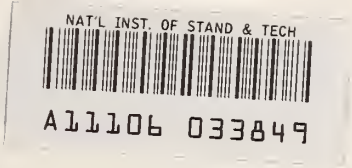

NBSIR 84-2976

The Development of A Fire Evaluation System for Detention and Correctional Occupancies

H. E. Nelson and A. J. Shibe

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Sponsored by
National Institute of Justice
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U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, *Secretary*
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

Preface

This report presents a Fire Safety Evaluation System for Detention and Correctional Occupancies. It was developed specifically to identify alternative combinations of widely accepted fire protection systems and building design features that provide a level of fire safety equivalent to that required by the Life Safety Code for detention and correctional occupancies. This work is an extension of research conducted by the Center for Fire Research with support from the Department of Health and Human Services towards development of a Fire Safety Evaluation System for Board and Care Homes.

The Fire Safety Performance Group, Center for Fire Research, National Engineering Laboratory, National Bureau of Standards, performed the research described in this report under the sponsorship of the National Institute of Justice of the U.S. Department of Justice.

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Abstract

A Fire Safety Evaluation System for Detention and Correctional Occupancies has been developed. It can be used for determining whether a facility has fire safety equivalent to that obtained by meeting the requirement of a given code. The system was calibrated for use with proposed chapters for detention and correctional occupancies of the Life Safety Code (1985). There are separate sets of requirements for each of four use conditions: one for zoned egress, one for zoned impeded egress, one for impeded egress, and one for contained. Within each set, there are two levels of evaluation: one for partially sprinklered and non-sprinklered buildings, and one for totally sprinklered buildings.

1. Introduction

At the request of the National Institute of Justice of the U.S. Department of Justice, the Center for Fire Research at the National Bureau of Standards has developed a Fire Safety Evaluation System for Detention and Correctional Occupancies. The Fire Safety Evaluation System (FSES) is designed to evaluate the fire safety (using equivalency to the fire safety obtained by meeting the requirements in the Life Safety Code [1][1] as the criteria) for those detention and correctional facilities where, in case of fire, the occupants are generally prevented from taking self-preservation action because of security measures not under their control.

Use of the FSES offers more flexibility than strict conformance with the specifications in the Life Safety Code. It identifies combinations of widely accepted fire safety features and systems which, collectively, provide a level of safety equivalent to or greater than that achieved by meeting all the specifications in the Life Safety Code for Detention and Correctional Occupancies.

The Fire Safety Evaluation System for Detention and Correctional Occupancies is presented as Appendix A of this report. A companion workbook is presented in Appendix B. The evaluation system is being considered by NFPA for inclusion in the next (1985) edition of the Life Safety Code.

2. Background

2.1 Detention and Correctional Occupancies

Fire safety in detention and correctional facilities presents unique problems because the highest priority for a prison administrator

[1] Numbers in brackets refer to literature references listed at the end of this report.

is to provide security and not fire safety. Multiple fatality fires in the 1970's alerted the correctional facility administrators, the Department of Justice, and the general public to the potential losses of life because of inadequate fire safety levels provided in correctional facilities [2] [3] [4] [5] [6]. The National Fire Protection Association recognized that the Penal Occupancies Section of Chapter 10 of the Life Safety Code (1976) [7] did not fully meet the need for a set of fire safety requirements that covers the wide range of security arrangements found in detention and correctional facilities. Therefore, in 1981 the NFPA published [8] a new comprehensive set of fire safety requirements for detention and correctional occupancies. The new requirements are presented in Chapter 14, New Detention and Correctional Occupancies and Chapter 15, Existing Detention and Correctional Occupancies. The chapters have specific requirements to cover the wide range of security requirements of detention and correctional facilities. The following security levels or use conditions are covered by the code:

1. Free Egress - Free movement is allowed from sleeping areas and other spaces where access is permitted to the exterior without physical restrictions such as locks.

2. Zoned Egress - Free movement is allowed from sleeping areas and any other occupied smoke compartment to one or more other smoke compartments.

3. Zoned Impeded Egress - Free movement is allowed within all individual smoke compartments. Egress to other smoke compartments may be impeded by a physical restriction such as a locked door. Remote controlled release is provided to permit movement to other smoke compartments.

4. Impeded Egress - Free movement is restricted from an occupied space; for example, occupants are locked in their cells. Remote controlled release is provided to permit movement from all sleeping rooms and other occupied areas within the smoke compartment to another smoke compartment.

5. Contained - Free movement is restricted from an occupied space. Staff controlled manual release at doors is provided to permit movement from all sleeping rooms and other occupied areas within the smoke compartment to other smoke compartments.

Those buildings meeting the requirements of Use Condition 1 - Free Egress are classified as residential and should meet the requirements of Chapters 16-20 of the Life Safety Code (hotels, dormitories, apartments, and lodging or rooming houses) as appropriate. This is based on Sections 14-1.4.3 and 15-1.4.3 of the Life Safety Code, "Areas housing occupancies corresponding to Use Condition 1 - Free Egress shall conform to the requirements of residential occupancies under this Code." The Fire Safety Evaluation System for Detention and Correctional Occupancies is not designed for use with facilities having free egress.

2-2. Fire Safety Evaluation System

The Center for Fire Research (CFR) of the National Bureau of Standards (NBS) has previously developed a Fire Safety Evaluation System for Health Care Facilities (FSES/HC) [9]. The original FSES/HC was designed as an alternative to meeting all the specifications in Chapter 10 (Hospitals and Nursing Homes) of the 1973 Life Safety Code (LCS). Appendix C of the 1981 LSC contains a slightly modified version of the FSES/HC for the use with Chapters 12 and 13 of the 1981 LSC. Similarly, CFR has developed Fire Safety Evaluation Systems for Multifamily Housing, [10] Board and Care Homes, [11] and Overnight Accommodations. [12]

A fire safety evaluation system is a procedure for evaluating the fire safety of a building by obtaining weighted runs of the point values of individual safety parameters. These safety parameters are measures of building characteristics and fire protection features that bear upon the safety of the building occupants. For example, Fire Alarm is one parameter. For each safety parameter, two or more levels or categories are defined, where each category corresponds to a condition specifically identified as a level of performance in the Life Safety Code and/or likely to be

encountered in a building. For example, "No Alarm" is one category. Each category is assigned a point value.

A basic principle of fire protection is that there must be a redundancy of protection so that the failure of a single protection device or method will not result in failure of the entire safety system.

The development of a fire safety evaluation system involves the following steps:

(1) Identifying all the factors or parameters, (i.e., building characteristics and fire safety features) which significantly contribute to life safety with respect to fire.

(2) Quantifying or assigning a numerical weight to each of these parameters.

(3) Creating redundant safety subsystems within the system to assure that failure of any one fire safety feature or method will not create an unacceptable decrease in fire safety.

(4) Seeking professional judgment review and critique.

(5) Calibrating to the requirements in the Life Safety Code.

(6) Field testing of the system.

Once these tasks are accomplished, and the Fire Safety Evaluation System is completed, it can be used to:

(1) Evaluate the level of life safety in an existing facility.

(2) Compare the existing level of life safety in a facility to the level of safety specified by the Life Safety Code.

(3) Design new facilities and retrofit buildings with combinations of fire safety features that provide the level of safety prescribed by the Life Safety Code.

When the original Fire Safety Evaluation System for Health Care Facilities was developed, the whole approach was novel, and therefore, to some extent suspect. To allay apprehensions, the technical report by Nelson and Shibe [9] gave a detailed justification for the structure of the system. The approach is no longer novel and unfamiliar to fire experts, and the background descriptions in the Nelson and Shibe report also explain the methodological basis for the FSES/for Detention and Correctional Occupancies.

The Fire Safety Evaluation System for Detention and Correctional Occupancies is a procedure for determining if a jail or prison provides the level of fire safety equivalent to that attained by meeting all the applicable specifications in Chapter 14 or 15 of the Life Safety Code. While failure to satisfy requirements of the FSES means failure to demonstrate equivalency it does not necessarily mean failure to attain equivalency; other methods of demonstrating equivalency may be used. However, satisfying the requirements of the FSES does demonstrate equivalency to the level of safety prescribed by the Life Safety Code.

2.3 Development of Chapters 14 and 15 of the Life Safety Code

The goal of this project was to apply the methodology used in developing the previous fire safety evaluation system to develop an equivalency system for evaluating the fire safety of jails and prisons. At the beginning of the project there was no satisfactory generally accepted model fire safety code for jails and prisons. However, the National Fire Protection Association (NFPA) was developing a new Chapter for the 1981 edition of the Life Safety Code to cover these facilities. NBS staff worked with the appropriate NFPA Committee, the Subcommittee on Detention and Correctional Occupancies of the Committee on Safety to Life, and one NBS staff member was appointed by NFPA to serve as a member of the subcommittee.

The early efforts of the Subcommittee indicated that the new requirements would not permit the atrium-like multi-tier cell blocks. However, the known fire history indicates that these multi-tier cell blocks have a better fire safety record then small jails. NBS initiated a special sub-project to provide the technical background that permitted the Subcommittee to develop requirements that would permit those multi-tier cell blocks that have a high level of safety. The needed fire test data is contained in B.T. Lee's report, "Effect of Ventilation on the Rates of Heat, Smoke and Carbon Monoxide Production in a Typical Jail Cell Fire." [13] The methodological basis is described in Appendix B of Nelson et. al. [9].

The Fire Safety Evaluation System was designed to measure whether a facility has the same level of fire safety (or better) as a facility meeting the requirements of Chapter 14 or 15 of the Life Safety Code, as appropriate. As the FSES was being refined and tested, the subcommittee was also modifying Chapters 14 and 15 for the 1985 edition of the Life Safety Code. The FSES was modified so that the version in Appendix A is compatible with the latest version of the 1985 Code, and it is being considered for inclusion in the code as an appendix.

3. System Development

3.1 Orientation and Problem Definition

Early in the project, NBS staff visited a wide variety of detention and correctional facilities. They observed the operational characteristics of the facilities and discussed them with their hosts. They also studied the fire safety features of the buildings and analyzed the existing fire safety systems.

The staff concluded that the fire safety problem for jails and prisons has many similarities with other types of residences. The current Life Safety Code recognizes this when it states that facilities meeting the requirements of Use Condition 1 - Free Egress should meet the requirements of the most appropriate residential chapter of the Code. Facilities that

restrict the movement of the residents do need more fire protection features to compensate for the evacuation delays that may occur. However, the basic approach to providing fire safety should be similar.

This conclusion significantly affected the strategy for developing the FSES. Since fire safety evaluation systems were being developed for residential occupancies, it was decided to construct the Fire Safety Evaluation System for Detention and Correctional Occupancies as a modification of those under development, rather than to develop a completely new system. This approach had several desirable consequences:

1. It saved time and money.

2. It minimized the time commitment of outside fire protection experts who served on the consulting panels.

3. It maximized the similarity among fire safety evaluation systems, making it easier for the code officials to deal with several fire safety evaluation systems.

3.2 Consulting Panels

The tasks involved in system development were heavily dependent on professional judgment. The professional judgment of the project staff was supplemented and supported in a formal manner. Two consulting panels were formed to provide this support: The Delphi Panel and the Peer Consulting Panel.

Delphi Panel. A group of 14 experts from the Center for Fire Research not assigned to the program served as the Delphi panel. They provided guidance in the selection of preliminary numerical values representing the relative importance of various fire safety features of buildings and of fire safety hazards. Details regarding the function and composition of this panel are contained in Appendix A of NBSIR 82-2562 [10].

Peer Consulting Panel. NBS staff worked in close cooperation with a task group selected by the subcommittee for Detection and Correctional Occupancies of the NFPA Committee on the Safety to Life to provide advice to the staff and in-depth review of their work. See Section 4.5.

4.1 Fire Safety Parameter Identification

The fire safety parameters are measures of the building characteristics and fire protection features that bear upon the safety of the people who may be in the facility at the time of a fire. The safety parameters, selected by the project staff, were determined by examining the specific code requirements for residential facilities, and by evaluating the impact of various elements of the code. The selected safety parameters were modified first by the NBS Delphi Panel and later by the Peer Consulting Panel. The preliminary safety parameters are shown in Figure 1.

For each safety parameter, two or more levels or categories were defined. Each category corresponded to a condition specifically identified as a level of performance in the Life Safety Code and/or likely to be encountered in residential buildings, and each category differed from all other categories in a significant way. For example, one parameter was defined as "Manual Fire Alarm" and the three categories are: No Alarm; Manual Fire Alarm without Fire Department Notification; and Manual Fire Alarm with Fire Department Notification.

Figure 2 shows the preliminary "matrix" form of the breakdown of the safety parameters for the facility classifications. The safety parameters are designed to constitute a complete assembly of all of the basic building factors determining the level of safety in a residential facility for which equivalency could be expressed.

In addition to the safety parameters and their subcategories illustrated in Figure 2, there is an additional series of items required by the Life Safety Code for which no equivalency could be expressed. These items, illustrated in Figure 3, relate primarily to building utilities or building

services and are covered in the Facility Fire Safety Requirements Worksheet section of the Fire Safety Evaluation System for Detention and Correctional Occupancies (Appendix A of this report). Only two subcategories are defined for these items: "Yes" (Meets the requirements) "No" (Does not meet the requirements).

4.2 Fire Safety Parameter Quantification

The goal of the NBS research effort was to develop a system for evaluating the fire safety of a building by obtaining weighted sums of the point values of the individual safety parameters. Therefore, each subcategory of each parameter had to be assigned a point value. In order to provide the best available concensus judgment and experience in determining the preliminary values, the Delphi panel was established.

Each member of the panel was provided with copies of an initial matrix similar to the one shown in Figure 2. Each person then evaluated the relative importance with respect to fire safety of each item in the matrix without consultation with other members of the panel. The members of the Delphi Panel were advised that the goal of the project was to develop a system that was similar to the Fire Safety Evaluation System for Health Care Facilities. See Appendix B of Reference 9 or Appendix E of Reference 11 for a more detailed discussion of this operation and its methodological base.

4.3 Redundant Safety Subsystem Creation

A basic principle of fire protection is that there must be a redundancy of protection so that the failure of a single protection device or method will not result in failure of the entire safety system. In addition, the development of a redundant approach, as used in this safety evaluation system, avoids the pitfall of traditional approaches sometimes used in grading systems where all of the elements are considered mutually exclusive of each other and a single total score determines acceptability. It is possible under such a system to fail to detect the absence of a critical element. The evaluation system establishes redundancy on the basis of

in-depth coverage of the principal fire safety methodologies. The original redundant methodologies used in the system were those related to fire safety through General Fire Safety, and the subsystems: Fire Development, Fire Containment, Emergency Egress, and Emergency Refuge. As the project progressed, the values assigned to Fire Development and Fire Containment were quite similar, and the two were combined to form a single redundancy system, Fire Control.

The original redundant methodologies were chosen after analysis of residential fire safety decision trees, especially the National Fire Protection Association's Fire Safety Concepts Tree. [14] [15]

The decision tree approach divides fire protection into two groups of elements: "Manage Fire" and "Manage Exposed". Those elements related to "Manage Fire" (i.e., the control of fuel and arrangement, compartmentalization, and other mechanisms to contain fire and its impacts; extinguishment suppressions and other means of terminating fire development) were incorporated into Fire Control.

"Manage Exposed" (i.e., the provision of refuge either by evacuation or by establishment of safe areas of refuge) was subdivided into two redundancy methodologies: Emergency Egress and Emergency Refuge.

Each member of the Delphi panel judged the importance of each safety parameter relative to the separate fire safety methodologies of Fire Development, Fire Containment, Emergency Egress, and Emergency Refuge. The Delphi results were processed and analyzed by the project staff at NBS and then reviewed in subsequent conference meetings of the Delphi panel. By this process, the parameters that have a significant impact on each of the redundant methodologies were identified. It was found that many of the parameters affect more than one of the methodologies. In the judgment of the panel, Sprinklers, Separation of Residential Housing areas, Vertical Openings, and Protection of Hazardous Areas have an impact on all four. Figure 4 (Table 2 of the evaluation worksheets found in Appendix A) shows which parameters apply to which methodologies, where Fire Development and Fire Containment are combined as Fire Control.

4.4. Calibration

Once the basic framework for the system was established, it was necessary to determine the level at which code equivalency is achieved. Chapter 14 and 15 contain a set of requirements for each combination of the following facility characteristics:

1. Use Conditions (Zoned Egress, Zoned Impeded Egress, Impeded Egress, and Contained)

2. Number of floors above grade (one, two, and greater than or equal to three)

3. Totally sprinklered or not totally sprinklered

4. New or existing facility

For each of the 48 combinations of use condition, age, number of floors, and sprinkler level, there is a category for each parameter on the worksheet (Table 1 of Figure 5) that corresponds to the requirements of Chapters 14 and 15. The circled values in Figure 5 show the requirements for Chapter 14 (new facility) for use condition V, three or more stories and not totally sprinklered. The circled values in Figure 5 are transferred to the appropriate unshaded blocks in Figure 6. Where the block contains a (÷2), one-half the value in Figure 5 is entered. The four columns are each summed. These four sums are the four values in the table of Mandatory Requirements (Table 3a, Page A15 in Appendix A.) Figure 7 shows the numerical values for each of the 48 sets of requirements for the FSES/D&C.

4.5 Professional Judgment and Review

The Peer Consulting Panel was formed to provide an independent in-depth review of the staff's work and for the insight of experts. The first Panel assisted in developing a system that was generally useful for evaluating residential facilities. This panel was called the Peer Consulting Panel for the development of the Fire Safety Evaluation System for Board and Care Home and the Fire Safety Evaluation System for Multifamily Housing. Once the basic residential system was developed, it was necessary to modify the system to meet the special needs and characteristics of detention and correctional

facilities. This was done with the assistance of a second Peer Consulting Panel. The members of this second panel were selected by the Subcommittee for Detention and Correctional Occupancies from among its members. The modus operandi for both Peer Consulting Panels was to present candidate solutions that could be produced by the FSES and ask the panel members to appraise the relative safety of that solution to the safety provided by explicit compliance with the detailed requirements of the Life Safety Code. The NBS staff presented to the panel members those solutions considered to involve the minimum level of safeguards. The approach is discussed in greater detail by Nelson [16].

The Second Peer Consulting Panel first met after the staff had developed a Fire Safety Evaluation System for Detection and Correctional Occupancies based on the 1981 edition of the Life Safety Code. The panel suggested changes to update the system to meet the requirements of the proposed 1985 edition of the Life Safety Code. It also suggested other changes for individual parameters. At the second meeting the staff presented to the panel a survey of prison and jail facilities. No additional changes were proposed at this meeting.

4.6 Computer Program

In addition to the formation of the Peer Consulting Panel, the staff members made use of a computer program to aid them in evaluating the proposed system and analyzing proposed changes. This program generates all alternative combinations of building safety features that the system will indicate as acceptable. (To simplify the computer output, only the minimum demand set of acceptable solutions are printed)

Since the evaluation system is theoretically capable of evaluating each of over 80 million combinations of the 13 safety parameters, it is important that the only combinations meeting the requirements of the system are those that provide a satisfactory level of fire protection. By using the computer output, the evaluator can review all acceptable solutions for upgrading a given building configuration, and can be assured that the selection of combinations to be reviewed is the complete set and not an unintentionally

biased subset. The printouts of the combinations of safety features can be analyzed by an experienced individual to establish acceptability of the solutions. From the computer printout, it is easy to determine those combinations that just miss being acceptable solutions. The computer generated building configurations were used by the staff and the Peer Consulting Panel to check whether the system gives acceptable evaluations. The computer analysis was used as part of an iterative process of changing and checking, in an effort to refine the system.

5. System Testing

5.1 Need for Testing

The Peer Consulting Panel recommended to the National Fire Protection Association, Committee on Safety to Life, Subcommittee for Detention and Correctional Occupancies that the Fire Safety Evaluation System for Detention and Correctional Occupancies should be seriously considered for incorporation in the Life Safety Code. It also suggested that the subcommittee request NBS to inform the prison and jail management community about the details of the evaluation system and to obtain as many actual field test measurements of such facilities as possible before a final decision is made. The Subcommittee accepted the panel's recommendation and reported its decision to the Committee on the Safety to Life. An official statement of this decision was published in the NFPA Technical Committee Reports (1984) TCR-84-A [1, p. 395].

5.2 Testing

Because of time and monetary constraints, a special appeal was made to the industry for volunteers to participate in the field testing. Approximately 50 organizations volunteered for this effort. A number of these organizations represented large groups of facilities (e.g. Federal prisons, U.S. Navy jails, metropolitan area jail systems, and state jails). The exact number of individual facilities covered was not determined, but NBS mailed out more than four hundred individual evaluation packages.

The individual evaluation package (Appendix C - Field Test Package) included: A fire safety evaluation worksheet, a supplemental building data form, and a

concluding comments form. The worksheet was similiar to the worksheet shown in Appendix A. A completed worksheet identified the safety conditions in the facility and whether or not the facility passed the FSES equivalency criteria. The supplemental building data form consisted of a series of questions about the 13 safety parameters used in the worksheet. The purpose of the questions was to evaluate the surveyor's detailed knowledge of the Life Safety Code and the safety parameter definitions. Another purpose, was to identify ambiguities in the proposed safety parameter definitions which may lead to wrong classifications of safety systems in surveyed facilities. The concluding comments form asked questions about: 1. the workability of the FSES in surveying a facility and 2. whether or not the system gives an appropriate appraisal of facility safety conditions.

NBS received 32 completed evaluation forms. A detailed analysis of data received showed that in the 15 cases where the surveyor was familiar with the definitions of the Life Safety Code, it was believed the FSES correctly evaluated the level of safety of the facility. These 15 cases were used to support the Peer Consulting Panel. In 17 cases the surveyor was not familiar with the code definitions, the FSES was not applied correctly, and the FSES could not be properly evaluated.

NBS presented the survey data, the data analysis, and the output of computer program, described in 4.6, to the Peer Consulting Panel. Based on this presentation the Panel decided that the available data provides sufficient evidence that passing the FSES demonstrated that a facility provides a level of fire safety equivalent to the code requirements. They presented this conclusion to the LSC Subcommittee for Detention and Correctional Occupancies, and asked that the FSES be included as an appendix in the 1985 edition of the LSC and be referenced in the detention and correctional occupancies chapters.

6.0 Summary

The report provides a method for evaluating the fire safety of jails and prisons by determining if a building has fire safety equivalent to a building that meets the requirements of the Life Safety Code. This method is based on the articulation of levels of building safety and on the redundancy of safeguards. This method can provide the necessary flexibility enabling a designer to achieve minimum cost solutions for a specfied level of safety.

The "Fire Safety Evaluation System for Detention and Correctional Occupancies" is a specific example of an equivalency approach. The system provides equivalency to life safety requirements to the proposed 1985 edition of the Life Safety Code and can be revised to reflect other editions of the Life Safety Code.

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Figure 1
Preliminary Safety Parameters

1. CONSTRUCTION
   BUILDING HEIGHTS
   1 Story _____
   2 Story _____
   3-6 Story _____
   Over 6 Story _____

2. HAZARDOUS AREAS

3. SMOKE CONTROL

4. MANUAL FIRE ALARM

5. SMOKE DETECTION

6. AUTOMATIC SPRINKLERS

LIVING UNIT PARAMETERS

7. INTERIOR FINISH WITHIN LIVING UNIT(S)

8. INTERIOR ARRANGEMENT OF LIVING UNIT(S)

9. EGRESS FROM LIVING UNIT(S)

MULTI-UNIT/EXTRA & INTER UNIT PARAMETERS

10. SEPARATION WALLS (LIV. UNIT FROM OTHER LIV. UNITS AND/OR COMMON SPACES)

11. SEPARATION DOORS

12. EMERGENCY MOVEMENT ROUTES (Quality)

13. EXIT ROUTE

14. INTERIOR FINISH (EGRESS ROUTES)

15. VERTICAL OPENINGS

Figure 2. Sample Delphi Form–Large Facilities

" What is the relative impact on the general (or overall) life safety of the occupants of a hotel of a dormitory type residential structure of each of the items identified in the matrix? "

1. CONSTRUCTION	COMBUSTIBLE				NONCOMBUSTIBLE			
	WOOD FRAME		ORDINARY		HEAVY			FIRE
BUILDING HEIGHTS	UNPROT.	PROT.	UNPROT.	PROT.	TIMBER	UNPROT.	PROT.	RESIS.
1 Story								
2 Story								
3–6 Story								
Over 6 Story								

2. HAZARDOUS AREAS	STRUCTURALLY ENDANGERING			NOT STRUCTURALLY ENDANGERING			NO HAZARDOUS AREAS
	NO PROT.	SINGLE PROT.	DOUBLE PROT.	NO PROT.	SINGLE PROT.	DOUBLE PROT.	

3. SMOKE CONTROL	NO CONTROL	SMOKE PARTITIONS		MECHANICALLY ASSISTED AUTO		
		MANUAL	AUTOMATIC	BY ZONE	BY UNIT	CORRIDORS

4. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. CONN.	w/F.D. CONN.

5. SMOKE DETECTION	NONE	SINGLE STATION		INTERIOR CONNECTED SYSTEM	
		LIVING UNITS ONLY	UNITS & CORR.	LIVING UNITS	TOTAL SYSTEM

6. AUTOMATIC SPRINKLERS	NONE	LIVING UNITS ONLY	CORR. ONLY	CORR. & HAB. SPACE	TOTAL

LIVING UNIT PARAMETERS

7. INTERIOR FINISH WITHIN LIVING UNIT(S)	SPECIAL HAZARD	FLAME SPREAD RATINGS			
		<200	>75 ≤200	>25 ≤ 75	≤25

8. INTERIOR ARRANGEMENT OF LIVING UNIT(S)	OPEN STAIRS ETC.	MULTI-LEVEL		SINGLE LEVEL	
		LEVELS CUT OFF			
		MANUAL CLOSING	AUTO CLOSING	PARTITIONED	UNPARTITIONED (i.e., Sing e Room)
			< 20 MIN ≥ 20 MIN		

9. EGRESS FROM LIVING UNIT(S)	MULTI-LEVEL			SINGLE LEVEL	
	SINGLE ROUTE	MULTI ROUTE	EACH LEVEL	SINGLE ROUTE	MULTI ROUTE

MULTI-UNIT/EXTRA & INTER UNIT PARAMETERS

10. SEPARATION WALLS (LIV. UNIT FROM OTHER LIV. UNITS AND/OR COMMON SPACES)	NONE OR INCOMPLETE	<20 MIN	≥20 MIN <1 HOUR	≥HOUR

11. SEPARATION DOORS	NO DOOR	< 20 MIN F.R.	≥ 20 MIN F.R.	≥ 20 MIN F.R.& CLOSER

12. EMERGENCY MOVEMENT ROUTES (Quality)	MULTIPLE ROUTES				
	< 2 STANDARD ROUTES	DEFICIENT	w/o HORIZ.	HOR. EXIT	DIRECT EXIT FROM LIVING UNIT

13. EXIT ROUTE	D.E. >100'	D.E. 35'–100'	NO D.E. > 35' & TRAVEL IS:			
			>150'	100–150'	50–100'	< 50'

14. INTERIOR FINISH (EGRESS ROUTES)	SPECIAL HAZARD	FLAME SPREAD RATINGS			
		<200	>75 ≤200	>25≤75	<25

15. VERTICAL OPENINGS	OPEN(OR INCOMPLETE ENCLOSURE)		ENCLOSED			
	THRU 4 OR MORE FLRS	2–3 FLRS	1 FLR	<1 HR	≥1 HR <2 HR	≥2 HR

Figure 3 Additional Safety Factors

STEP 7: Considerations

The following items are required by the Life Safety Code as fire safety features but are beyond the scope of equivalency evaluation of the Fire Safety Evaluation System. They must be accounted for separately.

	YES	NO
1. Utilities and building services conform to the requirement of Section 14-5 or 15-5 of the Life Safety Code.		
2. 24-hour staffing is provided as required by Section 31-5.1 of the Life Safety Code.		
3. Furnishing and decorations combustibility is limited in accordance with section 31-5.4 of the Life Safety Code.		
4. Portable fire extinguishers are provided at least at staff locations.		
5. Standpipes are provided in all buildings over 75 ft. tall and non-sprinklered buildings over 3 stories in height.		
6. If use conditions III or IV are involved, is the combination of staff location, remote release locks, and fire detection sufficient to insure the prompt release required by those use conditions?		

