

Table 2-1. UL Fire Resistance Directory ratings for columns and composite floors (UL 1983).

	Reference	Rating	Thickness (in.)	Notes
Composite Floor Beams Deck	BXUV.D739	2 h	1/2 3/8	For W8x28 steel beams or larger, a normal weight concrete slab, and MK-5 SFRM.
Column	BXUV.X704	3 h	7/8	For W14x228 steel columns or larger.

The SFRM application was inspected by Testwell Craig Laboratories, Inc. NIST obtained a set of Inspection Reports⁷ with SFRM thickness measurements for the columns, floor beams, and metal deck showing measurement data taken at Floors 3 through 12, 32 through 40, and 42 through 47. The inspection reports include plan views of the WTC 7 floors indicating where measurements were taken. SFRM thicknesses were listed in the Inspection Reports and were presumably intended for the inspectors who were determining minimum allowable SFRM thicknesses.

The measurements gave the statistics shown in Table 2-2. The column measurements were based on data listed for Floors 3 to 12 and 32 to 40 because the columns at Floors 42 to 47 were smaller than the W14x228 minimum column size. The metal deck measurements used only the data associated with the 3/8 in. SFRM thickness.

Table 2-2. Statistics of SFRM thickness measurements on steel columns, floor beams, and metal decks in WTC 7.

	Specified Thickness (in.)	Data Points	Average (in.)	Standard Deviation (in.)	COV	Minimum (in.)	Maximum (in.)
Column	0.875	51	0.955	0.155	0.162	0.85	2.0
Floor Beams	0.5	82	0.534	0.054	0.101	0.4	0.775
Metal Deck	0.375	63	0.416	0.033	0.079	0.375	0.5

SFRM thicknesses were needed for the thermal finite element analyses of Floors 7 to 14, where uncontrolled fires burned until the building collapsed. The thermal analyses used the gas temperatures from the FDS analyses, which modeled the growth and spread of the fires on Floors 7, 8, and 9, and 11, 12, and 13. The gas temperatures were applied to the surface of the SFRM coating in the finite element analyses (Chapter 10) to determine temperature histories for the steel framing and concrete slab.

NIST used the following uniform thicknesses in the thermal analyses, based on the available information SFRM thicknesses, the lack of gaps in the applied SFRM, and the relatively smooth surface of applied MK-5 to the steel beams and columns (Section 2.5.3):

- 7/8 in. on columns
- 7/16 in. on floor beams
- 3/8 in. on metal deck

⁷ Inspection Reports prepared by Testwell Craig Laboratories Inc. for Silverstein Development Corporation, 7 World Trade Center, dated from January 1986 to November 1986.