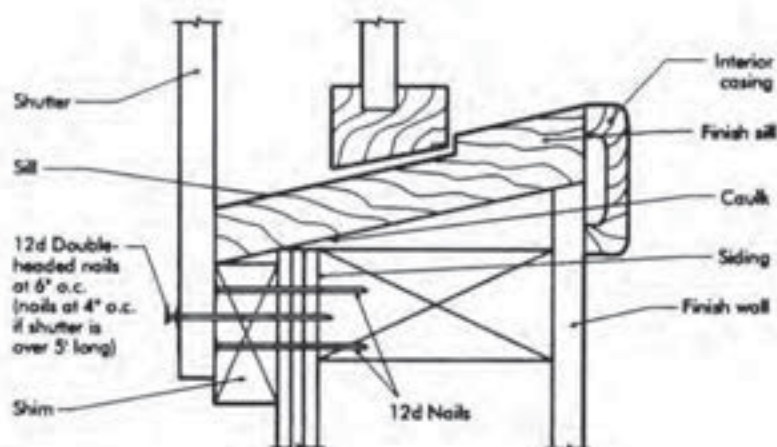


FIGURE 3B

SHUTTER ATTACHMENT – BOTTOM



4 inches o.c. at each end of the shutter panel. Nailing the panel on all four sides, instead of just the two ends, will further limit deflection and maximize strength.

6. Any permanently installed hardware, shims or fastening devices must be installed using standard/acceptable methods of waterproofing. All abandoned holes must be sealed.

7. After fabrication each shutter should be marked for orientation and location to simplify installation.

8. If shims are to be left in place, use galvanized nails and finish like siding or exterior trim.

Hurricane Shutter Designs from APA – The Engineered Wood Association

APA offers a series of Hurricane Shutter Designs. They include:

Design 1: Shutters for Wood-Frame Buildings

Design 2: Shutters for Masonry Block Structures, Barrel Bolt Latch Supports

Design 3: Shutters for Masonry Block Structures, Steel or Aluminum Angle and Screw Supports

Design 4: Shutters for Masonry Block Structures, Shutters Attached to Outside Wall with Permanently Mounted Brackets

Design 5: Shutters for Masonry Block Structures, For Openings Wider than 8 Feet

Each design is available from APA – The Engineered Wood Association for \$1.

Designs may also be ordered as a complete set for \$5. To order, contact APA – The Engineered Wood Association, P.O. Box 11700, Tacoma, Washington 98411-0700. Phone: (253) 565-6600. Fax: (253) 565-7265.

TABLE 1 - GENERAL DESCRIPTION OF SOILS

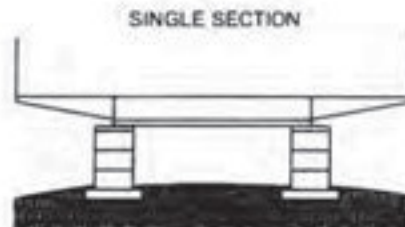
Soil Type based on the unified classification system	Allowable Pressure (pounds per square foot)*
Rock or hard pan	4,000 and up
Sandy gravel and gravel	2,000
Sand, silty sand, clayey sand, silty Gravel, or clayey gravel	1,500
Clay, sandy clay, silty clay, or clayey Silt	1,000
Uncompacted fill	Special 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 1 - ELIMINATION OF WATER BENEATH THE HOME



DO: CROWN AND GRADE SITE SO THAT WATER DOES NOT COLLECT BENEATH HOME. COVER THE GROUND WITH 6 MIL POLYETHYLENE SHEETING OR EQUIVALENT VAPOR BARRIER. PLACE ALL FOOTERS BELOW THE FROST LINE.



DON'T: GRADE SITE SO THAT WATER COLLECT BENEATH HOME OR PLACE FOOTERS ABOVE FROST LINE OR OMIT THE VAPOR BARRIER.

TABLE 2

FOOTING SIZES

SOIL CAPACITY (PSF)	MINIMUM PAD SIZE (IN X IN)	FOOT CAPACITY	SINGLE STACK PIER- FOOTER THICKNESS	DOUBLE STACK PIER- FOOTER THICKNESS
1000	16 X 16-256 SQ. IN.	1778	4"	4"
	(2) 16 X 16-512 SQ. IN.	3556	4"	4"
	20 X 20-400 SQ. IN.	2778	4"	4"
	24 X 24-576 SQ. IN.	4000	4"	4"
	30 X 30-900 SQ. IN.	6250	5.5"	4"
1500	16 X 16-256 SQ. IN.	2667	4"	4"
	(2) 16 X 16-512 SQ. IN.	5333	4"	4"
	20 X 20-400 SQ. IN.	4167	4"	4"
	24 X 24-576 SQ. IN.	6000	4.5"	4"
	30 X 30-900 SQ. IN.	9375	6.5"	4"
2000	16 X 16-256 SQ. IN.	3556	4"	4"
	(2) 16 X 16-512 SQ. IN.	7111	4"	4"
	20 X 20-400 SQ. IN.	5556	4"	4"
	24 X 24-576 SQ. IN.	8000	5"	4"
	33 X 33-1089 SQ. IN.	15125	8"	5.5"
2500	16 X 16-256 SQ. IN.	4444	4"	4"
	(2) 16 X 16-512 SQ. IN.	8889	4"	4"
	20 X 20-400 SQ. IN.	6944	4.5"	4"
	24 X 24-576 SQ. IN.	10000	6"	4"
	30 X 30-900 SQ. IN.	15000	7.5"	4"
3000	16 X 16-256 SQ. IN.	5333	4"	4"
	(2) 16 X 16-512 SQ. IN.	10667	4"	4"
	20 X 20-400 SQ. IN.	8333	5"	4"
	24 X 24-576 SQ. IN.	12000	6"	4"
	30 X 30-900 SQ. IN.	18000	7.5"	4"
3500	16 X 16-256 SQ. IN.	6222	4"	4"
	(2) 16 X 16-512 SQ. IN.	12445	4"	4"
	20 X 20-400 SQ. IN.	9722	5"	4"
	24 X 24-576 SQ. IN.	14223	6"	4"
	30 X 30-900 SQ. IN.	21333	7.5"	4"
4000	16 X 16-256 SQ. IN.	7111	4"	4"
	(2) 16 X 16-512 SQ. IN.	14223	4"	4"
	20 X 20-400 SQ. IN.	11111	5.5"	4"
	24 X 24-576 SQ. IN.	16000	7.5"	4"
	30 X 30-900 SQ. IN.	21780	9"	5.5"

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

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 2 for minimum footing sizes based on pier loads and allowable soil bearing capacities.
3. The concentrated loads consist of roof loads only.

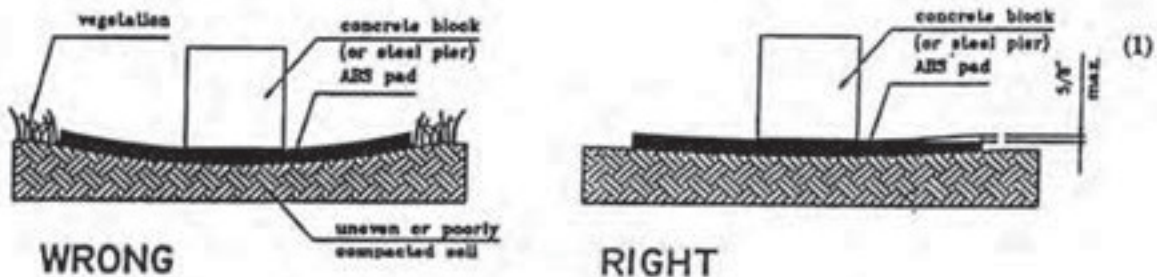


MANUFACTURED HOUSING FOUNDATION SYSTEMS
A Division of Oliver Technologies, Inc.
1-800-284-7437
HOME OF THE ORIGINAL ABS PIER PAD

(IMPORTANT)
IF PAD DEFLECTS MORE THAN 5/8" WHEN
INSTALLED, PIER SPACING IS INCORRECT FOR SOIL
CONDITIONS OR A DOUBLE FIRST BLOCK
CONFIGURATION SHOULD BE USED ⁽¹⁾

Installation Instructions for ABS Pads

The purpose of this addendum is to emphasize that the ground under the ABS pads must be leveled, evenly compacted, and cleared of all vegetation and debris before the placement of the pads.



The maximum deflection in a single pad is 5/8" measured from the highest point to the lowest point of the top. ⁽¹⁾

PAD SIZE	PAD AREA	1,000 LB SOIL	2,000 LB SOIL	3,000 LB SOIL
16" x 16"	256 SQ IN.	1,780 LBS	3,560 LBS	5,333 LBS
16" x 18"	288 SQ IN.	2,000 LBS	4,000 LBS	6,000 LBS
13" x 26"	338 SQ IN.	2,375 LBS	4,750 LBS	7,125 LBS
18.5" x 18.5"	342 SQ IN.	2,375 LBS	4,750 LBS	7,125 LBS
20" x 20"	400 SQ IN.	2,750 LBS	5,500 LBS	8,250 LBS*
24" x 24"	576 SQ IN.	4,000 LBS	8,000 LBS*	

*Concrete blocks are only rated at 8,000 lbs. +8,000 lbs. must be double blocked.

