Appendix I-a: Preliminary Code Review

PRELIMINARY CODE REVIEW

Virginia Uniform Statewide Building Code - 2000 Edition (Effective 10/1/03)
Virginia Americans with Disabilities Act - 2003 Edition

Subterranean Code: National Fire Protection Association - Subterranean Space Code (NFPA 520)
IBC 2003 Edition - Section 405


A. OCCUPANCY CLASSIFICATION
[Section 302.1, Table 302.3.3]

<table>
<thead>
<tr>
<th>GROUP</th>
<th>DESCRIPTION OF AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Offices and v &amp; Meeting Rooms</td>
</tr>
<tr>
<td>H-2</td>
<td>Laboratories with a deflagration or accelerated burning hazard including Class I, II or III flammable or combustable liquids</td>
</tr>
<tr>
<td>H-3</td>
<td>Laboratories with a combustion or physical hazard including cryogen liquids</td>
</tr>
<tr>
<td>S-1</td>
<td>Storage</td>
</tr>
<tr>
<td>S-2</td>
<td>Enclosed Paed Parking Garage</td>
</tr>
</tbody>
</table>

ACCESSORY USE AREA (IF ANY): [Section 302.2] Not Applicable

MIXED OCCUPANCY: [Section 302.3]
Group B to Group H-2 = 2-hour separation required
Group B to Group H-3 = 1-hour separation required
Group H-2 to Group H-3 = 1-hour separation required
Section 302.3.3 Separated Uses - Separation required with Group H Occupancy

INCIDENTAL USE AREAS (IF ANY): [Table 302.1.1]
2-hour separation around Automotive Parking Garage
1-hour separation around storage room greater than 100 s.f.

B. TYPE OF CONSTRUCTION
[Table 601, Section 602]
Type I A
C. ALLOWABLE HEIGHTS AND BUILDING AREA

[Table 503]

HEIGHT MODIFICATIONS: [Section 504]

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>ALLOW. HEIGHT</th>
<th>SPRINKLER INCREASE</th>
<th>ALLOW. STORIES</th>
<th>SPRINKLER INCREASE</th>
<th>ACTUAL HEIGHT</th>
<th>ACTUAL STORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>UL</td>
<td>NA</td>
<td>UL</td>
<td>NA</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>H-2</td>
<td>UL</td>
<td>NA</td>
<td>UL</td>
<td>NA</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>H-3</td>
<td>UL</td>
<td>NA</td>
<td>UL</td>
<td>NA</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>S-1</td>
<td>UL</td>
<td>NA</td>
<td>UL</td>
<td>NA</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>S-2</td>
<td>UL</td>
<td>NA</td>
<td>UL</td>
<td>NA</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

AREA MODIFICATIONS: [Section 506, Equations 5-1 and 5-2]

Basic Allowable Area = Unlimited
Sprinkler Increase = NA
Frontage Increase = NA
Total allowable Floor area = Unlimited

UNLIMITED AREA ALLOWANCE APPLICABLE: [Section 507] YES

BUILDING AREA: OCCUPANCY ALLOWABLE AREA ESTIMATED AREA

<table>
<thead>
<tr>
<th></th>
<th>OCCUPANCY</th>
<th>ALLOWABLE AREA</th>
<th>ESTIMATED AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Facilities: B</td>
<td>-</td>
<td>UL</td>
<td>150,000</td>
</tr>
<tr>
<td>Central Campus: B, H &amp; S</td>
<td>-</td>
<td>UL</td>
<td>272,700</td>
</tr>
<tr>
<td>Deep Campus: B, H &amp; S</td>
<td>-</td>
<td>UL</td>
<td>163,100</td>
</tr>
<tr>
<td><strong>BUILDING TOTAL:</strong></td>
<td></td>
<td><strong>UL</strong></td>
<td><strong>585,800</strong></td>
</tr>
</tbody>
</table>

Note:

1 Separated Uses (Section 302.3.3)
2 Estimated Area is Gross Square Footage and includes tunnels

D. FIRE RESISTIVE REQUIREMENTS BY TYPE OF CONSTRUCTION

[Table 601 and 602]

CONSTRUCTION TYPE: I-A

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>REQUIREMENT</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. STRUCTURAL FRAME</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2. BEARING WALLS-EXTERIOR</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3. BEARING WALLS-INTERIOR</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4. NONBEARING WALLS-EXTERIOR</td>
<td>0</td>
<td>Separation Distance &gt;/=30'-0&quot;</td>
</tr>
<tr>
<td>5. NONBEARING WALLS-INTERIOR</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>6. FLOOR CONSTRUCTION</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7. ROOF CONSTRUCTION</td>
<td>1 1/2</td>
<td></td>
</tr>
</tbody>
</table>

FIRE RESISTIVE SUBSTITUTION (IF APPLICABLE): NA

2/24/2005
E. EXTERIOR WALL AND OPENING PROTECTION -- (TO BE DETERMINED)

FIRE RESISTANCE REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE

<table>
<thead>
<tr>
<th>Separation Distance (ft.)</th>
<th>&gt;5-10</th>
<th>10-30</th>
<th>&gt;30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Resistance Rating</td>
<td>1 hour</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
</tbody>
</table>

MAXIMUM AREA OF EXTERIOR WALL OPENINGS - UNPROTECTED

<table>
<thead>
<tr>
<th>Separation Distance (ft.)</th>
<th>&gt;5-10</th>
<th>10-15</th>
<th>15-20</th>
<th>20-25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Window Area</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Actual Window Area</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note:
1. Allowable areas for Protected Openings used due to Section 704.8.1 for Sprinkled Building

F. OCCUPANT LOAD AND NUMBER OF EXITS (TO BE FINALIZED)

[Table 1003.2.2, Section 1003.2.2, 1003.2.3, Table 1004.2.1]

<table>
<thead>
<tr>
<th>OCCUPANCY CATEGORY NAME/DESCRIPTION</th>
<th>NO.</th>
<th>NAME/DESCRIPTION</th>
<th>AREA (sf)</th>
<th>LOAD FACTOR</th>
<th>OCCUP. LOAD</th>
<th>REQD. EXITS</th>
<th>PROV. EXITS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURFACE FACILITIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business - Visitor Ctr &amp; Admin.</td>
<td>-</td>
<td>25,000</td>
<td>100</td>
<td>250</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Residence - Housing</td>
<td>-</td>
<td>25,000</td>
<td>200</td>
<td>125</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Storage - Warehouse</td>
<td>-</td>
<td>50,000</td>
<td>300</td>
<td>167</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Hazard - Laboratories</td>
<td>-</td>
<td>50,000</td>
<td>100</td>
<td>500</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CENTRAL CAMPUS</td>
<td></td>
<td>SURFACE SUB-TOTALS</td>
<td>150,000</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business - Common Facilities</td>
<td>-</td>
<td>44,400</td>
<td>100</td>
<td>444</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Hazard - Module A</td>
<td>-</td>
<td>62,000</td>
<td>300</td>
<td>207</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Hazard - Module B</td>
<td>-</td>
<td>17,600</td>
<td>300</td>
<td>59</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Hazard - Module E</td>
<td>-</td>
<td>22,300</td>
<td>300</td>
<td>75</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Hazard - Module F</td>
<td>-</td>
<td>1,600</td>
<td>300</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Hazard - Module H-K</td>
<td>-</td>
<td>13,560</td>
<td>300</td>
<td>46</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Storage - Car Parking</td>
<td>-</td>
<td>1,725</td>
<td>200</td>
<td>9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CENTRAL CAMPUS SUB-TOTALS</td>
<td></td>
<td>163,185</td>
<td></td>
<td>846</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEEP CAMPUS</td>
<td></td>
<td>SURFACE SUB-TOTALS</td>
<td>110,525</td>
<td>619</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business - Common Facilities</td>
<td>-</td>
<td>37,000</td>
<td>100</td>
<td>370</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Hazard - Module A</td>
<td>-</td>
<td>7,100</td>
<td>300</td>
<td>24</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Hazard - Module D</td>
<td>-</td>
<td>33,900</td>
<td>300</td>
<td>113</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Hazard - Module H-K</td>
<td>-</td>
<td>30,800</td>
<td>300</td>
<td>103</td>
<td>-</td>
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<tr>
<td>Storage - Car Parking</td>
<td>-</td>
<td>1,725</td>
<td>200</td>
<td>9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>DEEP CAMPUS SUB-TOTALS</td>
<td></td>
<td>110,525</td>
<td></td>
<td>619</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUILDING TOTALS</td>
<td></td>
<td>423,710</td>
<td></td>
<td>1,965</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
1. All Occupancies shall have minimum 2 exits per
2. Area used to determine occupant load will require modification for experiment mass

