

RESIDENTIAL CODE OF OHIO: INTERPRETATIONS



OHIO BOARD OF BUILDING STANDARDS

These code interpretations are based upon reviews and recommendations from the Residential Construction Advisory Committee (RCAC) to the Ohio Board of Building Standards. After deliberation and review of the recommendations from the RCAC, the Board's Code Committee reports its recommendation to the full Board for action at a regularly scheduled conference meeting. Upon formal action of the Ohio Board of Building Standards, pursuant to ORC Sections 3781.10 and 4740.14, the interpretation will apply for enforcement of the *Residential Code of Ohio for 1-, 2-, and 3-Family Dwellings*.

OHIO BOARD OF BUILDING STANDARDS RESIDENTIAL CODE OF OHIO CODE INTERPRETATIONS

CHAPTER 5

No. 1-2013

Issued: DATE

RCO Section 502.14 Fire Resistance of Floors. Floor assemblies, not required elsewhere in this code to be fire resistance rated, shall be provided with a 1/2 inch gypsum board membrane or a 5/8 inch wood structural panel membrane or an equivalent material on the underside of the floor framing member which complies with section 302.14.

Exceptions:

1. Floor assemblies located directly over a space protected by an automatic sprinkler system designed and installed in accordance with Sections 313.1.1 or 313.2.1.
2. Floor assemblies located directly over an underfloor space as referenced in section 408 which is not intended for storage or fuel-fired appliances.
3. Portions of floor assemblies can be unprotected when complying with the following:
 - 3.1 The aggregate area of the unprotected portions shall not exceed 80 square feet per story.
 - 3.2 Fire blocking in accordance with Section 302.11.1 shall be installed along the perimeter of the unprotected portion to separate the unprotected portion from the remainder of the floor assembly.
4. Wood floor assemblies using dimension lumber or structural composite lumber equal to or greater than 2-inch by 10-inch nominal dimension, or other approved floor assemblies demonstrating equivalent fire performance.

Q. What is the intent of the requirement of Section 502.14 that a protective layer be attached to the underside of engineered light frame construction?

A. When explaining the effects of fire on structural elements, it is important to understand that the longer these elements can absorb heat energy (traditionally because of a structural element's mass), the longer it will resist the effects of that heat. Fire science author, Frank Brannigan, in *Building Construction for the Fire Service*¹, explains why this is important today when he writes, "In recent years, the economics of using geometry (e.g., truss shapes) over mass has had a tremendous effect on structures." By changing the shape of engineered light-frame components, the mass of structural components are configured in such a way that maximizes structural characteristics while minimizing the amount of material it takes to "build" them. These components are not products of nature in the sense that sawn lumber is but are *composed*



Illustration A

¹ Brannigan, Francis J *Building Construction for the Fire Service*, Third Edition. Quincy, Mass.: National Fire Protection Association, 1992.

of products of nature that are modified and reconstituted to take advantage of the material's natural properties while minimizing the amounts of material needed.

The positive results of this engineering of structural components are increases in spans, smaller dead loads, higher load carrying capacities, reduced impact on the resources, and the use of heretofore unused or "waste" materials. A negative consequence of the development of these wood products has been their susceptibility to mold, moisture, or fire. The last of which is why, when dealing with engineered light-frame construction, RCO Section 502.14 has been incorporated into the code.

During fire testing, unprotected floors assemblies of engineered light-weight construction have been shown to have a short time to failure (Illustration B). RCO Section 502.14 (Section 501.3 in the 2012 International Residential Code) requires some protection of these engineered light-frame construction structural elements when used in floor assemblies. This protection for these structural components takes the form of a membrane attached to the underside of the light-weight construction. This membrane is intended to provide more time to occupants for evacuation and for fire service to begin search and rescue operations by protecting these elements from the effects of heat and fire. This section is not included in the code to provide or be considered to be a fire rated assembly but to provide a layer of thermal protection to extend the amount of time these components have to resist the effects of heat and fire.



