

CHAPTER 1 - GENERAL INFORMATION

100. APPLICATION

100-1. GENERAL. Manufactured homes, as addressed by this handbook, are manufactured in accordance with 24 CFR Chapter XX, Part 3280, *Manufactured Home Construction and Safety Standards* (MHCSS), and are sited on a permanent foundation in accordance with *Handbook 4145.1, REV-2, Change 1, Feb. 14, 1992*, Architectural Processing and Inspections for Home Mortgage Insurance, paragraph 3-4.

A. Description of Manufactured Unit. Designs and approval for foundations in this manual are based on the following assumptions about the manufactured home:

1. Transportable in one or more sections.
2. Between 11'-4" and 16'-0" in width in transport mode.
3. Minimum 400 sf. in area for a single section unit.
4. Exterior wall height of 7'-6" or 8'-0" from top of wall to foundation.
5. Built on permanent chassis with minimum distance between main chassis beams of:

Mfg. Home Width	Beam Spacing
12' nom.	6'-3"
14' nom.	6'-10"
16' nom.	8'-0"

Note: Smaller beam spacing will require design by a professional engineer.

6. Chassis beams 10" deep for 12' and 14' nominal unit widths, and 12" deep for 16' nominal unit width.
7. Roof slope varies from a minimum 1/2:12 to a maximum 4.4:12 (20°).
8. Set on permanent foundation of piers, or of continuous, cast-in-place concrete, concrete-block masonry, all-weather wood, or other approved systems.
9. Double width units are assumed connected to behave structurally as a single box.

B. Chassis Removal. The chassis of a manufactured home, under the *Federal Manufactured Housing and Construction safety Standards*, is not permitted to be removed. Accordingly, foundations in this manual are designed for manufactured homes that **DO NOT HAVE THEIR CHASSIS REMOVED.**

C. Definition of Permanent Foundation. Permanent foundations must be constructed of durable materials; i.e. concrete, mortared masonry, or treated wood - and be site-built. It shall have attachment points to anchor and stabilize the manufactured home to transfer all loads, herein defined, to the underlying soil or rock. The permanent foundations shall be structurally developed in accordance with this document or be structurally designed by a licensed professional engineer for the following:

1. Vertical stability:

- a. Rated anchorage capacity to prevent uplift and overturning due to wind or seismic forces, whichever controls. Screw-in soil anchors are not considered a permanent anchorage.
 - b. Footing size to prevent overloading the soil-bearing capacity and avoids soil settlement. Footing shall be reinforced concrete to be considered permanent.
 - c. Base of footing below maximum frost-penetration depth.
 - d. Encloses a basement of crawl space with a continuous wall (whether bearing or non-bearing) that separates the basement of crawl space from the backfill, and keeps out vermin and water.
2. Lateral stability. Rated anchorage capacity to prevent sliding due to wind or seismic forces, whichever controls, in the transverse and longitudinal directions.

100-2. DEFINITIONS. These are terms used throughout the Handbook and the Design Worksheet. Additional terms are used in Appendix D, where the derivation of equations is shown. These terms are defined in Appendix D, and illustrated in Figure 6-2.

Anchorage: Connection between superstructure and foundation, by means of welds, bolts, and various light gage metal plates. Anchorage does not refer to any type of soil anchor.

Chassis: The structural system running beneath the manufactured home. Example: Pair of steel beams.

Exterior Foundation Wall: Foundation walls placed directly below the exterior perimeter walls of the unit. These walls may, or may not, be structurally used as bearing walls under gravity loads, and/or used as shear walls under horizontal loads. If these walls are not used structurally they are called non-bearing walls or skirt walls.

Exterior Piers: Piers inside the exterior walls, needed to support the chassis beams nearest the longitudinal foundation walls.

Foundation Types:

Type C: Foundation system supported and anchored at chassis only, to equally spaced piers.

Type E: Foundation system supported at chassis and exterior wall but anchored for uplift and overturning at exterior wall only.

Type I: Foundation system supported at chassis and exterior wall but anchored for uplift and overturning at exterior piers only.