2/24/2005
### G. EXITING --- (TO BE DETERMINED)

#### EXIT WIDTH

**[Table 1003.2.3]**

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>OCC. LOAD FOR LEVEL</th>
<th>TRIB. OCC. LOAD</th>
<th>TOTAL OCC. LOAD</th>
<th>OCC. LOAD PER EXIT</th>
<th>TOTAL EXIT WIDTH</th>
<th>ACTUAL EXIT WIDTH</th>
<th>NO. OF EXITS</th>
<th>OCC. LOAD AT STAIRS</th>
<th>TOTAL EXIT WIDTH</th>
<th>ACTUAL EXIT WIDTH</th>
<th>NO. OF EXITS</th>
<th>OCC. LOAD PER EXIT</th>
<th>TOTAL EXIT WIDTH</th>
<th>ACTUAL EXIT WIDTH</th>
<th>NO. OF EXITS</th>
<th>OCC. LOAD PER EXIT</th>
<th>TOTAL EXIT WIDTH</th>
<th>ACTUAL EXIT WIDTH</th>
<th>NO. OF EXITS</th>
<th>OCC. LOAD PER EXIT</th>
<th>TOTAL EXIT WIDTH</th>
<th>ACTUAL EXIT WIDTH</th>
<th>NO. OF EXITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.15 inch/occ.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Fac.</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>#VALUE!</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
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<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
</tr>
<tr>
<td>Cen. Campus</td>
<td>-</td>
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<td>0</td>
<td>#VALUE!</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
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<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
</tr>
<tr>
<td>Deep Campus</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>#VALUE!</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
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<td>#VALUE!</td>
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<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
<td>#VALUE!</td>
<td>-</td>
</tr>
</tbody>
</table>

**Note:**

1. Exiting to further developed at the individual facility or campus level.

#### EXIT ACCESS TRAVEL DISTANCE:  **[Table 1004.2.4]**

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>ALLOWABLE **</th>
<th>ACTUAL *</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>300</td>
<td>TBD</td>
</tr>
<tr>
<td>H-2</td>
<td>100</td>
<td>TBD</td>
</tr>
<tr>
<td>H-3</td>
<td>150</td>
<td>TBD</td>
</tr>
<tr>
<td>H-4</td>
<td>175</td>
<td>TBD</td>
</tr>
<tr>
<td>S-1</td>
<td>250</td>
<td>TBD</td>
</tr>
<tr>
<td>S-2</td>
<td>400</td>
<td>TBD</td>
</tr>
</tbody>
</table>

**Note:**

- (Actual travel distance to exit/area of refuge; not to public way.)
- with sprinkler system

#### TRIBUTARY STAIR WIDTHS

<table>
<thead>
<tr>
<th>TRIBUTARY STAIR WIDTHS</th>
<th>STAIR x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Facilities</td>
<td>-</td>
</tr>
<tr>
<td>Central Campus</td>
<td>-</td>
</tr>
<tr>
<td>Deep Campus</td>
<td>-</td>
</tr>
</tbody>
</table>

| Total Required Stair Width | 0 |

| Actual Stair Width | TBD |

#### CORRIDOR CONSTRUCTION (w/ sprinkler system)

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>Req'd Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>0</td>
</tr>
<tr>
<td>Hazard</td>
<td>2</td>
</tr>
<tr>
<td>Storage</td>
<td>1</td>
</tr>
</tbody>
</table>

2/24/2005
### H. PLUMBING FACILITIES --- TO BE DETERMINED

(Table 2902.1)

<table>
<thead>
<tr>
<th>Occupancy Category</th>
<th>Business</th>
<th>Hazard</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Occupants</td>
<td>1,064</td>
<td>1,030</td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water Closets</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Occupant Factor</td>
<td>Occupant Factor</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lavatories</th>
<th>Occupant Factor</th>
<th>Req'd</th>
<th>Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80</td>
<td>0</td>
<td>TBD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drinking Fountains</th>
<th>Occupant Factor</th>
<th>Req'd</th>
<th>Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100</td>
<td>0</td>
<td>TBD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service Sink</th>
<th>Req'd</th>
<th>Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>TBD</td>
</tr>
</tbody>
</table>

**Note:**
Note: These calculations do not apply to buildings with unlimited area.

Date: 2/18/2005
Project: Kimbalton DUSEL
CNA0402

**IBC Area Increase Calculation - Section 506**

Enter project specific information in shaded cells

<table>
<thead>
<tr>
<th>Frontage Increase</th>
<th>Notation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building perimeter fronting on public way or open space with 20 ft. minimum width (LF)</td>
<td>F</td>
<td>312</td>
</tr>
<tr>
<td>Perimeter of entire building (LF)</td>
<td>P</td>
<td>703</td>
</tr>
<tr>
<td>Minimum width of public way or open space (LF)</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Minimum width of public way or open space (LF) divided by 30 &lt; /=1</td>
<td>W</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Area increase due to frontage (%) If 19

<table>
<thead>
<tr>
<th>Automatic Sprinkler System Increase</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of stories</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Does the building contain Occupancy Group H-1, H-2, or H-3?</td>
<td>If the answer is yes, enter a &quot;1&quot;</td>
<td>0</td>
</tr>
</tbody>
</table>

Area increase due to sprinkler protection (%) Is 200

<table>
<thead>
<tr>
<th>Allowable Floor Area</th>
<th>Notation</th>
<th>Enter Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowable area per floor in from Table 503 (SF)</td>
<td>At</td>
<td>9500</td>
</tr>
</tbody>
</table>

Allowable area per floor (SF) Aa 30,341
Note: These calculations do not apply to buildings with unlimited area.

