ANSI A225.1
NFPA 501A
Manufactured Home Installations
1982

National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
National Conference of States on Building Codes and Standards, Inc., 481 Carlisle Drive, Herndon, VA 22070

NOTICE

All questions or other communications relating to the fire safety portions of this document should be sent to NFPA Headquarters, other questions should be sent to NCSBCS, addressed to the attention of the Committee responsible for the document.

For information on obtaining Formal Interpretations of the document, proposing Tentative Interim Amendments, proposing amendments for Committee consideration, and appeals on matters relating to the content of the document, write to the Secretary, Standards Council, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 for the fire safety portions and to Director of Codes & Standards, NCSBCS, for other questions.

A statement, written or oral, that is not processed in accordance with Section 16 of the Regulations Governing Committee Projects shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

Users of this document should consult applicable Federal, State and local laws and regulations. NFPA does not, by the publication of this document, intend to urge action which is not in compliance with applicable laws and this document may not be construed as doing so.

NCSBCS Standard for
Manufactured Home Installations
(Manufactured Home Sites, Communities and Set-ups)

ANSI A225.1-1982

including

NFPA Standard for
Firesafety Criteria for
Mobile Home Installations, Sites and Communities

NFPA 501A-1982

1982 Edition of ANSI A225.1

This edition of NCSBCS *Standard for Manufactured Home Installations (Manufactured Home Sites, Communities and Set-ups)* was prepared by the National Conference of States on Building Codes and Standards, Inc. (NCSBCS) Committee on Manufactured Home Installations (Manufactured Home Sites, Communities and Set-ups). It was reported out to the NCSBCS Standards and Evaluation Committee at the September 14, 1982 Annual Meeting of the Conference. It was approved by the NCSBCS Standards and Evaluation Committee at that meeting. Prior to approval, the document had been submitted to public review and comment both within NCSBCS and via the American National Standards Institute (ANSI). The document was also submitted to the NFPA Committee and was coordinated with NFPA staff. All public comments were resolved and this document has been submitted to ANSI for their separate approval. However, under the NCSBCS procedures, the NCSBCS Standards and Evaluation Committee approval of September 14, 1982 is the effective date for this standard as an NCSBCS standard and for joint publication as an NCSBCS/NFPA standard. This edition supersedes all previous editions.

1982 Edition of NFPA 501A

This edition of NFPA 501A, *Standard for Firesafety Criteria for Mobile Home Installations, Sites and Communities*, was prepared by the Technical Committee on Firesafety for Mobile Homes and acted on by the National Fire Protection Association, Inc., on May 19, 1982, at its Annual Meeting in San Francisco, California. It was issued by the Standards Council on June 8, 1982 with an effective date of June 28, 1982, and supersedes all previous editions.

Origin and Development of NFPA 501A

NFPA activity in this general area commenced in 1937 when NFPA organized its first Committee on Trailers and Trailer Courts. The first standard covering Trailer Coach Camps appeared in 1939, with revisions in 1940, 1952, 1960, and 1964. A completely new edition was adopted in 1971, and this text was revised in 1972, 1973, 1974, 1975, and 1977.

The American National Standards Institute (ANSI) approved the 1972 NFPA edition on May 8, 1973; the 1973 NFPA edition on December 28, 1973; the 1974 NFPA edition on January 30, 1975; the 1975 NFPA edition on February 27, 1976; and the 1977 NFPA edition on October 18, 1977. This 1982 NFPA edition has also been submitted for similar approval.

The 1977 edition was developed by the Sectional Committee on Mobile Home Installations and processed through the Correlating Committee on Mobile Homes and Recreational Vehicles and was approved by the National Fire Protection Association at its 1977 Annual Meeting, May 16-19. The only substantive changes since the previous (1975) edition were revisions to Part 8 on mobile home park electrical systems with the revisions thereto indicated by vertical marginal rules. Some editorial revisions were accomplished in other Parts and references to other standards referenced therein were updated.

This 1982 edition on *Standard for Firesafety Criteria for Mobile Home Installations, Sites and Communities* supersedes the 1977 edition and was adopted by NFPA at its Annual Meeting held in San Francisco on May 19, 1982.

This edition of the standard was produced by the newly formed Committee for Firesafety for Mobile Homes (June 20, 1979) charged with the responsibility of developing documents for firesafety criteria for single-family mobile homes including the installation, sites and communities and the maintenance of and improvements for existing mobile homes. Therefore, this edition excludes all sections of previous editions not considered within the Committee scope. Notably excluded are stabilizing and anchoring systems; requirements for piers and footings; and plumbing, including sewage disposal systems. Requirements for park electrical systems are addressed by reference to the *National Electrical Code®*.

Modifications have also been made in sections dealing with fuel supply, air conditioning and life and firesafety.

NCSBCS Committee on

Manufactured Home Installations

(Manufactured Home Sites, Communities, and Set-ups)

Donald R. Fairman, *Chairman*
U.S. Department of Housing & Urban Development

Michael J. Slifka, P.E., *Secretary*
National Conference of States on Building Codes and Standards, Inc.

G. W. Anderson, American Gas Association
Thomas R. Arnold, T. R. Arnold & Associates
Artie O. Barker, International Association of Electrical Inspectors
Douglas R. Betts, Fleetwood Enterprises, Inc.
Richard Bullock, Hilborn, Werner, Carter & Associates
Dr. Riley M. Chung, National Bureau of Standards
Earl Ferguson, Compliance Systems Publications
Martin C. Gilchrist, Urban Research and Development Corp.
Jordan Heiman, Jordan Heiman, Inc.
Ronald D. Hepler, Rockwool Industries
Al Howard, Foremost Insurance Co.
Ramero Inocencio, State of Arizona
Walter H. Johnson, National LP Gas Association
Norman J. Latter, International Association of Plumbing & Mechanical Officials
Henry Omson, Resources, Applications, Designs & Controls
Jim Phipps, National Manufactured Housing Federation
Dr. Mary S. Pickett, Illuminating Engineering Society
Syd Adler, National Manufactured Housing Federation
Leonard Wehrman, National Mobile/Manufactured Home Owners Foundation
Holton E. Blomgren, National Manufactured Housing Federation
D. Denson Hutchinson, Tie Down Engineering
Frank Walter, Manufactured Housing Institute

Alternates

Tom Highman, International Association of Plumbing & Mechanical Officials
A. W. G. Jones, American Gas Association
John Siebel, National Manufactured Housing Federation
Craig White, National Manufactured Housing Federation
Dr. Felix Yokel, National Bureau of Standards

Nonvoting

Walter Burke, U.S. Veterans Administration
Eric Kent, Canadian Standards Association
Chester L. Tate, U.S. Public Health Service

NFPA Committee for Firesafety for Mobile Homes

Russell R. Bahr, *Chairman*
Dept. of Housing & Community Devel., CA

Artie O. Barker, Electrical Bureau
Rep. IAEI

Jesse J. Beitel, Southwest Research Inst.

Thomas W. Fritz, Armstrong World Industries

Martin C. Gilchrist, Urban Research & Development Corp.

Bob Gore Jr., State Fire Marshal's Office, GA

Jordan Heiman, Jordan L. Heiman Inc.
Rep. ASHRAE

Al Howard, Foremost Insurance Co.

John H. Jensen, Mobile Home Owners of America Inc.

Walter H. Johnson, National LP-Gas Assn.

Arthur W. G. Jones, Southern California Gas Co.

David P. Klein, National Bureau of Standards

Jiyun Nakaji, RADCO

Charles V. Opdyke, Dept. of Labor, MI
Rep. MI Bureau of Construction Standards

W. J. Smith, Underwriters Laboratories Inc.

Chester Lee Tate Jr., Center for Disease Control, GA

John A. Thom, Lariat Homes
Rep. National Mfd. Housing Federation

Glenna Tollett, Washington Mobile Home Park Assn. Inc.

J. Herbert Witte, Lincolnwood, IL
Rep. Gas Vent Inst.

Alternates

Douglas R. Betts, Fleetwood Enterprises Inc.
(Alternate to Fleetwood Enterprises Inc.)

S. L. Blachman, American Gas Assn. Laboratories
(Alternate to A. W. G. Jones)

Kenneth L. Hallmark, Dept. of Housing & Community Development, CA
(Alternate to R. R. Bahr)

James M. Phipps, Silver Star Mobile Homes Inc.
(Alternate to J. Thom)

Marvin Smith, Gypsum Assn.
(Alternate to Gypsum Assn.)

Nonvoting

George E. Renault Jr., Manufactured Housing Inst.

Frank Walter, Manufactured Housing Inst.
(Alternate to G. E. Renault Jr.)

This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or any document developed by the Committee on which the member serves.

Contents

Cross-Reference Between NCSBCS/NFPA Standard for Manufactured Home Installations (Manufactured Home Sites, Communities, and Set-ups) and the NFPA Standard for Firesafety Criteria for Mobile Home Installations, Sites, and Communities

NCSBCS/ NFPA	*NFPA 501A*	*NCSBCS/ NFPA*	*NFPA 501A*
1-1	1-1		
1-2.1 (a)	1-2 (a)	8-2	5-2
1-2.1 (b)	1-2 (b)	8-2.1	5-2.1
1-2.2	1-2.1	8-2.1.1	5-2.1.1
1-3	1-3	8-2.1.2	5-2.1.2
1-4	1-4	8-3	5-3
1-4.2	1-4.1	8-3.1	5-3.1
1-5	1-5	8-3.2	5-3.2
1-5.1	1-5.1	8-3.4	5-3.3
1-5.5	1-5.2	8-4	5-4
1-6.3.1	1-6	8-4.1	5-4.1
		8-4.2	5-4.2
		8-4.3	5-4.3
		8-5.1	5-5.1
5-1.1	2-1	8-5.2	5-5.2
5-3.1.1	2-1		
5-2.1.1	2-1.1	9-3.2.2	5-4.4
5-4.1	2-2	9-3.4	5-4.4.1
5-4.3	2-3	9-3.5	5-4.4.2
		9-4.4	5-4.5
6-1	3-1		
6-1.1	3-1.1	Appendix D	Appendix A
6-1.2	3-1.2		
6-1.3	3-1.3		
		Appendix E	Appendix B
7-1	4-1		
7-1.1	4-1	Appendix F	Appendix C
8-1	5-1	Appendix J	Appendix D
8-1.1	5-1.1		
8-1.3.2	5-1.2		
8-1.4	5-1.3		
8-1.5	5-1.4		
8-1.5.1	5-1.4.1		
8-1.5.2	5-1.4.2		
8-1.6	5-1.5		

Standard for
Manufactured Home Installations
(Manufactured Home Sites, Communities and Set-ups)

NFPA 501A-1982 **ANSI A225.1-1982**

Chapter 1 Scope and Intent of Standard, Organization of Standard, and Definitions

1-1 Scope. This standard covers the installation of manufactured homes, wherever located, and minimum construction standards for manufactured home communities. Included are requirements for manufactured home sites (whether a single site or sites located in communities), utility facilities (light, heat, water and sanitation), manufactured home set-ups, and manufactured home on-site accessory buildings or structures. This standard also covers firesafety requirements for the installation of manufactured homes, sites including accessory buildings and structures, and communities and the maintenance of and improvements for existing manufactured homes.

1-2 Intended Usage of Manufactured Homes Covered Under this Standard. The provisions of this standard are intended to apply to manufactured homes (single, multiple, or expandable types) for use as single-family dwellings.

Exception 1: This standard does not apply to manufactured homes constructed and approved by the enforcing authority having jurisdiction specifically for multifamily usage.

Exception 2: This standard does not apply to manufactured homes utilized for other than dwelling purposes.

1-2.1 Types of Structures Covered.

(a) *Manufactured Homes.* The manufactured homes covered under this standard are manufactured homes complying with the Manufactured Home Construction and Safety Standards as set forth in 24 C.F.R., Parts 3280, 3282 and 3283 (42 U.S.C. 5401 et seq.) as mandated in the United States of America or, for manufactured homes built prior to June 15, 1976, to those complying with the *Standard for Mobile Homes*, NFPA 501B-1974/ANSI A119.1-1975 in effect at the time of manufacture.

NOTE 1: For the Manufactured Home Procedural and Enforcement Regulations, as applicable in the United States of America, 24 C.F.R., Parts 3280, 3282 and 3283 (U.S.C. 5401 et seq.)

NOTE 2: The *Standard for Mobile Homes*, NFPA 501B (ANSI), may be referred to for guidance and may be used as the governing document in areas outside the United States of America and its possessions where other national or local laws do not apply. Manufactured homes used for other than dwelling purposes are not covered.

NOTE 3: For manufactured homes constructed prior to June 15, 1976, consult with the manufactured home manufacturer for his installation requirements.

(b) *Accessory Buildings and Structures.* See Chapter 9 for requirements and descriptions of all accessory buildings.

1-2.2 Applicability. This standard is designed to be adopted by authorities having jurisdiction responsible for the safety and health of manufactured home users and for establishing regulations applicable to manufactured home communities. It is intended to apply to new rather than existing manufactured home sites, communities and set-ups. While this standard may provide useful technical data for improvements to existing facilities falling within its scope and such use is encouraged, it is not intended to be applied retroactively to existing facilities except where the authority having jurisdiction considers such application essential for the safety and health of the occupants or

users of the facilities. This standard shall not be construed as relieving the installer of a manufactured home of responsibility for compliance with local ordinances, codes, and regulations established by the authorities having jurisdiction; for relieving owners or operators of manufactured home communities from complying with any other legally enforceable regulations of any responsible authority having jurisdiction; or for relieving the manufactured home owner or tenant from responsibilities for the proper use and maintenance of a manufactured home.

1-2.3 Organization of Standard. This standard is divided into nine chapters with appendix material. The chapters are divided generally by the kinds of work involved to facilitate adoption by local jurisdictions. Chapter 1 provides general information; Chapter 2 gives information on site design; Chapter 3 contains material on setting up and stabilizing the manufactured home; Chapter 4 is on plumbing; Chapter 5 on fuels and supply systems; Chapter 6 on heating and cooling; Chapter 7 contains standards for electrical work; Chapter 8 gives information on life and firesafety; and Chapter 9 treats the subjects of manufactured home accessory buildings and structures. Appendix material gives additional guidance as shown in the Contents.

1-3 Definitions and Units.

Accessory Building or Structure, Manufactured Home. A building or structure which is an addition to or supplements the facilities provided by a manufactured home. It is not a self-contained, separate, habitable building or structure. Examples are: awnings, cabanas, ramadas, storage structures, carports, fences, windbreaks, or porches.

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

Anchoring System. A combination of ties, anchoring equipment, and ground anchors that will, when properly designed and installed, resist overturning and lateral movement of the manufactured home from wind forces.

Approved. Acceptable to the authority having jurisdiction. Acceptance shall be measured to the requirements of the U.S. Department of Housing and Urban Development as regards the Federal Manufactured Home Construction and Safety Standard as set forth in 24 C.F.R., Parts 3280 and 3282 (42 U.S.C. 5401 et seq.).

Authority Having Jurisdiction. The "authority having jurisdiction" is the organization, office, or individual responsible for "approving" equipment, an installation, or a procedure.

NOTE: The National Conference of States on Building Codes and Standards, Inc. (NCSBCS), the National Fire Protection Association (NFPA), and the American National Standards Institute (ANSI) do not approve, inspect or certify any installations, procedures, equipment, or material nor do they approve or certify any installations, procedures, equipment, or material nor do they approve or evaluate testing laboratories. In determining the acceptability of installations or procedures, equipment or materials, the authority having jurisdiction may base acceptance on compliance with NCSBCS, NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure or use. The authority having jurisdiction may also refer to the listing or labeling practices of an organization concerned with product evaluations which is in a position to determine compliance with appropriate standards for the current production of listed items.

Awning. A shade structure supported by posts or columns and partially supported by a manufactured home installed, erected, or used on a manufactured home site.

Awning, Freestanding. A shade structure supported entirely by columns or posts and not attached to or supported by a manufactured home or other structure.

Awning, Window or Door. A shade structure supported wholly by the manufactured home or building to which it is attached, giving shade to a window or door.

Baling. A method of "wrapping" a cross section (roof, walls, and floor) and the main frame (chassis) of a manufactured home with straps.

Building. A roofed structure erected for permanent use.

Cabana. A room enclosure erected or constructed adjacent to a manufactured home for residential use by the occupant of the manufactured home.

Carport. An awning or shade structure for a vehicle or vehicles which may be freestanding or attached to a manufactured home.

Community Building. Any nonresidential building used for manufactured home community purposes.

Community Building, Manufactured Home. One or more rooms that are designed for industrial, professional or commercial purposes and not intended as a dwelling unit.

Community Electrical Wiring System. All of the electrical wiring, fixtures, equipment and appurtenances related to electrical installations within a manufactured home community (park, estate, subdivision, etc.), including the manufactured home service equipment.

Community Management. The person or entity who owns a manufactured home development or has charge, care, or control of a manufactured home community (park, estate, subdivision, etc.).

Community, Manufactured Home. A parcel (or contiguous parcels) of land which has been so designated and improved that it contains two or more manufactured home sites available to the general public for the placement of manufactured homes for occupancy.

NOTE: The manufactured home sites may be for rent (as in a park), or sites may be sold for residential occupancy (as in a subdivision).

Community Street. A private way which affords

principal means of access to abutting individual manufactured home sites and community buildings.

Diagonal Tie. A tie intended to primarily resist horizontal or shear forces and which may secondarily resist vertical, uplift, and overturning forces.

Dwelling Unit. One or more habitable rooms which are designed to be occupied by one family with facilities for living, sleeping, cooking, eating and sanitation.

Feeder Assembly (Electrical), Manufactured Home. The overhead or underchassis feeder conductors, including the grounding conductor, together with the necessary fittings and equipment, or a power supply cord approved for manufactured home use, designed for the purpose of delivering energy from the electrical service location (per NCSBCS) to the distribution panel board provided within the manufactured home.

Feeder Equipment (Electrical), Manufactured Home. The equipment containing the disconnecting means, overcurrent protective devices, and receptacles or other means for connecting a manufactured home feeder assembly.

Fence. A structure designed and erected as a free-standing unit, the surface of which has more than 50 percent open area. (*Also see Windbreak.*)

Foundation, Manufactured Home. A site-built or site-assembled system of stabilizing devices which is:

(a) Capable of transferring design dead loads and live loads required by Federal Regulations (*see 1-2*), and other design loads unique to local home sites, wind, seismic and water site conditions, that are imposed by or upon the structure, into the underlying soil and/or bedrock without failure, and

(b) In frost susceptible areas, placed at an adequate depth, or otherwise adequately insulated/protected, to prevent frost damage.

(c) Constructed of materials acceptable to the authority having jurisdiction. (*See Appendix C for examples.*)

Gas Supply Connector. A listed connector designed for connecting the manufactured home to the gas supply source.

Ground Anchor. Any device at the manufactured home stand designed to transfer manufactured home anchoring loads to the ground.

Habitable Room. A room or enclosed floor space arranged for living, eating, food preparation, or sleeping purposes not including bathrooms, toilet compartments, laundries, pantries, foyers, hallways, and other accessory floor space.

Hurricane-Resistive Manufactured Home. A manufactured home which meets the wind design load requirements for Zone II in Subpart D of 3280.305(c)(2) of the Federal Standard or the applicable hurricane-resistive design requirements of the *Standard for Mobile Homes*, NFPA 501B-1974/ANSI A119.1-1975, in effect at the time of manufacture.

Labeled. Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Listed. Equipment or materials included in a list published by an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or materials meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

Main Frame. The structural component on which is mounted the body of the manufactured home.

Manufactured Home. A structure, transportable in one or more sections, which, in the traveling mode, is 8 body ft (2.4 m) or more in width or 40 body ft (12 m) or more in length, or, when erected on site, is 320 or more sq ft (28.8 m^2), and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air conditioning and electrical systems contained therein; except that such term shall include any structure which meets the size requirements and with respect to which the manufacturer voluntarily files a certification required by the Secretary of the U.S. Department of Housing and Urban Development and complies with the National Manufactured Home Construction and Safety Standards.

NOTE 1: For the purpose of this standard the phrases "manufactured home" and "mobile home" are synonomous.

NOTE 2: This definition should not be interpreted to include any types of recreational vehicles (including so-called "park models" or travel trailers) which may equal or exceed the body length specified herein.

Mobile Home. A structure, transportable in one or more sections, which is 8 body ft (2.4 m) or more in width and 32 body ft (9.6 m) or more in length, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation, when connected to the required utilities, and includes the plumbing, heating, air conditioning, and electrical systems contained therein.

NOTE: For the purpose of this standard the phrases "manufactured home" and "mobile home" are synonomous.

Occupied Area of a Manufactured Home Site. The total of all of a manufactured home site covered by a

manufactured home and roofed home accessory buildings and structures.

Pier. That portion of the support system between the footing and the manufactured home, exclusive of caps and shims.

Porch. An outside walking area having the floor elevated more than 8 in. (203 mm) above grade.

Ramada. Any freestanding roof or shade structure, installed or erected above an occupied manufactured home or any portion thereof.

Running Gear Assembly. The assembly (which includes springs, spring hangers, axles, bearings, wheels, brakes, rims and tires with their related hardware) designed to permit the manufactured home to be transported over a highway.

Set-up. The work performed and operations involved in the placement of a manufactured home on a foundation system in accordance with the manufacturer's instructions, to include installation of accessories or appurtenances and anchoring devices, and when local regulations permit, connection of utilities, but excluding preparation of the site.

Shall. Indicates a mandatory requirement.

Should. Indicates a recommendation or that which is advised but not required.

Site, Manufactured Home. A designated parcel of land in a manufactured home park designed for the accommodation of one manufactured home, its accessory buildings or structures, and accessory equipment for the exclusive use of the occupants.

Skirting. A weather-resistant material used to enclose the space from the bottom of the manufactured home to grade.

Special Permission. The written consent of the authority having jurisdiction.

Stabilizing Devices. All components of the anchoring and support systems such as piers, footings, ties, anchoring equipment, ground anchors and any other equipment which supports the manufactured home and secures it to the ground.

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

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

Structure. That which is built or constructed, an edifice or building of any kind, or any piece of work artificially built up or composed of parts joined together in some definite manner.

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

Tie. Strap, cable or securing device used to connect the manufactured home to ground anchors.

Vertical Tie. A tie intended to resist the uplifting and overturning forces.

Windbreak. A man-made wall structure designed and erected as a freestanding unit, the vertical surface of which has less than 50 percent open area. (*Also see Fence.*)

1-3.1 Units. Metric units of measurement in this standard are in accordance with the metric system known as the International System of Units (SI). Two units (liter and bar), outside of but recognized by SI, are commonly used. These units are listed in Table 1-3.1 with conversion factors.

Table 1-3.1

Name of Unit	Unit Symbol	Conversion Factor
liter	L	1 gal = 3.785L
cubic decimeter	dm^3	1 gal = 3.785 dm^3
pascal	Pa	1 psi = 6894.757 Pa
bar	bar	1 psi = 0.0689 bar
bar	bar	1 bar = 10^4 Pa

For additional conversions and information see ASTM E380-1979, *Standard for Metric Practice* (*see Appendix I*).

1-3.2 If a value for measurement as given in this standard is followed by an equivalent value in other units, the first stated is to be regarded as the requirement. A given equivalent value may be approximate.

1-3.3 The conversion procedure for the SI units is to multiply the quantity by the conversion factor and then round the result to the approximate number of significant digits.

1-4 Single and Multiple Manufactured Home Sites — General.

