APPENDIX I-F

SPECIAL RESIDENCES AND OCCUPANCIES

SECTION 1 — GENERAL

The following are evacuation capability formulas for determining the classification of Group SR Occupancies.

SECTION 2 — DEFINITIONS

Group SR Occupancies are special residences where personal care is administered in buildings or portions thereof which will be licensed by or under the authority of the Department of Human Resources (DHR) under ORS Chapter 418 or 443, or any other state agency. Group SR Occupancies shall be:

DIVISION 1. A building or part thereof used for the lodging, boarding and personal care of residents whose evacuation capability is classified as Impractical. Division 1 has the following classifications:

SR 1.1- Large, licensed to provide care for 17 or more residents.

SR 1.2- Small, licensed to provide care for six to 16 residents.

SR 1.3- Licensed to provide care for five or fewer residents in a home.

DIVISION 2. A building or part thereof used for the lodging, boarding and personal care of residents whose evacuation capability is classified as Slow, Division 2 has the following classifications:

SR 2.1- Large, licensed to provide care for 17 or more residents.

SR 2.2 Small, licensed to provide care for six to 16 residents.

SR 2.3 Licensed to provide care for five or fewer residents in a home.

DIVISION 3. A building or part thereof used for the lodging, boarding and personal care of residents whose evacuation capability is classified as Prompt. Division 3 has the following classifications:

SR 3.1 Large, licensed to provide care for 17 or more residents.

SR 3.2 Small, licensed to provide care for six to 16 residents.

SR 3.3 Licensed to provide care for five or fewer residents in a home.

EXCEPTIONS; 1. Group SR Occupancies shall not include foster care homes as defined in ORS Chapter 418 and ORS 443.705. Foster care homes are considered dwellings constructed under the One and Two Family Specialty Code.

2. Correctional facilities including jails, prisons, half-way houses and juvenile detention and correctional education facilities where egress is limited and occupants are confined under the authority of the state. A county or city shall comply with the Building Code, Section 308 provisions applying to Group 1, Divisions 3 and 3.1.

SECTION 3 — EVACUATION CAPABILITY

3.1 General. All group SR Occupancies must maintain the capability to exit within the evacuation rates defined as prompt, slow or impractical as specified by the facility occupancy classification. Records of fire drills required by licensing agents shall be made available to the authorities having jurisdiction. Impromptu fire drills may be required to verify occupancy classification.

3.2 Evacuation Capability Defined. Evacuation capability is the ability of the occupants, including residents and staff as a group to either evacuate the building or relocate from a point of occupancy to a point of safety. Evacuation capability shall be determined by using Tables A-I-F-A, A-I-F-B, A-I-F-C, A-I-F-D and A-I-F-E. There are three categories of evacuation capability:

1. Impractical (SR-1). A group, even with staff assistance, that cannot reliably move to a point safety in a timely manner, determined by an evacuation capability score of 5 or greater or with evacuation drill times in excess of 13 minutes.

2 Slow (SR-2). A group that can move to a point of safety in a timely manner, determined by an evacuation capability score greater than 1.5 and less than 5 or with evacuation drill times over three minutes but not in excess of 13 minutes.

3. Prompt (SR-3). A group with an evacuation capability score of 1.5 or less or equivalent to that of the general population or with evacuation drill times of three minutes or less.

3.3 Rating Residents. These tables are a worksheet for rating the individual resident and are a form for record keeping purposes. This method of determining evacuation capability has been designed to minimize speculation about how a resident might perform in an actual fire emergency by using ratings based upon observed performance. Instead of speculating, raters who are not familiar enough with a resident to provide ratings confidently should consult with an individual who has observed the resident on a daily basis or observed the resident during fire drills. Due to the stress of an actual fire emergency, some residents are not likely to perform at full capacity. Therefore, ratings based on commonly observed examples of poor performance provide the best readily available indication of behavior that could be reduced by the unusually stressful conditions of an actual fire. All persons are less capable on some occasions, and the ratings should be based on examples of resident performance on a typical "bad" day. Ratings should not be based on rare instances of poor performance. Table A-I-F-A rates the risk of a possibility that, during an emergency evacuation, the resident might resist leaving the facility. Unless there is specific evidence that resistance might occur, the resident should be rated as "minimal risk". Specific evidence of resistance means that staff have had to use some physical force in the past. For additional instructions in completing these tables, see NFPA 101A, Chapter 5, 1998 Edition.

WORKSHEET FOR RATING RESIDENTS

Complete one worksheet for each resident. Base ratings on commonly observed examples of poor performance.

Resident's Name _____ **Evaluator** _____

Facility _____ **Zone Date** _____

WRITE ANY EXPLANATORY REMARKS HERE:

TABLE A-I-F-A- WORKSHEET FOR RATING RESIDENTS
Rating the Resident on the Risk Factors

Rate the resident on each of the factors below by selecting one score in each risk factor that best describes the resident. For the first six factors, write the selected scores in the appropriate score boxes in the far right column. For "response to fire drills", write the three selected scores in the square boxes. Write the sum of the three ("fire drills") score boxes in the large box on the right.

					SCORE BOXES
I. Risk of Resistance (Circle only one)	Minimal Risk score=0	Risk of Mild Resistance score=6	Risk of Strong Resistance score=20		☐
II. Impaired Mobility (Circle only one)	Self-Starting score=0	Slow score=3	Needs Limited Assistance score=6	Needs Full Assistance or Very Slow score=20	☐
III. Impaired Consciousness (Circle only one)	No Significant Risk score=0	Partially Impaired score=6	Totally Impaired score=20		☐
IV. Need for Extra Help (Circle only one)	Needs at Most One Staff score=0	Needs Limited Assistance from 2 Staff score=30	Needs Full Assistance from 2 Staff score=40		☐
V. Response to Instructions (Circle only one)	Follows Instructions score=1	Requires Supervision score=3	Requires Considerable Attention/May Not respond score=10		☐
VI. Waking Response to Alarm (Circle only one)	Response Probable score =0	Response Not Probable score=6			☐

VII. Response to Fire Drills (Without Guidance or Advice from Staff)	Initiates and Completes Evacuation Promptly	Yes score=0	No score=8	☐		
	Chooses and Completes Back-up Strategy	Yes score-0	No score=4	+ ☐		
	Stays at Designated Location	Yes score=0	No score=6	+ ☐	SUM OF THESE THREE SCORES	☐

Finding the Resident's Overall Need for Assistance

Compare the numbers in the 7 score boxes you have filled in. Take the one highest score from the score boxes and write it in this box.

EVACUATION ASSISTANCE SCORE ☐

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TABLE A-I-F-B—TOTAL RESIDENT EVACUATION ASSISTANCE SCORE

1. List each resident's name on Score Sheet. Use a separate score sheet for each zone being rated. Use additional score sheets for a large number of residents.
2. Enter the score from each form, which was completed for each resident.
3. Total the scores for all residents in the facility or zone being rated as appropriate.

Score Sheet	
Resident Scores	
Resident's Name	Evacuation Assistance Score
Evacuation Assistance Score Total	

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TABLE A-I-F-C- STAFF SHIFT SCORE

Facility: _____ Zone: _____

Evaluator: _____ Date: _____

Staff Shift: From: _____ To: _____

This form is to be completed for the time of day, week, etc., when the combined ratings for staff and residents yield the highest score. This usually is late at night. Where it is not obvious which staff shift will score highest, complete separate forms for each staff shift and utilize the highest score. Refer to instructions in NFPA 101A, Chapter 5, when filling out this form.

CHECKLIST STAFF RESPONSE AND TRAINING	YES	NO
A protection plan has been promulgated and all staff members considered in this rating have been trained in its implementation.		
The total available staff at any given time is able to handle the individual evacuation needs of each resident who is in the facility.		
Every staff member considered in this rating can meaningfully participate in the evacuation of every resident		
All staff members considered in this rating are required to be in the facility when on duty, except as permitted.		
At least 12 fire drills were conducted during the previous year.		

All items must score "Yes" before proceeding.

TABLE A-I-F-D--DETERMINING THE STAFF SHIFT SCORE

NOTE: In large facilities, staff might be responsible for assisting residents in a fire or smoke zone but also might have responsibilities for residents in other zones.

PROMPTNESS OF RESPONSE

Promptness of Response Scores		
Staff Availability	Alarm Effectiveness	
	Assured	Not Assured
Standby or asleep	16	2
Immediately available	20	2
Immediately available and close by	20	10

1. On Score Sheet, list the names of staff members who are required to be on duty in the facility during the shift being rated.
2. Determine whether the effectiveness of the alarm is "assured" or "not assured."
3. Using the values from the table, determine each staff member "promptness of response score" for the shift being rated. Enter each staff member's name and score in the appropriate spaces on Score Sheet.
4. Total the "promptness of response scores" for the shift rated.

Score Sheet	Staff Scores
Staff Name	Promptness of Response Score
Staff Shift Score Total	

TABLE A-I-F-E—RATING THE FACILITY

Rate the facility by checking the box that indicates the vertical distance a resident must travel from a sleeping room (SR) to an exit.

	Vertical Distance from Sleeping Rooms to Exits		
	All SR on Floors with Direct Exit	Any SR One Floor from Exit	Any SR Two or More Floors from Exit
Small Facility	☐ Score 0.8	☐ Score 1.0	☐ Score 1.2
Large Facility or Apartment		☐ Score 1.0	

NOTE: Small facilities have 16 or fewer residents.

DETERMINING EVACUATION CAPABILITY

Multiply the "Total Resident Evacuation Assistance Score" by the facility score ("Vertical Distance, Sleeping Room to Exit"); divide the answer by the "Staff Shift Score" to determine the Evacuation Capability Score.

Calculation of Evacuation Capability Score

Total Resident Evacuation Assistance		Vertical Distance from Sleeping Room to Exit			
	X		=		
Staff Shift Score				Evacuation Capability Score	

Determine and record evacuation capability below:

Evacuation Capability Score	Level of Evacuation Capability	Evacuation Capability for this Facility or Zone
≤ 1.5	Prompt	
> 1.5 ≤ 5.0	Slow	
> 5.0	Impractical	

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SECTION 4 — STATE OF OREGON GROUP SR OCCUPANCY REQUIREMENTS

For state of Oregon requirements for group SR Occupancies, see the Building Code, Section 312A and the following statutes and rules: ORS Chapter 418, ORS 479.210, ORS 443.400 through 443.460, ORS 443.500, OAR 309-35-100 to 309-35-190 and OAR 309-49-030 through 309-49-220.

ORS Chapter 418 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:

ORS Chapter 418 defines the State of Oregon's statutes governing Child Welfare Services.

ORS 479.210 is not part of this code but is reproduced or paraphrased here for the reader's convenience:
ORS 479.210. Institutions defined as used in ORS 479.215 to 479.220, unless the context requires otherwise, "institution" means:
(1) A child -caring facility which provides residential care and which receives state aid under ORS 418.005 to 418.025, 418.035 to 418.185, 418.205 to 418.315, and 418.625 to 418.685.
(2) An inpatient care facility required to be licensed under ORS 441.015 to 441.087, 441.525 to 441.595, 441.815, 441.820, 441.990, 442.342, 442.344 and 442.400 to 442.450 or
(3) A residential facility subject to licensure under ORS 443.400 to 443.455 and 443.991 (2).

ORS 443.400 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:
ORS 443.400 provides definitions for the following terms: Department, Director, Resident, Residential care, Residential care facility, Residential facility, Residential training facility, Residential training home, Residential treatment facility, Residential treatment home, Training and Treatment.

ORS 443.405 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:
ORS 443.405 provides exclusions from the definition of "residential facility."

ORS 443.410 is not a part of this code but is reproduced or paraphrased here for the reader's convenience.
ORS 443.410. A license issued by the department is required in order to operate or maintain any residential facility for persons who are developmentally disabled, physically disabled or socially dependent, psychiatrically disabled or alcohol or drug dependent. In the case of a combination of residents, the category of licenser shall be determined by the director.

ORS 443.415 is not a part of this code but is reproduced for paraphrased here for the reader's convenience:
ORS 443.415 defines the parameters for license applications, fees, investigations, and grounds for issuance and denial of license.

ORS 443.420 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:
ORS 443.420 defines the qualifications required for a person applying for a license under ORS 443.414.

ORS 443.422 is not a part of this code but is reproduced or paraphrased here for the reader's convenience.:
ORS 443.422 (1) To prevent the perpetuation of segregated housing patterns, the Department of Human Resources shall determine the location and type of licensed residential facilities and the location of facilities subject to the provisions of ORS 169.690.
(2) Before a license is issued for a residential facility as defined in ORS 443.400, the issuing agency shall determine the number and type of any other licensed residential facilities and the number and type of facilities subject to the provisions of ORS 169.690 within a 1,200 foot radius.
(3) None of the data collected under this section shall be used in a manner that violates the Fair Housing Amendments Act of 1988.

ORS 443.425 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:
ORS 443.425 defines the parameters for the term, the contents, and the renewal of licenses and the fees involved.

ORS 443.430 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:
ORS 443.430 defines the parameters for the transfer of licenses and the disposition of license fees.

ORS 443.435 is not a part of this code but is reproduced or paraphrased here for the reader's convenience.
ORS 443.435. The director or authorized representative shall periodically visit and inspect every residential facility to determine whether it is maintained and operated in accordance with ORS 443.400 to 443.455 and 443.991 (2) and the rules of the director, and to consult with and advise management concerning methods of care, treatment, training, records, housing and equipment. Employees of the department and the State Fire Marshal or authorized representative on request shall be permitted access to the premises and records of individuals in a residential facility pertinent to fire safety.

ORS 443.437 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:
ORS 443.437 states that a resident in a residential facility must have a choice of prescription and nonprescription drugs and supplies.

ORS 443.440 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:
ORS 443.440. The department may revoke or suspend the license of any residential facility which is not operated in accordance with ORS 443.440 to 443.400 and 443.991(2) or the rules adopted thereunder. Such revocation or suspension shall be taken in accordance
with rules of the department and ORS 183.310 to 183.550. However, in cases where an imminent danger to the health or safety of the residents exists, a license may be suspended immediately pending a fair hearing not later than the 10th day after such suspension.

ORS 443. 445 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:

ORS 443.445 defines the requirements for persons admissible at facilities and homes, the transfer of persons requiring certain treatment and operation of facilities by person relying on spiritual means for healing.

ORS 443.450 is not a part of this code but is reproduced or paraphrased here for the reader's convenience.

ORS 443.450 (1) requires the director to adopt rules governing: Physical properties of the residential facility: Storage, preparation and service of food: Care, treatment or training of the staff: the number, experience and training of the staff, and any other factors affecting the care, treatment or training provided. (2) Distinct rules shall be adopted for homes of five or fewer residents, for facilities of six or more but fewer than 16 residents, and for facilities for 16 or more residents. The rules shall differentiate among categories of residents. (3) For purposes of this section, "categories" refers to different population of residents, differentiated by, but not limited to, age and need, as defined by rule.

ORS 443.452 is not a part of this code but is reproduced or paraphrased here for the reader's convenience.

ORS 443.452 defines situations whereby the director may waive the requirements of ORS 443.410.

ORS 443.455 is not a part of this code but is reproduced or paraphrased here for the reader's convenience.

ORS 443.455 requires the director to prescribe a schedule of penalties appropriate to residential facilities licensed under ORS 443.400 to 443.455 and 443.991(2).

OAR 309-49-030 to 309-49-220 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:

OAR 309-49-030 to 309-49-220 prescribe standards by which the Mental Health and Developmental Disability Services Division approves programs that provide 24-hour-residential support services for individuals with developmental disabilities.

ORS 443.460 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:

ORS 443.460 allows the director to exempt residential care facilities from the license, inspection and fee provisions when they exist in a county where there is a county agency which provides similar programs for licensing and inspection that the director finds are equal to or superior to the requirements of ORS 443.400 to 443.455.

ORS 443.500 is not a part of this code but is reproduced or paraphrased here for the reader's convenience.

