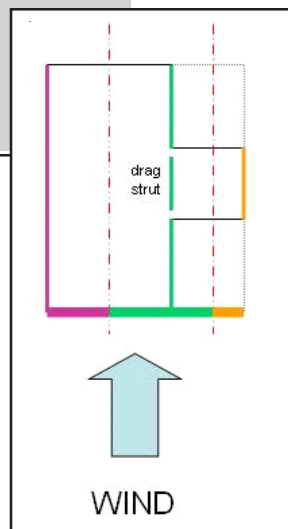
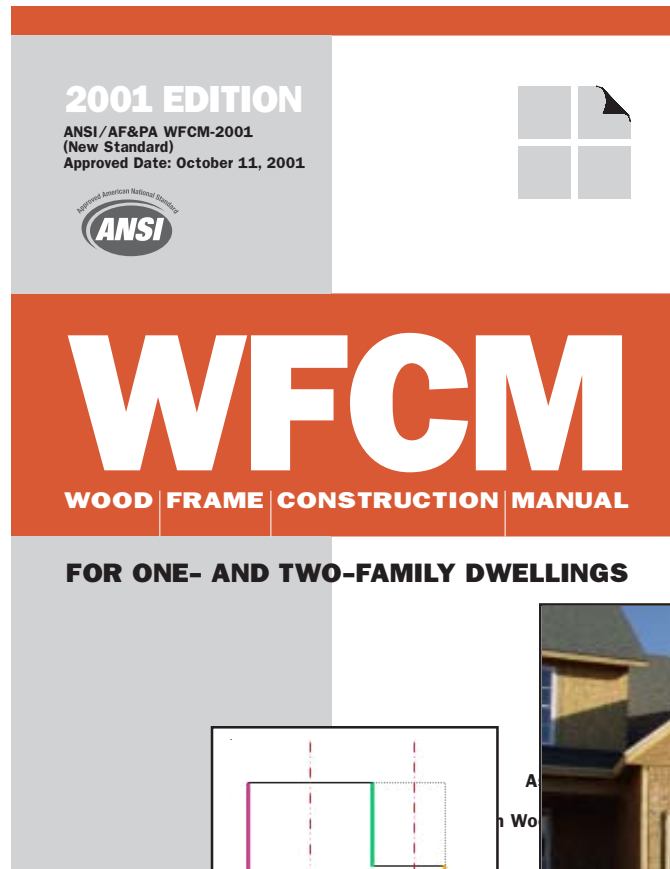
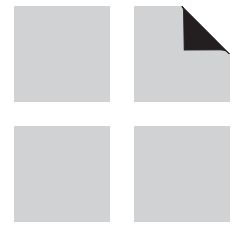


# INSCRIBED VERSUS SEPARATE STRUCTURES IN THE WFCM



## DESIGN AID No. 5

American  
Forest &  
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# DESIGN AID FOR INSCRIBED VERSUS SEPARATE STRUCTURES IN THE WFCM

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American Wood Council  
1111 19<sup>th</sup> St., NW, Suite 800  
Washington, DC 20036  
202-463-4713

[awcinfo@afandpa.org](mailto:awcinfo@afandpa.org)

[www.awc.org](http://www.awc.org)

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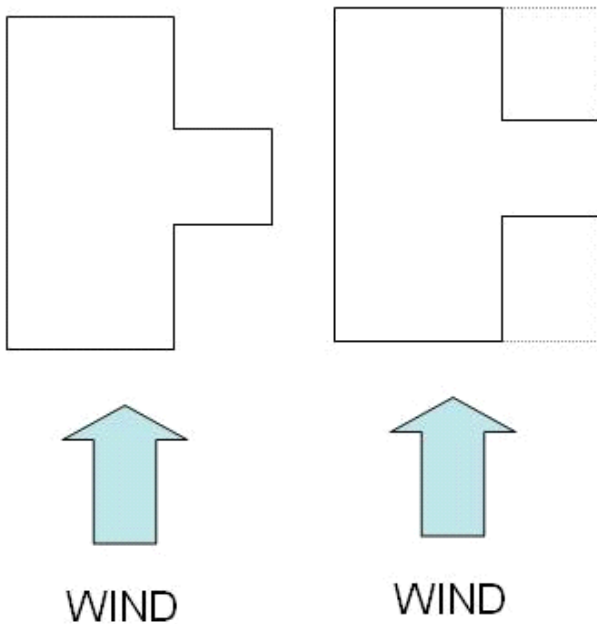
# Introduction