Figure 4
Individual Safety Evaluation

Safety Parameter	Fire Control Provided (S_1)	Egress Provided (S_2)	Refuge Provided (S_3)	General Fire Safety Provided (S_4)
1. Construction				
2. Hazardous Areas		÷2		
3. Fire Alarm	÷2			
4. Smoke Detection	÷2			
5. Automatic Sprinklers		÷2	÷2	
6. Interior Finish (egress, etc.)				
7. Interior Finish (other areas)	÷2			
8. Cell/Room Enclosure				
9. Separation of Residential Housing Areas From Other Areas		÷2		
10. Exit System			÷2	
11. Exit Access				
12. Vertical Openings	÷2			
13. Smoke Control				
TOTAL	S_1 =	S_2 =	S_3 =	S_4 =

Figure 5
Safety Parameter Values
Condition V – More than 3 story
Existing Occupancy – Now Sprinklered

1. CONSTRUCTION TYPE	V(000)	V(111)	IV(2HH)	III(200)	III(211)	II(000)	II(111)	II(222) or I(any)
1st FLOOR	-2	0	0	-2	0	0	2	2
2nd FLOOR	-2	0	0	-2	0	-2	2	2
3rd FLOOR	-8(-2)A	-2(0)A	-2(0)A	-8(-2)A	0	-5(-2)A	2	2
≥4th FLOOR	-10(-2)A	-4(0)A	-4(0)A	-10(-2)A	-2(0)A	-8(-2)A	0	2

2. HAZARDOUS AREAS	Within Res. Housing Area		Outside Res. Housing Area		None or No Deficiencies
	Double Deficiency	Single Deficiency	Double Deficiency	Single Deficiency	
	-7	-4	-4(-7)B	0	0

3. FIRE ALARM	No Alarm	w/o FD Notification	w/ FD Notification	
			w/o Man. Alarm	w/ Man. Alarm
	-1	0	1	2

4. SMOKE DETECTION	None	Residential Housing Area			Total Bldg.
		Partial Coverage		Full Coverage	
		Corr. & Comm. Spa. & Lrg. Sleeping Rms.	All Sleeping Rms.		
	-4(-1)A	0	2	4	5

5. AUTOMATIC SPRINKLERS	None	Residential Housing Area	Entire Building
	0	8	10

6. INTERIOR FINISH (Corridors & Egress)	Class C	Class B	Class A
	-8	-1	0

7. INTERIOR FINISH (Other Areas)	Class C	Class B	Class A
	-2	-1	0

8. CELL/ROOM ENCLOSURE	Cells (rooms) Face on corridor (each cell is a separate residential housing area)	Intervening Common space Within Res. Housing Area		
		Open	Smoke Tight < 1 hr	≥ 1 hr Fire Resistive
	0	-3(-5)C (0)D	0(-2)C	2(0)C

9. SEPARATION OF RES. HOUSING AREAS FROM OTHER AREAS	Incomplete	Smoke Tight < 1 hr .	≥ 1 hr Fire Resistive
	-6(2)K	2(4)H	4(2)B

10. EXIT SYSTEM	< 2 Routes	Multiple Routes		
		Deficient	No Deficiencies	Direct Exit
	-6	-2	0	3

11. EXIT ACCESS	Dead Ends		No Dead Ends > 50 ft(I) & Travel Is		
	< 100 ft	>50 ft(I)	> 225 ft	≤225 ft & v150 ft	≤150 ft
	-2(0)G	-1(0)G	-2(0)G	-1(0)G	0

12. VERTICAL OPENINGS	Open or Incomplete Enclosures			Enclosed (E)	
	Thru ≥ 4 Floors	2-3 Floors	1 Floor	Smoke Tight	Fire Resistive
	-10(0)F	-7(0)F	-2(0)F	0	2(0)F

13. SMOKE CONTROL	No Control	Smoke Compartments		Heat & Smoke Vent System
		Passive	Mechanically Assisted	
	-2	2	3	8

Figure 6
Individual Safety Evaluation
Condition V – More than 3 story

Safety Parameter	Fire Control Provided (S_1)	Egress Provided (S_2)	Refuge Provided (S_3)	General Fire Safety Provided (S_4)
1. Construction	2		2	2
2. Hazardous Areas	0	÷2 0	0	0
3. Fire Alarm	÷2 1	2		2
4. Smoke Detection	÷2 2	4		4
5. Automatic Sprinklers	0	÷2 0	÷2 0	0
6. Interior Finish (egress, etc.)		−1		−1
7. Interior Finish (other areas)	÷2 −1			−2
8. Cell/Room Enclosure			0	0
9. Separation of Residential Housing Areas From Other Areas	4	÷2 2	4	4
10. Exit System		0	÷2 0	0
11. Exit Access		0		0
12. Vertical Openings	÷2 1	2	2	2
13. Smoke Control		2	2	2
TOTAL	$S_1 = 9$	$S_2 = 11$	$S_3 = 10$	$S_4 = 13$

Figure 7a
Requirements for Safety Parameters Values
Partially Sprinklered and Non-Sprinklered Buildings
Condition II – Zoned Egress
Existing Occupancy

FLOOR	1	2	≥ 3
1. Construction	-2	0	2
2. Hazardous areas	0	0	0
3. Fire alarm	2	2	2
4. Smoke detection	0	0	0
5. Automatic sprinklers	0	0	0
6. Interior finish (egress, etc.)	-1	-1	-1
7. Interior finish (other areas)	-2	-2	-2
8. Cell/Room enclosure	0	0	0
9. Separation of residential housing areas from other areas	2	2	2
10. Exit system	0	0	0
11. Exit access	0	0	0
12. Vertical openings	0	2	2
13. Smoke control	2	2	2

Figure 7b
Requirements for Safety Parameters Values
Partially Sprinklered and Non-Sprinklered Bldg.
Condition III - Impeded Zoned Egress
Existing Occupancy

FLOOR	1	2	≥3
1. Construction	-2	0	2
2. Hazardous areas	0	0	0
3. Fire alarm	2	2	2
4. Smoke detection	0	0	0
5. Automatic sprinklers	0	0	0
6. Interior finish (egress, etc.)	-1	-1	-1
7. Interior finish (other areas)	-2	-2	-2
8. Cell/Room enclosure	0	0	0
9. Separation of residential housing areas from other areas	2	2	2
10. Exit system	0	0	0
11. Exit access	0	0	0
12. Vertical openings	0	2	2
13. Smoke control	2	2	2

Figure 7C
Requirements for Safety Parameters Values
Partially Sprinklered and Non-Sprinklered Buildings
Condition IV - Impeded Egress
Existing Occupancy

FLOOR	1	2	≥3
1. Construction	-2	0	2
2. Hazardous areas	0	0	0
3. Fire alarm	2	2	2
4. Smoke detection	4	4	4
5. Automatic sprinklers	0	0	0
6. Interior finish (egress, etc.)	-1	-1	-1
7. Interior finish (other areas)	-2	-2	-2
8. Cell/Room enclosure	0	0	0
9. Separation of residential housing areas from other areas	2	2	2
10. Exit system	0	0	0
11. Exit access	0	0	0
12. Vertical openings	0	2	2
13. Smoke control	2	2	2

Figure 7d
Requirements for Safety Parameters Values
Partially Sprinklered and Non-Sprinklered Buildings
Condition V - Contained
Existing Occupancy

FLOOR	1	2	≥3
1. Construction	0	2	2
2. Hazardous areas	0	0	0
3. Fire alarm	2	2	2
4. Smoke detection	4	4	4
5. Automatic sprinklers	0	0	0
6. Interior finish (egress, etc.)	-1	-1	-1
7. Interior finish (other areas)	-2	-2	-2
8. Cell/Room enclosure	0	0	0
9. Separation of residential housing areas from other areas	4	4	4
10. Exit system	0	0	0
11. Exit access	0	0	0
12. Vertical openings	0	2	2
13. Smoke control	2	2	2

Figure 7e
Requirements for Safety Parameters Values
Partially Sprinklered and Non-Sprinklered Buildings
Condition II - Zoned Egress
Condition III - Impeded Zoned Egress
New Occupancy

FLOOR	1	2	≥3
1. Construction	0	0	2
2. Hazardous areas	0	0	0
3. Fire alarm	2	2	2
4. Smoke detection	0	0	0
5. Automatic sprinklers	0	0	0
6. Interior finish (egress, etc.)	0	0	0
7. Interior finish (other areas)	-2	-2	-2
8. Cell/Room enclosure	0	0	0
9. Separation of residential housing areas from other areas	4	4	4
10. Exit system	0	0	0
11. Exit access	0	0	0
12. Vertical openings	0	2	2
13. Smoke control	2	2	2

Figure 7f
Requirements for Safety Parameters Values
Partially Sprinklered and Non-Sprinklered Buildings
Condition IV – Impeded Egress
New Occupancy

FLOOR	1	2	≥3
1. Construction	0	0	2
2. Hazardous areas	0	0	0
3. Fire alarm	2	2	2
4. Smoke detection	4	4	4
5. Automatic sprinklers	0	0	0
6. Interior finish (egress, etc.)	0	0	0
7. Interior finish (other areas)	−2	−2	−2
8. Cell/Room enclosure	0	0	0
9. Separation of residential housing areas from other areas	4	4	4
10. Exit system	0	0	0
11. Exit access	0	0	0
12. Vertical openings	0	2	2
13. Smoke control	2	2	2

Figure 7g
Requirements for Safety Parameters Values
Partially Sprinklered and Non-Sprinklered Buildings
Condition V - Contained
New Occupancy

FLOOR	1	2	≥3
1. Construction	0	2	2
2. Hazardous areas	0	0	0
3. Fire alarm	2	2	2
4. Smoke detection	4	4	4
5. Automatic sprinklers	0	0	0
6. Interior finish (egress, etc.)	0	0	0
7. Interior finish (other areas)	-2	-2	-2
8. Cell/Room enclosure	0	0	0
9. Separation of residential housing areas from other areas	4	4	4
10. Exit system	0	0	0
11. Exit access	0	0	0
12. Vertical openings	0	2	2
13. Smoke control	2	2	2

Figure 7h
Requirements for Safety Parameters Values
Totally Sprinklered Buildings
Condition II – Condition III – Condition IV
Existing Occupancy

FLOOR	1	2	≥ 3
1. Construction	−2	−2	−2
2. Hazardous areas	0	0	0
3. Fire alarm	2	2	2
4. Smoke detection	0	0	0
5. Automatic sprinklers	10	10	10
6. Interior finish (egress, etc.)	−3	−3	−3
7. Interior finish (other areas)	−2	−2	−2
8. Cell/Room enclosure	0	0	0
9. Separation of residential housing areas from other areas	−6	−6	−6
10. Exit system	0	0	0
11. Exit access	−1	−1	−1
12. Vertical openings	0	0	0
13. Smoke control	2	2	2

Figure 7i
Requirements for Safety Parameters Values
Totally Sprinklered Buildings
Condition V – Contained
Existing Occupancy

FLOOR	1	2	≥3
1. Construction	−2	−2	−2
2. Hazardous areas	0	0	0
3. Fire alarm	2	2	2
4. Smoke detection	0	0	0
5. Automatic sprinklers	10	10	10
6. Interior finish (egress, etc.)	−3	−3	−3
7. Interior finish (other areas)	−2	−2	−2
8. Cell/Room enclosure	0	0	0
9. Separation of residential housing areas from other areas	2	2	2
10. Exit system	0	0	0
11. Exit access	−1	−1	−1
12. Vertical openings	0	0	0
13. Smoke control	2	2	2

Figure 7j
Requirements for Safety Parameters Values
Totally Sprinklered Buildings
Condition II – Condition III – Condition IV
New Occupancy

FLOOR	1	2	≥3
1. Construction	−2	−2	2
2. Hazardous areas	0	0	0
3. Fire alarm	2	2	2
4. Smoke detection	0	0	0
5. Automatic sprinklers	10	10	10
6. Interior finish (egress, etc.)	−1	−1	−1
7. Interior finish (other areas)	−2	−2	−2
8. Cell/Room enclosure	0	0	0
9. Separation of residential housing areas from other areas	−6	−6	−6
10. Exit system	0	0	0
11. Exit access	−1	−1	−1
12. Vertical openings	0	0	2
13. Smoke control	2	2	2

Figure 7k
Requirements for Safety Parameter Values
Totally Sprinklered Buildings
Condition V – Contained
New Occupancy

ROOM	1	2	≥ 3
1. Construction	−2	−2	2
2. Hazardous areas	0	0	0
3. Fire alarm	2	2	2
4. Smoke detection	0	0	0
5. Automatic sprinklers	10	10	10
6. Interior finish (egress, etc.)	−1	−1	−1
7. Interior finish (other areas)	−2	−2	−2
8. Cell/Room enclosure	0	0	0
9. Separation of residential housing areas from other areas	2	2	2
10. Exit system	0	0	0
11. Exit access	−1	−1	−1
12. Vertical openings	0	0	2
13. Smoke control	2	2	2

Appendix A

Fire Safety Evaluation System for Detention and Correctional Occupancies

This manual describes a system for determining the relative level of safety for new or existing Detention and Correctional Occupancies in Use Conditions II, III, IV, or V, as compared with explicit conformance with the applicable requirements of the Life Safety Code (National Fire Protection Association Standard, No. 101-1985. This system considers mixes and arrangements of safeguards, most of which are described in detail in that code. References to "sections" in this manual refer to sections in the 1981 edition of the Life Safety Code.

Procedure for Determining Equivalency

Use the "Fire Safety Evaluation Worksheets, Detention and Correctional Occupancies" to evaluate the entire facility as defined in Sections 14-1 and 15-1 on a single worksheet. Where different use conditions or fire protection features are involved, portions of the facility separated from each other by 2-hour or greater fire resistive construction (including any members that bear the load of detention use, egress, or refuge space and with Class B fire doors in any communication opening) may be evaluated separately.

Maintenance

Any protection system, requirements, arrangements, or procedures which are not maintained in a dependable operating condition are used in such a manner that the intended fire safety function or hazard constraint is impaired, or those not in a sufficient state of readiness should be considered as defective and receive no credit in the evaluation.

Use Conditions

Use conditions are as defined in sections 14-1.4 and 15-1.4. The basic definitions from those sections are repeated below. Use Condition I is not covered by this evaluation system.

Use Condition I -- Free Egress

Free movement is allowed from sleeping areas, and other spaces where access or occupancy is permitted, to the exterior via means of egress meeting the requirements of the code.

Use Condition II - Zoned Egress

Free movement is allowed from sleeping areas and any other occupied smoke compartment to one or more other smoke compartments.

Use Condition III - Zoned Impeded Egress

Free movement is allowed within individual smoke compartments, such as within a residential unit comprised of individual sleeping rooms and group activity space, with egress impeded by remote control release of means of egress from such smoke compartment to another smoke compartment.

Use Condition IV - Impeded Egress

Free movement is restricted from an occupied space. Remote controlled release is provided to permit movement from all sleeping rooms, activity spaces and other occupied areas within the smoke compartment to other smoke compartment(s).

Use Condition V -- Contained

Free movement is restricted from an occupied space. Staff controlled manual release at each door is provided to permit movement from all sleeping rooms, activity spaces and other occupied areas within the smoke compartment to other smoke compartment(s).

Safety Parameter Table (General Discussion)

The safety parameters are a measure of those building factors that bear upon or contribute to the safety of those persons who may be in the building at the time of a fire.

Each of the safety parameters is to be analyzed. And the safety value for each parameter that best describes the condition in the building is to be identified. Only one value for each of the parameters is to be chosen. If two or more appear to apply, the one with the lowest point value governs.

1. Construction

Construction types are defined by the fire resistance and combustibility of load bearing framing members, floor construction and roof construction in accordance with NFPA 220 (1979), Standards of Building Construction. The following table is abstracted from NFPA 220 (1979).

Table 3 Fire Resistance Requirements for Type I through Type V Construction

	Type I		Type II			Type III		Type IV	Type V	
	443	332	222	111	000	211	200	2HH	111	000
EXTERIOR BEARING WALLS —										
Supporting more than one floor, columns or other bearing walls	4	3	2	1	0[1]	2	2	2	1	0[1]
Supporting one floor only	4	3	2	1	0[1]	2	2	2	1	0[1]
Supporting a roof only	4	3	1	1	0[1]	2	2	2	1	0[1]
INTERIOR BEARING WALLS —										
Supporting more than one floor, columns or other bearing walls	4	3	2	1	0	1	0	2	1	0
Supporting one floor only	3	2	2	1	0	1	0	1	1	0
Supporting a roof only	3	2	1	1	0	1	0	1	1	0
COLUMNS —										
Supporting more than one floor, bearing walls or other columns	4	3	2	1	0	1	0	H[2]	1	0
Supporting one floor only	3	2	2	1	0	1	0	H[2]	1	0
Supporting a roof only	3	2	1	1	0	1	0	H[2]	1	0
BEAMS, GIRDERS, TRUSSES & ARCHES —										
Supporting more than one floor, bearing walls or columns	4	3	2	1	0	1	0	H[2]	1	0
Supporting one floor only	3	2	2	1	0	1	0	H[2]	1	0
Supporting a roof only	3	2	1	1	0	1	0	H[2]	1	0
FLOOR CONSTRUCTION	3	2	2	1	0	1	0	H[2]	1	0
ROOF CONSTRUCTION	2	1½	1	1	0	1	0	H[2]	1	0
EXTERIOR NONBEARING WALLS	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]

Those members listed that are permitted to be of approved combustible material.

[1] Requirements for fire resistance of exterior walls, the provision of spandrel wall sections, and the limitation or protection of wall openings are not related to construction type. They need to be specified in other standards and codes, where appropriate, and may be required in addition to the requirements of this Standard for the construction type.

[2] "H" indicates heavy timber members; see text for requirements.

Where the facility includes additions or connected structures of different construction the rating and classification of the structure is based on (a) separate buildings if a two hour or greater fire resistive separation exists between the portions of the building and on (b) the lower safety parameter point score involved if such a separation does not exist.

The story used to determine the parameter values is the highest story used for confinement purposes. Story height is based on stories starting with the primary level of exit discharge. When there are stories below the primary level of exit discharge, the maximum value assigned the construction parameter is based on a 2-story building or the actual story height, which ever is the lower value.

A multi-tiered open cell block may be considered as single story providing that one or more of the following conditions exist:

a. A smoke control system is provided (see recommended design criteria in A-15-3.1.3) to maintain the level of smoke filling, from potential cell fires, at least 5 feet above the floor level of any occupied tier.

b. A smoke control system as described in a. above is provided to maintain the level of smoke filling at least 5 feet above the exit level where:

(1) The cell block is Occupancy Condition II, or

(2) The cell block is Occupancy Condition III and all persons housed in the cell block can pass through a free access smoke barrier or freely pass below the calculated smoke level with not more than 50 feet of travel from their cell.

c. Complete automatic sprinkler protection is provided.

2. Hazardous Areas

The assignment of charges for hazardous areas is a four-step process.

Step. 1. Identify Hazardous Areas. Hazardous areas are defined in sections 14-3.2 and 15-3.2.

Step 2. Determine the Level of Hazard. A hazardous area is classed as severe if it is a padded cell or if it has sufficient fire or explosion potential to defeat the basic integrity of the building framing as defined in Parameter 1.

Step 3. Determine the Fire Protection Provided. The parameter value for hazardous areas is based on the presence or absence of the fire protection necessary to control or confine the hazard. Two levels of fire protection are considered. The first consists of automatic sprinklers or other appropriate extinguishing system covering the entire hazard. The second is based on fire resistive enclosures including any bearing members in the space, partitions separating the hazardous area from all other spaces, and doors to the space sufficient to exceed the potential of the fire load involved. Any hazardous space that has either protection system is classified as having single protection. Any hazardous space that is both fully enclosed in a capable fire resistive enclosure and sprinklered is classified as having both (i.e. double level protection). On this basis, any fuel load that has such potential as to overwhelm the available structural capability of both its own enclosure and the basic structure could as a maximum have single protection.

Step. 4 Determine the Degree of Deficiency and Assign Parameter Values. The parameter value is finally determined on the basis of the degree of deficiencies that the hazardous area has in terms of the level of protection needed.

Figure 1 provides a matrix type table to assist in determining degree of deficiency to be assessed.

In some situations, more than one hazardous area with the same or differing levels of deficiency will exist. The charge is based on the single most serious charge for a hazardous area found.

	NO PROTECTION	SPRINKLER PROTECTION	1-HOUR FIRE RESISTIVE ENCLOSURE	SPRINKLERED & 1-HOUR FIRE RESISTIVE ENCLOSURE
HAZARDOUS AREA	SINGLE DEFICIENCY	NO DEFICIENCIES		
SEVERELY HAZARDOUS AREA	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	NO DEFICIENCIES [A] DOUBLE DEFICIENCY [B]	NO DEFICIENCIES [A] SINGLE DEFICIENCY [B]

A. If fire resistance and structural strength exceed maximum potential of hazard.

B. If fire resistance or structural strength is not sufficient to withstand potential of hazard.

FIGURE 1 - HAZARDOUS AREAS - DEGREE OF DEFICIENCY

3. Fire Alarm

a. No Alarm - There is no fire alarm system, or the system is incomplete and does not meet the requirements necessary for a higher scored category.

b. W/O F.D. Notification - There is a manual fire alarm system or smoke detection system conforming with the appropriate requirements of 14-3.4 or 15-3.4 except that the requirements of 14-3.4.4 or 15-3.4.4 covering automatic transmission of the alarm to the fire department are not met.

c. W/F.D. Notification - There is a manual fire alarm or smoke detection system conforming with the appropriate requirements of 14-3.4 or 15-3.4.

(1) W/O Manual Alarm - There is no manual alarm system but a smoke detection alarm system or sprinkler system recognized under Parameters 4 or 5 of this system is provided and is arranged to transmit an alarm automatically to the fire department.

(2) W/Manual Alarm - There is a manual alarm system arranged to transmit an alarm automatically to the fire department.

Note: The locking of manual fire alarm boxes at staff locations in lieu of resident accessible alarm boxes in sleeping room areas is acceptable when staff is present and has immediate access to the alarm boxes.

4. Smoke Detection

A detection system as used here is one based on use of smoke detectors meeting the installation requirements of Sections 14-3.4.5 and 15-3.4.5 and NFPA Standard No. 72E with the extent of coverage as defined below. No credit is given for thermal detectors in habitable spaces. The detection system categories are as follows:

a. None - There are no smoke detectors or if present they do not meet the requirements needed for a higher score.

b. Corridors, Common Spaces and Sleeping Rooms for More Than Four Persons - Smoke detection requirements of such spaces located within the residential housing area are covered by smoke detector installations in accordance with NFPA 72E.

c. Sleeping Rooms - Smoke detectors are considered as meeting this requirement when there is at least one smoke detector protecting each sleeping room occupied or used by prisoners. In rooms having a dimension in excess of 30 feet, additional detectors are provided so that detector spacing does not exceed approximately 30 feet. Detectors are not required in restrooms or closets.

d. Full Coverage - Meets the combined requirements for b. and c.

e. Total Facility - Total facility detector credit requires conformance with the requirements of NFPA 72E for total coverage.

5. Automatic Sprinklers

In evaluating sprinkler protection, the protection or lack of protection of hazardous areas is considered separately and covered under safety Parameter 2 except that total building protection must include hazardous areas. Also the presence or lack of fire department notification is considered separately under Parameter 3. In all other aspects, any sprinkler installations shall conform to sections 14-3.5 and 15-3.5 and be graded on the following basis:

a. None - No credit is given if there are no sprinklers or if sprinklers, though present, are not sufficient to qualify for one of the other categories listed herein.

b. Residential Housing Areas - The credit for sprinkler protection of residential housing area is given for arrangements where sprinklers are located throughout the areas such that all space within such area (including cells or sleeping rooms) are covered by the protection spray pattern or sprinkler heads.

c. Entire Building - The building is totally sprinkler protected in accordance with NFPA Standard No. 13 for light hazard occupancy (or higher hazard occupancy for any spaces classified as higher hazard by NFPA Standard No. 13).

6. & 7. Interior Finish

Classification of interior finish is in accordance with Sections 14-3.3.2 and 15-3.3.2, as appropriate.

No consideration is included in the Safety Parameter Value for any finish with a flame spread rating > 200 or for any material not rationally measured by the ASTM E84 Test. Materials not rationally measured include: foam plastics, asphalt impregnated paper and/or materials capable of inducing extreme rates of fire growth and rapid flashover. In any case where these materials are involved, the resultant risk is considered to classify any such finish area as a hazardous area to be evaluated under Parameter 2, Hazardous Areas.

Note: 1/4 inch plywood is considered as having a flame spread of 200 or less.

Note: For Parameter 6, Interior Finish (Corridors and Egress Routes), the credit for Class A interior finish is given only if the interior floor finish is also Class I. The credit for Class B interior finish is given only if the interior floor finish is also Class I or II or is an existing floor finish having previously been evaluated as having a flame spread of 75 or less in accordance with NFPA Standard 255.

For Parameter 7, Interior Finish (other areas) the credit for interior finish is to be based on walls and ceiling finishes without consideration of floor finishes.

8. Cell/Sleeping Room Enclosure

The charges for cell or sleeping room enclosure are divided between those for cells or sleeping rooms that face directly onto a corridor and those where there is an intervening common space (i.e. day room, group activity space or other space between the sleeping room and the corridor access).

a. Open - Open includes any cell or sleeping room enclosure that includes opening in excess of 120 sq. inches. In use condition V the closure is considered "open" if there are any openings exceeding the minimum necessary for door swing and latch unless: (1) the affected cells meet the smoke control requirements for mechanically assisted in Parameter 13, or (2) there is a closure for such openings closeable from inside the cell.

b. Smoke Tight - An enclosure qualifies in this category if the walls are complete from slab to slab or to a continuous smoke tight ceiling and doors are complete but some wall aspect (wall, ceiling, etc.) is less than 1-hr. fire resistive, or the door is not capable of resisting fire for at least 20 minutes.

c. Fire Resistive - An enclosure qualifies in this category if it meets all of the requirements for b. above, and all wall aspects have at least 1-hr. fire resistance and the door is capable of resisting fire for at least 20 minutes.

9. Separation of Residential Housing Areas* From Other Areas

The charges for separation of residential housing areas are based on the quality of the common walls and separating partitions and door between residential housing areas and the rest of the building. The charge is based on the residentual housing area that has the lowest quality separation. Where a building contains more than one residential housing area, the separation of residential housing areas from each other is also to be considered equally to the separation of a residential housing area from some other type of space. In buildings entirely composed of a single residential housing area the separation is considered equivalent to fire resistive if there is at least 30 feet separation from other structures, smoke tight if there is a separation less than 30 feet.

Classification of internal separations is based on the following:

a. Incomplete - Any separation that does not meet the criteria for b. or c. below or if the doors involved are not self closing or automatic closing as described in sections 5-2.1.2.3, 14-2.11.5 and 15-2.11.5.

*Residential housing area includes: sleeping areas and any contiguous day room, group activity space or other common space.

b. Smoke Tight - An enclosure qualifies in this category if the walls are complete from slab to slab or to a continuous smoke tight ceiling and doors are complete but some wall aspect (wall, ceiling, etc.) is less than 1-hr. fire resistive, or the door is not capable of resisting fire for at least 20 minutes.

c. Fire Resistive - An enclosure qualifies in this category if it meets all of the requirements for b. above, and all wall aspects have at least 1-hr. fire resitance and the door is capable of resisting fire for at least 20 minutes.

10. Exit System

Exit routes are the paths of travel from the residential housing area to outside of any of the types and arrangements described in Chapter 5 of the Life Safety Code. The exit route starts at the corridor interface with the cell or common space as indicated by Parameter 8.

a. Multiple Routes - Multiple routes exist when the occupants of any residential housing area either have, from the residential housing area or through access in a corridor adjacent to the residential housing area, a choice of 2 separate exit routes to the outside of the types listed in sections 14-2.2 and 15-2.2.

b. Deficient - An exit route is deficient if it is useable with reasonable safety but fails to meet any of the applicable criteria in Chapter 5.

c. Direct Exits - To be credited with direct exits, each cell or other sleeping room must have a door that opens to the exterior at grade, or to an unenclosed exterior balcony with direct access to an exterior exit or smoke proof tower. The locking of such door must be no more restrictive than that required for the least restrictive exit or smoke barrier door for the use condition involved. In large rooms the maximum travel distance from any occupiable location to a direct exit must not exceed 50 feet. Where the separation of the individual sleeping roms involved from other spaces and from each other is smoke tight, the credit for direct exits is applicable even if there are no other exit routes from the involved sleeping rooms.

No exit shall be considered in this parameter unless the overall locking arrangement of the exit system involved conforms with the criteria for the use condition being applied to the facility.

11. Exit Access

Exit access is the travel distance from any point in a room to an exit (or smoke partition in an existing building). In addition, any exit arrangement that does not conform with the supplementary travel distance criteria listed below, is limited to a parameter value no higher than the score for egress travel that is > 150 and < = 225 feet.

Supplementary Travel Distance Criteria: The travel distance

a. between any room door required as exit access and an exit does not exceed 100 ft. (30.48 m);

b. between any point in a sleeping room to the door of that room does not exceed 50 ft. (15.24 m).

Exception No. 1: The travel distance in a. or b. above may be increased by 50 ft. (15.24 m) in buildings protected throughout by an approved automatic sprinkler system or smoke control system.

Exception No. 2: The travel distance in b. above, may be increased to 100 ft. in open dormitories where the enclosing walls of the dormitory space are at least of smoke-tight construction. Where travel distance to the exit access door from any point within the dormitory exceeds 50 ft. (15.24 m), at least two exit access doors remote from each other, shall be provided.

The charge for deadend (D.E.) access is charged when any corridor affords access in only one direction to a required exit from that corridor. The calculation of the distance to determine the level of charge is the measurement from the centerline of the doorway exiting to the corridor to a point where there is a choice of two paths of travel to remote exits. Exit travel is the distance from the door to the corridor to the point where the building is exited or a stairwell is entered which ever is less. Where the distance to the stairwell is the shorter distance, that distance is based on the distance to the door enclosing the stairwell if the stairwell is enclosed or to the top tread if the stairwell is open.

12. Vertical Openings

These values apply to vertical openings and penetrations including exit stairways, ramps and any other vertical exits, pipeshafts ventilation shafts, duct penetrations and laundry and incinerator chutes. The charge for vertical openings is based on the presence of lack of enclosure and the fire resistance of enclosure if present.

A vertical opening or penetration is classified as open (or Incomplete Enclosure) if it is: (a) unenclosed; (b) is enclosed but does not have doors; (c) is enclosed but has openings other than doorways; (d) is enclosed with cloth, paper, or similar materials without any sustained fire stopping capabilities.

If a shaft other than a credited exit route (i.e. credited as one of the multiple routes required in Parameter 10 or in determining travel distance in Parameter 11) is enclosed on all floors but one and this results in an unprotected opening between that shaft, and one and only one floor, the parameter value assigned to that shaft is 0. If a required egress route is contained in that shaft the parameter value is -2. If vertical firestopping is incomplete, the vertical opening so created is evaluated using the above criteria.

Two communicating floor levels are permitted without enclosure protection between levels provided they meet the requirements of sections 14-3.1.2 or 15-3.1.2, as appropriate.

Vertical opening charges do not apply to open multi-tiered cell blocks classified as single story buildings in accordance with the permission set forth in Parameter 1, Construction.

a. Smoke Tight - A complete enclosure is provided and is capable of resisting the passage of smoke but does not meet the fire resistance requirements of section 6-2.2.3.2.

b. Fire Resistant - A smoke tight enclosure that also meets the fire resistance requirements of 6-2.2.3.2.