Date: 2/18/2005
Project: Kimbalton DUSEL
CNA0402

**Plumbing Systems**

<table>
<thead>
<tr>
<th>MINIMUM NUMBER OF PLUMBING FACILITIES</th>
<th>Occupancy Category</th>
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<td>Assembly/**</td>
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<tr>
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**Water Closets**

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<td>1</td>
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<tr>
<td>Provided</td>
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<td>3 in unisex</td>
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<tr>
<td>Provided</td>
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**Lavatories**

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</tr>
<tr>
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**Drinking Fountains**

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**Service Sink**

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<tbody>
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<td></td>
<td></td>
</tr>
<tr>
<td>Provided</td>
<td>2</td>
<td></td>
<td></td>
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</tbody>
</table>

* Using subcategory for “Theaters, halls, museums, etc.”
** Full occupant load for Terrace included, although this occupancy would not coincide with full use of meeting room.
*** Business category served by 3 accessible unisex restrooms.
**** Includes family unisex restroom in Children's area.
Definition of an Underground Building
• IBC Section 405.1 – (Underground Buildings) General. “The provisions of this section apply to building spaces having a floor level used for human occupancy more than 30 ft below the lowest level of exit discharge.”
• NFPA 101 – Life Safety Code Section 101.3.3.217.11 Underground Structure “A structure or portions of a structure in which the floor level is below the level of exit discharge.”

Construction Requirements
• IBC Section 405.2 – (Underground Buildings) “The underground portion of the building shall be of Type I construction.”

Egress Requirements
• IBC Section 405.8 – (Underground Buildings) Means of egress. “Means of egress shall be in accordance with Sections 405.8.1 and 405.8.2.”
  o IBC Section 405.8.1 – Number of Exits. “Each floor level shall be provided with a minimum of two exits. Where compartmentation is required by Section 405.4, each compartment shall have a minimum of one exit and shall also have an exit access doorway into the adjoining compartment.”
  o IBC Section 405.8.2 – Smokeproof Enclosure. “Every required stairway serving floor levels more than 30 feet (9144 mm) below its level of exit discharge shall comply with the requirements for a smokeproof enclosure as provided in Section 1019.1.8.”
• IBC/IFC Section 1019.1.8 – Smokeproof Enclosures. “In buildings required to comply with Section 405 or 405, each of the exits of a building that serves stories where the floor surface is located more than 75 feet (22,860 mm) above the lowest level of fire department vehicle access or more than 30 feet (9144 mm) below the level of exit discharge serving such floor levels shall be a smokeproof enclosure or pressurized stairway in accordance with Section 909.20 of the International Building Code.”
  o IBC/IFC Section 1019.1.8.1 – Enclosure exit. “A smoke proof enclosure or pressurized stairway shall exit to a public way or into an exit passageway, yard or open space having direct access to a public way. The exit passageway shall be without other openings and shall be separated from the remainder of the building by 2-hour fire-resistance-rated construction. Exceptions: 1) Openings in the exit passageway serving a smokeproof enclosure are permitted where the exit passageway is protected and pressurized in the same manner as the smokeproof enclosure, and opening s are protected as required for access from other floors. 2) Openings in the exit passageway serving a pressurized stairway are permitted where the exit passageway is protected and pressurized in the same manner as the pressurized stairway.”
  o IBC/IFC Section 1019.1.8.2 – Enclosure access. “Access to the stairway within a smokeproof enclosure shall be by way of a vestibule or an open exterior balcony. Exception: Access is not required by way of a vestibule or exterior balcony for stairways using the pressurization alternative complying with Section 909.20.5.”
• IBC Section 909.20 – Smokeproof enclosures. “Where required by section 1019.1.8, a smokeproof enclosure shall be constructed in accordance with this section. A smokeproof enclosure shall consist of an enclosed interior exit stairway that conforms to Section 1019.1 and an outside balcony or ventilated vestibule meeting the requirements of this section. Where access to the roof is required by the International Fire Code, such access shall be from the smokeproof enclosure where a smokeproof enclosure is required.

  o IBC Section 909.20.1 – Access. “Access to the stair shall be by way of a vestibule or an open exterior balcony. The minimum dimension of the vestibule shall not be less than the required width of the corridor leading to the vestibule but shall not have a width of less than 44 inches (1118 mm) and shall not have a length of less than 72 inches (1829 mm) in the direction of egress travel.”

  o IBC Section 909.20.2 – Construction. “The smokeproof enclosure shall be separated from the remainder of the building by not less than a 2-hour fire-resistance-rated fire barrier without openings other than the required means of egress doors. The vestibule shall be separated from the stairway by not less than a 2-hour fire-resistance-rated barrier. The open exterior balcony shall be constructed in accordance with the fire-resistance-rating requirements for floor construction.”

  o IBC Section 909.20.2.1 – Door Closers. “Doors in a smokeproof enclosure shall be self-closing or automatic closing by actuation of a smoke detector in accordance with Section 715.3.7. The actuation of the smoke detector on any door shall activate the closing devices on all doors in the smokeproof enclosure at all levels. Smoke detectors shall be installed in accordance with Section 907.10.” 907.10 included under smoke detection section of this document.

• IBC Section 1019.1 – Enclosures required. “Interior exit stairways and interior exit ramps shall be enclosed with fire barriers. Exit enclosures shall have a fire-resistance rating of not less than 2 hours where connecting four stories or more and not less than 1 hour where connecting less than four stories. The number of stories connected by the shaft enclosure shall include any basements but not any mezzanines. An exit enclosure shall not be sued for any purpose other than means of egress. Enclosures shall be constructed as fire barriers in accordance with Section 706.” There is a list of 9 exceptions. DUSEL does not appear to meet any of them.

• IBC Section 715.3.7 – Door Closing. “Fire doors shall be self-closing or automat-closing in accordance with this section. Exception: Fire doors located in common walls separating sleeping units in Group R-1 shall be permitted without automatic-closing or self-closing devices.”

  o IBC Section 715.3.7.1 – Latch Required. “Unless otherwise specifically permitted, single fire doors and both leaves of pairs of side-hinged swinging fire doors shall be provided with an active latch bolt that will secure the door when it is closed.”

  o IBC Section 715.3.7.2 – Automatic-closing fire door assemblies. “Automatic-closing fire door assemblies shall be self-closing in accordance with NFPA 80.”

  o IBC Section 715.3.7.3 – Smoke-activated doors. “Automatic-closing fire doors installed in the following locations shall be automatic-closing by the actuation of smoke detectors installed in accordance with Section 907.10 or by loss of power to the smoke detector or hold-open device. Fire door that are automatic-closing by smoke detection shall not have more than a 10-second delay before the door starts to close after the smoke detector is actuated.

  o IBC Section 715.3.7.4 – Doors in pedestrian ways. “Vertical sliding or vertical rolling steel fire doors in openings through which pedestrians travel shall be heat activated or activated by smoke detectors with alarm verification.”

• IBC Section 706 – Included as attachment.

• IBC Section 1006 – Means of Egress Illumination

  o IBC Section 1006.1 – Illumination required. “The means of egress, including the exit discharge, shall be illuminated at all times the building space served by the means of egress is occupied.”

  o IBC Section 1006.2 – Illumination level. “The means of egress illumination level shall not be less than 1 foot-candle (11 lux) at the floor level."
o IBC Section 1006.3 – Illumination emergency power – See emergency power section of this document.