This Design Aid was developed as supplemental information for the *Wood Frame Construction Manual (WFCM) for One- and Two-Family Dwellings* to facilitate the design of inscribed versus separate structures. This information is based on provisions of the *WFCM* which is integral to the use and understanding of this Design Aid.

## 1. What is meant by inscribed structure in the WFCM?

The inscribed structure method, applicable for wind loads, is a means of facilitating the calculation of shear wall sheathing lengths where building geometry is non-rectangular - by inscribing the overall building into one rectangle. An illustration of this is provided in Figure 1.

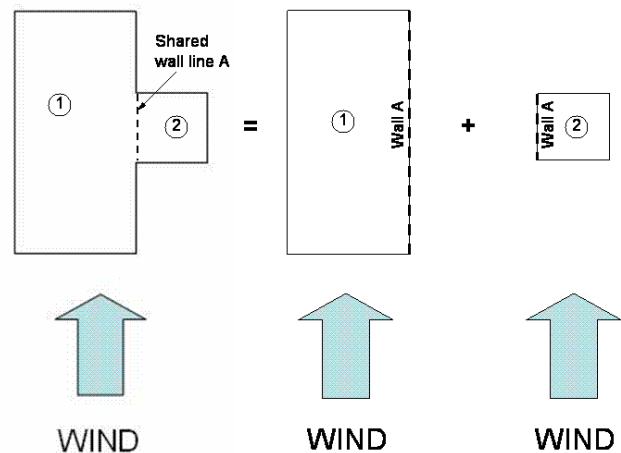
**Figure 1. Inscribed structure.**



## 2. What is meant by separate structures?

Where wall offsets exceed 4 feet within a single story, rectangular portions of the structure are to be considered as separate structures in accordance with *WFCM* Section 3.1.3.3c. Sidewall and endwall shear wall sheathing lengths are determined based on the geometry of each “separate” structure comprising the overall building as shown in Figure 2. Where wall lines are shared, such as Wall Line A, the shear wall sheathing amount for the wall line is taken as the sum of shear wall sheathing lengths for each “separate” structure at that location.

**Figure 2. Separate structures.**



### 3. Can bracing lengths be determined in accordance with the inscribed method where wall offsets are greater than 4 feet within a single story?

As noted in *WFCM* Section 3.1.3.3c, determination of shear wall sheathing length based on the overall “inscribed” building dimension is permitted for wind. Shear wall sheathing lengths can be determined using the inscribed area as shown in Figure 3 (in dotted lines).

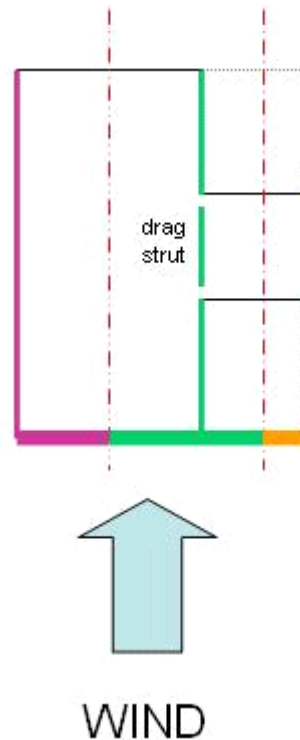
Distribution of required shear wall sheathing lengths, as shown in Figure 3, based on tributary area for each wall line provides a balanced shear wall lay-out. For example, the thicker purple line (left) shows the tributary wall area to be used (in plan) for designing the shear wall shown in purple. Similarly the same holds true for the tributary areas and shear walls shown in green (center) and orange (right).