General Notes:

1. Any configuration above may be used to replace a home manufacturer's recommended concrete or wood base pad.
2. The maximum load at any intermediate soil value may be determined as the average of the next lower and next higher soil values given in the above table.
3. Pad sizes shown are nominal dimensions and may vary up to 1/8".
4. Pad loads are the same when using single stack or double stack blocks.

⁽¹⁾ NOTE: Actual test results were less than 5/8"

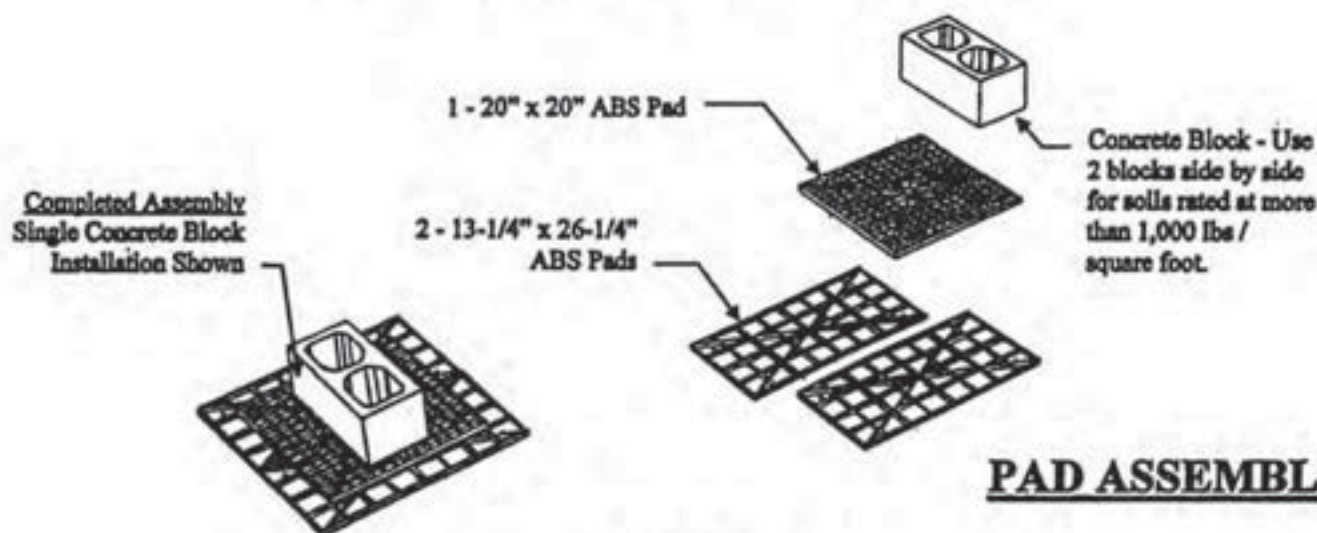


MANUFACTURED HOUSING FOUNDATION SYSTEMS

A Division of Oliver Technologies, Inc.

1-800-284-7437

INSTALLATION INSTRUCTIONS FOR ABS PADS



PAD ASSEMBLY

ABS PAD TYPES:

Pad Size	Pad Area	Model Identification
13-1/4" x 26-1/4"	2.395 SQ FT	ID #4148-4
20" x 20"	2.777 SQ FT	ID #1055-7
26" x 26"	4.79 SQ FT	Nominal Size

GENERAL INSTRUCTIONS:

1. All pads are to be installed flat side down, ribbed side up
2. The ground under the pads should be leveled as smooth as possible with all vegetation removed. Pads to be placed on natural grade unless otherwise permitted by the local building authority.
3. Pier and pad spacing will be determined by the manufactured homes' written set-up instructions or any local or state codes.
4. The open cells between the ribbing on the upper side of the pads may be filled with soil or sand after installation to prevent any accumulation of stagnant water in the pads.
5. A pocket penetrometer may be used to determine the actual soil bearing value. If soil-testing equipment is not available, use an assumed soil value of 1,000 lbs/square foot.
6. All pad sizes shown are nominal dimensions and may vary up to 1/8".
7. The maximum deflection in a single pad is 5/8" measured from the highest point to the lowest point of the top face. ⁽¹⁾
8. In frost areas, a 6" deep gravel base installed in well drained, non-frost susceptible soil is recommended.

MAXIMUM PIER LOADS IN POUNDS:

No. of Concrete Blocks	Soil Bearing Value	Maximum Allowable Load
1	1,000 lbs/sq foot	4,800 lbs
2	2,000 lbs/sq ft "and greater"	9,600 lbs

⁽¹⁾ NOTE: Actual test results were less than 5/8"



REQUIRED FOOTINGS AND PIER BLOCKING

In Table 3 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 a roof live load of 30 psf and a floor live load of 30 psf are specified in Table below.

All load bearing pier supports and footings may be subject to approval by the local enforcement agency. As specified in Table 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 must be placed on either undisturbed soil or compacted fill.

TABLE 3
PIER LOADING UNDER MAIN I-BEAMS

CALL SIZE	ROOF LIVE LOAD	PIER LOAD 4 FT	PIER LOAD 6 FT	PIER LOAD 8 FT	PIER LOAD 10 FT	PIER LOAD 12 FT
12" WIDE	30 PSF	2685 LBS	3843 LBS	5000 LBS	6158 LBS	7315 LBS

NOTES:

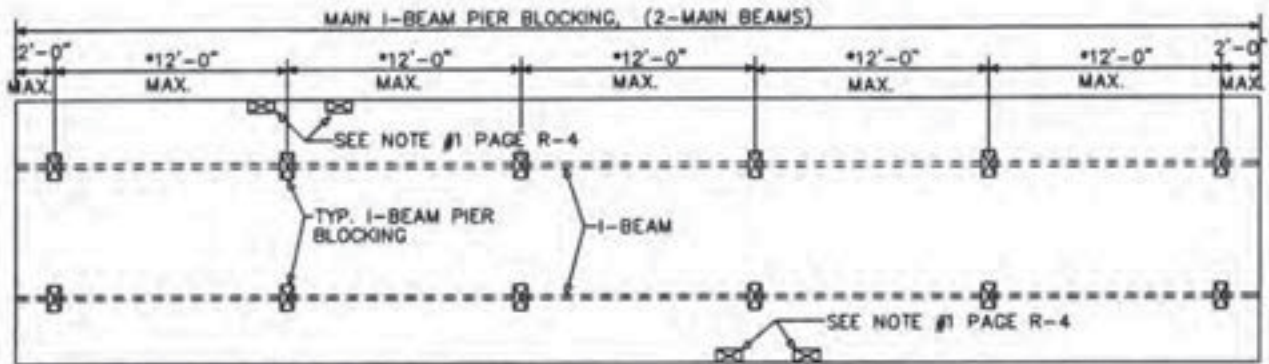
1. See Table 3 for minimum footing sizes based on pier loads and allowable soil bearing capacities. The footing sizes and pier loads are minimums required for the applicable conditions. The footing shall not be smaller than the pier it supports or 256 square inches.
2. The maximum spacing of piers is not to exceed 8 feet for 8 inch I-Beam, 10 feet for 10 inch I-Beam and 12 feet for 12 inch I-Beam.
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".

GENERAL NOTES: See Figure 2

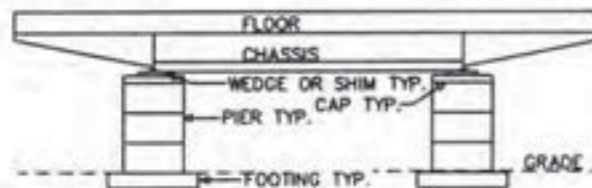
1. ALL EXTERIOR DOORS, WALL OPENINGS 4 FEET AND WIDER (I.E. PATIO DOORS, GARDEN DOORS) SHALL HAVE A PIER INSTALLED AT JOIST LOCATIONS ON EACH SIDE OF OPENINGS AND AT ALL PORCH COLUMN/POST LOCATIONS. All required perimeter and specialty pier locations will be marked with a sticker or (white or yellow) paint on the bottom board large enough to remain visible after the piers are in place.
2. Piers are required at all interior shearwall locations if angle or bracket is installed. See shearwall tiedown installation details.
3. Footings and pier supports must be designed to support the load values.
4. The tabulated pier loads include the indicated live loads plus home dead loads (including chassis and walls).



FIGURE 2

TYPICAL SINGLE SECTION PIER LAYOUT

*MAXIMUM SPACING OF PIERS IS NOT TO EXCEED 8 FEET FOR 8 INCH I-BEAM, 10 FEET FOR 10 INCH I-BEAM AND 12 FEET FOR 12 INCH I-BEAM.


