(b) The definition of an automatic sprinkler system is unique to the Act. In addition to describing the physical characteristics of an automatic sprinkler system, the definition sets a performance objective for the system. Automatic sprinkler systems installed in compliance with the Act must *protect human lives*. Sprinklers would provide the level of life safety prescribed in the Act by controlling the spread of fire and its effects beyond the room of origin. A functioning sprinkler system should activate prior to the onset of flashover.

(c) This subpart establishes a general measure of building firesafety performance. To achieve the level of life safety specified in the Act, the structure under consideration must be designed, constructed, and maintained to minimize the impact of fire. As one option, building environmental conditions are specified in this subpart to ensure the life safety of building occupants outside the room of fire origin. They should be applicable independent of whether or not the evaluation is being conducted for the entire building or for just the hazardous areas. In the latter case, the room of origin would be the hazardous area while any room, space, or area could be a room of origin in the entire building scenarious.

(d) The *equivalent level of safety* regulation in this subpart does not address property protection, business interruption potential, or firefighter safety during fire fighting operations. In situations where firefighters would be expected to rescue building occupants, the safety of both firefighters and occupants must be considered in the *equivalent level of safety* analysis. Thorough prefire planning will allow firefighters to choose whether or not to enter a burning building solely to fight a fire.

§ 101–6.602 Application.

The requirements of the Act and this subpart apply to all Federal agencies and all federallly owned and leased buildings in the United States, except those under the control of the Resolution Trust Corporation.

§ 101–6.603 Definitions.

(a) *Qualified fire protection engineer* is defined as an individual, with a thorough knowledge and understanding of the principles of physics and chemistry governing fire growth, spread, and suppression, meeting one of the following criteria:

(1) An engineer having an undergraduate or graduate degree from a college or university offering a course of study in fire protection or firesafety engineering, plus a minimum of four (4) years work experience in fire protection engineering,

(2) A professional engineer (P.E. or similar designation) registered in Fire Protection Engineering, or

(3) A professional engineer (P.E. or similar designation) registered in a related engineering discipline and holding Member grade status in the International Society of Fire Protection Engineers.

(b) *Flashover* means fire conditions in a confined area where the upper gas layer temperature reaches 600 °C (1100 °F) and the heat flux at floor level exceeds 20 kW/m² (1.8 Btu/ft²/sec).

(c) *Reasonable worst case fire scenario* means a combination of an ignition source, fuel items, and a building location likely to produce a fire which would have a significant adverse impact on the building and its occupants. The development of *reasonable worst case scenarios* must include consideration of types and forms of fuels present (e.g., furniture, trash, paper, chemicals), potential fire ignition locations (e.g., bedroom, office, closet, corridor), occupant capabilities (e.g., awake, intoxicated, mentally or physically impaired), numbers of occupants, detection and suppression system adequacy and reliability, and fire department capabilities. A quantitative analysis of the probability of occurrence of each scenario and combination of events will be necessary.

(d) *Room of origin* means an area of a building where a fire can be expected to start. Typically, the size of the area will be determined by the walls, floor, and ceiling surrounding the space. However, this could lead to unacceptably large areas in the case of open

plan office space or similar arrangements. Therefore, the maximum allowable fire area should be limited to 200 m^2 (2000 ft^2) including intervening spaces. In the case of residential units, an entire apartment occupied by one tenant could be considered as the *room of origin* to the extent it did not exceed the 200 m^2 (2000 ft^2) limitation.

§ 101–6.604 Requirements.

(a) The equivalent level of life safety evaluation is to be performed by a qualified fire protection engineer. The analysis should include a narrative discussion of the features of the building structure, function, operational support systems and occupant activities which impact fire protection and life safety. Each analysis should describe potential reasonable worst case fire scenarios and their impact on the building occupants and structure. Specific issues which must be addressed include rate of fire growth, type and location of fuel items, space layout, building construction, openings and ventilation, suppression capability, detection time, occupant notification, occupant reaction time, occupant mobility, and means of egress.

(b) To be acceptable, the analysis must indicate that the existing and/or proposed safety systems in the building provide a period of time equal to or greater than the amount of time available for escape in a similar building complying with the Act. In conducting these analyses, the capability, adequacy, and reliability of all building systems impacting fire growth, occupant knowledge of the fire, and time required to reach a safety area will have to be examined. In particular, the impact of sprinklers on the development of hazardous conditions in the area of interest will have to be assessed. Three options are provided for establishing that an *equivalent level of safety* exists.

(1) In the first option, the margin of safety provided by various alternatives is compared to that obtained for a code complying building with complete sprinkler protection. The margin of safety is the difference between the available safe egress time and the required safe egress time. Available safe egressd time is the time available for evacuation of occupants to an area of safety prior to the onset of untenable conditions in occupied areas or the egress pathways. The required safe egress time is the time required by occupants to move from their positions at the start of the fire to areas of safety. Available safe egress times would be developed based on analysis of a number of assumed *reasonable worst case fire scenarios* including assessment of a code complying fully sprinklered building. Additional analysis would be used to determine the expected required safe egress times for the various scenarios. If the margin of safety plus an appropriate safety factor is greater for an alternative than for the fully sprinklered building, then the alternative should provide an *equivalent level of safety*.

(2) A second alternative is applicable for typical office and residential scenarios. In these situations, complete sprinkler protection can be expected to prevent flashover in the room of fire origin, limit fire size to no more than 1 megawatt (950 Btu/sec), and prevent flames from leaving the room of origin. The times required for each of these conditions to occur in the area of interest must be determined. The shortest of these three times would become the time available for escape. The difference between the minimum time available for escape and the time required for evacuation of building occupants would be the target margin of safety. Various alternative protection strategies would have to be evaluated to determine their impact on the times at which hazardous conditions developed in the spaces of interest and the times required for egress. If a combination of fire protection systems provides a margin of safety equal to or greater than the target margin of safety, then the combination could be judged to provide an *equivalent level of safety*.

(3) As a third option, other technical analysis procedures, as approved by the responsible agency head, can be used to show equivalency.

(c) Analytical and empirical tools, including fire models and grading schedules such as the Fire Safety Evaluation System (Alternative Approaches to Life Safety, NEPA 101M)