• IMC Section 401.4 – (Ventilation) Exits. “Equipment and ductwork for exit enclosure ventilation shall comply with one of the following items:
  1. Such equipment and ductwork shall be located exterior to the building and shall be directly connected to the exit enclosure by ductwork enclosed in construction as required by the International Building Code for shafts.
  2. Where such equipment and ductwork is located within the exit enclosure, the intake air shall be taken directly from the outdoors and the exhaust air shall be discharged directly to the outdoors, or such air shall be conveyed through ducts enclosed in construction as required by the International Building Code for shafts.
  3. Where located within the building, such equipment and ductwork shall be separated from the remainder of the building, including other mechanical equipment, with construction as required by the International Building Code for Shafts.

In each case, openings into fire-resistance-rated construction shall be limited to those needed for maintenance and operation and shall be protected by self-closing fire-resistance-rated devices in accordance with the International Building Code for enclosure wall opening protectives. Exit enclosure ventilation systems shall be independent of other building ventilation systems.”

• IFC Section 1003.7 – (General Means of Egress) Elevators, escalators, and moving walks. “Elevators, escalators and moving walks shall not be used as a component of a required means of egress from any other part of the building. Exception: Elevators used as an accessible means of egress in accordance with Section 1007.4.

• IFC Section 1007.4 – (Accessible Means of Egress) Elevators. “An elevator to be considered part of an accessible means of egress shall comply with the emergency operation and signaling device requirements of Section 2.27 of ASME A17.1. Standby power shall be provided in accordance with Section 2702 and 3003 of the International Building Code. The elevator shall be assessed from either an area of refuge complying with Section 1007.6 or a horizontal exit. Exceptions: 1) Elevators are not required to be accessed from an area of refuge or horizontal exit in open parking garages. 2) Elevators are not required to be accessed from an area of refuge or horizontal exit in buildings and facilities equipped throughout with an automatic sprinkler system installed in accordance with Section 909.3.1.1 or 909.3.1.2.”

Areas of Refuge

• IFC Section 1007.6 – (Accessible Means of Egress) Areas of refuge. “Every required area of refuge shall be accessible from the space it serves by an accessible means of egress. The maximum travel distance from any accessible space to an area of refuge shall not exceed the travel distance permitted for the occupancy in accordance with Section 1015.1. Every required area of refuge shall have direct access to an enclosed stairway complying with Section 1007.3 and 1019.1 or an elevator complying with Section 1007.4. Where an elevator lobby is used as an area of refuge, the shaft and lobby shall comply with Section 1019.1.8 for smokeproof enclosures except where the elevators are in an area of refuge formed by a horizontal exit or smoke barrier.”

  o IFC Section 1007.6.1 – Size. “Each area of refuge shall be sized to accommodate one wheelchair space of 30 inches by 48 inches (762 mm by 1219 mm) for each 200 occupants or portion thereof based on the occupant load of the area of refuge and areas served by the area of refuge. Such wheelchair spaces shall not reduce the required means of egress width. Access to any of the required wheelchair spaces in an area of refuge shall not be obstructed by more than one adjoining wheelchair space.

  o IFC Section 1007.6.2 – Separation. “Each area of refuge shall be separated from the remainder of the story by a smoke barrier complying with Section 709 of the International Building Code. Each area of refuge shall be designed to minimize the intrusion of smoke. Exceptions: 1) Areas
of refuge located within a stairway enclosure. 2) Areas of refuge where the area of refuge and areas served by the area of refuge are equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

- IFC Section 1007.6.3 – Two Way Communication. “Areas of refuge shall be provided with a two-way communication system between the area of refuge and a central control point. If the central control point is not constantly attended the area of refuge shall also have controlled access to a public telephone system. Location of the central point shall be approved by the fire department. The two-way communication system shall include both audible and visible signals.”

**Compartmentation and Smoke Venting of Chambers**

- IBC Section 405.4 – (Underground Buildings) Compartmentation. “Compartmentation shall be in accordance with Sections 405.4.1 through 405.4.3.

  - IBC Section 405.4.1 – Number of Compartments. “A building having a floor level more than 60 feet below the lowest level of exit discharge shall be divided into a minimum of two compartments of approximately equal size. Such Compartmentation shall extend through the highest level of exit discharge serving the underground portions of the building and all levels below. (Exception: the lowest story need not be compartmented where the area does not exceed 1500 square feet and has an occupant load of less than 10.

  - IBC Section 405.4.2 – Smoke Barrier Penetration. The separation between the two compartments shall be of minimum 1-hour fire barrier wall construction that shall extend from floor slab to floor deck above. Openings between the two compartments shall be limited to plumbing and electrical piping and conduit penetrations firestopped in accordance with Section 712. Doorways shall be protected by fire door assemblies that are automatic-closing by smoke detection in accordance with Section 715.3 and shall be provided with gasketing and a drop sill to minimize smoke leakage. Where provided, each compartment shall have an air supply and an exhaust system independent of the other compartments.”

  - IBC Section 405.4.3 – Where elevators are provided, each compartment shall have direct access to an elevator. Where an elevator serves more than one compartment, an elevator lobby shall be provided and shall be separated from each compartment by a 1-hour fire barrier wall. Doors shall be gasketeted, have a drop sill, and be automatic-closing by smoke detection installed in accordance with Section 907.10”

- IBC Section 712 – Penetrations. 712.1 Scope. “The provisions of this section shall govern the materials and methods of construction used to protect through penetrations and membrane penetrations.” There are no specific additional considerations that need to be made for underground buildings or compartmented buildings.

- IBC Section 715.3 – Fire door and shutter assemblies. “Approved fire door and fire shutter assemblies shall be constructed of an material or assembly of component materials that conforms to the test requirements of Section 715.3.1, 715.3.2, or 715.3.3 and the fire protection rating indicated in Table 715.3. Fire door assemblies and shutters shall be installed in accordance with the provisions of this section and NFPA 80.” There are no specific additional considerations that need to be made for underground buildings or compartmented buildings.

- IBC Section 715.3. – Smoke and draft control door labeling requirements. Smoke and draft control doors complying with UL 1784 shall be labeled in accordance with Section 175.3.5.1 and shall show the letter “S” on the fire rating label of the door. This marking shall indicate that the door and frame assembly are in compliance when listed or labeled gasketing is also installed.

- IMC Section 607.5.2 – (Duct Systems) Fire barriers. “Duct penetrations and air transfer openings in fire barriers shall be protected with approved fire dampers installed in accordance with their listing.” For DUSEL, Exception 2 appears to apply. “Ducts are used as part of an approved smoke control system in accordance with Section 513.”
Related to several requirements of size with requirements for multiple independent systems

