

**Oregon**  
**Interpretive Ruling No. 93-93**  
**APPLICATION OF CONCENTRATED FLOOR LOAD**

**Initiated By:** MARVIN R. SHETLER, PRESIDENT OF BLAZER INDUSTRIES  
DANA ROBERTS, MANAGER OF BUILDING CODES DIVISION  
SALEM OPERATIONS

**QUESTION**

An interpretive ruling on the proper method of applying the concentrated floor load specified in Section 2304(a) of the Oregon Structural Specialty Code.

1. In designing the floor system with joists 16 inches on center, the manufacturer assumed one third of the concentrated load can be carried by the floor system beyond 2<sup>1/2</sup> foot square indicated in the code. Is this a valid engineering design that meets the requirements of the code?
2. Does paragraph two of Section 2304(a) also require more than one concentrated load be placed on an otherwise unloaded floor at the same time?

**APPLICABLE CODE SECTIONS**

Section 2304(c) says in part:

(c) **Concentrated Loads.** Provision shall be made in designing floor loads for a concentrated load as set forth in Table No. 23-A placed upon any space 2 ½ feet square. wherever this load upon an otherwise unloaded floor would produce stresses greater than those caused by the uniform load required therefor.

**BACKGROUND**

The interpretation of the above code section has been called into dispute by the manufacturers of prefabricated structures. The Division has requested and received a code interpretation from the International Conference of Building Officials (ICBO) which is consistent with staff's interpretation. The manufacturers continue to remonstrate against both interpretations.

**FINDINGS**

This interpretation is authorized by ORS 455.060, Rulings on Acceptability of Materials, Design or Methods of Construction, and the Attorney General's Opinion OP-5208 issued by October 1, 1981, which advised the statute permits authoritative interpretations of existing code requirements. ICBO, writers of the code, have provided an interpretation which is supported by Building Codes Division staff. This interpretation is consistent with the intent of the code section and the current standard of fundamental engineering design.

**DISCUSSION**

In designing the floor system with joists 16 inches on center, the manufacturer assumed one third of the concentrated load can be carried by the floor system beyond 2<sup>1/2</sup> foot square indicated in the code.

ICBO notes that the code intends the concentrated load be located to create the maximum stress on the joist system. The base of the concentrated load is considered to be rigid but the floor system may deflect. Therefore, the joists which carry the concentrated load will share the load. The worst case for joists 16 inches on center would be to center the 2<sup>1/2</sup> foot square between two joists, rather than having one edge of the square start at anyone joist. The sharing of load by joists, outside the 2<sup>1/2</sup> foot square is dependent upon the stiffness and strength of the flooring and subflooring, their attachment to the joist. and the location of joints in the flooring and subflooring. The stiffer the flooring and subfloor, the more the load will be shared by adjacent joists. This sharing of load by adjacent joists must not be assumed but must be determined by structural analysis taking into account the elastic properties of the joists and the flooring and subflooring.

For this analysis, the joints in the flooring and subflooring must be assumed to be in the most disadvantageous position. This load has to be moved around to obtain the maximum moment (at the center of the joist span) and the maximum shear. [One edge of the distributed load is kept the depth of the joist,  $d$ , away from the bearing point. See Section 2506(c)].

Does paragraph two of this code section also require that more than one concentrated load be placed on an otherwise unloaded floor at the same time? The answer provided by ICBO is the code does not require multiple concentrated loads on the floor at the same time. However, all portions of the entire floor system must be able to handle this single concentrated load as it can be placed anywhere on the floor as indicated in the paragraph above.

**RULING: Answer 1:** The assumption that one third of the concentrated load can be carried by the floor system beyond the  $2^{1/2}$  foot square is not valid. The sharing of the load by the floor system outside the  $2^{1/2}$  foot square must be determined by rational structural analysis considering the strength and elastic behavior of the elements composing the floor system. The code intends that the concentrated load be located to create the maximum stress on the joist system. The base of the concentrated load is considered to be rigid but the floor system may deflect. For joists 16 inches on center the worst case for the flexible flooring would be with the load centered between the joists and for stiffer flooring with the load centered on a joist.

**Answer 2.** The code does not require multiple concentrated loads on the floor at the same time.

(signed January 26, 1994)

John Talbott, Chairman  
Structural Code Advisory Board

Date

The recommendations and findings of the Structural Code Advisory Board are accepted and the conclusion are adopted.

(signed February 8, 1994)

Gary J. Wicks, Administrator  
Building Codes Division

Date