1-4.1 Location of Utility Lines, Connections. Utility lines and connections shall be located as specified in 4-1.2 for water, 4-1.6.2 for sewer, 7-1 for electrical, and 5-1.3 for gas to serve the manufactured home stand.

NOTE: For manufactured home communities, see also Sections 4-3, 5-3 and 7-3.

1-4.2 Marking of Underground Utility Lines. The location of electrical cables, gas piping, water piping and sewer lines buried underground along the periphery or within 4 ft (1.2 m) of the perimeter of the manufactured home stand shall be indicated by an aboveground sign(s), and/or only by underground marker tapes identifying the proximity of the lines. A plot plan showing the "as built" location of underground utility lines shall be available for installations in multiple-site facilities.

NOTE 1: This requirement is to preclude possible damage to such underground services by the use of ground anchors, in-

stallation of skirting (underfloor enclosures), plantings, foundations for steps at access doors, etc.

NOTE 2: Aboveground sign(s) may be erected to readily assist in locating utility lines, but such sign(s) shall not be misconstrued to be in lieu of the required underground marker tapes identifying the proximity of the lines.

1-5 Manufactured Home Installations.

1-5.1 Installer Qualifications. Manufactured home installers shall be qualified by training, education and experience to erect/install homes in accordance with the provisions of the manufacturer's installation instructions, the provisions of this standard, the standards referenced in 1-2.1, and in accordance with any state or local regulations.

1-5.2 The authority having jurisdiction is responsible for establishing reasonable qualifications for installers which assure that manufactured home installations comply with 1-2.1 and 1-5.1.

Exception: When the manufactured home is located where there is no state or local authority having jurisdiction, the seller/developer is responsible for establishing the qualifications of the installers.

1-5.3 Manufactured Home Utility Connections. When a manufactured home consists of two or more sections, all utility connections from one section to another shall be installed in accordance with the manufacturer's instructions, inspected, and determined to be effective in the manner intended.

1-5.4 Rigid Utility Connections. No rigid utility connections shall be made unless the home is installed on a foundation constructed in accordance either with the local building code having jurisdiction or, in the absence of a local code, with a recognized model building code.

1-5.5 Approved Materials Required. All manufactured home utility services shall be connected to the supply sources only with approved materials.

1-6 Accessory Buildings and Structures.

1-6.1 General. Because of variable conditions encountered in different areas of the United States, it is impractical to develop detailed requirements for manufactured home accessory buildings and structures. The requirements set forth in this standard are basic standards applicable to the type of structures defined.

1-6.2 Scope. When manufactured home accessory buildings and structures are erected, constructed, or occupied on a manufactured home site, they shall comply with this standard.

1-6.3 Construction, General. Every manufactured home accessory building or structure shall be designed and constructed in accordance with any applicable provisions of nationally recognized building codes and shall conform to the criteria of the authority having jurisdiction.

1-6.3.1 Any manufactured home, accessory building, structure or connecting building construction shall be located so that any required egress window or door of the manufactured home is not blocked.

1-7 Manufactured Home Community Buildings.

1-7.1 Construction. Every community building shall be designed and constructed in accordance with the applicable provisions of local building codes.

1-7.2 Materials, Fixtures, Devices, Fittings. Materials, fixtures, devices, and fittings, and their installation shall conform to nationally recognized standards.

Chapter 2 Site Design

2-1 Site Acceptability Criteria.

2-1.1 Trespass. Each site shall be located so that access and use can be assured without trespass upon adjoining properties.

2-1.2 Site Hazards. Each site shall be evaluated by the authority having jurisdiction to determine: (a) if it is suitable for its intended use; (b) that such use complies with any applicable federal, state, and local laws; (c) if such hazards as flood, erosion, sediment deposition, noise or air pollution from nearby traffic or industrial activities, vibration from vehicular traffic or construction or industrial production operations, or unstable landfill conditions exist which might impair the use or utility of the property. When, during preparation of the site, such unforeseen factors as rock formation, high groundwater levels, springs, biologically generated gases, etc., are encountered, corrective work shall be taken prior to siting the manufactured home.

NOTE: See Appendix H.

2-1.3 Need For Stabilizing Devices/Systems. Stabilizing devices and stabilizing systems shall be in accordance with Chapter 3 where required by the authority having jurisdiction. (*See 3-2.5.1.*)

2-1.4 Protective Slopes of Unpaved Areas Around Manufactured Home Stands and Accessory Buildings. Grades shall slope downward from patios and stands, from all walls, skirting, and foundations, and from water supply wells to adequate outfalls or to drainage swales discharging to adequate outfalls.

2-1.5 Selection of Manufactured Home for the Site. The manufactured home shall be located only in climatic zones where it meets or exceeds design requirements.

NOTE: See Appendix B for wind, roof load, and winter climate zone maps.

2-2 Single and Multiple Manufactured Home Site Development.

2-2.1 Site Grading and Drainage. The objectives are: (1) to preserve as many desirable site features as prac-

ticable; (2) to provide diversion of surface water away from the manufactured home, accessory structures and stands; (3) to prevent standing water and soil saturation detrimental to structures and site use; (4) to provide for disposal of surface water except as desired for controlled irrigation; (5) to provide finished grades for the safe and convenient access and use of sites; and (6) to provide protection from erosion.

2-2.2 Drainage Provisions. Manufactured home stands, unless subsurface drainage structures are provided, shall have a crown or gradient for surface drainage acceptable to the authority having jurisdiction. At stand perimeters accepting drainage water, surface or subsurface drainage structures shall be provided.

2-2.3 Storm Water Disposal.

NOTE: Drainage designs should accommodate storm runoff calculated on the basis of foreseeable conditions of contributory site and off-site drainage areas.

2-2.3.1 All areas shall slope to lower elevations off the site or to drainage structures on the site.

2-2.3.2 Emergency surface drainage overflows for drain inlets or catch basins shall be provided where necessary to prevent flooding of manufactured home stands, damage to accessory structures and any wells, in the event of failure of any underground drainage structures.

2-2.4 Drainage Structures.

NOTE: Collection and disposal of surface and subsurface water should be provided, as necessary, to protect the manufactured home and its stand and accessory buildings.

2-2.4.1 Required Drainage Structures. Where erosion due to high runoff velocity is not prevented by grading or by plantings, drainage structures shall be constructed.

2-2.4.2 Gutter Connections. Gutters, if provided, shall be connected to adequate outfall with off-site drainage ways protected for permanence.

2-2.4.3 Drain Inlets. Drain inlets shall be sized, designed, and constructed for their intended use.

2-2.4.4 Drain Lines. Drain lines shall be of durable materials, sized and installed to assure positive runoff. Drain lines for surface drainage shall have sealed joints. Drain lines for subsurface drainage shall be permitted to be perforated, porous, or open joint pipe with not less than 9 in. (229 mm) previous backfill over pipe. Drain lines shall be connected to an adequate outfall.

2-2.4.5 Dry Wells. Where their installation is authorized, dry wells shall be located not less than 10 ft (3.5 m) from a manufactured home stand, at least 20 ft (6.10 m) from sewage disposal fields, and not less than 50 ft (15.24 m) from water supply wells.

NOTE: For effectiveness, dry wells should be relied upon only in areas of well-drained soils with high sand and gravel content.

2-3 Single Manufactured Home Site Development.

2-3.1 General. The appropriate provisions of this section shall apply to single manufactured home sites (e.g., individual manufactured homes not located in a manufactured home community).

2-3.2 Access. Each site shall be accessible from abutting streets for all essential and emergency uses by vehicular equipment, including equipment used by public protective agencies (fire, police, ambulance services) during all anticipated weather conditions. Access streets shall either be dedicated for public use or, when authorized by the authority having jurisdiction, shall be private ways protected by permanent easements. Driveways shall extend from such access streets to a garage, carport, or parking space with the location, alignment and grades designed to provide for safe and convenient use. Driveways shall have a minimum width of 10 ft (3.05 m) and shall have a 5-ft (1.52-m) radius or shall flare to a 14-ft (4.27-m) width at street entrance.

2-4 Multiple Manufactured Home Site Development.

2-4.1 General. In addition to the provisions for single and multiple site development, the following provisions relate to sites located in manufactured home communities.

2-4.2 Land Use Requirements.

2-4.2.1 Space Utilization. Site coverage and building separation in a manufactured home community for each manufactured home and its accessory structure(s) shall be in accordance with this section and Section 8-2.

2-4.2.2 Setbacks. Each manufactured home stand shall be set back at least 25 ft (7.62 m) from any community boundary line abutting an existing or proposed public street or highway right-of-way line. Each manufactured home stand shall be set back at least 3 ft (0.91 m) from any abutting street within a manufactured home community. (*Also see 8-2.1.1.*)

NOTE: Where there is no access or when adequate screening or fencing is provided between a manufactured home stand and a public street or highway, the 25-ft (7.62-m) distance may be reduced when authorized by the authority having jurisdiction.

2-4.2.3 Access To Community Streets. Each manufactured home site within a manufactured home community shall have direct access to a community street. The access shall be an unobstructed area, not less than 14 ft (4.27 m) in width for the movement of a manufactured home on or off the site.

2-4.3 Community Streets and Common Walk Systems.

2-4.3.1 Minimum pavement widths shall be 24 ft (7.32 m) for two-way traffic; 14 ft (4.27 m) for one-way traffic; and at least 7 ft (2.13 m) shall be added for each parking lane if provided.

2-4.3.2 The street system shall have direct connection to a public way.

2-4.3.3 Streets and walkways designed for the general use of the manufactured home community residents shall be lighted during the hours of darkness. Lighting shall be provided and maintained to produce a minimum of 0.1 footcandle (1.1 lux) at street level throughout the system.

Potentially hazardous locations, such as major street intersections and steps or stepped ramps, shall be individually illuminated within a minimum of 0.3 footcandle (3.2 lux). Such lighting shall be under the control of the manufactured home community operator or under an automatic control system.

NOTE 1: Street grades should generally be not more than 8 percent. Short runs with a maximum grade of 12 percent may be permitted, provided traffic safety is assured.

NOTE 2: A common walk system should be provided and maintained between locations where pedestrian traffic is concentrated and is not separated from automobile traffic. Such common walks should have a minimum width of 3½ ft (1.07 m). (*See also Appendix A, Section A-2.*)

NOTE 3: When designing manufactured home communities, care must be taken to provide for maneuvering room for placing manufactured homes on stands, considering the home sizes allowed in the community.

Chapter 3 Manufactured Home Foundation Systems

3-1 General. This chapter prescribes standards for the proper design and installation of manufactured home foundation systems. It further clarifies the definition of a "manufactured home foundation," and identifies acceptable alternative foundation systems. This chapter is applicable to all new and relocated manufactured homes, when and wherever newly installed at a home site. Foundation systems designed and constructed in accordance with this chapter may be considered as permanent installations.

3-1.1 Manufactured Home Foundation System. A manufactured home foundation, defined in 1-3, is the means to adequately support the structure. This construction constitutes a foundation constructed in accordance either with the foundation system included in the manufacturer's installation instructions, or requirements of this chapter, or the local building code having jurisdiction or, in the absence of a local code, with a recognized model building code. The manufacturer or owner shall be permitted to design for and specify installation of any foundation system which meets the requirements of this chapter.

Exception: The authority having jurisdiction shall be permitted to waive compliance for anchoring system components based upon local conditions.

3-2 Manufactured Home Installation.

3-2.1 Removal of Manufactured Home Transportation Components at Time of Installation. No portion of a manufactured home shall be removed when located on its home site unless it is designed to be removable and removed in accordance with the manufacturer's instructions.

3-2.2 Manufactured Homes With Manufacturer's Instructions. The manufacturer's instructions shall include a typical foundation system designed by a registered professional engineer or architect to support the anticipated loads specified in the manufacturer's installation instructions for the design zone (including climate) of installation, and shall meet the requirements of this chapter. These instructions shall be provided with the home following installation as required by 24 C.F.R., Parts 3280, 3282 and 3283 (42 U.S.C. 5401 et seq.).

3-2.3 Manufactured Homes Without Manufacturer's Installation Instructions. Homes not provided with manufacturer's instructions shall have a foundation system which meets the requirements of this chapter and is installed in a manner acceptable to the authority having jurisdiction. (See Appendix C for recommended foundation design criteria which may be used to determine home foundation requirements.)

3-2.4 Manufactured Home Stabilizing Systems.

3-2.4.1 Stabilizing Devices. Each manufactured home, upon being installed on a manufactured home stand, shall have stabilizing devices, or shall be installed on a foundation constructed in accordance either with the local building code having jurisdiction or, in the absence of a local code, with a recognized model building code, except that the authority having jurisdiction shall be permitted to waive compliance with the provisions for anchoring systems where low design wind velocities do not justify such systems. Requirements for stabilizing devices are included in Paragraphs 3-2.4 through 3-2.10.

3-2.4.2 Stabilizing devices not provided with the manufactured home shall be listed or labeled to meet or exceed the design and capacity requirements of the manufactured home manufacturer and this standard.

3-2.4.3 Footings shall be sized to support the loads shown in the manufacturer's instructions. (*Also see 3-2.5.*)

3-2.4.4 Support System Spacing. Unless the entire support system is designed by a professional engineer or architect, the support system shall be designed in accordance with Table 3-2.5B. The supports shall begin not more than 2 ft (0.61 m) from the exterior of each end wall. Supports shall be installed directly under the main frame (chassis) of the manufactured home.

NOTE: Methods other than those specified herein may be approved by the authority having jurisdiction.

3-2.4.5 Clearance Under Homes. A minimum clearance of 12 in. (305 mm) shall be maintained beneath the lowest member of the main frame (I-beam or channel beam) in the area of utility connections. No more than 25 percent of the underside of the main frame of the home shall be less than 12 in. (305 mm) above grade.

3-2.4.6 Elevated Manufactured Homes. When the manufactured home is installed on a basement or split-entry type foundation over a habitable lower-level area, or when more than one-fourth of the area of a manufactured home is installed so that the bottom of the main-frame members are more than 3 ft (0.91 m) above ground level, the foundation system shall be designed by a registered professional engineer or architect and the in-

stallation shall be approved by the local authority having jurisdiction.

3-2.5 Footings. Where no manufacturer's instructions are available, the required load-bearing capacity of individual load-bearing supports and their footings shall be calculated (*see Table 3-2.5A*) at not less than a combined live and dead load of 75 psf (366 kg/m²) for the South Zone or 85 psf (415 kg/m²) for the Middle Zone or 95 psf (464 kg/m²) for the North Zone. Footings shall be adequate in size to withstand the tributary live and dead loads of the manufactured home and any concentrated loads. (*Also see 3-2.4.3.*)

(a) Footings shall be at least 144 sq in. (0.09 m²) of solid concrete, blocks or other materials approved for the intended use by the authority having jurisdiction.

(b) Footings or pier foundations (unless approved by a registered professional engineer), when required, shall be placed level on firm undisturbed soil or on controlled fill which is free of grass and organic materials, to a minimum load-bearing capacity of 1000 psf (4882 kg/m²). Where unusual conditions exist, the spacing of piers and the load-bearing capacity of the soil shall be determined specifically for such conditions.

NOTE: In areas subject to ground frost heave, see 3-2.7.7, Note 2.

3-2.5.1 Design of Manufactured Home Stand Footing. Where natural soils or controlled-fill (free of grass and organic material) are used, it shall support the loads imposed by the support system of the manufactured home placed thereon. The required load-bearing capacity shall be calculated based on the design loads shown in Table 3-2.5A.

Table 3-2.5A
Manufactured Home Stand Load-Bearing Calculations**

DESIGN ZONE	SOUTH ZONE		MIDDLE ZONE		NORTH ZONE	
	psf	kg/m²	psf	kg/m²	psf	kg/m²
Roof Live Load:	20*	98.	30*	146.	40*	195.
Roof Dead Load:	5	24.	5	24.	5	24.
Floor Live Load:	40	195.	40	195.	40	195.
Floor Dead Load:	10	49.	10	49.	10	49.
DESIGN DISTRIBUTED LOAD:	75	366.	85	415.	95	464.

*Where greater vertical (snow) loads have been determined to exist in localized areas by the authority having jurisdiction through surveys or experience, such roof live loads shall apply.

**For manufactured homes labeled as complying with the Federal Manufactured Home Construction and Safety Standards, refer to the Manufacturer's Installation Instructions.

Table 3-2.5B shall be applicable unless the entire support system is designed and calculated by a registered professional engineer or architect.

Table 3-2.5B
Non-Designed Footing Areas for Allowable Soil Bearing Capacity

	Roof Live Load 20 (psf) South Zone 75 (psf)					Roof Live Load 30 (psf) Middle Zone 85 (psf)					Roof Live Load 40 (psf) North Zone 95 (psf)				
Width of Units up to and including (ft)**		12	14	12	14	Multiple Section Homes ***	12	14	12	14	Multiple Section Homes ***	12	14	12	14	Multiple Section Homes ***
Tributary Pier Spacing (ft)**		6	6	8	8		6	6	8	8		6	6	8	8	
Pier Load (lb)**	2700	3150	3600	4200			3060	3570	4080	4760		3420	3990	4560	5320	
Allowable Soil Bearing Capacity	Minimum Required Footing Area (sq in.)															
1000 psf		389	454	518	605		441	514	588	685		493	575	657	766	
1500 psf		259	302	346	403		294	343	392	457		328	383	438	511	
2000 psf		194	227	259	302		220	257	294	343		246	287	328	383	
3000 psf		*	151	173	202		147	171	196	229		164	192	219	255	
4000 psf		*	*	*	151		*	*	147	171		*	*	164	192	
6000 psf		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
8000 psf		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

a) Rear cantilever of floor beyond the frame is assumed to be less than 2 ft.

b) For units wider than the dimensions shown in Table 3-2.5B, an engineering analysis will be needed to determine pier spacing.

c) Individual supports shall not bear a load greater than 8,000 lb, 14,000 lb ultimate.

d) *Minimum required footings shall be not less than 144 sq in. (1 sq ft). All values above 144.0 shown.

e) **If unit(s) is supplied with overhanging eaves, see manufacturer's installation instructions.

f) To convert to SI units, use the following equivalents: 1 in. = 25.40 mm; 1 ft = 0.3048 m; 1 psf = 4.882 kg/m²; 1 ft² = 0.0929 m².

g) ***See appropriate column for individual section width selected. Multiple section homes may have concentrated roof support which will require special consideration.

Notes to Table 3-2.5B:

NOTE 1: The following table may be used if the soil type is known. If the soil type is unknown, the following resources may be consulted to determine the soil type/bearing capacity: (a) local authority having jurisdiction; (b) soil conservation district; (c) United States Geological Survey; (d) the Soil Conservation Service of the U.S. Department of Agriculture; (e) highway department. If none of the above resources can provide information on the soil type, a qualified professional engineer can be used to determine the soil type.

psf	kg/m²	Soil Types
2000	9765	Loose sand clay soils or medium soft clay
3000	14647	Firm or stiff clay
4000	19530	Loose fine sand or compact sand inorganic silt soils
6000	29295	Compact sand-clay soils
8000	39059	Loose coarse to medium sand or medium compact fine sand

NOTE 2: See other requirements in Chapter 3 for information on manufactured home stabilizing systems.

NOTE 3: Where natural soils or controlled fills cannot meet this design, a prepared surface shall be provided to a sufficient depth to meet the minimum load-bearing capacity specified herein.

3-2.6 Piers. Piers or load-bearing supports or devices shall be designed and constructed to evenly distribute the loads. Load-bearing supports or devices shall be listed and labeled, shall be designed by a registered professional engineer or architect, shall be approved for the use intended, or piers shall be constructed as follows:

3-2.6.1 Piers less than 36 in. (914 mm) in height shall be constructed of open or closed cell, 8-in. by 8-in. by 16-in. (203-mm × 203-mm × 406-mm) concrete blocks (with open cells vertically placed upon the footing). Single-stacked block piers shall be installed with the 16-in. (406 mm) dimension perpendicular to the main (I-beam) frame. The piers shall be covered with a 2-in. by 8-in. by 16-in. (51-mm × 203-mm × 406-mm) wood or concrete cap. (*See Figure C-1 in Appendix C.*)

3-2.6.2 Subject to the limitations of 3-2.4.6, piers between 36 in. and 80 in. (914 mm and 2032 mm) in height and all corner piers over three blocks high shall be double blocked with blocks interlocked and capped with a 4-in. by 16-in. by 16-in. (102-mm × 406-mm × 406-mm) solid concrete block, or equivalent. (*See Figure C-2 in Appendix C.*)

3-2.6.3 Subject to the limitations of 3-2.4.6, piers over 80 in. (2032 mm) in height shall be constructed as per 3-2.6 and they shall be laid in concrete mortar and steel reinforcing bars inserted in block cells with the block cells filled with concrete [*See Figures C-3(a) and C-3(b) in Appendix C.*]

3-2.6.4 Plates and Shims. A wood plate not exceeding 2 in. (51 mm) in thickness and shims not exceeding 1 in. (25.4 mm) in thickness shall be permitted to be used to fill any gap between the top of the pier and the main frame. Two-in. or 4-in. (51-mm or 102-mm) solid concrete blocks shall be permitted to be used to fill the remainder of any gap. Shims shall be at least nominal 4 in. (102 mm) wide and 6 in. (152 mm) long and shall be fitted and driven tight between the wood plate or pier and main frame.

3-2.6.5 Steel Piers. Steel piers, when used, shall be galvanized per 3-2.8.1 after fabrication to provide corrosion protection.

3-2.7 Anchoring Ties.

3-2.7.1 Number of Ties. The minimum number of ties per side for various lengths of manufactured homes in hurricane and nonhurricane zones shall be in accordance with Table 3-2.7.

Table 3-2.7
Number of Ties Required per Side of Single Section[1] Manufactured Homes[2]

This table is based on a minimum working load per anchor of 3,150 lb (1429 kg) with a 50 percent overload [4,725 lb (2143 kg) total].

A	B	C	D	E	F	G	H	I
		Hurricane Resistive			Nonhurricane Resistive			
			Alternate Method[4]				Alternate Method	
Length of[3] Manuf. Home (ft)*	No. of Vertical Ties	No. of Diagonal Ties[5]	No. of Baling Straps	No. of Diagonal Ties[6]	No. of Vertical Ties	No. of Diagonal Ties[5]	No. of Baling Straps	No. of Diagonal Ties[6]
up to 40	2	4	2	5	2	3	2	3
40 to <46	2	4	2	6	2	3	2	3
46 to <49	2	5	2	6	2	3	2	3
49 to <54	3	5	3	7	2	3	2	3
54 to <58	3	5	3	7	2	4	2	4
58 to <64	3	6	3	8	2	4	2	4
64 to <70	3	6	3	9	2	4	2	5
70 to <73	3	7	3	9	2	4	2	5
73 to <84	4	7	4	10	2	5	2	5

[1]Double section manufactured homes require only the diagonal ties specified in column 3 or 7.

[2]Except when the anchoring system is designed and approved by a registered professional engineer or architect.

[3]Length of manufactured home (as used in this table) means length excluding draw bar.

[4]Alternate Method. When this method is used, an approved wall reinforcement means shall be provided. If baling is used to accomplish reinforcement, the provisions of 3-2.7.6 shall apply.

[5]Diagonal ties in this method shall deviate at least 45° from a vertical direction.

[6]Diagonal ties in this method shall be 45° ± 5° from vertical and shall be attached to the nearest main frame member.

*For conversion to meters, 1 ft = 0.3048 m, rounding off the total length to zero decimal points.