**Smoke Control System**

- IBC Section 405.5 – Smoke Control System. “A smoke control system shall be provided in accordance with Sections 405.5.1 and 405.5.2.
- IBC Section 405.5.1 – Control System. “A smoke control system is required to control the migration of products of combustion in accordance with Section 909 and the provisions of this section. Smoke control shall restrict movement of smoke to the general area of fire origin and maintain means of egress in a usable condition.
- IBC Section 909 – Included as attachment.
- IBC Section 405.5.2 – Smoke Exhaust System. “Where compartmentation is required, each compartment shall have an independent smoke control system. The system shall be automatically activated and capable of manual operation in accordance with Section 907.2.18.”
- IBC Section 907.2.18 – Underground Buildings with Smoke Exhaust System. “Where a smoke exhaust system is installed in an underground building in accordance with this code, automatic fire detectors shall be provided in accordance with this section.”
- IBC Section 907.2.18.1 – Smoke Detectors. “A minimum of one smoke detector listed for the intended purpose shall be installed in the following areas: 1) Mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar rooms. 2) Elevator lobbies. 3) The main return and exhaust air plenum of each air-conditioning system serving more than one story and located in a serviceable area downstream of the last duct inlet. 4) Each connection to a vertical duct or riser serving two or more floors from return air ducts or plenum of heating, ventilating, and air conditioning systems, except that in Group R occupancies, a listed smoke detector is allowed to be used in each air riser carrying not more than 5,000 cfm (2.4 m³/s) and serving not more than 10 air inlet openings.”
- IBC Section 907.2.18.2 – Alarm Required. “Activation of the smoke exhaust system shall activate an audible alarm at a constantly attended location.
- IFC Section 909.20 – (Smoke Control Systems) Underground building smoke exhaust system. “Where required by the International Building Code for underground buildings, a smoke exhaust system shall be provided in accordance with this section.”
  o IFC Section 909.20.1 – Exhaust capability. “Where compartmentation is required, each compartment shall have an independent, automatically activated smoke exhaust system capable of manual operation. The system shall have an air supply and smoke exhaust capability that will provide a minimum of six air changes per hour.
  o IFC Section 909.20.2 – Operation. “The smoke exhaust system shall be operated in accordance with the International Fire Code.”
  o IFC Section 909.20.3 – Alarm required. “Activation of the smoke exhaust system shall activate an audible alarm at a constantly attended location in accordance with the International Fire Code.”
- IFC Section 909.1 – (Smoke Control Systems) Scope and purpose. “This section applies to mechanical and passive smoke control systems that are required by the International Building Code. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations, or for assistance in fire suppression or overhaul activities. Smoke control systems regulated by this section serve a different purpose than the smoke and heat venting provisions found in Section 910 of the International Building Code. Mechanical smoke control systems shall not be considered exhaust systems under Chapter 5 of the International Mechanical Code.”
• IFC Section 909.2 – (Smoke Control Systems) General Design Requirements. “Buildings, structures, or parts thereof required by this code to have a smoke control system or systems shall have such systems designed in accordance with the applicable requirements of Section 909 and the generally accepted and well-established principles of engineering relevant to the design. The construction documents shall include sufficient information and detail to describe adequately the elements of the design necessary for the proper implementation of the smoke control systems. These documents shall be accompanied with sufficient information and analysis to demonstrate compliance with these provisions.”

• IFC Section 909.3 – (Smoke Control Systems) Special inspection and test requirements. “In addition to the ordinary inspection and test requirements which buildings, structures, and parts thereof are required to undergo, smoke control systems subject to the provisions of Section 909 shall undergo special inspections and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition. The design submission accompanying the construction document shall clearly detail procedures and methods to be used and the items subject to such inspections and tests. Such commissioning shall be in accordance with generally accepted engineering practice and, where possible, based on published standards for the particular testing involved. The special inspections and tests required by this section shall be conducted under the same terms as found in International Building Code.

• IFC Section 909.5 – (Smoke Control Systems) Smoke Barrier Construction. “Smoke barriers shall comply with the International Building Code. Smoke barriers shall be constructed and sealed to limit leakage areas exclusive of protected openings.” (This is a partial quotation of this section. For max allowable leakage areas see full version of section 909.5.)

• IFC Section 909.5.2.1 – (Smoke Control Systems) Duct and air transfer openings. “Ducts and air transfer openings are required to be protected with a minimum Class II, 250°F (121°C) smoke damper complying with the International Building Code.”

• IFC Section 909.10 – (Smoke Control Systems) Equipment. “Equipment such as, but not limited to, fans, ducts, automatic dampers and balance dampers shall be suitable for their intended use, suitable for the probable exposure temperatures and that the rational analysis indicates, and as approved by the code official.”
  o IFC Section 909.10.1 – Exhaust Fans. “Components of exhaust fans shall be rated and certified by the manufacturer for the probable temperature rise to which components will be exposed.” (Equation for Tc provided in 513.10.1, but not included here.)
  o IFC Section 909.10.2 – Ducts. “Duct materials and joints shall be capable of withstanding the probable temperatures and pressures to which they are exposed as determined in accordance with Section 513.10.1. Ducts shall be constructed and supported in accordance with Chapter 6. Ducts shall be leak tested to 1.5 the maximum design pressure in accordance with nationally accepted practices. Measured leakage shall not exceed 5 percent of design flow. Results of such testing shall be part of the documentation procedure. Ducts shall be supported directly from fire-resistance-rated structural elements of building by substantial, noncombustible supports.”
  o IFC Section 909.10.5 – Fans. “In addition to other requirements, belt-driven fans shall have 1.5 times the number of belts required for the design duty with the minimum number of belts being two. Fans shall be selected for stable performance based on normal temperature and, where applicable, elevated temperature. Calculations and manufacturer’s fan curves shall be part of the documentation procedures. Fans shall be supported and restrained by noncombustible devices in accordance with the structural design requirements of the International Building Code. Motors driving fans shall not be operating beyond their nameplate horsepower (kilowatts) as determined from measurement of actual current draw. Motors driving fans shall have a minimum service factor of 1.15.”

• IFC Section 909.11 – (Smoke Control Systems) Power systems. “The smoke control system shall be supplied with two sources of power. Primary power shall be the normal building power systems.
Secondary power shall be from an approved standby source complying with the ICC Electrical Code. The standby power source and its transfer switches shall be in a separate room from the normal power transformers and switch gear and shall be enclosed in a room constructed of not less than 1-hour fire-resistance-rated fire barriers, ventilated directly to and from the exterior. Power distribution from the two sources shall be by independent routes. Transfer to full standby power shall be automatic and within 60 seconds of failure of the primary power. The systems shall comply with the ICC Electrical Code.

- IFC Section 909.12 – (Smoke Control Systems) Detection and control systems. “Fire detection systems providing control input or output signals to mechanical smoke control systems or elements thereof shall comply with the requirements of Chapter 9 of the International Building Code and NFPA 72. Such systems shall be equipped with a control unit complying with UL 864 and listed as smoke control equipment. Control systems for mechanical smoke control systems shall include provisions for verification. Verification shall include positive confirmation of actuation, testing, manual override, the presence of power downstream of all disconnects and, through a preprogrammed weekly test sequence report, abnormal conditions audibly, visually and by printed report.

**Standpipe Systems**

- IBC Section 405.11 – Standpipe System. “The underground building shall be equipped throughout with a standpipe system in accordance with Section 905.”
- IBC Section 905.3.5 – Underground buildings. “Underground buildings shall be equipped throughout with a Class I automatic wet or manual wet standpipe system.”
- IFC Section 905.3.5 – (Standpipe systems) Underground buildings. “Underground buildings shall be equipped throughout with a Class I automatic wet or manual wet standpipe system.”