13. Smoke Control

Smoke control definitions are as follows:

a. No Control - There are no smoke barriers (or horizontal exits) on the floor and accessible to those confined.

b. Smoke Compartment - Passive - The credit for smoke barriers is to be credited to any facility meeting the requirements of sections 14-3.7 or 15-3.7, as appropriate.

c. Smoke Compartment - Mechanically Assisted - Mechanically assisted smoke control on a compartment basis must include a smoke barrier (or a horizontal exit) supported by a mechanism of automatic control fans, smoke vent shafts, or a combination thereof to provide a pressure differential that will assist in confining smoke to the compartment of origin. Fans involved may be special smoke control fans or special adjustments of the normal building air movement fans.

d. Heat and Smoke Vent System - A heat and smoke vent system is a system meeting the design criteria set forth in A-15-3.1.3, Recommended Method of Calculating Expected Level of Smoke in a Smoke Removal Equipped Cell Block or other satisfactory means so designed as to maintain the level of smoke above head height in the residential housing area. The additional credit for this system shall be given if the operation of the exhaust system is initiated automatically by smoke detection available in the zone.

Fire Safety Evaluation Worksheet
Detention and Correctional Occupancies

Building Identification _____

Evaluator _____ Date _____

Complete one worksheet for each building evaluated.

STEP 1: Complete the building identification, evaluator and date entries above.

STEP 2: Determine the most restrictive use condition in the facility. Check the appropriate box below.

- ☐ Use condition II – Zoned Egress
- ☐ Use condition III – Zoned Impeded Egress
- ☐ Use condition IV – Impeded Egress
- ☐ Use condition V – Contained

NOTE: If use conditions III or IV are involved, the combination of staff location, remote release locks, and/or fire detection must be sufficient to insure the prompt release required by the use condition checked.

STEP 3: Determine safety parameter values – use Table 1.

A. Select and circle the safety value for each safety parameter that best describes the conditions in the zone. Choose only one value for each of the 13 parameters. If two or more appear to apply choose the one with the lowest point value.

Residential housing area: includes sleeping areas and any contiguous day room, group activity space, or other common space.

Table 1. Safety Parameter Values

1. CONSTRUCTION TYPE		V(000)	V(111)	IV(2HH)	III(200)	III(211)	II(000)	II(111)	II(222) or I(any)
	1st FLOOR	-2	0	0	-2	0	0	2	2
	2nd FLOOR	-2	0	0	-2	0	-2	2	2
	3rd FLOOR	-8(-2)A	-2(0)A	-2(0)A	-8(-2)A	0	-5(-2)A	2	2
	≥4th FLOOR	-10(-2)A	-4(0)A	-4(0)A	-10(-2)A	-2(0)A	-8(-2)A	0	2

2. HAZARDOUS AREAS	Within Res. Housing Area		Outside Res. Housing Area		None or No Deficiencies
	Double Deficiency	Single Deficiency	Double Deficiency	Single Deficiency	
	-7	-4	-4(-7)B	0	0

3. FIRE ALARM	No Alarm	w/o FD Notification	w/ FD Notification	
			w/o Man. Alarm	w/ Man. Alarm
	-1	0	1	2

4. SMOKE DETECTION	None	Residential Housing Area			Total Bldg.
		Partial Coverage		Full Coverage	
		Corr. & Comm. Spa. & Lrg. Sleeping Rms.	All Sleeping Rms.		
	-4(-1)A	0	2	4	5

5. AUTOMATIC SPRINKLERS	None	Residential Housing Area	Entire Building
	0	8	10

6. INTERIOR FINISH (Corridors & Egress)	Class C	Class B	Class A
	-3	-1	0

7. INTERIOR FINISH (Other Areas)	Class C	Class B	Class A
	-2	-1	0

8. CELL/ROOM ENCLOSURE	Cells (rooms) Face on corridor (each cell is a separate residential housing area)	Intervening Common space Within Res. Housing Area		
		Open	Smoke Tight < 1 hr	≥ 1 hr Fire Resistive
	0	-3(-5)C (0)D	0(-2)C	2(0)C

9. SEPARATION OF RES. HOUSING AREAS FROM OTHER AREAS	Incomplete	Smoke Tight < 1 hr	≥ 1 hr Fire Resistive
	-6(2)K	2(4)H	4(2)B

10. EXIT SYSTEM	< 2 Routes	Multiple Routes		
		Deficient	No Deficiencies	Direct Exit
	-6	-2	0	3

11. EXIT ACCESS	Dead Ends		No Dead Ends > 50 ft(I) & Travel Is		
	< 100 ft	>50 ft(I)	>225 ft	≤225 ft & v150 ft	≤150 ft
	-2(0)G	-1(0)G	-2(0)G	-1(0)G	0

12. VERTICAL OPENINGS	Open or Incomplete Enclosures			Enclosed (E)	
	Thru ≥ 4 Floors	2-3 Floors	1 Floor	Smoke Tight	Fire Resistive
	-10(0)F	-7(0)F	-2(0)F	0	2(0)F

13. SMOKE CONTROL	No Control	Smoke Compartments		Heat & Smoke Vent System
		Passive	Mechanically Assisted	
	-2	2	3	8

NOTES:

A – Use ( ) if parameter 5 is 10.

B – Use ( ) if parameter 1 is based on II(000), III(200), or V(000) construction and parameter 5 is 0.

C – Use ( ) for level V new when parameter 5 is 0.

D – Use ( ) for all level II.

- For level III if intervening space is ≤50 ft.
- For level IV if parameter 5 is ≤8 and intervening space is ≤50 ft.
- Also use ( ) in existing buildings if either parameter 13 = 8, or if parameter 5 is ≥ 8 and parameter 4 is ≥0.

E – Use 0 in 1 story buildings.

F – Use ( ) if parameter 13 is 8.

G – Use ( ) if parameter 10 is -6.

H – Use ( ) for levels II new, III new, and IV new it cells are facing access corridor.

I – 20 ft for level V.

K – Use ( ) for level II existing and cells facing on corridors.

STEP 4: Compute individual safety evaluations - use Table 2.

A. Transfer each of the 14 circled safety parameter values on Table 1 to every unshaded block in the line with the corresponding parameter title in Table 2. Where the block is indicated (÷2) enter only one-half the value shown in Table 1.

B. Add the four columns, keeping in mind that any negative numbers deduct.

C. Transfer the resulting values for S_1, S_2, S_3, and S_4 to the blanks marked S_1, S_2, S_3, and S_4 in Table 4.

Table 2. Individual Safety Evaluations

Safety Parameter	Fire Control Provided (S_1)	Egress Provided (S_2)	Refuge Provided (S_3)	General Fire Safety Provided (S_4)
1. Construction				
2. Hazardous Areas		÷2		
3. Fire Alarm	÷2			
4. Smoke Detection	÷2			
5. Automatic Sprinklers		÷2	÷2	
6. Interior Finish (egress, etc.)				
7. Interior Finish (other areas)	÷2			
8. Cell/Room Enclosure				
9. Separation of Residential Housing Areas From Other Areas		÷2		
10. Exit System			÷2	
11. Exit Access				
12. Vertical Openings	÷2			
13. Smoke Control				
TOTAL	S_1 =	S_2 =	S_3 =	S_4 =

STEP 5: Determine mandatory safety requirements – use Table 3.

A. Select the proper row of Table 3. Circle the appropriate values.

B. Transfer the circled values from Table 3 to the blocks marked S_a, S_b, S_c, and S_d in Table 4.

Table 3a. Mandatory Safety Requirements Partially Sprinklered and Non-Sprinklered Buildings

Use Condition	Height	Fire Control S_a		Egress S_b		Refuge S_c		General S_d	
		New	Exist	New	Exist	New	Exist	New	Exist
II & III	1&2 Story	4(5)	0(3)	6(8)	4(6)	6(8)	2(6)	6(8)	1(5)
	≥3 Story	7	5	8	6	10	8	10	7
IV	1&2 Story	6(7)	2(5)	10(12)	8(10)	6(8)	2(6)	10(12)	5(9)
	≥3 Story	9	7	12	10	10	8	14	11
V	1&2 Story	6(9)	6(9)	10(12)	9(11)	6(10)	6(10)	10(14)	9(13)
	≥3 Story	9	9	12	11	10	10	14	13

NOTE: Use ( ) values for 2 story buildings

Table 3b. Mandatory Safety Requirements Totally Sprinklered Buildings

Use Condition	Height	Fire Control S_a		Egress S_b		Refuge S_c		General S_d	
		New	Exist	New	Exist	New	Exist	New	Exist
II, III, IV	1&2 Story	2	2	4	2	-1	-1	2	0
	≥3 Story	7	2	6	2	5	-1	8	0
V	1&2 Story	10	10	8	6	7	7	10	8
	≥3 Story	15	10	10	6	13	7	16	8

STEP 6: Fire safety equivalency evaluation

A. Perform the indicated subtractions in Table 4. Enter the differences in the appropriate answer blocks.

B. For each row check "YES" if the value in the answer block is zero or greater. Check "NO" if the value in the answer block is a negative number.

Table 4. Fire Safety Equivalency Evaluation

							YES	NO
Control Provided	(S_1)	Less	Required Control	(S_a)	≥ 0	S_1 □ − S_a □ = C □		
Egress Provided	(S_2)	Less	Required Egress	(S_b)	≥ 0	S_2 □ − S_b □ = E □		
Refuge Provided	(S_3)	Less	Required Refuge	(S_c)	≥ 0	S_3 □ − S_c □ = R □		
General Fire Safety	(S_4)	Less	Required Gen. Fire Safety	(S_d)	≥ 0	S_4 □ − S_d □ = G □		

CONCLUSIONS:

1. All of the checks in Table 4 are in the "YES" column. The level of fire safety is at least equivalent to that prescribed by the Life Safety Code.

2. One or more of the checks in Table 4 are in the "NO" column. The level of fire safety is not shown by this system to be equivalent to that prescribed by the Life Safety Code.

NOTE: The equivalency covered by this worksheet includes the majority of considerations covered by the Life Safety Code. There are a few considerations that are not evaluated by this method. These must be considered separately. These additional considerations are covered in STEP 7.

STEP 7: Considerations

The following items are required by the Life Safety Code as fire safety features but are beyond the scope of equivalency evaluation of the Fire Safety Evaluation System. They must be accounted for separately.

	YES	NO
1. Utilities and building services conform to the requirement of Section 14-5 or 15-5 of the Life Safety Code.		
2. 24-hour staffing is provided as required by Section 31-5.1 of the Life Safety Code.		
3. Furnishing and decorations combustibility is limited in accordance with section 31-5.4 of the Life Safety Code.		
4. Portable fire extinguishers are provided at least at staff locations.		
5. Standpipes are provided in all buildings over 75 ft. tall and non-sprinklered buildings over 3 stories in height.		
6. If use conditions III or IV are involved, is the combination of staff location, remote release locks, and fire detection sufficient to insure the prompt release required by those use conditions?		

Appendix B

WORKBOOK ON
FIRE SAFETY EVALUATION SYSTEM
FOR
DETENTION AND CORRECTIONAL FACILITIES

MARCH 1983

CENTER FOR FIRE RESEARCH
NATIONAL BUREAU OF STANDARDS

INTRODUCTION

This guide is designed to assist those applying the Fire Safety Evaluation System for Detention and Correctional Facilities. The Guide includes the full text of the evaluations system plus additional explanatory text and illustrations. The guide is arranged in the same step by step order as the evaluation system worksheet.

So that the user may easily differentiate between the test of the Fire Safety Evaluation System and the text of the expanded explanations and background information, two different kinds of type have been used in this document. The text of the actual fire safety evaluation system is printed in elite (small) type and the expanded explanations and background information are printed in orator (large) type.

FIRE SAFETY EVALUATION WORKSHEET

DETENTION AND CORRECTIONAL OCCUPANCIES

BUILDING IDENTIFICATION _____

EVALUATOR _____ DATE _____

Complete one worksheet for each building evaluated.

STEP 1. Complete the building identification, evaluator and date entries above.

Procedure for Determining Equivalency

Using the "Fire Safety Evaluation Worksheets, Detention and Correctional Occupancies" evaluate the entire facility as defined in Sections 14-1 and 15-1 on a single worksheet. Where different use conditions or fire protection features are involved, portions of the facility separated from each other by 2-hour or greater fire resistive construction (including any members that bear the load of detention use, egress, or refuge space and with Class B fire doors in any communication opening) may be evaluated separately.

Maintenance

Any protection system, requirements, arrangements, or procedures which are not maintained in a dependable operating condition, are used in such a manner that the intended fire safety function or hazard constraint is impaired or are not in a sufficient state of readiness should be considered as defective and receive no credit in the evaluation.

COMPLETING STEP 1, IDENTIFICATION

NORMALLY AN ENTIRE BUILDING WILL BE DONE ON A SINGLE WORKSHEET. IN SUCH CASE THE POOREST CONDITION IN THE BUILDING WILL CONTROL THE EVALUATION. IN LARGE FACILITIES HOWEVER WHERE INDIVIDUAL PORTIONS ARE SEPARATED FROM EACH OTHER BY HEAVY FIRE RESISTIVE CONSTRUCTION (E.G., BRICK WALLS, REINFORCED CONCRETE FLOORS, FIRE DOORS PROTECTING COMMUNICATING OPENINGS AND STIRWELLS, ETC.) EACH INDIVIDUAL ZONE MAY BE DONE SEPARATELY. THIS IS USUALLY BENEFICIAL IF DIFFERENT PORTIONS OF THE FACILITY ARE OPERATED UNDER DIFFERENT LEVELS OF SECURITY (I.E., ASSIGN DIFFERENT USE CONDITIONS BY THIS SYSTEM).

Step 2. Determine the most restrictive use condition in the facility. Check the appropriate box below.

☐ Use condition II - Zoned Egress

☐ Use condition III - Zoned Impeded Egress

☐ Use condition IV - Impeded Egress

☐ Use condition V - Contained

Note: If use conditions III or IV are involved, the combination of staff location, remote release locks, and/or fire detection must be sufficient to insure the prompt release required by the use condition checked.

Use Conditions

Use conditions are as defined in sections 14-1.4 and 15-1.4. The basic definitions from those sections are repeated below. Use Condition I is not covered by this evaluation system.

Use Condition I -- Free Egress

Free movement is allowed from sleeping areas, and other spaces where access or occupancy is permitted, to the exterior via means of egress meeting the requirements of the code.

Use Condition II - Zoned Egress

Free movement is allowed from sleeping areas and any other occupied smoke compartment to one or more other smoke compartments.

Use Condition III - Zone Impeded Egress

Free movement is allowed within individual smoke compartments, such as within a residential unit comprised of individual sleeping rooms and group activity space, with egress impeded by remote control release of means of egress from such smoke compartment to another smoke compartment.

Use Condition IV - Impeded Egress

Free movement is restricted from an occupied space. Remote controlled release is provided to permit movement from all sleeping rooms, activity spaces and other occupied areas within the smoke compartment to other smoke compartment(s).

Use Condition V -- Contained

Free movement is restricted from an occupied space. Staff controlled manual release at each door is provided to permit movement from all sleeping rooms, activity spaces and other occupied areas within the smoke compartment to other smoke compartment(s).

Completing Step 2, Determining Use Conditions

A check is placed in the box indicating the most restrictive use conditions in the facility (or zone within the facility) being evaluated. There is no box for use condition I. Use condition I is considered to be a residence or dormitory and from a fire safety standpoint it is not subjected to the same restrictions as prison housing. If this worksheet were used to evaluate a use condition I facility, it would have to be graded in terms of the requirements for use condition II. In most cases, this would produce a more restrictive requirement than simply going to the Life Safety Code and applying the criteria for a resident or dormitory as might be appropriate.

In terms of fire safety requirements, both the Life Safety Code and the FSES/D&C divide correctional facilities into five "use conditions" with varying levels of safety requirements prescribed for each condition. This recognizes that the operational and security requirements vary and are a managerial decision. It is felt that five conditions provide enough variation to accommodate all of the operating arrangements. Use conditions are based on the locking arrangements used. Understanding these categories is essential to use either the Life Safety Code or the Fire Safety Evaluation System. They are:

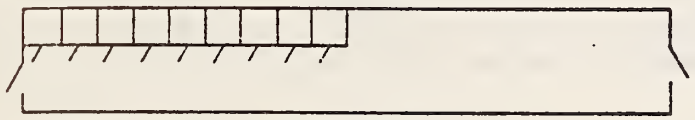


Figure 0-1 – USE CONDITION 1

A. Use Condition I - Free Egress. There are no locks preventing egress through any door that any occupant of the building might use under fire emergency. See figure 0-1

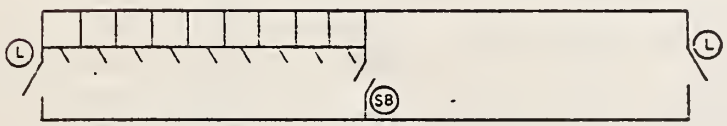


Figure 0-2 – USE CONDITION 2

(L) LOCKED
(RL) LOCKED–REMOTE RELEASE OR EQUIVALENT
(SB) SMOKE BARRIER OR HORIZONTAL EXIT

B. Use Condition II - Zone Egress. Any or all of the exit doors from the building may be locked. Every floor housing prisoners is however divided by a smoke and fire resisting subdivision and there are no locking arrangements that in any way restrict any of the prisoners from leaving their cell, dormitory, recreation space or other area and passing through the subdividing barrier. See figure 0-2

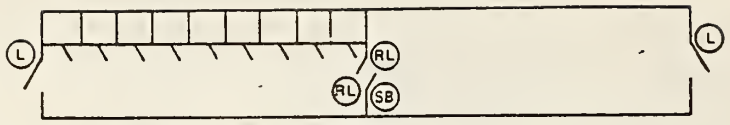


Figure 0-3 USE CONDITION 3

(L) LOCKED
(RL) LOCKED-REMOTE RELEASE OR EQUIVALENT
(SB) SMOKE BARRIER OR HORIZONTAL EXIT

C. USE CONDITION III - ZONE IMPEDED EGRESS. THIS IS THE SAME AS USE CONDITION II EXCEPT THAT THE PASSAGE THROUGH THE SUBDIVIDING BARRIER WHILE NOT FREELY AVAILABLE TO THE PRISONERS CAN BE RELEASED BY A REMOTE CONTROL DEVICE OPERATIONAL BY A CONSTANTLY MANNED STAFF LOCATION THAT IS CLOSE ENOUGH TO THE DIVIDING WALL TO PROVIDE CONTINUOUS SUPERVISION. SEE FIGURE 0-3

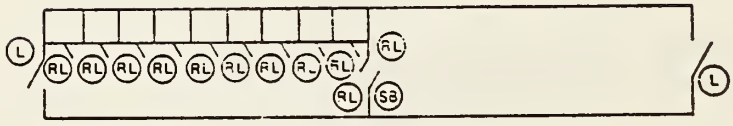


Figure 0-4 – USE CONDITION 4

(L) LOCKED
(RL) LOCKED-REMOTE RELEASE OR EQUIVALENT
(SB) SMOKE BARRIER OR HORIZONTAL EXIT

D. USE CONDITION IV - IMPEDED EGRESS. PRISONERS MAY BE LOCKED IN INDIVIDUAL CELLS OR ROOMS BUT REMOTE RELEASE CAPABILITY IS PROVIDED FOR ALL CELL DOORS AND DOORS IN SUBDIVIDING PARTITIONS. SEE FIGURE 0-4

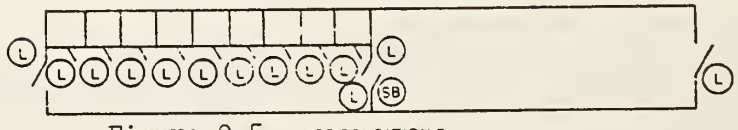


Figure 0-5 – USE CONDITION 5

(L) LOCKED
(RL) LOCKED-REMOTE RELEASE OR EQUIVALENT
(SB) SMOKE BARRIER OR HORIZONTAL EXIT

E. USE CONDITION V - CONTAINED. THIS COVERS ALL OTHER ARRANGEMENT. IT IS PARTICULARLY DIRECTED AT FACILITIES WHERE PRISONERS ARE LOCKED IN THEIR CELLS AND IT IS NECESSARY TO GO TO EACH CELL AND USE A KEY OR OTHER DEVICE TO RELEASE THE PRISONERS ONE BY ONE. SEE FIGURE 0-5

STEP 3: DETERMINE SAFETY PARAMETER VALUES - USE TABLE 1.

A. SELECT AND CIRCLE THE SAFETY VALUE FOR EACH SAFETY PARAMETER THAT BEST DESCRIBES THE CONDITIONS IN THE ZONE. CHOOSE ONLY ONE VALUE FOR EACH OF THE 13 PARAMETERS. IF TWO OR MORE APPEAR TO APPLY CHOOSE THE ONE WITH THE LOWEST POINT VALUE.

THE RESIDENTIAL HOUSING AREA IS THE INMATE OCCUPIED AREA. IT INCLUDES SLEEPING AREAS AND ANY CONTIGUOUS DAY ROOM, GROUP ACTIVITY SPACE, OR OTHER COMMON SPACE. SEE FIGURE 0.6 FOR EXAMPLE.

Safety Parameter Table (General Discussion)

The safety parameters are a measure of those building factors that bear upon or contribute to the safety of those persons who may be in the building at the time of a fire.

Each of the safety parameters is to be analyzed. And the safety value for each parameter that best describes the condition in the building is to be identified. Only one value for each of the parameters is to be chosen. If two or more appear to apply, the one with the lowest point value governs.

COMPLETING STEP 3, TABLE 1, SAFETY PARAMETER VALUES

TABLE 1 CONSISTS OF 13 FIRE SAFETY PARAMETERS THAT REPRESENT THE 13 KEY ELEMENTS CONTROLLING THE DEVELOPMENT AND SPREAD OF FIRE AND THE PROTECTION OF THOSE EXPOSED TO IT. EACH OF THESE 13 PARAMETERS ARE SUBDIVIDED INTO FROM 3 TO 8 LEVELS OF PERFORMANCE. THE LEVELS COVER BOTH CONDITIONS SPECIFIED BY THE CODE AND OTHER CONDITIONS OFTEN FOUND IN THE REAL WORLD.

FOR SOME OF THE PARAMETER VALUES, TWO OR THREE SCORES ARE NOTED FOR A SINGLE PARAMETER LEVEL. IN EACH SUCH CASE THERE IS A FOOTNOTE TELLING WHICH TO USE. PAST EXPERIENCE WITH FSES WORKSHEETS SUGGEST THAT IT IS BEST TO IGNORE THE FOOTNOTES UNTIL ALL OF THE PARAMETERS HAVE BEEN COVERED AND ALL OF THE APPLICABLE LEVELS CIRCLED. THEN REVIEW THE TABLE, IDENTIFY WHERE FOOTNOTES APPLY AND DETERMINE WHICH SCORE SHOULD BE USED.

Residential Housing Area

- **Sleeping Area + Contiguous Day Room, Activity Space, Etc.**

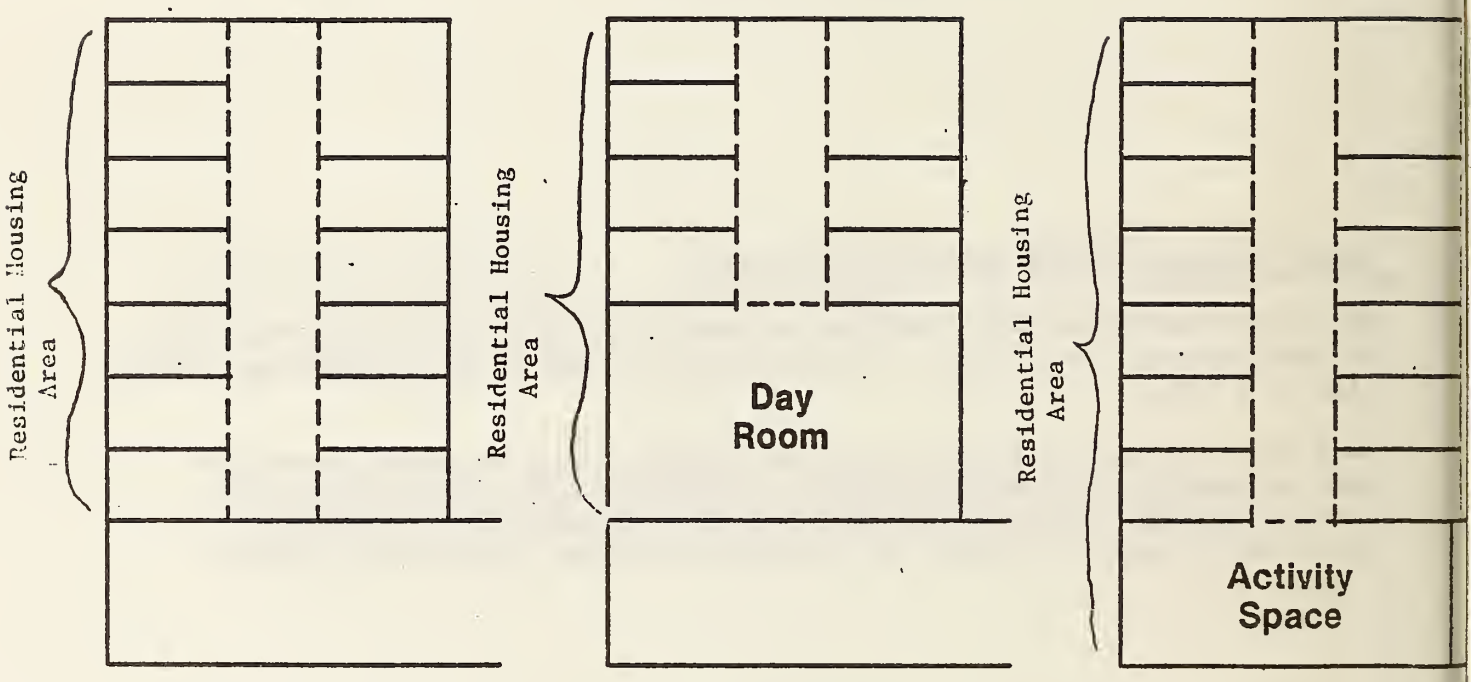


Figure 0.6 Residential Housing Area

1. Construction Type	V(000)	V(111)	IV(2HH)	III(200)	III(211)	II(000)	II(111)	II(222) Or I(ANY)
1st Flr	-2	0	0	-2	0	0	2	2
2nd Flr	-2	0	0	-2	0	-2	2	2
3rd Flr	-8(-2)A	-2(0)A	-2(0)A	-8(-2)A	0	-5(-2)A	2	2
>=4th Flr	-10(-2)A	-4(0)A	-4(0)A	-10(-2)A	-2(0)A	-8(-2)A	0	2

A-Use ( ) if parameter 5 is 10.

1. Construction

Construction types are defined by the fire resistance and combustibility of load bearing framing members, floor construction, and roof construction in accordance with NFPA 220 (1979), Standards of Building Construction. The following table is abstracted from NFPA 220 (1979).

Table 3 Fire Resistance Requirements for Type I through Type V Construction

	Type I		Type II			Type III		Type IV	Type V	
	443	332	222	111	000	211	200	2HH	111	000
EXTERIOR BEARING WALLS —										
Supporting more than one floor, columns or other bearing walls	4	3	2	1	0[1]	2	2	2	1	0[1]
Supporting one floor only	4	3	2	1	0[1]	2	2	2	1	0[1]
Supporting a roof only	4	3	1	1	0[1]	2	2	2	1	0[1]
INTERIOR BEARING WALLS —										
Supporting more than one floor, columns or other bearing walls	4	3	2	1	0	1	0	2	1	0
Supporting one floor only	3	2	2	1	0	1	0	1	1	0
Supporting a roof only	3	2	1	1	0	1	0	1	1	0
COLUMNS —										
Supporting more than one floor, bearing walls or other columns	4	3	2	1	0	1	0	H[2]	1	0
Supporting one floor only	3	2	2	1	0	1	0	H[2]	1	0
Supporting a roof only	3	2	1	1	0	1	0	H[2]	1	0
BEAMS, GIRDERS, TRUSSES & ARCHES —										
Supporting more than one floor, bearing walls or columns	4	3	2	1	0	1	0	H[2]	1	0
Supporting one floor only	3	2	2	1	0	1	0	H[2]	1	0
Supporting a roof only	3	2	1	1	0	1	0	H[2]	1	0
FLOOR CONSTRUCTION	3	2	2	1	0	1	0	H[2]	1	0
ROOF CONSTRUCTION	2	1½	1	1	0	1	0	H[2]	1	0
EXTERIOR NONBEARING WALLS	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]

▨ Those members listed that are permitted to be of approved combustible material.

[1] Requirements for fire resistance of exterior walls, the provision of spandrel wall sections, and the limitation or protection of wall openings are not related to construction type. They need to be specified in other standards and codes, where appropriate, and may be required in addition to the requirements of this Standard for the construction type.

[2] "H" indicates heavy timber members; see text for requirements.

Where the facility includes additions or connected structures of different construction the rating and classification of the structure is based on (a) separate buildings if a two hour or greater fire resistive separation exists between the portions of the building and on (b) the lower safety parameter point score involved if such a separation does not exist.

The story used to determine the parameter values is the highest story used for confinement purposes. Story height is based on stories starting with the primary level of exit discharge. When there are stories below the primary level of exit discharge, the maximum value assigned the construction parameter is based on a 2-story building or the actual story height, which ever is the lower value.

A multi-tiered open cell block may be considered as single story providing that one or more of the following conditions exist:

a. A smoke control system is provided (see recommended design criteria in A-15-3.1.3) to maintain the level of smoke filling, from potential cell fires, at least 5 feet above the floor level of any occupied tier.

b. A smoke control system as described in a. above is provided to maintain the level of smoke filling at least 5 feet above the exit level where:

(1) The cell block is Occupancy Condition II, or

(2) The cell block is Occupancy Condition III and all persons housed in the cell block can pass through a free access smoke barrier or freely pass below the calculated smoke level with not more than 50 feet of travel from their cell.

c. Complete automatic sprinkler protection is provided.