3-2.7.2 Spacing of Vertical Ties. Vertical ties shall be as evenly spaced as practicable over rafters or over studs along the length of the manufactured home with not more than 8 ft (2.44 m) open-end spacing on each end.

3-2.7.3 Location of Ties. When continuous straps are provided as vertical ties, such ties shall be positioned at rafters and studs. Where a vertical tie and diagonal tie are located at the same place, both ties shall be permitted to be connected to a single ground anchor, provided that either the anchor used is capable of carrying both loadings, or that the load capacity of the total number of anchors used is equal to 3150 lbs (1429 kg) working load plus 50 percent overload (4725 lbs or 2143 kg) the number of ties specified in Table 3-2.7.

3-2.7.4 Special Ties. Clerestory roofs and add-on sections of expandable manufactured homes shall have provisions for vertical ties at the exposed ends.

3-2.7.5 Protection of Ties and Manufactured Home Roofing and Siding. Protection shall be provided at sharp corners where the anchoring system requires the use of external cables or straps. Protection shall also be provided to minimize damage to roofing or siding by the cable or strap.

3-2.7.6 Alternate Method Using Strapping. If the alternate method incorporating straps specified in Table 3-2.7 is used, the baling straps shall be wrapped completely around the manufactured home passing under the main steel frame, with both ends of each strap fastened together under tension. The straps shall be in accordance with Section 3-2.8.4. The method used to connect the ends of the strap shall not reduce the allowable working load and overload. Straps shall be installed in accordance with the requirements for ties in 3-2.7.1 through 3-2.7.5.

3-2.7.7 Other Considerations (Maintenance of Anchoring Systems; Ground Frost Heaves).

NOTE 1: Tie tension should be checked and adjusted when necessary to prevent damage to the manufactured home from settling or other unforeseen movements (such as frost heave).

NOTE 2: Frost heave can have an adverse effect on the manufactured home through displacement of the manufactured home anchoring and blocking systems. If a manufactured home is located in an area subject to frost heave, one of the following additional steps should be considered:

(a) Footings and the load-carrying portion of the ground anchors should extend below the frost line, or

(b) The manufactured home should be placed on a reinforced concrete slab as specified in 3-2.9.3(c).

3-2.8 Anchoring Equipment. Anchoring equipment, when installed, shall be capable of resisting an allowable working load equal to or exceeding 3,150 lbs (1429 kg) and shall be capable of withstanding a 50 percent overload (4,725 lbs or 2143 kg total) without failure of either the anchoring equipment or the attachment point on the manufactured home. When the stabilizing system is designed by a qualified registered professional engineer or architect, alternative working loads may be used provided the anchoring equipment is capable of withstanding a 50 percent overload. All anchoring equipment shall be listed or labelled as being capable of meeting all the requirements of this section.

3-2.8.1 Resistance to Weather Deterioration. All anchoring equipment exposed to weathering shall have a resistance to weather deterioration at least equivalent to that provided by a coating of zinc on steel of not less than 0.625 ounces per sq ft (0.19 kg/m^2) on each side of the surface coated, as determined by ASTM *Standard Methods of Test for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles* (ASTM A90-69).

NOTE: Slit or cut edges of zinc-coated steel strapping do not need to be zinc coated.

3-2.8.2 Permanency of Connections. Anchoring equipment shall be designed to prevent self-disconnection when ties are slack. Open hook ends shall not be used in any part of the anchoring system.

3-2.8.3 Tensioning Device Design. Tensioning devices such as turnbuckles or yoke-type fasteners shall be ended with a clevis or forged or welded eyes.

3-2.8.4 Ties. Strappings or other approved methods or material shall be used for ties. All ties shall be fastened to ground anchors and drawn tight with turnbuckles or other adjustable tensioning devices or devices supplied with the ground anchor.

(a) Tie materials shall be capable of resisting an allowable working load of 3,150 lbs (1429 kg) with no more than 2 percent elongation and shall withstand a 50-percent overload (4,725 lbs or 2143 kg total). Ties shall comply with the weathering requirements of 3-2.8.1.

(b) Ties shall connect the ground anchor and the main structural steel frame (I-beam or other shape) which runs lengthwise under the manufactured home. Ties shall not connect to steel outrigger beams which fasten to and intersect the main structural frame unless specifically stated in the manufacturer's installation instructions.

(c) Connection of the cable frame tie to the manufactured home I-beam or equivalent main structural frame member shall be by a $\frac{5}{8}$-in. (16-mm) drop-forged closed eye bolt through a hole drilled in the center of the I-beam web or other approved methods. The web shall be reinforced if necessary to maintain the designed I-beam strength.

(d) Cable ends shall be secured with at least three U-bolt-type cable clamps with the U portion of the clamp installed on the short (dead) end of the cable to assure strength equal to that required by 3-2.8.4(a).

3-2.9 Ground Anchors, Concrete Slabs, or Continuous Footings. Ground anchors, including means for attaching ties, shall be located to effectively match the anchoring system instructions provided by the manufactured home manufacturer, or, if there are no instructions, in accordance with the requirements of 3-2.3 herein, and shall be designed and installed to transfer the anchoring loads to the ground.

3-2.9.1 Capacity of Anchors. Each approved ground anchor, when installed, shall be capable of resisting an allowable working load at least equal to 3,150 lbs (1429 kg) in the direction of the tie plus a 50-percent overload (4,725 lbs or 2143 kg total) without failure. Failure shall

be considered to have occurred when the point of connection between the tie and anchor moves more than 2 in. (51 mm) at 4,725 lbs (2143 kg) in the direction of the vertical tie when the anchoring equipment is installed in accordance with the manufacturer's instructions. Those ground anchors which are designed to be installed so that the loads on the anchor are other than direct withdrawal shall be designed and installed to resist an applied design load of 3,150 lbs (1429 kg) at 45° from horizontal without displacing the anchor more than 4 in. (102 mm) horizontally at the point where the tie attaches to the anchor. Anchors designed for connection of multiple ties shall be capable of resisting the combined working load and overload consistent with the intent expressed herein.

3-2.9.2 Anchor Design and Installation. Each manufactured ground anchor shall be listed and installed in accordance with the terms of its listing and the anchor manufacturer's instructions and shall include means of attachment of ties meeting the requirements of 3-2.8.4. Ground anchor manufacturer's installation instructions shall include the amount of preload required, the methods of adjustment after installation, and the load capacity in various types of soil. These instructions shall include tensioning adjustments which may be needed to prevent damage to the manufactured home, particularly damage that can be caused by frost heave.

(a) Each ground anchor shall have the manufacturer's identification and listed model identification number marked thereon so that the number is visible after installation. Instructions shall accompany each listed ground anchor specifying the types of soil for which the anchor is suitable under the requirements of 3-2.9.1.

NOTE: The following data gives information relative to soil types with blow counts and torque values:

Types of Soils	Blow Count (ASTM D1586)	Test Probe[1] Torque Value[2]
Sound hard rock	NA	NA
Very dense and/or cemented sands, coarse gravel and cobbles, preloaded silts, clays, and corals	40-up	more than 550 lbs in. (62 N.m)
Medium-dense coarse sands, sandy gravels, very stiff silts and clays	24-39	350-549 lbs in. (40-62 N.m)
Loose to medium dense sands, firm to stiff clays and silts, aluvian fill	14-23[3]	200 to 349 lbs in. (23-40 N.m)[3]

[1]The test probe is a device for measuring the torque of soils to assist in evaluating the holding capability of the soils in which the anchor is placed. The test probe has a helix on it. The overall length of the helical section is 10.75 in. (273 mm); the major diameter is 1.25 in. (32 mm); the minor diameter is 0.81 in. (21 mm); the pitch is 1.75 in. (45 mm). The shaft must be of suitable length for anchor depth.

[2]A measure synonymous with moment of a force when distributed around the shaft of the test probe.

[3]Below these values, a registered professional engineer should be consulted.

3-2.9.3 Use of Concrete Slabs or Continuous Footings. If concrete slabs or continuous footings are used to transfer the anchoring loads to the ground, the following shall be required:

(a) Steel rods cast in concrete shall be capable of resisting loads as specified in 3-2.9.1.

(b) Deadman concrete anchors may be used in place of listed anchors if they meet the requirements of 3-2.9.1.

(c) Concrete slabs may be used in place of ground anchors, provided the slab is so constructed that it provides holding strength equal to the requirements of 3-2.9.1.

3-2.9.4 Other Anchoring Devices. Other anchoring devices meeting the requirements of this section shall be permitted if acceptable to the authority having jurisdiction.

3-2.10 Anchor Installations.

3-2.10.1 Specifications for Anchors. Each type anchor suitable for this purpose shall have specification data showing the soil classification(s) for which it qualifies.

3-2.10.2 Selection of Anchors. Anchor selection shall be based on a determination of the soil class at the depth the anchor helical plate will be installed.

3-2.10.3 Depth of Anchors. All anchors shall be installed to the full depth shown in the anchor manufacturer's installation instructions.

3-2.11 Skirting.

3-2.11.1 Materials. Skirting, if used, shall be of durable materials suitable for exterior exposures.

3-2.11.2 Installation.

3-2.11.2.1 General. Skirting, if used, shall be installed in accordance with the manufacturer's installation instructions. It shall be secured, as necessary, to assure stability, to minimize vibrations, to minimize susceptibility to wind damage, and to compensate for possible frost heave. Access opening(s) not less than 18 in. (457 mm) in any dimension and not less than 3 sq ft (0.28 m²) in area shall be provided and shall be located so that any water supply and sewer drain connections located under the manufactured home are accessible for inspection. Such access panel(s) or doors(s) shall not be fastened in a manner requiring the use of a special tool to remove or open same. On-site fabrication of skirting shall meet the objectives cited herein.

3-2.12 Access to and Ventilation of Under-Floor Areas.

(a) Provisions shall be made to minimize condensation in under-floor areas through ventilation openings or other suitable means.

(b) If combustion air for heat-producing appliance(s) is taken from within the under-floor areas, ventilation shall be adequate to assure proper operation of the appliance(s). This requirement shall take precedence over the provisions of 3-2.12(a).

(c) Ventilation openings shall be provided for low-profiled manufactured homes that are installed by depressing the supporting foundation in accordance with

3-2.12(d). (See Appendix I for "Low Profile" — Ground Level Installations.)

(d) A minimum of four ventilation openings shall be provided from the under-floor space to the exterior. One shall be placed at or near each corner as high as practicable. Their total net area shall be calculated by:
a = (2L/100) + (A/300) where

L = the perimeter of the crawl space, linear feet.

A = the area of the crawl space, square feet.

a = the total gross area of all vents, square feet.

Openings shall provide cross ventilation on at least two opposite sides. The openings shall be covered with corrosion resistant wire mesh not less than ⅛ in. (3 mm) and not more than ½ in. (13 mm) in any dimension or with screened louvered openings to retard entry of dry vegetation, waste materials, or rodents.

Chapter 4 Plumbing

4-1 Single and Multiple Manufactured Site Plumbing.

4-1.1 Need for Water-Riser Pipe. Each manufactured home stand shall be provided with a water-riser pipe and connection located and arranged to permit attachment in a workmanlike manner to a manufactured home utilizing the stand.

4-1.2 Location of Water-Riser Pipe. The water supply riser pipe shall be located within 4 ft (1.22 m) of the manufactured home stand.

Exception: All water supply riser pipes for manufactured homes located on an all-weather wood or concrete or concrete block foundation system shown in Appendix C, or on a foundation constructed in accordance with the local building code or, in the absence of a local code, with a recognized model building code. (Also see Appendix C for examples of manufactured home foundation systems.)

4-1.3 Water-Riser Pipes, Size and Protection. Water-riser pipes shall be at least ¾ in. (19 mm) nominal diameter. Water-riser pipes shall extend a minimum of 4 in. (102 mm) above ground elevation. Water-riser outlets shall be terminated with a threaded plug or cap when a manufactured home does not occupy the site. Surface drainage shall be diverted from the location of the riser pipe (*see also 2-2.2*).

4-1.4 Shutoff Valves. A shutoff valve shall be provided on the water-riser pipe serving each manufactured home site.

4-1.5 Protection Against Freezing. Where necessary, provisions shall be made to prevent freezing of water supply lines, valves and riser pipes, whether or not the stand is occupied. Similarly, provisions may be required to protect risers from the heaving and thawing actions of the ground where periodic freezing weather conditions are encountered. Where ground frost conditions occur, the shutoff valve required under 4-1.4 shall be protected and shall be listed for backflow protection.

4-1.5.1 Heat Tapes. Heat tapes, when used for protection of plumbing components against freezing, shall be of the listed type.

4-1.6 Sewer Connections — General.

4-1.6.1 Need for Sewer Connection. Each manufactured home stand shall be provided with a sewer connection located and arranged to permit attachment in a workmanlike manner to a manufactured home utilizing the stand.

NOTE: For sewage collection systems in manufactured home communities, see 4-3.5. See also 4-4.3 and 4-4.4.

4-1.6.2 Location of Sewer Connection. The sewer drain inlet shall be positioned within 4 ft (1.22 m) of the manufactured home stand.

Exception: All sewage service connections for manufactured homes located on an all-weather wood or concrete or concrete block foundation system shown in Appendix C, or on a foundation constructed in accordance with the local building code or, in the absence of a local code, with a recognized model building code. (Also see Appendix C for examples of manufactured home foundation systems.)

4-1.6.3 Size of Sewer Connection Inlet. The sewer connection inlet shall have a nominal inside diameter of at least 3 in. (76 mm).

4-2 Single Manufactured Home Site Plumbing System.

4-2.1 Minimum Sustained Flow. The water supply system shall be capable of delivering a minimum sustained flow of 5 gpm (0.31 l/s).

NOTE: If a well is the source of supply, a test of at least 4 hours' duration should be conducted to determine the yield and maximum drawdown.

4-2.2 Water Quality. The supplied water shall be of a quality meeting the chemical, radiological and bacteriological requirements of the health authority having jurisdiction. However, if the requirements of that health authority are not at least equal to the National Secondary Drinking Water Regulations, 40 C.F.R., Part 143 (42 U.S.C. 300 f et seq.), the National Secondary Drinking Water Regulations shall apply. Acceptable evidence of approval by the health authority shall be required in each case.

NOTE: A water analysis may be required by the authority having jurisdiction.

4-2.3 Water Distribution. The water distribution system shall comply with this standard and all applicable local plumbing codes.

4-2.4 Disinfection of Single Water Supply System. After a single water supply system is installed, the system

shall be disinfected in accordance with the recommendations of the health authority having jurisdiction. In the absence of a health authority, system cleaning and disinfection shall conform to the U.S. Environmental Protection Agency's Manual of Individual Water Supply Systems.

NOTE: Bacteriological examination of the water supply may be required by a local, state, or federal regulatory authority.

4-2.5 Wells as the Source of Supply.

4-2.5.1 Location of Wells.

(a) A well shall not be located within the boundaries of a manufactured home stand, except in arctic and subarctic regions.

(b) Subject to meeting the water quality provisions of 4-2.2, water which comes from any soil formation which may be polluted or contaminated, is fissured or creviced, or which is less than 20 ft (6.10 m) below the natural ground surface shall not be acceptable.

(c) All well design and construction shall be approved by the authority having jurisdiction. In the absence of local standards, nationally recognized manuals and standards shall be used (*see Appendix J*).

NOTE: Special care needs to be taken in areas where chemical soil poisoning is practiced if the overburden of soil between the ground surface and the water-bearing strata is coarse-grained sand, gravel, or porous rock, or is creviced in a manner which will permit the toxicants to be carried into the zone of saturation.

4-2.5.2 Well Construction.

(a) The well shall be constructed to allow the pump to be easily placed and to function properly.

(b) All drilled wells shall be provided with a sound, durable and watertight casing capable of sustaining the loads imposed. The casing shall extend from a point several feet below the water level at drawdown or from an impervious strata above the water level to 12 in. (305 mm) above either the ground surface or the pump room floor. The casing shall be sealed at the upper opening.

(c) Bored wells shall be lined with concrete, vitrified clay, or equivalent materials.

(d) The space between the casing or liner and the wall of the well hole shall be sealed with cement grout.

(e) The well casing shall not be used to convey water except under positive pressure. A separate drop pipe shall be used for the suction line.

(f) When sand or silt is encountered in the water-bearing formation, the well shall either be gravel-packed, or a removable strainer or screen shall be installed.

(g) The surface of the ground above and around the well shall be graded to drain surface water away from the well.

(h) Openings in the casing, cap, or concrete cover for the entrance of pipes, pump or manholes shall be made watertight.

(i) If a breather is provided, it shall extend above the highest level to which surface water may rise. The breather shall be watertight, and the open end shall be screened and positioned to prevent entry of dust, insects and foreign objects.

4-2.5.3 Well Pumps and Equipment.

(a) Each pump shall be capable of delivering the volume of water required herein under normal operating pressure within the living unit of the manufactured home. Pump capacity shall not exceed the output of the well.

(b) Pump and equipment shall be mounted to minimize vibration, flooding, pollution, and freezing.

(c) Suction lines shall terminate below maximum drawdown of the water level in the well.

(d) Horizontal segments of suction line shall be placed below the frost line in a sealed casing pipe or in at least 4 in. (102 mm) of concrete.

4-2.6 Water Storage Tanks.

(a) Each pump shall be capable of delivering the volume of water required herein under normal operating pressure within the living unit of the manufactured home. Pump capacity shall not exceed the output of the well.

(b) Pump and equipment shall be mounted to minimize vibration, flooding, pollution, and freezing.

4-2.7 Single Manufactured Home Site Sewage Disposal Systems.

4-2.7.1 General.

4-2.7.1.1 Each sewage disposal system for a single manufactured home site shall consist of a drainage system of a design approved by the authority having jurisdiction. The system shall be designed to receive all sanitary sewage (bathrooms, kitchen, and laundry) from a manufactured home but not footing or roof drainage. The system shall be designed so that all gases generated are properly vented. After the system has been constructed, the appropriate authority shall inspect the system prior to backfilling.

4-2.7.1.2 The structural design and materials used in the construction of sewage disposal systems shall be in accordance with generally accepted good structural engineering practice, providing a sound, durable structure which will safely sustain all anticipated dead and live loads.

4-2.7.1.3 The type of system shall be determined on the basis of location, topography, soil absorbency and the depth and fluctuation of the groundwater level.

4-2.7.1.4 Installation of systems in swampy areas, areas with a high water table (permanent, fluctuating, or seasonal), areas with ledge rock, or areas which are subject to flooding shall not be acceptable.

4-2.7.1.5 All design and construction of individual sewage disposal systems shall be approved by the authority having jurisdiction. In the absence of local standards, nationally recognized manuals and standards shall be used (*see Appendix J*).

4-2.7.2 Single Manufactured Home Site Sewer Piping Installations.

4-2.7.2.1 The installation of single manufactured home site sewer piping shall be approved by the authority having jurisdiction.

4-2.7.2.2 The sewer piping shall have watertight joints and shall slope not less than one percent (⅛ in. per ft; 3 mm/0.30 m). Ells or bends of 90 degrees shall be long-sweep type.

4-2.7.3 Septic Tanks.

4-2.7.3.1 The design shall provide adequate volume for settling, for sludge and scum storage, and access for cleaning. The structural design shall provide for a sound, durable tank which will sustain all loads and pressures, and resist corrosion.

NOTE: The authority having jurisdiction may require a test for watertightness and strength.

4-2.7.3.2 Liquid capacity shall be based on the number of bedrooms proposed or reasonably anticipated and shall be at least as required in Table 4-2.7.3.2. The liquid depth of the tank or a compartment thereof shall be not less than 30 in. (762 mm). A liquid depth greater than 6 ft (1.83 m) shall not be considered in determining tank capacity.

Table 4-2.7.3.2 Septic Tank Capacity

	MINIMUM CAPACITY	
NUMBER OF BEDROOMS	GAL	L
2 or less	750	2840
3	900	3410
4	1,000	3790
Each additional bedroom added	250	950

4-2.7.3.3 When multi-compartment tanks are used, the volume of the first compartment shall be equal to or greater than that of any other compartment.

4-2.7.3.4 A septic tank or compartment thereof shall not have an inside horizontal dimension less than 24 in. (610 mm). Scum storage volume shall be not less than 15 percent of the required liquid capacity.

4-2.7.3.5 Inlet and outlet connections shall be submerged or baffled. The inlet invert shall be at least 1 in. (25.4 mm) above the outlet invert.

4-2.7.3.6 Baffles, and pipe fittings used as baffles, shall extend up to a point above the normal water level, and downward to a point of 40 percent below the normal water level. Both ends (top and bottom) shall remain open. A partition wall used to subdivide the tank shall have at least a 4-in. (102-mm) opening, the midpoint of which is located 40 percent below the liquid depth.

4-2.7.3.7 Access to each compartment of the tank shall be provided by a 16-in. (406-mm) minimum manhole or removable cover. The inlet and outlet connections shall also be accessible through properly placed manholes, handholes, or by easily removable covers.

4-2.7.3.8 A minimum of 4 in. (102 mm) of cover or soil shall be provided over the top of the septic tank. Where the top of the tank is lower than 18 in. (457 mm) below grade, manholes shall be built up to within that measurement of grade.

NOTE: Subsurface absorption fields, absorption beds, and seepage pits, where used, should be subject to the restrictions of local, state, or federal standards governing same.

4-3 Multiple Manufactured Home Site Plumbing Systems.

NOTE: See also Sections 4-1, 4-4.1, 4-4.2, and 8-1.6.

4-3.1 General Requirements. An accessible and adequate supply of potable water shall be provided in each manufactured home community. The supplied water shall be of a quality meeting the chemical, radiological, and bacteriological requirements of the health authority having jurisdiction. In no case shall the water quality be less than the intent of the National Secondary Drinking Water Regulations, 40 C.F.R., Part 143 (42 U.S.C. 300 f et seq.). Where a public supply of water of satisfactory quantity, quality, and pressure is available at or within the boundary of the community the connection shall be made thereto and its supply used exclusively. When a satisfactory public water supply is not available, an approved private system shall be provided.

4-3.2 Source of Supply.

4-3.2.1 The water supply shall be capable of supplying a minimum of 150 gal (570 L) per day per manufactured home site.

4-3.2.2 The water supply source, water treatment and/or disinfection methods, and water distribution system shall be in accordance with applicable laws and regulations of the authority having jurisdiction.

4-3.2.3 Well-casing, pumping machinery or suction pipes shall not be placed in any pit, room or space extending below ground level, nor in any room or space above ground which is walled-in or otherwise enclosed, unless such rooms, whether above or below ground, have adequate drainage to prevent surface water backflow.

4-3.3 Water Storage Facilities. All water storage reservoirs shall be covered, watertight, and constructed of impervious material. Overflows and vents of such reservoirs shall be effectively screened. Manholes shall be constructed with overlapping covers, so as to prevent the entrance of contaminated material. Reservoir overflow pipes shall discharge through an acceptable air gap to the surface of the ground in areas not subject to flood.

4-3.4 Water Distribution Systems.

4-3.4.1 All water piping, fixtures and other equipment shall be constructed and maintained in accordance with state and local regulations and requirements and shall be of a type and in locations approved by the authority having jurisdiction.

4-3.4.2 The water distribution system shall not be connected with nonpotable or questionable water supplies, and shall be protected against the hazards of backflow or back siphonage.

4-3.4.3 The water supply system shall be so designed and maintained as to provide a pressure of not less than 20 lbs per sq in. (138 kPa) under all normal operating conditions at each manufactured home stand.