Illustration B

RCO Section 502.14 requires that:

- The layer of protection can be $\frac{1}{2}$ gypsum or $\frac{5}{8}$ " structural panel membranes.
 - This layer is not required to be sealed with gypsum joint compound, taped, or sealed.
 - The layer components shall be butted to ductwork, other membrane sheets, piping, the plate at walls, or other structural or non-structural elements.
 - When butted to these elements, the elements themselves are a part of the thermal protection and do not constitute an opening in the membrane. (Refer to Figure 1)
 - Furthermore, if the protective membrane attached to the bottom of the engineered lightweight framing members is not continuous above ductwork, no fire blocking is required if the space between the bottom of the engineered lightweight framing members and the top of the ductwork is a maximum of $1\frac{1}{2}$ or less. (Refer to Figure 3)

Additionally, the new RCO code section (Section 501.3 in the 2012 IRC) also states that an "*equivalent material on the underside of the floor framing member which complies with section 302.14*" can be used.

- The intent of this provision is clarified when RCO Section 302.14 is read. The first paragraph of the section specifies the appropriate tests that must be used when a *rated assembly* is required in the code. As stated above, Section 502.14 does not require a rating; therefore this paragraph does not apply.
- The second paragraph of RCO Section 302.14 specifies that an “*equivalent fire resistive value can be derived by using Section 712 in the OBC or Resource A, Guidelines on Fire Ratings of Archaic Materials and Assemblies in the International Existing Building Code.*”
 - In order to allow for conditions that may occur in the field, this provision could be used, for instance, to address additions to existing buildings where there may be a protective layer of some sort beneath the existing floor system and a new floor is installed adjacent to the existing floor. Since that layer would need to be evaluated for compliance if it is to remain, the owner/builder and the building official have tools to make that evaluation.

RCO Section 502.14 EXCEPTIONS:

- **Exception 1** permits the protective layer to be omitted if the engineered light frame construction is “*located directly over a space protected by an automatic sprinkler system designed and installed in accordance with Sections 313.1.1 or 313.2.1.*”
 - These two referenced sections regulate the types of fire sprinkler systems that can be installed, whether the structure is an R-3 multi-family dwelling using the RCO pursuant to OBC Section 310, or a one-, two-, or three-family dwelling. The systems, NFPA 13, 13R, or 13D, must be designed and installed in accordance with RCO Section 2904 using the standards referenced and listed in RCO Chapter 44.
- **Exception 2** allows the protective layer to be omitted if the engineered light frame construction is “*located directly over an underfloor space as referenced in section 408 which is not intended for storage or fuel-fired appliances.*”
 - If the construction documents indicate that under-floor spaces are not to be used for storage or will not contain a fuel-fired appliance, the protective layer is not required to be installed.
 - The building official should reflect the condition that there will be no storage or fuel-fire appliances in the crawl space when completing the special conditions portion of the certificate of occupancy.
 - Some individuals have made the assumption that, if a concrete slab is used to cover the floor of an under-floor space, that space is assumed to be used for storage and, if it is earth or gravel with a Class I vapor retarder, it is not to be used for storage. Neither should be assumed but the applicant for plans approval should specify the intent or should be asked if it is not specified in the submission.
- **Exception 3** provides for a limited area where the protective layer can be omitted and the floor system can be unprotected. There are two conditions that must be complied with if this exception is to be used.
 - The first condition requires that the total or aggregate area of openings in the protective layer shall be 80 sq. ft. or less. This is not meant to require the totaling of the area of seams and joints as a part of the 80 sq. ft. but provides an allowable area where the membrane may be omitted. These openings could represent main supply and return ducts at the furnace, chimney or flue locations, or other places where access is needed.
 - The second condition requires that blocking shall be installed at the perimeter of any openings in the protective layer. This blocking at the perimeter of any openings in the protective layer assures that the remainder of the light frame construction remains protected. (Refer to Figure 2)
- **Exception 4** permits the omission of the protective layer if the wood floor assembly is constructed using “*dimension lumber or structural composite lumber equal to or greater than 2-inch by 10-inch nominal dimension, or other approved floor assemblies demonstrating equivalent fire performance.*”
 - The exception requires floor framing to be sawn or structural composite lumber with nominal dimensions of 2”x10” or greater. Tests have shown that these types of framing provide more time for evacuation and for fire fighter search and rescue.