PARAMETER 1, CONSTRUCTION

THE CONSTRUCTION PARAMETER IS BASED ON BOTH THE TYPE OF CONSTRUCTION AND THE HEIGHTH OF THE BUILDING.

THE HEIGHT IS BASED ON THE HIGHEST FLOOR HOUSING PRISONERS. IN FIGURING OUT THE FLOORS, TIER TYPE ARRANGEMENTS REQUIRE SPECIAL CONSIDERATION. IF A POD OR OTHER HOUSING AREA HAS A TWO-TIER LEVEL INSIDE THE POD, THE TWO-TIER LEVEL IS CONSIDERED TO BE ONLY ONE STORY PROVIDED THAT THE SPACE IS SUFFICIENTLY OPEN TO PERMIT SUPERVISORY PERSONNEL TO IMMEDIATELY RECOGNIZE A POTENTIAL FIRE PROBLEM, THAT THE TOTAL EXIT CAPACITY MUST BE SUFFICIENT TO HANDLE THE ENTIRE OCCUPANT LOAD OF BOTH FLOORS, AND THAT EACH LEVEL MUST HAVE EXIT ACCESS DIRECTLY OUT OF THAT LEVEL WITHOUT TRAVEL ON THE COMMUNICATING LEVEL TO HANDLE ONE-HALF ITS OCCUPANT LOAD. EACH TIER IN A CELL BLOCK HAVING MORE THAN TWO TIERS (OR TWO-TIER PODS THAT DO NOT QUALIFY AS A SINGLE STORY) IS CONSIDERED A SEPARATE STORY UNLESS THE ENTIRE CELL BLODK IS PROTECTED BY AUTOMATIC SPRINKLERS OR WITH A SPECIAL HEAT AND SMOKE VENT SYSTEM (COVERED UNDER PARAMETER 13, SMOKE CONTROL). IN THESE LATTER TWO CASES, THE ENTIRE CELL BLOCK IS CONSIDERED A SINGLE STORY.

THE CONSTRUCTION TYPES ARE INDICATED BY ROMAN NUMERALS I THROUGH V. THIS METHOD OF CLASSIFYING CONSTRUCTION MATCHES THAT IN THE NATIONAL FIRE PROTECTION ASSOCIATION'S STANDARDS. FOR THE MOST PART, CORRECTIONAL FACILITIES ARE CLASS I (REINFORCED CONCRETE OR CONCRETE-PROTECTED STEEL CONSTRUCTION); CLASS II (000) (BARE STEEL COLUMNS, BEAMS AND GIRDERS); OR CLASS V (000) (WOOD FRAME DORMITORIES OR BARRACKS). THE FOLLOWING PAGES COVER THE CLASSIFICATION AND SCORING OF THE CONSTRUCTION PARAMETER IN GREATER DETAIL.

CONSTRUCTION TYPES

TO DETERMINE THE APPROPRIATE VALUE FOR CONSTRUCTION IT IS NECESSARY TO:

1. IDENTIFY THE TYPE OF CONSTRUCTION. THERE ARE FIVE TYPES, IN THE ORDER LISTED IN THE FSES WORKSHEET THEY ARE:

   TYPE V (WOOD FRAME CONSTRUCTION)
   TYPE III (ORDINARY - MASONRY BEARING WALL/WOOD JOISTED CONSTRUCTION)
   TYPE IV (HEAVY TIMBER - MILL CONSTRUCTION)
   TYPE II (NONCOMBUSTIBLE CONSTRUCTION)
   TYPE I (FIRE RESISTIVE CONSTRUCTION)

2. FOR TYPE II, III, OR V CONSTRUCTION ESTABLISH THE LEVEL OF BUILT-IN FIRE RESISTING CAPABILITIES. IN THE FSES WORKSHEET THE LEVEL OF FIRE RESISTING CAPABILITY IS SHOWN BY A CODE OF THREE NUMBERS IN PARENTHESES UNDER THE TYPE. THESE NUMBERS SHOW THE MINIMUM NUMBER OF HOURS OF FIRE RESISTANCE RATING FOR WALLS, COLUMNS, FLOORS AND OTHER STRUCTURAL ELEMENTS.

3. IF THE BUILDING IS TYPE V; TYPE IV; TYPE III; TYPE II(000) AND THREE OR MORE STORIES, IT IS ALSO NECESSARY TO DETERMINE IF THE BUILDING IS FULLY SPRINKLER PROTECTED BY A HIGHLY RELIABLE SPRINKLER SYSTEM MEETING THE REQUIREMENTS FOR A 10 POINT SPRINKLER SYSTEM UNDER ITEM 5. IN THAT CASE NOTE A OF THE FSES WORKSHEET APPLIES.

TYPE V - WOOD FRAME

TYPE V OR WOOD FRAME CONSTRUCTION IS THAT TYPE OF CONSTRUCTION IN WHICH THE EXTERIOR WALLS MAY BE MADE UP OF CLOSELY SPACED WOOD OR STEEL STUDS, WITH AN EXTERIOR COVERING OF WOOD SIDING, SHINGLES, STUCCO, BRICK OR STONE VENEER OR OTHER MATERIALS. TYPE V CONSTRUCTION MAY BE CLASSIFIED AS "PROTECTED" CONSTRUCTION OR TYPE V (111) IF THE ROOFS, FLOORS AND THEIR SUPPORTS HAVE ONE HOUR FIRE RESISTANCE. EXAMPLES OF TYPE V OR WOOD FRAME CONSTRUCTION ARE ILLUSTRATED BELOW (FIGURES 1-2 AND 1-3).

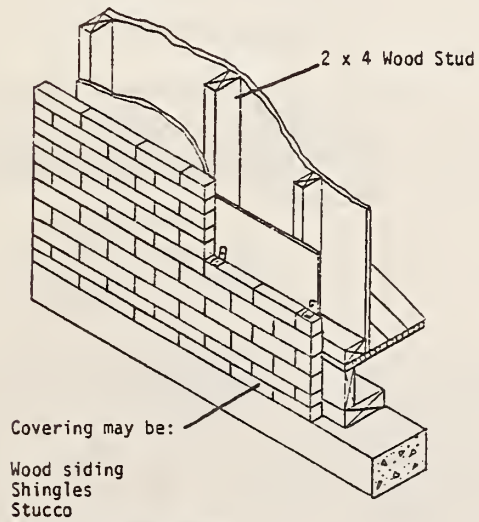
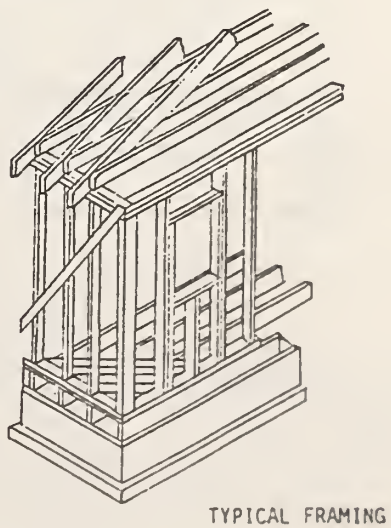


Fig. 1-2



TYPICAL FRAMING

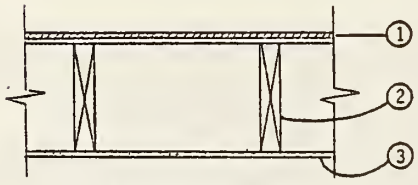
Fig. 1-3

THE FSES WORKSHEET COVERS TWO DIFFERENT LEVELS OF TYPE V (WOOD FRAME) CONSTRUCTION AS FOLLOWS:

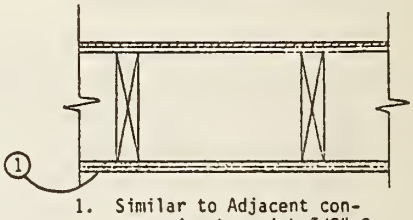
A. TYPE V (111), ALSO CALLED "PROTECTED WOOD FRAME". TO MEET THIS LEVEL, ALL INTERNAL SURFACES OF WALLS AND BEARING PARTITIONS, ALL THE FLOOR SYSTEMS, AND THE SHEATHING OF LOFTS, VOID SPACES, AND UNUSED ATTICS HAVE FIRE RESISTIVE SHEATHING THAT PROVIDES APPROXIMATELY 1-HOUR FIRE RESISTIVE PROTECTION AGAINST STRUCTURAL COLLAPSE OR FIRE PENETRATION TO THE OPPOSITE SIDE. THE SPECIFIC DETAILS OF SUCH SHEATHING NEED TO CONFORM WITH THE ESSENCE OF PUBLISHED LISTS OF FIRE RESISTIVE ASSEMBLIES SUCH AS THE UNDERWRITERS' LABORATORIES LISTINGS. MANY SUPPLIERS OF GYPSUM BOARD OR PLASTER SYSTEMS SEPARATELY PUBLISH DETAILS. TYPICALLY THE 1-HOUR PROTECTION INVOLVES METAL AND LATH AND GYPSUM CEMENT PLASTER OR 5/8 INCH THICK FIRE RATED GYPSUM BOARD SHEATHING.

B. TYPE V (000). THIS LEVEL COVERS ANY FACILITY THAT CANNOT MEET SOME OTHER TYPE OF CONSTRUCTION OR HIGHER LEVEL OF TYPE V CONSTRUCTION. THIS LEVEL REQUIRES ONLY THAT COMMON BUILDING MATERIALS BE USED. UNUSUALLY HAZARDOUS OR UNKNOWN MATERIALS SUCH AS EXPOSED FOAM PLASTIC OR TAR PAPER ARE NOT CONSIDERED BY THE EVALUATION SYSTEM AND THIS SYSTEM SHOULD NOT BE USED FOR EVALUATING BUILDINGS OF SUCH CONSTRUCTION.

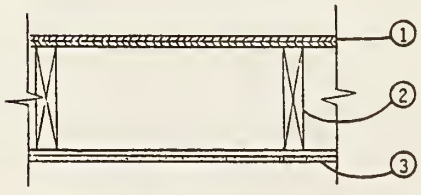
EXAMPLES OF THE DESIGN OF ONE HOUR FIRE RESISTANT FLOOR CEILING ASSEMBLIES IN TYPE V (111) OR TYPE III (211) CONSTRUCTION (FIGURE 1-4).



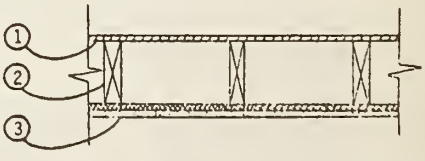
1. 5/8" Wood Floor and 1/2" Plywood Subfloor
2. 2 x 10 joists at 16' O.C.
3. 1/2" Mineral Acoustical Ceiling Panel Installed on Metal T-Bar Grid With Hold-Down Clips



1. Similar to Adjacent construction but with 5/8" Gypsum Board (Type X) Attached to Bottom of Joists (or to Metal Furring Channels)



1. 23/32" Plywood Panels
2. 2 x 10 Joists at 24' O.C.
3. 5/8" Gypsum Board (Type X) Installed on Metal Furring Channels, Spaced at 16" O.C.



1. 5/8" Stressed - Skin Plywood Panel
2. 2 x 6 Joists at 12' O.C.
3. 1/2" Gypsum Board (Type X) Installed on 1/2" Fiber Insulation Board

Fig. 1-4

TYPE IV - HEAVY TIMBER

THIS IS A CONSTRUCTION TYPE IN WHICH THE STRUCTURAL MEMBERS ARE UNPROTECTED WOOD WITH A LARGER CROSS SECTIONAL AREA THAN STRUCTURAL DESIGN CONSIDERATIONS ALONE MIGHT REQUIRE. NO CONCEALED SPACES ARE PERMITTED AROUND THE FLOORS, ROOF OR OTHER STRUCTURAL MEMBERS. SHOWN BELOW IS AN EXAMPLE OF HEAVY TIMBER CONSTRUCTION HIGHLIGHTING THE DETAILS OF CONSTRUCTION (FIGURE 1-6). THE MINIMUM DIMENSIONS OF STRUCTURAL MEMBERS ARE SUMMARIZED IN THE FOLLOWING TABLE:

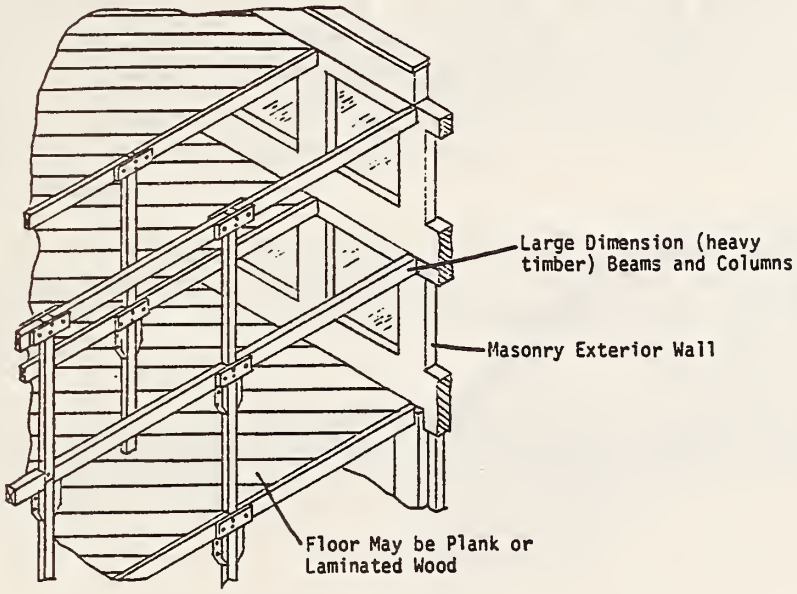


Fig. 1-6

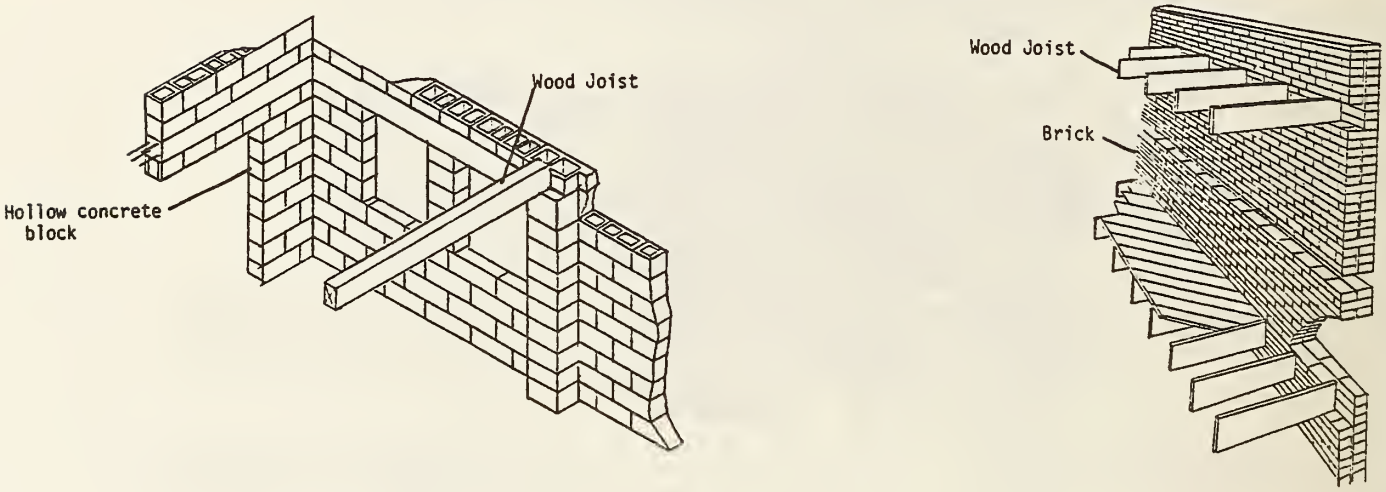
Type IV - Heavy Timber Construction

STRUCTURAL ELEMENT	NOMINAL DIMENSIONS
COLUMNS AND ARCHES	8 INCH X 8 INCH - FOR FLOORS 6 INCH X 8 INCH - FOR ROOFS
BEAMS AND GIRDERS	6 INCH X 10 INCH - FOR FLOORS 4 INCH X 6 INCH - FOR ROOFS
FLOORS	4 INCHES
ROOFS	2 INCHES TONGUE AND GROOVED 3 INCHES LAMINATED

NOTE: THE PRESENCE OF LARGE WOODEN BEAMS, COLUMNS AND/OR TRUSSES DOES NOT IN ITSELF CLASSIFY A BUILDING AS TYPE IV (HEAVY TIMBER). MASONRY EXTERIOR WALLS AND HEAVY TIMBER FLOORS AND ROOFS ARE EQUALLY REQUIRED. FEW IF ANY ACCOMMODATION BUILDINGS ARE LIKELY TO BE OF TRUE TYPE IV (HEAVY TIMBER) CONSTRUCTION AS THIS IS GENERALLY FOUND IN OLDER INDUSTRIAL BUILDINGS.

Type III - Ordinary

Two often used terms are most suitable for describing ordinary construction. These are "brick-joisted" and "brick wood-joisted". As the terminology indicates, ordinary construction is characterized by brick or other masonry exterior walls with the inherent fire resistance of masonry; and roofs, floors and supporting members partly or wholly of wood construction. Examples of ordinary construction are shown below (Figure 1-5). In protected ordinary construction, the interior walls, roofs, floors and supports are protected with one hour fire resistance. This fire resistance is usually provided by sheathing the wooden members with sufficient thicknesses of lath and plaster or gypsum board finish.



TYPICAL TYPE III

Fig. 1-5

The FSES Worksheet covers two different levels of Type III (ordinary) construction. These parallel the two levels of Type V construction except that exterior walls must be bearing masonary walls to qualify as Type III construction. The levels are:

A. Type III (211), also called "Protected Ordinary"

B. Type III (200)

TYPE II - NONCOMBUSTIBLE

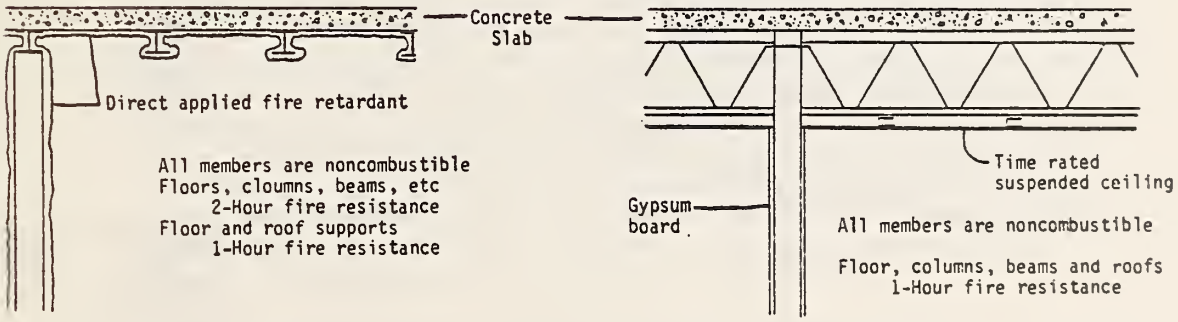
TYPE II (NONCOMBUSTIBLE) CONSTRUCTION IS CHARACTERIZED BY STRUCTURAL MEMBERS AND EXTERIOR CONSTRUCTION WHICH ARE NONCOMBUSTIBLE (FIGURE 1-7). THIS TYPE OF CONSTRUCTION IS SIMILAR TO TYPE I (FIRE RESISTIVE) CONSTRUCTION WITH FIRE RESISTANCE REQUIREMENTS RANGING FROM NONE TO TWO HOURS FOR ANY STRUCTURAL MEMBER.

THE FSES WORKSHEET COVERS THREE DIFFERENT LEVELS OF TYPE II (NONCOMBUSTIBLE) CONSTRUCTION BASED ON THE LEVEL OF FIRE RESISTANCE OR EXTENT OF SHEATHING. THESE ARE AS FOLLOWS:

A. TYPE II (222) A BUILDING WHERE ALL BEARING MEMBERS AND THE ENTIRE BUILDING EXTERIOR IS NONCOMBUSTIBLE IN WHICH ALL OF THE BEARING MEMBERS INCLUDING FLOORS HAVE 2-HOUR FIRE RESISTANCE. THE ROOF AND THOSE MEMBERS THAT SUPPORT ONLY THE ROOF NEED BE OF 1-HOUR CONSTRUCTION.

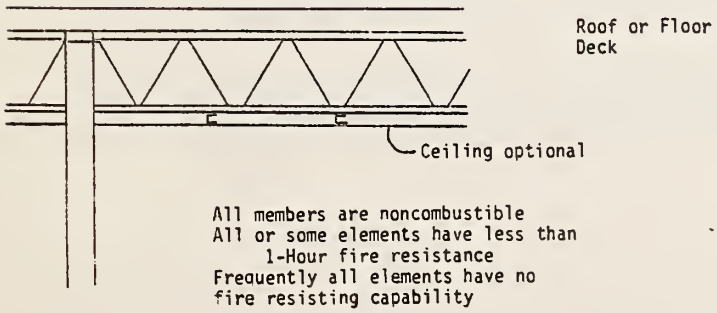
B. TYPE II (111) A BUILDING WHERE ALL BEARING MEMBERS AND THE ENTIRE BUILDING EXTERIOR IS NONCOMBUSTIBLE AND IN WHICH ALL BEARING MEMBERS AND THE ROOF AND ROOF SUPPORTS HAVE 1-HOUR FIRE RESISTANCE.

C. TYPE II (000). ANY BUILDING WHERE ALL BEARING MEMBERS AND THE ENTIRE EXTERIOR ARE NONCOMBUSTIBLE BUT THE LEVEL OF FIRE RESISTANCE OR SHEATHING IS NOT SUFFICIENT TO QUALIFY FOR A HIGHER LEVEL RATING.



TYPE II (222)

TYPE II (111)



TYPE II (000)

This type is the same as Type II (000) except that all members have at least 20 minutes fire resistance or are sheathed with sound lath and plaster or gypsum board sheathing

TYPE II (000) - Sheathed

Fig. 1-7
TYPICAL TYPE II

Type I - Fire Resistive

Fire resistive construction is characterized by noncombustible structural members including walls, floors, roofs, beams and columns with high fire resistance. Due to these fire resistance requirements, concrete, steel and iron are the principal materials of construction. Shown below is an illustration of Type I construction and typical methods of protecting steel columns and beams (Figure 1-8).

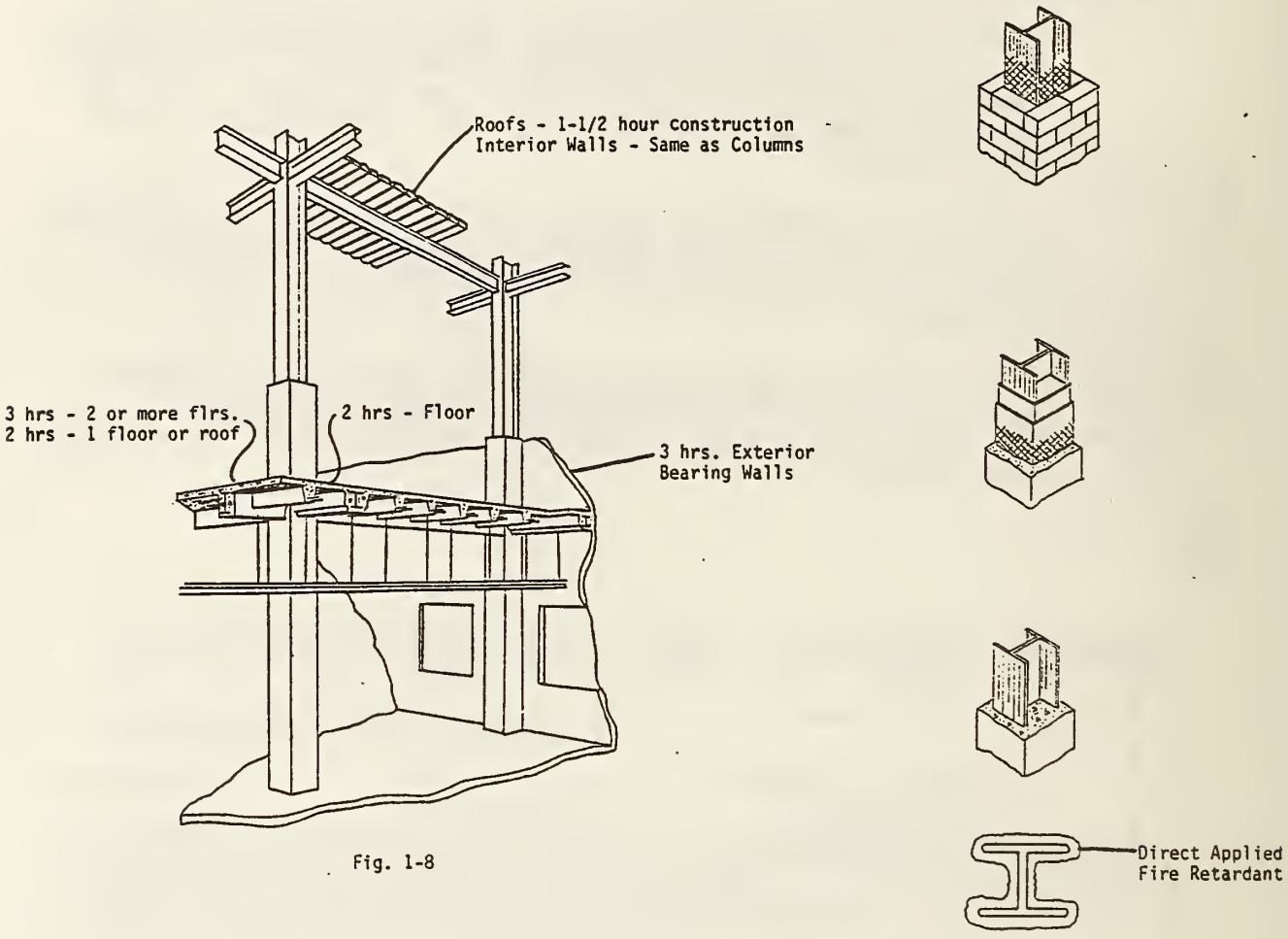


Fig. 1-8

2. Hazardous Areas	Within Res. Housing Area		Outside Res. Housing Area		None or No Deficiencies
	Double Deficiency	Single Deficiency	Double Deficiency	Single Deficiency	
	−7	−4	−4(−7)B	0	0

B-Use ( ) if parameter 1 is based on II(000), III(200), or V(000) construction and parameter 5 is 0.

2. Hazardous Areas

The assignment of charges for hazardous areas is a four-step process.

Step. 1. Identify Hazardous Areas. Hazardous areas are defined in sections 14-3.2 and 15-3.2.

Step 2. Determine the Level of Hazard. A hazardous area is classed as severe if it is a padded cell or if it has sufficient fire or explosion potential to defeat the basic integrity of the building framing as defined in Parameter 1.

Step 3. Determine the Fire Protection Provided. The parameter value for hazardous areas is based on the presence or absence of the fire protection necessary to control or confine the hazard. Two levels of fire protection are considered. The first consists of automatic sprinklers or other appropriate extinguishing system covering the entire hazard. The second is based on fire resistive enclosures including any bearing members in the space, partitions separating the hazardous area from all other spaces, and doors to the space sufficient to exceed the potential of the fire load involved. Any hazardous space that has either protection system is classified as having single protection. Any hazardous space that is both fully enclosed in a capable fire resistive enclosure and sprinklered is classified as having both (i.e. double level protection). On this basis, any fuel load that has such potential as to overwhelm the available structural capability of both its own enclosure and the basic structure could as a maximum have single protection.

Step. 4 Determine the Degree of Deficiency and Assign Parameter Values. The parameter value is finally determined on the basis of the degree of deficiencies that the hazardous area has in terms of the level of protection needed.

Figure 2 provides a matrix type table to assist in determining degree of deficiency to be assessed.

In some situations, more than one hazardous area with the same or differing levels of deficiency will exist. The charge is based on the single most serious charge for a hazardous area found.

Parameter 2, Hazardous Areas

The evaluation system bases the charge for hazardous areas on whether or not the hazardous areas are within the bounds of a residential housing area and the degree of protection provided for them.

	NO PROTECTION	SPRINKLER PROTECTION	1-HOUR FIRE RESISTIVE ENCLOSURE	SPRINKLERED & 1-HOUR FIRE RESISTIVE ENCLOSURE
HAZARDOUS AREA	SINGLE DEFICIENCY	NO DEFICIENCIES		
SEVERELY HAZARDOUS AREA	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	NO DEFICIENCIES A DOUBLE DEFICIENCY B SINGLE DEFICIENCY C	NO DEFICIENCIES A,C SINGLE DEFICIENCY B

A. If fire resistance and structural strength exceed maximum potential of hazard.

B. If fire resistance or structural strength is not sufficient to withstand potential of hazard.

C. Padded Cell

FIGURE 2 - HAZARDOUS AREAS - DEGREE OF DEFICIENCY

Figure 2 provides a table to assist in making this determination. Hazardous areas are any type of storage area, paint shop, or other area that presents a collection of burnable material more than what would be found in cells or involves a special hazard of flash fire or explosion. Because of the history of problems with padded cells, padded cells are always considered hazardous areas. In this same category, padded cells, large paint shops, and large storage areas (as might be related to an industrial operation) are considered to be severely hazardous areas.

It is also necessary to determine if the building is of Type II (000), Type III(200), or Type V(000) construction, and if the building is not spinklered or does not meet the requirements of a 8 point sprinkler system under Item 5. In that case Note B of the FSES Worksheet applies.