NOTE: Greater design values may be required when the system is to provide fire protection.

4-3.4.4 Where static water pressure exceeds 80 psi (552 kPa), a pressure regulator shall be installed.

4-3.5 Community Sewage Systems and Treatment Facilities.

NOTE: See also 4-1.6, 4-4.3, and 4-4.4.

4-3.5.1 General Requirements. An approved sewage collection system shall be provided in all manufactured home communities for conveying and disposing of all sewage. Where a public sewage collection system is available at or within the boundary of the manufactured home community, connection shall be made to the public system. When a public system is not available, a private system shall be provided. The private system shall be approved by the authority having jurisdiction prior to construction and shall be designed, constructed, and maintained in accordance with applicable laws and regulations.

4-3.5.2 Underground Sewage Collection Lines. All underground sewage collection lines shall be located in trenches of sufficient depth to be free of breakage from surface traffic or other movements and shall be separated from the community's water supply system as specified by the appropriate authority. Sewage collection lines shall be at a grade which will ensure a velocity of 2 ft (0.61 m) per second when flowing full.

4-3.6 Pipe Sizes.

4-3.6.1 Each manufactured home drain inlet shall be assigned a waste-loading value of not less than six fixture units or as applicable to the type of manufactured home expected to be placed on the site and each community collection system shall be sized according to Table 4-3.6.1 or as provided in 4-3.6.2. Drainage laterals shall be not less than 3 in. nominal (76 mm) in diameter.

Table 4-3.6.1

Nominal Size of Drainage Pipe in.	mm	Minimum No. of Fixture Units	Maximum No. of Fixture Units
3	76	6	35
4	102	36	180
5	127	181	356
6	152	375	600

Table 4-3.6.2 Minimum Grade or Slope of Drainage Pipe

Nominal Pipe Size in.	mm	Slope per 100 ft (30.48 m) in.	mm
3	76	20	508
4	102	15	381
5	127	11	279
6	152	8	203

4-3.6.2 A community collection system which exceeds the fixture unit loading of Table 4-3.6.1, or in which the grade or slope of pipe does not meet the minimum specified in Table 4-3.6.2, shall be designed by a registered professional engineer.

4-3.7 Sewage Treatment Plant. If required, an approved sewage treatment plant shall be designed and installed in accordance with the regulations of the authority having jurisdiction.

4-4 Plumbing Installation.

4-4.1 Water Inlet. Each manufactured home shall be connected to the water-riser pipe outlet by semi-rigid tubing (copper tubing permitted) or by an approved flexible connector not less than ¾ in. (19 mm) nominal in diameter.

Exception: All water riser pipe outlet connections for manufactured homes located on an all-weather wood or concrete or concrete block foundation system shown in Appendix C, or on a foundation constructed in accordance with the local building code or, in the absence of a local code, with a recognized model building code. (Also see Appendix C for examples of manufactured home foundation systems.)

4-4.2 Water System Test. The water distribution system of the manufactured home and the supply connection shall show no evidence of leakage under normal operating pressure. If water at normal operating pressure is not available, the manufactured home water distribution system shall show no evidence of leakage.

4-4.3 Sewer Drain Connector. Each manufactured home shall be connected to the site sewer inlet by means of a drain connector consisting of approved pipe not less than Schedule 40, appropriate fittings and connectors, and shall be not less in size than the manufactured home drain outlet. The fitting connected to the inlet shall be a directional fitting to discharge into the sewer inlet. A listed flexible connector may be used at each end of the pipe.

Exception: All sewer drain connections for manufactured homes located on an all-weather wood or concrete or concrete block foundation system shown in Appendix C, or on a foundation constructed in accordance with the local building code or, in the absence of a local code, with a recognized model building code. (Also see Appendix C for examples of manufactured home foundation systems.)

NOTE: See also 4-1.6, 4-3.5, and 4-4.4.

4-4.4 Drain Plumbing Test. The manufactured home drainage piping system shall be connected to the lot or site drain inlet, and tested by allowing water to flow into all fixtures and receptors, including the clothes washer standpipe, for a period of 3 minutes. If water under pressure is not available, the drainage piping system shall be tested by letting at least 3 gal (11 L) of water into each fixture and receptor. There shall be no visible evidence of leaks.

4-5 Manufactured Home Accessory Building Plumbing Installation. Plumbing equipment, materials, and installations in a manufactured home accessory building or structure shall comply with the applicable provisions of the local plumbing code or, in the absence of a local plumbing code, a nationally recognized plumbing code.

4-6 Manufactured Home Community Building Plumbing Installation. Plumbing equipment, materials and installations in a permanent building within a manufactured home community shall comply with the applicable provisions of the local plumbing code or, in the absence of a local plumbing code, a nationally recognized plumbing code.

Chapter 5 Fuel Supply

5-1 Fuel Supply.

5-1.1 General. All fuel gas piping systems serving manufactured homes, accessory buildings, or structures and communities shall be designed and constructed in accordance with any applicable provisions of NFPA 54, *National Fuel Gas Code*, and NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*. NFPA 31, *Standard for Installation of Oil Burning Equipment*, shall apply to oil fuel-burning systems and shall conform to the criteria of the authority having jurisdiction.

5-1.2 Gas Supply Connections. Gas supply connections at sites, when provided from an underground gas supply piping system, shall be located and arranged to permit attachment to a manufactured home occupying the site in a workmanlike manner. For the installation of liquefied petroleum gas storage systems, the applicable provisions of NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*, shall be followed.

5-1.3 Location of Gas Supply Connection. The gas supply to the manufactured home shall be located within 4 ft (1.22 m) of the manufactured home stand.

Exception: The above requirements do not apply to gas supply connections for manufactured homes located on an all-weather wood or concrete or concrete block foundation system shown in Appendix C, or on a foundation constructed in accordance with the local building code or, in the absence of a local code, with a recognized model building code. (Also see Appendix C for examples of manufactured home foundation systems.)

NOTE: See also Sections 5-3 and 5-4, 5-3.2 and 5-4.5.

5-2 Single and Multiple Manufactured Home Site Fuel Supply Systems.

5-2.1 Gas Piping Installations.

5-2.1.1 Gas Supply Connections — Underground Gas Piping. Gas supply connections at sites, when provided from an underground gas supply piping system, shall be located and arranged to permit attachment in a workmanlike manner to a manufactured home occupying the site. For the installation of liquefied petroleum gas storage systems, the provisions of NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*, shall be followed.

5-2.1.2 Underground gas piping system installations shall follow, as applicable, the appropriate provisions of Section 5-3, and shall comply with the following:

(a) Gas piping shall not be installed underground beneath that portion of a manufactured home site reserved for the location of a manufactured home, a manufactured home accessory building or structure, unless installed in open-ended gastight conduit. The conduit shall conform to the following:

1. The conduit shall be a pipe approved for installation underground beneath buildings and shall be not less than Schedule 40 pipe. The interior diameter of the conduit shall be not less than ½ in. (13 mm) larger than the outside diameter of the gas piping.

2. The conduit shall extend to a point not less than 4 in. (102 mm) beyond the outside wall of the manufactured home or accessory building or structure, and the outer ends shall not be sealed. Where the conduit terminates within a manufactured home or accessory building or structure, it shall be readily accessible and the space between the conduit and the gas piping shall be sealed to prevent leakage of gas into the building.

5-2.2 Manufactured Home Site Gas Shutoff Valve. Each manufactured home site shall have a listed gas shutoff valve installed upstream of the manufactured home site gas outlet and it shall be located on the outlet riser at a height of not less than 6 in. (152 mm) above grade. Such valve shall not be located under any manufactured home. The outlet shall be equipped with a cap or plug to prevent discharge of gas whenever the manufactured home site outlet is not connected to a home.

Exception: All gas shutoff valves for manufactured homes located on a foundation constructed in accordance with the local building code or, in the absence of a local code, with a recognized model building code. (Also see Appendix C for examples of manufactured home foundation systems.)

5-2.3 Gas Meters.

5-2.3.1 Support of Meters. When gas meters are installed, they shall not depend on the gas outlet riser for support, but shall be adequately supported by a post or bracket placed on a firm footing or other means providing equivalent support.

5-2.3.2 Location of Meters. Each meter installed shall be in an accessible location and shall be provided with unions or other fittings so as to be easily removable and replaced in an upright position. Meters shall not be installed in unventilated or inaccessible locations, or closer than 3 ft (0.91 m) to sources of ignition.

NOTE: Manufactured home electrical service equipment should not be considered a source of ignition when not enclosed in the same compartment with a gas meter.

5-2.4 Meter Shutoff Valve or Cock. All gas meter installations shall be provided with a shutoff valve or cock located adjacent to and on the inlet side of the meter. In the case of a single meter installation utilizing a liquefied petroleum gas container, the container service valve may be used in lieu of the shutoff valve or cock. All gas meter installations shall be provided with a test tee located adjacent to and on the outlet side of the meter.

5-3 Multiple Manufactured Home Site Fuel Distribution and Supply Systems.

NOTE: See also Sections 5-1, 5-4, 5-3.5 and 5-4.5.

5-3.1 Manufactured Home Community Gas Distribution and Supply Systems.

5-3.1.1 Manufactured Home Community Natural-Gas Distribution Systems. All underground metallic fuel piping systems shall comply with the cathodic protection requirements of 49 C.F.R., Parts 191 and 192.

NOTE 1: Gas as referred to in the referenced title means natural gas, flammable gas, or gas which is toxic or corrosive.

NOTE 2: The Natural Gas Pipeline Safety Act of 1979 has the effect of requiring that all gas distribution system operators must adhere to the referenced title. Any master-metered gas distribution system through which a manufactured home community is supplied gas, and which, in turn, distributes the gas to the ultimate users (tenants), is defined as a gas distribution system within the context of the Federal Regulations. Owners of master-metered housing projects or manufactured home communities accordingly are defined as "gas distribution system operators."

NOTE 3: Attention is also called to 49 C.F.R., Part 191, prescribing requirements for the reporting of gas leaks that are not intended by the operator.

NOTE 4: The Code of Federal Regulations, Title 49, Transportation, Parts 100-199, revised as of October 1, 1974, is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. The American Society of Mechanical Engineers (345 East 47th Street, New York, NY 10017) publishes the ASME *Guide for Gas Transmission & Distribution Piping Systems*, which contains C.F.R., Title 49, Part 192, along with other useful technical information.

NOTE 5: A *Handbook on Natural Gas Pipeline Safety in Residential Areas Served by Master Meters* is published by the Superintendent of Documents, U.S. Government Printing Office. It was developed under contract for the U.S. Department of Housing and Urban Development (HUD-PDR-124, November 1975) and is specifically aimed at providing "a timely and comprehensive safety guide for architects and engineers involved in the planning and design phases of multifamily projects and manufactured home parks."

5-3.1.2 Liquefied Petroleum Gas Supply Systems. When ten or more customers are served by one liquefied petroleum gas supply system, the installation shall be in accordance with 49 C.F.R., Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards. For other systems and for the storage and handling of liquefied petroleum gas, NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*, shall be followed.

NOTE: See also 5-3.2.

5-3.1.3 Installation of Cathodic Protection Systems. Where required by the federal standard cited in 5-3.1.1, cathodic protection shall be installed for corrosion control of buried or submerged metallic gas piping [*see also 5-3.1.6(a) and (b)*].

NOTE: Gas piping systems (natural gas, manufactured gas, liquefied petroleum gas in the vapor phase, liquefied petroleum gas-air mixtures, or mixtures of these gases) owned, operated, and maintained by a public utility are exempt from the provisions of this standard but are required to conform to 49 C.F.R., Part 192 (*see 5-3.1.1*).

5-3.1.4 Required Gas Supply. The minimum hourly volume of gas required at each manufactured home site outlet or any section of the manufactured home community gas piping system shall be calculated as shown in Table 5-3.1.4.

Table 5-3.1.4 Demand Factors for Use in Calculating Gas Piping Systems in Manufactured Home Communities

No. of Manufactured Home Sites	Btu Per Hour Per Manufactured Home Site
1	125,000
2	117,000
3	104,000
4	96,000
5	92,000
6	87,000
7	83,000
8	81,000
9	79,000
10	77,000
11-20	66,000
21-30	62,000
31-40	58,000
41-60	55,000
Over 60	50,000

NOTE: In extreme climate areas additional capacities should be considered.

5-3.1.5 Gas Pipe Sizing and Pressure.

(a) The size of each section of a gas piping system shall be determined in accordance with NFPA 54, *National Fuel Gas Code*, or by other standard engineering methods acceptable to the authority having jurisdiction.

(b) When all connected appliances are operated at their rated capacity the supply pressure shall be not less than 4 oz per sq in. (7 in. water column) (1743 Pa). The gas supply pressure shall not exceed 8 oz per sq in. (14 in. water column) (3486 Pa).

5-3.1.6 Gas Piping Materials.

(a) *Metal.* Metal gas pipe shall be standard-weight wrought iron or steel (galvanized or black), yellow brass containing not more than 75 percent copper, or internally tinned or treated copper of iron pipe size. Galvanizing shall not be considered protection against corrosion.

Seamless copper or steel tubing may be used with gases not corrosive to such material. Steel tubing shall comply with ANSI/ASTM A539 or ANSI/ASTM A254. Copper tubing shall comply with ANSI/ASTM B88 (Type K or

L) or ANSI/ASTM B280. Copper tubing (unless tin-lined) shall not be used if the gas contains more than an average of 0.3 grains of hydrogen sulfide per 100 standard cubic feet of gas.

(b) *Protection Coatings for Metal Gas Piping.* All buried or submerged metallic gas piping shall be protected from corrosion by approved coatings or wrapping materials. All gas pipe protective coatings shall be approved types, machine-applied, and conform to recognized standards. Field-wrapping shall provide equivalent protection and is restricted to those short sections and fittings necessarily stripped for threading or welding. Risers shall be coated or wrapped to a point at least 6 in. (152 mm) above ground.

(c) *Plastic.* Plastic piping shall only be used underground and shall meet the requirements of ASTM D-2513, Thermoplastic Gas Pressure Pipe, Tubing, and Fittings or ASTM D-2517, Reinforced Epoxy Resin Gas Pressure Pipe and Fittings and shall meet the design pressure and design limitations of 49 C.F.R., Part 192.123 and shall otherwise conform to the installation requirements thereof.

5-3.1.7 Gas Piping Installations.

(a) *Minimum Burial Below Ground Level and Clearances.* All gas piping installed below ground shall have a minimum earth cover of 18 in. (451 mm) and shall be installed with at least 12 in. (305 mm) of clearance in any direction from any other underground utility system.

(b) *Metallic Gas Piping.*

1. *Plan Approval Required.* All metallic gas piping systems shall be installed in accordance with approved plans and specifications, including provisions for cathodic protection. Each cathodic protection system shall be designed and installed to conform to the provisions of 49 C.F.R., Part 192.

2. *When Cathodic Protection Is Designed Only to Protect Underground Gas Piping.* When the cathodic protection system is designed to protect only the gas piping system, the gas piping system shall be electrically isolated from all other underground metallic systems or installations. When only the gas piping system is cathodically protected against corrosion, a dielectric fitting shall be used in the manufactured home gas connection to insulate the manufactured home from the underground gas piping system.

3. *When Cathodic Protection is Designed to Protect All Underground Metallic Systems.* When a cathodic protection system is designed to provide all underground metallic systems and installations with protection against corrosion, all such systems and installations shall be electrically bonded together and protected as a whole.

(c) *Plastic Gas Piping.* Plastic gas piping shall only be used underground and shall be installed with an electrically conductive wire for locating the pipe. The plastic pipe-locating wire shall be copper, not less in size than No. 18 AWG, with insulation approved for direct burial. Every portion of a plastic gas piping system consisting of metallic pipe shall be cathodically protected against corrosion.

5-3.2 Liquefied Petroleum Gas Equipment. LP-Gas equipment shall be installed in accordance with the applicable provisions of NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases.*

The referenced standard, NFPA 58, includes provisions on: location of containers; installation of containers; installation of container appurtenances; regulator installations; piping system service limitations; installation of pipe, tubing, pipe and tubing fittings, valves and hose; and hydrostatic relief valve installation.

5-3.3 Oil Supply. The following three methods of supplying oil to an individual manufactured home site shall be permitted:

(a) Supply from an outside underground tank (*see 5-4.6*).

(b) Supply from a centralized oil distribution system designed and installed in accordance with accepted engineering practice and in compliance with NFPA 31, *Standard for the Installation of Oil-Burning Equipment.*

(c) Supply from an outside aboveground tank (*see 5-4.6*).

5-3.4 Minimum Oil Supply Tank Size. Oil supply tanks shall have a minimum capacity equal to 20 percent of the average annual oil consumption. [Sixty gal (230 L) ICC-5 shipping containers or drums are not recommended, except for areas with less than 1,800 degree days.]

(d) *Gas Piping System Shutoff Valve.* A readily accessible and identified shutoff valve controlling the flow of gas to the entire manufactured home community gas piping system shall be installed near the point of connection to the service piping or to the supply connection of a liquefied petroleum gas container.

5-3.5 Oil Supply Connections — General. Oil supply connections at manufactured home stands, when provided from a centralized oil distribution system, shall be located and arranged to permit attachment in a workmanlike manner to a manufactured home utilizing the stand. The installation of such facilities shall meet the provisions of NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, and particularly Section 3-8 thereof.

5-4 Fuel Supply Systems Installation.

5-4.1 Flexible Gas Connector. Each gas supply connector shall be listed for outside manufactured home use, be not more than 6 ft (1.83 m) in length and have a capacity rating adequate to supply the connected load.

Exception: All gas supply connections for manufactured homes located on an all-weather wood or concrete or concrete block foundation system shown in Appendix C, or on a foundation constructed in accordance with the local building code or, in the absence of a local code, with a recognized model building code. (Also see Appendix C for examples of manufactured home foundation systems.)

NOTE: The flexible connector should be installed to provide some slack.

5-4.2 Use of Approved Pipe and Fittings of Extension. When it is necessary to extend the manufactured home inlet to permit connection of the 6-ft (1.83-m) listed connector to the site gas outlet, the extension shall be of ap-

proved materials of the same size as the manufactured home inlet and be adequately supported at no more than 4-ft (1.22-m) intervals to the manufactured home.

5-4.3 Mechanical Protection. Where subject to physical damage, all gas outlet risers, regulators, meters, valves or other exposed equipment shall be protected against accidential damage.

NOTE: Such protection may consist of posts, fencing, or other permanent barriers.

5-4.4 Special Rules on Atmospherically Controlled Regulators. Atmospherically controlled regulators shall be installed in such a manner that moisture cannot enter the regulator vent and accumulate above the diaphragm. Where the regulator vent may be obstructed due to snow and icing conditions, shields, hoods, or other suitable devices shall be provided to guard against closing the vent opening.

5-4.5 Fuel Gas Piping Test. The manufactured home fuel gas piping system shall be tested with air only before it is connected to the gas supply. The manufactured home gas piping system shall be subjected to a pressure test with all appliance shutoff valves, except those ahead of fuel gas cooking appliances, in the open position. Appliance shutoff valves ahead of fuel gas cooking appliances shall be closed.

(a) The test shall consist of air pressure at not less than 10 in. nor more than 14 in. water column (6 oz to 8 oz per sq in.) (2490 to 3486 Pa). The system shall be isolated from the air pressure source and maintain this pressure for not less than 10 minutes without perceptible leakage. Upon satisfactory completion of the test, the appliance valves ahead of fuel gas cooking appliances shall be opened and the gas cooking appliance connectors tested with soapy water or bubble solution while under the pressure remaining in the piping system. Solutions used for testing for leakage shall not contain corrosive chemicals. Pressure shall be measured with either a manometer, slope gage, or gage calibrated in either water in. or psi with increments of either one-tenth in. or one-tenth psi, as applicable. Upon satisfactory completion of the test, the manufactured home gas supply connector shall be installed, and the connections tested with soapy water or bubble solution.

WARNING: Do Not Overpressurize the Fuel Gas Piping System! Pressurization beyond the maximums specified may result in damage to valves, regulators, appliances, etc.

(b) Gas appliance vents shall be visually inspected to ensure that they have not been dislodged in transit and are securely connected to the appliance.

5-4.6 Oil Tanks. Not more than one 660 gal (2500 L) tank or two tanks of aggregate capacity of 660 gal (2500 L) or less shall be connected to one oil-burning appliance. Two supply tanks, where used, shall be cross-connected and provided with a single fill and single vent as described in Appendix A of NFPA 31, *Standard for the Installation of Oil-Burning Equipment*; but when so connected, they shall be on a common slab and rigidly secured one to the other. Tanks having a capacity of 660 gal (2500 L) or less shall be securely supported by rigid noncombustible supports to prevent settling, sliding, or lifting.

5-4.6.1 Oil supply tanks shall be installed in accordance with the applicable provisions of NFPA 31, *Standard for the Installation of Oil-Burning Equipment*. Chapter 2 of the referenced standard includes provisions on the design and construction of tanks, installation of underground tanks, outside aboveground tanks not larger than 660 gal (2500 L), and location with respect to adjacent buildings and adjoining property lines.

NOTE: These provisions do not apply to centralized oil distribution systems (*see 5-3.5 and 5-6.2 of this code*). See also NFPA 31, *Standard for the Installation of Oil-Burning Equipment*.

5-4.6.2 A tank not larger than 60 gal (230 L) capacity shall be permitted to be a DOT-5 shipping container (drum), and so marked, or a tank meeting the provisions of Standard UL 80, *Steel Inside Tank for Oil Burner Fuel*, 1980. Tanks other than DOT-5 shipping containers having a capacity of not more than 660 gal (2500 L) shall meet the provisions of Standard UL 80. Pressure tanks shall be built in accordance with the Code for Unfired Pressure Vessels, Section VIII of the ASME *Boiler and Pressure Vessel Code*.

5-4.6.3 Tanks as described in 5-4.6 and 5-4.6.2 may be located adjacent to buildings, but shall be located not less than 10 ft (3.05 m) from a property line which may be built upon.

5-4.6.4 Tanks not larger than 660 gal (2500 L) capacity shall be equipped with an open vent not smaller than 1½ in. (38 mm) iron pipe size; tanks with a 500 gal (1900 L) or less capacity shall have a vent of 1¼ in. (32 mm) iron pipe size.

5-4.6.5 Tanks shall be provided with a means to determine the liquid level.

NOTE: See Section 3-6 of NFPA 31, *Standard for the Installation of Oil-Burning Equipment* (ANSI).

5-4.6.6 The fill opening shall be of such size and so located as to permit ready filling in a manner which will avoid spillage.

5-5 Manufactured Home Accessory Building Fuel Supply Systems. Fuel gas supply systems installed in a manufactured home accessory building or structure shall comply with the applicable provisions of NFPA 54, *National Fuel Gas Code*, and NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*. Fuel oil supply systems shall comply with the applicable provisions of NFPA 31, *Standard for the Installation of Oil-Burning Equipment*.

5-6 Community Buildings Fuel Supply Systems.

5-6.1 Fuel Gas Piping and Equipment Installations. Fuel gas piping and equipment installations installed within a permanent building in a manufactured home community shall comply with nationally recognized appliance and fuel gas piping codes and standards adopted by the authority having jurisdiction. Where the state or other political subdivision does not assume jurisdiction,

such fuel gas piping and equipment installations shall be designed and installed in accordance with the appropriate provisions of NFPA 54, *National Fuel Gas Code*, or NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*.