**TIE DOWN SPACING CHART
NEAR BEAM ANCHOR SYSTEM**

Single Double	Unit Width	Overall Width	I-Beam Spacing	Over- Hang	Wall Hght	Max. Roof Pitch	Wind Zone	ANCHOR ATTACHMENT HEIGHT			
								Spacing/ Anchor Angle	Max. Hght	Spacing/ Anchor Angle	Max. Hght
Single	141"	141"	99.5	3"	96"	4.34	1	10'-0"/36 Deg	32"	8'-0"/27 Deg	44"

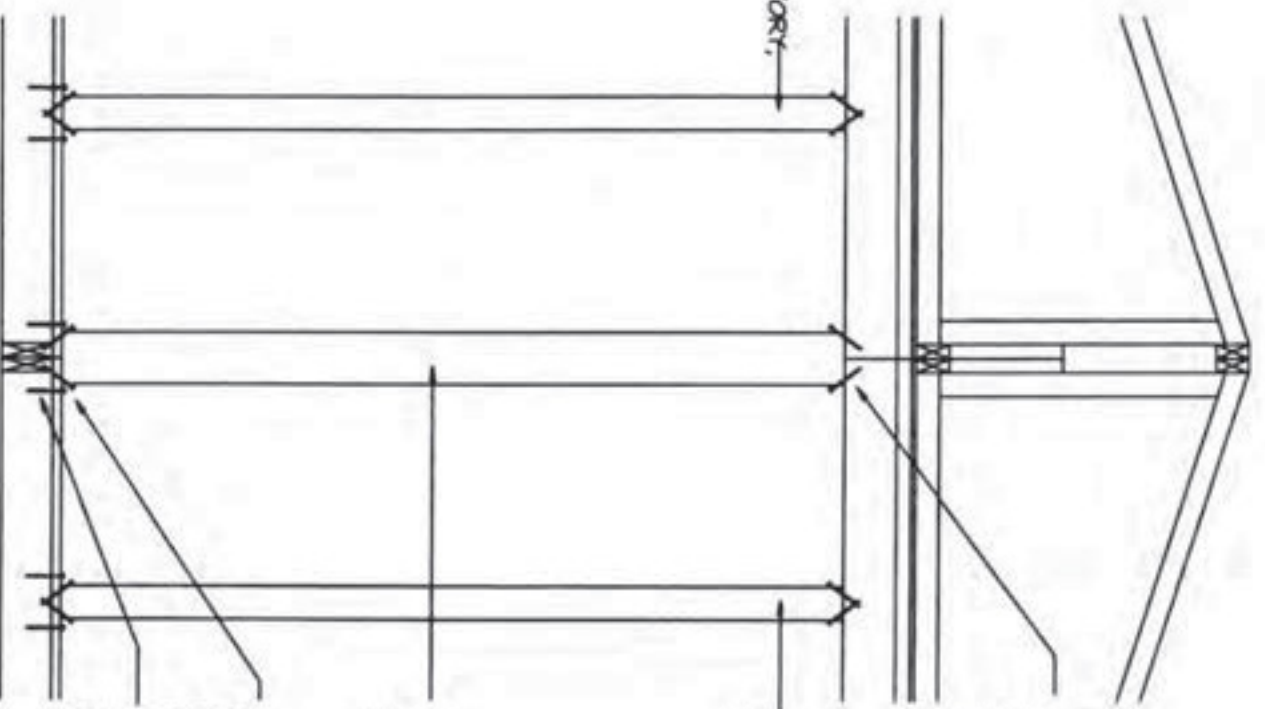
Refer to Chapter 5 of the installation manual for typical installation procedures.

TIE DOWN SYSTEM NOTES:

1. Frame tie down shall be installed to properly secure the home.
2. Reserved
3. Reserved
4. When anchors are not installed at the angle specified in the table a stabilizer plate must be installed in accordance with the anchor manufacture's instructions.
5. Frame tie downs and anchors are not supplied by CAVALIER HOMES.
6. When required vertical tie straps and/or brackets are supplied by CAVALIER HOMES. Anchors and end treatments are to be supplied by others.
7. Frame ties shall be capable of resisting an ultimate tension load of 4725 lbs. And are to be installed per the manufacture's installation instructions.
8. Steel anchoring equipment exposed to the weather shall be protected with at least 0.30 oz. of zinc per square foot of steel.
9. Design based on unit width, I-Beam spacing and a maximum side wall height shown.
10. Reserved.
11. Frame tie downs are positioned at crossmember location (within 3") when attachment point is at the bottom of the chassis.
12. Anchors to be certified by a professional engineer, architect or 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.
13. Ground anchors to be embedded below the frost line and be at least 12" above the water table. Anchors to be installed to their full depth and are not to extend beyond the side wall of the home.
14. Ground anchors to be rated for 1.5 x anchor capacity or an ultimate load of 4725 lbs.
15. Strapping to be certified by a registered professional engineer, architect or approved testing laboratory to resist these specified forces in accordance with testing procedures in ASTM standards specification D3593-91.
16. Shearwall anchor and strap are required at beam opposite shearwall attachment. See details this section.
17. Minimum pier height shall be 18" and maximum pier height per table for tie spacing.



POST INSTALLED AT THE FACTORY,
REMOVE IN THE FIELD.



IN THE FIELD, ATTACH POST TO
HEADER EACH SIDE WITH (4) #6x3"
WOOD SCREWS (10 TOTAL) WITH 1/2"
PENETRATION

POST INSTALLED AT THE FACTORY,
REMOVE IN THE FIELD.

6x6 WESTERN CEDAR POST
INSTALLED AT CENTERLINE IN THE
FIELD

IN THE FIELD, ATTACH POST TO
FLOOR EACH SIDE WITH (5) #6x3"
WOOD SCREWS (10 TOTAL) WITH 1/2"
PENETRATION

IN THE FIELD, ATTACH DECKING
AROUND POST TO FLOOR EACH SIDE
WITH (4) #6x3" WOOD SCREWS (10
TOTAL) WITH 1/2" PENETRATION

APPROVED BY
NIP INC.
APR 24, 2008
GENERAL BUILDINGS AND
CONSTRUCTION AND SAFETY STANDARDS



Cavalier Home Builders

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NTS
R. Ullman
1

Site Installed Centerline Post

S-1

Appendix T

In-field testing

Per the requirements of 24 CFR Part 3285, all homes are to be subjected to full function testing of the water supply lines, water drain lines, total electrical system and gas lines. Within this appendix is a method listed for testing each of these systems. Alternate methods of testing must be approved by the local official having jurisdiction.

Water supply piping test:

All water piping in the water distribution system shall be subject to a Hydrostatic or air pressure test. The test shall be made by subjecting the system with water and/or air at 50 psi (or local operating pressure) for 15 minutes without loss of pressure.

Test Apparatus: A pressure gauge capable of reading 100 psi.

The test apparatus must be arranged so that the source of the pressure is isolated from the system being tested after 50 psi or local operating pressure is reached (typically achieved by a shut-off valve).

The test should include the following:

1. All supply connections to the water lines have been installed.
2. All portions of the hot and cold supply piping must be tested. Verify that hot & cold water lines are on the correct pipe of each lav, tub, shower & sink. Verify that the water line supplying the toilet is cold.
3. All faucets are closed.
4. The float arm in the toilet tank is raised to the shut-off lever and held there.
5. All shut-off valves in the piping system are opened fully (e.g., a shutoff valve beneath the toilet tank).
6. The test gauge is connected to the water piping system.
7. The source of pressure (water) is connected to the piping system, and the system is pressurized to 50 psi or maximum pressure of the local supply.
8. When 50 psi or maximum local pressure is reached, the source of pressure is isolated (disconnected) from the water piping.
9. The pressure must be maintained for at least 15 minutes.
10. If the gauge shows a drop in pressure, the leak(s) must be located and repaired.
11. After repairs are made, the system must be retested.

Drain test:

REQUIREMENTS: The waste and vent system shall be tested by the following methods for evidence or indication of leakage, prior to the DWV lines being connected to the septic system.

PURPOSE: To assure that those portions of the DWV system (piping, fitting, and connections) which are below the rim of the toilet bowl are free of leaks.

NOTE: On straight dropout plumbing, only a fixture test is required (tubs, showers, & stools requires a flood test). Water supply system test and flood level test may be run at the same time, as long as each procedure is performed properly.

TEST APPARATUS: A source of water. Drain plugs/caps that will prevent leakage at the DWV dropout and the fixture drains (e.g., shower, tub, sink, lavatory).