- The minimum size requirement is meant to assure that framing members have a contiguous cross section with minimum nominal dimensions of 2” wide by 10” high. This assures a mass of sufficient size that these components can resist the effects of fire and heat for an amount of time to provide occupant egress and responder search and rescue. These minimum nominal dimensions are not the total cross sectional area of the members that make up a truss joist, I-joist, or other configuration of engineered light frame construction floor framing.
- The exception also allows the protective layer to be omitted if Structural Composite Lumber is used.
 - Structural Composite Lumber is a family of solid and uniformly engineered wood products designed for structural use. It is created by layering dried and graded wood veneers, strands, or flakes with exterior type adhesives into blocks of material. The blocks are cured in a heated press and sawn to consistent sizes that are easily worked in the field using conventional construction tools. These products include laminated veneer lumber, parallel strand lumber, laminated strand lumber, and oriented strand lumber. These products are commonly used in the same structural applications as conventional sawn lumber and timber including rafters, headers, beams, joists, rim boards, studs and columns.
- Exception 4 also uses the phrase, “*or other approved floor assemblies demonstrating equivalent fire performance.*” The intent of this provision is to direct code users to the other approval methods the code provides for demonstrating compliance.
 - One compliance method is found in RCO Section 106.5 *Alternative Engineered Design*. If an Ohio registered design professional completes an application for plan approval and indicates that a system shown in their proposed design is being submitted as an alternative engineered design, the registered design professional must submit appropriate system manufacturer’s installation instructions as well as sufficient technical data to substantiate their alternate engineered design to prove that it meets the intent of the code. Once evaluated for compliance with this section, the alternate design can be approved. The plan approval certification, certificate of occupancy, and permanent approval records should identify the design professional and that the project approval included an alternate engineered design submitted by the design professional.
 - Another common compliance method is found in RCO Section 114.2.1 *Research Reports and Listings*. If the product has obtained an appropriate evaluation report produced by a Board-approved evaluation service, the product, when installed according to the report and indicated as equivalent to sawn lumber under exception 4 in RCO Section 502.14, is deemed to comply.

If either of these options is selected by the owner for compliance under Exception 4 and the respective information is submitted to the building official, as required in RCO Sections 106.5 or 114.2.1, the building official has the information needed for determining equivalent fire performance.

RCO Section 502.14 and existing buildings

Many questions can arise when dealing with existing buildings and what is required if a space is being altered that may have been built using engineered light frame construction before the requirements of RCO Section 502.14 were adopted. While this should not be a difficult problem, the easiest solution is to understand the intent of OBC Section 113, *Existing Buildings and Structures*. Section 113.4 makes it clear that, “*Portions of the structure not altered and not affected by the alteration are not required to comply with the code requirements for a new structure.*” The code should only, then, be applied to the work being done and to the extent of the alteration.

If you have further questions, please call the Board’s office at 614-644-2613 or E-mail to dic.bbs@com.state.oh.us.