5-6.2 Manufactured Home Community Oil Supply Systems.

5-6.2.1 General. Oil-burning equipment and installations within a manufactured home community shall be designed and constructed in accordance with the applicable codes adopted by the authority having jurisdiction. Where the state or other political subdivision does not assume jurisdiction, such installations shall be designed and constructed in accordance with the applicable provisions of the standard referenced in 5-3.5.

5-6.3 Oil-Burning Equipment and Installation. Oil-burning equipment and installations within a building constructed to the local building code or a nationally recognized building code in a manufactured home community shall comply with nationally recognized codes and standards adopted by the authority having jurisdiction. Where the state or other political subdivision does not assume jurisdiction, such oil-burning equipment and installation shall be designed and installed in accordance with the appropriate provisions of NFPA 31, *Standard for the Installation of Oil-Burning Equipment*.

Chapter 6 Air Conditioning (Heating and Cooling)

6-1 Exterior Air Conditioning Equipment.

6-1.1 Air conditioning equipment installed outside of a manufactured home and not attached thereto shall be mounted on a level slab not less than 3½ in. (89 mm) thick or a precast, treated or reinforced concrete slab or equivalent strength, or be mounted in accordance with the equipment manufacturer's installation instructions.

6-1.2 Air conditioning equipment installed outside shall be listed and labeled for the outside installation use intended and installed in accordance with the manufacturer's installation instructions.

6-1.3 Air conditioning equipment shall not be installed in a manner that would obstruct any means of required egress.

NOTE: Air conditioning equipment should not be installed in any window opening which is part of an occupant exiting or egress system. Said equipment should not obstruct sidewalks or other means of egress from the manufactured home.

Chapter 7 Electrical

7-1 Manufactured Home Site and Community Electrical Connections.

7-1.1 Manufactured home sites and communities provided with an electrical service shall have all electrical installations designed and constructed in accordance with the applicable provisions of NFPA 70, *National Electrical Code®*.

7-1.2 NFPA 70, *National Electrical Code*, is divided into the Introduction and nine chapters: Chapter 1 — General, Chapter 2 — Wiring Design and Protection, Chapter 3 — Wiring Methods and Materials, and Chapter 4 — Equipment for General Use apply generally to all electrical installations and materials. Chapter 5 — Special Occupancies (which includes Article 550, Manufactured Homes and Manufactured Home Parks, for the variances from the general rules for these installations), Chapter 6 — Special Equipment (for example Article 680 — Swimming Pools), and Chapter 7 — Special Conditions, apply to special occupancies, special equipment, or other special conditions. These latter chapters supplement or modify the rules. Chapters 1 — 4 apply except as amended by Chapters 5, 6 and 7 — Special Conditions. Chapter 8 covers communication systems and is independent of other chapters except where they are specifically referenced therein. Chapter 9 consists of tables and examples to assist the user of NFPA 70, *National Electrical Code*.

NOTE 1: The purpose of NFPA 70, *National Electrical Code*, is the practical safeguarding of persons and property from hazards arising from the use of electricity. The NFPA 70, *National Electrical Code*, is not intended as a design specification nor as an instruction manual for untrained persons.

NOTE 2: Some manufactured homes are constructed to have the service equipment installed in or on the structure. The installer and the local authority having jurisdiction should be aware that these units should have the service installed in accordance with NFPA 70, *National Electrical Code*, Article 230, for service, and Article 250 for equipment and service grounding.

7-2 Manufactured Home Accessory Building Electrical Systems, General. Electrical equipment installed in a manufactured home accessory building or structure shall comply with the applicable provisions of NFPA 70, *National Electrical Code*.

7-3 Manufactured Home Community Building Electrical Installations. Electrical wiring fixtures and equipment installed in a building other than a manufactured home in a manufactured home community shall comply with the applicable provisions of NFPA 70, *National Electrical Code*.

Chapter 8 Life and Firesafety

8-1 Firesafety Considerations. Community management shall instruct its staff in the use of the fire protection equipment available and define specific duties in the event of fire. Tenants shall be instructed in applicable fire prevention and fire protection rules. (*See Appendix D.*)

8-1.1 Arrangement of Manufactured Homes. The arrangement of each manufactured home community shall meet the approval of the authority responsible for providing the necessary fire protection services.

A community site plan shall be supplied to the enforcement agencies having jurisdiction. The site plan shall show the numerical designation or street name and number of each manufactured home site in the community. Each manufactured home site shall be marked for identification. Such a marker shall be easily readable from the street serving the site.

8-1.2 Access To Manufactured Home For Fire Protection Services. Access to a manufactured home for fire protecion services shall be such as to permit fire apparatus to approach within 100 ft (30.48 m) of each manufactured home.

8-1.3 Incinerators and Rubbish Burning.

8-1.3.1 Burning of rubbish within a community shall not be permitted unless specifically permitted by the authority having jurisdiction.

8-1.3.2 Incinerators, when permitted by the authority having jurisdiction, shall be constructed in accordance with NFPA 82, *Standard on Incinerators, Waste and Linen Handling Systems and Equipment.*

8-1.3.3 Incinerators, when permitted by the authority having jurisdiction, shall meet the applicable Standards of the Environmental Protection Agency having jurisdiction.

8-1.4 Outdoor Hazards. Care shall be taken to maintain all areas free of dry brush, leaves and weeds which might spread fires to buildings.

8-1.5 Fire Detection and Alarm Systems.

8-1.5.1 Detection Systems in Community Buildings. Fire detection and alarm systems installed in community buildings shall be installed in accordance with NFPA 72A, *Standard on Local Protective Signaling Systems.*

NOTE: See NFPA 71, *Central Station Signaling Systems*; NFPA 72B, *Auxiliary Protective Signaling Systems*; NFPA 72C, *Remote Station Protective Signaling Systems*; or NFPA 72D, *Proprietary Protective Signaling Systems*, for other suitable types of fire protective signaling systems.

8-1.5.2 Public Fire Alarm Services. Street fire alarm services for the community, when provided, shall be in accordance with NFPA 1221, *Standard on Public Fire Service Communications*. Where such services are not provided, alarm procedures shall be posted as required by the local fire service.

8-1.6 Water Supplies For Fire Protection — Minimum Requirements. Water supplies for fire department operations shall be as required by the authority having jurisdiction. Where there are no such requirements, water supplies shall be at least adequate to permit the effective operation of two 1½-in. (38-mm) hose streams on any fire in a building. The supply may be derived from hydrants connected to an underground water supply system, a reservoir or water supply with a source of not less than 3,000 gal (11,360 L) (accessible fire department drafting operations), or fire department apparatus equipped with a water tank(s) with a capacity of 750 gal (2840 L) and a pump capacity of 250 gpm (16 L/s) constructed in accordance with NFPA 1901, *Standard for Automative Fire Apparatus.*

Hydrants, when provided, shall be located along the community streets or public ways readily accessible for fire department use and located within 500 ft (152.40 m) of all homes and buildings. Hydrant-hose coupling threads shall be national standard threads (see NFPA 1963, *Standard for Screw Threads and Gaskets for Fire Hose Connections*) or shall conform to those used by the local fire department if different from those specified in the referenced standard.

8-2 Single and Multiple Manufactured Home Site Firesafety Requirements.

8-2.1 Firesafety Separation Requirements.

8-2.1.1 Any portion of a manufactured home, excluding the tongue, shall not be located closer than 10 ft (3.04 m) side to side, 8 ft (2.44 m) end to side or 6 ft (1.83 m) end to end horizontally from any other manufactured home or community building unless the exposed composite walls and roof of either structure are without openings and constructed of materials which will provide a one-hour fire rating, or the structures are separated by a one-hour fire rated barrier. (*See 8-4.1.*)

8-2.1.2 Vertical Positioning of Manufactured Homes. Manufactured homes shall not be positioned vertically (stacked with one over the other) in whole or in part unless the structure is designed and approved for such installation and permitted by the authority having jurisdiction.

8-3 Manufactured Home and Community Firesafety Requirements.

8-3.1 Use and Maintenance of Space Under Manufactured Homes, Accessory Buildings, or Structures. The space under manufactured homes and accessory buildings and structures shall not be used for the storage of combustible materials nor for the storage or placement therein of flammable liquids, gases, or liquid-or gasoline-powered equipment.

8-3.2 Emergency Information. The requirements of this section shall be printed and posted in conspicuous places in the community and shall contain the following information. (*See Appendix D.*)

(a) List the following phone numbers:

1. Fire Department
2. Police Department or Sheriff's Office

3. Community Office

4. The person responsible for operation and maintenance.

(b) List the following locations:

1. Nearest fire alarm box, when available

2. Nearest public telephone

3. Address of community.

8-3.3 Smoke Detectors. Current manufactured home standards (see, for instance, Manufactured Homes Construction and Safety Standards, 24 C.F.R., Part 3280.208, subpart C 208, and the *Standard for Mobile Homes*, NFPA 501B-1974, Section 2-21) require the installation of smoke detectors in each manufactured home. This equipment is highly recommended for any existing manufactured home not so equipped.

8-3.4 Portable Fire Extinguishers. Portable fire extinguishers, when required or installed, shall be of the type and size required by NFPA 10, *Standard for Portable Fire Extinguishers*.

NOTE: It is recommended that each building owner provide a listed portable fire extinguisher suitable for handling incipient fire in the building. A listed extinguisher labeled as suitable for class A, B, and C fires (multipurpose dry chemical type) is recommended. The provision on each site of a ¾-in. (19-mm) nominal valved water outlet designed for connecting a ¾-in. (19-mm) nominal female swivel hose connection for fire suppression use is desirable when practical and if protected against freezing.

8-4 Accessory Building or Structure Firesafety Requirements.

8-4.1 A carport, awning, ramada, or open (screened) porch shall be permitted to be located immediately adjacent to a site line when constructed entirely of materials which do not support combustion and provided that such facilities are not less than 3 ft (0.91 m) from a building, cabana, or enclosed porch on an adjacent site. A carport, awning, or ramada or open (screened) porch using combustible materials shall not be located closer than 5 ft (1.52 m) from the site line of an adjoining site.

8-4.2 Exits. Every habitable room in an accessory building or structure shall have access to at least one exterior opening directly to the outside without passing through the manufactured home. When a building or structure encloses two doors of the manufactured home or an emergency exit window, an additional exterior door shall be installed. This exterior door shall be not less than 28 in. (0.71 m) in width and 74 in. (1.88 m) in height.

8-4.3 An accessory building or structure which encloses all required means of manufactured home egress shall not be constructed. One required means of egress must be open directly to the outside.

8-5 Community Building Firesafety Requirements.

8-5.1 Life Safety From Fire. The provisions of the NFPA *101®*, *Life Safety Code®*, regarding construction, protection, and occupancy features of community buildings to minimize danger to life from fire, smoke or panic shall be followed, as applicable, with special attention given the number, size and arrangement of exit facilities in community buildings used as places of public assembly.

8-5.2 Portable Fire Fighting Equipment. Community buildings shall be provided with listed portable fire extinguishers in accordance with the applicable provisions of NFPA 10, *Standard for Portable Fire Extinguishers*.

Chapter 9 Manufactured Home Accessory Buildings and Structures

9-1 Cabanas.

9-1.1 General. A cabana shall be erected, constructed, occupied or maintained on a manufactured home site only as an accessory to a manufactured home.

9-1.2 Design and Construction. A cabana shall be designed and constructed as a freestanding structure. A cabana shall be permitted to be attached to a manufactured home with appropriate flashing or sealing materials to provide a weather seal. Location shall comply with the provisions of Section 8-4.

9-1.3 Design Considerations.

9-1.3.1 The height of a cabana shall not exceed one story or the height of the manufactured home, except when constructed in conjunction with a ramada.

9-1.3.2 A cabana shall have a minimum ceiling height of 7 ft (2.14 m) from the finished floor to the finished ceiling, or, if there is no finished ceiling, to the roof. If the ceiling or roof is sloped, one-half of the sloped ceiling area shall meet the minimum ceiling height. No portion of any room having a ceiling height of less than 5 ft (1.52 m) shall be considered as contributing to the minimum area prescribed in 9-1.3.4.

9-1.3.3 Habitable rooms shall be not less than 7 ft (2.14 m) in any horizontal dimension and toilet compartments shall be not less than 30 in. (762 mm) in width, and there shall be not less than 21 in. (533 mm) clear space in front of each toilet.

9-1.3.4 Each habitable room in a cabana shall have a floor area of not less than 90 sq ft (8.36 m^2), excluding a toilet and bath compartment or other enclosed area.

9-1.3.5 Light and Ventilation.

9-1.3.5.1 General. Each cabana shall be provided with windows or doors having a total glazed area of not less than 10 percent of the floor area. An area equivalent to not less than 5 percent of the floor area shall be available for unobstructed ventilation.

NOTE: Glazed areas need not be openable where a mechanical ventilation system is provided and is capable of producing a change of air in the room(s) every 30 minutes with not less than ⅓ of the air supply taken from outside the cabana.

9-1.3.5.2 Windows and Doors Used For Light and Ventilation. Such windows and doors shall open directly to the outside.

9-1.3.5.3 Bathroom. Each bathroom shall be provided with windows or doors having a total glazed area of not less than 1½ sq ft (0.14 m²) of full openable window except where artificial light and an approved mechanical ventilation system are provided and capable of producing a change of air every 12 minutes.

9-1.3.5.4 Cabana Windows. Required windows of a cabana shall open on a court, yard or street either directly or through a porch or awning having a minimum clear height of not less than 7 ft (2.14 m). Such porch or awning shall be at least 50 percent open on the side opposite the windows.

9-1.3.6 Foundation. A cabana shall be permitted to be set on piers and girders in lieu of continuous footings. Piers and girders shall be designed and constructed to support the live and dead loads imposed on them in accordance with standard engineering practice and the criteria established by the authority having jurisdiction.

9-1.3.7 Floors. Floors shall be designed and constructed to support the live and dead loads to which they may be subjected in accordance with criteria established by the authority having jurisdiction.

9-1.3.8 Walls. Walls shall be designed and constructed to withstand horizontal and lateral forces in accordance with design criteria established by the authority having jurisdiction.

9-1.3.9 Roofs. Roofs of cabanas shall be designed and constructed to withstand vertical and horizontal forces to which they may be subjected in accordance with criteria established by the authority having jurisdiction.

9-1.3.10 Exits. Every room in a cabana shall have access to at least one exterior door opening directly to the outside without passing through the manufactured home. The opening shall be not less than 28 in. (.71 mm) in width nor less than 74 in. (1.88 m) in height. When the cabana encloses two doors of the manufactured home, an additional exterior door shall be installed which provides an alternate route of exit in the event the other exit becomes blocked. When two exit doors are required on the cabana, the separation of the two doors shall be greater than 12 ft (3.66 m).

9-1.3.11 A cabana shall not be constructed which encloses all required means of manufactured home egress. One means of egress must be open directly to the outside. (*Also see 8-4.3.*)

9-2 Awnings and Carports.

9-2.1 General. An awning or carport shall be erected, constructed, or maintained on a manufactured home site only as an accessory to a manufactured home located on the same site. An awning shall not be enclosed with rigid materials or walls or converted for use as a habitable room or cabana unless the completed construction complies with all the requirements for a cabana. (*See Section 9-1.*)

9-2.2 Location. Location as regards site line proximity shall comply with the provisions of Section 8-4 dependent upon the type of construction utilized.

9-2.3 Design Considerations.

9-2.3.1 The load imposed by an attached awning or carport, supported in part by a manufactured home, shall not exceed the load-bearing capacity of the supporting structure of the manufactured home.

9-2.3.2 A freestanding awning or carport is not limited as to width or length, except that the occupied area of a manufactured home site shall not exceed the limit imposed by Section 8-4.

9-2.3.3 Exits From Awning Enclosures. An awning with enclosures of nonrigid materials shall have at least one door in the enclosure opening directly to the outside of the enclosure. The opening shall be not less than 28 in. (.71 mm) in width nor less than 74 in. (1.88 m) in height. Two such door openings shall be provided from the enclosure when the enclosure encloses two doors of the manufactured home. When two exit doors are required from the awning enclosure, the separation of the two doors shall be greater than 12 ft (3.66 m).

9-3 Ramadas.

9-3.1 General. A ramada shall be erected, constructed, or maintained on a manufactured home site only as an accessory to a manufactured home located on the same site.

9-3.2 Location.

9-3.2.1 Horizontal separation to a site line shall be in accordance with Section 8-4, dependent on the type of construction utilized.

9-3.2.2 A ramada or any portion thereof shall have a clearance of not less than 18 in. (457 mm) in a vertical direction above the top of any fuel-burning appliance vent or plumbing vent extending through the roof of a manufactured home and not less than 6 in. (152 mm) in a horizontal direction from each side of a manufactured home.

9-3.2.3 Cross braces, architectural appurtenances or structural ties shall not obstruct movement of any manufactured home.

9-3.3 Design and Construction. A ramada shall be designed and erected as a freestanding, self-supporting structure meeting structural requirements for cabanas.

9-3.4 Enclosure Prohibited. A ramada shall not be enclosed or partially enclosed on any side or end, except that one side may be enclosed when the ramada roof is continuous with the roof of a cabana constructed on one side only of the manufactured home.

9-3.5 Roof Venting. A ventilating opening shall be installed at the highest point in the ramada roof to relieve

products of combustion from vents or ducts of fuel-burning equipment. Vent openings shall have a minimum cross-sectional area of 28 sq in. (0.018 m^2). Chimneys or vents of appliances burning solid or liquid fuel shall extend through the ramada roof surface and shall terminate in an approved roof jack and cap.

9-4 Porches, Stairways and Landings.

9-4.1 General.

9-4.1.1. A porch erected, constructed or maintained on a manufactured home to be used as an exit way for the use of the occupants of the manufactured home located on the same site shall comply with all the applicable NFPA *101, Life Safety Code* requirements herein.

9-4.1.2 Porches shall also meet all the requirements herein.

9-4.1.3 Enclosed porches shall be located as specified in Section 8-4.

9-4.2 Design and Construction.

9-4.2.1 The design and construction of all structural elements of a porch, stairs leading thereto, and rails shall be in accordance with the applicable provisions of nationally recognized dwelling codes. Live loads applicable to porch floors shall be not less than 40 lbs per sq ft (195 kg/m^2).

9-4.2.2 Where a door swings outward, the floor of the exterior porch shall be not more than 8 in. (203 mm) lower than the floor level of the manufactured home and not less than 22 in. (559 mm) in clear width with the door open. The width of the porch perpendicular to the main doorway opening shall be not less than the full width of the door when open at least 90 degrees. Guardrails shall permit the main door to open at least 90 degrees.

9-4.2.3 Where a door swings inward, the doorway shall be permitted to open on the top step of a stairway or porch not more than 8 in. (203 mm) below the floor level of the manufactured home.

9-4.3 Foundation.

9-4.3.1 Porches shall be permitted to be supported on piers in lieu of continuous footings. Individual piers shall be designed and constructed to evenly distribute the loads carried to the footings. Manufactured piers shall be listed and labeled by an approved listing agency and identified as being approved.

9-4.3.2 Individual load-bearing footings for piers shall be adequate in size to withstand tributary dead and live load.

9-4.3.3 Individual load-bearing footings for piers shall be permitted to be placed on the surface of the ground, but they shall be placed on firm, undisturbed soil or compacted fill.

NOTE: Individual load-bearing footings for piers may consist of one of the following:

(a) Pressure-treated lumber not less than 2 in. (51 mm) nominal thickness;

(b) Precast or poured-in-place concrete footings not less than 3 ½ in. (89 mm) in thickness;

(c) Other approved material providing equivalent load-bearing capacity and resistance to decay.

9-4.4 Porches Used As An Exit Way. A porch erected, constructed or maintained on a manufactured home and used as an exit way for the use of the occupants of the manufactured home located on the same site shall comply with applicable requirements of NFPA *101, Life Safety Code*.

9-4.5 Railings. Railings shall be provided around the perimeter of porches or landings which are 36 in. (91 mm) or more above grade. Railings shall be not less than 42 in. (1067 mm) in height above the floor. Intermediate rails in open-type railings shall be spaced not more than 6 in. (152 mm) apart. Railings shall be designed and constructed to withstand a horizontal force of 20 lbs per lineal ft (292 N.m) applied at the top of the railing.

9-4.6 Stairways and Steps. The rise of every step in a stairway shall not exceed 8 in. (203 mm) and the run shall be not less than 9 in. (229 mm). The height of risers and the width of treads in any stairway shall have the same dimensions with a maximum allowable variation of ¼ in. (6 mm). Every stairway with four or more risers shall have at least one handrail. A landing not exceeding 8 in. (203 mm) in height above grade shall be provided at the bottom of a stairway when necessary to comply with this section. No horizontal dimension of the landing shall be less than the width of the stairway. The landing shall comply with the design and construction requirements for a porch. Pressure-treated lumber or heartwood grade redwood not less than 2 in. (51-mm) nominal thickness, shall be used. Other approved material or assemblies of materials of equivalent durability and resistance to decay may be used.

9-4.6.1 A landing, at least as wide as the door, plus an additional 18 in. (457 mm) on the latch side of the door, shall be installed on all exterior stairs consisting of 4 or more risers.

9-4.6.2 Handrails. Every stairway with four or more risers or stairways serving porches having the finished floor 30 in. (762 mm) or more above grade shall be equipped with handrails. Handrails shall be not less than 30 in. (762 mm) nor more than 34 in. (864 mm) as measured vertically from the nosing of stair treads.

9-5 Storage Structures.

9-5.1 General. Not more than two individual storage structures shall be located or maintained on one manufactured home site.

9-5.2 Location. Storage structures shall be located in accordance with the provisions of Section 8-4.

NOTE: Storage structures should not obstruct openings for light and ventilation of the manufactured home, interfere with requirements for open space, or prevent inspection of manufactured home service equipment and utility connections.

9-6 Fences and Windbreaks.

9-6.1 General. If a fence or windbreak is located on a manufactured home site, it shall not exceed 6 ft (1.83 m) in height, except where such fence or windbreak is on the park property line.

9-6.2 Location. A fence or windbreak exceeding 42 in. (1067 m) in height shall not be located closer than 3 ft (0.91 m) to any manufactured home or manufactured home accessory building or structure. A fence or windbreak shall not be used to form an enclosure of any part of an awning or carport.

NOTE: See also 2-4.2.3.

Appendix A Barrier-Free Design Aspects for the Physically Handicapped (Exterior Only)

This Appendix is not part of the requirements of this document, but is included for information purposes only.

A-1 General. The following provisions are offered as guidelines to provide some basic barrier-free design features in manufactured home communities to the extent considered desirable or needed by the operators to facilitate use by the physically handicapped. The Appendix material represents informational material only and does not comprise a part of the mandatory provisions of this standard.

NOTE 1: Dimensions herein are in US units only as they are advisory.

NOTE 2: This is a developing technology and data herein should be checked with the latest guidance from recognized authorities (see NOTE on available texts in this Appendix).

A-2 Walks. Walks should be 42 in. wide. If the slope of a walk is greater than 5 percent (1 in. rise in a 20 in. run), a handrail should be provided. The slope of a walk should not exceed 8.33 percent (1 in. rise in a 12 in. run). Walks should have a continuous common surface, not interrupted by steps or abrupt changes in level greater than ½ in. Where walks cross driveways or parking lots they should blend to a common level by means of curb cuts, ramps, or other means. Curb cuts should have a textured nonslip surface (such as broom-finish concrete). Walks should be provided with a level area no less than 5 ft by 5 ft where they terminate at doors; in no case should such walks extend less than 1 ft beyond the side from which the door opens.