Note that shear wall sheathing lengths are based on main wind force resisting system (MWFRS) loads. Localized components and cladding (C&C) loads on roof surfaces, rafters, dormers, etc. are handled in other tables of the *WFCM*.

### 4. What if wall offsets are less than 4 feet?

Both the “inscribed method” and “separate structures” method are permitted where walls are offset by less than 4 feet within a single story. For such small offsets, distribution of shear wall sheathing lengths based on tributary area is not required where the inscribed method is used. In the *WFCM*, it is assumed that diaphragms in accordance with *WFCM* provisions are capable of maintaining load path to supporting elements below where offsets are small.

**Figure 3. Distribution of required shear wall lengths.**



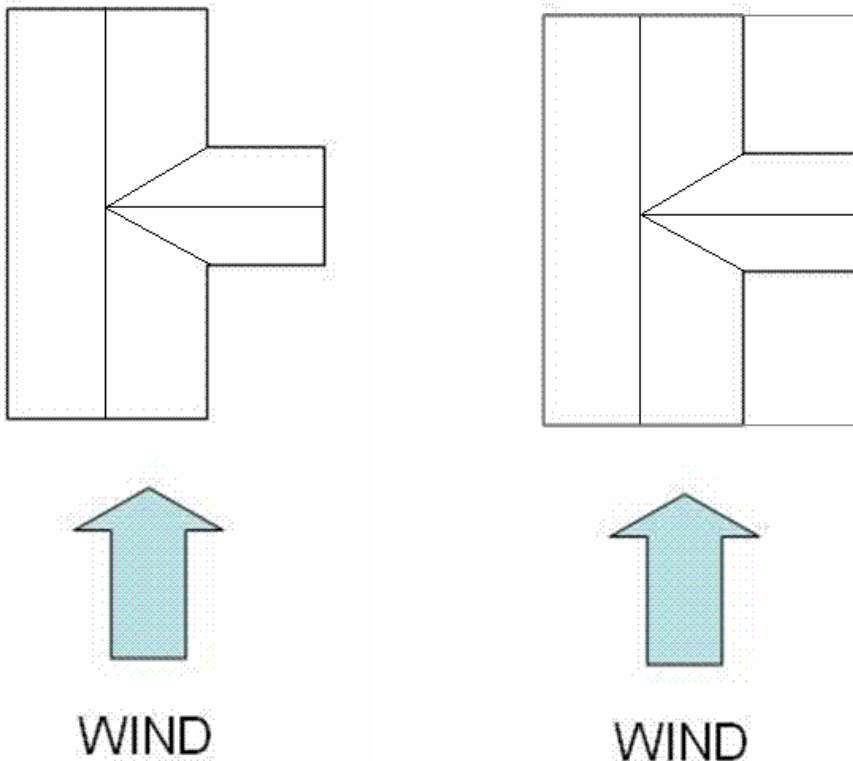
**5. Can the inscribed structure method be used to determine required shear wall sheathing lengths where wall offsets are greater than 4 feet and ridge lines are not parallel?**

The inscribed structure method can be used (Figure 4) but required shear wall sheathing lengths should be conservatively determined assuming wind is perpendicular to the ridge (see *WFCM* Table 3.17A).

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**Figure 4. Inscribed structure method with non-parallel ridge lines.**

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**American Forest & Paper Association  
American Wood Council  
1111 19th Street, NW  
Suite 800  
Washington, DC 20036  
Phone: 202-463-4713  
Fax: 202-463-2791  
awcinfo@afandpa.org  
www.awc.org**

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