



AMERICAN FOREST & PAPER ASSOCIATION
American Wood Council
Engineered and Traditional Wood Products

Design Requirements for
the Permanent Wood Foundation System

Prepared for the State of Minnesota
by the
American Forest & Paper Association

Introduction

The Permanent Wood Foundation (PWF) system uses pressure preservative-treated dimension lumber and plywood, constructed similarly to wood frame walls, as a building foundation. Foundation walls transfer the weight of the structure, via concrete, gravel or crushed stone footings, to suitable bearing conditions. In addition to transferring vertical loads, the walls of the foundation also resist horizontal forces resulting from backfill. Therefore, the structural elements of a foundation wall are under compression and bending loads, simultaneously. Dimension lumber (e.g. 2x6, 2x8), when sheathed with plywood, provides an ideal structural system for resisting these forces. When properly designed for the appropriate loads and detailed to prohibit water intrusion, the PWF provides a structurally sound foundation system.

PWF Acceptance

The PWF system is recognized by all U.S. model building codes and the U.S. Department of Housing and Urban Development. The American Forest & Paper Association (AF&PA) is the publisher of *Technical Report #7, Basic Requirements for the Permanent Wood Foundation System - 1987 (TR7) with 1992 revisions*, the building-code-recognized reference for the design and construction requirements of the PWF. This document provides detailed information on design load criteria, treated lumber and plywood requirements, fastener durability, waterproofing materials, and footing design. The publication does not provide prescriptive solutions for the appropriate size, grade, or species of lumber or plywood. The loads induced on foundation walls are unique and may result in a required analysis of the resisting system. With one exception presented later in this paper, it is the position of AF&PA that foundations must be designed for each unique building configuration and soil condition.

The State of Minnesota's building code has adopted the *1997 Uniform Building Code (UBC)*. Chapter 18, Division II of the 1997 UBC is based on TR7. Therefore, any jurisdiction enacting the Minnesota State Building Code must follow the provisions of this section in the design, construction, and fabrication of wood foundations. Further, any jurisdiction enacting the Minnesota State Building Code has the option of referencing Appendix Chapter 3, Division III, of the UBC. This appendix

chapter is further amended by the Minnesota State Building Code to reference the *1992 CABO One and Two-Family Dwelling Code* (OTFDC). The OTFDC requires that “for most soils,” wood foundation walls “shall be designed assuming a lateral soil pressure of 30 pounds per cubic foot equivalent fluid weight.” Since lateral soil pressures vary depending on the type of soil, higher design pressures are often warranted. It is the recommendation of AF&PA that PWF system design be in accordance with the most current edition of the *National Design Specification® for Wood Construction* (NDS®) and Supplement and TR7. AF&PA defers to Minnesota laws governing “design” for the purpose of enforcement of this requirement.

Notching and Boring

AF&PA believes it is not the intent of the code to permit the notching or boring of wood foundation studs as permitted by sections 2320.11.9 and 2320.11.10 of the 1997 UBC for wall studs. The forces acting on a foundation wall stud may resist sizeable permanent forces, which are uncommon in above grade, exterior wall studs. Conversely, however, there is nothing in the code to prohibit notches and holes when designed in accordance with good engineering practice. As notches and holes remove fiber that is otherwise considered to be present when an analysis is performed, as long as a designer considers the loss of cross-section in an analysis, there is no reason to prohibit notches or holes.

Other Sources of Information

The *International Residential Code* (IRC) published by the International Code Council, provides a simple, prescriptive solution for the PWF. It is the position of AF&PA that foundations may comply with this prescriptive solution in lieu of design. Wood foundations must strictly comply with the prescriptive requirements in addition to the provisions of TR7. Under the IRC backfill is limited to 4' in height. Further, there must be equal height of fill around all sides of the foundation, and the distance between points of lateral support (the point at which an interior wall is perpendicular to and abuts the exterior foundation wall) cannot exceed the width of the building (cannot exceed the smaller of either the building length or width). Minimum dimensions and strength characteristics are specified in the IRC for wall studs, along with minimum thicknesses for plywood sheathing. When these limitations cannot be met, the prescriptive provisions of the code do not apply. Therefore, any structure or portion thereof outside the prescriptive requirements must be competently designed. The requirement for design of the PWF is no different than it is for other structural elements which are not prescribed.

The Permanent Wood Foundation System, Design, Fabrication, and Installation Manual (DFI) is no longer published by the American Forest & Paper Association. Last published in 1987, the prescriptive design solutions are no longer in compliance with the model building codes or the *National Design Specification® for Wood Construction* (NDS®). Although the DFI has never been referenced in the model building codes, it has been popular as a guidance document for foundation designers, and the design details contained therein are still used by them.

However, a *Permanent Wood Foundation Design and Construction Guide*, is now published by the Southern Forest Products Association on behalf of the Southern Pine Council. It provides the most current design and construction information prepared by the industry. The Guide is not referenced in the building codes, nor was it developed for that purpose. Rather, the Guide is intended to provide a homeowner, builder, designer, or building official with best practices reference material. It should not be considered an alternative to the requirement for structural engineering, unless recognized for that purpose by the State.