A-3 Ramps. Ramps should not have a slope greater than 1 ft within 12 ft (or 8.33 percent) and should be no less than 4 ft in. clear width; they should be structurally designed to carry a minimum of 100 lbs per sq ft live load when freestanding. If the ramp slope is greater than 5 percent and there is no dropoff, one handrail should be provided; where a ramp drops off on one or both sides, handrails should be required on both sides of the ramp. Handrails should be 32 in. in height measured from the surface of the ramp and extend 1 ft beyond the top and bottom of the ramp or turn at right angles. The ramp should have a nonslip surface. Each ramp should have a level platform at the top which is at least 5 ft by 5 ft and this platform should extend at least 1 ft on the side from which a door opens. Each ramp should have at least 5 ft of straight level clearance at the bottom. Straight run ramps should have 3-ft minimum long intermediate level platforms at 30-ft intervals for purposes of rest and safety, and should have level platforms wherever they turn which should be at least as wide as the ramp and 5 ft long (deep).

A-4 Doors and Doorways. Each exterior and interior door should have a clear opening of not less than 32 in. when the door is open. Such a door should be operable by a single effort with one hand. The distance between two doors (e.g., outer and inner) should be a minimum of 6½ ft. The floor on the inside and outside of each such double doorway should be level and clear for a distance of 5 ft. from the door and should extend 1 ft. beyond the side from which the door opens. The bottom rail of narrow stile framed glass doors should have a minimum height of 7½ in. Exterior thresholds should be leveled with a maximum edge height of ¾ in. Interior thresholds should be flush with the floor or leveled at not more than 5 percent slope with a maximum edge height of ½ in. Where door closers are used, the pressure to open a door should not exceed a maximum of 15 lbs. (The lightest possible door pressure for use by handicapped people is preferred.)

A-5 Outside Stairs. Outside stairs should not have abrupt (square) nosing; a 1-in. diameter rounded nosing is desirable. Stairs should have at least one continuous handrail, 32 in. as measured from the tread at the face of the riser. The handrail should extend at least 18 in. beyond the top step and beyond the bottom step or turned at right angles. Care should be taken that the extension of the handrails is not in itself a hazard and the extensions should be made on the side of a continuing wall where available.

A-6 Other Facilities for Assistance to the Physically Handicapped. Special designs are available for such other facilities as listed herein for the convenience of physically handicapped persons:

(a) Campsites

(b) Control devices for light, power, heat, ventilation windows, draperies, doors, and similar devices

(c) Elevators

(d) Kitchen arrangements

(e) Swimming pool facilities

(f) Telephone

(g) Toilet rooms and toilet fixtures (including showers)

(h) Water fountains.

NOTE: Available texts for further guidance are:

(a) "Barrier Free Site Design" available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. This publication is based on research and studies conducted by the American Society of Landscape Architects Foundation under contract with the U.S. Department of Housing and Urban Development, Office of Policy Development and

Research and was issued in April 1975 (HUD-PDR-84). This publication also contains a helpful Bibliography for additional data.

(b) "An Illustrated Handbook of the Handicapped Section of the North Carolina State Building Code," issued in 1974, and available from the North Carolina Department of Insurance, P.O. Box 26387, Raleigh, NC 27611.

(c) "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People," American National Standard A117.1-1977. This standard applies to buildings, outdoor facilities, public walks, and residential structures and is available from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

(d) "Design for the Physically Handicapped," US Department of the Army, Office of the Corps of Engineers, Washington, DC 20314.

Appendix B Wind Zone, Roof Load, and Winter Climate Zone Maps

This Appendix is not part of the requirements of this document, but is included for information purposes only.

B-4 Comments on Maps.

B-4.1 The Wind Zone Map (Figure B-1). This map shows that along the Gulf and Atlantic coastlines is the Hurricane Zone where manufactured homes "Designated for Hurricane Zones" should be used. It is not feasible to show all the other areas subject to high winds in the United States, but areas where recurrent winds up to 90 miles per hour (25 psf) are experienced should use manufactured homes similarly designed. Consult the authority having jurisdiction.

B-4.2 The Roof Load Zone Map (Figure B-2). This map shows areas in the northern tier of states where it is necessary to protect against snow loads. It is not feasible to show all the other areas subject to heavy snows (as in mountain ranges) where similar precautions should be followed. Consult the authority having jurisdiction.

B-4.3 Winter Climate Zone Map (Figure B-3). This map divides the USA into three "Zones" for purposes of calculating thermal protection requirements. It is not feasible to show limited areas in some of the zones where climate conditions may vary from the generalized zones. Consult the authority having jurisdiction.

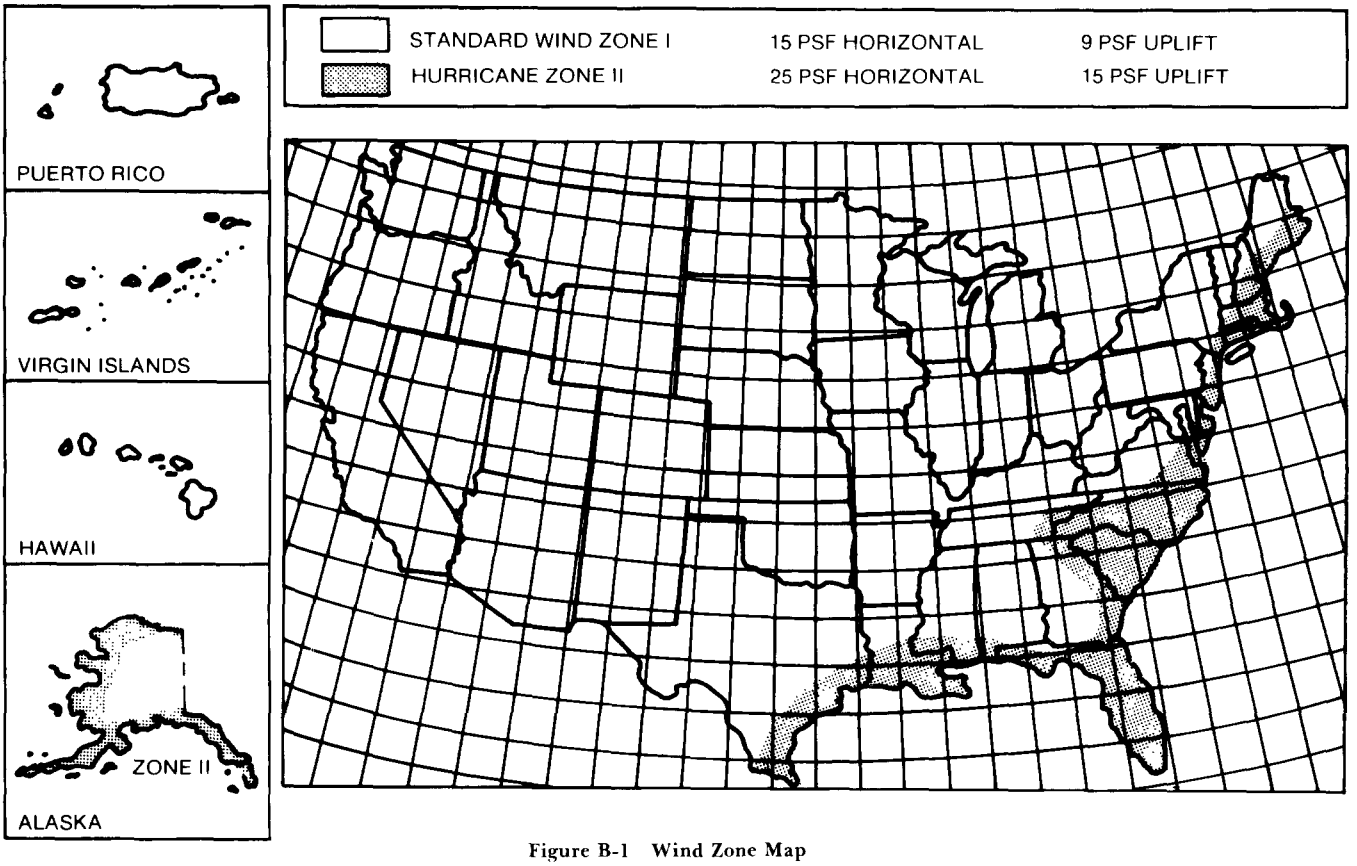


Figure B-1 Wind Zone Map

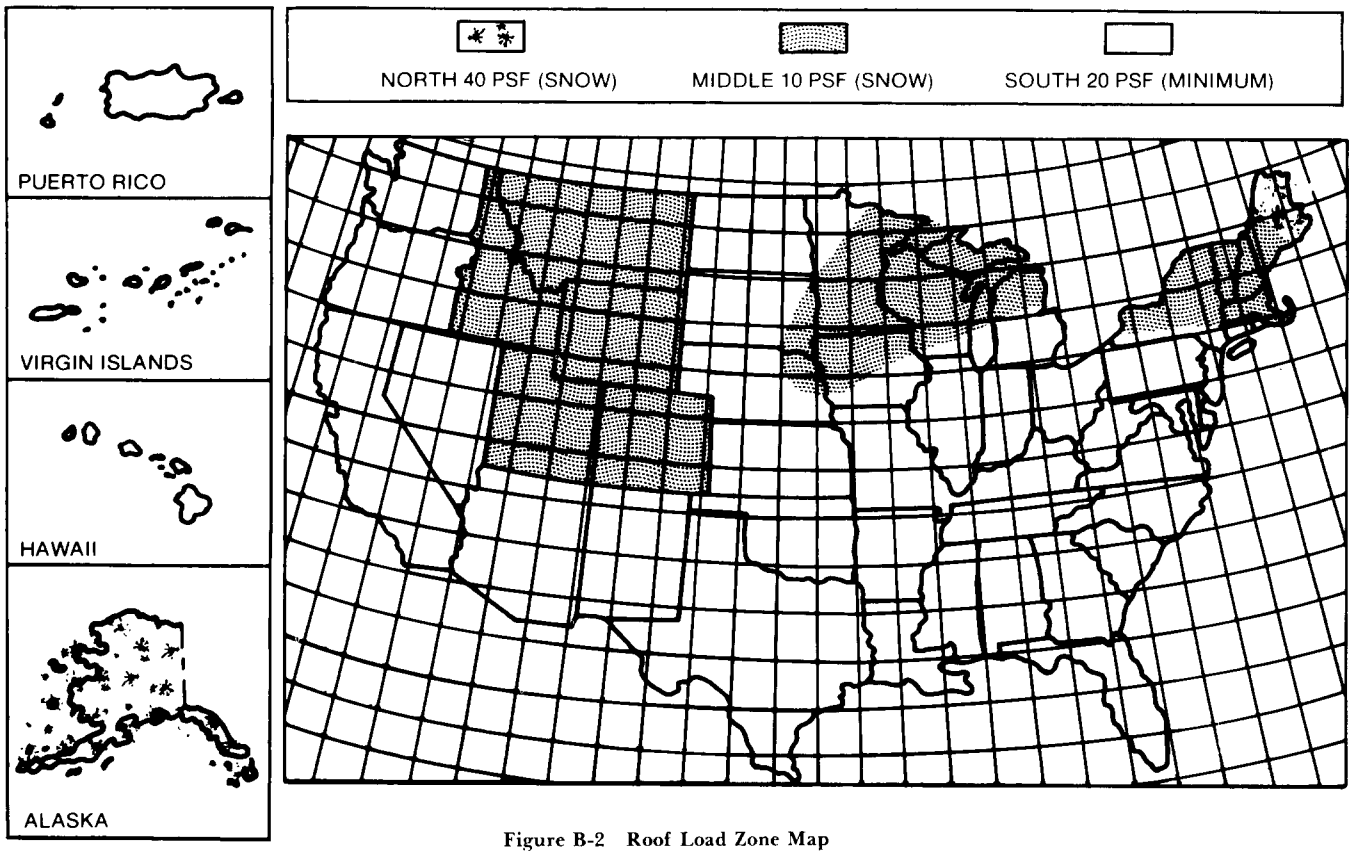


Figure B-2 Roof Load Zone Map

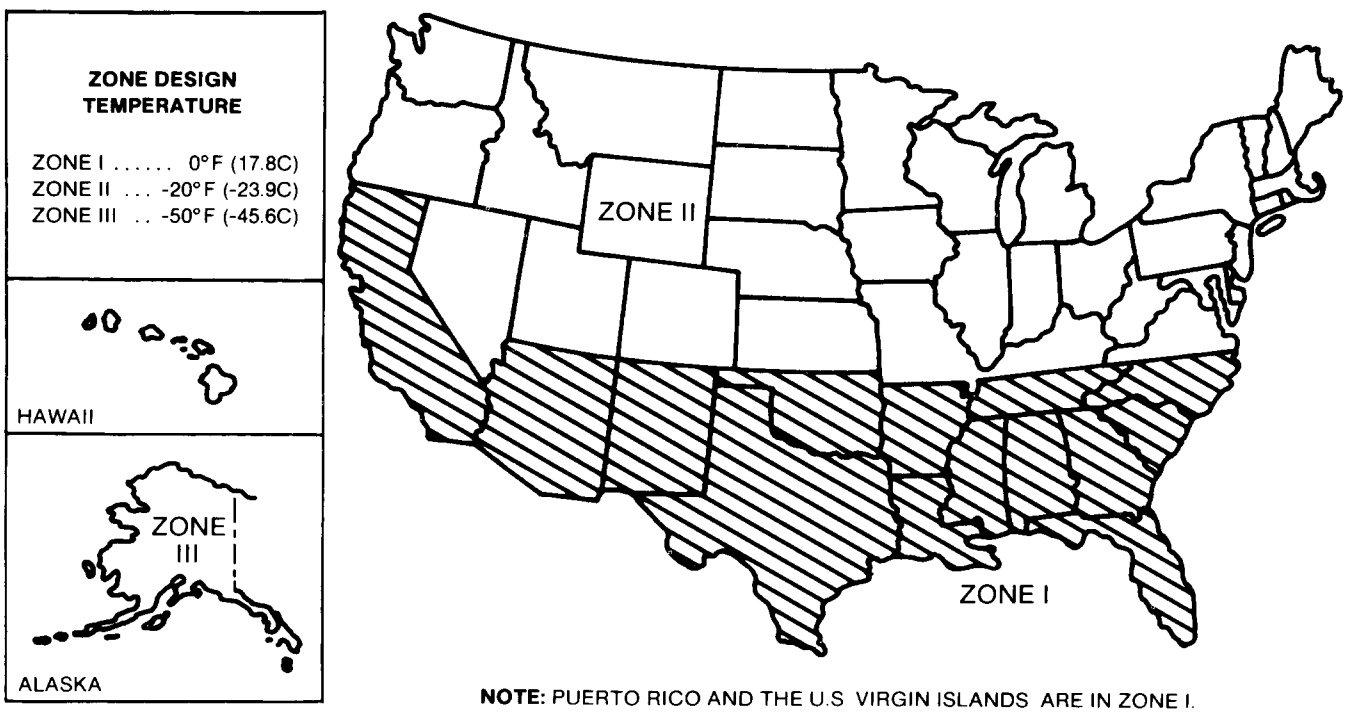


Figure B-3 Winter Climate Zone Map

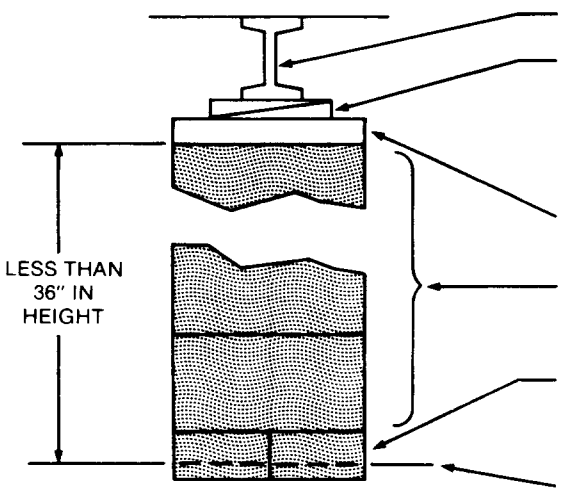
Appendix C Typical Designs of Piers or Load-Bearing Supports for Manufactured Homes

This Appendix is not part of the requirements of this document, but is included for information purposes only.

(Dimensions herein are in US units only, as they are advisory only.)

The following represent typical design arrangements followed by several producers of manufactured homes. They are illustrative examples only. It should be noted that, in addition to these design examples, guidance is found in these typical arrangements for drainage under the manufactured home, moisture prevention, consideration of termite infestation and other critical aspects that must be taken into consideration when installing or setting-up a manufactured home. The user should consult the producer or dealer of the manufactured home in question for the actual design configuration of support, piers, etc. to be followed.

NOTE: IN AREAS SUBJECT TO FROST HEAVE, SEE 3-3.7.7.



I-BEAM FRAME

GAP BETWEEN TOP OF PIER AND MAIN FRAME MAY BE A WOOD PLATE (NOT EXCEEDING 2" IN THICKNESS) AND SHIMS (NOT EXCEEDING 1" IN THICKNESS). SHIMS SHALL BE AT LEAST 4" WIDE AND 6" LONG, FITTED AND DRIVEN TIGHT BETWEEN WOOD PLATE OR PIER AND MAIN FRAME. TWO INCH OR 4" SOLID CONCRETE BLOCK MAY FILL REMAINDER OF GAP.

CAP — WOOD OR CONCRETE, 2" X 8" X 16"

SINGLE OPEN OR CLOSED CELL CONCRETE BLOCKS 8" X 8" X 16" (OPEN CELLS PLACED VERTICALLY UPON FOOTER) INSTALLED WITH 16" DIMENSION PERPENDICULAR TO THE I-BEAM FRAME.

FOOTING — 16" X 16" X 4" SOLID CONCRETE OR OTHER PRODUCT APPROVED FOR THE PURPOSE OR, ALTERNATELY, TWO 8" X 16" X 4" SOLID CONCRETE BLOCKS WITH JOINT BETWEEN BLOCKS PARALLEL TO THE STEEL I-BEAM FRAME.

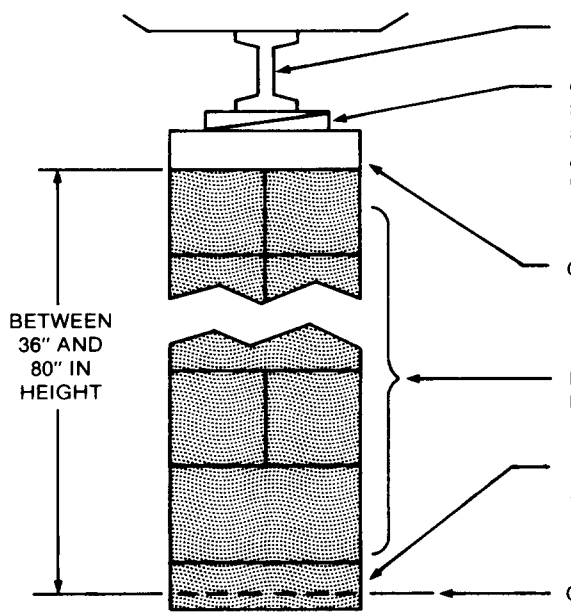
GROUND LEVEL

FOOTING PLACED ON FIRM UNDISTURBED SOIL OR ON CONTROLLED FILL FREE OF GRASS AND ORGANIC MATERIALS COMPACTED TO A MINIMUM LOAD-BEARING CAPACITY OF 2000 PSF

(FOR CONVERSION TO SI UNITS 1 in. = 25.40 mm.)

Figure C-1

NOTE: IN AREAS SUBJECT TO FROST HEAVE, SEE 3-3 7.7.



I-BEAM FRAME

GAP BETWEEN TOP OF PIER AND MAIN FRAME MAY BE A WOOD PLATE (NOT EXCEEDING 2" IN THICKNESS) AND SHIMS (NOT EXCEEDING 1" IN THICKNESS). SHIMS SHALL BE AT LEAST 4" WIDE AND 6" LONG, FITTED AND DRIVEN TIGHT BETWEEN WOOD PLATE OR PIER AND MAIN FRAME. TWO INCH OR 4" SOLID CONCRETE BLOCK MAY FILL REMAINDER OF GAP.

CAP — SOLID CONCRETE BLOCK OR EQUIVALENT 4" X 16" X 16"

DOUBLE CONCRETE BLOCKS (SOLID OR CELLED) WITH BLOCKS INTERLOCKED AND CAPPED AS SPECIFIED ABOVE

FOOTING — 16"X16"X4" SOLID CONCRETE OR OTHER PRODUCT APPROVED FOR THE PURPOSE OR, ALTERNATELY, TWO 8"X16"X4" SOLID CONCRETE BLOCKS WITH JOINT BETWEEN BLOCKS PARALLEL TO THE STEEL I-BEAM FRAME.

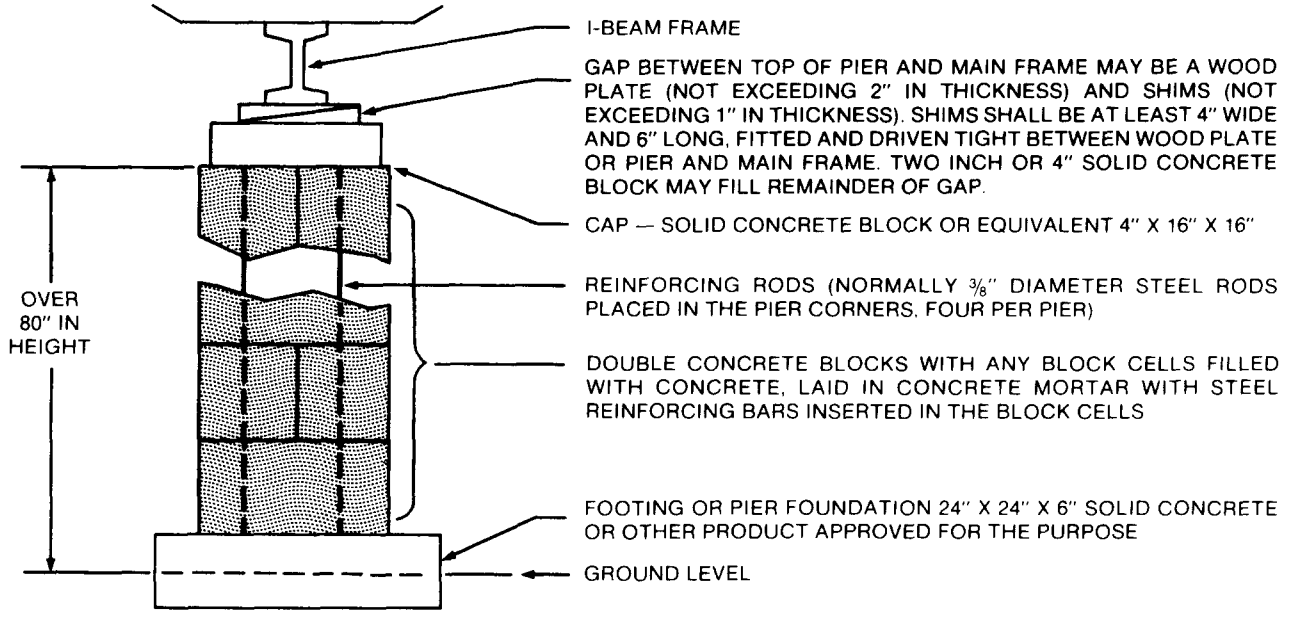
GROUND LEVEL

FOOTING PLACED ON FIRM UNDISTURBED SOIL OR ON CONTROLLED FILL FREE OF GRASS AND ORGANIC MATERIALS COMPACTED TO A MINIMUM LOAD-BEARING CAPACITY OF 2000 PSF.