THE TEST SHOULD INCLUDE THE FOLLOWING:

1. All drain, waste and vent piping and fittings have been installed, and all fixtures have been connected to the DWV system. (Exception: Those portions of the system which are to be field installed).
2. The dropout is plugged or capped to prevent leakage through the dropout.
3. The system ("system" is all plumbing fixtures connected together by a common drain) is filled with water from a high fixture to the rim of the toilet bowl, or a length of a measuring tape fastened to a cleat, and placed on the toilet bowl. Verify water level, by writing down the measurement, where the water level is at, on the measuring tape, before and after test, and all trapped air is released from the system. This will require observing air being forced out of the tub and shower p-trap. Water will rise in both tub & shower min. 1", then the drains are to be plugged or stopped. Water then continues to rise in the system, until the water level reaches the rim of the toilet bowl. Run a hose (e.g., water hose) down to the toilet trap to release any trapped air.
4. When a home contains two toilets at different levels, the system must be filled with water to the rim of the higher toilet. One way to accomplish this is to plug the lower toilet after air has been forced upwards through the trap and water has begun rising upward into the bowl~ then continue to fill the system until the water level reaches the rim of the higher toilet.
5. Water is held in the system for at least 15 minutes with no leaks occurring. Leaks can be determined by either checking all joints and connections in the DWV line or observing a drop in the level of the water in the toilet bowl from the rim and measuring tape.

6. Failure (leakage) requires repair and retest.

Alternate flood test:

1. Alternate flood test procedures for one or more fixtures connected to a single drop with plumbing concealed in floor and no water closet to measure the water in the system.
 - A. Cap off the drop thru the floor.
 - B. With a water proof marker, at a depth of 1" to 3" make a mark on lowest fixture in group being tested.
 - C. Fill the fixture up to the mark from the highest fixture.
 - D. Let it stand for a minimum of 15 minutes. If the system shows any leaks, they must be repaired and retested.
 - E. If the anti-siphon device shows any signs of leakage, they must be plugged and the system retested or anti-siphon device may be removed and plugged before test is performed.
2. Failure requires repair and retest.

Fixture test:

REQUIREMENTS of Fixture test: The plumbing fixture and connections shall be subjected to a flow test by filling them with water (3" min. depth) and checking for leaks in the p-trap connection areas and retarded flow while they are being emptied.

PURPOSE: To assure that the plumbing fixtures, the connections to the draining system, and the fixture drain lines are free of leaks and retarded flow.

TEST APPARATUS: A source of water. Drain plugs for the fixtures.

THE TEST SHOULD INCLUDE THE FOLLOWING:

1. All drain lines, fixtures, and connections have been installed. All work has been completed.
2. The fixture drains are plugged.

3. The fixtures are filled with a min. of 3" of water.
4. The drain plugs are pulled, and the fixture connections and fixture drains are checked for leakage and retarded flow while they are being emptied.
5. Failure requires repair and retest.

Gas system testing:

BEFORE APPLIANCES ARE CONNECTED: (High Pressure)

REQUIREMENTS: Testing for leakage. (i) Before appliances are connected, piping system shall stand a pressure of at least six inches mercury or three PSI gauge for a period of not less than ten minutes without showing any drop in pressure. Pressure shall be measured with a mercury manometer or slope gauge calibrated so as to be read in increments of not greater than one-tenth pound, or an equivalent device. The source of normal operating pressure shall be isolated before the pressure tests are made. Before a test is begun, the temperature of the ambient air and of the piping shall be approximately the same, and constant air temperature be maintained throughout the test.

When gas appliances are located in both halves of multi-wide units, gas tests must be run on both halves. The half with the gas inlet should have the gas tests run as normal with the crossover gas valve in the off position. The other half should have the flex connector connected to the gas line and the gas test performed.

PURPOSE: To assure that there are no leaks in the gas piping system between the inlet and the outlets.

TEST APPARATUS: A gauge, mercury manometer, slope gauge, or equivalent device which can be read in increments of one-tenth pound (1/10 lb.) or less. A source of air capable of providing 3 psi. The test apparatus must be arranged so that the source of the pressure may be isolated from the system being tested after 3 psi is reached.

THE TEST SHOULD INCLUDE THE FOLLOWING:

1. All gas lines and risers up to the valve have been installed.
2. Shut-off valves, if installed, shall be closed at each outlet. If valves are not installed, the appliance outlets must be capped

3. The test gauge is connected to the gas piping system.
4. The source of air pressure is connected to the piping system and the system is pressurized to 3 psi.
5. When 3 psi is reached, the source of pressure is isolated (disconnected) from the system being tested.
6. This pressure is then held on the system for 10 minutes without any loss.
7. If there is a drop in pressure, the leak must be located and repaired.
8. Failure requires repair and retest.

*INFORMATION NOTE: Equivalencies 3 psi = 48 oz. = 84" water column = 6" mercury column.

Gas system testing continued:

AFTER APPLIANCES ARE CONNECTED: (Low Pressure)

REQUIREMENTS: (ii) After appliances are connected, the piping system shall be pressurized to not less than 10 inches nor more than 14 inches water column and the appliance connections tested for leakage with soapy water or bubble solution.

PURPOSE: To assure that there are no leaks in the gas system at the appliance connections (between the in-line appliance shut-off valve and the appliance).

TEST APPARATUS: A test gauge or equivalent device capable of reading between 10 and 14 inches water column. A source of air pressure capable of providing a pressure of Between 10 and 14 inches of water column (between .375 psi and .50 psi). The source of air pressure may require a pressure regulator (see test description below). A soapy water or bubble solution which will bubble when applied to a leaking joint.

THE TEST SHOULD INCLUDE THE FOLLOWING:

1. The installation of the gas piping system is complete (gas piping or tubing, in-line shut-off valves, and appliance connectors) and the appliance have been connected.
2. The shut-off valves at all appliances are in the open ("on") position. (The typical valve is "open" when the handle is parallel to the length of the pipe).

3. All shut-off valves which are integral to an appliance (not the in-line valves) are turned to the off position. All appliance pilot lights are turned off, if possible. (If the pilot lights cannot be turned off, air will leak out through the open pilots when pressure is applied to the system. Hence, the test apparatus will have to include a pressure regulator, so that a continuous flow of air can be provided at the required pressure).
4. The test gauge is connected to the gas supply system.
5. An air pressure of 10 to 14 inches water column is applied continuously to the system.
6. With a soapy solution, all connections from the outlet (line shut-off valve) to the appliances are swabbed and checked for leaks. Bubbling will occur if there is a leak.
7. Failure requires repair and retest.

* INFORMATION NOTE: Equivalencies

10" water column = 6 oz. = .375 psi = 0.75" mercury column.

14" water column = 8 oz. = .5 psi = 1" mercury column.

Electrical

Operational & polarity testing:

Each home shall be subjected to an operational/polarity test to verify that receptacles and lights are properly wired and in working order.

For receptacles, this can be achieved with various devices, one such example is the receptacle tester from Ideal Industries, part number 61-501 which retails for around \$12.00 and is also available on the internet.

Each 120 volt receptacle is to be checked. The device mentioned above (or similar) will have the capability of verifying proper operation and polarity. With the breakers that control all circuits containing receptacles in the on position, insert the device into each receptacle throughout the home. Verify that the device indicates correct wiring. If for some reason any of the receptacles indicate a problem, have the issue corrected by a qualified individual/electrician.

The same device (or similar) shall be used in conjunction with a transition piece that will allow the device to be screwed into light fixtures. Perform an operational test on each light fixture to verify that wiring/polarity is correct. If any fixtures indicate a problem, have the wiring/polarity corrected by a qualified individual/electrician.

Continuity testing:

All metallic parts that could potentially become energized are to be tested to ensure proper bonding to the ground system of the home.

This can be achieved by a simple low current device which will indicate/verify a completed circuit.

The metallic components that are to be tested include, but are not limited to:
Furnace, water heat, fireplace, range hood, dishwasher, garbage disposal, whirlpool motor, metal light fixtures, exhaust fans, metal receptacle covers, metal duct, frame, panel box, metal junction boxes, gas lines, metal siding, metal roof, metal supply lines, etc.

CORRUGATED METAL ROOF FASTENING AT RIDGE WIND ZONE I, II & III

INSTALLATION INSTRUCTIONS (REFER TO METAL
ROOFING MANUFACTURERS INSTALLATION INSTRUCTIONS FOR
ADDITIONAL INFORMATION)



Patrick M. McGuire
4-18-06

1. REMOVE SHIPPING PLASTIC FROM ROOF AT MARRIAGE WALLS. REMOVE SHIPPING FASTENERS FROM CORRUGATED METAL AT PEAK OF ROOF.
2. FASTEN ROOF PER REX SECTION OF DAPIA.
3. CENTER RIDGE CAP OVER CORRUGATED ROOF PANELS AT ROOF PEAKS. OVERLAP END JOINTS FOR A MINIMUM OF 9". SILICONE SEALANT OR PUTTY TAPE (POLYBUTYL) RECOMMENDED AT END LAP JOINTS.
4. FASTEN RIDGECAP ACCORDING TO FIGURE 1 AND FIGURE 2. DO NOT OVERDRIVE NAILS.