Interior Piers: Piers nearest the marriage wall and supporting the chassis in multi-section units.

Longitudinal Foundation Walls: Two walls beneath the long dimension of the unit (in its transport mode) which are structurally used as foundation shear walls that resist applied wind or seismic forces from the superstructure's shear walls in the longitudinal direction.

Longitudinal Direction: Direction of horizontal wind or seismic forces applied parallel to long dimension of unit. See Figure 1-1.

Marriage Wall: The wall where two single-section units are structurally joined to form a multi-section unit. The marriage wall may contain openings that permit interior spaces to expand to two units wide.

Marriage Wall Piers: Piers placed beneath a continuous marriage wall in multi-section homes are assumed to be equally spaced. Piers are also placed at the ends of openings, beneath the posts that transfer concentrated loads from the roof.

Superstructure Shear walls: Vertical elements (usually walls) of the superstructure's lateral load resistance system. These vertical elements structurally transfer horizontal wind or seismic forces, applied to the roof and floor planes of the unit, to the foundation system.

Transverse Foundation Walls: Walls across the short dimension of the unit which are structurally designed to function as foundation shear walls that resist horizontal applied wind or seismic forces from the superstructure's shear walls in the transverse direction.

Transverse Direction: Direction of horizontal wind or seismic forces applied perpendicular to long dimension of unit. See Figure 1-1.

Aa: The seismic coefficient representing the effective peak acceleration as determined by the seismic map 1.

Av: The seismic coefficient representing the effective peak velocity-related acceleration as determined by the seismic map 2.

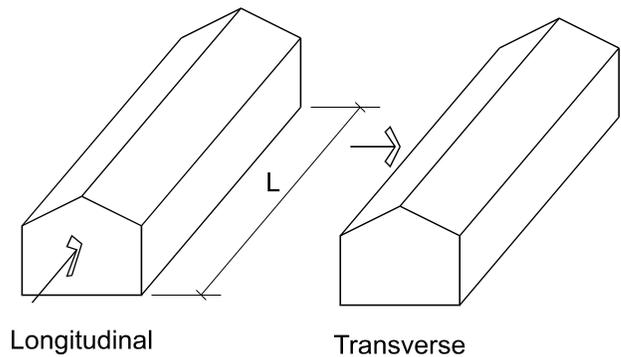


Figure 1 - 1

Av: Vertical anchorage force requirement for the unit; (Pier load in lbs. or wall load in lbs./LF). Example; Anchorage force to prevent uplift and overturning in the transverse direction of applied wind or seismic forces.

Ah: Horizontal anchorage force requirement (lbs./ft.). Example; Anchorage force to keep unit from sliding in the transverse and longitudinal directions of applied wind or seismic forces.

Aftg: Foundation footing size for the isolated unit pier spread footing area (sq. ft.) & continuous wall footing width (ft.).

hn: The height of the manufactured unit exterior wall.

hp: The depth at which a pier footing must be placed to prevent it from pulling out of the soil (ft.).

hw: The depth at which a continuous foundation wall must be placed to prevent it from pulling out of the soil (ft.).

L: Length of manufactured home (ft.).

W: Actual self (dead load) weight of the unit (lbs.).

w: The distributed weight of the unit (lbs./ft). $W/L = w$; therefore weight per foot of length.

Wt: Actual measured width of the unit (ft.) between superstructure walls, excluding roof projections. A single-section unit has one width measurement (Wt). A double-section unit is composed of 2 single-section widths (2Wt).

100-3. LICENSED PROFESSIONALS.

Those using this handbook are referred to using licensed professionals when design considerations require additional information or when a particular site, foundation system, or superstructure (manufactured home) falls outside the design assumptions and parameters of the handbook. As used herein, the term Geotechnical Engineer is a professional engineer registered under the appropriate laws of the State to practice in the field of Geotechnical Engineering. The term Structural Engineer is a professional or structural engineer registered under the appropriate laws of the State to practice in the field of Structural Engineering. And the term Architect is a professional architect registered under the appropriate laws of the State to practice Architecture.