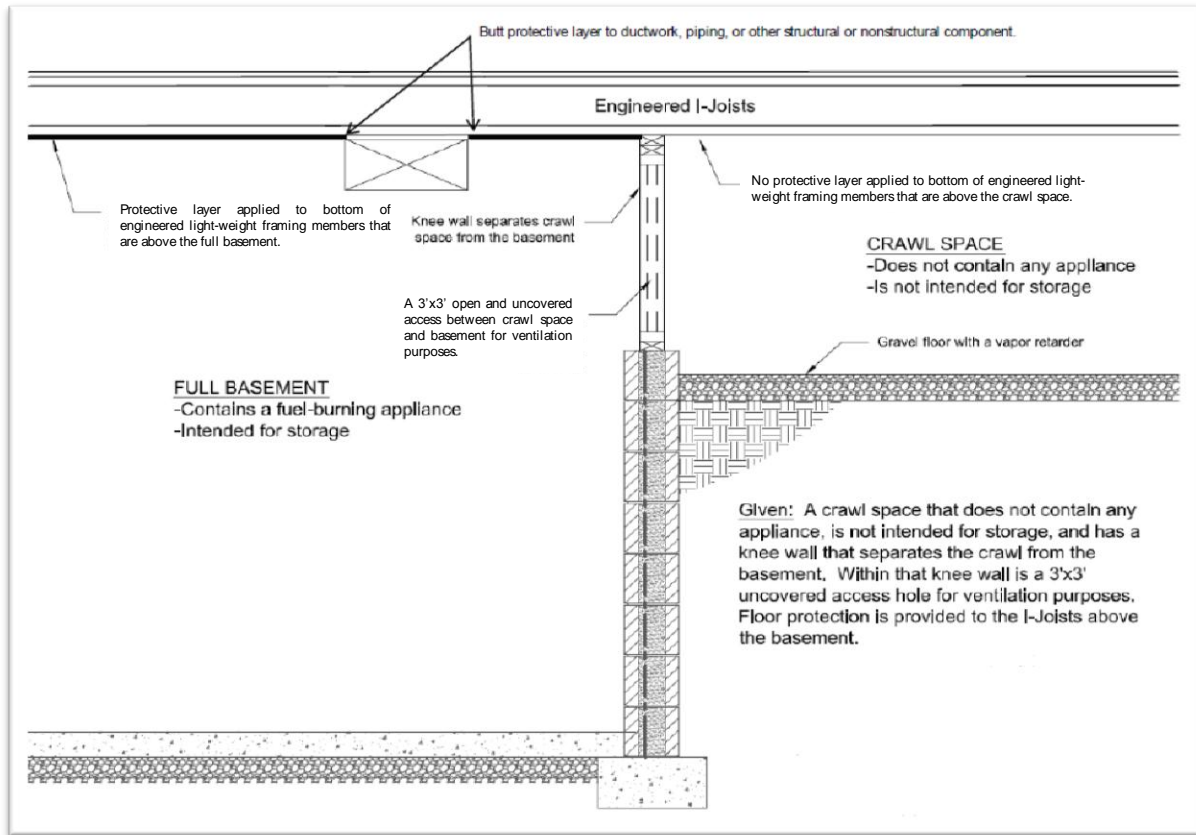


FIGURE 1

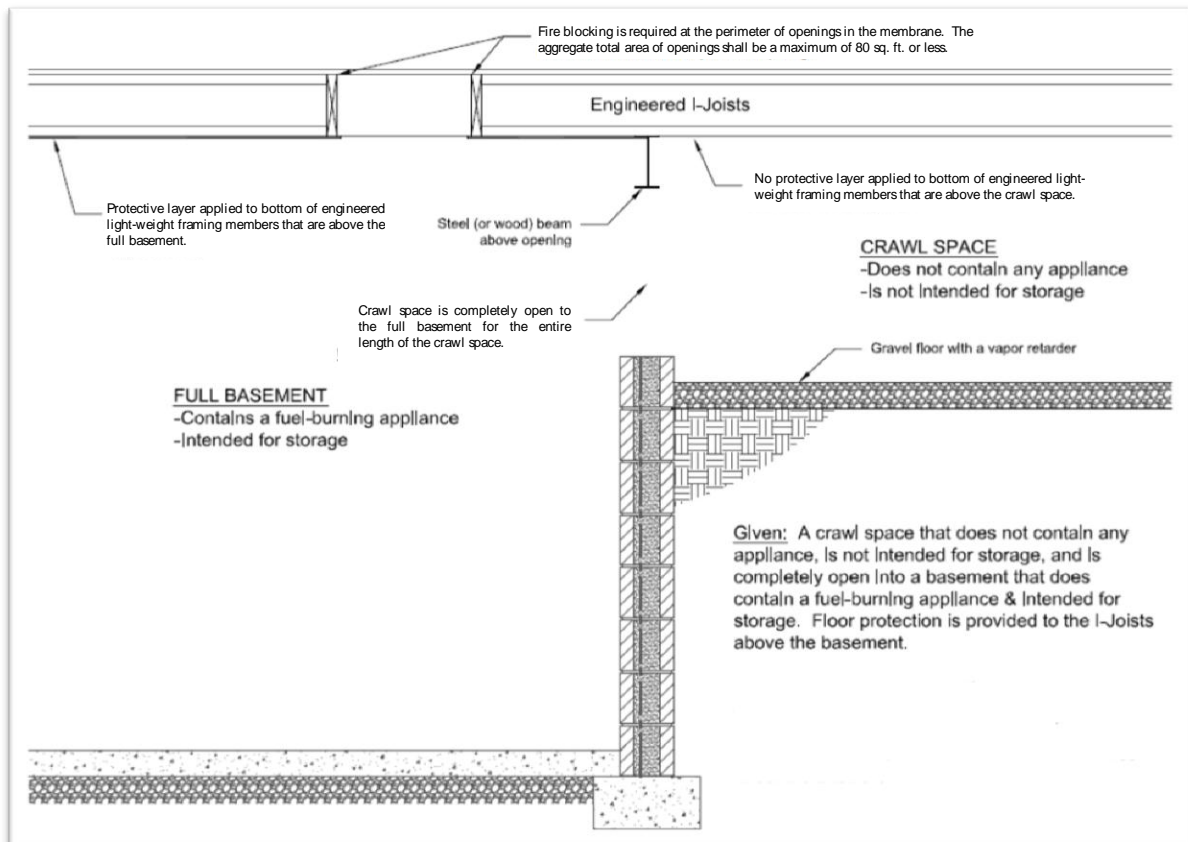