**Fire Protection - Sprinklers**

- NFPA 101.7.3.1 – (Underground and Limited Access Structures) “A structure or portion of a structure that does not have openings in compliance with 11.7.3.1 (A) and 11.7.3.1 (B) shall be designed as a limited access structure and shall comply with 11.7.3.4 and 11.7.3.5.” DUSEL does not comply with 11.7.3.1(A) or 11.7.3.1(B).
- NFPA 101.7.3.4 – (Underground and Limited Access Structures) “Underground and limited access structures, and all areas and floor levels traversed in traveling to the exit discharge, shall be protected by an approved, supervised, automatic sprinkler system in accordance with Section 9.7…”
- IBC Section 405.3 – Automatic Sprinkler System. “The highest level of exit discharge serving the underground portions of the building and all levels below shall be equipped with an automatic sprinkler system installed in accordance with Section 903.3.1.1. Water-flow switches and control valves shall be supervised in accordance with Section 903.4
- IBC Section 903.3.1.1 – NFPA 13 Sprinkler Systems. “Where the provisions of this code require that a building or portion thereof be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, sprinklers shall be installed in accordance with NFPA 13 except as provided in Section 903.1.1.1.
  - IBC Section 903.3.1.1.1 – Exempt Locations. “Automatic sprinklers shall not be required in the following rooms or areas where such rooms or areas are protected with an approved automatic fire detection system in accordance with Section 907.2 that will respond to visible or invisible particles of combustion. Sprinklers shall not be omitted from any room merely because it is damp, of fire-resistance-rated construction, or contains electrical equipment.
    1. “Any room where the application of water, or flame and water, constitutes a serious life or fire hazard.
    2. “Any room or space where sprinklers are considered undesirable because of the nature of the contents, when approved by the building official.
3. “Generator and transformer rooms separated from the remainder of the building by walls and floor/ceiling or roof/ceiling assemblies having a fire-resistance rating of not less than 2 hours.
4. “In rooms or areas that are of noncombustible construction with wholly noncombustible contents.”

- IMC Section 513.9.4 (Smoke Control Systems) Sprinkler effectiveness assumptions. “A documented engineering analysis shall be provided for conditions that assume fire growth is halted at the time of sprinkler activation.”
- IFC Section 903.2.2 – (Automatic Sprinkler Systems, Where Required.) Group E. “An automatic sprinkler system shall be provided for Group E occupancies as follows:
  1. Throughout all Group E fire areas greater than 20,000 square feet (1858 m²) in area.
  2. Throughout every portion of educational buildings below the level of exit discharge.
- IFC Section 903.2.10 – (Automatic Sprinkler Systems, Where Required.) All occupancies except Groups R-3 ad U. “An automatic sprinkler system shall be installed in the locations set forth in Sections903.2.10.1 through 903.2.10.1.3.”
  o IFC Section 903.2.10.1 – Stories and basements without openings. “An automatic sprinkler system shall be installed in every story or basement of all buildings where the floor area exceeds 1,500 square feet (139.4 m²) and where there is not provided at least one of the following types of exterior wall openings.
    1. Openings below grade that lead directly to ground level by an exterior stairway complying with Section 1009 or an outside ramp complying with Section 1010. Openings shall be located in each 50 linear feet (15240 mm), or fraction thereof, of exterior wall in the story on at least one side.
    2. Openings entirely above the adjoining ground level totaling at least 20 square feet (1.86 m²) in each 50 linear feet (15240 mm), or fraction thereof, of exterior wall in the story on at least one side.

Smoke Detection
- IBC Section 907.10 – Fire Safety Functions. “Automatic fire detectors utilized for the purpose of performing fire safety functions shall be connected to the building’s fire alarm control panel where a fire alarm system is required by Section 907.2. Detectors shall, upon action, perform the intended function and activate the alarm notification appliances or a visible and audible supervisory signal at a constantly attended location. In buildings not required to be equipped with a fire alarm system, the automatic fire detector shall be powered by normal electrical service and, upon actuation, perform the intended function. The detectors shall be located in accordance with NFPA 72.

Fire Alarm
- IBC Section 405.6 – Fire Alarm Systems. “A fire alarm system shall be provided where required by Section 907.2.19.
- IBC Section 907.2.19 – Underground Buildings. “Where the lowest level of a structure is more than 60 feet (18,288 mm) below the lowest level of exit discharge, the structure shall be equipped throughout with a manual fire alarm system, including an emergency voice/alarm communication system installed in accordance with Section 907.2.12.2.
- IBC Section 907.2.12.2 – Emergency voice/alarm communication system. “The operation of any automatic fire detector, sprinkler water-flow device or manual fire alarm box shall automatically sound an alert tone followed by voice instructions giving approved information and directions on a general or selective basis to the following terminal areas on a minimum of the alarming floor, the floor above and the floor below in accordance with the International Fire Code. 1) Elevator lobbies. 2) Corridors. 3) Rooms and tenant spaces exceeding 1,000 square feet (93 m²) in area. 4) Dwelling
units or seeping units in Group R-2 occupancies. 5) Sleeping units in Group R-1 occupancies. 6) Areas of refuge as defined in Section 1002.”

- IBC Section 1002 – Definition of Area of Refuge: “An area where persons unable to use stairways can remain temporarily to await instructions or assistance during emergency evacuation.”
- IBC Section 907.2.12.2.1 – Manual Override. “A manual override for emergency voice communication shall be provided for all paging zones.”
- IBC Section 907.2.12.2.2 – Live Voice Messages. “The emergency voice/alarm communication system shall also have the capability to be broadcast live voice messages through speakers located in elevators, exit stairways and throughout a selected floor or floors.”
- IBC Section 907.2.12.2.3 – Standard. “The emergency voice/alarm communication system shall be designed and installed in accordance with NFPA 72.”
- IBC Section 405.7 – Public Address. “A public address system shall be provided where required by Section 907.2.19.1”
- IBC Section 907.2.19.1 – Public Address System. “Where a fire alarm system is not required by Section 907.2 a public address system shall be provided that shall be capable of transmitting voice communications to the highest level of exit discharge serving the underground portions of the structure and all levels below.”
- IBC Section 907.2 – Where Required. “An approved manual, automatic or manual and automatic fire alarm system shall be provided in accordance with Sections 907.2.1 through 907.2.23.” (Those sections describe requirements based on occupancy and are not included in this document.) “Where automatic sprinkler protection, installed in accordance with Section 903.3.1.1 or 903.3.1.2, is provided and connected to the building fire alarm system, automatic heat detection required by this section shall not be required. An approved automatic fire detection system shall be installed in accordance with the provisions of this code and NFPA 72. Devices, combinations of devices, and appliances and equipment shall comply with Section 907.1.2. The automatic fire detectors shall be smoke detectors, except that an approved alternative type of detector shall be installed in spaces such as boiler rooms where, during normal operation, products of combustion are present in sufficient quantity to actuate a smoke detector.”
- IBC Section 907.1.2 – Equipment. “Systems and their components shall be listed and approved for the purpose for which they are installed.”