101. LOCAL CODES AND STANDARDS

101-1. NEW CONSTRUCTION. This handbook has been developed for use at all new permanent manufactured home sites, communities, and set-ups.

101-2. EXISTING CONSTRUCTION. The practices recommended in the Handbook are not intended to be applied retroactively to existing sites unless the authority in the jurisdiction considers such application essential for safety and health of occupants. Upgrade of

existing anchorages and footings shall meet the intent of the definition of permanent foundation stated herein.

101-3. RESPONSIBILITY. This handbook does not relieve the installer of responsibility for compliance with local ordinances, codes, and regulations established by authorities having jurisdiction.

101-4. OTHER FOUNDATION DESIGNS.

Manufacturers of home designs not covered by this handbook or recommending a foundation system not included in this handbook shall submit drawings and structural calculations prepared and sealed by a licensed professional to the owner.

102. REFERENCED STANDARDS

102-1. CODES GOVERNING SUBSURFACE INVESTIGATION

A. HUD *Minimum Property Standards for Housing 1994 Ed. Handbook 4910.1*; Final Rule-24 CFR Part 200.926 contain provisions that apply to permanent foundation installations recommended in this handbook.

B. Engineering Report. If adverse site conditions are discovered, specific recommendations by a Geotechnical Engineer shall be included with the Design Worksheet (Appendix F).

102-2. CODES GOVERNING BUILDINGS AND SITES

A. Seismic, Wind and Snow Loads for each type of structure were computed based on ASCE 7-93: *Minimum Design Loads for Buildings and Other Structures*. Minimum wind and minimum roof live load were based on MPS

HUD Document 4910.1, Appendix K, art. 200.926e (a) & (c).

B. Grading, Drainage and Fill. The HUD *Land-Planning Data Sheets (79g)*, Handbooks 4140.3 and 4145.1, should be used for grading, drainage and fill specifications.

C. Manufactured Homes on Elevated Foundations should follow standards in *Manufactured Home Installation in Flood Hazard Areas, FEMA 85/September 1985*.

D. Additions to CABO *One and Two Family Dwelling Code, 1992 Ed. (including 1993 Amendments)* that apply to construction in this manual are found in CABO, Appendix C -- Section C-101, C-102, C-201, C-301, C-302, C-303, C-304, C-305, C-306, C-307, C-401, C-501, C-502, C-503, C-504, C-505, C-506, C-507, C-600, C-601, C-602, C-603, C-604, C-605.

E. Rural Housing Service (RHS) Formerly Rural Housing and Community Development Service, formerly Farmers Home Administration (FmHA). Provisions for the approval of direct loans for manufactured homes on permanent foundations are contained in Subpart A of Part 1944: Section 502 Rural Housing Loan Policies and Authorizations and for guaranteed loans in Subpart D of Part 1980: Rural Housing Loans. The provisions for acceptable site development, installation and set-up are contained in Subpart A of Part 1924 Exhibit J: Manufactured Home Sites, Rental Pro-

jects and Subdivisions. These Agency instructions are available in any RHS field office.

F. Superstructure HUD Code - *Federal Manufactured Home Construction and Safety Standards Oct. 25, 1994*. The structural design of the superstructure of the manufactured home has been assumed to be in conformance with HUD Code Section 3280.305 and .306 (a)(2) which anticipates the manufactured unit to make provision for the support and anchoring system forces required by this document.

103. GENERAL PROCEDURE

103-1. SUBMISSIONS. Three worksheets must be filled out before evaluation of the foundation system can begin, the "Owner's Site Acceptability Worksheet and Manufacturer's Worksheet" in Appendix E, and the "Design Worksheet" in Appendix F. Refer to Table i - 1 in the Introductory Comments, which indicates requirements and submissions.

103-2. BEGINNING THE APPROVAL PROCESS. If the worksheets in Appendices E and F have been filled out, the approval process can begin. See Chapter 2, "Site Acceptability Criteria" and the Design Worksheet, Appendix F. Persons using the handbook should fill out the Design Worksheets while progressing through the chapters in the Handbook. Questions on the Design Worksheet are tied to sections of the Handbook and the section numbers are noted on the Worksheet.