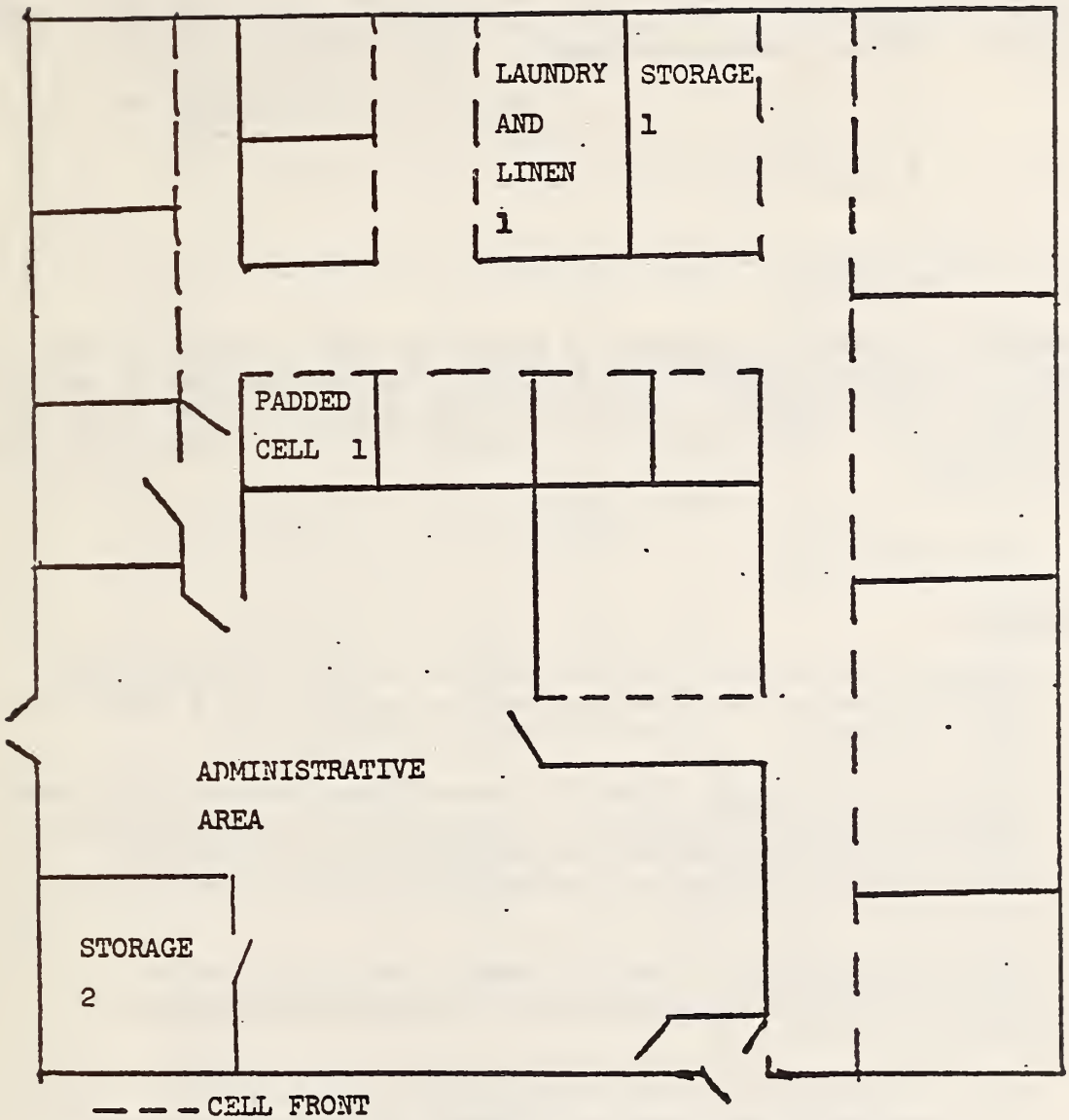


Figure 2.1 -Examples of Hazardous Areas

FIGURE 2.1 PROVIDES EXAMPLES OF HAZARDOUS AREAS WITHIN THE RESIDENTIAL HOUSING AREA, AND HAZARDOUS AREAS OUTSIDE THE RESIDENTIAL HOUSING AREA.

3. Fire Alarm	No Alarm	W/O F.D. Notification	W/F.D. Notification	
			W/O Man. Alarm	W. Man. Alarm
	-1	0	1	2

PARAMETER 3, FIRE ALARMS

THIS PARAMETER ADDRESSES THE PRESENCE OR ABSENCE OF MANUALLY OPERATED FIRE ALARM BOXES. WHERE STAFF MEMBERS ARE CONSTANTLY PRESENT, THE BOXES DO NOT HAVE TO BE AVAILABLE TO THE INMATES. SCORING IS BASED ON WHETHER OR NOT THERE IS SUCH A SYSTEM, AND IF THERE IS ONE IS IT ARRANGED SO THAT IT AUTOMATICALLY CALLS A FIRE DEPARTMENT.

3. Fire Alarm

a. No Alarm - There is no fire alarm system, or the system is incomplete and does not meet the requirements necessary for a higher scored category.

b. W/O F.D. Notification - There is a manual fire alarm system or smoke detection system conforming with the appropriate requirements of 14-3.4 or 15-3.4 except that the requirements of 14-3.4.4 or 15-3.4.4 covering automatic transmission of the alarm to the fire department are not met.

c. W/F.D. Notification - There is a manual fire alarm or smoke detection system conforming with the appropriate requirements of 14-3.4 or 15-3.4.

(1) W/O Manual Alarm - There is no manual alarm system but a smoke detection alarm system or sprinkler system recognized under Parameters 4 or 5 of this system is provided and is arranged to transmit an alarm automatically to the fire department.

(2) W/Manual Alarm - There is a manual alarm system arranged to transmit an alarm automatically to the fire department.

FIRE DEPARTMENT NOTIFICATION IS NORMALLY ACCOMPLISHED BY A DIRECT CONNECTION BY TELEPHONE LINES TO THE FIRE DEPARTMENT DISPATCHER, POLICE DEPARTMENT, AN APPROVED CENTRAL STATION WHICH IS A PRIVATE COMPANY SPECIFICALLY DESIGNATED TO RECEIVE AUTOMATIC ALARM SIGNALS OR THROUGH OTHER SUITABLE RECEIVING STATIONS. IN REMOTE AREAS CREDIT CAN BE GIVEN FOR A DIRECT CONNECTION IF THE ALARM IS TRANSMITTED TO A LOCATION OUTSIDE OF THE BUILDING WHERE THE ALARM WAS INITIATED, AND THE LOCATION IS MANNED 24 HOURS PER DAY BY RESPONSIBLE PERSONNEL DESIGNATED AND INSTRUCTED TO NOTIFY THE FIRE DEPARTMENT WITHOUT DELAY WHEN AN ALARM IS RECEIVED.

THE INTENT OF AUTOMATIC NOTIFICATION IS THAT THE SYSTEM IS DESIGNED TO AVOID A DELAYED BY HUMAN INTERVENTION, SUCH AS THE PRISON STAFF CHECKING THE BUILDING BEFORE CALLING THE FIRE DEPARTMENT. THE KEY WORD IN THE EXPLANATION ABOVE IS THAT THE SYSTEM MUST BE AUTOMATIC.

Note: The locking of manual fire alarm boxes at staff locations in lieu of resident accessible alarm boxes in sleeping room areas is acceptable when staff is present and has immediate access to the alarm boxes.

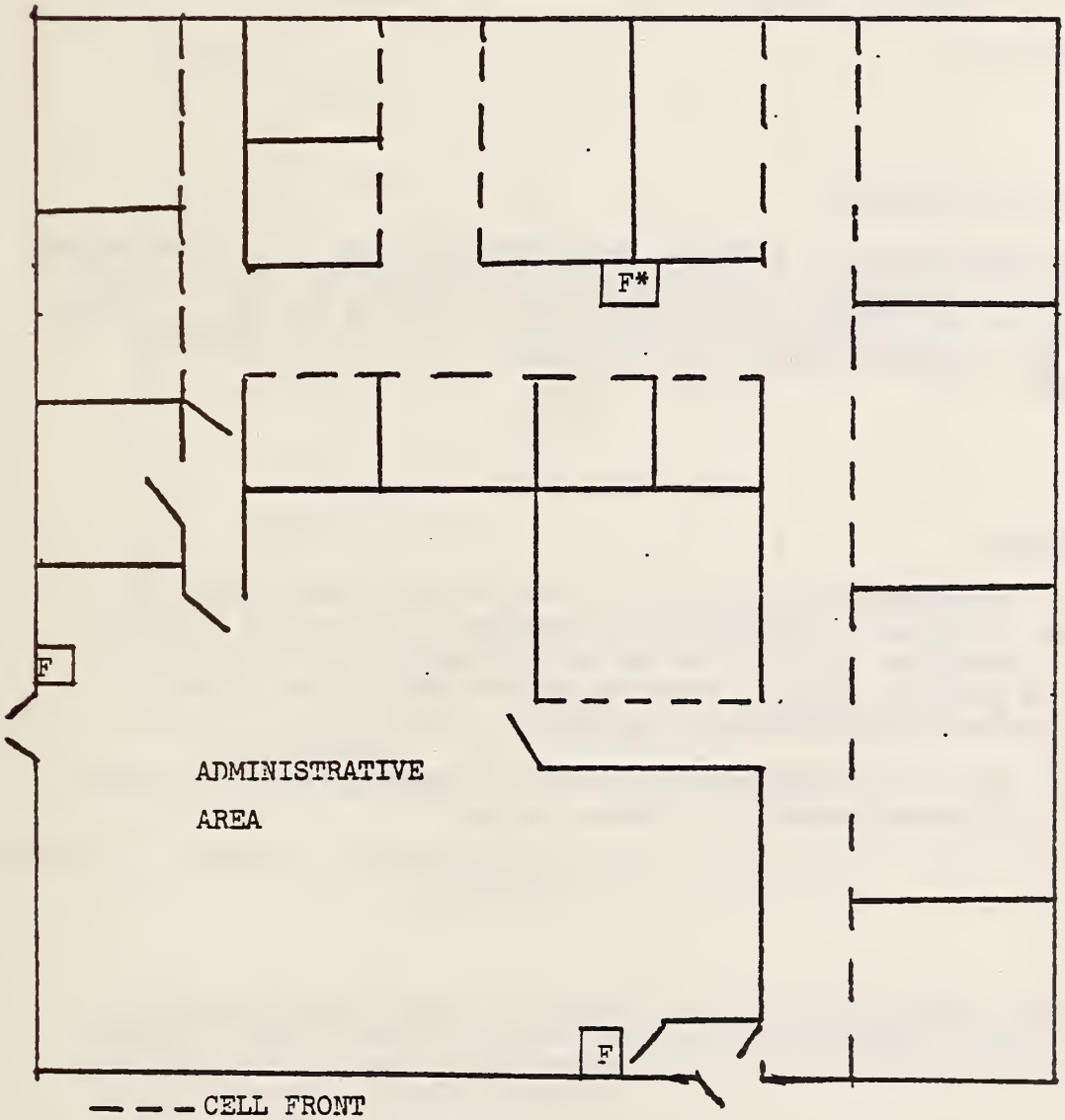


Figure 3.1- Manual Fire Alarm Placement

FIGURE 3.1 PROVIDES EXAMPLE OF MANUAL FIRE ALARM PLACEMMENT. ALARM STATIONS MUST BE PLACED ACCORDING TO CODE, BUT MAY BE LOCKED IF UNDER STAFF SUPERVISION.

4. Smoke Detection	None	Residential Housing Area			Total Bldg.
		Partial Coverage		Full Coverage	
		Corr. & Comm. Spa & Lrg. Sleeping Rms.	All Sleeping Rms.		
	-4(-1)A	0	2	4	5

A-Use ( ) if parameter 5 is 10.

PARAMETER 4, SMOKE DETECTION

THIS PARAMETER COVERS WHETHER THERE ARE SMOKE DETECTORS AND IF THEY ARE PRESENT HOW MUCH COVERAGE IS PROVIDED. THE DETECTORS FOR COVERAGE OF CELLS OR OTHER SLEEPING AREAS CAN BE LOCATED IN THE VENTILATION SYSTEM FOR THE CELLS. THERE HOWEVER MUST BE A SEPARATE DETECTION ARRANGEMENT FOR EACH PROTECTED CELL (SLEEPING ROOM).

4. Smoke Detection

A detection system as used here is one based on use of smoke detectors meeting the installation requirements of Sections 14-3.4.5 and 15-3.4.5 and NFPA Standard No. 72E with the extent of coverage as defined below. No credit is given for thermal detectors in habitable spaces. The detection system categories are as follows:

a. None - There are no smoke detectors or if present they do not meet the requirements needed for a higher score.

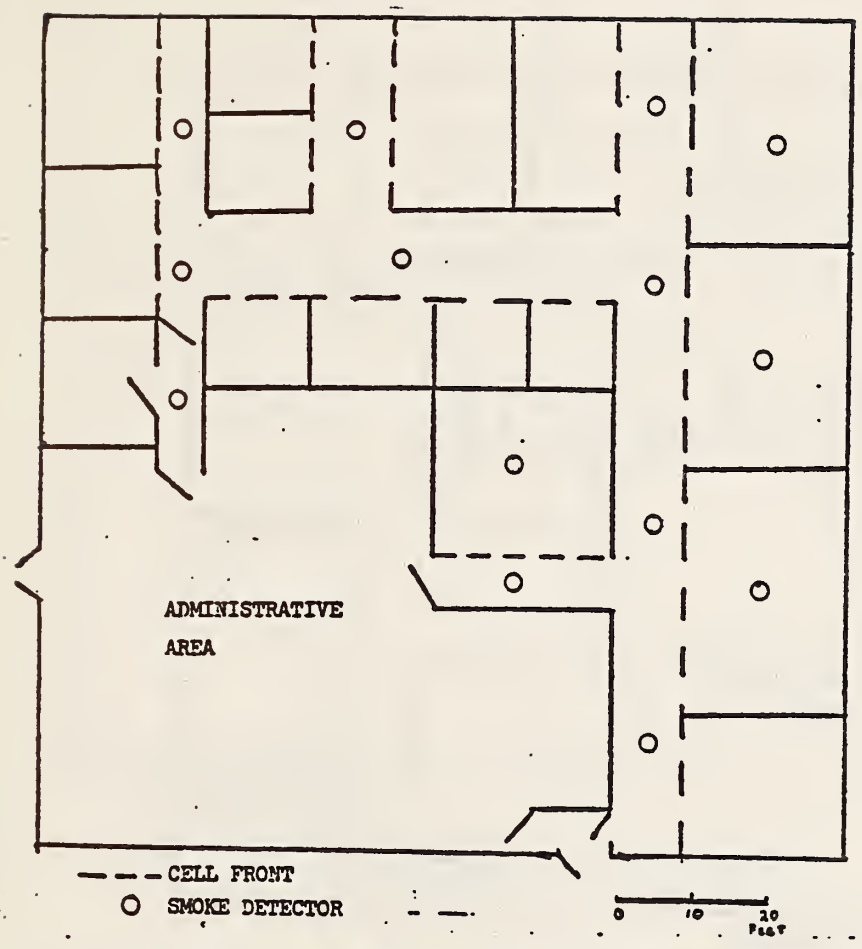


Figure 4.1 -Corridors, Common Spaces and Sleeping rooms of More Than Four Persons Detector Locations

b. **Corridors, Common Spaces and Sleeping Rooms for More Than Four Persons - Smoke detection requirements of such spaces located within the residential housing area are covered by smoke detector installations in accordance with NFPA 72E.**

SEE FIGURE 4.1 FOR EXAMPLE

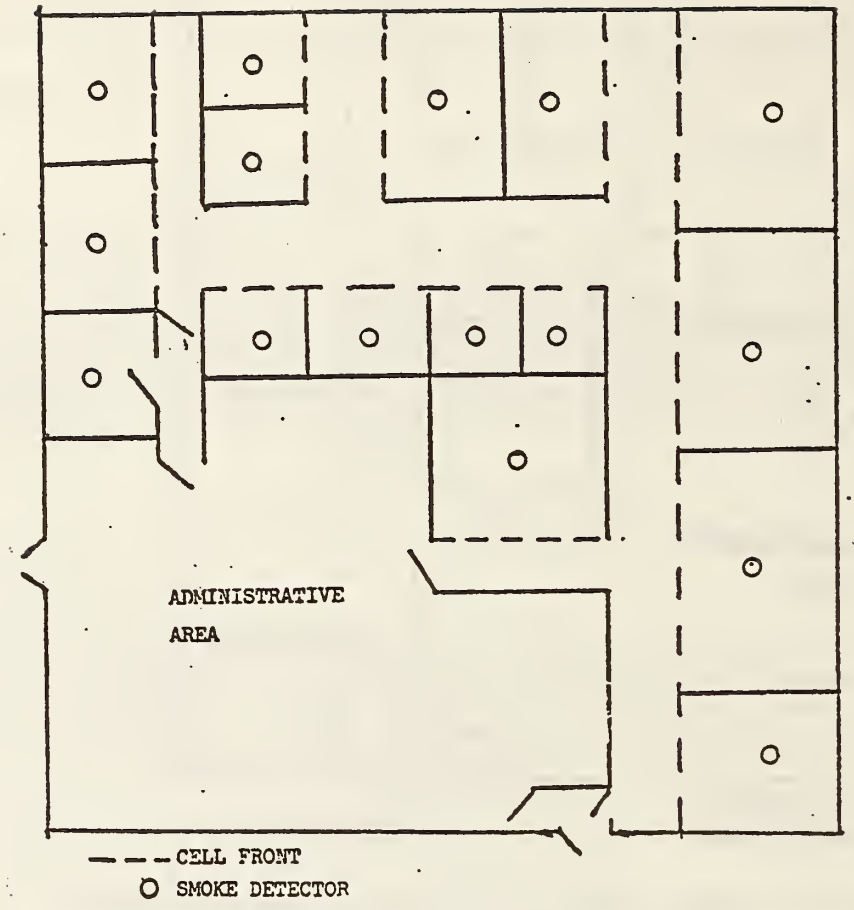


Figure 4.2- Sleeping Rooms Detector Locations

c. Sleeping Rooms - Smoke detectors are considered as meeting this requirement when there is at least one smoke detector protecting each sleeping room occupied or used by prisoners. In rooms having a dimension in excess of 30 feet, additional detectors are provided so that detector spacing does not exceed approximately 30 feet. Detectors are not required in restrooms or closets.

SEE FIGURE 4.2 FOR EXAMPLE

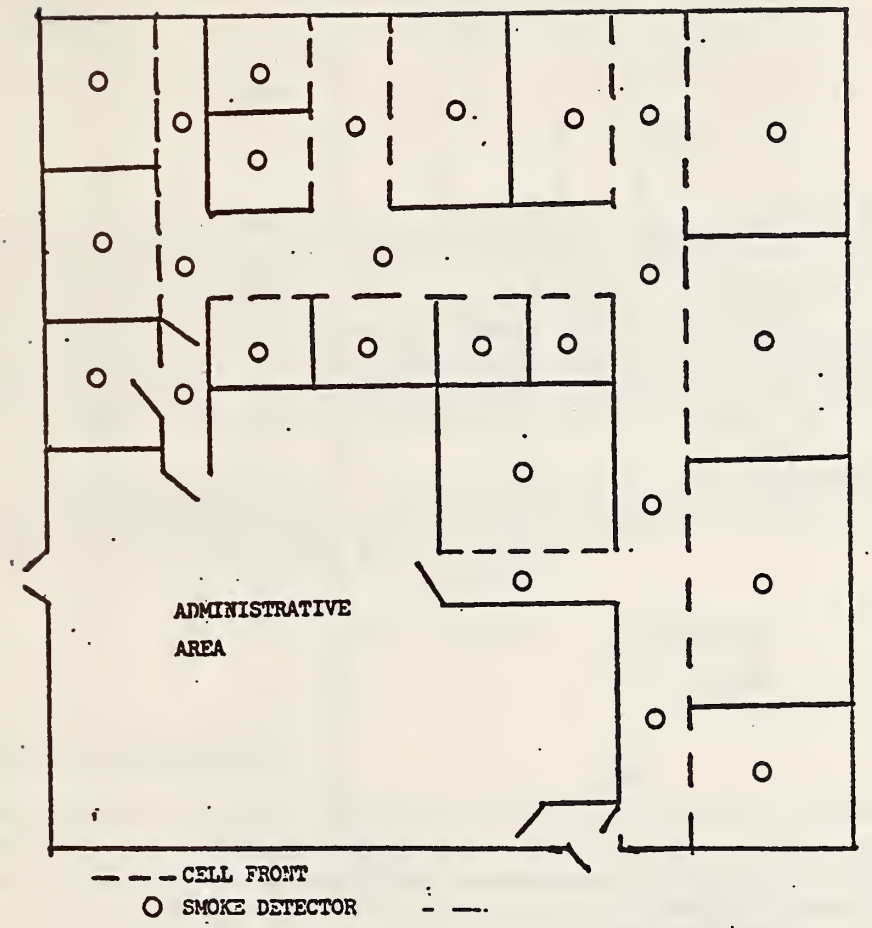


Figure 4.3 - Full Coverage Detector Location

d. Full Coverage - Meets the combined requirements for b. and c.
SEE FIGURE 4.3 FOR EXAMPLE

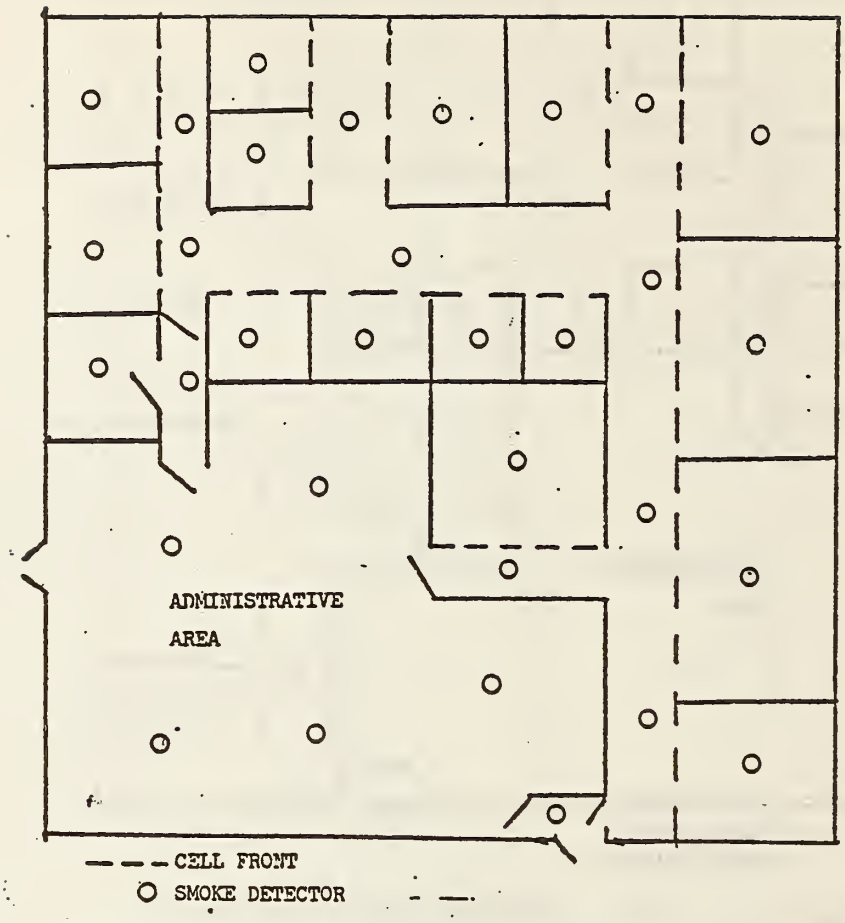


Figure 4.4- Total Facility Detector Location

e. Total Facility - Total facility detector credit requires conformance with the requirements of NFPA 72E for total coverage.

SEE FIGURE 4.4 FOR EXAMPLE

IT IS ALSO NECESSARY TO DETERMINE IF THE BUILDING IS FULLY SPRINKLER PROTECTED BY A HIGHLY RELIABLE SYSTEM MEETING THE REQUIREMENTS OF A 10 POINT SPRINKLER SYSTEM UNDER ITEM 5. IN THAT CASE NOTE A OF THE FSES WORKSHEET APPLIES.

5. Automatic Sprinklers	None	Residential Housing Area	Entire Building
	0	8	10

A SPRINKLER SYSTEM CONSISTS OF A NETWORK OF PIPE, CONTROL VALVES AND ACCESSORIES, AND SPRINKLER HEADS. SPRINKLER HEADS ARE ACTIVATED INDIVIDUALLY BY ELEVATED TEMPERATURES. THE AREA OF COVERAGE BY A SINGLE SPRINKLER HEAD CAN VARY ACCORDING TO THE REQUIRED DESIGN CRITERIA, BUT THE MAXIMUM AREA ALLOWED WILL NOT EXCEED 225 SQUARE FEET PER SPRINKLER HEAD. AS A RULE OF THUMB, SPRINKLERS ARE USUALLY SPACED 15 FEET OR LESS APART, AND NOT MORE THAN 7-1/2 FEET FROM ANY WALL.

THE SYSTEM SHOULD BE SUPPLIED BY A RELIABLE WATER SUPPLY SUCH AS A PRESSURE TANK, ELEVATED STORAGE TANK, OR WATER SUPPLY DISTRIBUTION SYSTEM. SUFFICIENT GALLONAGE AND PRESSURE MUST BE AVAILABLE.

5. Automatic Sprinklers

In evaluating sprinkler protection, the protection or lack of protection of hazardous areas is considered separately and covered under safety Parameter 2 except that total building protection must include hazardous areas. Also the presence or lack of fire department notification is considered separately under Parameter 3. In all other aspects, any sprinkler installations shall conform to sections 14-3.5 and 15-3.5 and be graded on the following basis:

a. None - No credit is given if there are no sprinklers or if sprinklers, though present, are not sufficient to qualify for one of the other categories listed herein.

SPRINKLERS ARE GIVEN CREDIT ONLY IF THERE ARE ENOUGH TO COVER AT LEAST THE ENTIRE RESIDENTIAL HOUSING AREA.

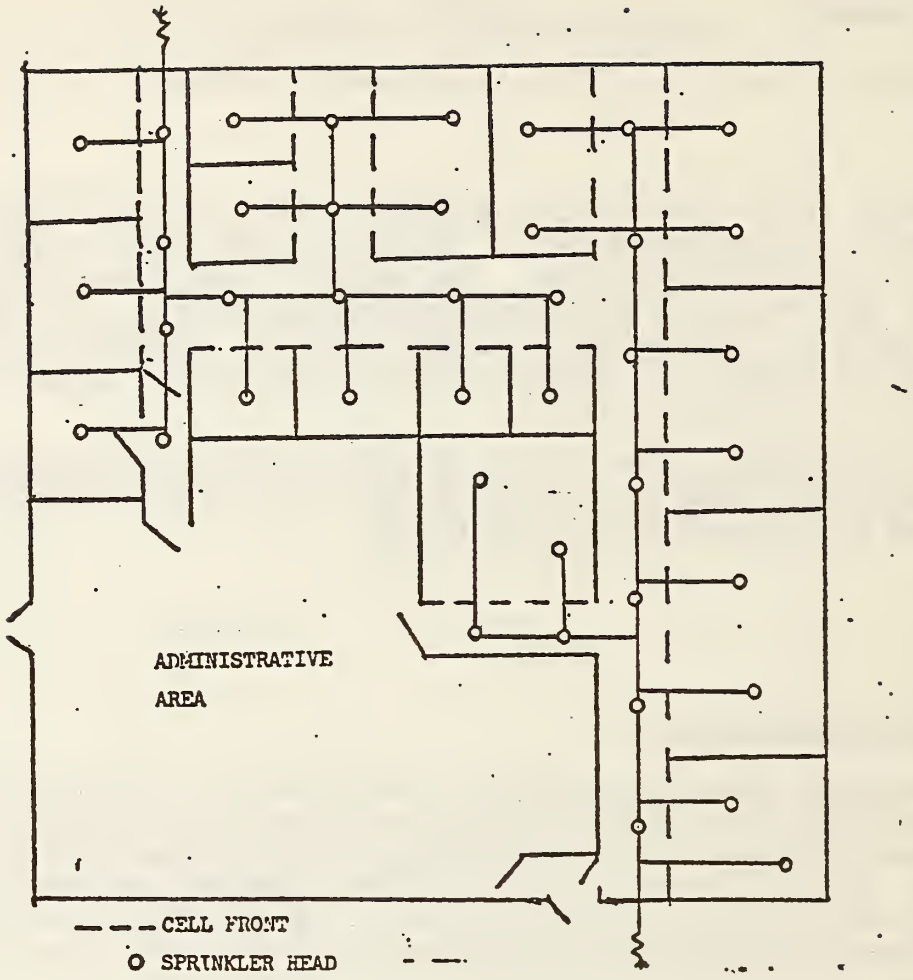


Figure 5.1- Residential Housing Area Sprinkler Location

b. Residential Housing Areas - The credit for sprinkler protection of residential housing area is given for arrangements where sprinklers are located throughout the areas such that all space within such area (including cells or sleeping rooms) are covered by the protection spray pattern or sprinkler heads.
SEE FIGURE 5.1 FOR EXAMPLE

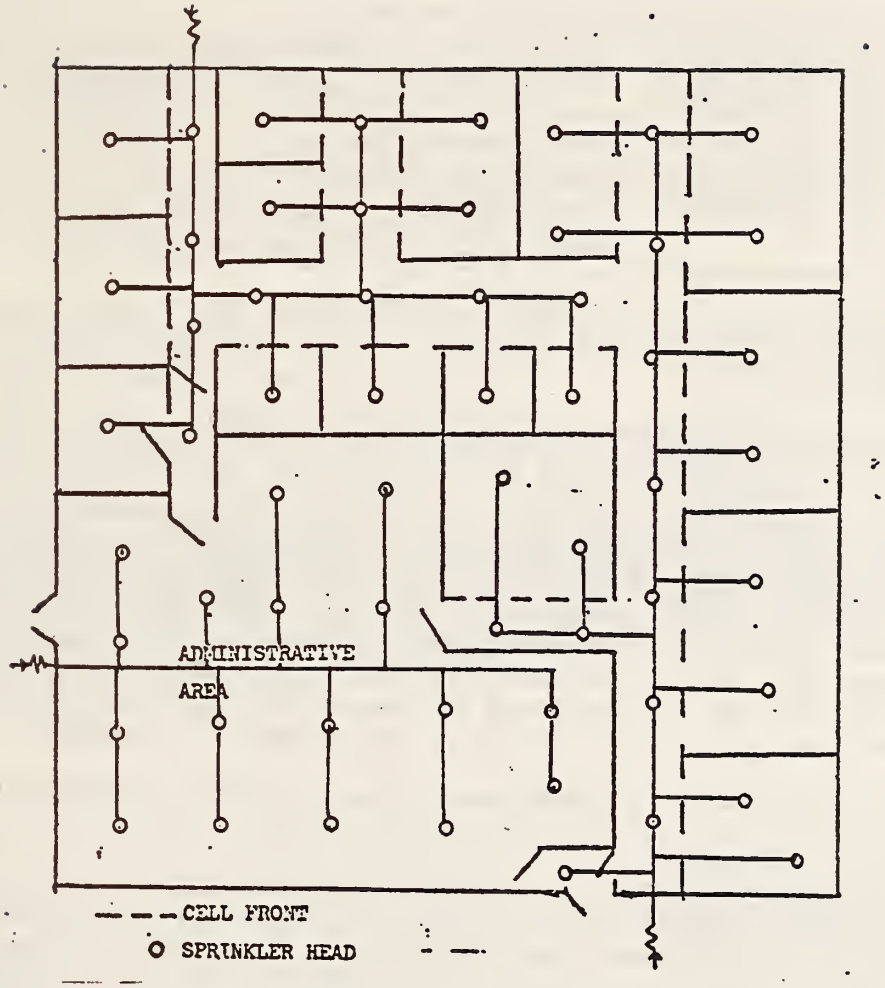


Figure 5.2- Entire Building Sprinkler Location

c. Entire Building - The building is totally sprinkler protected in accordance with NFPA Standard No. 13 for light hazard occupancy (or higher hazard occupancy for any spaces classified as higher hazard by NFPA Standard No. 13).