APPROVED BY

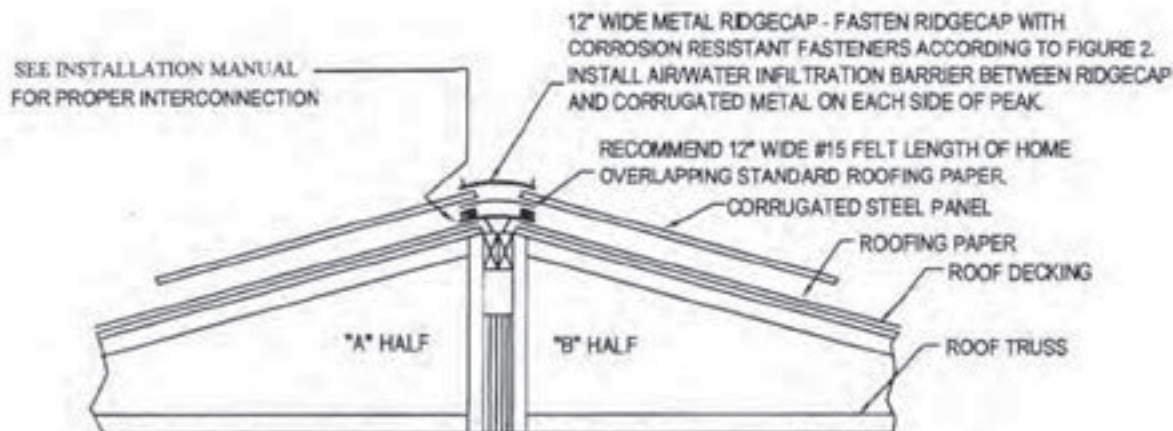


FIGURE 1 - RIDGE CONSTRUCTION FOR CORRUGATED METAL ROOF

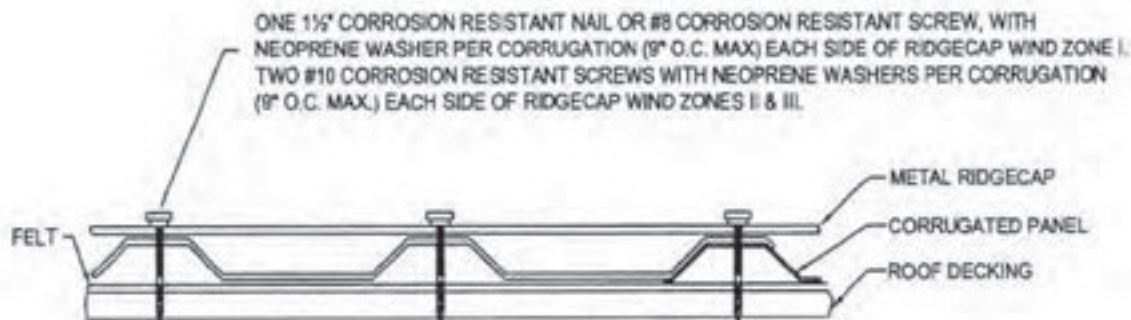
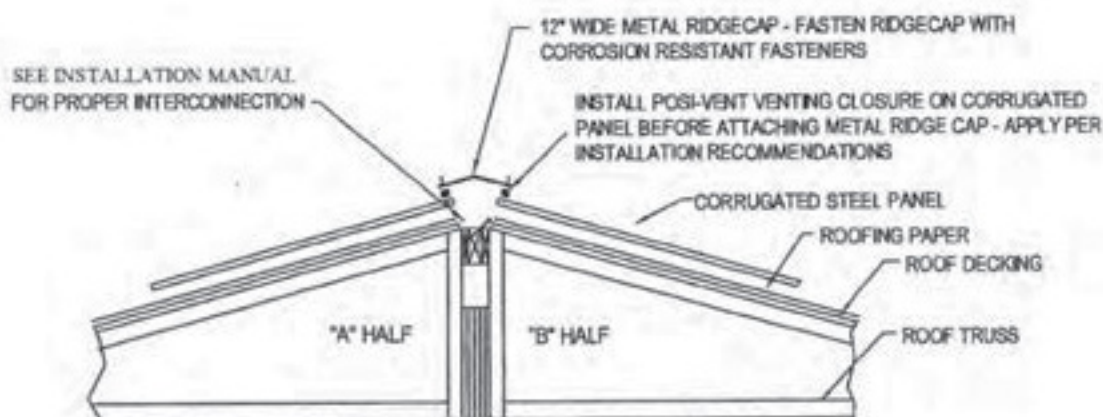


FIGURE 2 - FASTENING DETAIL FOR RIDGE CAP

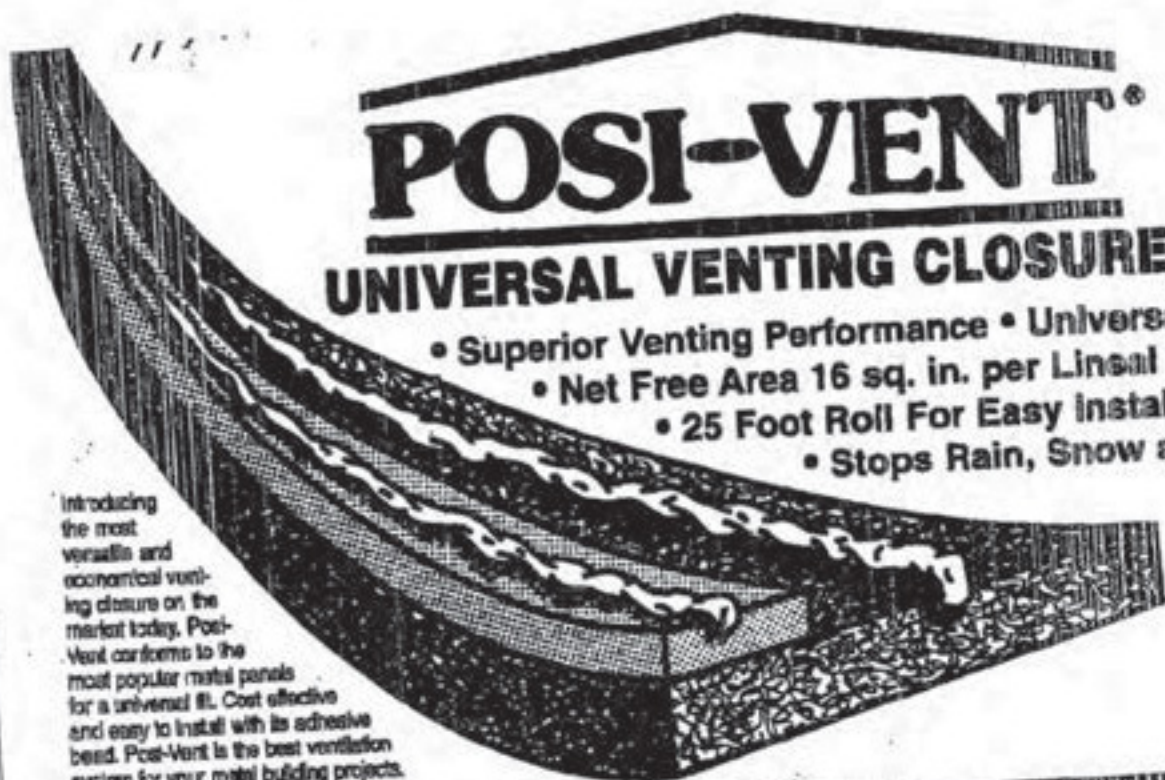
CORRUGATED METAL ROOF WITH RIDGE VENT PROVISIONS

1. REMOVE SHIPPING PLASTIC FROM ROOF, BE SURE ALL MATERIALS ARE REMOVED FROM THE GAP BETWEEN RIDGE RAILS AT THE RIDGE VENT AREA TO ALLOW FREE VENTILATION.
2. FASTEN ROOF AS SHOWN ON DAPLA DETAIL PAGES
3. APPLY POSI-VENT VENTING CLOSURE TO CORRUGATED PANEL
4. APPLY AND FASTEN CENTER RIDGE CAP



RIDGE CONSTRUCTION FOR CORRUGATED METAL ROOF
WITH RIDGE BENT PROVISIONS

APPROVED BY
NIA INC. Feb 14, 2011
FEDERAL MANUFACTURED HOME
CONSTRUCTION AND SAFETY STANDARDS



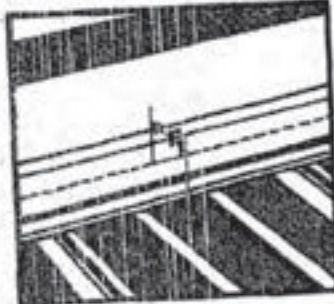
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UNIVERSAL VENTING CLOSURE

- Superior Venting Performance • Universal Fit
- Net Free Area 16 sq. in. per Linear Foot
- 25 Foot Roll For Easy Installation
- Stops Rain, Snow and Insects

Introducing the most versatile and economical venting closure on the market today. Posi-Vent conforms to the most popular metal panels for a universal fit. Cost effective and easy to install with its adhesive bond. Posi-Vent is the best ventilation system for your metal building projects.

