Fire Performance of a Non-load Bearing Steel Stud Gypsum Board Wall Assembly

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ABSTRACT

To mitigate fire spread in buildings, building codes dictate that compartments in buildings must be separated by fire rated barriers or partitions. Consequently, these partitions are rated based on their resistance to the passage of heat and smoke [1-2]. Use of these standards has been successful in reducing the number of fires that have killed people and destroyed structures.

Intact partitions are important in preventing the spread of flame, keeping egress paths available, and increasing safe time in places of refuge. To assess partition performance for these functions, it is necessary to know, in terms of real time, how long the interior partitions in a building will contain flames and smoke. Unfortunately, it has long been known that current fire resistance ratings obtained in furnaces do not coincide with actual safety times, but rather only provide *relative* guidance as to partition performance.

This suggests a high benefit to public safety from placing the fire resistance of partitions on an absolute basis. Such an advance would empower the use of prescriptive requirements while contributing to the emerging discipline of performance-based design. We have embarked on a course to provide a methodology to be used in performance-based design of buildings. The research involves obtaining real-scale experimental data, modeling the behavior of partitions as they are driven to failure by the fire, and developing recommendations for obtaining input parameters from modifications to standard fire resistance tests such as ASTM E119 [1] and ISO 834 [2].

To this end, a gypsum wall assembly was exposed to an intense real-scale compartment fire. For the wall assembly, temperatures were measured at the exposed face, within the stud cavity, and at the unexposed face during the fire exposure. Total heat flux gauges were used to measure the temporal variation of the energy incident on the walls and cameras, both visual and infrared, were used to image the unexposed face of the wall assembly during the fire exposure. The behavior of the wall assembly under the fire load is presented as are current model results for a simulation of the fire test.

KEYWORDS: compartmentation, fire resistance, partitions

REFERENCES

[1] "Test Method for Fire Resistance Tests of Building Construction and Materials," ASTM E119-00a, American Society for Testing and Materials.

[2] "Fire Resistance Tests – Elements of Building Construction," ISO 834, Parts 1 through 9, International Organization for Standardization, Geneva, Switzerland.