

Designing for Fire Resistive Construction in Quad-Deck Floor and Roof Structures

Structures built with suspended concrete floors and roofs that are formed by Quad-Deck insulating forms can be designed for fire resistive construction using ACI 216 "Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies". Using components (like concrete and Type X gypsum wallboard) that contribute known fire resistance ratings, a fire resistive assembly can be specified by the project engineer.

Concrete:

ACI 216 (Table 2.1) shows 4 common types of concrete (by aggregate type) and the minimum slab thickness required to generate fire resistance ranging from 1 hour to 4 hours. (Table also found in IBC 721.2.2.1)

Table 2.1

Aggregate Type	Minimum equivalent thickness for fire resistive rating, in.				
	1 hr.	1 ½ hrs.	2 hrs.	3 hrs.	4 hrs.
Siliceous	3.5	4.3	5.0	6.2	7.0
Carbonate	3.2	4.0	4.6	5.7	6.6
Semi-lightweight	2.7	3.3	3.8	4.6	5.4
Lightweight	2.5	3.1	3.6	4.4	5.1

Requirements for calculating the minimum equivalent thickness for floor and roof panels formed with Quad-Deck can be found in ACI 216, Chapter 2, Section 2.2.4(a). Therefore, because of Quad-Deck's shape, the required slab thickness is equal to the minimum equivalent thickness in Table 2.1.

If Quad-Deck is used in a roof structure, ACI 216, Section 2.2.6 may permit an additional 10 minute fire resistance credit for certain roofing materials.

Note: Typical structural specifications for Quad-Deck floors/roofs call for minimum slab thickness ranging from 3 to 5 inches. Most engineered designs call for a minimum 3/4" to 1" concrete coverage of reinforcement. Refer to Section 2.3 for minimum concrete coverage of reinforcing bar in fire resistive designs.

Gypsum Drywall:

ACI 216, Chapter 5 contains "Effects of Finish Materials on Fire Resistance". Here, design professionals will find methods for calculating the fire resistance of walls and slabs that are finished on one or both sides with different finish materials, including gypsum drywall. Tables 5.1 and 5.2 display values for materials placed on both the non-fire exposed and fire exposed side of the structure. The building type and occupancy will determine how the information in these tables is applied, so each project must be considered individually. Note that in all cases, foam plastic insulation is required to be covered by a 15 minute thermal barrier; i.e. ½" gypsum drywall.

ACI 216 is available from the American Concrete Institute bookstore at www.concrete.org, or call the Quad-Lock Training and Technical Services Department for more information. 1-888-711-5625

Quad-Deck Sound Resistive Construction Test

Air-borne Sound Transmission (ASTM-E90 / ISO 140-3)