ORS 443.500 requires that access be granted to the Senior and Disabled Services Division, the state or local fire inspector, or the state or local health officer in order to investigate complaints of abuse in all facilities registered under ORS 443.480 to 443.500.

OAR 309-35-100 to 309-35-190 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:

OAR 309-35-100 to 309-35-190. These rules prescribe the standards and procedures by which the Mental Health and Developmental Disabilities Services Division approves and licenses residential care facilities for mentally or emotionally disturbed persons only. These rules are authorized by ORS 430.041 and carry out the provisions of ORS 443.400 through 443.455.

APPENDIX II–E

HAZARDOUS MATERIALS MANAGEMENT PLANS AND HAZARDOUS MATERIALS INVENTORY STATEMENTS

(See UFC Sections 8001.3.2 and 8001.3.3)

SECTION 1 — SCOPE

Hazardous materials inventory statements (HMIS) and hazardous materials management plans (HMMP) which are required by the chief pursuant to Article 80 shall be provided for hazardous materials in accordance with Appendix II–E.

EXCEPTIONS: 1. Materials which have been satisfactorily demonstrated not to present a potential danger to public health, safety or welfare, based upon the quantity or condition of storage, when approved.

2. Chromium, copper, lead, nickel and silver need not be considered hazardous materials for the purposes of Appendix II–E unless they are stored in a friable, powdered or finely divided state.

Proprietary and trade secret information shall be protected under the laws of the state or jurisdiction having authority.

SECTION 2 — HAZARDOUS MATERIALS INVENTORY STATEMENTS (HMIS)

2.1 When Required. A separate HMIS shall be provided for each building, including its appurtenant structures, and each exterior facility in which hazardous materials are stored.

The hazardous materials inventory statement shall list by hazard class all hazardous materials stored. The hazardous materials inventory statement shall include the following information for each hazardous material listed:

1. Hazard class.

2. Common or trade name.

3. Chemical name, major constituents and concentrations if a mixture. If a waste, the waste category.

4. Chemical Abstract Service number (CAS number) found in 29 Code of Federal Regulations (C.F.R.).

5. Whether the material is pure or a mixture, and whether the material is a solid, liquid or gas.

6. Maximum aggregate quantity stored at any one time.

7. Storage conditions related to the storage type, temperature and pressure.

2.2 Changes to HMIS. An amended HMIS shall be provided within 30 days of the storage of any hazardous materials which changes or adds a hazard class or which is sufficient in quantity to cause an increase in the quantity which exceeds 5 percent for any hazard class.

SECTION 3 — HAZARDOUS MATERIALS MANAGEMENT PLAN (HMMP)

3.1 General. Applications for a permit to store hazardous materials shall include an HMMP standard form or short form in accordance with Section 3 and shall provide a narrative description of the operations and processes taking place at the facility. See Figure A–II–E–1.

3.2 Information Required. The HMMP standard form shall include the information detailed in Section 3.2.

3.2.1 General Information. General information, including business name and address, emergency contacts, business activity, business owner or operator, SIC code, number of employees and hours, Dunn and Bradstreet number, and signature of owner, operator or designated representative.

3.2.2 General Site Plan. A general site plan drawn at a legible scale which shall include, but not be limited to, the location of buildings, exterior storage facilities, permanent access ways, evacuation routes, parking lots, internal roads, chemical loading areas, equipment cleaning areas, storm and sanitary sewer accesses, emergency equipment and adjacent property uses. The exterior storage areas shall be identified with the hazard class and the maximum quantities per hazard class of hazardous materials stored. When required by the chief, information regarding the location of wells, flood plains, earthquake faults, surface water bodies and general land uses within 1 mile (1.609 km) of the facility boundaries shall be included.

3.2.3 Building Floor Plan. A building floor plan drawn to a legible scale which shall include, but not be limited to, hazardous materials storage areas within the building and shall indicate rooms, doorways, corridors, means of egress and evacuation routes. Each hazardous materials storage facility shall be identified by a map key which lists the individual hazardous materials, their hazard class and quantity present for each area.

3.2.4 Hazardous Materials Handling. Information showing that activities involving the handling of hazardous materials between the storage areas and manufacturing processes on site are conducted in a manner to prevent the accidental release of such materials.

3.2.5 Chemical Compatibility and Separation. Information showing procedures, controls, signs or other methods used to ensure separation and protection of stored materials from factors which could cause accidental ignition or reaction of ignitable, reactive or incompatible materials in each area.

3.2.6 Monitoring Program. Information including, but not limited to, the location, type, manufacturer's specifications, if applicable, and suitability of monitoring methods for each storage facility when required.

3.2.7 Inspection and Record Keeping. Schedules and procedures for inspecting safety and monitoring and emergency equipment. The permittee shall develop and follow a written inspection procedure acceptable to the chief for inspecting the facility for events or practices which could lead to unauthorized discharges of hazardous materials. Inspections shall be conducted at a frequency appropriate to detect problems prior to a discharge. An inspection check sheet shall be developed to be used in conjunction with routine inspections. The check sheet

shall provide for the date, time and location of inspection; note problems and dates and times of corrective actions taken; and include the name of the inspector and the countersignature of the designated safety manager for the facility.

3.2.8 Employee Training. A training program appropriate to the types and quantities of materials stored or used shall be conducted to prepare employees to safely handle hazardous materials on a daily basis and during emergencies. The training program shall include:

1. Instruction in safe storage and handling of hazardous materials, including maintenance of monitoring records,

2. Instruction in emergency procedures for leaks, spills, fires or explosions, including shutdown of operations and evacuation procedures, and

3. Record-keeping procedures for documenting training given to employees.

3.2.9 Emergency Response. A description of facility emergency procedures is to be provided.

3.3 HMMP Short Form—(Minimal Storage Site). A facility shall qualify as a minimal storage site if the quantity of each hazardous material stored in one or more facilities in an aggregate quantity for the facility is 500 pounds (227 kg) or less for solids, 55 gallons (208.2 L) or less for liquids, or 200 cubic feet (5.7 m^3) or less at NTP for compressed gases and does not exceed the threshold planning quantity as listed in 40 C.F.R., Part 355, Sections 302 and 304. The applicant for a permit for a facility which qualifies as a minimal storage site is allowed to file the short form HMMP. Such plan shall include the following components:

1. General facility information,

2. A simple line drawing of the facility showing the location of storage facilities and indicating the hazard class or classes and physical state of the hazardous materials being stored,

3. Information describing that the hazardous materials will be stored and handled in a safe manner and will be appropriately contained, separated and monitored, and

4. Assurance that security precautions have been taken, employees have been appropriately trained to handle the hazardous materials and react to emergency situations, adequate labeling and warning signs are posted, adequate emergency equipment is maintained, and the disposal of hazardous materials will be in an appropriate manner.

SECTION 4 — MAINTENANCE OF RECORDS

Hazardous materials inventory statements and hazardous materials management plans shall be maintained by the permittee for a period of not less than three years after submittal of updated or revised versions. Such records shall be made available to the chief upon request.

FIGURE A–II–E–1
SAMPLE FORMAT
HAZARDOUS MATERIALS MANAGEMENT PLAN (HMMP) INSTRUCTIONS

SECTION I—FACILITY DESCRIPTION

1.1 **Part A**

1. Fill out Items 1 through 11 and sign the declaration.
2. Only Part A of this section is required to be updated and submitted annually, or within 30 days of a change.

1.2 **Part B—General Facility Description (Site Plan)**

1. Provide a site plan on $8^1/_2$– by 11–inch (215 mm by 279 mm) paper, using letters on the top and bottom margins and numbers on the right and left side margins, showing the location of all buildings, structures, chemical loading areas, parking lots, internal roads, storm and sanitary sewers, wells, and adjacent property uses. Indicate the approximate scale, northern direction and date the drawing was completed.
2. List all special land uses within 1 mile (1.609 km).

1.3 **Part C—Facility Storage Map (Confidential Information)**

1. Provide a floor plan of each building on $8^1/_2$– by 11–inch (215 mm by 279 mm) paper, using letters on the top and bottom margins and numbers on the right and left side margins, with approximate scale and northern direction, showing the location of each storage area. Mark map clearly "Confidential—Do not disclose" for trade–secret information as specified by federal, state and local laws.
2. Identify each storage area with an identification number, letter, name or symbol.
3. Show the following:
   - 3.1 Accesses to each storage area.
   - 3.2 Location of emergency equipment.
   - 3.3 The general purpose of other areas within the facility.
   - 3.4 Location of all aboveground and underground tanks to include sumps, vaults, below–grade treatment systems, piping, etc.
4. **Map key.** Provide the following on the map or in a map key or legend for each storage area:
   - 4.1 A list of hazardous materials, including wastes.
   - 4.2 Hazard class of each hazardous waste.
   - 4.3 The maximum quantity for hazardous materials.
   - 4.4 Include the contents and capacity limit of all tanks at each area and indicate whether they are above or below ground.
   - 4.5 List separately any radioactives, cryogens and compressed gases for each facility.
   - 4.6 Trade–secret information shall be listed as specified by federal, state and local laws.

SECTION II—HAZARDOUS MATERIALS INVENTORY STATEMENT (HMIS)

2.1 **Part A—Declaration**

Fill out all appropriate information.

2.2 **Part B—Inventory Statement**

1. You must complete a separate inventory statement for all waste and nonwaste hazardous materials. List all hazardous materials in alphabetical order by hazard class.
2. **Inventory Statement Instructions**

Column	Information Required
1	Provide hazard class for each material.
2	**Nonwaste.** Provide the common or trade name of the regulated material. **Waste.** In lieu of trade names, you may provide the waste category.
3	Provide the chemical name and major constituents and concentrations, if a mixture.
4	Enter the chemical abstract service number (CAS number) found in 29 C.F.R. For mixtures, enter the CAS number of the mixture as a whole if it has been assigned a number distinct from its constituents. For a mixture that has no CAS number, leave this item blank or report the CAS numbers of as many constituent chemicals as possible.
5	Enter the following descriptive codes as they apply to each material. You may list more than one code, if applicable. P = Pure M = Mixture S = Solid L = Liquid G = Gas
6	6.1 Provide the maximum aggregate quantity of each material handled at any one time by the business. For underground tanks, list the maximum volume [in gallons (liters)] of the tank. 6.2 Enter the estimated average daily amount on site during the past year.
7	Enter the units used in Column 6 as: LB = Pounds GA = Gallons CF = Cubic Feet
8	Enter the number of days that the material was present on site (during the last year).
9	Enter the storage codes below for type, temperature and pressure.

Type

A = Aboveground Tank
B = Belowground Tank
C = Tank inside Building
D = Steel Drum
E = Plastic or Nonmetallic Drum
F = Can
G = Carboy
H = Silo
I = Fiber Drum
J = Bag
K = Box
L = Cylinder
M = Glass Bottle or Jug
N = Plastic Bottles or Jugs
O = Tote Bin
P = Tank Wagon
Q = Rail Car
R = Other

Temperature

4 = Ambient
5 = Greater than Ambient
6 = Less than Ambient, but not Cryogenic [less than -150°F (-101.1°C)]
7 = Cryogenic conditions [less than -150°F (-101.1°C)]

Pressure

1 = Ambient (Atmospheric)
2 = Greater than Ambient (Atmospheric)
3 = Less than Ambient (Atmospheric)

10 For each material listed, provide the SARA hazard class as listed below. You may list more than one class. These categories are defined in 40 C.F.R. 370.3.

Physical Hazards

F = Fire
P = Sudden Release of Pressure
R = Reactivity

Health Hazards

I = Immediate (Acute)
D = Delayed (Chronic)

11 **Waste Only.** For each waste, provide the total estimated amount of hazardous waste handled throughout the course of the year.

SECTION III—SEPARATION AND MONITORING

3.1 **Part A—Aboveground**

Fill out Items 1 through 6, or provide similar information for each storage area shown on the facility map. Use additional sheets as necessary.

3.2 **Part B—Underground**

1. Complete a separate page for each underground tank, sump, vault, below-grade treatment system, etc.
2. Check the type of tank and method(s) that applies to your tank(s) and piping, and answer the appropriate questions. Provide any additional information in the space provided or on a separate sheet.

SECTION IV—WASTE DISPOSAL

Check all that apply and list the associated wastes for each method checked.

SECTION V—RECORD KEEPING

Include a brief description of your inspection procedures. You are also required to keep an inspection log and recordable discharge log, which are designed to be used in conjunction with routine inspections for all storage facilities or areas. Place a check in each box that describes your forms. If you do not use the sample forms, provide copies of your forms for review and approval.

SECTION VI—EMERGENCY-RESPONSE PLAN

1. This plan should describe the personnel, procedures and equipment available for responding to a release or threatened release of hazardous materials that are stored, handled or used on site.
2. A check or a response under each item indicates that a specific procedure is followed at the facility, or that the equipment specified is maintained on site.
3. If the facility maintains a more detailed emergency-response plan on site, indicate this in Item 5. This plan shall be made available for review by the inspecting jurisdiction.

SECTION VII—EMERGENCY-RESPONSE TRAINING PLAN

1. This plan should describe the basic training plan used at the facility.
2. A check in the appropriate box indicates the training is provided or the records are maintained.
3. If the facility maintains a more detailed emergency-response training plan, indicate this in Item 4. This plan shall be made available for review by the inspecting jurisdiction.

FIGURE A–II–E–1—(Continued)
HAZARDOUS MATERIALS MANAGEMENT PLAN
SECTION I: FACILITY DESCRIPTION

PART A—GENERAL INFORMATION

1. Business Name: _____ Phone: _____
   Address: _____
2. Person Responsible for the Business:

Name	Title	Phone

3. Emergency Contacts:

Name	Title	Home Number	Work Number

4. Person Responsible for the Application/Principal Contact:

Name	Title	Phone

5. Property Owner:

Name	Address	Phone

6. Principal Business Activity: _____
7. Number of Employees: _____
8. Number of Shifts: _____
9. Hours of Operation: _____
10. SIC Code: _____
11. Dunn and Bradstreet Number: _____
12. Declaration
    I certify that the information above and on the following parts is true and correct to the best of my knowledge.
    Signature: _____ Date: _____
    Print Name: _____ Title: _____
    (Must be signed by owner/operator or designated representative)

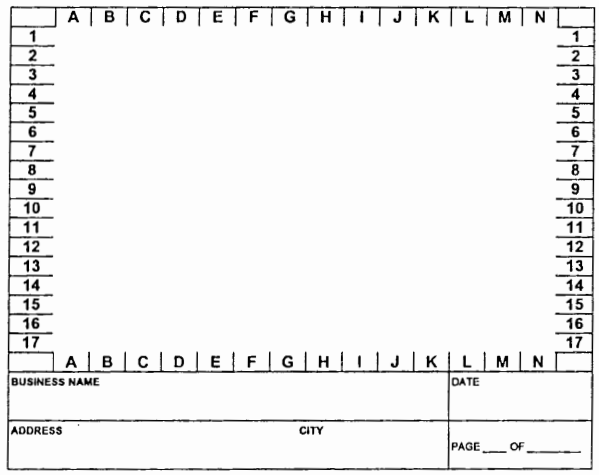
PART B—GENERAL FACILITY DESCRIPTION/SITE PLAN

(Use grid format below.)

Special land uses within 1 mile (1.609 km): _____

PART C—FACILITY MAP

(Use grid format below.)



SECTION II: HAZARDOUS MATERIALS INVENTORY STATEMENT

PART A—DECLARATION

1. Business Name: _____
2. Address: _____
3. Declaration:

Under penalty of perjury, I declare the above and subsequent information, provided as part of the hazardous materials inventory statement, is true and correct.