(FOR CONVERSION TO SI UNITS 1 in. = 25.40 mm.)

Figure C-2

NOTE: IN AREAS SUBJECT TO FROST HEAVE, SEE 3-3.7.7.



(FOR CONVERSION TO SI UNITS 1 in. = 25.40 mm.)

FOOTING PLACED ON FIRM UNDISTURBED SOIL OR ON CONTROLLED FILL FREE OF GRASS AND ORGANIC MATERIALS COMPACTED TO A MINIMUM LOAD BEARING CAPACITY OF 2000 PSF.

Figure C-3(a)

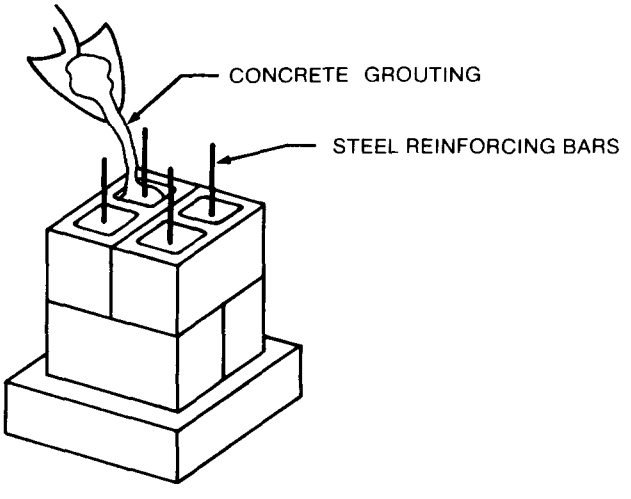


Figure C-3(b) For piers exceeding 80 in. in height the concrete blocks should be filled with concrete grouting and steel reinforcing rods utilized.

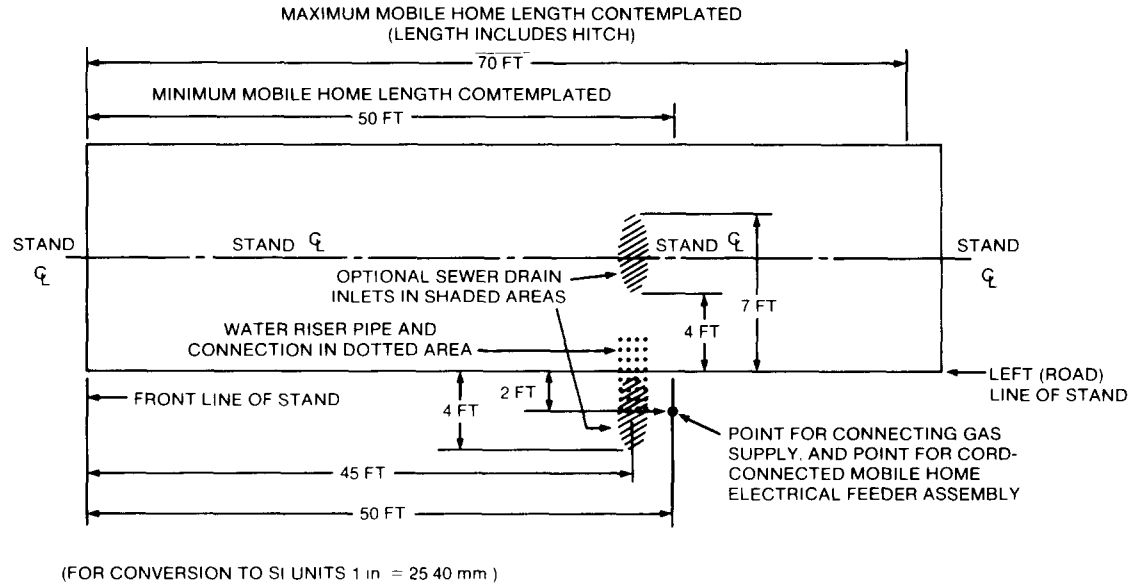


Figure C-4 Diagram of Optimum Placement of Utility Connections Serving a Manufactured Home. The diagram illustrates suggested locations of utility connections for the convenience of users of this standard.

NOTE 1: Drainage. Underfloor areas should be drained in accordance with the requirements of the authority having jurisdiction.

NOTE 2: Wood and Earth Separation. Wood joists or the bottom of perimeter joists should be a minimum of 8 in. from finished grade.

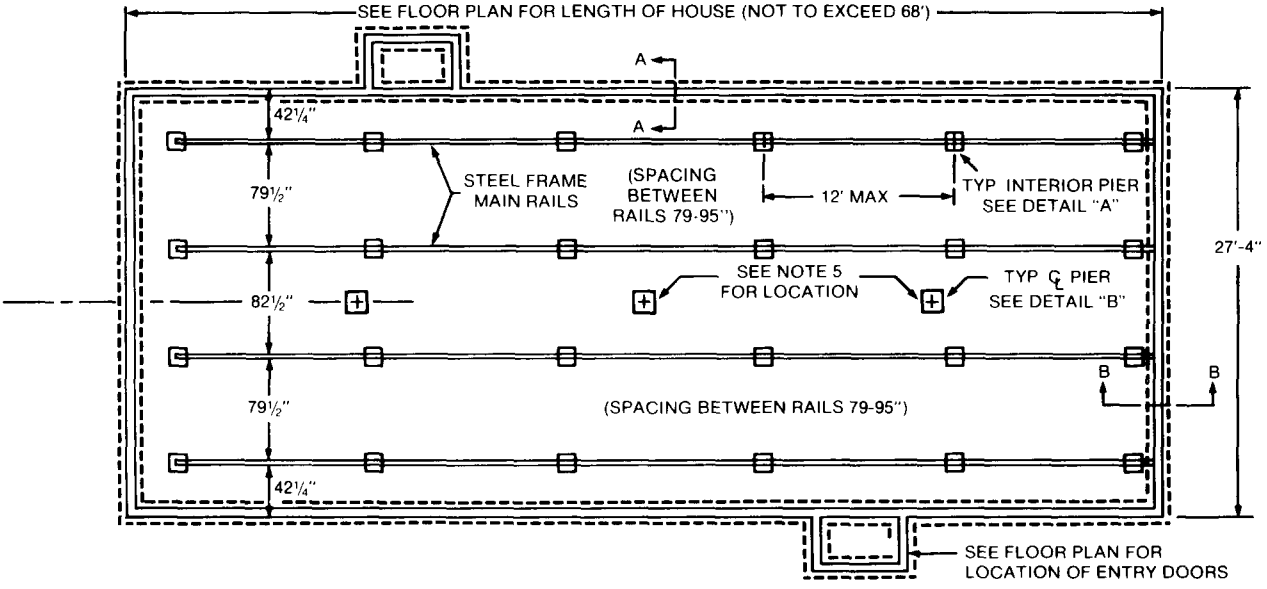


Figure C-5 All Weather Wood Foundation System

Notes:

1. Design Basis: *Uniform Building Code*, Chapter 29, 1979 Ed.
   20 PSF Max. wind force
   30 PSF roof live load
   Seismic Zone 3

2. Foundation footing size and depth to be based on soil conditions at the site.

3. Crawl space access and ventilation to be provided per code.

4. All lumber and plywood used in the foundation system within 6 in. of earth shall be preservative treated and shall bear the FDN grade mark:

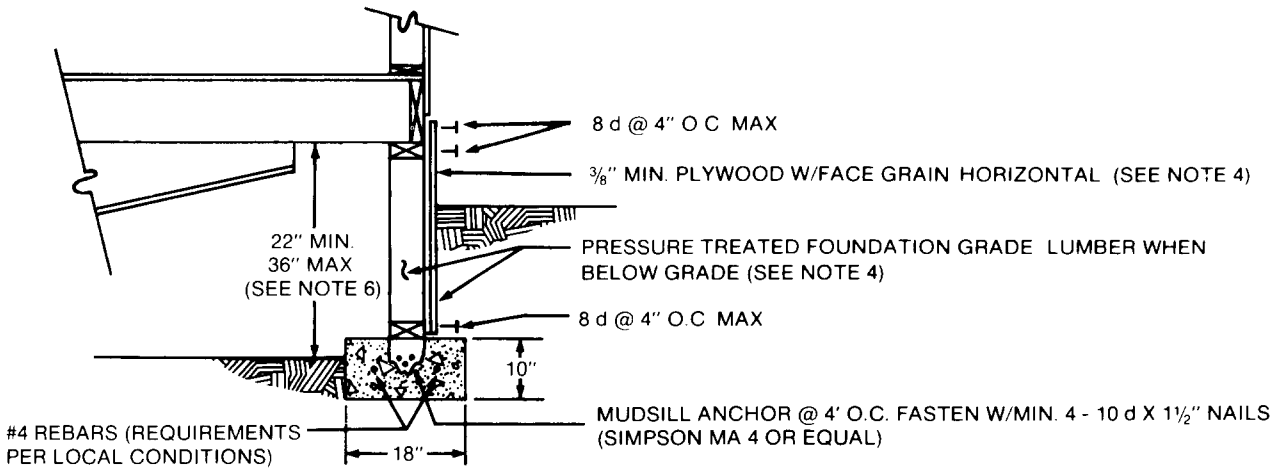
   a. Lumber shall be stud grade Douglas Fir-Larch or Hem-Fir.

   b. Plywood shall be minimum ⅜ in. CD with exterior glue and bearing the APA trademark.

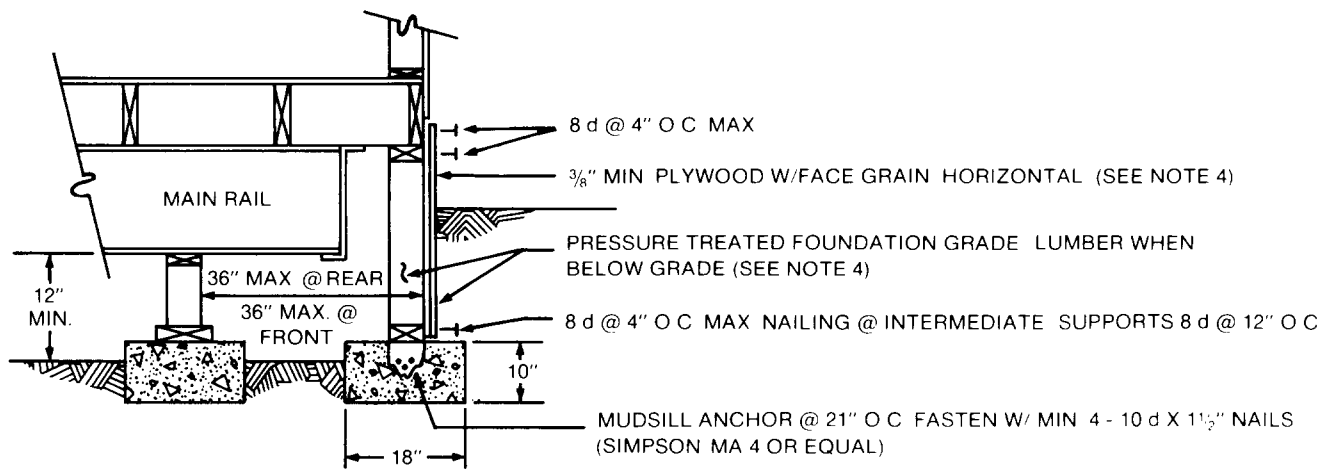
   c. Fasteners in preservative treated wood shall be stainless steel or hot-dipped zinc-coated steel.

5. Centerline piers to be located directly below ridge beam support posts. See floor plan for post locations shown by [2] → For applicable post numbers see floor plan.

6. When under floor clearances exceeds 36 ft., a special foundation stem wall design may be required.



SECTION "A-A" - TYPICAL SIDEWALL FOUNDATION



SECTION "B-B" - TYPICAL FRONT/REAR END WALL FOUNDATION

SIDEWALL ELEVATION

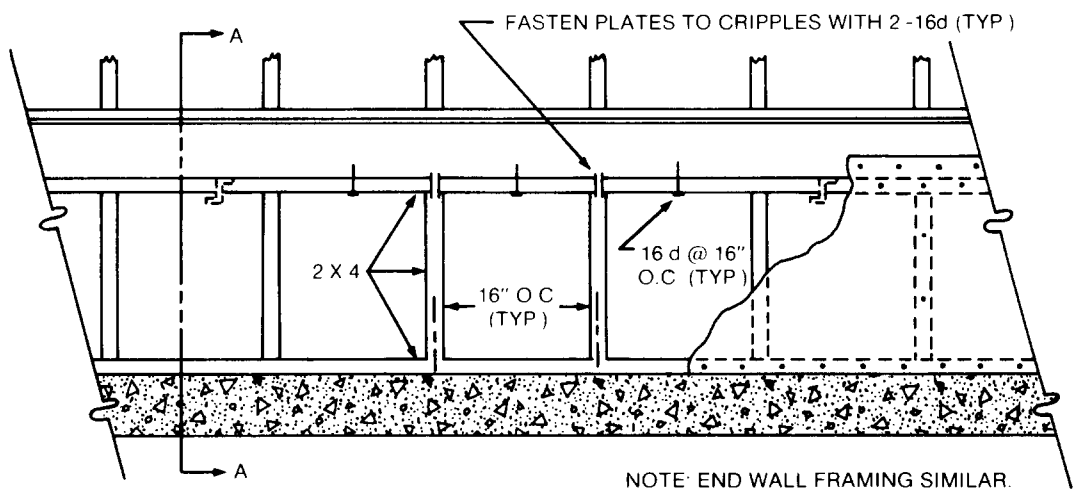
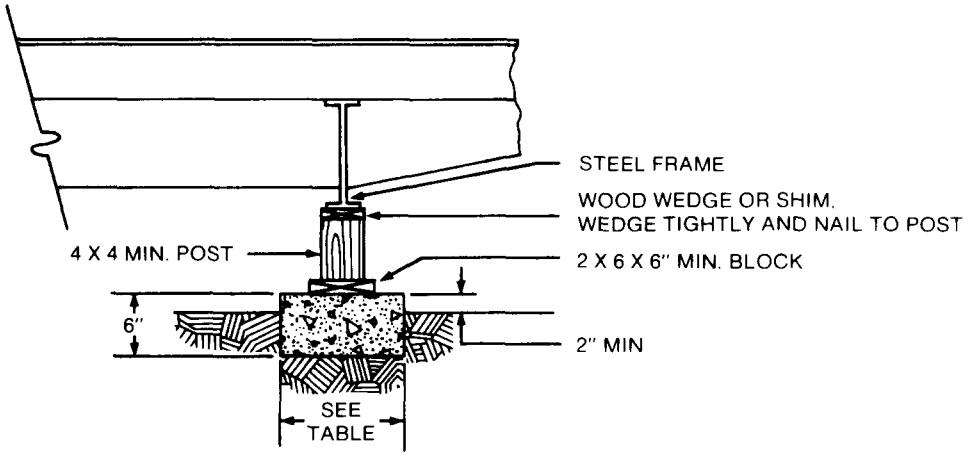
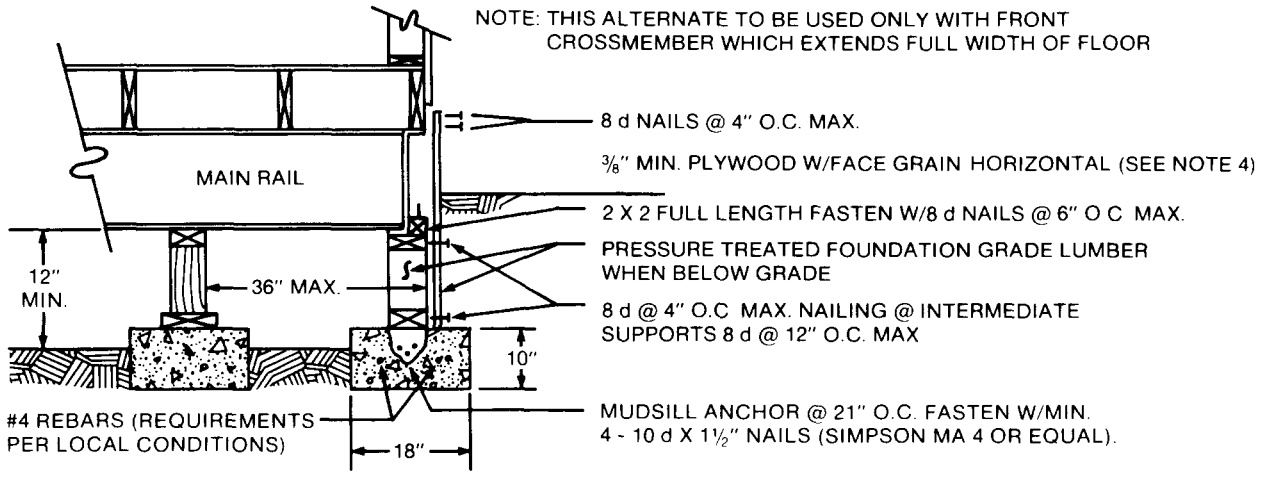


Figure C-6 All Weather Wood Foundation System



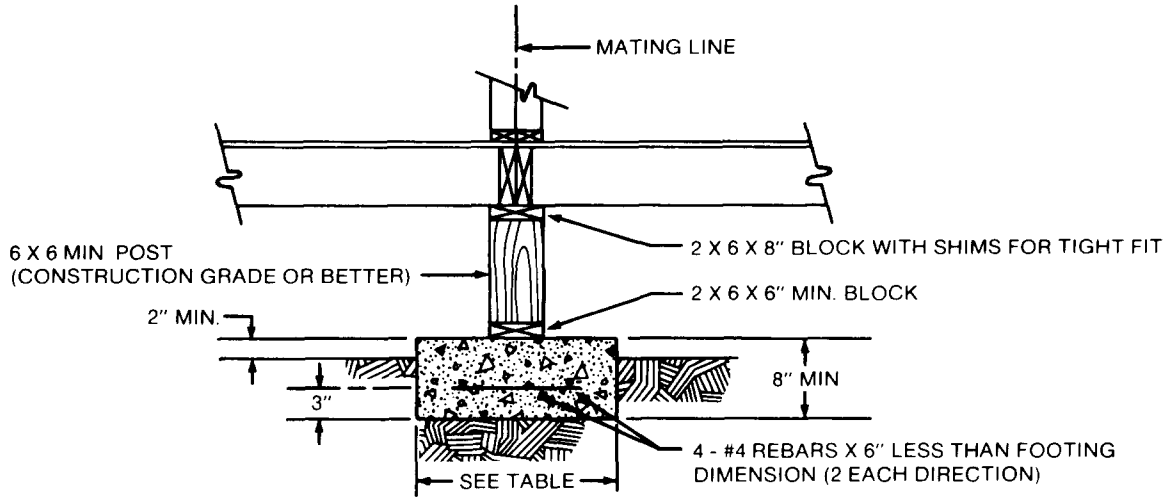
DETAIL "A" - TYPICAL INTERIOR PIER

FOOTING SIZE - INTERIOR PIER			
ON-CENTER PIER SPACING	ALLOWABLE SOIL BEARING PRESSURE		
	1000 PSF	1500 PSF	2000 PSF
6'	18" x 18"	14" x 14"	12" x 12"
8'	20" x 20"	16" x 16"	14" x 14"
10'	22" x 22"	18" x 18"	16" x 16"
12'	25" x 25"	20" x 20"	18" x 18"



ALTERNATE SECTION "B-B" - ALTERNATE FRONT END WALL FOUNDATION

Figure C-7 All Weather Wood Foundation System



FOOTING SIZE - RIDGE BEAM PIER							
COLUMN NO.*	ALLOWABLE SOIL BEARING PRESSURE			COLUMN NO.*	ALLOWABLE SOIL BEARING PRESSURE		
	1000 PSF	1500 PSF	2000 PSF		1000 PSF	1500 PSF	2000 PSF
1	24" x 30"	20" x 20"	20" x 20"	14	30" x 36"	24" x 30"	24" x 24"
2	24" x 30"	20" x 20"	20" x 20"	15	30" x 30"	24" x 24"	24" x 24"
3	24" x 30"	20" x 20"	20" x 20"	16	30" x 30"	24" x 24"	20" x 20"
4	36" x 36"	30" x 30"	24" x 24"	17	30" x 30"	24" x 24"	24" x 24"
5	30" x 36"	24" x 30"	24" x 24"	18	36" x 42"	30" x 36"	24' x 30"
6	30" x 36"	24" x 30"	24" x 24"	19	36" x 36"	30" x 30"	24" x 24"
7	36" x 36"	30" x 30"	24" x 24"	20	30" x 30"	24" x 24"	20" x 20"
8	36" x 40"	30" x 36"	24" x 30"	21	36" x 42"	30" x 30"	24" x 30"
9	36" x 36"	30" x 30"	24" x 30"	22	30" x 30"	24" x 24"	24" x 24"
10	30" x 36"	24" x 30"	24" x 24"	23	42" x 42"	36" x 36"	30" x 30"
11	30" x 30"	24" x 24"	24" x 24"	24	36" x 42"	30" x 36"	24" x 30"
12	36" x 36"	30" x 30"	24" x 30"	25	36" x 36"	30" x 30"	24" x 24"
13	36" x 42"	30" x 36"	24" x 30"				

*SEE NOTE 5

DETAIL "B" - TYPICAL RIDGE BEAM COLUMN PIER

Figure C-8 All Weather Wood Foundation System

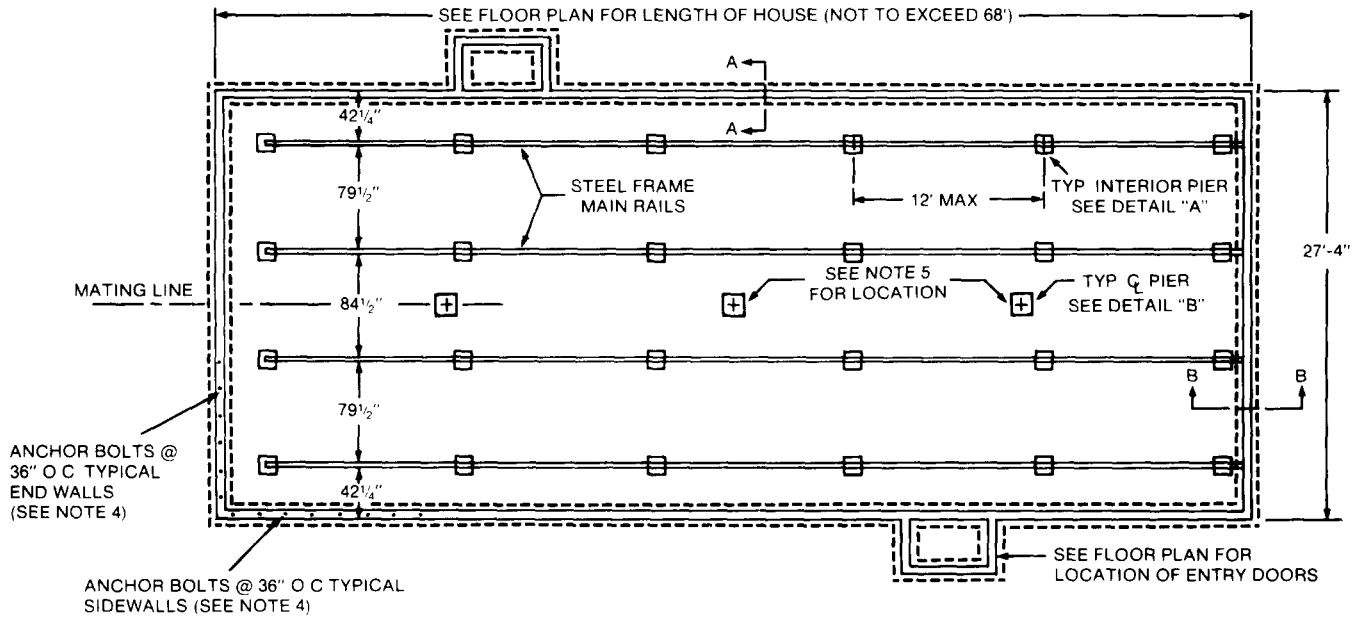


Figure C-9 Concrete or Concrete Block Foundation System

Notes:

1. Design Basis: *Uniform Building Code*, Chapter 29, 1979 Ed.
   20 PSF Max. wind force
   30 PSF roof live load
   Seismic Zone 3

2. Foundation footing size and depth to be based on soil conditions at the site.

3. Crawl space access and ventilation to be provided per code.

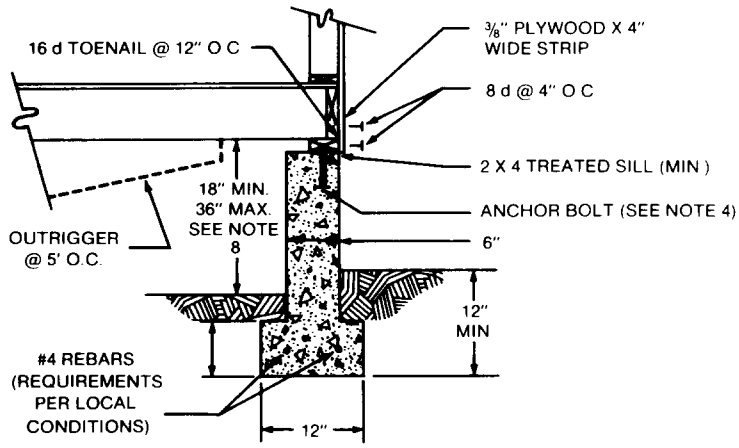
4. Anchor bolts to be installed within 12 in. of each end of sill and as shown on plan. Bolts to be ½ in. ϕ × 7 in. in concrete foundation. Bolts to be ½ in. ϕ × 15 in. in concrete block foundation.