SEE FIGURE 5.2 FOR EXAMPLE

6. Interior Finish (Corrs & Egress)	Class C	Class B	Class A
	-3	-1	0
7. Interior Finish (Other Areas)	Class C	Class B	Class A
	-2	-1	0

6. & 7. Interior Finish

Classification of interior finish is in accordance with Sections 14-3.3.2 and 15-3.3.2, as appropriate.

No consideration is included in the Safety Parameter Value for any finish with a flame spread rating > 200 or for any material not rationally measured by the ASTM E84 Test. Materials not rationally measured include: foam plastics, asphalt impregnated paper and/or materials capable of inducing extreme rates of fire growth and rapid flashover. In any case where these materials are involved, the resultant risk is considered to classify any such finish area as a hazardous area to be evaluated under Parameter 2, Hazardous Areas.

Note: 1/4 inch plywood is considered as having a flame spread of 200 or less.

Note: For Parameter 6, Interior Finish (Corridors and Egress Routes), the credit for Class A interior finish is given only if the interior floor finish is also Class I. The credit for Class B interior finish is given only if the interior floor finish is also Class I or II or is an existing floor finish having previously been evaluated as having a flame spread of 75 or less in accordance with NFPA Standard 255.

For Parameter 7, Interior Finish (other areas) the credit for interior finish is to be based on walls and ceiling finishes without consideration of floor finishes.

PARAMETERS 6 & 7, INTERIOR FINISH

INTERIOR FINISH IS THAT FINAL LINING ON THE WALLS AND ROOF. IN MANY PRISONS THE INTERIOR CONSISTS OF THE MASONRY, STEEL OR THE OTHER MATERIALS OF BUILDING AND CELLS CONSTRUCTION. IN THAT CASE THOSE MATERIALS ARE THE INTERIOR FINISH.

MANY MATERIALS USED FOR INTERIOR FINISH HAVE UNDERWRITERS LABORATORIES LABELS THAT SHOW THE FLAME SPREAD RATE OF THE MATERIAL. THESE ARE USUALLY MANUFACTURED MATERIALS SUCH AS FIRE RETARDANT TREATED PLYWOODS, PLASTIC LAMINATED MATERIALS, AND INSULATING MATERIALS.

MOST COMMON MATERIALS PURCHASED IN LOCAL LUMBER YARDS OR BUILDING SUPPLY STORES ARE NOT SO LABELED. FIGURE 6.1 IS A CHART TO ASSIST IN CLASSIFYING SUCH MATERIAL.

DURING THE PERIOD OF APPROXIMATELY 1960 TO THE LATE 1975 A GREAT DEAL OF USE WAS MADE OF A FIBERBOARD MATERIAL THAT WAS FACTORY IMPREGNATED WITH FIRE RETARDANT TREATED SALTS. THIS TYPE OF MATERIAL WAS FREQUENTLY USED IN CEILING TILES. IT ALSO HAS A LOW FLAME SPREAD. EVERY TILE SO MADE HAS SOME TYPE OF MARKING ON THE BACK OF THE TILE INDICATING THAT IT IS FIRE RETARDANT TREATED. IF NO SUCH MARKING IS FOUND IT CAN BE PRESUMED THAT IT IS AN UNTREATED FIBERBOARD AND HAS A HIGH FLAME SPREAD.

MOST COMMON WOOD MATERIALS HAVE FLAME SPREAD BETWEEN 75 AND 200 UNLESS THEY ARE TREATED WITH A FIRE RETARDANT PAINT. IN WHICH CASE THE FLAME SPREAD MAY BE REDUCED BELOW 75 AND IN SOME CASES BELOW 25.

LESS THAN A QUARTER INCH THICK PLYWOOD AND UNTREATED FIBERBOARD BOTH NORMALLY HAVE FLAME SPREAD THAT EXCEED 200. THE BASIC PREMISE OF THE FSES IS THAT IF FLAME SPREAD EXCEEDS 200, THE BALANCES IN THE FSES ARE INAPPROPRIATE. UNTREATED FIBERBOARD THAT HAS BEEN PAINTED WITH ANY LATEX OR WATER BASED PAINT CAN BE CONSIDERED AS HAVING IMPROVED FLAME SPREAD TO SOMETHING SLIGHTLY LESS THAN 200. THIN WALL PANELING, HOWEVER, REQUIRES EITHER REPLACEMENT OR APPLICATION OF A STANDARD APPROVED OR LISTED FIRE RETARDANT PAINT TO REDUCE THE FLAME SPREAD.

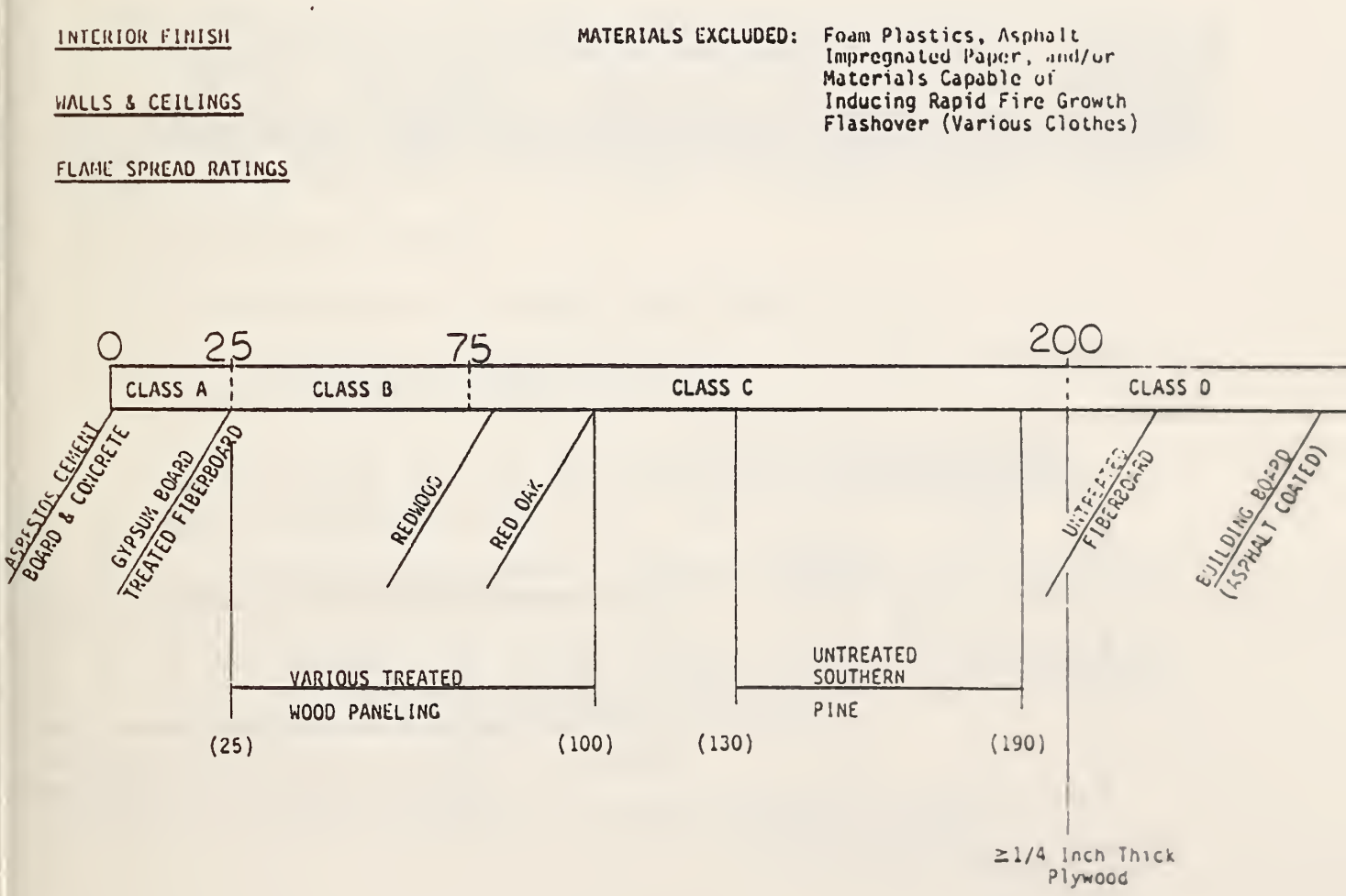


Figure 6.1 Flame Spread Ratings

8. Cell/Room Enclosure	Cells(Rooms) Face on Corridor (Each Cell is a Separate) Residential Housing Area)	Intervening Common Space Within Resid. Housing Area		
		Open	Smoke Tight <1 Hr.	>=1 Hr. Fire Resis.
	0	-3(-5)C (0)D	0(-2)C	2(0)C

C-Use ( ) for level V new when parameter 5 is 0.
D-Use ( ) for all level II.
-For level III if intervening space is <=50 ft.,
-For level IV if parameter 5 is >=8 and intervening space is <=50 ft.
-Also use ( ) in existing buildings if either parameter 13=8, or if parameter 5 is >=8 and parameter 4 is >=0.

8. Cell/Sleeping Room Enclosure

The charges for cell or sleeping room enclosure are divided between those for cells or sleeping rooms that face directly onto a corridor and those where there is an intervening common space (i.e. day room, group activity space or other space between the sleeping room and the corridor access).

SEE FIGURE 8.1 AND 8.2 FOR EXAMPLES

IF THE PATH OF EMERGENCY TRAVEL TRAVERSES A COMMON USE SPACE OR IS OPEN TO ANY SPACE HAVING COMBUSTIBLE CONTENTS, THEN THE ENTRIES IN LINE 8 ARE BASED ON "INTERVENING COMMON SPACE WITHIN THE RESIDENTIAL HOUSING AREA." THE PATH OF EMERGENCY TRAVEL IS THE ROUTE FROM ANY CELL TO THE POINT WHERE THAT ROUTE LEAVES THE BUILDING, ENTERS A FIRE STAIR, OR PASSES THROUGH A SMOKE BARRIER.

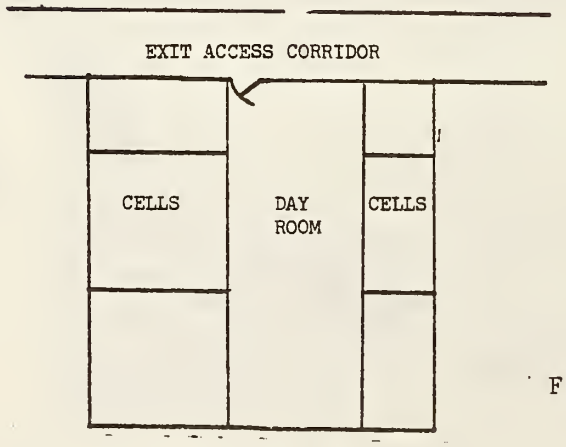


Figure 8.1 Intervening Common Space Within Residential Housing Area

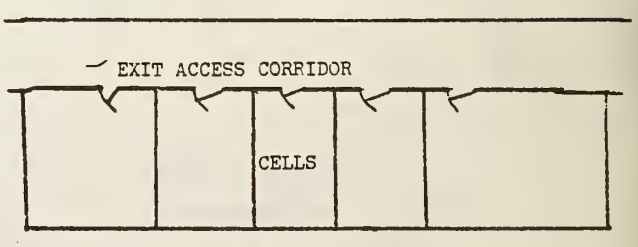


Figure 8.2 Cells Face Directly Onto Corridor (Each is a Residential Housing Area)

a. Open - Open includes any cell or sleeping room enclosure that includes opening in excess of 120 sq. inches. In use condition V the closure is considered "open" if there are any openings exceeding the minimum necessary for door swing and latch unless: (1) the affected cells meet the smoke control requirements for mechanically assisted in Parameter 13, or (2) there is a closure for such openings closeable from inside the cell.

b. Smoke Tight - An enclosure qualifies in this category if the walls are complete from slab to slab or to a continuous smoke tight ceiling and doors are complete but some wall aspect (wall, ceiling, etc.) is less than 1-hr. fire resistive, or the door is not capable of resisting fire for at least 20 minutes.

c. Fire Resistive - An enclosure qualifies in this category if it meets all of the requirements for b. above, and all wall aspects have at least 1-hr. fire resistance and the door is capable of resisting fire for at least 20 minutes.

WHEN CONSIDERING THIS PARAMETER IT IS NECESSARY TO KNOW IF THE USE CONDITION IS LEVEL V AND THE BUILDING HAS NO SPRINKLER SYSTEM OR QUALIFIES AS A 0 POINT SPRINKLER SYSTEM UNDER ITEM 5. IF SO NOTE C OF THE FSES WORKSHEET APPLIES.

IT IS ALSO NECESSARY TO KNOW:

A. IF THE BUILDING IS OF USE CONDITION LEVEL II.

B. IF THE BUILDING IS OF USE CONDITION LEVEL III, AND THE INTERVENING SPACE IS LESS THAN OR EQUAL TO 50 FEET.

C. IF THE BUILDING IS OF USE CONDITION LEVEL IV, AND THE BUILDING QUALIFIES UNDER ITEM 5 AS AN 8 POINT OR MORE SPRINKLER SYSTEM, AND THE INTERVENING SPACE IS LESS THAN OR EQUAL TO 50 FEET.

D. IF THE BUILDING IS AN EXISTING STRUCTURE AND UNDER ITEM 13 QUALIFIES FOR AN 8 POINT SMOKE CONTROL SYSTEM.

E. IF THE BUILDING IS AN EXISTING STRUCTURE AND UNDER ITEM 5 QUALIFIES AS AT LEAST AN 8 POINT SPRINKLER SYSTEM AND UNDER ITEM 4 IT QUALIFIES AS AT LEAST A 0 POINT SMOKE DETECTION SYSTEM.

IN ANY OF THE ABOVE CASES NOTE D OF THE FSES WORKSHEET APPLIES.

9. Separation of Residential Housing Areas From Other Areas	Incomplete	Smoke Tight<1 Hr	>=1 Hr. Fire Resistive
	-6	2(4)H	4(2)B

B-Use ( ) if parameter 1 is based on II(000), III(200), or V(000) construction and parameter 5 is 0.

H-Use ( ) for levels II, III, and IV new if cells are facing access corridor.

9. Separation of Residential Housing Areas* From Other Areas

The charges for separation of residential housing areas are based on the quality of the common walls and separating partitions and door between residential housing areas and the rest of the building. The charge is based on the residential housing area that has the lowest quality separation. Where a building contains more than one residential housing area, the separation of residential housing areas from each other is also to be considered equally to the separation of a residential housing area from some other type of space. In buildings entirely composed of a single residential housing area the separation is considered equivalent to fire resistive if there is at least 30 feet separation from other structures, smoke tight if there is a separation less than 30 feet.

SEE FIGURE 9.0 FOR EXAMPLE OF THE WALLS WHICH ARE OF CONCERN WHEN CONSIDERING SEPARATION OF RESIDENTIAL HOUSING AREA FROM OTHER AREAS.

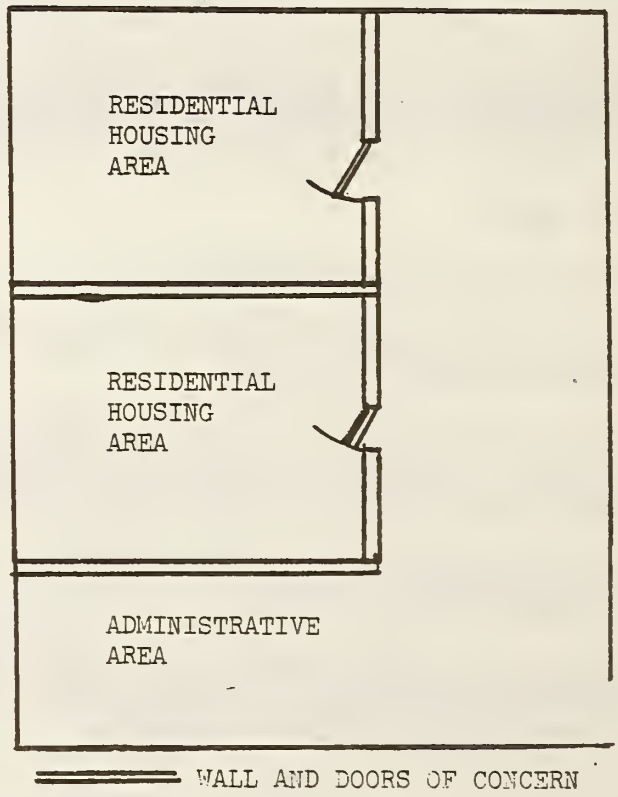


Figure 9.0 Separation Concerns

* Residential housing area includes: sleeping areas and any contiguous day room, group activity space or other common space.

Classification of internal separations is based on the following:

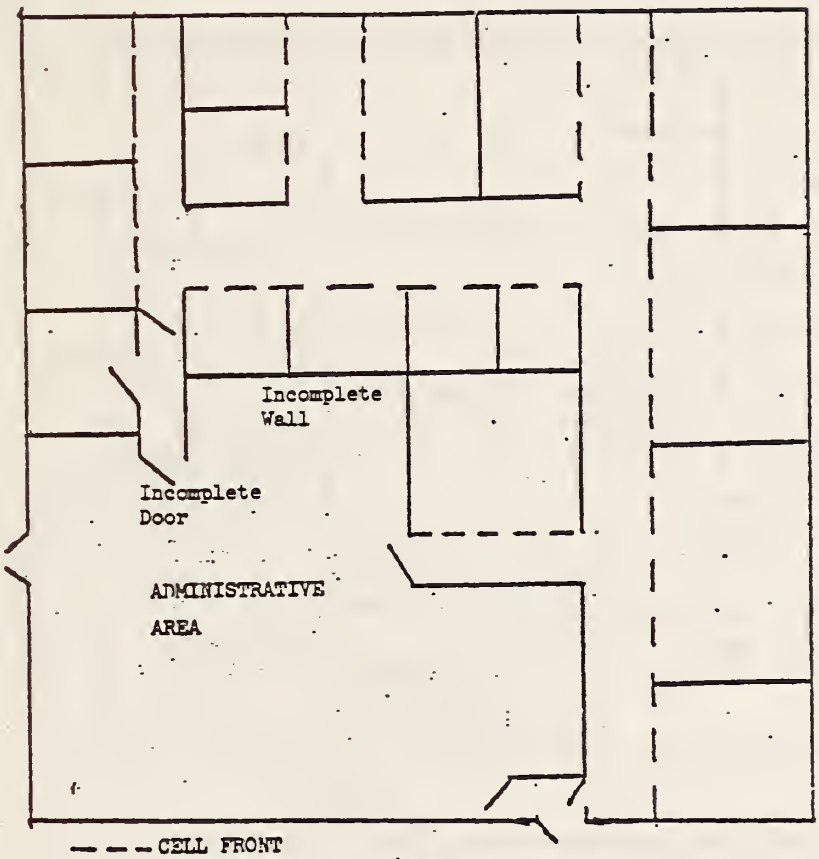


Figure 9.1 Incomplete Separation

a. Incomplete - Any separation that does not meet the criteria for b. or c. below or if the doors involved are not self closing or automatic closing as described in sections 5-2.1.2.3, 14-2.11.5 and 15-2.11.5.

SEE FIGURE 9.1 FOR EXAMPLE

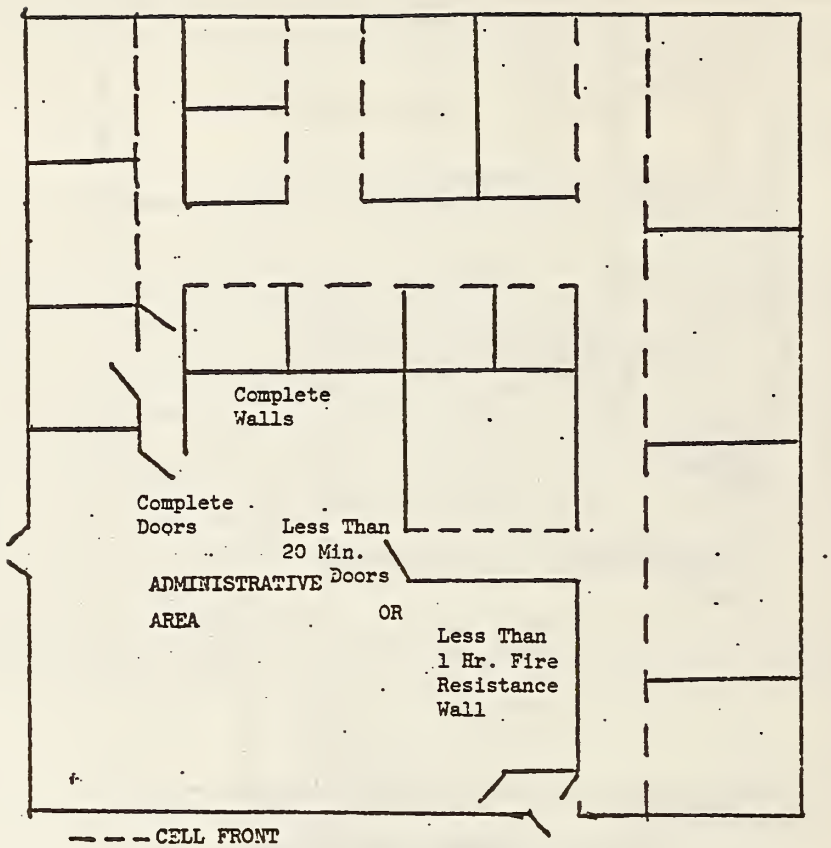


Figure 9.2 Smoke Tight Separation

b. Smoke Tight - An enclosure qualifies in this category if the walls are complete from slab to slab or to a continuous smoke tight ceiling and doors are complete but some wall aspect (wall, ceiling, etc.) is less than 1-hr. fire resistive, or the door is not capable of resisting fire for at least 20 minutes.

SEE FIGURE 9.2 FOR EXAMPLE

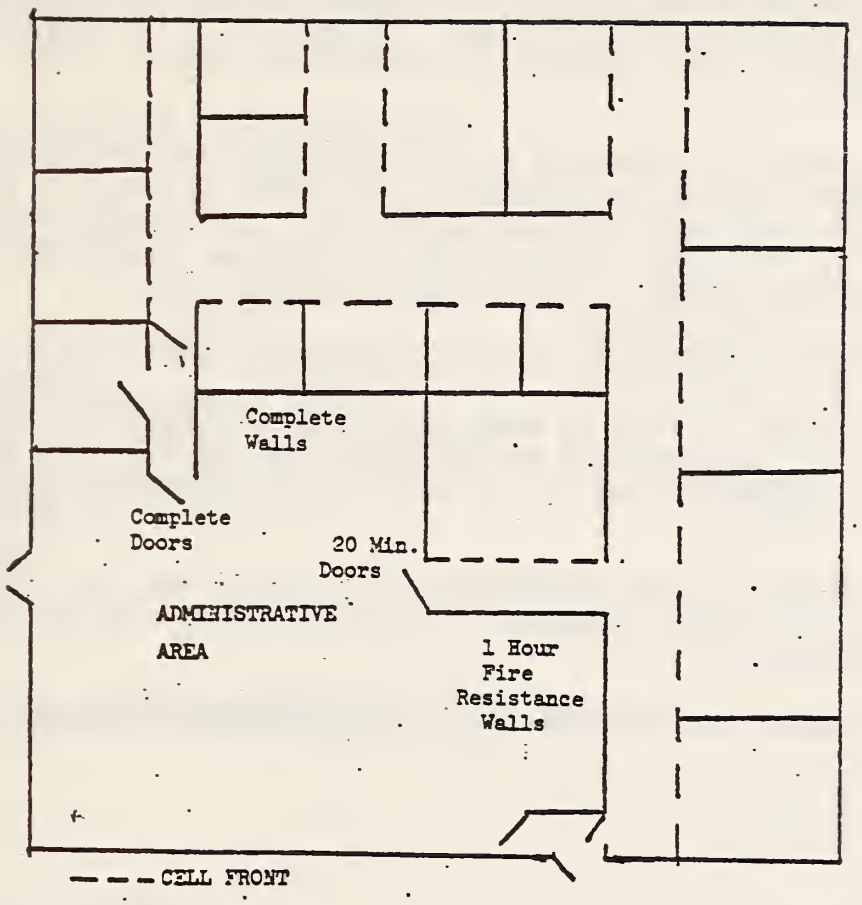


Figure 9.3 Fire Resistive Separation

c. Fire Resistive - An enclosure qualifies in this category if it meets all of the requirements for b. above, and all wall aspects have at least 1-hr. fire resitance and the door is capable of resisting fire for at least 20 minutes.

SEE FIGURE 9.3 FOR EXAMPLE

Parameter 9, Separation of Residential Housing Areas from Other Areas

This parameter relates to the separation between residential housing area and the administrative area or between one residential housing area and another. The classification factors are essentially the same as in the separation between cells with the title "INCOMPLETE" meaning the same as "OPEN" in the previous parameter.

If the previous parameter (parameter 8, cell enclosure) was scored as "0" based on cell rooms that face on corridors, this score is based on both the construction of the cell faces and on any separation between the total residential housing area and the administrative portions of the building, whichever has the least smoke and fire stopping capabilities.

When evaluating this parameter it is also necessary to know:

A. If construction, Item 1, is based on II(000), III(200), or V(000) construction; <u>and</u> there are no sprinklers, or the value for Item 5, automatic sprinklers, was 0. In this case Note B of the FSES worksheet applies.

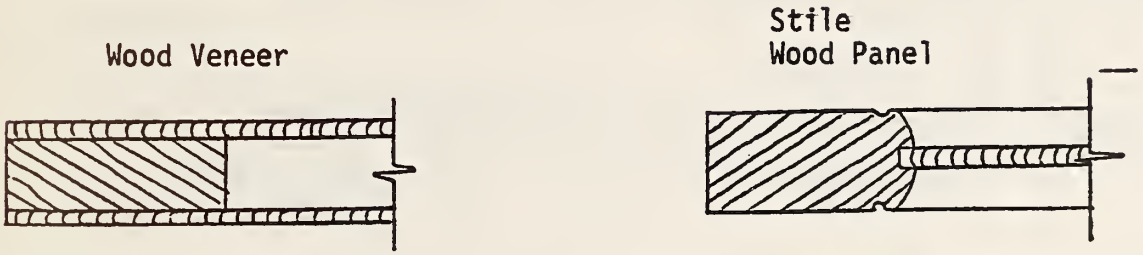
B. If the building has use conditions II, III, or V new, <u>and</u> the cells are facing the access corridor. In this case Note H of the FSES worksheet applies.

On the following pages are explanations of fire resistance ratings of walls and doors.

Doors

Shown below are typical fire-resistance ratings for common wood doors (Figure 9.5).

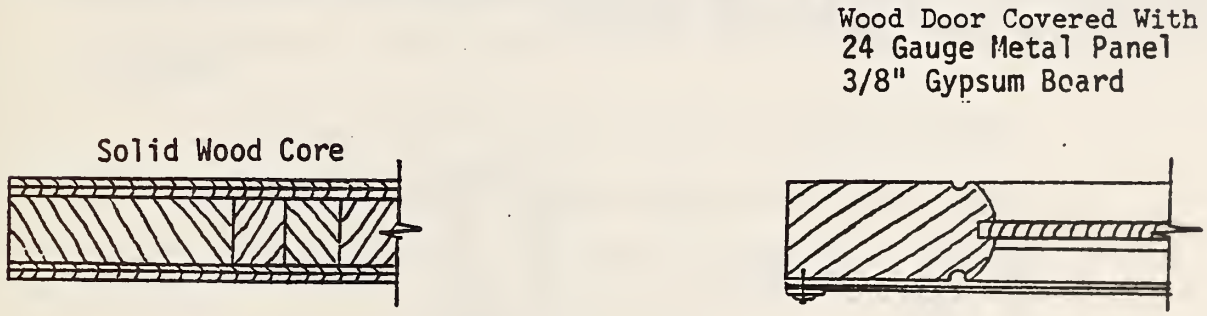
Less than 20 minute fire resistance



Wood Hollow-Core Flush (or Hollow Core with Louvers)

Wood Panel

About 20 minute fire resistance



Wood Solid-Core Flush

Protected Wood Panel

Figure 9.5-Common Styles of Wood Framed Doors

Hollow steel or sheet steel doors have the equivalent of a 20 minute fire resistance rating

Greater than 20 minute fire resistance

Fire door ratings can be obtained from either Factory Mutual or Underwriters' Laboratories labels generally affixed to the door and frame. This is the only way to insure a greater than 20 minute fire resistance rating.