Signature: _____ Date: _____
Print Name: _____ Title: _____
(Must be signed by owner/operator or designated representative)

PART B—HAZARDOUS MATERIALS INVENTORY STATEMENT

(1) HAZARD CLASS	(2) COMMON/ TRADE NAME	(3) CHEMICAL NAME, COMPONENTS AND CONCENTRATION	(4) CHEMICAL ABSTRACT SERVICE NO.	(5) PHYSICAL STATE	(6) MAXIMUM QUANTITY ON HAND AT ANY TIME	(7) UNITS	(8) DAYS ON SITE	(9) STORAGE CODE (TYPE, PRES., TEMP.)	(10) SARA CLASS	(11) ANNUAL WASTE THROUGHPUT
/										

FIGURE A–II–E–1—(Continued)
SECTION III: SEPARATION, SECONDARY CONTAINMENT AND MONITORING
PART A—ABOVEGROUND STORAGE AREAS

Storage Area Identification (as shown on facility map): _____

1. Storage Type:

_____ Original Containers
_____ Inside Machinery
_____ 55–gallon (208.2 L) Drums or Storage Shed
_____ Pressurized Vessel
_____ Other: _____

_____ Safety Cans
_____ Bulk Tank
_____ Outside Barrels

2. Storage Location:

_____ Inside Building
_____ Outside Building
_____ Secured

3. Separation:

_____ All Materials
_____ Compatible
_____ Separated by 20 Feet (6096 mm)
_____ Other: _____

One–hour Separation Wall/Partition
Approved Cabinets

4. Secondary Containment:

_____ Approved Cabinet
_____ Tray
_____ Vaulted Tank
_____ Other: _____

_____ Secondary Drums
_____ Bermed, Coated Floor
_____ Double–wall Tank

5. Monitoring:

_____ Visual
_____ Other: _____

_____ Continuous

Attach specifications if necessary

6. Monitoring Frequency:

_____ Daily
_____ Other: _____

_____ Weekly

Attach specifications if necessary

SECTION III: SEPARATION, CONTAINMENT AND MONITORING
PART B—UNDERGROUND

SINGLE–WALL TANKS AND PIPING

Tank Area Identification (as shown on facility map): _____

1. _____ Backfill Vapor Wells—
   Model and Manufacturer: _____
   Continuous or Monthly Testing: _____
2. _____ Groundwater Monitoring Wells
3. _____ Monthly Precision Tank Test
4. _____ Piping—
   Monitoring Method: _____
   Frequency: _____
5. _____ Other: _____

DOUBLE–WALL TANKS AND PIPING

Tank Area Identification (as shown on facility map): _____

1. Method of monitoring the annular space: _____
2. Frequency:
   _____ Continuous _____ Daily _____ Weekly
   _____ Other:
3. List the type of secondary containment for piping: _____
4. List the method of monitoring the secondary containment for piping: _____
5. Are there incompatible materials within the same vault? _____
   _____ Yes _____ No
   If yes, how is separate secondary containment provided?

Note: If you have continuous monitoring equipment, you shall maintain copies of all service and maintenance work. Such reports shall be made available for review on site, and shall be submitted to the fire prevention bureau upon request.

Attach additional sheets as necessary

SECTION IV: WASTE DISPOSAL

_____Discharge to the Sanitary Sewer—Wastes: _____

_____ Pretreatment—Wastes: _____

_____ Licensed Waste Hauler—Wastes: _____

_____ Recycle—Wastes: _____

_____ Other—
Describe Method: _____
Wastes: _____

_____ No Waste

SECTION V: RECORD KEEPING

Description of our inspection program: _____

_____ We will use the attached sample forms in our inspection program.
_____ We will not use the sample forms. We have attached a copy of our own forms.

SECTION VI: EMERGENCY–RESPONSE PLAN

1. In the event of an emergency, the following shall be notified:
   A. On–site Responders:

Name	Title	Phone

   B. Method of Notification to Responder:
   _____ Automatic Alarm
   _____ Manual Alarm
   _____ Other: _____
   _____ Phone
   _____ Verbal

   C.

Agency	Phone Number
Fire Department:	
State Office of Emergency:	
Services:	
Other:	

2. Designated Local Emergency Medical Facility:

Name	Address	Phone (24 hours)

3. Mitigation Equipment:
   A. Monitoring Devices:
   _____ Toxic or flammable gas detection
   _____ Fluid detection
   _____ Other:

   B. Spill Containment:
   _____ Absorbants
   _____ Other: _____

   C. Spill Control and Treatment
   _____ Vapor Scrubber
   _____ Pumps/vacuums
   _____ Neutralizer
   _____ Mechanical Ventilation
   _____ Secondary Containment
   _____ Other: _____

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4. Evacuation:
   _____ Immediate area evacuation routes posted
   _____ Entire building evacuation procedures developed
   _____ Assembly areas preplanned
   _____ Evacuation maps posted
   Other:

5. Supplemental hazardous materials emergency response plan on site.
   Location: _____
   Responsible Person: _____
   Phone: _____

SECTION VII: EMERGENCY–RESPONSE TRAINING PLAN

1. Person responsible for the emergency–response training plan:
   Name _____ Title _____ Phone _____
2. Training Requirements:
   A. All employees trained in the following as indicated:
      _____ Procedures for internal alarm/notification
      _____ Procedures for notification of external emergency–response organizations
      _____ Location and content of the emergency–response plan
   B. Chemical handlers are trained in the following as indicated:
      _____ Safe methods for handling and storage of hazardous materials
      _____ Proper use of personal protective equipment
      _____ Locations and proper use of fire– and spill–control equipment
      _____ Specific hazards of each chemical to which they may be exposed
   C. Emergency–response team members are trained in the following:
      _____ Procedures for shutdown of operations
      _____ Procedures for using, maintaining and replacing facility emergency and monitoring equipment
3. The following records are maintained for all employees:
   _____ Verification that training was completed by the employee
   _____ Description of the type and amount of introductory and continuing training
   _____ Documentation on and description of emergency–response drills conducted at the facility
4. A more comprehensive and detailed emergency–response training plan is maintained on site.
   Location: _____
   Responsible Person: _____
   Phone: _____

APPENDIX II–F

SECONDARY CONTAINMENT FOR UNDERGROUND TANK SYSTEMS CONTAINING FLAMMABLE OR COMBUSTIBLE LIQUIDS

(See UFC Section 7902.6.11)

SECTION 1 — SCOPE

Secondary containment shall be provided for underground tank systems containing flammable and combustible liquids when required by the chief in accordance with Section 7902.6.11.

See C.F.R. Title 40, Part 280, and UFC Section 8001.4.5.1 for additional requirements related to secondary containment for tanks containing hazardous materials other than flammable and combustible liquids.

SECTION 2 — CIRCUMSTANCES WARRANTING SECONDARY CONTAINMENT

Sites selected for the installation of underground storage tank systems shall be carefully evaluated for the potential fire or explosion hazards that would be present if a release of product occurred. Such analysis shall include the tank's size, location, product stored and potential receptors that could be impacted.

Secondary containment shall be provided for tank systems in the following circumstances. Such circumstances are representative, but not all inclusive, of cases where a leak would constitute an immediate hazard to persons or property for the purpose of applying Section 7902.6.11.

1. Tank systems that are located totally or partially under buildings as allowed in Section 7902.6.3.

2. Tank systems that are located closer than 5 feet (1524 mm) from a building without subgrade areas or the property line of a property that can be built upon.

3. Tank systems that are located closer than 10 feet (3048 mm) from any subgrade structure, including basements, crawlspaces, utility vaults, trainways, subways or other confined spaces in which vapors could accumulate should a leak occur.

4. Tank systems located within or below the water table and within 50 feet (15 240 mm) of a known active well.

5. Tank systems located within or below the water table and within 50 feet (15 240 mm) up–gradient of a location where the table intercepts the surface.

SECTION 3 — APPROVED METHODS OF SECONDARY CONTAINMENT

For methods of secondary containment for tank systems, see Section 9003, Standard u.3.2.

APPENDIX II–K

NONPROTECTED ABOVEGROUND STEEL TANKS FOR PRIVATE MOTOR VEHICLE FUEL–DISPENSING STATIONS OUTSIDE BUILDINGS

(See UFC Sections 5202.3.1 and 5202.4.1)

SECTION 1 — SCOPE

Storage and dispensing of motor fuels at private automotive, marine and aircraft motor vehicle fuel–dispensing stations into the fuel tanks of motor vehicles from aboveground steel tanks, other than protected tanks located outside buildings in approved locations, shall be in accordance with Appendix II–K.

SECTION 2 — DEFINITIONS

For the purpose of Appendix II–K, certain terms are defined as follows:

FUEL–DELIVERY SYSTEM is a system that consists of a tank vehicle containing a pump, fill hose with appropriate connections, and a person who performs the tank filling operation of transferring fuel from the tank vehicle to an aboveground tank. The two types of fuel–delivery systems for aboveground steel tanks are as follows:

PRECONNECTED FLEXIBLE HOSE SYSTEM is a fuel–delivery system containing a reel–mounted precon- nected flexible hose having a maximum nominal diameter of 2 inches (51mm) and a manually controlled fuel–delivery nozzle at the downstream end of the hose.

RIGID HOSE SYSTEM is a fuel–delivery system utilizing one or more sections of large diameter hose [usually 3 or 4 inches (76.2 to 101.6 mm) in nominal diameter] which does not contain a nozzle but which contains interlocking connections for manually connecting the hose from the tank vehicle to the tank.

PRIVATE MOTOR VEHICLE FUEL–DISPENSING STATION is a motor vehicle fuel–dispensing station to which the general public does not have access to.

SECTION 3 — PERMITS AND PLANS

A permit is required to install, operate, repair or modify aboveground steel tanks used for storage and dispensing of flammable or combustible liquid motor fuels.

The installation plans shall be submitted with permit applications. The plans shall include the design, details and specifications for the following:

3.1 Quantities and types of liquids to be stored;

3.2 Distances from tanks and dispensers to property lines and buildings;

3.3 Vehicle access;

3.4 Fire appliances;

3.5 Vehicle impact protection;

3.6 Aboveground tanks and their supports;

3.7 Method of storage and dispensing;

3.8 Overfill prevention, spill containment, vents, vapor recovery, dispensers, and other equipment and accessories;

3.9 Seismic design in accordance with the Building Code;

3.10 Secondary containment;

3.11 Venting;

3.12 Piping;

3.13 Electrical systems;

3.14 Grounding;

3.15 Corrosion protection for tank bottoms and underground piping;

3.16 Emergency controls; and

3.17 Other information as required by the chief.

SECTION 4 — TANK DESIGN

4.1 General. Aboveground steel tanks within the scope of Appendix II–K shall be designed in accordance with Section 7902.1.8.2 and shall also be listed and meet the requirements of Section 9003, Standard u.1.7.

Tank supports, foundations and anchorage shall be in accordance with Section 7902.1.14

4.2 Size. Aboveground steel tanks shall not exceed a 6,000 gallon (22 712 L) individual or 18,000 gallon (68 137 L) aggregate capacity.

4.3 Vents.

4.3.1 Capacity. Aboveground steel tanks shall be provided with vents for normal venting in accordance with Section 7902.1.11. Aboveground steel tanks shall be provided with construction or vents for emergency relief venting in accordance with Section 7902.2.6. The vent capacity reduction factor as provided for in Section 7902.2.6.3.4 shall not be allowed.

4.3.2 Flame Arresters. Approved flame arresters shall be installed in normal vents.

SECTION 5 — INSTALLATION OF TANKS

The installation of aboveground steel tanks within the scope of Appendix II–K shall be in districts or zones as established by the jurisdiction, or in approved locations. Storage of Class I and II liquids in aboveground tanks outside of buildings is prohibited within the limits established by law as the limits of districts in which such storage is prohibited. (See sample adoption ordinance, Section 4.) Installations shall be in accordance with the following:

5.1 Separation Distances.

5.1.1 Individual Tanks. An aboveground steel tank shall be separated from property lines, important buildings, public ways and other tanks in accordance with the following:

1. A minimum of 100 feet (30 480 mm) from the nearest side of any public way or from the nearest important building on the same property;

2. A minimum of 100 feet (30 480 mm) from any property line which is or can be built upon, including the opposite side of a public way; and

3. A minimum of 3 feet (914 mm) between tanks.

5.1.2 Aggregate Capacity. Aboveground steel tank installations having the maximum allowable aggregate capacity shall be separated from other installations of aboveground tanks by not less than 100 feet (30 480 mm).

5.2 Secondary Containment. Aboveground steel tanks shall be provided with spill control and secondary containment in accordance with Section 7901.8 or with drainage control and diking in accordance with Section 7902.2.8 or with a listed secondary containment system. Secondary containment systems shall be monitored either visually or automatically. Enclosed secondary containment systems shall be provided with emergency venting.

5.3 Vehicle Impact Protection. Guard posts or other approved barrier protection shall be provided for each aboveground steel tank or group of tanks, and for connected piping subject to vehicle impact. The design of guard posts shall be in accordance with Section 8001.11.3.

5.4 Overfill Prevention. Aboveground steel tanks shall not be filled in excess of 90 percent of their capacity. An overfill prevention system shall be provided for each tank. During tank filling operation, the system shall:

1. Provide an independent means of notifying the person filling the tank that the fluid level has reached 85 percent of tank capacity by providing an audible and visual alarm signal, providing a tank level gauge marked at 85 percent of tank capacity, or other approved means, and

2. Automatically shut off the flow of fuel to the tank when the quantity of liquid in the tank reaches 90 percent of tank capacity or other approved method of overfill prevention. For rigid hose fuel–delivery systems, an approved means shall be provided to empty the fill hose into the tank after the automatic shutoff device is activated.

A permanent sign shall be provided at the fill point for the tank documenting the filling procedure and the tank calibration chart. The filling procedure shall require the person filling the tank to determine the gallonage required to fill it to 90 percent of capacity before commencing the fill operation.

5.5 Fill Pipe Connections. The fill pipe shall be provided with a means for making a direct connection to the tank vehicle's fuel–delivery hose so that the delivery of fuel is not exposed to the open air during the filling operation. When any portion of the fill pipe exterior to the tank extends below the level of the top of the tank, a check valve shall be installed in the fill pipe not more than 12 inches (304.8 mm) from the fill hose connection. See Section 7901.11 for tank valves.

5.6 Spill Containers. A spill container having a capacity of not less than 5 gallons (18.9 L) shall be provided for each fill connection. For tanks with a top fill connection, spill containers shall be noncombustible and shall be fixed to the tank and equipped with a manual drain valve that drains into the primary tank. For tanks with a remote fill connection, a portable spill container shall be provided.

5.7 Signs. Warning signs and identification signs shall be installed to clearly identify hazards. The design of such signs shall be in accordance with Sections 5201.8 and 7901.9. Conspicuous signs prohibiting simultaneous tank filling and fuel dispensing shall be posted.

SECTION 6 — INSTALLATION OF DISPENSING AND PIPING SYSTEMS

6.1 General. Dispensing and piping systems and electrical controls shall be installed in accordance with Section 7901.11 and Article 52, except as provided in Appendix Sections 6.2, 6.3 and 6.4.

6.2 Tank Openings. Tank openings shall be through the top only.

6.3 Dispensing Devices. Dispensing devices shall be located a minimum of 50 feet (15 240 mm) from any aboveground storage tank.

6.4 Antisiphon Devices. Approved antisiphon devices shall be installed in each external pipe connected to the tank when the pipe extends below the level of the top of the tank.

SECTION 7 — PARKING OF TANK VEHICLES

Tank vehicles shall not be parked within 25 feet (7620 mm) of an aboveground tank.

EXCEPTION: When the tank is being filled by the tank vehicle.

SECTION 8 — MAINTENANCE

Aboveground steel tanks, piping and dispensing systems shall be maintained in a safe operating condition. Aboveground steel tanks and components of dispensing systems shall be maintained in accordance with their listings.

APPENDIX II–L

VEHICLE FUELING

TANK VEHICLE TO TANK VEHICLE FUELING AT AIRPORT SITES

SECTION 1 — SCOPE

The purpose of this appendix is to provide minimum safety standards when transferring flammable and combustible liquids from distributor tank vehicle into tanks of tank vehicles at airport sites. Personnel, equipment and sites shall be approved for this activity.

SECTION 2 — DEFINITIONS

For the purpose of Appendix II-L, certain terms are defined as follows:

QUALIFIED PERSONNEL are those who have been thoroughly trained in the operation of fuel transfer when utilizing vehicles or equipment within their responsibility.