INSTALLATION RECOMMENDATIONS



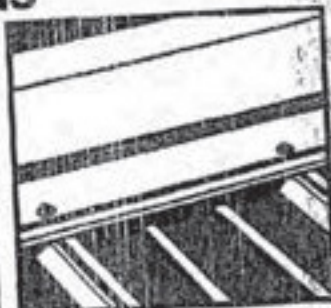
1. Posi-Vent® should be located approximately 1/2" - 1" back from front edge of ridge cap.



2. Unroll Posi-Vent® material with adhesive side down toward the roof. The 1/2" wide foam strip should contact the metal roof and face toward the front edge of the ridge cap.



3. While rolling out material it is important that the material is firmly pressed into place following the contour of the roofing material. Make sure that the adhesive is in good contact with the metal sheet especially at the ribs.



4. Install Posi-Vent® using either Ideal's Dual-Grip or SDS (self-drilling) fasteners per the panel manufacturer's recommendations making sure the fasteners penetrate the ridge and then pass through the Posi-Vent® material.

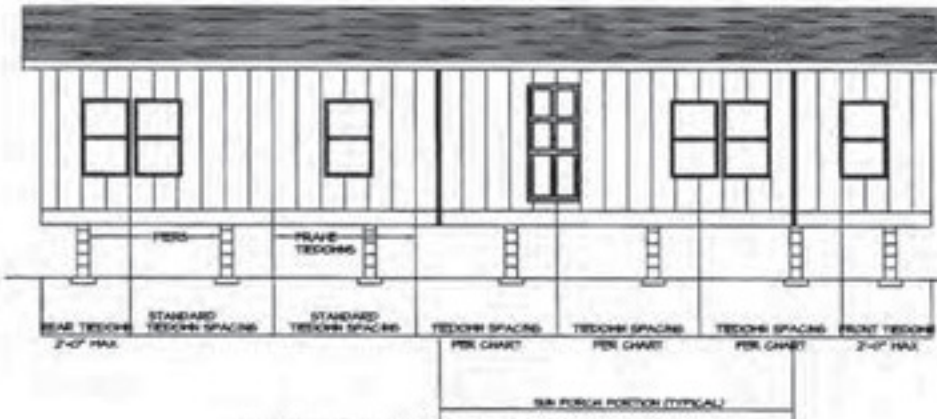
Caution: Posi-Vent is a passive ventilation system and should only be utilized with other passive ventilation systems such as soffit or gable end vents. Power venting should be avoided with passive systems.

IDEAL
BUILDING FASTENERS

APPROVED BY
NIA Feb 14, 2011
INC.
FEDERAL MANUFACTURED HOME
CONSTRUCTION AND SAFETY STANDARDS

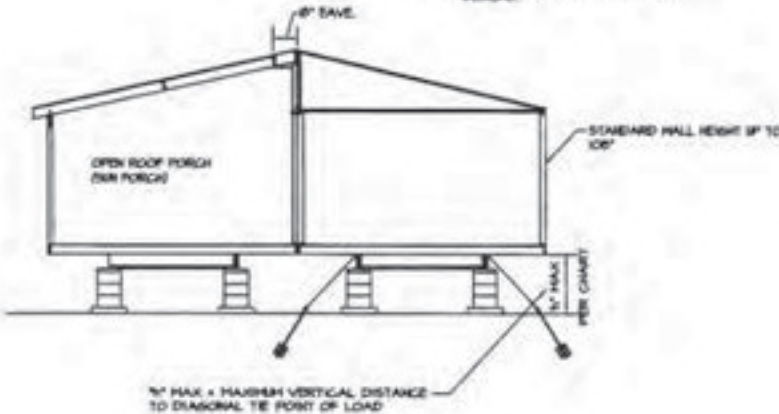
POSI-VENT®
UNIVERSAL VENTING CLOSURE

RECOMMENDED TIEDOWN SYSTEM WIND ZONE I (15 PSF LATERAL)



TYPICAL SIDE ELEVATION SHOWING TIEDOWN SPACINGS

NOTE: THIS PAGE ONLY APPLICABLE TO
SUN PORCH PORTION. SEE APPLICABLE
CHARTS FOR REMAINING TIEDOWN
DESIGNS.



TYPICAL CROSS SECTIONS SHOWING TIEDOWNS

NOTES:

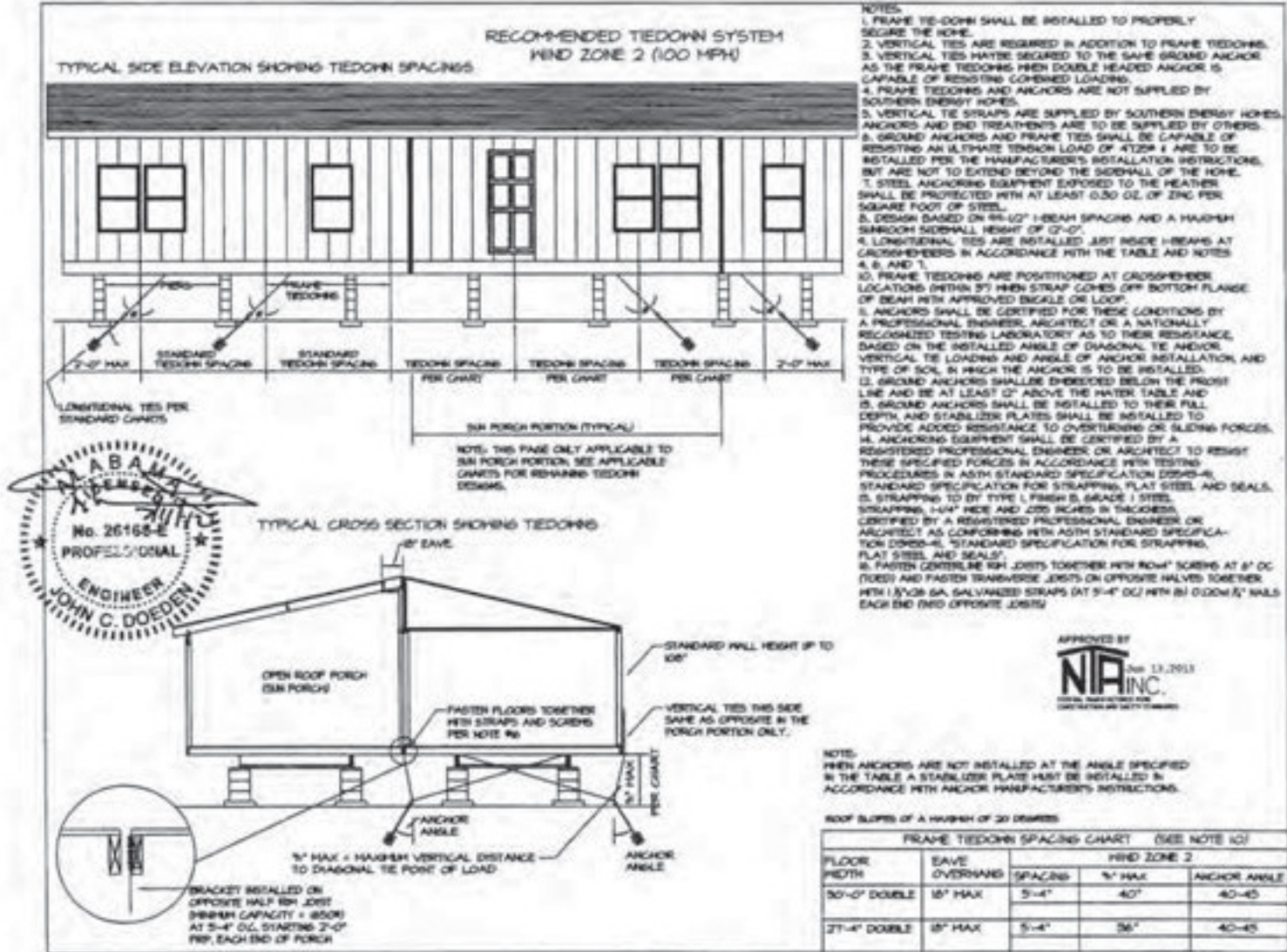
1. FRAME TIE-DOWN SHALL BE INSTALLED TO PROPERLY SECURE THE HOME.
2. OVER-THE-ROOF TIES ARE NOT REQUIRED WITH PROPERLY SPACED AND INSTALLED FRAME TIEDOWNS. HOWEVER, IF OVER-THE-ROOF TIEDOWNS ARE REQUIRED BY THE LOCAL JURISDICTION, THEY MAY BE INSTALLED.
3. OVER-THE-ROOF TIES (WHEN REQUIRED) MAY BE SECURED TO THE SAME GROUND ANCHORS AS THE FRAME TIEDOWNS.
4. FRAME TIEDOWNS AND ANCHORS ARE NOT SUPPLIED BY SOUTHERN ENERGY HOMES.
5. OVER-THE-ROOF STRAPS (WHEN REQUIRED) ARE SUPPLIED BY SOUTHERN ENERGY HOMES. ANCHORS AND END TREATMENTS ARE TO BE SUPPLIED BY OTHERS.
6. GROUND ANCHORS AND FRAME TIES SHALL BE CAPABLE OF RESISTING A TENSILE LOAD OF 4225 POUNDS AND ARE TO BE INSTALLED PER THE MANUFACTURER'S INSTALLATION INSTRUCTIONS, BUT ARE NOT TO EXTEND BEYOND THE SIDING OF THE HOME.
7. STEEL ANCHORING EQUIPMENT EXPOSED TO THE WEATHER SHALL BE PROTECTED WITH AT LEAST 0.030 OIL OF ZINC PER SQUARE FOOT OF STEEL PER SIZE.
8. RESERVED FOR FUTURE USE.
9. DESIGN BASED ON 16 1/2\"/>
10. ANCHORS SHALL 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.
11. GROUND ANCHORS SHALL BE EMBEDDED BELOW THE FROST LINE AND BE AT LEAST 12\"/>
12. GROUND ANCHORS SHALL BE INSTALLED TO THEIR FULL DEPTH, AND STABILIZER PLATES SHOULD BE INSTALLED TO PROVIDE ADDED RESISTANCE TO OVERTURNING OR SLIDING FORCES.
13. ANCHORING EQUIPMENT SHALL BE CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER OR ARCHITECT TO RESIST THESE SPECIFIED FORCES IN ACCORDANCE WITH TESTING PROCEDURES IN ASTM STANDARD SPECIFICATION D698-04, STANDARD SPECIFICATION FOR STRAPPING, PLAT STEEL, AND SEALS.
14. STRAPPING TO BE TYPE L FINISH 5/16\"/>
15. STRAPPING, 1/4\"/>
16. CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER OR ARCHITECT AS CONFORMING WITH ASTM STANDARD SPECIFICATION D698-04, STANDARD SPECIFICATION FOR STRAPPING, PLAT STEEL, AND SEALS.