**Standby & Emergency Power and Emergency Lighting**

- IBC Section 405.9 – Standby power. “A standby power system comply with Section 2702 shall be provided standby power loads specified in Section 405.9.1.”
  - IBC Section 405.9.1 – Standby power loads. “The following loads are classified as standby power loads. 1) Smoke control systems. 2) Ventilation and automatic fire detection equipment for smokeproof enclosures. 3) Fire pumps. Standby power shall be provided for elevators in accordance with Section 3003.”
  - IBC Section 905.9.2 – Pick-up time. “The standby power system shall pick up connected loads within 60 seconds of failure of the normal power supply.”
- IBC Section 2702 – Included as attachment.
- IBC Section 405.10 – Emergency power. “An emergency power system comply with Section 2702 shall be provided for emergency power loads specified in Section 405.10.1.”
  - IBC Section 405.10.1 – Emergency power loads. “The following loads are classified as emergency power loads: 1) Emergency voice/alarm communications systems. 2) Fire alarm systems. 3) Automatic fire detection systems. 4) Elevator car lighting. 5) Means of egress and exit sign illumination as require by Chapter 10.”
- IBC Section 1006.3 – Illumination emergency power. “The power supply for means of egress illumination shall normally be provided by the premise’s electrical supply. In the event of power
supply failure, an emergency electrical system shall automatically illuminate the following areas: 1) Exit access corridors, passageways and aisles in rooms and spaces which require two or more means of egress.  2) Exit access corridors and exit stairways located in buildings required to have two or more exits. 3) Exterior egress components at other than the level of exit discharge until exit discharge is accomplished for buildings required to have two or more exits. 4) Interior exit discharge elements, as permitted in Section 1023.1, in buildings required to have two or more exits. 5) The portion of the exterior exit discharge immediately adjacent to exit discharge doorways in buildings required to have two or more exits. The emergency power system shall provide power for a duration of not less than 90 minutes and shall consist of storage batteries, unit equipment or an on-site generator. The installation of the emergency power system shall be in accordance with Section 2072.”

- NFPA 101.7.3.1 – (Underground and Limited Access Structures) “A structure or portion of a structure that does not have openings in compliance with 11.7.3.1 (A) and 11.7.3.1 (B) shall be designed as a limited access structure and shall comply with 11.7.3.4 and 11.7.3.5.”  
  DUSEL does not comply with 11.7.3.1(A) or 11.7.3.1(B).
- NFPA 101.7.3.5 – (Underground and Limited Access Structures) “Underground or limited access portions of structures and all areas traversed in traveling to the exit discharge, other than in one and two family dwellings, shall be provided with emergency lighting in accordance with Section 7.9.”
- NFPA 101.7.9 – (Emergency Lighting) Section 7.9.2.1 Performance of Systems. “Emergency illumination shall be provided for not less than 1½ hours in the event of failure of normal lighting. Emergency lighting facilities shall be arranged to provide initial illumination that is not less than an average of 10.8 lux (1 ft-candle) and, at any point, not less than 1.1 lux (0.1 ft-candle), measured along the path of egress at floor level. Illumination levels shall be permitted to decline to not less than an average of 6.5 lux (0.6 ft-candle) and, at any point, not less than 6.5 lux (0.06 ft-candle) at the end of the 1½ hours. A maximum to minimum illumination uniformity ratio of 40 to 1 shall not be exceeded.
- NFPA 101.7.9.2.2 – “The emergency lighting system shall be arranged to provide the required illumination automatically in the event of any interruption of normal lighting due to any of the following: 1) Failure of a public utility or other outside electrical power supply. 2) Opening of a circuit breaker or fuse. 3) Manual act(s), including accidental opening of a switch controlling normal lighting facilities.”
- IFC Section 604.2.15 – (Emergency and Standby Power Systems) Underground Buildings. “Emergency and standby power systems in underground buildings covered in Chapter 4 of the International Building Code shall comply with Sections 604.15.1 and 604.15.2.
  o IFC Section 604.2.15.1 – Standby Power. “A standby power system complying with the ICC Electrical Code shall be provided for standby power loads as specified in Section 604.2.15.1.1.
    ▪ IFC Section 604.2.15.1.1 – Standby power loads. “The following loads are classified as standby power loads: 1) Smoke control system, 2) Ventilation and automatic fire detection equipment for smokeproof enclosures, 3) Fire pumps, 4) Standby power shall be provided for elevators in accordance with Section 3003 of the International Building Code.
    ▪ IFC Section 604.2.15.1.2 – Pickup time. “The standby power system shall pick up its connected loads within 60 seconds of failure of the normal power supply.
  o IFC Section 604.2.15.2 – Emergency Power. “An emergency power system complying with the ICC Electrical Code shall be provided for emergency power loads as specified in Section 604.2.15.2.1.
    ▪ IFC Section 604.2.15.2.1 – Emergency power loads. “The following loads are classified as emergency power loads: 1) Emergency voice/alarm communication systems, 2) Fire alarm systems, 3) Automatic fire detection systems, 4) Elevator Car lighting, 5) Means of egress lighting and exit sign illumination as required by Chapter 10.
International Building Code 2003
International Mechanical Code 2003
International Fire Code 2003
NFPA 2003
705.8 Openings. Each opening through a fire wall shall be protected in accordance with Section 715.3 and shall not exceed 120 square feet (11 m²). The aggregate width of openings at any floor level shall not exceed 25 percent of the length of the wall.

Exceptions:

1. Openings are not permitted in party walls constructed in accordance with Section 503.2.

2. Openings shall not be limited to 120 square feet (11 m²) where both buildings are equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

705.9 Penetrations. Penetrations through fire walls shall comply with Section 712.

705.10 Joints. Joints made in or between fire walls shall comply with Section 713.

705.11 Ducts and air transfer openings. Ducts and air transfer openings shall not penetrate fire walls.

Exception: Penetrations by ducts and air transfer openings of fire walls that are not on a lot line shall be allowed provided the penetrations comply with Sections 712 and 716. The size and aggregate width of all openings shall not exceed the limitations of Section 705.8.

SECTION 706
FIRE BARRIERS

706.1 General. Fire barriers used for separation of shafts, exits, exit passageways, horizontal exits or incidental use areas, to separate different occupancies, to separate a single occupancy into different fire areas, or to separate other areas where a fire barrier is required elsewhere in this code or the International Fire Code, shall comply with this section.

706.2 Materials. The walls and floor assemblies shall be of materials permitted by the building type of construction.

706.3 Fire-resistance rating. The fire-resistance rating of the walls and floor assemblies shall comply with this section.

706.3.1 Shaft enclosures. The fire-resistance rating of the fire barrier separating building areas from a shaft shall comply with Section 707.4.

706.3.2 Exit enclosures. The fire-resistance rating of the fire barrier separating building areas from an exit shall comply with Section 1019.1.

706.3.3 Exit passageway. The fire-resistance rating of the separation between building areas and an exit passageway shall comply with Section 1020.1.

706.3.4 Horizontal exit. The fire-resistance rating of the separation between building areas connected by a horizontal exit shall comply with Section 1021.1.

706.3.5 Incidental use areas. The fire barrier separating incidental use areas shall have a fire-resistance rating of not less than that indicated in Table 302.1.1.

706.3.6 Separation of mixed occupancies. Where the provisions of Section 302.3.2 are applicable, the fire barrier separating mixed occupancies shall have a fire-resistance rating of not less than that indicated in Section 302.3.2 based on the occupancies being separated.

706.3.7 Single-occupancy fire areas. The fire barrier separating a single occupancy into different fire areas shall have a fire-resistance rating of not less than that indicated in Table 706.3.7.