SECTION 3 — SITES REQUIREMENTS

Sites shall be approved, permanent locations that meet the intent of this appendix.

3.1 There shall be separations from the nearest important building and from property or lease lines of not less than 100 feet when transferring fuel from tank vehicle to tank vehicle.

> **EXCEPTION:** The distance may be reduced to not less than 50 feet when the fuel transfer is accomplished through sealed vapor, hose tight connections such as bottom loading.

3.2 A minimum rating of 40 B:C fire protection equipment shall be provided during fuel transfer.

3.3 Flammable and combustible liquids shall not be discharged onto the surface/grade. In locations where fuel is transferred, spill and drainage control shall be provided with impounding, slopes of at least 1% or other approved methods to prevent unauthorized discharges from reaching sidewalks, streets, highways, drainage canals, ditches, storm drains, sewers, flood-control channels, lakes, rivers or tidal water-ways.

3.4 Smoking or other ignition sources shall not be permitted with 50 feet of fuel transfer operations.

3.5 A minimum separation of 10 feet shall be provided between tank vehicles.

SECTION 4 — PERSONNEL REQUIREMENTS

Qualified personnel shall be in attendance of fuel transfer operation.

4.1 Personnel shall be trained in the methods of proper use and operation and shall be qualified in the use of fuel transfer equipment. The minimum level of training shall include:

A. All aspects of the tank vehicle relating to the movement or placement of the vehicle for the purpose of transferring fuel.

B. The operating features associated with transferring fuel.

C. The use of emergency equipment or devices.

D. Safety aspects of the fuel products being transferred.

4.2 Records shall be maintained to verify current qualifications of fuel transfer personnel.

4.3 Personnel shall be assigned to each vehicle and shall be stationed at the control valves during fuel transfer.

4.4 Personnel shall not be located at the dome areas during fuel transfer.

SECTION 5 — VEHICLE AND EQUIPMENT REQUIREMENTS

Vehicles and equipment used for fuel transfer shall be approved in accordance with recognized standards and this appendix.

5.1 Tank vehicles shall be maintained in proper repair and free of accumulation of grease, oil or other combustible material.

5.2 Tank vehicles shall be maintained a minimum of 10 feet apart while transferring fuel.

5.3 Equipment used for fuel transfer shall be approved and shall include the following minimum safety equipment.

5.3.1 High level shut off devices that shall be tested during start up.

5.3.2 A positive means shall be provided for loading a predetermined quantity of liquid, together with a minimum of two approved control devices that will shut down the flow of fuel. The devices shall consist of:

A. An automatic secondary shut off device.

B. A primary valve located ahead of the hose connection.

5.3.3 Approved bonding devices shall be provided in accordance with nationally recognized standards. The bonding device shall be attached to create an electrical connection between the tank vehicles prior to making any hose connections and shall be maintained until all hoses are disconnected.

5.3.4 Only certified transfer hose in accordance with nationally recognized standards shall be used for fuel transfer.

5.3.5 Vapor recovery equipment shall be used when required.

5.3.6 (Transport) pressure systems shall have a pressure gauge.

5.3.7 Flow rates shall not exceed 200 gallons per minute for 3 inch hose and 100 gallons per minute for 2 inch hose.

5.4 Dry-break connections (single point or equivalent) shall be provided for bottom loading.

5.5 Existing top filling operations may be permitted to continue when approved by the Authority Having Jurisdiction and when in compliance with the following:

5.5.1 Approved downspouts are provided and extend to within 6 inches of the bottom of the tank.

5.5.2 Top fill loading operations shall be in accordance with this appendix.

APPENDIX II-M

MOBILE FLEET FUELING AT COMMERCIAL, INDUSTRIAL AND GOVERNMENTAL SITES

SECTION 1 — SCOPE

The requirements of this appendix are intended to provide a reasonable degree of safety while dispensing fuel from tank vehicles. It is the responsibility of the mobile fleet fueling applicant to ensure that fueling operations are in compliance with all applicable statutes of the State of Oregon and any local codes and ordinances.

SECTION 2 — DEFINITIONS

Mobile Fleet Fueling is the dispensing of fuels into tanks of commercial, industrial and governmental motor vehicles from cargo tank vehicles.

QUALIFIED PERSONEL. For the purpose of Appendix II-M, qualified personnel are persons trained in the operation of fuel dispensing utilizing tank vehicles and associated equipment within their responsibility.

REMOTE EMERGENCY SHUT-OFF DEVISE is an approved device capable of halting the pumping of fuel from a distance. This device shall not be affixed to the cargo tanker.

SECTION 3 — PERMITS

Approval from the Chief shall be obtained for each specific Mobile Fleet Fueling site. An application having local fire authority signature approvals, description of the tank vehicle and associated equipment, set backs to property lines and the type and amount of fuel being transferred shall be submitted to the Office of State Fire Marshal. Approval shall be obtained prior to conducting Mobile Fleet Fueling. Sites, personnel, vehicles and equipment shall be approved for this activity.

SECTION 4 — SITE REQUIREMENTS

4.1 Mobile Fleet Fueling shall be conducted in areas designed to prevent fuel from running into buildings, obstructing exits, blocking access of emergency apparatus, entering water ways, wetlands or unprotected storm drains or coming into contact with ignition sources.

4.2 The fuel-dispensing nozzle shall not be within 25 feet of buildings.

4.3 There shall be a separation of not less than 50 feet between the cargo tank vehicle and the nearest important building, property lines or lease lines when dispensing Class I flammable liquids from cargo tanks vehicles into the tanks of motor vehicles.

EXCEPTION: When Class I, flammable liquids are dispensed with an approved remote emergency shut-off device, the separation shall be not less than 25 feet.

4.4 There shall be a separation of not less than 25 feet between the cargo tank vehicle and the nearest important building or property lines when dispensing Class II and III combustible liquids from cargo tank vehicles into the tanks of motor vehicles.

SECTION 5 — PERSONNEL REQUIREMENTS

5.1 Driver/operators shall be trained and qualified in the operations of mobile tank vehicle fuel dispensing and shall have training for emergencies that may occur during fuel dispensing or vehicle operations. Operators shall be trained in controlling and mitigating unauthorized discharges.

5.2 Records shall be maintained of current employee training and qualifications.

5.3 Identification shall be carried by Mobile Fleet Fueling distributor personnel that will identify their company and themselves. Permits and a site plan shall be carried in the Mobile Fleet Fueling vehicle or maintained at the site that will validate the transfer of fuel at each location.

SECTION 6 — VEHICLE AND EQUIPMENT REQUIREMENTS

6.1 Vehicle and equipment used for Mobile Fleet Fueling shall be approved in accordance with DOT requirements, NFPA 385 and the following:

1. Only approved nozzles and hoses shall be used for Mobile Fleet Fueling.

2. Approved communications having the capability to contact a 911 emergency agency shall be readily accessible to the driver or operator in the event of, or during emergency conditions.

3. Provisions shall be maintained on the tank vehicle for controlling and mitigating spills, leaks and unauthorized discharges of at least 5 gallons. Minimum spill kit requirements shall include absorbent pads, wipes, gloves and a 5 gallon container and equipment needed for proper disposal.

4. Safety interlocks shall prevent the vehicle from being moved while fuel is being dispensed.

5. A minimum of two approved wheel chocks meeting OSHA and DOT Standards shall be carried on each Mobile Fleet Fueling tank vehicle.

6. Tank vehicles shall be maintained in proper repair and free of accumulation of grease, oil or other combustible material.

7. Portable fire protection equipment having a minimum rating of 40 B:C shall be provided during fuel dispensing. This requirement may be satisfied with either two 20B:C extinguishers or a single 40 B:C.

8. Tank vehicles shall be designed and equipped with the means to limit fuel delivery to 500 gallons without resetting a device at the pump to continue the fuel transfer as approved by the authority having jurisdiction.

EXCEPTION: Tankers utilizing an approved remote emergency shut-off device that when activated will shut of the flow at the pump. This device shall be constantly carried by the operator during fuel transfer.

SECTION 7 — DISPENSING OPERATIONS

7.1 Persons dispensing fuel from tank vehicles shall be responsible for any fuel spill, leak or unauthorized discharge.

7.2 The chief shall be notified immediately when:

1. Any quantity of a spill or discharge creates a distinct hazard to life or property.

2. An unauthorized discharge from a tank vehicle exceeds 42 gallons.

3. A spill, leak or discharge is required to be reported by other state, federal or local regulations.

7.3 Smoking or ignition sources shall not be allowed within 25 feet of mobile tank vehicle fueling dispensing operations. The prohibited area shall be measured from the point of transfer, the hose that is in use and the tank vehicle. Signage for this provision shall be posted during fuel transfer.

7.4 Vehicles shall be parked in a safe manner in accordance with Appendix II-M. Wheels shall be chocked and safety interlocks shall be engaged prior to dispensing fuel.

7.5 Fuel dispensing shall be conducted with distances not greater than 50 feet between the nozzle and the tank vehicle.

7.6 Personnel shall be constantly in attendance at the nozzle during Mobile Fleet Fueling operations.

7.7 Mobile Fleet Fueling shall be conducted in areas where the general public is not permitted.

7.8 Adequate lighting shall be provided and operated in an approved manner while conducting all phases of Mobile Fleet Fueling.

7.9 Before dispensing Class I, flammable liquids into the tanks of motor vehicles, the vehicles shall be electrically bonded.

7.10 There shall be a minimum of 10 feet between the cargo tank vehicle and the vehicle being fueled.

7.11 Other than during fuel dispensing, tank vehicles shall not be parked, garaged or stored on the same property as the dispensing operations.

EXCEPTION: Tank vehicles may be parked in areas meeting the requirements of Section 7904.6.5.2 for unattended parking.

Division III
FIRE PROTECTION
APPENDIX III–A

FIRE–FLOW REQUIREMENTS FOR BUILDINGS

(See UFC Section 903.3)

SECTION 1 — SCOPE

The procedure determining fire–flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with Appendix III–A. Appendix III–A does not apply to structures other than buildings.

SECTION 2 — DEFINITIONS

For the purpose of Appendix III–A, certain terms are defined as follows:

FIRE AREA is the floor area, in square feet, used to determine the required fire flow.

FIRE FLOW is the flow rate of a water supply, measured at 20 psi (137.9 kPa) residual pressure, that is available for firefighting.

SECTION 3 — MODIFICATIONS

3.1 Decreases. Fire–flow requirements may be modified downward by the chief for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire–flow requirements is impractical.

3.2 Increases. Fire flow may be modified upward by the chief where conditions indicate an unusual susceptibility to group fires or conflagrations. An upward modification shall not be more than twice that required for the building under consideration.

SECTION 4 — FIRE AREA

4.1 General. The fire area shall be the total floor area of all floor levels except as modified in Section 4.

4.2 Area Separation. Portions of buildings which are separated by one or more four–hour area separation walls constructed in accordance with the Building Code, without openings and provided with a 30 inch (762 mm) parapet, are allowed to be considered as separate fire areas.

4.3 Type I and Type II–F.R. Construction. The fire area of buildings constructed of Type I and Type II–F.R. construction shall be the area of the three largest successive floors.

SECTION 5 — FIRE–FLOW REQUIREMENTS FOR BUILDINGS

5.1 One– and Two–Family Dwellings. The minimum fire flow and flow duration requirements for one– and two–family dwellings having a fire area which does not exceed 3,600 square feet (344.5 m^2) shall be 1,000 gallons per minute (3785.4 L/min.). Fire flow and flow duration for dwellings having a fire area in excess of 3,600 square feet (344.5 m^2) shall not be less than that specified in Table A–III–A–1.

> **EXCEPTION:** A reduction in required fire flow of 50 percent, as approved, is allowed when the building is provided with an approved automatic sprinkler system.

5.2 Buildings Other Than One– and Two–Family Dwellings. The minimum fire flow and flow duration for buildings other than one– and two–family dwellings shall be as specified in Table A–III–A–1.

> **EXCEPTION:** A reduction in required fire flow of up to 75 percent, as approved, is allowed when the building is provided with an approved automatic sprinkler system. The resulting fire flow shall not be less than 1,500 gallons per minute (5677.5 L/min.).

TABLE A–III–A–1—MINIMUM REQUIRED FIRE FLOW AND FLOW DURATION FOR BUILDINGS

FIRE AREA (square feet) × 0.0929 for m²					FIRE FLOW (gallons per minute)[2]	FLOW DURATION (hours)
Type I–F.R. II–F.R.[1]	Type II One–HR. III One–HR.[1]	Type IV–H.T. V–One–HR.[1]	Type II–N III–N[1]	Type V–N[1]	× 3.785 for L/min.	
0–22,700	0–12,700	0–8,200	0–5,900	0–3,600	1,500	2
22,701–30,200	12,701–17,000	8,201–10,900	5,901–7,900	3,601–4,800	1,750	
30,201–38,700	17,001–21,800	10,901–12,900	7,901–9,800	4,801–6,200	2,000	
38,701–48,300	21,801–24,200	12,901–17,400	9,801–12,600	6,201–7,700	2,250	
48,301–59,000	24,201–33,200	17,401–21,300	12,601–15,400	7,701–9,400	2,500	
59,001–70,900	33,201–39,700	21,301–25,500	15,401–18,400	9,401–11,300	2,750	
70,901–83,700	39,701–47,100	25,501–30,100	18,401–21,800	11,301–13,400	3,000	3
83,701–97,700	47,101–54,900	30,101–35,200	21,801–25,900	13,401–15,600	3,250	
97,701–112,700	54,901–63,400	35,201–40,600	25,901–29,300	15,601–18,000	3,500	
112,701–128,700	63,401–72,400	40,601–46,400	29,301–33,500	18,001–20,600	3,750	
128,701–145,900	72,401–82,100	46,401–52,500	33,501–37,900	20,601–23,300	4,000	4
145,901–164,200	82,101–92,400	52,501–59,100	37,901–42,700	23,301–26,300	4,250	
164,201–183,400	92,401–103,100	59,101–66,000	42,701–47,700	26,301–29,300	4,500	
183,401–203,700	103,101–114,600	66,001–73,300	47,701–53,000	29,301–32,600	4,750	
203,701–225,200	114,601–126,700	73,301–81,100	53,001–58,600	32,601–36,000	5,000	
225,201–247,700	126,701–139,400	81,101–89,200	58,601–65,400	36,001–39,600	5,250	
247,701–271,200	139,401–152,600	89,201–97,700	65,401–70,600	39,601–43,400	5,500	
271,201–295,900	152,601–166,500	97,701–106,500	70,601–77,000	43,401–47,400	5,750	
295,901–Greater	166,501–Greater	106,501–115,800	77,001–83,700	47,401–51,500	6,000	
"	"	115,801–125,500	83,701–90,600	51,501–55,700	6,250	
"	"	125,501–135,500	90,601–97,900	55,701–60,200	6,500	
"	"	135,501–145,800	97,901–106,800	60,201–64,800	6,750	
"	"	145,801–156,700	106,801–113,200	64,801–69,600	7,000	
"	"	156,701–167,900	113,201–121,300	69,601–74,600	7,250	
"	"	167,901–179,400	121,301–129,600	74,601–79,800	7,500	
"	"	179,401–191,400	129,601–138,300	79,801–85,100	7,750	
"	"	191,401–Greater	128,301–Greater	85,101–Greater	8,000	

[1]Types of construction are based upon the Building Code.

[2]Measured at 20 psi (137.9 kPa). See Appendix III–A, Section 2.

APPENDIX III–B

FIRE HYDRANT LOCATIONS AND DISTRIBUTION

(See UFC Section 903.4.2)

SECTION 1 — SCOPE

Fire hydrants shall be provided in accordance with Appendix III–B for the protection of buildings, or portions of buildings, hereafter constructed.

SECTION 2 — LOCATION

Fire hydrants shall be provided along required fire apparatus access roads and adjacent public streets.