WALLS

PARTITIONS SHOULD BE CONSIDERED COMPLETE IF THE PARTITION EXTENDS TO THE UNDERSIDE OF THE FLOOR OR ROOF DECK ABOVE, (FIGURE 9.6A) OR TO A COMPLETE CEILING MEMBRANE (FIGURE 9.6B).

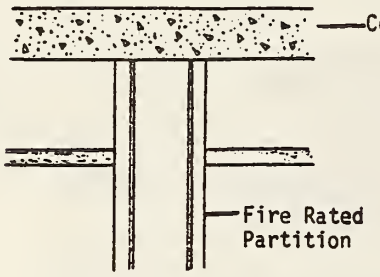


Figure 9.6a

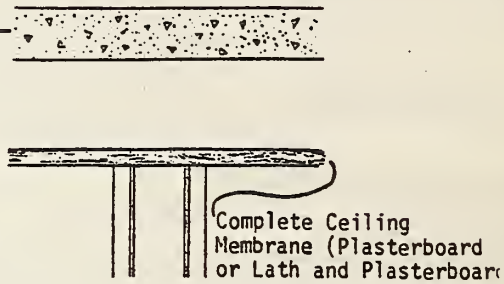


Figure 9.6b

SHOWN BELOW ARE TYPICAL EXAMPLES OF INTERIOR PARTITIONS HAVING A ONE HOUR FIRE RESISTANCE (FIGURES 9.7 AND 9.8). CONCRETE BLOCK WALLS SHOULD BE CONSIDERED AT LEAST 1-HOUR FIRE RESISTANT.

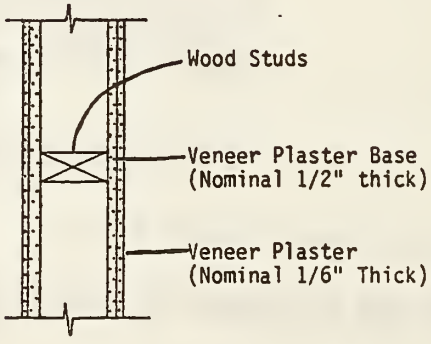


Figure 9.7

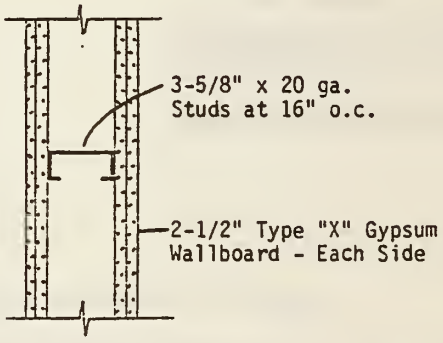


Figure 9.8

10. Exit System	<2 Routes	Mulitple Routes		
		Deficient	No Deficiencies	Direct Exit
	-6	-2	0	3

10. Exit System

Exit routes are the paths of travel from the residential housing area to outside of any of the types and arrangements described in Chapter 5 of the Life Safety Code. The exit route starts at the corridor interface with the cell or common space as indicated by Parameter 8.

PARAMETER 10, EXIT SYSTEM

THIS PARAMETER IS BASED ON THE NUMBER OF EXIT SYSTEMS AND WHETHER OR NOT EVERY ITEM IN THE EXIT SYSTEM MEETS CODE REQUIREMENTS. IF THE NUMBER OF EXIT ROUTES IS AT LEAST TWO BUT THERE ARE SOME DEFICIENCIES, THE EXIT SYSTEM IS CATEGORIZED AS "DEFICIENT" AND SCORED ACCORDINGLY.

TO DETERMINE THE APPROPRIATE VALUE FOR EXIT SYSTEMS IT IS NECESSARY TO DETERMINE:

1. DO THE WAYS OUT ACTUALLY QUALIFY AS EXIT ROUTES?
2. IS ANY OCCUPIED PORTION SERVED BY A SINGLE ROUTE?
3. IS THE EXIT FOR ANY OCCUPANT EXPOSED?
4. ARE THE EXIT ROUTES DEFICIENT?
5. IS A HORIZONTAL EXIT PRESENT?
6. ARE SMOKE PROOF STAIRS PROVIDED?
7. ARE DIRECT EXITS AVAILABLE FOR ALL SLEEPING ROOMS?

Exit Routes

An exit route is a clear arrangement of corridors, ramps, stairs, doors inside or outside of the building that can be safely traversed by an adult walking in an upright forward moving position. The specifically acceptable types of exit routes listed in the Life Safety Code include doors, interior stairs, outside stairs, smoke proof towers, ramps, horizontal exit ways, exit passageways and existing fire escapes. Essentially, a fire escape differs from an outside stair in that it may have open grate steps and/or be so steep as to be of questionable safety or retard the speed at which exit can take place. The FSES approach gives a charge for deficient exit route. It is possible to have exit routes that meet the general criteria listed above but where details such as levels of illumination, exit markings, width, stair dimensions, hand rails, etc. are not in conformance with detailed specifications for that type of exit in the Life Safety Code. It is essential, therefore, to have a basis for determining the difference between a deficient exit and an exit that is unsafe and should therefore not be credited in the FSES. An exit way is considered unsafe and not creditable if it does not meet at least one of the following criteria.

A. It fully conforms with the detailed specifications for all of the elements as contained in the Life Safety Code, or

B. It is regularly safely used when training occupants for emergency evacuation.

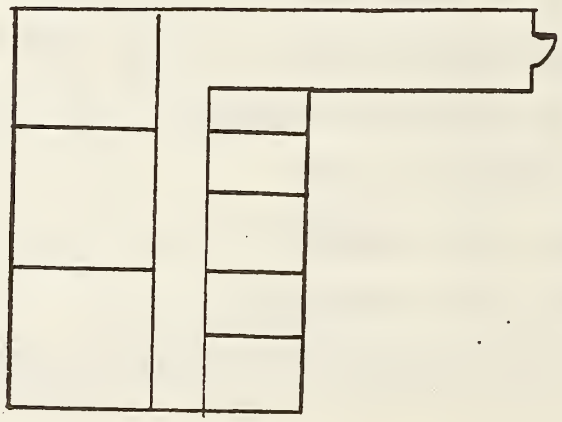


Figure 10.1 Single Exit Route

Single Route

The route is single if the only exit path for an occupant is to leave his room of origin and travel through corridors or other internal spaces and there is but one means by which he may exit the building or leave the floor or level which he occupies. See figure 10.1 for example.

Dead ends or common modes of travel through the floor of occupancy do not constitute a single route. The charge for such arrangement is covered under item 11 in the charge for "dead ends".

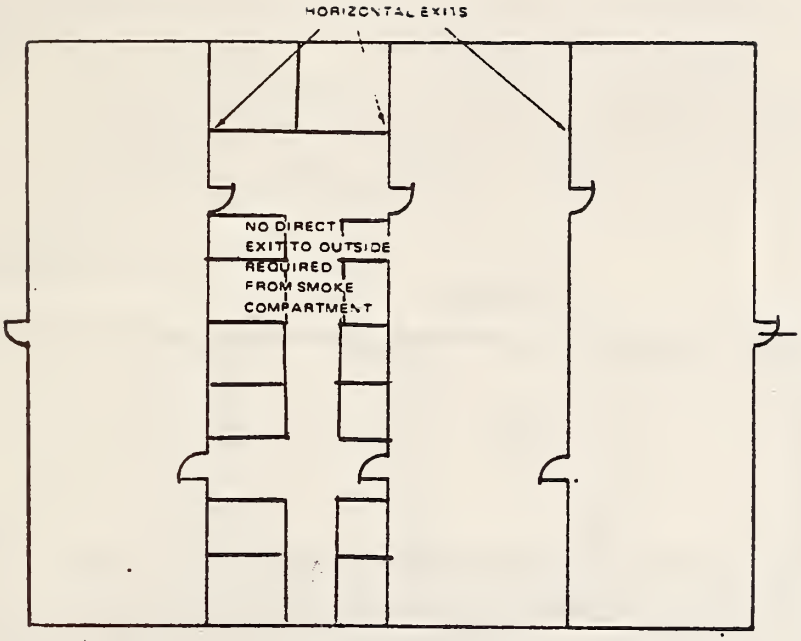


Figure 10.2 Multiple Exit Routes

a. Multiple Routes - Multiple routes exist when the occupants of any residential housing area either have, from the residential housing area or through access in a corridor adjacent to the residential housing area, a choice of 2 separate exit routes to the outside of the types listed in sections 14-2.2 and 15-2.2.

SEE FIGURE 10.2 FOR EXAMPLE

b. Deficient - An exit route is deficient if it is useable with reasonable safety but fails to meet any of the applicable criteria in Chapter 5.

DEFICIENT ROUTE

AN EXIT ROUTE IS CHARGED AS DEFICIENT IF THERE ARE ANY FACTORS IN WHICH IT DOES NOT MEET DETAILS OF THE REQUIREMENT OF THE LIFE SAFETY CODE. THESE WOULD INCLUDE ITEMS SUCH AS LACK OF EXIT SIGNS OR EMERGENCY ILLUMINATION, NARROW DOORS, CORRIDORS, OR STAIRS, WINDERS ON STAIRS, MISSING OR INCORRECT HANDRAILS, IMPROPER LATCHES OR SWINGS ON EXIT DOORS, OR ANY OTHER DEFICIENCY. IF STAIRWELL ENCLOSURES ARE DEFICIENT, EITHER BY BEING INCOMPLETE OR OF LOW FIRE RESISTANCE RATING, THE STAIRWAY SHOULD BOTH BE CHARGED AS DEFICIENT AND THE STAIRWAY CONSIDERED AS A VERTICAL OPENING IN ASSESSING THE CHARGES OF CREDITS IN ITEM 12 ON VERTICAL OPENINGS.

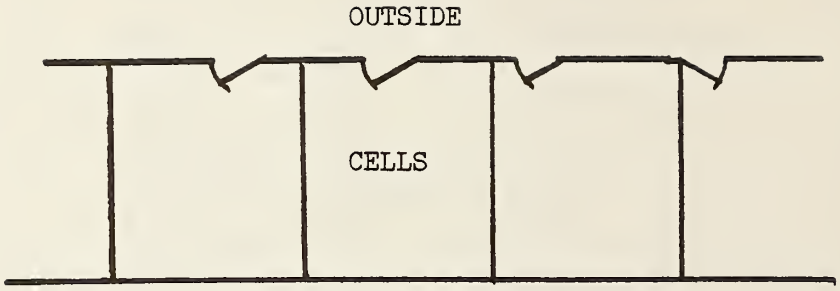


Figure 10.3 Direct Exits

c. Direct Exits - To be credited with direct exits, each cell or other sleeping room must have a door that opens to the exterior at grade, or to an unenclosed exterior balcony with direct access to an exterior exit or smoke proof tower. The locking of such door must be no more restrictive than that required for the least restrictive exit or smoke barrier door for the use condition involved. In large rooms the maximum travel distance from any occupiable location to a direct exit must not exceed 50 feet. Where the separation of the individual sleeping roms involved from other spaces and from each other is smoke tight, the credit for direct exits is applicable even if there are no other exit routes from the involved sleeping rooms.

SEE FIGURE 10.3 FOR EXAMPLE

No exit shall be considered in this parameter unless the overall locking arrangement of the exit system involved conforms with the criteria for the use condition being applied to the facility.

11. Exit Access	Dead Ends		No Dead Ends>50 Ft (I) & Travel Is		
	>100 Ft	>50 Ft (I)	>225 Ft	<=225 Ft & >150 Ft.	<=150 Ft.
	-2(0)G	-1(0)G	-2(0)G	-1(0)G	0

G-Use ( ) if parameter 10 is -6.

I -20 ft. for level V.

11. Exit Access

Exit access is the travel distance from any point in a room to an exit (or smoke partition in an existing building). In addition, any exit arrangement that does not conform with the supplementary travel distance criteria listed below, is limited to a parameter value no higher than the score for egress travel that is > 150 and < = 225 feet.

Supplementary Travel Distance Criteria: The travel distance

a. between any room door required as exit access and an exit does not exceed 100 ft. (30.48 m);

b. between any point in a sleeping room to the door of that room does not exceed 50 ft. (15.24 m).

Exception No. 1: The travel distance in a. or b. above may be increased by 50 ft. (15.24 m) in buildings protected throughout by an approved automatic sprinkler system or smoke control system.

Exception No. 2: The travel distance in b. above, may be increased to 100 ft. in open dormitories where the enclosing walls of the dormitory space are at least of smoke-tight construction. Where travel distance to the exit access door from any point within the dormitory exceeds 50 ft. (15.24 m), at least two exit access doors remote from each other, shall be provided.

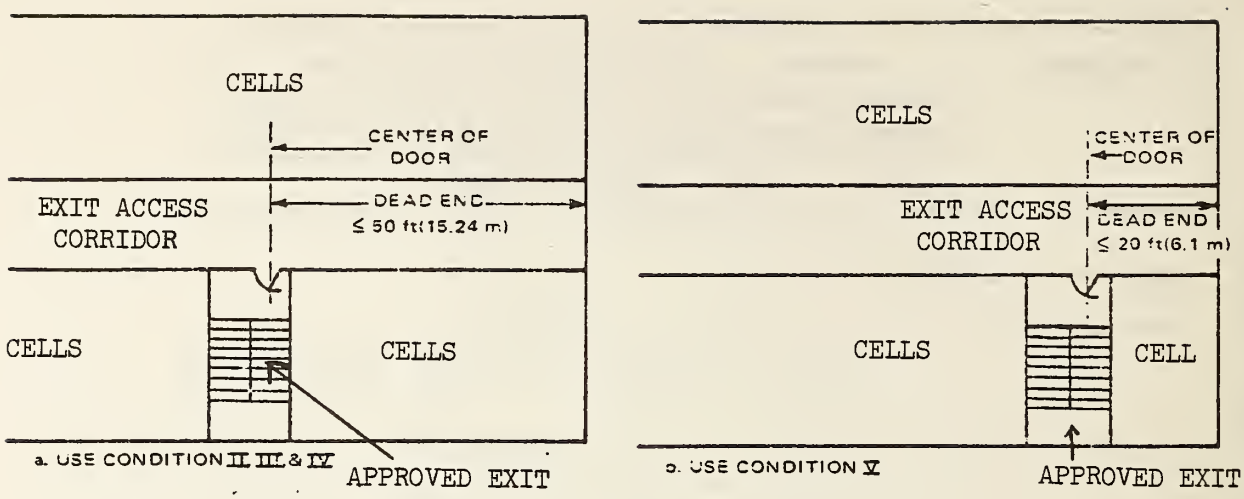


Figure 11.1 Measuring Dead-End Corridors

The charge for deadend (D.E.) access is charged when any corridor affords access in only one direction to a required exit from that corridor. The calculation of the distance to determine the level of charge is the measurement from the centerline of the doorway exiting to the corridor to a point where there is a choice of two paths of travel to remote exits. (Fig. 11.1) Exit travel is the distance from the door to the corridor to the point where the building is exited or a stairwell is entered which ever is less. Where the distance to the stairwell is the shorter distance, that distance is based on the distance to the door enclosing the stairwell if the stairwell is enclosed or to the top tread if the stairwell is open.

Parameter 11, Exit Access

This parameter simply measures the distance involved and whether or not any of that distance involves a deadend. The distance considered is from the most remote or most deadended cell until a person can pass into an exit, out of the building, or through a smoke barrier.

When evaluating this parameter it is also necessary to know:

A. If the value for Exit System, Parameter 10, is -6. In this case Note G of the FSES Worksheet applies.

B. If the building is of use condition V. In this case Note I of the FSES Worksheet applies.

12. Vertical Openings	Open or Incomplete Enclosures			Enclosed (E)	
	Thru >=4 Floors	2-3 Floors	1 Flr.	Smoke-Tight	Fire-Resistive
	-10(0)F	-7(0)F	-2(0)F	0	2

E-Use 0 in 1 story buildings.
F-Use ( ) if parameter 13 is 8.

12. Vertical Openings

These values apply to vertical openings and penetrations including exit stairways, ramps and any other vertical exits, pipeshafts ventilation shafts, duct penetrations and laundry and incinerator chutes. The charge for vertical openings is based on the presence of lack of enclosure and the fire resistance of enclosure if present.

A vertical opening or penetration is classified as open (or Incomplete Enclosure) if it is: (a) unenclosed; (b) is enclosed but does not have doors; (c) is enclosed but has openings other than doorways; (d) is enclosed with cloth, paper, or similar materials without any sustained fire stopping capabilities.

If a shaft other than a credited exit route (i.e. credited as one of the multiple routes required in Parameter 10 or in determining travel distance in Parameter 11) is enclosed on all floors but one and this results in an unprotected opening between that shaft, and one and only one floor, the parameter value assigned to that shaft is 0. If a required egress route is contained in that shaft the parameter value is -2. If vertical firestopping is incomplete, the vertical opening so created is evaluated using the above criteria.

Two communicating floor levels are permitted without enclosure protection between levels provided they meet the requirements of sections 14-3.1.2 or 15-3.1.2, as appropriate.

Vertical opening charges do not apply to open multi-tiered cell blocks classified as single story buildings in accordance with the permission set forth in Parameter 1, Construction.

a. Smoke Tight - A complete enclosure is provided and is capable of resisting the passage of smoke but does not meet the fire resistance requirements of section 6-2.2.3.2.

b. Fire Resistant - A smoke tight enclosure that also meets the fire resistance requirements of 6-2.2.3.2.

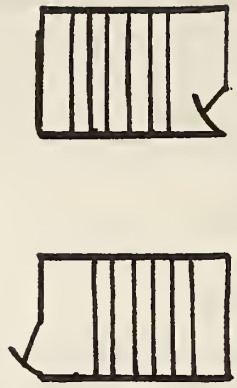
WHEN EVALUATING THIS PARAMETER IT IS ALSO NECESSARY TO KNOW:

A. IF THE BUILING IS ONLY ONE STORY. IN THIS CASE NOTE E OF THE FSES WORKSHEET APPLIES.

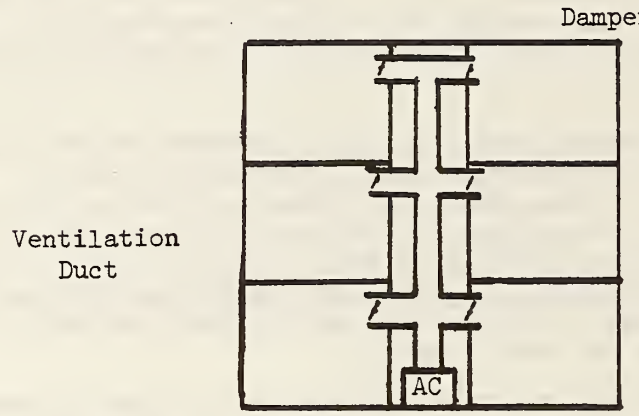
B. IF THERE IS SMOKE AND HEAT VENTING THAT QUALIFIES FOR AN 8 POINT SMOKE CONTROL SYSTEM UNDER PARAMETER 13. IN THAT CASE NOTE F OF THE FSES WORKSHEET APPLIES.

FOR EXAMPLES OF VERTICAL OPENINGS SEE FIGURE 12.1.

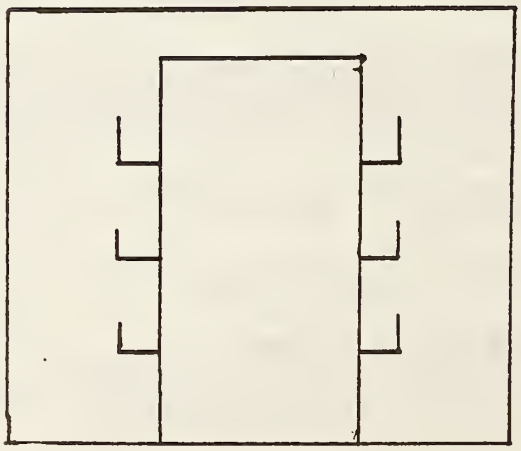
Stairwell Enclosures should include all walls and wall openings. Determine if construction is greater than or less than one hour fire resistance. Concrete block can be considered to have at least one hour fire resistance.



STAIRWELL ENCLOSURES



VENTILATION SHAFT ENCLOSURES



MULTI-TIERED CELL BLOCK

Vertical opening charges do not apply to multi-tiered cell blocks if the building is classified as a single story building in accordance with the perrmission set forth in Parameter 1, construction(ie. smoke and heat venting, or sprinklers).

Figure 12.1 Vertical Openings

13. Smoke Control	No Control	Smoke Compartments		Heat & Smoke Vent System
		Passive	Mechanically Assisted	
	-2	2	3	8

PARAMETER 13, SMOKE CONTROL

TWO TYPES OF SMOKE CONTROL ARE CONSIDERED. THE FIRST TYPE IS PROVIDED BY DIVIDING THE PRISONER SPACE INTO AT LEAST TWO SEPARATE COMPARTMENTS SO THAT PRISONERS CAN BE MOVED FROM ONE TO THE OTHER WITHOUT HAVING TO TAKE THEM OUT OF THE BUILDING. THE SECOND TYPE INVOLVES A MECHANICAL HEAT AND VENT SYSTEM. SUCH A SYSTEM WOULD HAVE TO BE DEVELOPED BY A QUALIFIED FIRE PROTECTION OR MECHANICAL ENGINEER.

13. Smoke Control

Smoke control definitions are as follows:

a. No Control - There are no smoke barriers (or horizontal exits) on the floor and accessible to those confined.

b. Smoke Compartment - Passive - The credit for smoke barriers is to be credited to any facility meeting the requirements of sections 14-3.7 or 15-3.7, as appropriate.
SEE FIGURE 13.1 FOR EXAMPLE

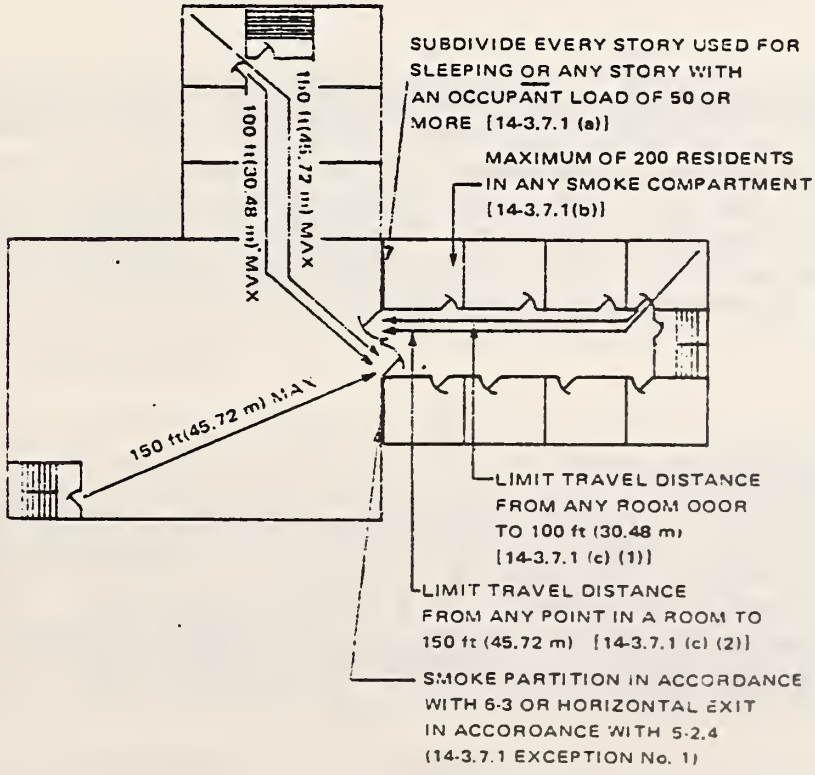


Figure 13.1 Smoke Compartment Requirements For New Facilities

SMOKE PARTITIONS

APPROPRIATE CREDIT MAY BE GIVEN TO SMOKE BARRIER PARTITIONS WHEN THESE PARTITIONS ARE CONTINUOUS FROM OUTSIDE WALL TO OUTSIDE WALL AND FROM THE FLOOR TIGHT TO THE FLOOR OR ROOF DECK ABOVE IN ACCORDANCE WITH SECTION 6-3 OF NFPA 101. ALL PARTITIONS OF THIS TYPE MUST BE OF CONSTRUCTION HAVING A CAPABILITY OF RESISTING THE PASSAGE OF SMOKE, SUCH AS MASONRY, TILE, OR GYPSUM WALLBOARD ON EACH SIDE OF APPROPRIATE STUDS. THE WALL MUST ALSO MAINTAIN A CONTINUOUS, ALTHOUGH NOT NECESSARILY STRAIGHT, PATH ACROSS THE ENTIRE BUILDING.

ALL OPENINGS IN SMOKE BARRIERS MUST BE PROTECTED TO STOP THE SPREAD OF SMOKE. TO ACHIEVE THIS ALL OPENINGS ARE USUALLY SEALED OR PROTECTED WITH DOORS OR DAMPERS WHEN SUCH PROTECTION IS NORMALLY HELD IN THE OPEN POSITION, IT MUST BE ARRANGED TO CLOSE AUTOMATICALLY IN THE EVENT OF ACTIVATION OF THE FIRE ALARM IN THAT AREA, INCLUDING APPROVED AUTOMATIC SMOKE DETECTION LOCATED NEAR THE DOORWAY.

c. Smoke Compartment - Mechanically Assisted - Mechanically assisted smoke control on a compartment basis must include a smoke barrier (or a horizontal exit) supported by a mechanism of automatic control fans, smoke vent shafts, or a combination thereof to provide a pressure differential that will assist in confining smoke to the compartment of origin. Fans involved may be special smoke control fans or special adjustments of the normal building air movement fans.

MECHANICALLY ASSISTED SYSTEMS

IN ORDER TO RECEIVE FULL CREDIT FOR A MECHANICALLY ASSISTED SMOKE CONTROL SYSTEM, THAT SYSTEM MUST BE DESIGNED AND INSTALLED IN ACCORDANCE WITH THE SPECIFIC SMOKE MANAGEMENT REQUIREMENTS OF A PARTICULAR BUILDING. THE DETERMINATION OF SUCH INSTALLATIONS MUST BE MADE THROUGH SOUND ENGINEERING EVALUATION NORMALLY INCLUDING A FIRE PROTECTION ENGINEER OR MECHANICAL ENGINEER EXPERIENCED IN THIS AREA.

d. Heat and Smoke Vent System - A heat and smoke vent system is a system meeting the design criteria set forth in A-15-3.1.3, Recommended Method of Calculating Expected Level of Smoke in a Smoke Removal Equipped Cell Block or other satisfactory means so designed as to maintain the level of smoke above head height in the residential housing area. The additional credit for this system shall be given if the operation of the exhaust system is initiated automatically by smoke detection available in the zone.

THE METHODOLOGY PRESENTED HEREIN IS BASED ON THE PHYSICS OF THE BUOYANT HOT GAS PLUME PRODUCED BY FIRE. THE RATE OF ACCUMULATION OF SMOKE ABOVE A FIRE IS DETERMINED BY BOTH THE RATE OF BURNING (RATE OF ENERGY PRODUCTION) AND THE AMOUNT OF AIR ENTRAINED IN THE RISING PLUME.

THE DETAILS OF THE RATE OF ENERGY PRODUCTION DRIVING THE PLUME IS THE LEAST PREDICTABLE FACTOR INVOLVED. CURRENT RESEARCH IS DIRECTED AT IMPROVING THE ABILITY TO PREDICT THE ACTUAL COURSE AND DURATION OF ENERGY RELEASE DURING A FIRE. TO BRIDGE THE RESULTING UNCERTAINTY, THIS METHOD ASSUMES THAT THE FIRE WILL CONTINUE TO BURN INDEFINITELY AT A GIVEN ENERGY LEVEL DEDUCED FROM FULL-SCALE BURN EXPERIMENTS.

THE INTENT IS TO PRESCRIBE EXHAUST CAPACITY BASED ON THE MAXIMUM ENERGY RELEASE RATES LIKELY TO OCCUR AND THE SIZE OF THE CELL OPENING. THIS APPROACH RESULTS IN A CONSERVATIVE OVERDESIGN WHICH IS NECESSARY UNTIL MORE DETAILED PREDICTION OF FIRE DEVELOPMENT IS AVAILABLE.

A RECOMMENDED METHOD OF CALCULATING EXPECTED LEVEL OF SMOKE IN A SMOKE REMOVAL EQUIPPED CELL BLOCK.

