

CODE APPLICATION NOTICE

Subject: Rebar in Lieu of Welded Wire
Fabric in Fire-Resistance-Rated Assemblies

CAN NO. 2-703.2
EFFECTIVE: 5/18/09

CODE SECTIONS

Sections 703.2 and 703.3
2007 California Building Code (CBC)

2007 California Building Code

703.2 Fire-resistance ratings. The fire-resistance ratings of building elements shall be determined in accordance with the test procedures set forth in ASTM E 119 or in accordance with Section 703.3. Where materials, systems or devices that have not been tested as part of a fire-resistance-rated assembly are incorporated into the assembly, sufficient data shall be made available to the building official to show that the required fire-resistance rating is not reduced. Materials and methods of construction used to protect joints and penetrations in fire-resistance-rated building elements shall not reduce the required fire-resistance rating.

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703.3 Alternative methods for determining fire resistance. The application of any of the alternative methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E 119. The required fire resistance of a building element shall be permitted to be established by any of the following methods or procedures:

1. Fire-resistance designs documented in approved sources.
2. Prescriptive designs of fire-resistance-rated building elements as prescribed in Section 720.
3. Calculations in accordance with Section 721.
4. Engineering analysis based on a comparison of building element designs having fire-resistance ratings as determined by the test procedures set forth in ASTM E 119.
5. Alternative protection methods as allowed by Section 104.11.

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PURPOSE

The purpose of this Code Application Notice is to clarify when rebar may be used in lieu of welded wire fabric in fire-rated concrete floor-ceiling assemblies.

BACKGROUND

Fire-resistance-rated concrete floor-ceiling assemblies are tested by independent laboratories and assigned a fire-resistance-rating based on the specific components of the tested assembly. The testing laboratory is required to comply with the testing procedures of ASTM E 119. Where materials that have not been tested as part of a fire-resistance-rated assembly are incorporated into the assembly, sufficient data shall be made available to the building official to show that the required fire-resistance-rating is not reduced. Many fire-resistance-rated concrete floor assemblies use welded wire fabric. Steel reinforcing bar (rebar) is a common alternative to welded wire fabric and is often required for the structural design of the building. Rebar is preferred by the structural engineering community because it has greater strength and better structural performance than welded wire fabric. Although rebar may be desirable for structural reasons, few assemblies have been tested with rebar.

ASTM E 2032 Standard Guide for Extension of Data from Fire Endurance Tests conducted in accordance with ASTM E119 covers the extension of fire endurance results obtained from tests performed in accordance with ASTM E 119 to constructions that have not been tested. The guide is based on principles involving the extension of test data using simple considerations and its application is based substantially on an analogous worst case scenario. Under the discussion of Principles Pertaining to Heat Transfer Characteristics of Concrete, the standard states “for concrete test specimens where temperature rise on the unexposed surfaces is the governing criterion, changes in the type or amount of reinforcement does not reduce the fire endurance of the assembly.” Under the discussion of Principles Pertaining to Fire Endurance of Floor or Roof Ceiling Assemblies, the standard affirms that “for concrete slab assemblies where temperature rise on the unexposed surface of a concrete slab is a governing criterion, (that is, the structural design requirements are met and adequate cover protection is provided to the steel reinforcement [prestressing and reinforcing bars]), modifications in the concrete materials used, concrete mixture, or slab designs (described in Section 6) do not reduce the fire endurance.”

INTERPRETATION

California Building Code Section 721 contains procedures by which the fire resistance of specific materials or combinations of materials is established by calculations; Section 721.2.2 contains the provisions for calculating the fire resistance of reinforced and prestressed concrete floor and roof slabs.

In accordance with Section 721.2.3.1, the minimum thickness of concrete cover to the positive moment reinforcement shall comply with Table 721.2.3(1) for reinforced concrete. This table is applicable to slabs that are either cast in place or precast.

TABLE 721.2.3(1)
COVER THICKNESS FOR REINFORCED CONCRETE FLOOR OR ROOF SLABS (inches)

CONCRETE AGGREGATE TYPE	FIRE-RESISTANCE RATING (hours)									
	Restrained					Unrestrained				
	1	1 ¹ / ₂	2	3	4	1	1 ¹ / ₂	2	3	4
Siliceous	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1	1 ¹ / ₄	1 ⁵ / ₈
Carbonate	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1 ¹ / ₄	1 ¹ / ₄
Sand-lightweight or lightweight	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1 ¹ / ₄	1 ¹ / ₄

For fire-resistance-rated concrete floor assemblies tested with welded wire mesh fabric, steel reinforcing bars (rebar) may be substituted for welded wire mesh if the minimum cover thickness for the reinforcing bars is at least as thick as the values shown in Table 721.2.3(1). An Engineering Judgment or an Alternate Method of Protection will not be required if the plans clearly detail the installation of all reinforcing bars and the relationship of the concrete cover thickness to the reinforcing bars.

Original Signed Paul Coleman 5/18/09
Date