SECTION 3 — NUMBER OF FIRE HYDRANTS

The minimum number of fire hydrants available to a building shall not be less than that listed in Table A–III–B–1. The number of fire hydrants available to a complex or subdivision shall not be less than that determined by spacing requirements listed in Table A–III–B–1 when applied to fire apparatus access roads and perimeter public streets from which fire operations could be conducted.

SECTION 4 — CONSIDERATION OF EXISTING FIRE HYDRANTS

Existing fire hydrants on public streets are allowed to be considered as available. Existing fire hydrants on adjacent properties shall not be considered available unless fire apparatus access roads extend between properties and easements are established to prevent obstruction of such roads.

SECTION 5 — DISTRIBUTION OF FIRE HYDRANTS

The average spacing between fire hydrants shall not exceed that listed in Table A–III–B–1.

EXCEPTION: The chief may accept a deficiency of up to 10 percent where existing fire hydrants provide all or a portion of the required fire hydrant service.

Regardless of the average spacing, fire hydrants shall be located such that all points on streets and access roads adjacent to a building are within the distances listed in Table A–III–B–1.

TABLE A–III–B–1—NUMBER AND DISTRIBUTION OF FIRE HYDRANTS

FIRE–FLOW REQUIREMENT (gpm)	MINIMUM NO. OF HYDRANTS	AVERAGE SPACING BETWEEN HYDRANTS[1,2,3] (feet)	MAXIMUM DISTANCE FROM ANY POINT ON STREET OR ROAD FRONTAGE TO A HYDRANT[4]
× 3.785 for L/min.		× 304.8 for mm	
1,750 or less	1	500	250
2,000–2,250	2	450	225
2,500	3	450	225
3,000	3	400	225
3,500–4,000	4	350	210
4,500–5,000	5	300	180
5,500	6	300	180
6,000	6	250	150
6,500–7,000	7	250	150
7,500 or more	8 or more[5]	200	120

[1]Reduce by 100 feet (30 480 mm) for dead–end streets or roads.

[2]Where streets are provided with median dividers which can be crossed by firefighters pulling hose lines, or arterial streets are provided with four or more traffic lanes and have a traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500 feet (152.4 m) on each side of the street and be arranged on an alternating basis up to a fire–flow requirement of 7,000 gallons per minute (26 495 L/min.) and 400 feet (122 m) for higher fire–flow requirements.

[3]Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet (305 m) to provide for transportation hazards.

[4]Reduce by 50 feet (15 240 mm) for dead–end streets or roads.

[5]One hydrant for each 1,000 gallons per minute (3785 L/min.) or fraction thereof.

APPENDIX III–C

INSPECTION, TESTING AND MAINTENANCE OF WATER–BASED FIRE–PROTECTION SYSTEMS

SECTION 1 — GENERAL

Inspection, testing and maintenance of water–based fire–protection systems shall be in accordance with UFC Appendix Standard A–III–C–1.

Division IV
SPECIAL COMBUSTION HAZARDS
APPENDIX IV–A
INTERIOR FLOOR FINISH

(See UFC Section 1101.1)

SECTION 1 — SCOPE

Exposed floor surfaces of buildings, including coverings which are applied over a previously finished floor, shall be in accordance with Appendix IV–A.

EXCEPTION: Interior floor finish materials of a traditional type, such as wood, vinyl, linoleum, terrazzo and other resilient floor-covering materials.

SECTION 2 — GENERAL

Interior floor finish materials determined by the chief to represent an unusual hazard shall meet the classification prescribed for the occupancy groups listed in Table A–IV–A–1 when tested in accordance with Section 3.

EXCEPTION: When an approved automatic sprinkler system is installed, Class 2 materials are allowed to be used in areas where Class 1 materials are required and the materials need not be classified in areas where Class 2 materials are required.

SECTION 3 — TESTING AND CLASSIFICATION OF MATERIALS

3.1 Testing. Critical radiant flux values of interior floor finishes shall be established by tests conducted by an approved testing agency in accordance with procedures specified within nationally recognized standards. NFPA Standard 253 is an example of such standards.

3.2 Classification.

3.2.1 General. Interior floor finish materials shall be classified in accordance with the following:

1. **Class 1 interior floor finish.** Materials having a minimum critical radiant flux of 0.45 watt per square centimeter.

2. **Class 2 interior floor finish.** Materials having a minimum critical radiant flux of 0.22 watt per square centimeter.

3.3 Test Report Availability. A copy of the test report identifying and representing the style to be installed shall be provided to the chief upon request. The test report shall identify the interior floor finish by manufacturer or supplier and the style name. The test report shall be representative of the current construction of the material to be installed.

3.4 Identification. The interior floor finish material shall be identified by a hang tag or other suitable method as to manufacturer or supplier, and style, and shall indicate the classification of the material based upon the limits specified within Section 2.

TABLE A–IV–A–1—INTERIOR FLOOR FINISH REQUIREMENTS

OCCUPANCY	CLASS	
	Required Exits and Passageways[1]	Corridors Providing Exit Access
Group A	2	2
Group B	2	2
Group E	2	2
Group F	2	2
Group I[2]	1	1
Group M	2	2
Group R, Division 1	2	2
Group S	2	2

[1]Combustible floor finish shall not be used on stairs in Types I and II construction, or other types of construction for buildings exceeding three stories in height.

[2]Combustible floor finish shall not be used in rooms occupied by inmates or patients whose personal liberties are restrained.

Division V
STANDARDS
APPENDIX V–A

NATIONALLY RECOGNIZED STANDARDS OF GOOD PRACTICE

SECTION 1 — SCOPE

The following standards and publications are intended for use as a guide to attain a reasonable level of safety where specific requirements are not stated or specific standards are not adopted or referenced in this code.

SECTION 2 — STANDARDS

AMERICAN GAS ASSOCIATION LABORATORIES
8501 East Pleasant Road, Cleveland, OH 44131
1425 Grande Vista Avenue, Los Angeles, CA 90023
DIRECTORY OF CERTIFIED APPLIANCES AND ACCESSORIES

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR–CONDITIONING ENGINEERS
1791 Tullie Circle, N.E.
Atlanta, GA 30329

ANSI/ASHRAE Standards
15 Safety Code for Mechanical Refrigeration
34 Number Designation and Safety Classification of Refrigerants

COMPRESSED GAS ASSOCIATION, INC.
1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202

CGA PAMPHLETS

C–6 Standard for Visual Inspection of Compressed Gas Cylinders

C–6.1 Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders

C–6.2 Guidelines for Visual Inspection and Requalification of Fiber Reinforced High Pressure Cylinders

C–10 Recommendations for Changes for Service for Compressed Gas Cylinders Including Procedures for Inspection and Container Removal

G–1 Acetylene

G–2 Anhydrous Ammonia

G–3 Sulphur Dioxide

G–4 Oxygen

G–5 Hydrogen

P–1 Safe Handling of Compressed Gases

P–2 Characteristics and Safe Handling of Medical Gases

S–1.1 Cylinders for Compressed Gas

V–5 Diameter–Index Safety System

FACTORY MUTUAL ENGINEERING AND RESEARCH
1151 Boston–Providence Turnpike, Norwood, MA 02062

INSTITUTE OF MAKERS OF EXPLOSIVES
1120 19th Street, N.W., Suite 310, Washington, DC 20036–3605

IME PAMPHLETS

1 Construction Guide for Storage Magazines

20 Radio Frequency Radiation Hazard in Use of Electric Blasting Caps

NATIONAL FIRE PROTECTION ASSOCIATION
One Batterymarch Park, Quincy, MA 02269
NFPA NATIONAL FIRE CODES

UNDERWRITERS LABORATORIES INC.
333 Pfingsten Road, Northbrook, IL 60062
1655 Scott Boulevard, Santa Clara, CA 95050

UL DIRECTORIES

Automotive, Burglary Protection and Mechanical Equipment

Building Materials

Electrical Appliance and Utilization Equipment

Electrical Construction Materials

Fire Protection Equipment

Fire Resistance

Gas and Oil Equipment

General Information from Electrical Construction Materials and Hazardous Location Equipment Directories

Hazardous Location Equipment

Marine Products

Recognized Component

UNITED STATES GOVERNMENT AGENCIES
Code of Federal Regulations, Titles 1–50, Superintendent of Documents
United States Government Printing Office, Washington, DC 20402

Division VI
INFORMATIONAL
APPENDIX VI–A

HAZARDOUS MATERIALS CLASSIFICATIONS

(See UFC Sections 8001.1.2 and 8002.3)

SECTION 1 — SCOPE

Appendix VI–A provides information, explanations and examples to illustrate and clarify the hazard categories contained in Article 80. The hazard categories are based upon the Code of Federal Regulations, Title 29. Where numerical classifications are included, they are in accordance with nationally recognized standards.

Appendix VI–A should not be used as the sole means of hazardous materials classification.

SECTION 2 — HAZARD CATEGORIES

2.1 Physical Hazards.

2.1.1 Explosives and Blasting Agents.

2.1.1.1 High explosives. Can be detonated by means of blasting cap when unconfined. Examples: dynamite, TNT, nitroglycerine, C–3 and C–4.

2.1.1.2 Low Explosives. Can be deflagrated when confined. Examples: black powder, smokeless powder, propellant explosives and display fireworks.

2.1.1.3 Blasting Agents. Oxidizer and liquid fuel slurry mixtures. Example: ammonium nitrate combined with fuel oil.

2.1.2 Compressed Gases.

2.1.2.1 Flammable. Examples: acetylene, carbon monoxide, ethane, ethylene, hydrogen and methane.

2.1.2.2 Oxidizing. Examples: oxygen, ozone, oxides of nitrogen, chlorine and fluorine. Chlorine and fluorine do not contain oxygen but reaction with flammables is similar to that of oxygen.

2.1.2.3 Corrosive. Examples: ammonia, hydrogen chloride and fluorine.

2.1.2.4 Highly Toxic. Examples: arsine, cyanogen, fluorine, germane, hydrogen cyanide, hydrogen selenide, nitric oxide, phosphine and stibene.

2.1.2.5 Toxic. Examples: chlorine, hydrogen fluoride, hydrogen sulfide, silicon tetrafluoride and phosgene.

2.1.2.6 Inert (Chemically unreactive). Examples: argon, helium, krypton, neon, nitrogen and xenon.

2.1.2.7 Pyrophoric. Examples: diborane, dichloroborane, phosphine and silane.

2.1.2.8 Unstable (Reactive). Examples: butadiene (unstabilized), ethylene oxide and vinyl chloride.

2.1.3 Flammable and Combustible Liquids.

2.1.3.1 Flammable Liquids.

CLASS I–A liquids include those having flash points below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C).

CLASS I–B liquids include those having flash points below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).

CLASS I–C liquids include those having flash points at or above 73°F (22.8°C) and below 100°F (37.8°C).

2.1.3.2 Combustible Liquids.

CLASS II liquids include those having flash points at or above 100°F (37.8°C) and below 140°F (60°C).

CLASS III–A liquids include those having flash points at or above 140°F (60°C) and below 200°F (93.3°C).

CLASS III–B liquids include those liquids having flash points at or above 200°F (93.3°C).

2.1.4 Flammable Solids.

2.1.4.1 Organic Solids. Examples: camphor, cellulose nitrate and napthalene.

2.1.4.2 Inorganic Solids. Examples: decaborane, lithium amide, phosphorous heptasulfide, phosphorous sesquisulfide, potassium sulfide, anhydrous sodium sulfide and sulfur.

2.1.4.3 Combustible Metals (Except dusts and powders). Examples: cesium, magnesium and zirconium.

2.1.4.4 Combustible Dusts and Powders (Including metals). Examples: wood sawdust, plastics, coal, flour and powdered metals (few exceptions).

2.1.5 Oxidizers.

2.1.5.1 Gases. Examples: oxygen, ozone, oxides of nitrogen fluorine and chlorine (reaction with flammables is similar to that of oxygen).

2.1.5.2 Liquids. Examples: bromine, hydrogen peroxide, nitric acid, perchloric acid and sulfuric acid.

2.1.5.3 Solids. Examples: chlorates, chromates, chromic acid, iodine, nitrates, perchlorates and peroxides.

2.1.5.4 Examples of Liquid and Solid Oxidizers According to Hazard.

Class 4—Examples: ammonium perchlorate (particle size greater than 15 microns), ammonium permanganate, guanidine nitrate, hydrogen peroxide solutions (greater than 91 percent) and tetranitromethane.

Class 3—Examples: ammonium dichromate, calcium hypochlorite (over 50 percent by weight), chloric acid (10 percent maximum concentration), hydrogen peroxide solutions (greater than 52 percent up to 91 percent), mono–(trichloro)–tetra–(monopotassium dichloro)–penta–s–triazinetrione, nitric acid, fuming (more than 86 percent concentration), perchloric acid solutions (60 percent to 72 percent by weight), potassium bromate, potassium chlorate, potassium dichloro–s–triazinetrione (potassium dichloroisocyanurate), sodium bromate, sodium chlorate, sodium chlorite (over 40 percent by weight) and sodium dichloro–s–triazinetrione (sodium dichloroisocyanurate).

Class 2—Examples: barium bromate, barium chlorate, barium hypochlorite, barium perchlorate, barium permanganate, 1–bromo–3–chloro–5, 5–dimethylhydantoin, calcium chlorate, calcium chlorite, calcium hypochlorite (50 percent or less by weight), calcium perchlorate, calcium permanganate, chromium trioxide (chromic acid), copper chlorate, halane (1, 3–dichloro–5, 5–dimethylhydantoin), hydrogen peroxide (greater than 27.5 percent up to 52 percent), lead perchlorate, lithium chlorate, lithium hypochlorite (more than 39 percent available chlorine), lithium perchlorate, magnesium bromate, magnesium chlorate, magnesium perchlorate, mercurous chlorate, nitric acid (more than 40 percent but less than 86 percent), perchloric acid solutions (more than 50 percent but less than 60 percent), potassium perchlorate, potassium permanganate, potassium peroxide, potassium superoxide, silver peroxide, sodium chlorite (40 percent or less by weight), sodium perchlorate, sodium perchlorate monohydrate, sodium permanganate, sodium peroxide, strontium chlorate, strontium perchlorate, thallium chlorate, trichloro–s–triazinetrione (trichloroisocyanuric acid), urea hydrogen peroxide, zinc bromate, zinc chlorate and zinc permanganate.

Class 1—Examples: all inorganic nitrates (unless otherwise classified), all inorganic nitrites (unless otherwise classified), ammonium persulfate, barium peroxide, calcium peroxide, hydrogen peroxide solutions (greater than 8 percent up to 27.5 percent), lead dioxide, lithium hypochlorite (39 percent or less available chlorine), lithium peroxide, magnesium peroxide, manganese dioxide, nitric acid (40 percent concentration or less), perchloric acid solutions (less than 50 percent by weight), potassium dichromate, potassium percarbonate, potassium persulfate, sodium carbonate peroxide, sodium dichloro–s–triazinetrione dihydrate, sodium dichromate, sodium perborate (anhydrous), sodium perborate monohydrate, sodium perborate tetrahydrate, sodium percarbonate, sodium persulfate, strontium peroxide and zinc peroxide.

2.1.6 Organic Peroxides.

Examples of organic peroxides according to hazard: Unclassified: Unclassified organic peroxides are capable of detonation and are regulated in accordance with Article 77.

Class I—Examples: acetyl cyclohexane sulfonyl 60–65 percent concentration by weight, fulfonyl peroxide, benzoyl peroxide over 98 percent concentration, t–butyl hydroperoxide 90 percent, t–butyl peroxyacetate 75 percent, t–butyl peroxyisopropylcarbonate 92 percent, diisopropyl peroxydicarbonate 100 percent, di–n–propyl peroxydicarbonate 98 percent and di–n–propyl peroxydi–carbonate 85 percent.