5. Centerline piers to be located directly below ridge beam support posts. See floor plan for post locations shown by [2] →. For applicable post numbers see floor plan.

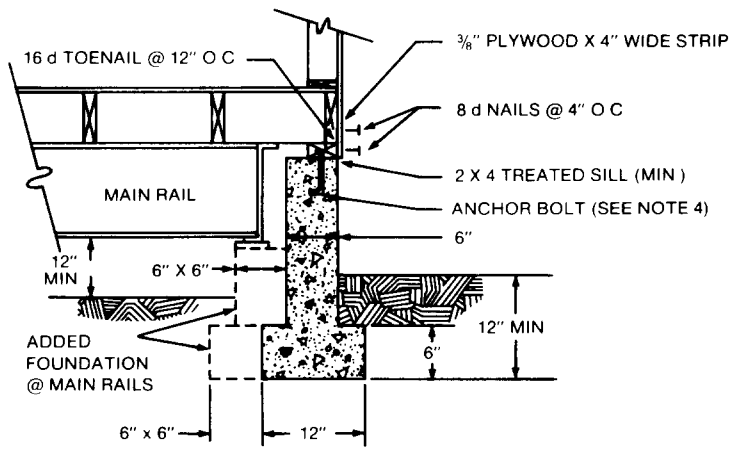
6. (ASTM C-90) with 2 - 14 fully grouted in cell with anchor bolt may be used in lieu of foundation stem wall.

7. Front and/or rear end wall stems may be built after house is placed on foundation.

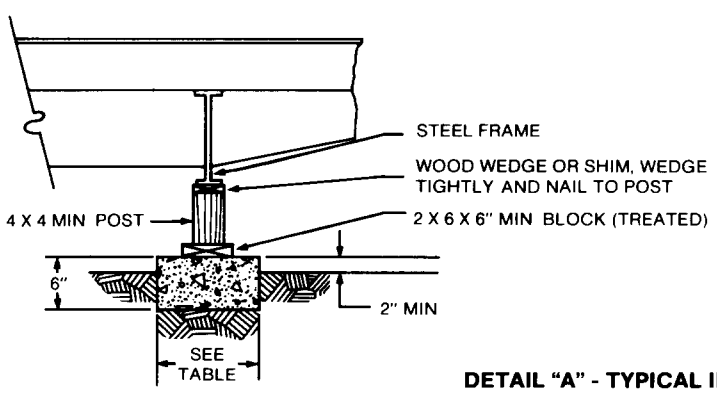
8. When under floor clearances exceeds 36 ft, a special foundation stem wall design is required.



SECTION "A-A" - TYPICAL SIDEWALL FOUNDATION



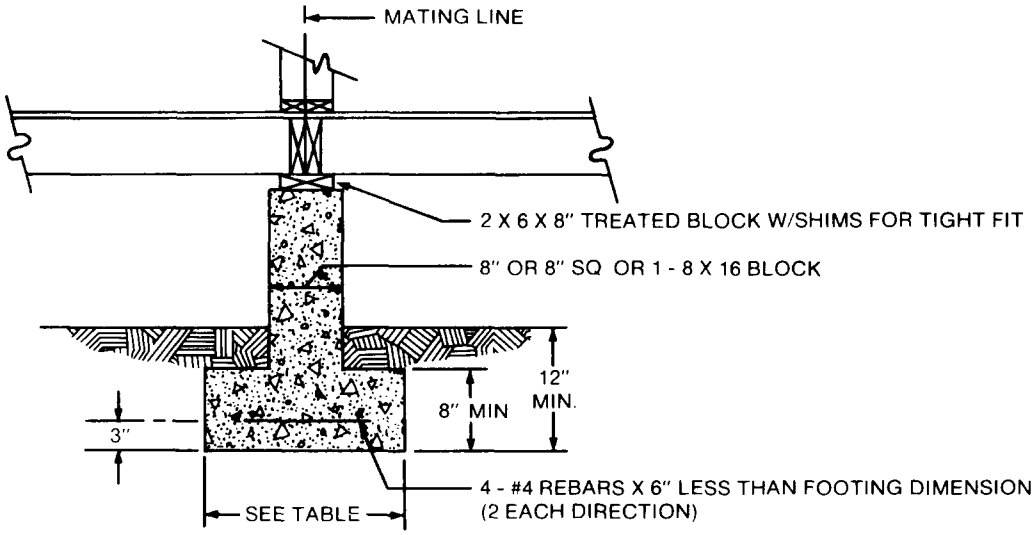
SECTION "B-B" - TYPICAL FRONT END WALL FOUNDATION



FOOTING SIZE - INTERIOR PIER			
ON-CENTER PIER SPACING	ALLOWABLE SOIL BEARING PRESSURE		
	1000 PSF	1500 PSF	2000 PSF
6'	18" x 18"	14" x 14"	12" x 12"
8'	20" x 20"	16" x 16"	14" x 14"
10'	22" x 22"	18" x 18"	16" x 16"
12'	25" x 25"	20" x 20"	18" x 18"

DETAIL "A" - TYPICAL INTERIOR PIER

Figure C-10 Concrete or Concrete Block Foundation System

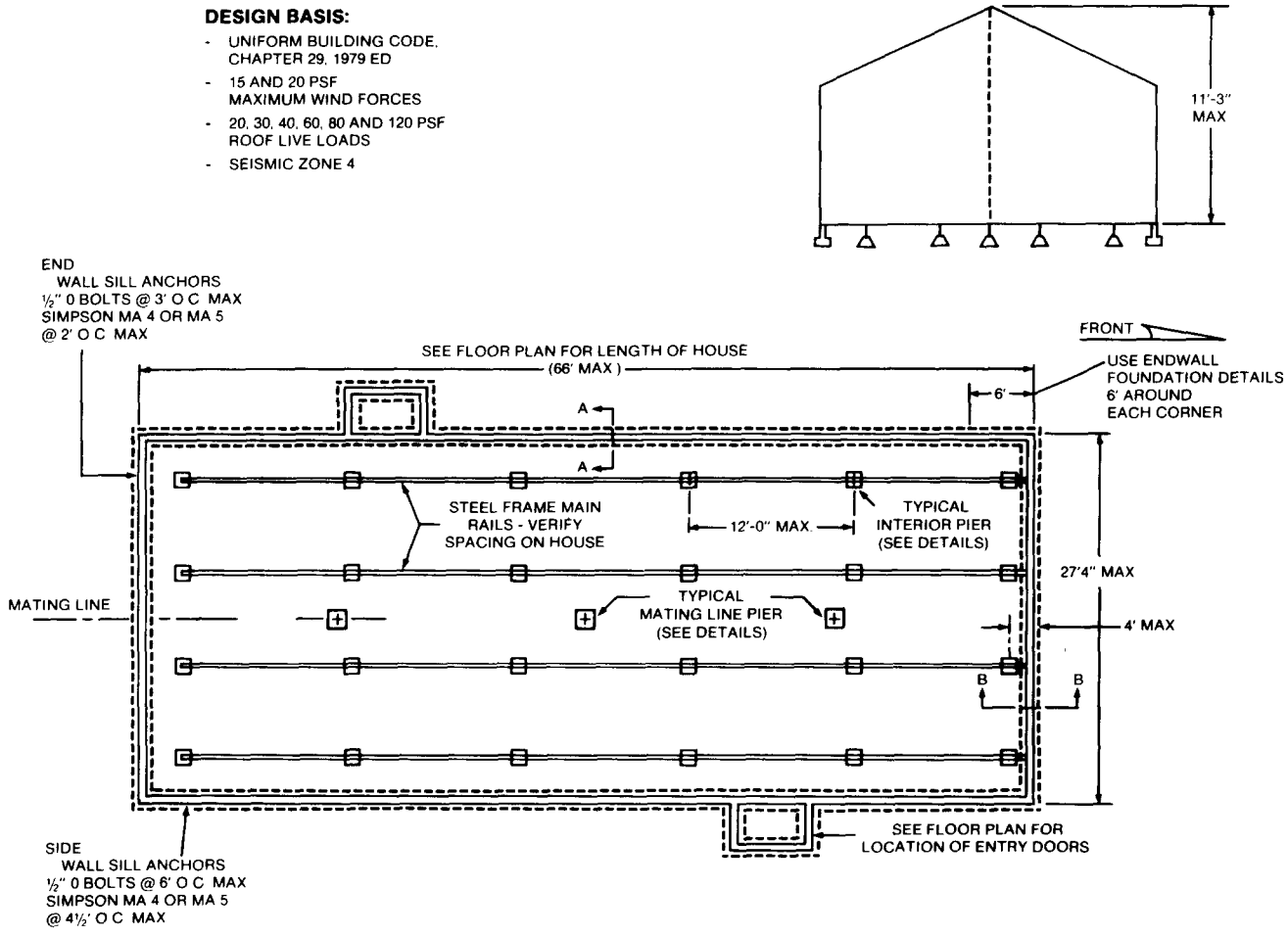


FOOTING SIZE - RIDGE BEAM PIER							
COLUMN NO.*	ALLOWABLE SOIL BEARING PRESSURE			COLUMN NO.*	ALLOWABLE SOIL BEARING PRESSURE		
	1000 PSF	1500 PSF	2000 PSF		1000 PSF	1500 PSF	2000 PSF
1	24" x 30"	20" x 20"	20" x 20"	14	30" x 36"	24" x 30"	24" x 24"
2	24" x 30"	20" x 20"	20" x 20"	15	30" x 30"	24" x 24"	24" x 24"
3	24" x 30"	20" x 20"	20" x 20"	16	30" x 30"	24" x 24"	20" x 20"
4	36" x 36"	30" x 30"	24" x 24"	17	30" x 30"	24" x 24"	24" x 24"
5	30" x 36"	24" x 30"	24" x 24"	18	36" x 42"	30" x 36"	24' x 30"
6	30" x 36"	24" x 30"	24" x 24"	19	36" x 36"	30" x 30"	24" x 24"
7	36" x 36"	30" x 30"	24" x 24"	20	30" x 30"	24" x 24"	20" x 20"
8	36" x 40"	30" x 36"	24" x 30"	21	36" x 42"	30" x 30"	24" x 30"
9	36" x 36"	30" x 30"	24" x 30"	22	30" x 30"	24" x 24"	24" x 24"
10	30" x 36"	24" x 30"	24" x 24"	23	42" x 42"	36" x 36"	30" x 30"
11	30" x 30"	24" x 24"	24" x 24"	24	36" x 42"	30" x 36"	24" x 30"
12	36" x 36"	30" x 30"	24" x 30"	25	36" x 36"	30" x 30"	24" x 24"
13	36" x 42"	30" x 36"	24" x 30"				

* See Note 5

DETAIL "B" - TYPICAL RIDGE BEAM COLUMN PIER

Figure C-11 Concrete or Concrete Block Foundation System



SECTION A-A, SEE "SIDEWALL FOUNDATION DETAILS"
SECTION B-B, SEE "END WALL FOUNDATION DETAILS"

Figure C-12

Example:

The foundation plan shown is general and is to be adjusted to meet the specific home being installed. The floor plan for the home is included in the technical installation manual provided with each home. The manual, floor plan and these details must be used together to establish dimensions and loads for the foundation. Where the word "max." is used with a dimension, any distance up to but not exceeding the dimension may be used. Several alternate construction methods are shown. Any combination of alternates may be used from within those for the design loads applicable to the construction site. Foundation system details used shall be compatible with local soil conditions.

These design drawings are supplemental to the technical installation manual. Details and dimensions of other types of foundations in the manual are not applicable to this design.

General Notes:

1. Contractor shall verify site conditions and all dimensions prior to starting work. Notify owner of any discrepancies.

2. All work shall conform to the requirements of the building code adopted by the agency having jurisdiction.

3. Provide an 8 in. × 24 in. (*see 3.11.2.1*) access crawl hole to under-floor area. Provide under-floor area ventilation of a net area of not less than 1½ sq ft for each 25 linear ft of exterior wall. Cover vent openings with corrosion-resistant wire mesh not less than ⅛ in. [*see 3-3.12(d)*] nor more than ½ in. in any dimension.

4. Mating line piers shall be located directly below ridge beam support columns. Support column locations are shown on the floor plan of the house by [N] . Column numbers are also shown on "Mating Line Pier Detail."

5. Mudsill anchors shall be installed within 12 in. of each end of sill and at spacing shown on foundation plan. Mudsill anchors may be ½ in. bolts or Simpson Strong Tie MA[4] or MAS.

— Anchor bolts shall be set 7 in. into concrete.

— Anchor bolts shall be set 15 in. into concrete block stem wall.

6. Wall stems may be built after house is set.

7. Wall stems may be concrete or concrete block.

8. Concrete shall be 200 psi at 28 days.

9. Concrete blocks shall conform to ASTM C-90, special inspection not required. Blocks shall be 8 in. × L ft × height desired for site conditions.

10. Mortar mix shall be Type S, Table 24-A of UBC or 1 part Portland Cement, ½ part hydrated lime and 4 parts sand by volume; do not use lime with plastic or waterproof cement.

11. Masonry grout shall be 1 part Portland Cement, 3 parts sand, 2 parts ⅜ in. gravel, by volume, mixed to pouring consistency.

12. In concrete block stem walls, place a minimum of 2 #4 reinforcing bars in block with mudsill anchors. Fully grout each cell containing rebar.

13. Reinforcing bars for concrete or concrete block foundation shall be deformed bars meeting ASTM A-615, Grade 40. Lap all bars 24 in. minimum.

14. All lumber in contact with concrete shall be pressure preservative treated or a specie approved for use directly in contact with concrete.

15. Design loads followed shall be consistent with the roof live load, wind load, and seismic zone as established for permanent buildings within a specific local area.

16. Each piece of lumber or plywood less than 6 in. above finish grade shall be preservative treated and shall have the following information permanently affixed:

a. Identity of company doing treatment and date of treatment (month and year).

b. Symbol for the type of preservative used.

c. The American Wood Preservers Bureau quality control trademark (Report No. AA-517).

d. The letters "TSO" specifying "treatment service only," where applicable.

e. Proper grade markings to identify the species and grade of wood for structural purposes by an approved grading agency.

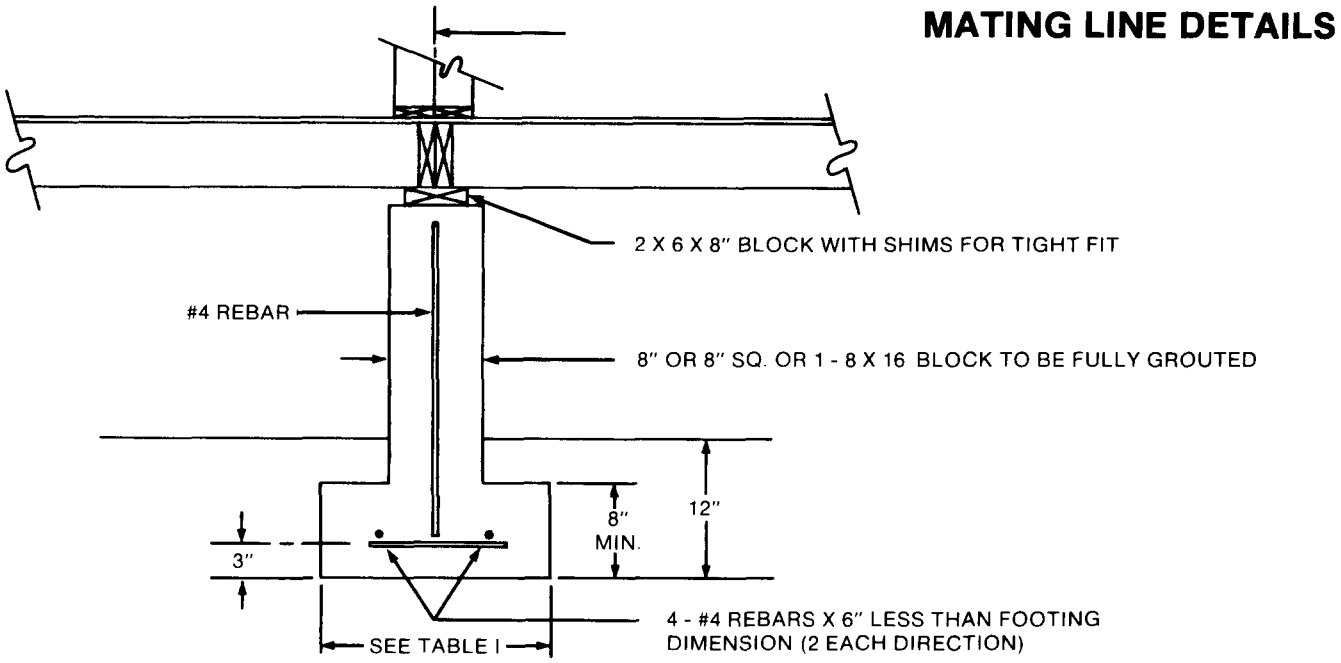
f. AWP-FON (identifies authorization under this report.)

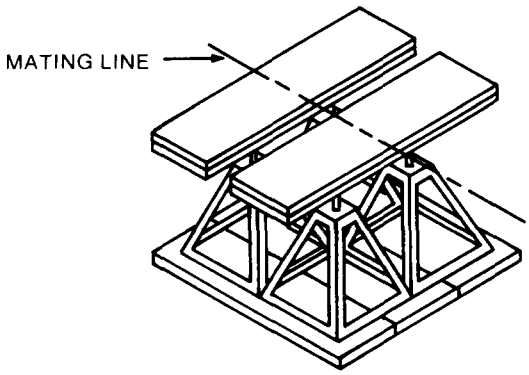
17. Where lumber is cut after treatment, the cut surface shall be brush-coated with not less than 3% solution of the same preservative used in the original treatment; or shall be field treated in conformance with AWPA standard M4-80 using a 5% solution of pentachlorophenol copper, naphthenate containing a min 2% copper metal, a 3% solution of ACA, CCA types A, B or C, or a 5% solution of FCAP or ACC: or creosote in conformance with AWPA standard M4-80 paragraph 1.511.

18. Refer to the Technical Installation Manual for ridge beam pier and main rail pier locations and loads. When spacing shown in the manual is less than shown here, the manual shall be followed.

19. Drainage Provisions. The installation site must be adequately graded so that water drains away from the foundation and does not accumulate under the home.

MATING LINE DETAILS





MANUFACTURED PIERS SHALL BE LISTED AND LABELED BY AN APPROVED AGENCY.

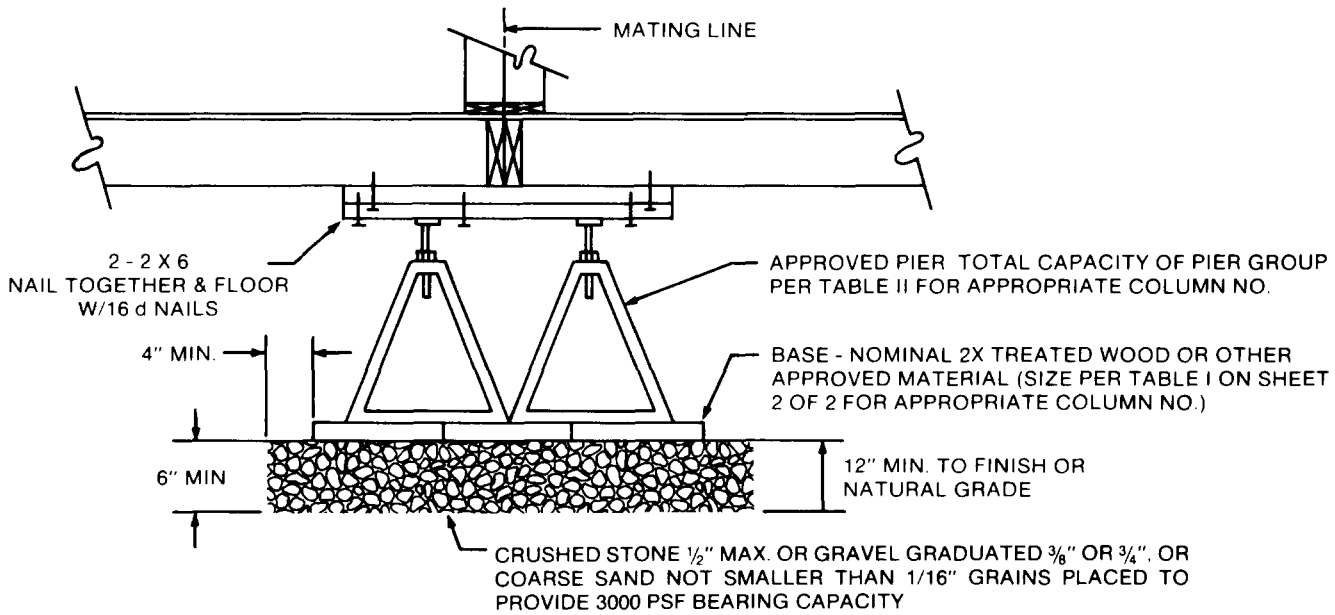


Figure C-13