ROOF SLOPES OF A MAJORITY OF 30 DEGREES

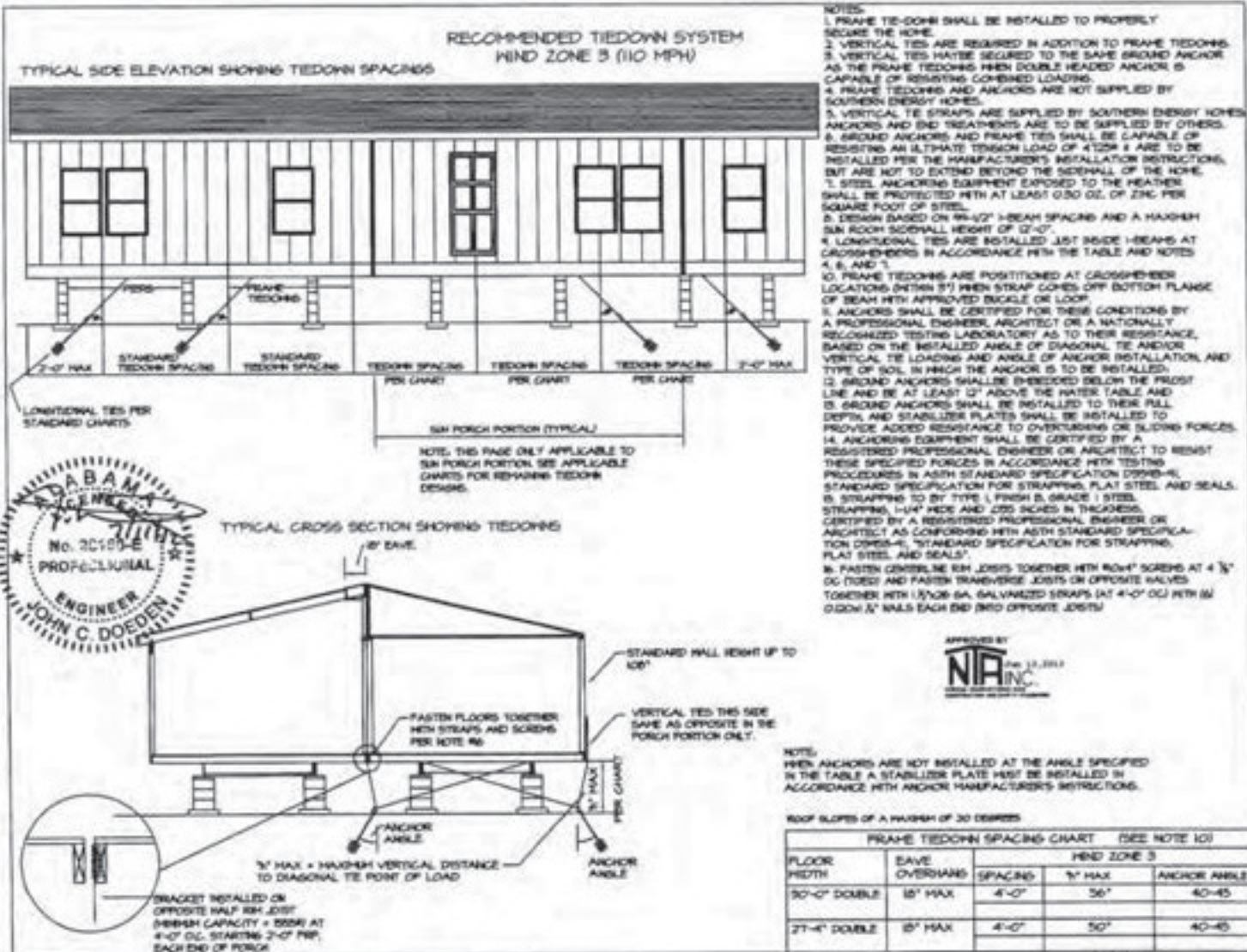
FRAME TIEDOWN SPACING CHART			
FLOOR PORTION	EAVE OVERHANG	TIEDOWN SPACING	MAX. * PIER HEIGHT
30'-0" DOUBLE	18" MAX	8'-0"	32"
27'-4" DOUBLE	18" MAX	6'-0"	40"

I-V-1



I-V-2

V-2



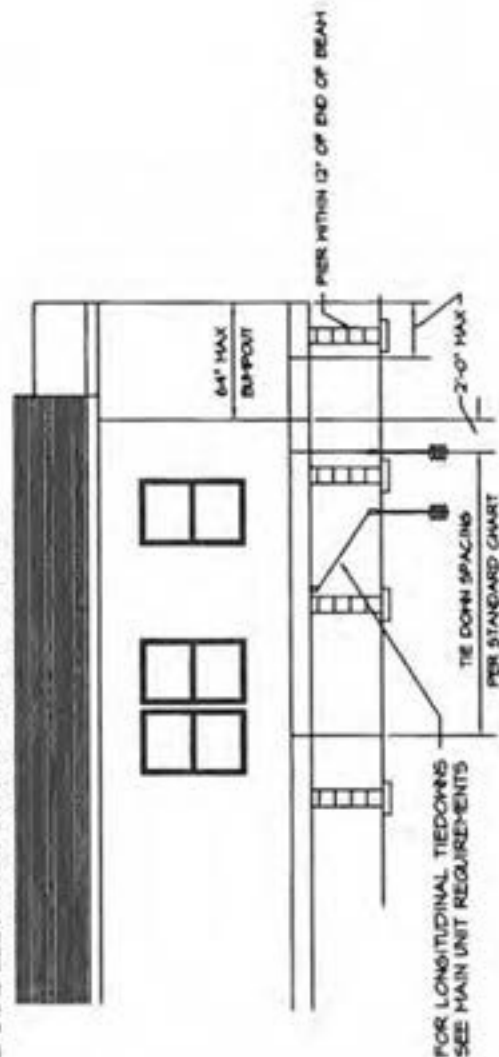
NOTES:

CAVALIER HOMES

TIEDOWN SYSTEM FOR UNITS WITH OFFSET TRUSS
WIND ZONE 1, WIND ZONE 2 (100 MPH) & WIND ZONE 3 (110 MPH)

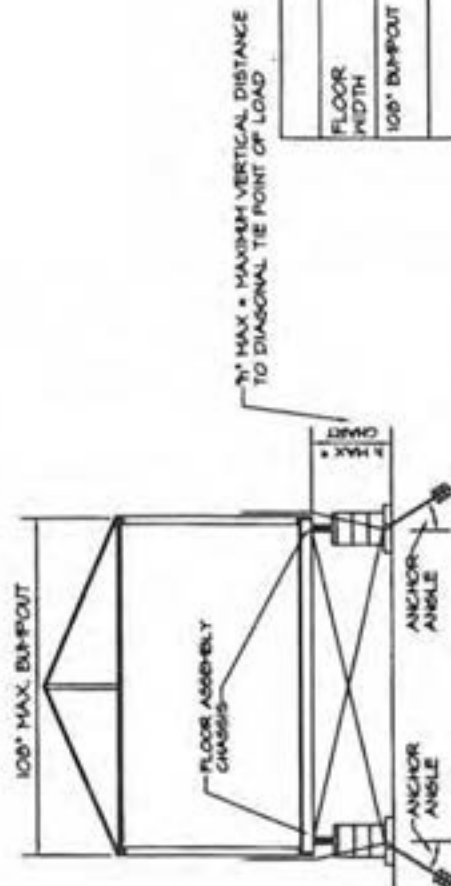
THIS DOCUMENT FOR THE INSTALLATION OF TIEDOWNS FOR THE BUMP-OUT SECTION ONLY. SEE STANDARD TIEDOWNS PAGES FOR MAIN UNIT TIEDOWNS AND FOR GENERAL NOTES.