Class II—Examples: acetyl peroxide 25 percent, t–butyl hydroperoxide 70 percent, t–butyl peroxybenzoate 98 percent, t–butyl peroxy–2–ethylhex–anoate 97 percent, t–butyl peroxy-isobutyrate 75 percent, t–butyl peroxyisopropyl–carbonate 75 percent, t–butyl peroxypivalate 75 percent, dybenz–oyl peroxydicarbonate 85 percent, di–sec–butyl peroxydicarbonate 98 percent, di–sec–butyl peroxydicarbonate 75 percent, 1,1–di–(t–butylperoxy)–3,5,5–trimethyecyclohexane 95 percent, di–(2–ethythexyl) peroxydicarbonate 97 percent, 2,5–dymethyl–2–5 di (benzoylperoxy) hexane 92 percent and peroxyacetic acid 43 percent.

Class III—Examples: acetyl cyclohexane sulfonal peroxide 29 percent, benzoyl peroxide 78 percent, benzoyl peroxide paste 55 percent, benzoyl peroxide paste 50 percent peroxide/50 percent butylbenzylphthalate diluent, cumene hydroperoxide 86 percent, di–(4–butylcyclohexyl) peroxydicarbonate 98 percent, t–butyl peroxy–2–ethytehexanoate 97 percent, t–butyl peroxy-neodecanoate 75 percent, decanoyl peroxide 98.5 percent, di–t–butyl peroxide 99 percent, 1,1–di– (t–butylperoxy)3,5,5–trimethylcyclohexane 75 percent, 2,4–dichlorobenzoyl peroxide 50 percent, diisopropyl peroxydi–carbonate 30 percent, 2,–5–dimethyl–2,5–di– (2–ethylhexanolyperoxy)–hexane 90 percent, 2,5–dimethyl–2,5–di– (t–butylperoxy) hexane 90 percent and methyl ethyl ketone peroxide 9 percent active oxygen diluted in dimethyl phthalate.

Class IV—Examples: benzoyl peroxide 70 percent, benzoyl peroxide paste 50 percent peroxide/15 percent water/35 percent butylphthalate diluent, benzoyl peroxide slurry 40 percent, benzoyl peroxide powder 35 percent, t–butyl hydroperoxide 70 percent, t–butyl peroxy–2–ethylhexanoate 50 percent, decumyl peroxide 98 percent, di–(2–ethylhexal) peroxydicarbonate 40 percent, laurel peroxide 98 percent, p–methane hydroperoxide 52.5 percent, methyl ethyl ketone peroxide 5.5 percent active oxygen and methyl ethyl ketone peroxide 9 percent active oxygen diluted in water and glycols. Class V—Examples: benzoyl peroxide 35 percent, 1,1–di–t–butyl peroxy 3,5,5–trimethylcyclohexane 40 percent, 2,5–di–(t–butyl peroxy) hexane 47 percent and 2,4–pentanedione peroxide 4 percent active oxygen.

2.1.7 Pyrophoric Materials.

2.1.7.1 Gases. Examples: diborane, phosphine and silane.

2.1.7.2 Liquids. Examples: diethyl aluminum chloride, diethyl beryllium, diethyl phosphine, diethyl zinc, dimethyl arsine, triethyl aluminum etherate, thriethyl bismuthine, thriethyl boron, trimethyl aluminum and trimethyl gallium.

2.1.7.3 Solids. Examples: cesium, hafnium, lithium, white or yellow phosphorus, plutonium, potassium, rubidium, sodium and thorium.

2.1.8 Examples of Unstable (Reactive) Materials According to Hazard.

CLASS 4: Examples: acetyl peroxide, dibutyl peroxide, dinitrobenzene, ethyl nitrate, peroxyacetic acid and picric acid (dry) trinitrobenzene.

CLASS 3: Examples: hydrogen peroxide (greater than 52 percent), hydroxylamine, nitromethane, paranitroaniline, perchloric acid and tetrafluoroethylene monomer.

CLASS 2: Examples: acrolein, acrylic acid, hydrazine, methacrylic acid, sodium perchlorate, styrene and vinyl acetate.

CLASS 1: Examples: acetic acid, hydrogen peroxide 35 percent to 52 percent, paraldehyde and tetrahydrofuran.

Classification by degree of hazard shall be in accordance with UFC Standard 79–3.

2.1.9 Examples of Water–reactive Materials According to Hazard.

CLASS 3: Examples: aluminum alkyls such as triethylaluminum, isobutylaluminum and trimethylaluminum; bromine pentafluoride, bromine trifluoride, chlorodiethyl-aluminium and diethylzinc.

CLASS 2: Examples: calcium carbide, calcium metal, cyanogen bromide, lithium hydride, methyldichlorosilane, potassium metal, potassium peroxide, sodium metal, sodium peroxide, sulfuric acid and trichlorosilane.

CLASS 1: Examples: acetic anhydride, sodium hydroxide, sulfur monochloride and titanium tetrachloride.

Classification by degree of hazard shall be in accordance with UFC Standard 79–3.

2.1.10 Cryogenic Fluids.

2.1.10.1 Flammable. Examples: carbon monoxide, deuterium (heavy hydrogen), ethylene, hydrogen and methane.

2.1.10.2 Oxidizing. Examples: fluorine, nitric oxide and oxygen.

2.1.10.3 Corrosive. Examples: fluorine and nitric oxide.

2.1.10.4 Inert (Chemically unreactive). Examples: argon, helium, krypton, neon, nitrogen and xenon.

2.1.10.5 Highly Toxic. Examples: fluorine and nitric oxide.

All of the cryogenics listed will exist as compressed gases when they are stored at ambient temperatures.

2.2 Health Hazards.

2.2.1 Highly Toxic and Toxic Materials.

2.2.1.1 Highly Toxic Materials. Examples:

Gases—arsine, chlorine trifluoride, cyanogen, diborane, fluorine, germane, hydrogen cyanide, nitric oxide, nitrogen dioxide, ozone, phosphine, hydrogen selenide and stibene.

Liquids—acrolein, acrylic acid, 2–chloroethanol (ethylene chlorohydrin), hydazine, hydrocyanic acid, 2–methylaziridine (propylenimine), 2–methyllactonitrile (acetone cyanohydrin), methyl ester isocyanic acid (methyl isocyanate), nicotine, tetranitromethane, and tetraethylstannane (tetraethyltin).

Solids—(acetato) phenylmercury (phenyl mercuric acetate), 4–aminopyridine, arsenic pentoxide, arsenic trioxide, calcium cyanide, 2–choloroacetophenone, aflatoxin B, decaborane (14), mercury (II) bromide (mercuric bromide), mercury (II) chloride (corrosive mercury chloride), pentachlorophenol, methyl parathion, phosphorus (white), and sodium azide.

2.2.1.2 Toxic Materials. Examples:

Gases—boron trichloride, boron trifluoride, chlorine, hydrogen fluoride, hydrogen sulfide, phosgene, silicon tetrafluoride.

Liquids—acrylonitrile, allyl alcohol, alpha–chlorotoluene, aniline, 1–chloro–2, 3–epoxypropane, chloroformic acid (allyl ester), 3–chloropropene (allyl chloride), o–cresol, crotonaldehyde, dibromomethane, diisopropylamine, diethyl ester sulfuric acid, dimethyl ester sulfuric acid, 2–furaldehyde (furfural), furfuryl alcohol, phorphorus chloride, phosphoryl chloride (phosphorus oxychloride), and thionyl chloride.

Solids—acrylamide, barium chloride, barium (II) nitrate, benzidine, p–benzoquinone, beryllium chloride, cadmium chloride, cadmium oxide, chloroacetic acid, chlorophenyl-mercury (phenyl mercuric chloride), chromium (VI) oxide (chromic acid, solid), 2,4–dinitrotoluene, hydroquinone, mercury chloride (calomel), mercury (II) sulfate (mercuric sulfate), osmium tetroxide, oxalic acid, phenol, P–phenylene-diamine, phenylhydrazine, 4–phenylmorpholine, phosphorus sulfide, potassium fluoride, potassium hydroxide, selenium (IV) disulfide, and sodium fluoride.

2.2.2 Radioactive Materials.

2.2.2.1 Common Radiation Source Materials. More than 100 radioisotopes are in common usage in various medical, academic and industrial test and measuring situations. Most emit beta and gamma radiation. Some emit alpha radiation also. Some emit beta or gamma radiation exclusively.

Table A–VI–2.2 indicates the types of radiation each isotope emits.

TABLE A–VI–2.2—RADIATION EMITTED FROM ISOTOPES[1]

Americium-241 α, γ	Dysprosium-165 β, γ	Krypton-85 β, γ	Praseodymium-143 β	Technetium-99m γ
Antimony-122 β, γ	Dysprosium-166 β, γ	Krypton-87 β, γ	Promethium-147 β	Technetium-99 β
Antimony-124 β	Erbium-169 β, γ	Lanthanum-140 β, γ	Promethium-149 β, γ	Tellurium-125m γ
Antimony-125 β, γ	Erbium-171 β, γ	Lead-210 α, β, γ	Radium-226, α, γ	Tellurium-127m β, γ
Arsenic-73 γ	Europium-152 9.2h β, γ	Lutetium-177 β, γ	Rhenium-185 β, γ	Tellurium-127 β, γ
Arsenic-74 β, γ	Europium-152m β, γ	Manganese-52 β, γ	Rhenium-188 β, γ	Tellurium-129m β, γ
Arsenic-76 β, γ	Europium-154 β, γ	Manganese-54 γ	Rhodium-103m γ	Tellurium-129 β, γ
Arsenic-77 β, γ	Europium-155 β, γ	Manganese-56 β, γ	Rhodium-105 β, γ	Tellurium-131m β, γ
Barium-131 γ	Fluorine-18 β, γ	Mercury-197m γ	Rubidium-81 β, γ	Tellurium 132 β, γ
Barium-133 γ	Gadolinium-153 γ	Mercury-197 γ	Rubidium-86 β, γ	Terbium-160 β, γ
Barium-140 β, γ	Gadolinium-159 β, γ	Mercury-203 β, γ	Rubidium-87 β	Thallium-200 γ
Beryllium-7 γ	Gallium-67 γ	Molybdenum-99 β, γ	Ruthenium-97 γ	Thallium-201 γ
Bismuth-210 α, β, γ	Gallium-72 β, γ	Neodymium-147 β, γ	Ruthenium-103 β, γ	Thallium-202 γ
Bromine-82 b, γ	Germanium-71 γ	Neodymium-149 β, γ	Ruthenium-105 β, γ	Thallium-204 β, γ
Cadmium-109 γ	Gold-198 β, γ	Nickel-59 γ	Ruthenium-106 β	Thorium (natural) α, γ
Cadmium-115m β, γ	Gold-199 β, γ	Nickel-63 γ	Samarium-151 β, γ	Thulium-170 β, γ
Cadmium-115 β, γ	Hafnium-181 β, γ	Nickel-65 β, γ	Samarium-153 β, γ	Thulium-171 β, γ
Calcium-45 β	Holmium-166 β, γ	Niobium-93m γ	Scandium-46 β, γ	Tin-113 γ
Calcium-47 β, γ	Hydrogen-3 β	Niobium-95 β, γ	Scandium-47 β, γ	Tin-125 β, γ
Carbon-14 β	Indium-111 γ	Niobium-97 β, γ	Scandium-48 β, γ	Tungsten-181 γ
Cerium-141 β, γ	Indium-113m γ	Osmium-185 γ	Selenium-75 γ	Tungsten-185 β
Cerium-143 β, γ	Indium-114m γ	Osmium-191m γ	Silicon-31 β, γ	Tungsten-187 β, γ
Cerium-144 β, γ	Indium-115m β, γ	Osmium-191 β, γ	Silver-105 γ	Uranium (natural or depleted) α, γ
Cesium-131 β	Iodine-123 γ	Osmium-193 β, γ	Silver-110m β, γ	
Cesium-134m β, γ	Iodine-125 γ	Palladium-103 γ	Silver-111 β, γ	Uranium-233 α, γ
Cesium-134 β, γ	Iodine-126 β, γ	Palladium-109 β, γ	Sodium-22 β, γ	Uranium-234 α, γ
Cesium-135 β	Iodine-129 β, γ	Phosphorus-32 β	Sodium-24 β, γ	Uranium-235 α, γ
Cesium-136 β, γ	Iodine-131 β, γ	Platinum-191 γ	Strontium-85 γ	Vanadium-48 β, γ
Cesium-137 β, γ	Iodine-132 β, γ	Platinum-193m γ	Strontium-89 β, γ	Xenon-131m γ
Chlorine-36 β, γ	Iodine-133 β, γ	Platinum-193 γ	Strontium-90 β	Xenon-133 β, γ
Chlorine-38 β, γ	Iodine-134 β, γ	Platinum-197m β, γ	Strontium-91 β, γ	Xenon-135 β, γ
Chromium-51 γ	Iodine-135 β, γ	Platinum-197 β, γ	Strontium-92 β, γ	Ytterbium-175 β, γ
Cobalt-57 γ	Iridium-192 β, γ	Plutonium-239 β, γ	Sulphur-35 β	Yttrium-90 β, γ
Cobalt-58m γ	Iridium-194 β, γ	Polonium-210 β, γ	Tantalum-182 β, γ	Yttrium-91 β, γ
Cobalt 58 β, γ	Iron-52 β, γ	Potassium-42 β, γ	Technetium-96 γ	Yttrium-92 β, γ
Cobalt-60 β, γ	Iron-55 γ	Potassium-43 β, γ	Technetium-97m γ	Yttrium-93 β, γ
Copper-64 β, γ	Iron-59 β, γ	Praseodymium-142 β, γ	Technetium 97 γ	

α = alpha radiation
β = beta radiation
γ = gamma radiation

2.2.2.2 Fissile Materials. Fissile materials are materials which may undergo a fission reaction, and are usually found only at reactor sites, or as part of a nuclear weapon. Fissile materials may emit alpha, beta, gamma and neutron radiation. Examples: plutonium–238, plutonium–239, plutonium–241, uranium–233 and uranium–235.

Note: Uranium (and certain other radioactive metals) are combustible in solid and finely divided form, as well as chemically toxic. When radioactive materials burn, the products of combustion (other than heat) will be radioactive as well.

2.2.3 Corrosives.

2.2.3.1 Acids. Examples: chromic, formic, hydrochloric (muriatic greater than 15 percent), hydrofluoric, nitric (greater than6 percent), perchloric and sulfuric (4 percent or more).

2.2.3.2 Bases (Alkalis). Examples: hydroxides—ammonium (greater than 10 percent), calcium, potassium (greater than 1 percent), sodium (greater than 1 percent) and certain carbonates—potassium.

2.2.3.3 Other Corrosives. Examples: bromine, chlorine, fluorine, iodine and ammonia.

Note: Corrosives which are oxidizers, e.g., nitric acid, chlorine, fluorine; or are compressed gases, e.g., ammonia, chlorine, fluorine; or are water–reactive, e.g., concentrated sulfuric acid, sodium hydroxide, are physical hazards in addition to being health hazards.

2.2.4 Carcinogens, Irritants, Sensitizers and Other Health Hazard Materials.

2.2.4.1 Carcinogens or Suspect Carcinogens. Substances which produce or are suspected of producing or inciting cancer (see definitions, Article 2). Examples: asbestos, benzene, beryllium, carbon tetrachloride, chloroform, diazomethane, P–dioxane, ethylene dichloride, polychlorinated biphenyls (PCBs) and vinyl chloride.

2.2.4.2 Other Health Hazard Materials. Substances which cause damage to particular organs or systems (see definition, Article 2). Examples:

Hepatotoxins (chemicals which produce liver damage): carbon tetrachloride and nitrosamines.

Nephrotoxins (chemicals which produce kidney damage): halogenated hydrocarbons and uranium.

Neurotoxins (chemicals which produce their primary toxic effects on the nervous system): mercury and carbon disulfide.

Blood or hematopoistic system toxins (chemicals which decrease hemoglobin function, deprive the body tissues of oxygen): carbon monoxide and cyanides.

Pulmonary damage agents (chemicals which irritate or damage the lungs): silica and asbestos.

Reproductive toxins (chemicals which affect the reproductive capabilities, including chromosomal damage [mutations] and effects on fetuses [tersiogenesis]): lead and DBCP.