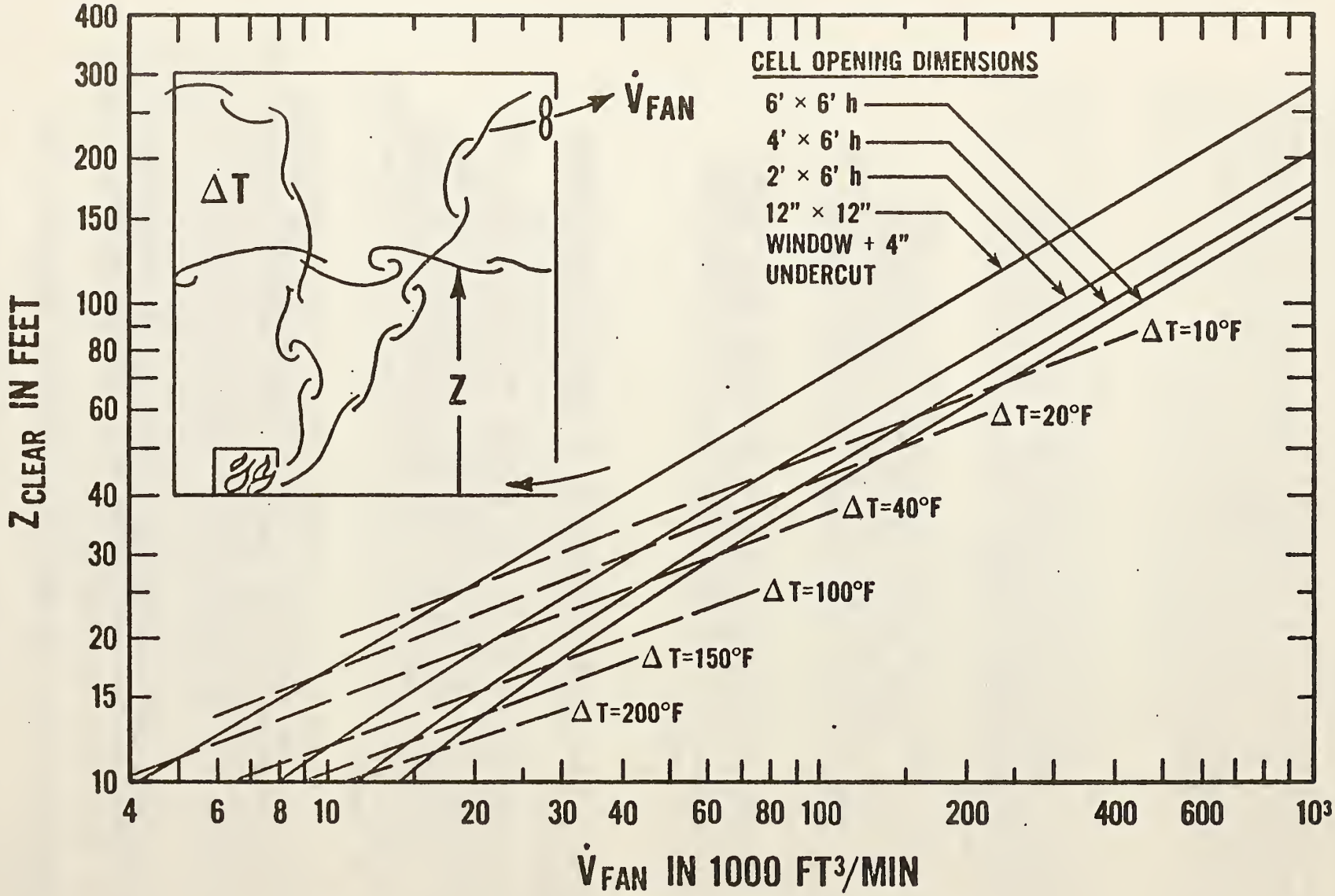
THIS METHOD FOR CALCULATING THE EXPECTED LEVEL OF SMOKE HAS BEEN DEVELOPED FROM DATA EXPERIMENTALLY PRODUCED IN FULL-SCALE BURNOUTS OF TEST CELLS. THE TEST CELLS WERE SIZED, LOADED WITH FUEL, AND CONSTRUCTED TO REPRESENT SEVERE CONDITIONS OF HEAVILY FUEL LOADED (APPROXIMATELY 6 LB/SQ FT (22.292 KG/SQ M)) CELLS AS FOUND IN PRISON LOCATIONS. THE FILLING RATE AND TEMPERATURE OF THE EFFLUENT GAS AND SMOKE HAVE BEEN CALCULATED USING THE DATA FROM THESE TESTS AND ESTABLISHED FORMULAE FROM PLUME DYNAMICS.

THE APPLICATION OF THIS METHOD SHOULD BE LIMITED TO SITUATIONS WHERE THERE IS AT LEAST 10 FT (3.05 M) FROM THE FLOOR LEVEL TO THE LOWEST ACCEPTABLE LEVEL OF SMOKE ACCUMULATION (Z); THE RESERVOIR ABOVE THE LOWEST ACCEPTABLE LEVEL FOR Z IS AT LEAST 20 PERCENT OF THE Z DIMENSION, THE LENGTH OF THE CELL BLOCK IS AT LEAST EQUAL TO Z, AND THE FAN IS AT LEAST 10 FT (3.05 M) HIGHER THAN THE FLOOR OF THE HIGHEST CELL.

THE DETERMINATION OF SMOKE REMOVAL REQUIREMENTS IS BASED ON THE DIMENSIONS OF THE CELL OPENING. WHERE MORE THAN ONE CELL OPENING IS INVOLVED, THE LARGER SIZE ON THE LEVEL BEING CALCULATED SHOULD BE USED.

THE FAN SIZE, TEMPERATURE RATING, AND OPERATIONS MEANS MAY BE DETERMINED BY THE FOLLOWING PROCEDURE:

1. ACCEPTABLE SMOKE LEVEL. DETERMINE THE LOWEST ACCEPTABLE LEVEL OF SMOKE ACCUMULATION IN ACCORDANCE WITH 15-3.1.3. THE VERTICAL DISTANCE BETWEEN THAT LEVEL AND THE FLOOR LEVEL OF THE LOWEST CELL IS THE VALUE OF Z TO BE USED IN CONNECTION WITH FIGURE 15-10.



ΔT - TEMPERATURE OF UPPER LAYER GASES ABOVE AMBIENT

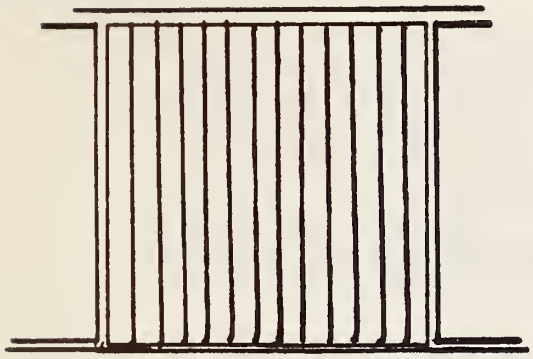
——— VENTILATION RATE CURVES

— — — CONSTANT TEMPERATURE RISE CURVES

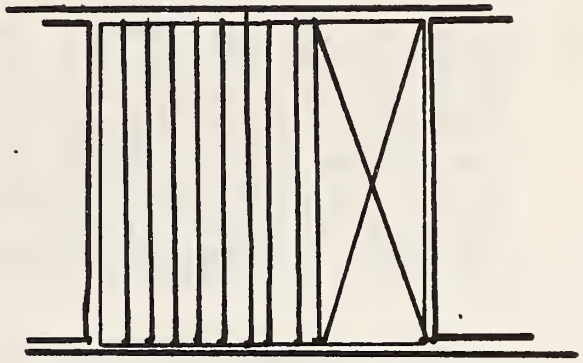
$\dot{V}_{FAN}$ - FAN DISCHARGE CAPACITY (AS INSTALLED)

Z_{CLEAR} - DISTANCE FROM CELL FLOOR TO SMOKE LAYER

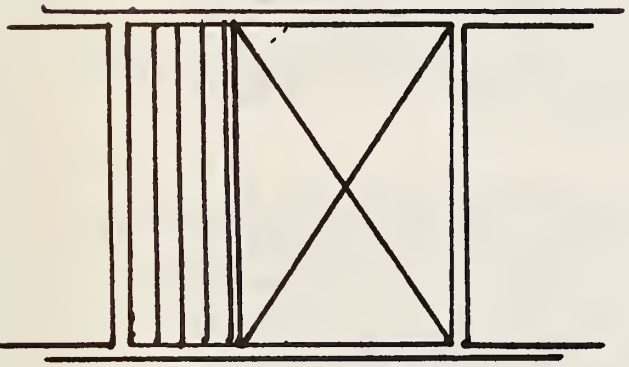
Figure 15.10 Heat and Smoke Venting



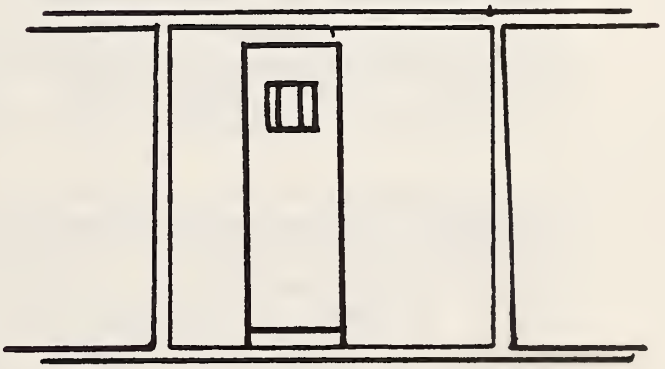
6 ft. x 6 ft.(1.83 m x 1.83 m)
OPENING



4 ft. x 6 ft. (1.22 m x 1.83 m)
OPENING



2 ft. x 6 ft.(.61 m x 1.83 m)
OPENING



12 in. x 12 in.(30.48 cm. x 30.48 cm)
WINDOW
4 in.(10.16 cm.) UNDERCUT

Figure 15.11 Typical Cell Openings

2. CHARACTERISTIC CELL OPENING. DETERMINE THE OPENING OF THE CELL FACE. WHERE THERE IS MORE THAN ONE SIZE OF CELL OPENING USE THE LARGEST. MATCH THE ACTUAL OPENING TO THOSE SHOWN IN FIGURE 15-11 AND USE THE CORRESPONDING CURVE ON FIGURE 15-10. IF THERE IS NO MATCH BETWEEN THE SIZE AND SHAPE OF OPENING AND FIGURE 15-11, THEN INTERPOLATE BETWEEN THE CURVES. IF THE OPENING EXCEEDS 6 FT BY 6 FT (3.34 SQ M), USE THE CURVE FOR A 6 FT BY 6 FT (3.34 SQ M) OPENING. THIS CURVE IS CONSIDERED TO REPRESENT THE MAXIMUM BURNING SITUATION AND INCREASING THE SIZE OF THE OPENING WILL NOT INCREASE THE ACTUAL BURNING RATE.

3. EXHAUST FAN RATE. DETERMINE THE EXHAUST FAN CAPACITY NEEDED TO EXTRACT SMOKE AT A RATE THAT WILL MAINTAIN THE SMOKE LEVEL AT A POINT HIGHER THAN Z. THIS IS THE RATE SHOWN ON THE BASELINE OF FIGURE 15-10 CORRESPONDING TO THE LEVEL OF Z ON THE VERTICAL AXIS FOR THE SOLID LINE (VENTILATION RATE) CURVE APPROPRIATE TO THE CELL DOOR SIZE. THIS EXHAUST CAPABILITY MUST BE PROVIDED AT A POINT HIGHER THAN Z.

4. INTAKE AIR. PROVIDE INTAKE AIR OPENINGS THAT ARE EITHER PRESENT OR AUTOMATICALLY PROVIDED AT TIMES OF EMERGENCY SMOKE REMOVAL. THESE ARE TO BE LOCATED AT OR NEAR THE BASELINE OF THE CELL BLOCK TO ALLOW FOR INTAKE AIR AT THE RATE TO BE VENTED BY THE FAN. THE OPENINGS PROVIDED SHALL BE SUFFICIENT TO AVOID A FRICTION LOAD THAT CAN REDUCE THE EXHAUST EFFICIENCY. STANDARD AIR-HANDLING DESIGN CRITERIA ARE USED IN MAKING THIS CALCULATION.

5. FAN TEMPERATURE RATING. DETERMINE THE POTENTIAL TEMPERATURE OF GASES THAT THE FAN MAY BE REQUIRED TO HANDLE. TO DO THIS, DETERMINE THE DISTANCE FROM THE FLOOR OF THE HIGHEST CELL TO THE CENTERLINE OF THE FAN (OR FAN PORTS IF THE FAN IS IN A DUCT OR SIMILAR ARRANGEMENT). DETERMINE THE INTERSECTION OF THIS NEW "Z" VALUE WITH THE APPROPRIATE VENTILATION RATE CURVE (SOLID LINE) ON FIGURE 15-10. ESTIMATE THE TEMPERATURE RISE BY INTERPOLATING ALONG THE APPROPRIATE VENTILATION RATE CURVE AND BETWEEN THE CONSTANT TEMPERATURE RISE CURVES (DASHED LINES) ON FIGURE 15-10. PROVIDE ALL ELEMENTS OF THE EXHAUST SYSTEM THAT ARE TO BE ABOVE THE ACCEPTABLE SMOKE LEVEL WITH THE CAPABILITY TO EFFECTIVELY OPERATE WITH THE INDICATED INCREASE IN TEMPERATURE.

6. OPERATION OF EXHAUST SYSTEM. THE EMERGENCY EXHAUST SYSTEM SHOULD BE ARRANGED TO INITIATE AUTOMATICALLY ON DETECTION OF SMOKE, OPERATION OF A MANUAL FIRE ALARM SYSTEM, OR DIRECT MANUAL OPERATION. THE CAPABILITY TO MANUALLY START THE AUTOMATIC EXHAUST SYSTEM SHOULD BE PROVIDED IN A GUARD POST IN THE CELL BLOCK AND/OR AT ANOTHER CONTROL LOCATION. WHEN APPROPRIATE, THE EMERGENCY EXHAUST FANS MAY BE USED FOR COMFORT VENTILATION AS WELL AS SERVING THEIR EMERGENCY PURPOSES.

(FIELD TEST PACKET - JANUARY 1983)

FIRE SAFETY EVALUATION WORKSHEET

DETENTION AND CORRECTIONAL OCCUPANCIES

IDENTIFICATION CODE* _____

EVALUATOR _____ DATE _____

Complete one worksheet for each building evaluated.

STEP 1. Complete the building identification, evaluator, and date entries above.

STEP 2. Determine the most restrictive use condition in the facility. Check the appropriate box below.

____ Use condition II - Zoned Egress

____ Use condition III - Zoned Impeded Egress

____ Use condition IV - Impeded Egress

____ Use condition V - Contained

Note: If use conditions III or IV are involved, the combination of staff location, remote release locks, and/or fire detection must be sufficient to insure the prompt release required by the use condition checked.

* Leave blank unless more than one facility is tested by a single evaluator. In such case, assign a convenient code number for use if follow-up content is needed.

STEP 3: DETERMINE SAFETY PARAMETER VALUES - USE TABLE 1.

A. SELECT AND CIRCLE THE SAFETY VALUE FOR EACH SAFETY PARAMETER THAT BEST DESCRIBES THE CONDITIONS IN THE ZONE. CHOOSE ONLY ONE VALUE FOR EACH OF THE 13 PARAMETERS. IF TWO OR MORE APPEAR TO APPLY CHOOSE THE ONE WITH THE LOWEST POINT VALUE.

RESIDENTIAL HOUSING AREA: INCLUDES SLEEPING AREAS AND ANY CONTIGUOUS DAY ROOM, GROUP ACTIVITY SPACE, OR OTHER COMMON SPACE.

TABLE 1. SAFETY PARAMETER VALUES

1. CONSTRUCTION TYPE	V(000)	V(111)	IV(2HH)	III(200)	III(211)	II(000)	II(111)	II(222) OR I(ANY)
1ST FLR	-2	0	0	-2	0	0	2	2
2ND FLR	-2	0	0	-2	0	-2	2	2
3RD FLR	-8(-2)A	-2(0)A	-2(0)A	-8(-2)A	0	-5(-2)A	2	2
>=4TH FLR	-10(-2)A	-4(0)A	-4(0)A	-10(-2)A	-2(0)A	-8(-2)A	0	2

2. HAZARDOUS AREAS	WITHIN RES. HOUSING AREA		OUTSIDE RES. HOUSING AREA		NONE OR NO DEFICIENCIES
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	-7	-4	-4(-7)B	0	0

3. FIRE ALARM	NO ALARM	W/O F.D.NOTIFICATION	W/F.D.NOTIFICATION	
			W/O MAN.ALARM	W.MAN.ALARM
	-1	0	1	2

4. SMOKE DETECTION	NONE	RESIDENTIAL HOUSING AREA			TOTAL BLDG.
		PARTIAL COVERAGE		FULL COVERAGE	
		CORR.&COMM.SPA.&LRG.SLEEPING RMS.	ALL SLEEPING RMS.		
	-4(-1)A	0	2	4	5

5. AUTOMATIC SPRINKLERS	NONE	RESIDENTIAL HOUSING AREA	ENTIRE BUILDING
	0	8	10

6. INTERIOR FINISH (CORRS&EGRESS)	CLASS C	CLASS B	CLASS A
	-3	-1	0

7. INTERIOR FINISH (OTHER AREAS)	CLASS C	CLASS B	CLASS A
	-2	-1	0

8. CELL/ROOM ENCLOSURE	CELLS(ROOMS) FACE ON CORRIDOR (EACH CELL IS A SEPARATE RESIDENTIAL HOUSING AREA)	INTERVENING COMMON SPACE WITHIN RESID. HOUSING AREA		
		OPEN	SMOKE TIGHT<1HR	>=1HR. FIRE RESISTIVE
	0	-3(-5)C (0)O	0(-2)C	2(0)C

9. SEPARATION OF RESID. HOUSING AREAS FROM OTHER AREAS	INCOMPLETE	SMOKE TIGHT < 1 HR.	>= 1 HR. FIRE RESIS.
	-6	2(4)H	4(2)B

10. EXIT SYSTEM	< 2 ROUTES	MULTIPLE ROUTES		
		DEFICIENT	NO DEFICIENCIES	DIRECT EXIT
	-6	-2	0	3

11. EXIT ACCESS	DEAD ENDS		NO DEAD ENDS > 50 FT (I) & TRAVEL IS		
	>100FT	>50FT(I)	>225FT	<=225FT&>150FT	<=150FT.
	-2(0)G	-1(0)G	-2(0)G	-1(0)G	0

12. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURES			ENCLOSED (E)	
	THRU >=4 FLOORS	2-3 FLOORS	1 FLR.	SMOKE-TIGHT	FIRE-RESISTIVE
	-10(0)F	-7(0)F	-2(0)F	0	2

13. SMOKE CONTROL	NO CONTROL	SMOKE COMPARTMENTS		HEAT&SMOKE VENT SYSTEM
		PASSIVE	MECHANICALLY ASSISTED	
	-2	2	3	8

A - USE ( ) IF PARAMETER 5 IS 10.
B - USE ( ) IF PARAMETER 1 IS BASED ON II(000). III(200). OR V(000) CONSTRUCTION AND PARAMETER 5 IS 0.
C - USE ( ) FOR LEVEL V NEW WHEN PARAMETER 5 IS 0.
D - USE ( ) FOR ALL LEVEL II.
- FOR LEVEL III IF INTERVENING SPACE IS <=50 FT.,
- FOR LEVEL IV IF PARAMETER 5 IS >=8 AND INTERVENING SPACE IS <=50 FT.
- ALSO USE ( ) IN EXISTING BUILDINGS IF EITHER PARAMETER 13 = 8, OR IF
- PARAMETER 5 IS >= 8 AND PARAMETER 4 IS >= 0.
E - USE 0 IN 1 STORY BUILDINGS.
F - USE ( ) IF PARAMETER 13 IS 8 .
G - USE ( ) IF PARAMETER 10 IS -6.
H - USE ( ) FOR LEVELS II, III, AND IV NEW IF CELLS ARE FACING ACCESS CORRIDOR.
I - 20 FT. FOR LEVEL V.

Step 4. COMPUTE INDIVIDUAL SAFETY EVALUATIONS. TABLE 2

A. Transfer each of the 14 circled safety parameter values on Table 1 to every unshaded block in the line with the corresponding parameter title in Table 2. Where the block is indicated (÷2) enter only one-half the value shown in Table 1.

B. Add the four columns, keeping in mind that any negative numbers deduct.

C. Transfer the resulting values for S_1, S_2, S_3, and S_4 to the blanks marked S_1, S_2, S_3, and S_4 in Table 4.

TABLE 2. INDIVIDUAL SAFETY EVALUATIONS

SAFETY PARAMETER	FIRE CONTROL PROVIDED (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION		XXXXXXXXXXXX XXXXXXXXXXXX		
2. HAZARDOUS AREAS		÷2		
3. FIRE ALARM	÷2		XXXXXXXXXXX XXXXXXXXXXX	
4. SMOKE DETECTION	÷2		XXXXXXXXXXX XXXXXXXXXXX	
5. AUTOMATIC SPRINKLERS		÷2	÷2	
6. INTERIOR FINISH (EGRESS ETC.)	XXXXXXXXXXXX XXXXXXXXXXXX		XXXXXXXXXXX XXXXXXXXXXX	
7. INTERIOR FINISH (OTHER AREAS)	÷2	XXXXXXXXXXXX XXXXXXXXXXXX	XXXXXXXXXXX XXXXXXXXXXX	
8. CELL/ROOM ENCLOSURE	XXXXXXXXXXXX XXXXXXXXXXXX	XXXXXXXXXXXX XXXXXXXXXXXX		
9. SEPARATION OF RESID. HOUSING AREAS FROM OTHER AREAS		÷2		
10. EXIT SYSTEM	XXXXXXXXXXXX XXXXXXXXXXXX		÷2	
11. EXIT ACCESS	XXXXXXXXXXXX XXXXXXXXXXXX		XXXXXXXXXXX XXXXXXXXXXX	
12. VERTICAL OPENINGS	÷2			
13. SMOKE CONTROL	XXXXXXXXXXXX XXXXXXXXXXXX			
TOTAL	S_1=	S_2=	S_3=	S_4=

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Step 5. DETERMINE MANDATORY SAFETY REQUIREMENTS - USE TABLE 3

1. Select the proper row of Table 3. Circle the appropriate values.
2. Transfer the circled values from Table 3 to the blocks marked S_a, S_b, S_c, and S_d in Table 4.

TABLE 3A - MANDATORY SAFETY REQUIREMENTS

SPRINKLERED AND NON-SPRINKLERED BUILDINGS

USE CONDITION	HEIGHT	FIRE CONTROL SA		EGRESS SB		REFUGE SC		GENERAL SD	
		NEW	EXIST	NEW	EXIST	NEW	EXIST	NEW	EXIST
II+III	1+2 STORY	4(4.5)	0(2.5)	6(7)	4(5)	6(7)	2(5)	6(7)	1(4)
	>=3 STORY	7	5	8	6	10	8	10	7
IV	1+2 STORY	6(6.5)	2(4.5)	10(11)	8(9)	6(7)	2(5)	10(11)	5(8)
	>=3 STORY	9	7	12	10	10	8	14	11
V	1+2 STORY	6(9)	6(9)	10(12)	9(11)	6(10)	6(10)	10(14)	9(13)
	>=3 STORY	9	9	12	11	10	10	14	13

A- USE ( ) VALUES FOR 2 STORY BUILDINGS.

TABLE 3B - MANDATORY SAFETY REQUIREMENTS

- TOTALLY SPRINKLERED BUILDINGS.

USE CONDITION	HEIGHT	FIRE CONTROL SA		EGRESS SB		REFUGE SC		GENERAL SD	
		NEW	EXIST	NEW	EXIST	NEW	EXIST	NEW	EXIST
II,III,IV	1+2 STORY	2	2	4	2	-1	-1	2	0
	>=3 STORY	7	2	6	2	5	-1	8	0
V	1+2 STORY	10	10	8	6	7	7	10	8
	>=3 STORY	15	10	10	6	12	7	16	8

Step 6. FIRE SAFETY EQUIVALENCY EVALUATION

1. Perform the indicated subtractions in Table 4. Enter the differences in the appropriate answer blocks.
2. For each row check "YES" if the value in the answer block is zero or greater. Check "NO" if the value in tne answer block is a negative number.

TABLE 4 FIRE SAFETY EQUIVALENCY EVALUATION							YES	NO
Control Provided	(S_1)	Less	Required Control	(S_a)	≥ 0	S_1 □ − S_a □ = C □		
Egress Provided	(S_2)	Less	Required Egress	(S_b)	≥ 0	S_2 □ − S_b □ = E □		
Refuge Provided	(S_3)	Less	Required Refuge	(S_c)	≥ 0	S_3 □ − S_c □ = R □		
General Fire Safety	(S_4)	Less	Required Gen. Fire Safety	(S_d)	≥ 0	S_4 □ − S_d □ = G □		

CONCLUSIONS:

1. [ ] All of the checks in Table 4 are in the "YES" column. The level of fire safety is at least equivalent to that prescribed by the Life Safety Code.

2. [ ] One or more of the checks in Table 4 are in the "NO" column. The level of fire safety is not shown by this system to be equivalent to that prescribed by the Life Safety Code.

* The equivalency covered by this worksheet includes the majority of considerations covered by the Life Safety Code. There are a few considerations that are not evaluated by this method. There must be considered separately. These additional considerations are covered in STEP 7.

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STEP 7

Considerations
(The following items are required by the Life Safety Code as fire safety features but are beyond the scope of equivalency evaluation of the Fire Safety Evaluation System. They must be accounted for separately.)

		Yes	No
1.	Utilities and building services conform to the requirement of Section 14-5 or 15-5 of the Life Safety Code.		
2.	24-hour staffing is provided as required by Section 31-5.1 of the Life Safety Code.		
3.	Furnishing and decorations combustibility is limited in accordance with section 3.1-5.4 of the Life Safety Code.		
4.	Portable fire extinguishers are provided at least at staff locations		
5.	Standpipes are provided in all buildings over 75 ft. tall and non-sprinklered buildings over 3 stories in height.		
6.	If use conditions III or IV are involved, is the combination of staff location, remote release locks, and fire detection sufficient to insure the prompt release required by those use conditions?		

SUPPLEMENTAL BUILDING DATA

1. CONSTRUCTION.

The building is built of:

_____ Wood
_____ Brick (or Block) and Wood
_____ Bare Steel (with or without brick, block, etc.)
_____ Fire Proofed Steel
_____ Reinforced Concrete
_____ Other (Explain)

2. HAZARDOUS AREAS*

Are there any		If so, are they	
	X-if yes	Sprinkler protected?	Enclosed in a fire resistive room with a fire door?
Padded cells			
Cells used as storage spaces			
Paint			
Shops*			
Storerooms or Warehouse spaces			
Other*			

* Hazardous areas are spaces (rooms, cells, lockers, cages, etc.) where there is a significant collection of combustible materials (wood, corrugated cartons, bedding, paint, paper supplies, flammable liquids, etc.).

3. FIRE ALARM.

Are there fire alarm boxes? _____
Who has access to them? Staff _____ Residents _____
What happens when a box is pulled?
Alarms sound in residential housing area. _____
Alarm signal is given to staff control position. _____
Signal automatically goes to a fire department. _____
If there are no fire alarm boxes, is there a smoke detection or sprinkler alarm system that automatically notifies a fire department? _____

4. SMOKE DETECTION.

Are there any smoke detectors in the building? _____
If so, approximately how many detectors are there? _____
Are the detectors connected together into a system? _____
Where are the detectors located? _____

5. AUTOMATIC SPRINKLERS.

Is the building provided with automatic sprinkler protection? _____
If so, is the entire building so protected? _____
If less than full protection, what is covered by sprinkler protection? _____

6&7. INTERIOR FINISH.

Are the walls or ceilings in any spaces made of, lined or padded** with, wood, plastic, rubber, or other combustible materials? If so, describe the areas and the materials involved. _____

_____

Are any floors carpeted or padded? Carpeted _____
_____ Padded (with what) _____

** Other than padded cells covered under Item 2, Hazardous Areas.

8. CELL/ROOM ENCLOSURE.

Describe the cell arrangement in terms of type of walls, front, doors; locks (and unlocking); tiers or levels; and day rooms or other space within the confinement space(s).

_____
_____
_____
_____

9. SEPARATION OF RESIDENTIAL HOUSING AREAS FROM OTHER AREAS.

Is the confinement area (cell block, etc.) a separate building? _____
If not (administration, security, dining, or other activities are in the same building as the cells), the separation between the residential housing area (confinement area) and the rest of the buildings is:

a. All or part is open grill _____
b. Masonry with solid doors. _____ Are the doors fire doors? _____
c. Other (explain) _____

10&11. EXIT SYSTEM AND ACCESS.

Please provide a diagram of the facility layout showing all proposed emergency evacuation or relocation routes. Mark doors that might be used to show type of lock or release involved. (In a large facility, one typical residential unit is sufficient.)

12. VERTICAL OPENINGS.

Describe any open stairs, elevators, shafts, etc., other than those in open tier spaces. _____

_____

13. SMOKE CONTROL.

Are there any smoke resisting partitions that residents can be taken through in an emergency? _____ (If so, mark them on plan.)
Are there any other special smoke control facilities? Explain _____

_____

CONCLUDING COMMENTS

1. Who completed the form? (Job not name.)

2. Was outside help used? If so, what type?

3. Workability. (Could you do it, could it be made simpler? If so, how?)

4. Fire Safety. (If a fire safety professional was involved.) Did the FSES/D&C give an appropriate appraisal of the fire safety level in the facility? Comments.

Appendix D

Peer Consulting Group

A. Residential Occupancies

William Austin	HUD - Public Housing
Donald Belles	Belles Associate
J. Armand Burgun	Rogers, Burgun Shanine and Deschler
M. Prassar	Prassar Associate
Arnold Gangnes	Gangnes/Klappenbach Architects
George Gray	Gray Associate
Robert Lynch	
Donald Moore	HUD - Research Center
Jonas Morehart	Health and Human Services
Hank Roux	Armstrong World Industries
J. Sanders	Fire Marshal/State of Oklahoma
Howard Summers, Jr.	Fire Marshal/State of Virginia

B. Detention and Correctional Occupancies

Wayne G. Carson	Carson Associate
Thomas Jaeger	Gage Babcock & Assoc.
Robert M. Norris	Virginia Dept. of Corrections
William E. Koffel	Maryland Fire Marshall Office

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5. AUTHOR(S)

Harold E. Nelson and A.J. Shibe

6. PERFORMING ORGANIZATION (If joint or other than NBS, see instructions)

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, D.C. 20234

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8. Type of Report & Period Covered

9. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS (Street, City, State, ZIP)

10. SUPPLEMENTARY NOTES

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)

A Fire Safety Evaluation System for Detention and Correctional Occupancies has been developed. It can be used for determining if a facility has fire safety equivalent to that obtained by meeting the requirement of a given code. The system was calibrated for use with proposed chapters for detention and correctional occupancies of the Life Safety Code (1985). There are separate sets of requirements for each of four use conditions: one for zoned egress, one for zoned impeded egress, one for impeded egress, and one for contained. Within each set, there are two levels of evaluation: one for partially sprinklered and non-sprinklered buildings, and one for totally sprinklered buildings.

12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

detention and correctional occupancies; fire safety; Fire Safety Evaluation System; jails; prisons

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