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THE NIST SOFA SUPER STORE DRAFT INVESTIGATION REPORT-PART 3 (ANALYSIS: INSULATED METAL DECK ROOF CONSTRUCTION)

By Richard Schulte

The Sofa Super Store in Charleston, South Carolina consisted of the main showroom constructed around 1960 and numerous additions. Page 1-34 in the NIST draft report of their investigation of the fire at the Sofa Super Store indicates that the original building was constructed with concrete masonry exterior walls and an insulated metal deck roof supported on steel bar joists. The insulation provided on the roof of the main showroom was a foam plastic material.

Page 1-34 in the NIST draft report is the only reference made to the construction of the roof deck of the main showroom. The report (and the appendices to the report) contains numerous photographs of the building construction, both prior to the fire and after the fire, however, the only photographs which shows the roof deck and insulation for the main showroom are on Pages D-16 and D-27 (Appendix D) of the report.

The insulation provided on the roof of the main showroom was a foam plastic material.

The International Building Code (IBC) contains special provisions for the use of foam plastic insulation in building construction in Chapter 26 of the Code, specifically Section 2603 in the 2006 edition of the Code. The general provisions for the use of foam plastic materials contained in Section 2603 indicate that foam plastic materials are required to have a flame spread index of 75 or less and a smoke developed index of 450 or less when the material is tested in accordance with ASTM E84.

The International Building Code (IBC) contains special provisions for the use of foam plastic insulation in building construction in Chapter 26 of the Code, specifically Section 2603 in the 2006 edition of the Code.

In addition to the requirement outlined above, section 2603.4 of the IBC requires that foam plastic materials be covered with materials which have a 15 minute finish rating when tested per ASTM E119. Given that metal roof decking will not develop a 15 minute finish rating, a material which develops a 15 minute finish rating, such as one-half inch thick gypsum wallboard, is required to be provided between the metal deck and the insulation where the roof is insulated with foam plastic materials.

The code provides a number of exceptions to the general requirement for separating foam plastic materials from interior building spaces with materials with a 15 minute finish rating. The exception contained in section 2603.4.1.5 specifically indicates that an insulated metal deck roof is exempt from the requirement for a thermal barrier between the deck and foam plastic insulation if the metal deck and roof covering are tested and pass either the 1989 edition of FM 4450 (with revisions through 1992), the Approval Standard for Class 1 Steel Deck Roofs, or the 2002 edition of UL 1256, Fire Test of Roof Deck Construction.

The following are excerpts from 1989 edition of FM 4450:

“This standard states FM Approvals requirements for the Approval of Class 1 insulated steel roof decks. A Class 1 insulated steel roof deck is one which meets the criteria of this standard for fire, wind uplift . . .” (Section 1.1, Page 1)

“Insulated steel deck roof components, incorporated in a complete insulated steel deck roof assembly(ies), which exhibit low fire spread below the deck. . .during the Approval examination will qualify as a Class 1 assembly.” (Section 1.2, Page 1)

“Flame spread over a noncombustible surface, such as a metal faced combustible core assembly, is dependent on the fuel contribution of combustible components and not the surface burning characteristics of the metal. This fact has been substantiated in actual rapidly spreading building fires on the underside of insulated steel roof decks in which combustibles above the steel deck have supplied the necessary fuel contributions to induce rapid flame spread.” (Section 1.1, Appendix B, Page 12)

“. . . This fact has been substantiated in actual rapidly spreading building fires on the underside of insulated steel roof decks in which combustible above the steel deck have supplied the necessary fuel contributions to induce rapid flame spread.”

“ . . .The furnace, test procedures, results and fire hazard ratings were developed by FM Approvals, and have been in use since 1955.” (Section 1.2, Appendix B, Page 12)

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Based upon the description of the roof deck construction of the main showroom and the two photographs included in the report, it does not appear that there was a thermal barrier between the metal decking and the foam plastic insulating material. Perhaps it is possible that the construction of the main showroom roof deck complied with either FM 4450 or UL 1256, but that seems highly unlikely given that early 1970's vintage editions of the BOCA Basic Building Code did not make reference to either one of these two standards for steel roof deck construction.

Did the insulated metal deck roof provided for the main showroom at the Sofa Super Store contribute to the fire? Assuming that the roof deck construction did not comply with FM 4450 or UL 1256, there seems that there would be little doubt that the roof deck insulation would have contribut-

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ed to the fire. Were the combustible gases generated by the foam plastic insulation on the metal deck the primary contributor to the increase in the rate of burning after the front windows of the main showroom were broken out? At this point in time, it's simply not possible to say, but it would seem that there is a relatively high probability that that was the case.

For certain, it can be stated that the NIST draft report totally ignored this possibility.

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