2.2.4.3 Irritants. Substances other than corrosives which cause a reversible inflammatory effect on living tissue by chemical action at the site of contact. Examples: diphenylamine-chloroarsine, xylyl bromide and chloracetophene.

2.2.4.4 Sensitizers. Substances which cause an allergic reaction in normal tissue after repeated exposure.

SECTION 3 — EVALUATION OF HAZARDS

3.1 Degree of Hazard. The degree of hazard present depends upon many variables which should be considered individually and in combination. Some of the variables are:

1. **Chemical Properties of the Material.** Chemical properties of the material determine self–reactions and reactions which may occur with other materials. Generally, materials within subdivisions of hazard categories will exhibit similar chemical properties. However, materials with similar chemical properties may present very different hazards. Each individual material should be researched to determine its hazardous properties and then considered in relation to other materials that it might contact and the surrounding environment.

2. **Physical properties of the Material.** Physical properties, such as whether a material is a solid, liquid or gas at ordinary temperatures and pressures, considered along with chemical properties will determine requirements for containment of the material. Specific gravity (weight of a liquid compared to water) and vapor density (weight of a gas compared to air) are both physical properties which are important in evaluating the hazards of a material.

3. **Amount and Concentration of the Material.**

3.1 **General.** The amount of material present and its concentration must be considered along with physical and chemical properties to determine the magnitude of the hazard. Hydrogen peroxide, for example, is used as an antiseptic and a hair bleach in low concentrations (approximately 8 percent in water solution). Over 8 percent, hydrogen peroxide is classed as an oxidizer and is toxic. Above 90 percent, it is a Class 4 oxidizer "that can undergo an explosive reaction when catalyzed or exposed to heat, shock or friction," a definition which incidentally also places hydrogen peroxide over 90 percent concentration in the unstable (reactive) category. Small amounts at high concentrations may present a greater hazard than large amounts at low concentrations.

3.2 **Mixtures.** Gases—toxic and highly toxic gases include those gases which have an LC_{50} of 2,000 parts per million (ppm) or less when rats are exposed for a period of one hour or less. To maintain consistency with the definitions for these materials, exposure data for periods other than one hour must be normalized to one hour. To classify mixtures of compressed gases which contain one or more toxic or highly toxic components, the LC_{50} of the mixture must be determined. Mixtures which contain only two components are binary mixtures. Those which contain more than two components are multicomponent mixtures. When two or more hazardous substances (components) having an LC_{50} below 2,000 ppm are present in a mixture, their combined effect, rather than that of the individual substances (components), must be considered. In the absence of information to the contrary, the effects of the hazards present must be considered as additive. Exceptions to the above rule may be made when there is a good reason to believe that the principal effects of the different harmful substances (components) are not additive.

For binary mixtures where the hazardous component is diluted with a nontoxic gas such as an inert gas, the LC_{50} of the mixture is estimated by use of the following formula:

$$LC_{50m} = \frac{1}{[C_i/LC_{50i}]}$$

For multicomponent mixtures where more than one component has a listed LC_{50}, the LC_{50} of the mixture is estimated by use of the following formula:

$$LC_{50m} = \frac{1}{C_{il}/LC_{50il} + C_{i2}/LC_{50i2} + C_{in}/LC_{50in}}$$

WHERE:

LC_{50m} = LC_{50} of the mixture in parts per million (ppm).

C = concentration of component (i) in decimal percent. The concentration of the individual components in a mixture of gases is to be expressed in terms of percent by volume.

LC_{50i} = LC_{50} of component (i). The LC_{50} of the component is based on a one–hour exposure. LC_{50} data which are for other than one–hour exposures shall be normalized to one hour by multiplying the LC_{50} for the time determined by the factor indicated in Table A–VI–A–1. The preferred mammalian species for LC_{50} data is the rat, as specified in the definitions of toxic and highly toxic in Article 2. If data for rats are unavailable, and in the absence of information to the contrary, data for other species may be utilized. The data shall be taken in the following order of preference: rat, mouse, rabbit, guinea pig, cat, dog, monkey.

i_n = component 1, component 2 and so on to the nth component.

TABLE A–VI–A–1—NORMALIZATION FACTOR

TIME (hours)	MULTIPLY BY
0.5	0.7
1.0	1.0
1.5	1.2
2.0	1.4
3.0	1.7
4.0	2.0
5.0	2.2
6.0	2.4
7.0	2.6
8.0	2.8

Examples: What is the LC_{50} of a mixture of 15 percent chlorine, 85 percent nitrogen? The one–hour (rat) LC_{50} of pure chlorine is 293 ppm.

LC_{50m} = 1 / (0.15 / 293) or 1,953 ppm. Therefore the mixture is toxic.

What is the LC_{50} of a mixture of 15 percent chlorine, 15 percent fluorine and 70 percent nitrogen? The one–hour (rat) LC_{50} of chlorine is 293 ppm. The one–hour (rat) LC_{50} of fluorine is 185 ppm.

LC_{50m} = 1 / (0.15 / 293) + (0.15 / 185) or 755 ppm. Therefore the mixture is toxic.

Is the mixture of 1 percent phosphine in argon toxic or highly toxic? The four–hour (rat) LC_{50} is 11 ppm.

LC_{50m} = 1 / [0.01 / (11 2)] or 2,200 ppm. Therefore the mixture is neither toxic nor highly toxic. Note that the four–hour LC_{50} of 11 ppm was normalized to one hour by use of Table A–VI–A–1.

4. **Actual Use, Activity or Process Involving the Material.** The definition of handling, storage and use in closed systems refers to materials in packages or containers. Dispensing and use in open containers or systems describes situations where a material is exposed to ambient conditions or vapors are liberated to the atmosphere. Dispensing and use in open systems, then, are generally more hazardous situations than handling, storage or use in closed systems. The actual use or process may include heating, electric or other sparks, catalytic or reactive materials and many other factors which could affect the hazard and must therefore be thoroughly analyzed.

5. **Surrounding Conditions.** Conditions such as other materials or processes in the area, type of construction of the structure, fire–protection features (e.g., fire walls, sprinkler systems, alarms, etc.), occupancy (use) of adjoining areas, normal temperatures, exposure to weather, etc., must be taken into account in evaluating the hazard.

3.2 Evaluation Questions. The following are sample evaluation questions:

1. What is the material? Correct identification is important; exact spelling is vital. Check labels, MSDS, ask responsible persons, etc.

2. What are the concentration and strength?

3. What is the physical form of the material? Liquids, gases and finely divided solids have differing requirements for spill and leak control and containment.

4. How much material is present? Consider in relation to permit amounts, exempt amounts (from Group H Occupancy requirements), amounts which require detached storage and overall magnitude of the hazard.

5. What other materials (including furniture, equipment and building components) are close enough to interact with the material?

6. What are the likely reactions?

7. What is the activity involving the material?

8. How does the activity impact the hazardous characteristics of the material? Consider vapors released or hazards otherwise exposed.

9. What must the material be protected from? Consider other materials, temperature, shock, pressure, etc.

10. What effects of the material must people and the environment be protected from?

11. How can protection be accomplished? Consider:

11.1 Proper containers and equipment.

11.2 Separation by distance or construction.

11.3 Enclosure in cabinets or rooms.

11.4 Spill control, drainage and containment.

11.5 Control systems—ventilation, special electrical, detection and alarm, extinguishment, explosion venting, limit controls, exhaust scrubbers and excess flow control.

11.6 Administrative (operational) controls—signs, ignition source control, security, personnel training, established procedures, storage plans and emergency plans.

Evaluation of the hazard is a strongly subjective process; therefore, the person charged with this responsibility must gather as much relevant data as possible so that the decision will be objective and within the limits prescribed in laws, policies and standards.

It may be necessary to cause the responsible persons in charge to have tests made by qualified persons or testing laboratories to support contentions that a particular material or process is or is not hazardous. See Section 103.1.2.

SECTION 4 — REFERENCE PUBLICATIONS

4.1 General. See Appendix V–A.

4.2 Specific.

4.2.1 CHLORINE INSTITUTE

2001 L Street, N.W., Washington, DC 20036

Chlorine Institute Publications

Chlorine Manual, 5th edition, 1986

Maintenance Manual for Chlorine Institute Standard Excess Flow Valves, Pamphlet 42

Piping Systems for Dry Chlorine, Pamphlet 6

Emergency Control Planning Checklist for Chlorine Facilities, Pamphlet 64

Atmospheric Monitoring for Chlorine, Pamphlet 73

Calculating the Area Affected by Chlorine Releases, Pamphlet 74

Instruction Booklet, Chlorine Institute Emergency Kit "B" for Chlorine Ton

Containers Instruction Booklet, Chlorine Institute Emergency Kit "C" for Chlorine Tank Cars and Trucks

Chlorine Institute Drawing 188, Chlorine Cylinder Salvage Vessel

4.2.2 COMPRESSED GAS ASSOCIATION, INC. (CGA)

1235 Jefferson Davis Highway, Arlington, VA 22202

CGA Pamphlets

G–1 Acetylene

G–2 Anhydrous Ammonia

G–3	Sulphur Dioxide
G–4	Oxygen
G–5	Hydrogen
P–1	Safe Handling of Compressed Gases
P–2	Characteristics and Safe Handling of Medical Gases

4.2.3 FACTORY MUTUAL ENGINEERING AND RESEARCH

1151 Boston–Providence Turnpike, Norwood, MA 02062

Data Sheets

	ELECTRICAL
5–1	Electrical Equipment in Hazardous Locations
5–8	Static Electricity
	HAZARDS
7–7	Semiconductor Plants
7–13S/12–61S	Ammonia Refrigeration Systems
7–14	Protection for Flammable Liquid/Flammable Gas–processing Equipment
7–19N	Fire Hazard Properties of Flammable Liquids, Gases, Solids
7–19S	Fire Hazard Properties of Flammable Liquids, Gases, Solids
7–22	Hydrazine and its Derivatives
7–23N	Hazardous Chemicals Data
7–28	Explosive Materials
7–28N	Explosive Materials
7–29	Flammable Liquids in Drums and Small Containers
7–34	Electrolytic Chlorine Process
7–43	Loss Prevention in Chemical Plants
7–44	Spacing of Facilities in Outdoor Chemical Plants
7–45	Chemical Process Control and Control Rooms
7–45S	Process Control Houses Subject to External Explosion
7–46/17–11	Chemical Reactors and Reactions
7–47	Physical Operations in Chemical Plants
7–49/12–65	Emergency Venting of Vessels
7–50	Compressed Gases in Cylinders
7–51/17–12	Acetylene
7–52/17–13	Oxygen
7–53	Liquefied Natural Gas (LNG)
7–54	Natural Gas and Gas Piping
7–55/12–28	Liquefied Petroleum Gas
7–56	MAPP Industrial Gas
7–58	Chlorine Dioxide
7–60/16–1	Fundamentals of Atomic Energy
7–61/16–2	Radioactive Materials
7–70	Fumigation
7–72/12–10	Catalytic Steam/Hydrocarbon Reformers
7–75	Grain Storage and Milling
7–76	Combustible Dusts
7–80	Organic Peroxides
7–81	Organic Peroxides—Hazard Classification
7–82N	Storage of Liquid/Solid Oxidizing Materials
7–83	Drainage for Flammable Liquids
7–84/12–48	Hydrogen Peroxide
7–86	Cellulose Nitrate
7–88	Storage Tanks for Flammable Liquids
7–89	Ammonium Nitrate
7–91	Hydrogen
7–92	Ethylene Oxide
7–94/12–22	Ammonia Synthesis Units
	STORAGE
8–0S	Commodity Classification
8–9	Storage of Plastics and Elastomers
8–10	Coal and Charcoal Storage
	BOILERS AND PRESSURE VESSELS
12–22/7–94	Ammonia Synthesis Units
12–23	Aqueous Nitrogen in Fertilizer Plants
12–27	Liquid Chlorine Storage Tanks and Systems
12–28/7–55	Liquefied Petroleum Gas
12–48/7–84	Hydrogen Peroxide
	NUCLEAR
16–6	Reactor Fuel Elements

4.2.4 NATIONAL FIRE PROTECTION ASSOCIATION

One Batterymarch Park

Quincy, MA 02269

Fire Protection Handbook

Industrial Fire Hazards Handbook

National Fire Codes, specifically the following codes and standards:

35	Manufacture of Organic Coatings
40	Cellulose Nitrate Motion Picture Film
43A	Storage of Liquid and Solid Oxidizing Materials
43B	Storage of Organic Peroxide Formulations
43C	Storage of Gaseous Oxidizing Materials
45	Laboratories Using Chemicals
48	Storage, Handling and Processing Magnesium
49	Hazardous Chemicals Data
56A	Use of Inhalation Anesthetics
56C	Laboratories in Health–Related Institutions
58	Storage and Handling of Liquefied Petroleum Gases
61B	Prevention of Fires and Explosions in Grain Elevators and Facilities Handling Bulk Raw Agricultural Commodities
61C	Prevention of Fire and Dust Explosions in Feed Mills
321	Basic Classification of Flammable and Combustible Liquids

325M	Fire Hazard Properties of Flammable Liquids, Gases and Volatile Solids
481	Production, Processing, Handling and Storage of Titanium
482	Production, Processing, Handling and Storage of Zirconium
490	Storage of Ammonium Nitrate
491M	Manual of Hazardous Chemical Reactions
495	Manufacture, Transportation, Storage and Use of Explosive Materials
651	Manufacture of Aluminum and Magnesium Powder
654	Prevention of Fire and Dust Explosions in the Chemical, Dye, Pharmaceutical and Plastics Industries
655	Prevention of Sulfur Fires and Explosions
704	Recommended System for the Identification of the Fire Hazards of Materials
801	Recommended Fire Protection Practice for Facilities Handling Radioactive Materials

4.2.5 NATIONAL TECHNICAL INFORMATION SERVICE

Springfield, VA 22161

A Method for Determining the Compatibility of Hazardous Wastes, EPA–600/2–80–076

4.2.6 UNITED STATES GOVERNMENT AGENCIES

U.S. Government Printing Office

Washington, DC 20402

Code of Federal Regulations, Title 29

Code of Federal Regulations, Title 49

APPENDIX VI–C

HAZARD RANKING

SECTION 1 — SCOPE

Assignment of levels of hazards to be applied to specific hazard classes as required by Section 9002, UFC Standard 79–3 shall be in accordance with this appendix. The appendix is based on application of the degrees of hazard as defined in Section 9002, UFC Standard 79–3 arranged by hazard class as for specific categories defined in Article 2 and used throughout the code.

SECTION 2 — GENERAL

The following hazard rankings have been established by using guidelines found within Section 9002, UFC Standard 79–3. As noted in Section 1–7 of the standard, there could be specific reasons to alter the degree of hazard assigned to a specific material, for example, ignition temperature, flammable range, or susceptibility of a container to rupture by an internal combustion explosion or to metal failure while under pressure or because of heat from external fire. As a result, the degree of hazard assigned for the same material can vary when assessed by different people of equal competence.

The hazard rankings assigned to each given class represent reasonable minimum hazard levels for a given class based on the use of criteria established by Section 9002, UFC Standard 79–3. Specific cases of use or storage may dictate the use of higher degrees of hazard in certain cases.