TYPICAL SIDE ELEVATION SHOWING TIEDOWN SPACINGS



TYPICAL CROSS SECTION SHOWING TIEDOWNS

VERTICAL TIE REQUIRED MINIMUM CAPACITY:
WIND ZONE 2 = 1365# (ULTIMATE = 2040#)
WIND ZONE 3 = 1765# (ULTIMATE = 2648#)



TYPICAL BUMP OUT CROSS SECTION SHOWING TIEDOWNS

20 DEGREE MAX. ROOF SLOPE

FRAME TIEDOWN SPACING CHART

FLOOR HEIGHT	EAVE OVERHANG	SIDEWALL HEIGHT	WIND ZONE 2		WIND ZONE 3	
			SPACING	ANCHOR ANGLE	SPACING	ANCHOR ANGLE
100' BUMP-OUT	12' MAX	48"	5'-4"	25-40	5'-4"	21° 40-45

FRAME TIEDOWN SPACING CHART

FLOOR HEIGHT	EAVE OVERHANG	SIDEWALL HEIGHT	WIND ZONE 1	
			SPACING	ANCHOR ANGLE
100' BUMP-OUT	12' MAX	48"	5'-4"	60° 50-55

APPROVED BY

NTA INC.
JUN 10, 2016
FEDERAL MARINE ALLIANCE
CONSTRUCTION AND SAFETY STANDARDS

V-4

* PER HEIGHT INCLUDES DEPTH OF I-BEAM

NOTES:

1. DESIGNED FOR 5 ON 12 AND 6 ON 12 ROOF SLOPES WITH 12" MAX. FRONT AND REAR OVERHANG
2. DESIGNED FOR WIND ZONES 2 AND 3 AND SOUTH ROOF ZONE.
3. TRUSS CONFIGURATION SHOWN IS FOR ILLUSTRATION ONLY. OTHER CONFIGURATIONS ACCEPTABLE.

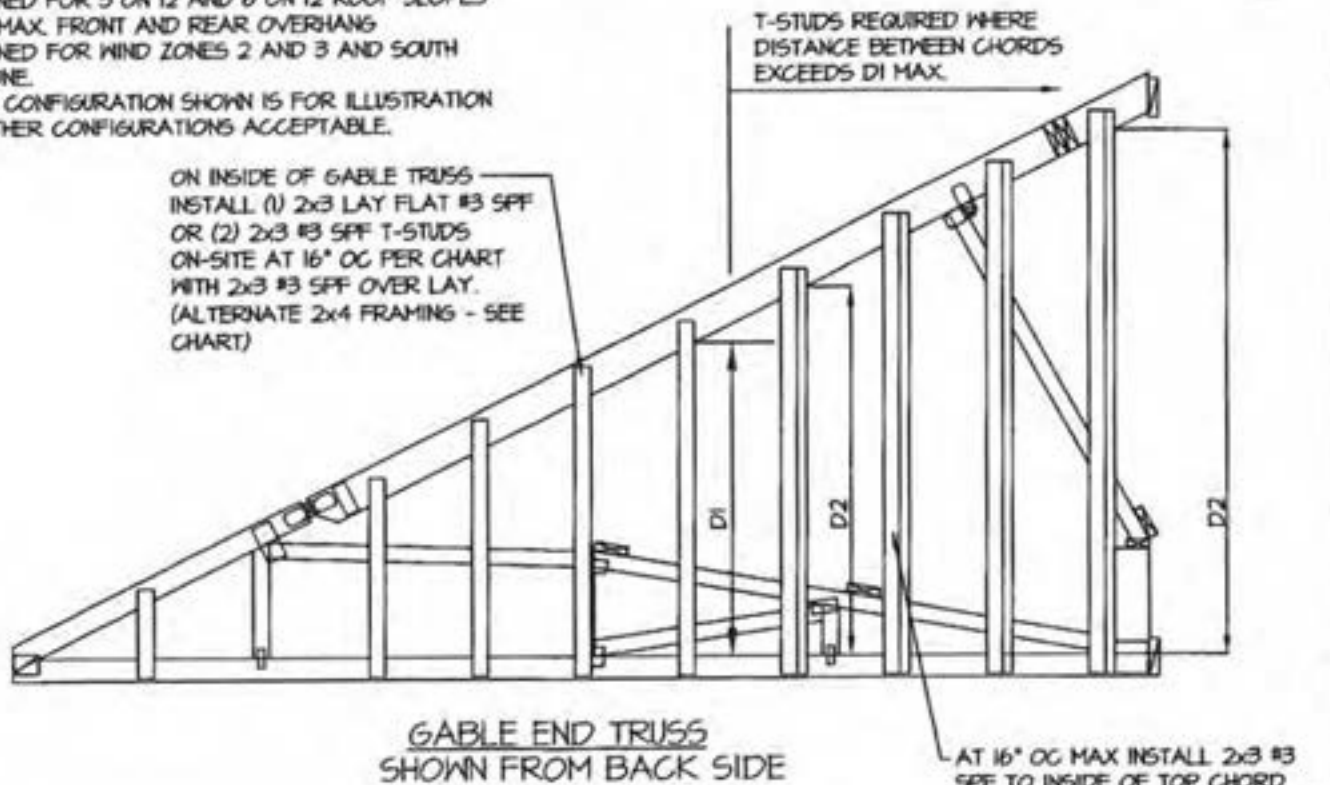


TABLE 1
MAX. DISTANCE FROM TOP CHORD TO BOTTOM CHORD CONNECTIONS

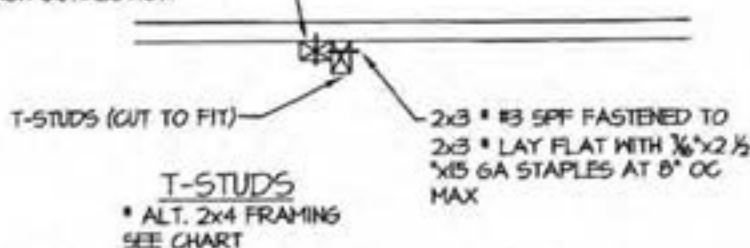
STUDS	WIND ZONE	LAY FLAT	T-STUDS
2x3	2	40 1/2"	68 1/2"
	3	38"	64 1/2"
2x4	2	45 1/2"	91 1/2"
	3	42 1/2"	85"
		D1	D2

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 Rev 30, 2016
 FEDERAL MANUFACTURED HOME
 CONSTRUCTION AND SAFETY STANDARDS

AT 16" OC MAX INSTALL 2x3 #3 SPF TO INSIDE OF TOP CHORD AND EXTEND DOWN TO INSIDE OF HORIZONTAL WEB MEMBER AND FASTEN WITH (2) #8x3" SCREWS (ALTERNATE 2x4 FRAMING OR ALTERNATE T-STUDS). OVER LAY EACH 2x3 WITH ANOTHER 2x3 #3 SPF CUT TO FIT IN BETWEEN TOP CHORD AND WEB AND FASTEN WITH 3/8"x2 1/2"x15 GA STAPLES AT 6" OC MAX

2x3 #3 SPF LAY FLAT TO TOP AND BOTTOM CHORD WITH (2) #8x3" SCREWS AT EACH CONNECTION



INSTRUCTIONS FOR FIELD INSTALLATION (DO NOT JOIN UNITS UNTIL ROOF ERECTION IS COMPLETED)

1. WHEN HINGED ROOF IS TOTALLY ERECTED INSTALL GABLE FRAMING (VERTICAL MEMBERS FLATWISE) TO THE INSIDE OF THE END TRUSS AND FASTEN AS SPECIFIED IN DETAIL.
2. SPLICE FASCIA AT BREAK WITH 2x4x32" LONG SCAB AND FASTEN FASCIA TO 2x4 EACH SIDE OF BREAK WITH (6) 3/8"x1 1/4"x15 GA STAPLES

**GABLE END FRAMING
HINGED ROOF INSTALLATION INSTRUCTIONS**