FIGURE 2

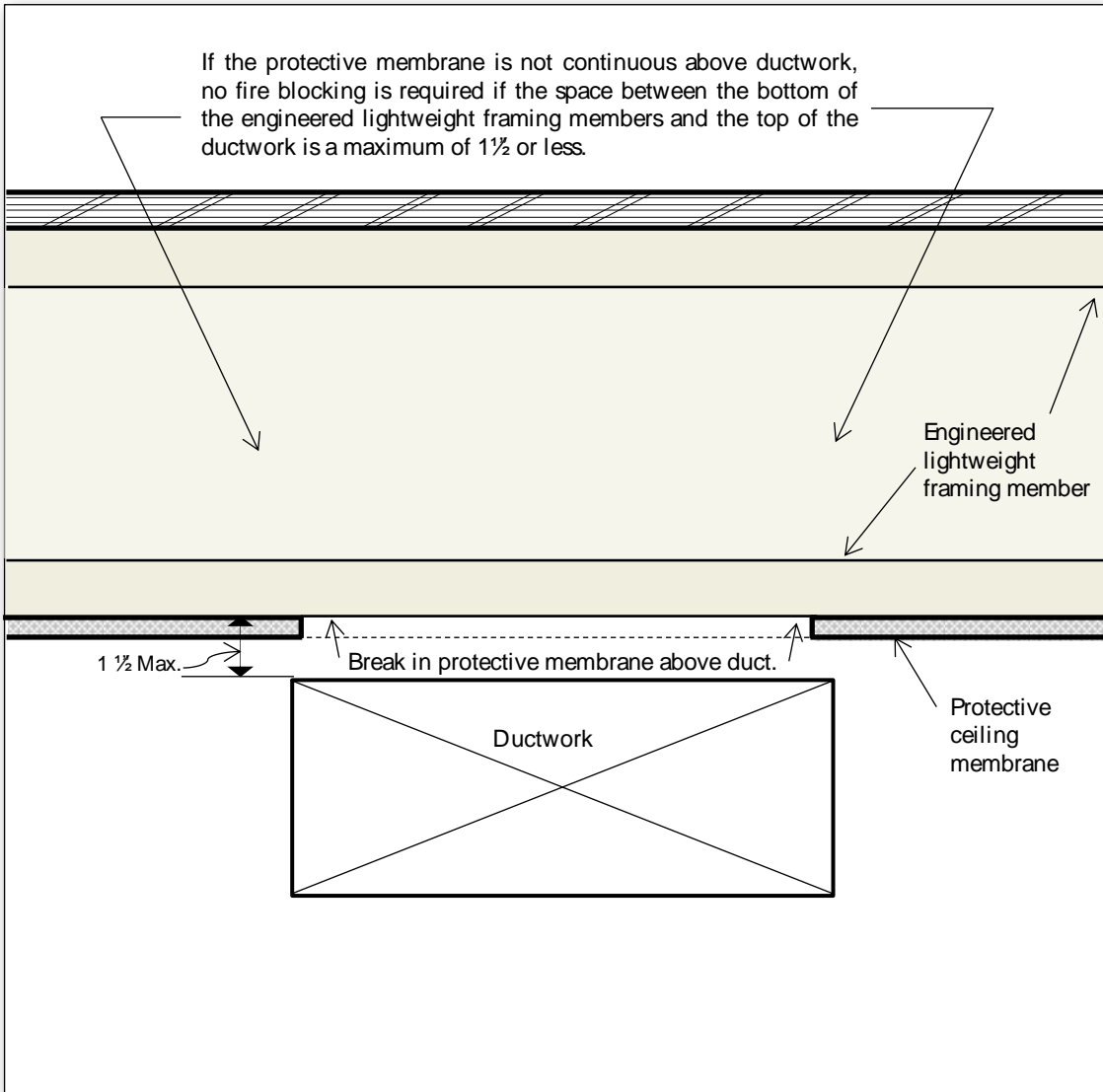


FIGURE 3