SECTION 3 — DEGREE OF HAZARD

FIREFIGHTER WARNING PLACARD DESIGNATIONS BASED ON HAZARD CLASSIFICATION CATEGORIES

HAZARD CATEGORY	DESIGNATION
Combustible liquid II	F2
Combustible liquid IIIA	F2
Combustible liquid IIIB	F1
Combustible dust	F4
Combustible fiber	F3
Cryogenic flammable	F4, H3
Cryogenic oxidizing	OX, H3
Explosive	R4
Flammable solid	F2
Flammable gas (gaseous)	F4
Flammable gas (liquefied)	F4
Flammable liquid IA	F4
Flammable liquid IB	F3
Flammable liquid IC	F3
Organic peroxide, UD	R4
Organic peroxide I	F4, R3
Organic peroxide II	F3, R3
Organic peroxide III	F2, R2
Organic peroxide IV	F1, R1
Organic peroxide V	Nonhazard
Oxidizing gas (gaseous)	OX
Oxidizing gas (liquefied)	OX
Oxidizer 4	OX
Oxidizer 3	OX
Oxidizer 2	OX
Oxidizer 1	OX
Pyrophoric gases	F4
Pyrophoric solids, liquids	F3
Unstable reactive 4D	R4
Unstable reactive 3D	R4
Unstable reactive 3N	R3
Unstable reactive 2	R2
Unstable reactive 1	R1
Water reactive 3	W, R3
Water reactive 2	W, R2
Water reactive 1	W, R1
Corrosive	H3, COR
Toxic	H3
Highly toxic	H4
Irritant	H2
Sensitizer	H1
Radioactive	H4, RAD
Carcinogen	H4, 3, 2 or 1
Other health hazards	H3, 2 or 1

F—Flammable category.
R—Reactive category.
H—Health category.
W—Special hazard: water reactive.
OX—Special hazard: oxidizing properties.
RAD—Special hazard: radioactivity (symbol used).
COR—Corrosive.
UD—Unclassified detonable material.
4D—Class 4 detonable material.
3D—Class 3 detonable material.
3N—Class 3 nondetonable material.

APPENDIX VI–G

REFERENCE TABLES FROM THE *UNIFORM BUILDING CODE*

Table 3A—DESCRIPTION OF OCCUPANCIES BY GROUP AND DIVISION[1]

GROUP AND DIVISION	SECTION	DESCRIPTION OF OCCUPANCY
A–1	303.1.1	A building or portion of a building having an assembly room with an occupant load of 1,000 or more and a legitimate stage.
A–2		A building or portion of a building having an assembly room with an occupant load of less than 1,000 and a legitimate stage.
A–2.1		A building or portion of a building having an assembly room with an occupant load of 300 or more without a legitimate stage, including such buildings used for educational purposes and not classed as a Group E or Group B Occupancy.
A–3		Any building or portion of a building having an assembly room with an occupant load of less than 300 without a legitimate stage, including such buildings used for educational purposes and not classed as a Group E or Group B Occupancy.
A–4		Stadiums, reviewing stands and amusement park structures not included within other Group A Occupancies.
B	304.1	A building or structure, or a portion thereof, for office, professional or service–type transactions, including storage of records and accounts; eating and drinking establishments with an occupant load of less than 50.
E–1	305.1	Any building used for educational purposes through the 12th grade by 50 or more persons for more than 12 hours per week or four hours in any one day.
E–2		Any building used for educational purposes through the 12th grade by less than 50 persons for more than 12 hours per week or four hours in any one day.
E–3		Any building or portion thereof used for day–care purposes for more than six persons.
F–1	306.1	Moderate–hazard factory and industrial occupancies include factory and industrial uses not classified as Group F, Division 2 Occupancies.
F–2		Low–hazard factory and industrial occupancies include facilities producing noncombustible or nonexplosive materials that during finishing, packing or processing do not involve a significant fire hazard.
H–1	307.1	Occupancies with a quantity of material in the building in excess of those listed in Table 3–D that present a high explosion hazard as listed in Section 307.1.1.
H–2		Occupancies with a quantity of material in the building in excess of those listed in Table 3–D that present a moderate explosion hazard or a hazard from accelerated burning as listed in Section 307.1.1.
H–3		Occupancies with a quantity of material in the building in excess of those listed in Table 3–D that present a high fire or physical hazard as listed in Section 307.1.1.
H–4		Repair garages not classified as Group S, Division 3 Occupancies.
H–5		Aircraft repair hangars not classified as Group S, Division 5 Occupancies and heliports.
H–6	307.1 and 307.11	Semiconductor fabrication facilities and comparable research and development areas when the facilities in which hazardous production materials are used, and the aggregate quantity of material is in excess of those listed in Table 3–D or Table 3–E.
H–7	307.1	Occupancies having quantities of materials in excess of those listed in Table 3–E that are health hazards as listed in Section 307.1.1.
I–1.1	308.1	Nurseries for the full–time care of children under the age of six (each accommodating more than five children), hospitals, sanitariums, nursing homes with nonambulatory patients and similar buildings (each accommodating more than five patients).
I–1.2		Health–care centers for ambulatory patients receiving outpatient medical care which may render the patient incapable of unassisted self–preservation (each tenant space accommodating more than five such patients).
I–2		Nursing homes for ambulatory patients, homes for children six years of age or over (each accommodating more than five persons).
I–3		Mental hospitals, mental sanitariums, jails, prisons, reformatories and buildings where personal liberties of inmates are similarly restrained.
I–4	308.1	Correctional facilities including jails, prisons, halfway houses and juvenile detention and correctional education facilities where egress is controlled by automatic egress control devices.
M	309.1	A building or structure, or a portion thereof, for the display and sale of merchandise, and involving stocks of goods, wares or merchandise, incidental to such purposes and accessible to the public.
R–1	310.1	Hotels and apartment houses, congregate residences (each accommodating more than 10 persons).
R–3		Dwellings, lodging houses, congregate residences (each accommodating 10 or fewer persons).
S–1	311.1	Moderate hazard storage occupancies including buildings or portions of buildings used for storage of combustible materials not classified as Group S, Division 2 or Group H Occupancies.
S–2		Low–hazard storage occupancies including buildings or portions of buildings used for storage of noncombustible materials.
S–3		Repair garages where work is limited to exchange of parts and maintenance not requiring open flame or welding and parking garages not classified as Group S, Division 4 Occupancies.
S–4		Open parking garages.
S–5		Aircraft hangars and helistops.
S-6	311.1 and 311.11	Mausoleums and columbariums.

(Continued)

Table 3A—DESCRIPTION OF OCCUPANCIES BY GROUP AND DIVISION[1]

GROUP AND DIVISION	SECTION	DESCRIPTION OF OCCUPANCY
SR	312A.1	Group SR Occupancies, special residences where personal care is administered in buildings or portions thereof which are licensed by, or are subject to licensure by, or under the authority of the Department of Human Resources (DHR) under ORS Chapters 418 or 443, or any other state agency.
SR-1		A building, or part thereof, used for the lodging, boarding and personal care of residents whose evacuation capability is classified as Impractical. Divis9o I has the following classifications: SR 1.1—Large, licensed to provide care for 17 or more residents. SR 1.2—Small, licensed to provide care for 6 to 16 residents. SR 1.3—Licensed to provide care for five or fewer residents in a home.
SR-2		A building, or part thereof, used for the lodging, boarding and personal care of residents whose evacuation capability is classified as Slow. Division 2 has the following classifications: SR 2.1—Large, licensed to provide care for 17 or more residents. SR 2.2—Small, licensed to provide care for 6 to 16 residents. SR 2.3—Licensed to provide care for five or fewer residents in a home.
SR-3		A building, or part thereof, used for the lodging, boarding and personal care of residents whose evacuation capability is classified as Prompt. Division 3 has the following classifications: SR 3.1—Large, licensed to provide care for 17 or more residents. SR 3.2—Small, licensed to provide care for 6 to 16 residents. SR 3.3—Licensed to provide care for five or fewer residents in a home.
U–1	312.1	Private garages, carports, sheds and agricultural buildings.
U–2		Fences over 6 feet (1829 mm) high, tanks and towers.

[1]For detailed descriptions, see the occupancy descriptions in the noted sections.

NOTE: UFC Section 216 contains complete descriptions.

Table 3B—REQUIRED SEPARATION IN BUILDINGS OF MIXED OCCUPANCY[1] (HOURS)

	A-1	A–2	A–2.1	A–3	A–4	B	E	F–1	F–2	H–2	H–3	H–4,5	H–6,7[2]	I	M	R–1	R–3	S–1	S–2	S–3	S–5	U–1[3]
A–1		N	N	N	N	3	N	3	3	4	4	4	4	3	3	1	1	3	3	4	3	1
A–2			N	N	N	1	N	1	1	4	4	4	4	3	1	1	1	1	1	3	1	1
A–2.1				N	N	1	N	1	1	4	4	4	4	3	1	1	1	1	1	3	1	1
A–3					N	N	N	N	N	4	4	4	3	2	N	1	1	N	N	3	1	1
A–4						1	N	1	1	4	4	4	4	3	1	1	1	1	1	3	1	1
B							1	N[5]	N	2	1	1	1	2	N	1	1	N	N	1	1	1
E								1	1	4	4	4	3	1	1	1	1	1	1	3	1	1
F–1									1	2	1	1	1	3	N[5]	1	1	N	N	1	1	1
F–2										2	1	1	1	2	1	1	1	N	N	1	1	1
H–1	NOT PERMITTED IN MIXED OCCUPANCIES. SEE CHAPTER 3.																					
H–2											1	1	2	4	2	4	4	2	2	2	2	1
H–3												1	1	4	1	3	3	1	1	1	1	1
H–4, 5													1	4	1	3	3	1	1	1	1	1
H–6,7[2]														4	1	4	4	1	1	1	1	3
I[6]															2	1	1	2	4	4	3	1
M																1	1	1[4]	1[4]	1	1	1
R–1																	N	3	1	3	1	1
R–3																		1	1	1	1	1
S–1																			1	1	1	1
S–2																				1	1	N
S–3																					1	1
S–4	OPEN PARKING GARAGES ARE EXCLUDED EXCEPT AS PROVIDED IN SECTION 311.2.																					
S–5																						N

N—No requirements for fire resistance.

[1]For detailed requirements and exceptions, see Section 302.4.

[2]For special provisions on highly toxic materials, see the Fire Code.

[3]For agricultural buildings, see also Appendix Chapter 3.

[4]See Section 309.2.2 for exception.

[5]For Group F, Division 1 woodworking establishments with more than 2,500 square feet (232.3 m^2), the occupancy separation shall be one hour.

[6]For exceptions for Group I, Division 1.2 and Group I, Division 1.3 Occupancies, see Section 308.2.

TABLE 3C—REQUIRED SEPARATION OF SPECIFIC-USE AREAS IN GROUP I, DIVISION 1.1 HOSPITALS AND NURSING HOMES

DESCRIPTION	OCCUPANCY SEPARATION
1. Employee locker rooms	None
2. Gift/retail shops	None
3. Handicraft shops	None
4. Kitchens	None
5. Laboratories which employ hazardous materials in quantities less than that which would cause classification as a Group H Occupancy	One hour
6. Laundries greater than 100 square feet (9.3 m^2)[1]	One hour
7. Paint shops employing hazardous substances and materials in quantities less than that which would cause classification as a Group H Occupancy	One hour
8. Physical plant maintenance shop	One hour
9. Soiled linen room[1]	One hour
10. Storage rooms 100 square feet (9.3 m^2) or less in area storing combustible material	None
11. Storage rooms more than 100 square feet (9.3 m^2) storing combustible material	One hour
12. Trash-collection rooms[1]	One hour

[1]For rubbish and linen chute termination rooms, see the Building Code.

TABLE 3F—MINIMUM DISTANCES FOR BUILDINGS CONTAINING EXPLOSIVE MATERIALS

QUANTITY OF EXPLOSIVE MATERIAL[1]		MINIMUM DISTANCE (feet) x 304.8 for mm		
Pounds Over	Pounds Not Over	Property Lines[2] and Inhabited Buildings[3]		
x 0.4536 for kg		Barricaded[4]	Unbarricaded	Separation of Magazines[4,5,6]
2	5	70	140	12
5	10	90	180	16
10	20	110	220	20
20	30	125	250	22
30	40	140	280	24
40	50	150	300	28
50	75	170	340	30
75	100	190	380	32
100	125	200	400	36
125	150	215	430	38
150	200	235	470	42
200	250	255	510	46
250	300	270	540	48
300	400	295	590	54
400	500	320	640	58
500	600	340	680	62
600	700	355	710	64
700	800	375	750	66
800	900	390	780	70
900	1,000	400	800	72
1,000	1,200	425	850	78
1,200	1,400	450	900	82
1,400	1,600	470	940	86
1,600	1,800	490	980	88
1,800	2,000	505	1,010	90
2,000	2,500	545	1,090	98
2,500	3,000	580	1,160	104
3,000	4,000	635	1,270	116
4,000	5,000	685	1,370	122
5,000	6,000	730	1,460	130
6,000	7,000	770	1,540	136
7,000	8,000	800	1,600	144
8,000	9,000	835	1,670	150
9,000	10,000	865	1,730	156
10,000	12,000	875	1,750	164
12,000	14,000	885	1,770	174
14,000	16,000	900	1,800	180
16,000	18,000	940	1,880	188
18,000	20,000	975	1,950	196
20,000	25,000	1,055	2,000	210

(Continued)

TABLE 3F—MINIMUM DISTANCES FOR BUILDINGS CONTAINING EXPLOSIVE MATERIALS—(Continued)

QUANTITY OF EXPLOSIVE MATERIAL[1]		MINIMUM DISTANCE (feet) x 304.8 for mm		
Pounds Over	Pounds Not Over	Property Lines[2] and Inhabited Buildings[3]		
x 0.4536 for kg		Barricaded[4]	Unbarricaded	Separation of Magazines[4,5,6]
25,000	30,000	1,130	2,000	224
30,000	35,000	1,205	2,000	238
35,000	40,000	1,275	2,000	248
40,000	45,000	1,340	2,000	258
45,000	50,000	1,400	2,000	270
50,000	55,000	1,460	2,000	280
55,000	60,000	1,515	2,000	290
60,000	65,000	1,565	2,000	300
65,000	70,000	1,610	2,000	310
70,000	75,000	1,655	2,000	320
75,000	80,000	1,695	2,000	330
80,000	85,000	1,730	2,000	340
85,000	90,000	1,760	2,000	350
90,000	95,000	1,790	2,000	360
95,000	100,000	1,815	2,000	370
100,000	110,000	1,835	2,000	390
110,000	120,000	1,855	2,000	410
120,000	130,000	1,875	2,000	430
130,000	140,000	1,890	2,000	450
140,000	150,000	1,900	2,000	470
150,000	160,000	1,935	2,000	490
160,000	170,000	1,965	2,000	510
170,000	180,000	1,990	2,000	530
180,000	190,000	2,010	2,010	550
190,000	200,000	2,030	2,030	570
200,000	210,000	2,055	2,055	590
210,000	230,000	2,100	2,100	630
230,000	250,000	2,155	2,155	670
250,000	275,000	2,215	2,215	720
275,000	300,000	2,275	2,275	770

[1]The number of pounds (kg) of explosives listed is the number of pounds of trinitrotoluene (TNT) or the equivalent pounds (kg) of other explosive.

[2]The distance listed is the distance to property line, including property lines at public ways.

[3]Inhabited building is any building on the same property that is regularly occupied by human beings. When two or more buildings containing explosives or magazines are located on the same property, each building or magazine shall comply with the minimum distances specified from inhabited buildings, and, in addition, they shall be separated from each other by not less than the distances shown for "Separation of Magazines," except that the quantity of explosive materials contained in detonator buildings or magazines shall govern in regard to the spacing of said detonator buildings or magazines from buildings or magazines containing other explosive materials. If any two or more buildings or magazines are separated from each other by less than the specified "Separation of Magazines" distances, then such two or more buildings or magazines, as a group, shall be considered as one building or magazine, and the total quantity of explosive materials stored in such group shall be treated as if the explosive were in a single building or magazine located on the site of any building or magazine of the group, and shall comply with the minimum distance specified from other magazines or inhabited buildings.

[4]Barricades shall effectively screen the building containing explosives from other buildings, public ways or magazines. When mounds or revetted walls of earth are used for barricades, they shall not be less than 3 feet (914 mm) in thickness. A straight line from the top of any side wall of the building containing explosive materials to the eave line of any other building, magazine or a point 12 feet (3658 mm) above the center line of a public way shall pass through the barricades.

[5]Magazine is a building or structure approved for storage of explosive materials. In addition to the requirements of this code, magazines shall comply with the Fire Code.

[6]The distance listed may be reduced by 50 percent when approved natural or artificial barriers are provided in accordance with the requirements in Footnote 4.