<table>
<thead>
<tr>
<th>OCCUPANCY GROUP</th>
<th>FIRE-RESISTANCE RATING (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1, H-2</td>
<td>4</td>
</tr>
<tr>
<td>F-1, H-3, S-1</td>
<td>3</td>
</tr>
<tr>
<td>A, B, E, F-2, H-4, H-5, I, M, R, S-2</td>
<td>2</td>
</tr>
<tr>
<td>U</td>
<td>1</td>
</tr>
</tbody>
</table>

706.4 Continuity of fire barrier walls. Fire barrier walls shall extend from the top of the floor/ceiling assembly below to the underside of the floor or roof slab or deck above and shall be securely attached thereto. These walls shall be continuous through concealed spaces such as the space above a suspended ceiling. The supporting construction for fire barrier walls shall be protected to afford the required fire-resistance rating of the fire barrier supported except for 1-hour fire-resistance-rated incidental use area separations as required by Table 302.1.1 in buildings of Type IIB, IIIB and VB construction. Hollow vertical spaces within the fire barrier wall shall be firestopped at every floor level.

Exceptions:

1. The maximum required fire-resistance rating for assemblies supporting fire barriers separating tank storage as provided for in Section 415.7.2.1 shall be 2 hours, but not less than required by Table 601 for the building construction type.

2. Shaft enclosure shall be permitted to terminate at a top enclosure complying with Section 707.12.

706.5 Horizontal fire barriers. Horizontal fire barriers shall be constructed in accordance with Section 711.

706.6 Exterior walls. Where exterior walls serve as a part of a required fire-resistance-rated enclosure, such walls shall comply with the requirements of Section 704 for exterior walls and the fire-resistance-rated enclosure requirements shall not apply.

Exception: Exterior walls required to be fire-resistance rated in accordance with Section 1022.6.

706.7 Openings. Openings in a fire barrier wall shall be protected in accordance with Section 715. Openings shall be limited to a maximum aggregate width of 25 percent of the length of the wall, and the maximum area of any single opening shall not exceed 120 square feet (11 m²). Openings in exit enclosures shall also comply with Section 1019.1.1.

Exceptions:

1. Openings shall not be limited to 120 square feet (11 m²) where adjoining fire areas are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. Fire doors serving an exit enclosure.
3. Openings shall not be limited to 120 square feet (11 m²) or an aggregate width of 25 percent of the length of the wall where the opening protective assembly has been tested in accordance with ASTM E 119 and has a minimum fire-resistance rating not less than the fire-resistance rating of the wall.

706.8 Penetrations. Penetrations through fire barriers shall comply with Section 712.

706.8.1 Prohibited penetrations. Penetrations into an exit enclosure shall only be allowed when permitted by Section 1019.1.2.

706.9 Joints. Joints made in or between fire barriers shall comply with Section 713.

706.10 Ducts and air transfer openings. Penetrations by ducts and air transfer openings shall comply with Sections 712 and 716.

SECTION 707
SHAFT ENCLOSURES

707.1 General. The provisions of this section shall apply to vertical shafts where such shafts are required to protect openings and penetrations through floor/ceiling and roof/ceiling assembles.

707.2 Shaft enclosure required. Openings through a floor/ceiling assembly shall be protected by a shaft enclosure complying with this section.

Exceptions:

1. A shaft enclosure is not required for openings totally within an individual residential dwelling unit and connecting four stories or less.

2. A shaft enclosure is not required in a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 for an escalator opening or stairway which is not a portion of the means of egress protected according to Item 2.1 or 2.2:
   2.1. Where the area of the floor opening between stories does not exceed twice the horizontal projected area of the escalator or stairway and the opening is protected by a draft curtain and closely spaced sprinklers in accordance with NFPA 13. In other than Groups B and M, this application is limited to openings that do not connect more than four stories.
   2.2. Where the opening is protected by approved power-operated automatic shutters at every floor penetrated. The shutters shall be of noncombustible construction and have a fire-resistance rating of not less than 1.5 hours. The shutter shall be so constructed as to close immediately upon the activation of a smoke detector installed in accordance with Section 907.10 and shall completely shut off the well opening. Escalators shall cease operation when the shutter begins to close. The shutter shall operate at a speed of not more than 30 feet per minute (152.4 mm/s) and shall be equipped with a sensitive leading edge to arrest its progress where in contact with any obstacle, and to continue its progress on release therefrom.

3. A shaft enclosure is not required for penetrations by pipe, tube, conduit, wire, cable, and vents protected in accordance with Section 712.4.

4. A shaft enclosure is not required for penetrations by ducts protected in accordance with Section 712.4. Grease ducts shall be protected in accordance with the International Mechanical Code.

5. A shaft enclosure is not required for floor openings complying with the provisions for covered malls or atriums.

6. A shaft enclosure is not required for approved masonry chimneys, where annular space protection is provided at each floor level in accordance with Section 717.2.5.

7. In other than Groups I-2 and I-3, a shaft enclosure is not required for a floor opening that complies with the following:
   7.1. Does not connect more than two stories.
   7.2. Is not part of the required means of egress system except as permitted in Section 1019.1.
   7.3. Is not concealed within the building construction.
   7.4. Is not open to a corridor in Group I and R occupancies.
   7.5. Is not open to a corridor on nonsprinklered floors in any occupancy.
   7.6. Is separated from floor openings serving other floors by construction conforming to required shaft enclosures.

8. A shaft enclosure is not required for automobile ramps in open parking garages and enclosed parking garages constructed in accordance with Sections 406.3 and 406.4, respectively.

9. A shaft enclosure is not required for floor openings between a mezzanine and the floor below.

10. A shaft enclosure is not required for joints protected by a fire-resistant joint system in accordance with Section 713.

11. Where permitted by other sections of this code.

707.3 Materials. The shaft enclosure shall be of materials permitted by the building type of construction.

707.4 Fire-resistance rating. Shaft enclosures shall have a fire-resistance rating of not less than 2 hours where connecting four stories or more and not less than 1 hour where connecting less than four stories. The number of stories connected by the shaft enclosure shall include any basements but not any mezzanines. Shaft enclosures shall be constructed as fire barriers in accordance with Section 706. Shaft enclosures shall have a
1014.5 Refrigerated rooms or spaces. Rooms or spaces having a floor area of 1,000 square feet (93 m²) or more, containing a refrigerant evaporator and maintained at a temperature below 68°F (20°C), shall have access to not less than two exits or exit access doors.

Travel distance shall be determined as specified in Section 1015.1, but all portions of a refrigerated room or space shall be within 150 feet (45,720 mm) of an exit or exit access door where such rooms are not protected by an approved automatic sprinkler system. Egress is allowed through adjoining refrigerated rooms or spaces.

**Exception:** Where using refrigerants in quantities limited to the amounts based on the volume set forth in the *International Mechanical Code*.

1014.6 Stage means of egress. Where two means of egress are required, based on the stage size or occupant load, one means of egress shall be provided on each side of the stage.

1014.6.1 Gallery, gridiron and catwalk means of egress. The means of egress from lighting and access catwalks, galleries and gridirons shall meet the requirements for occupancies in Group F-2.

**Exceptions:**

1. A minimum width of 22 inches (559 mm) is permitted for lighting and access catwalks.
2. Spiral stairs are permitted in the means of egress.
3. Stairways required by this subsection need not be enclosed.
4. Stairways with a minimum width of 22 inches (559 mm), ladders, or spiral stairs are permitted in the means of egress.
5. A second means of egress is not required from these areas where a means of escape to a floor or to a roof is provided. Ladders, alternating tread devices or spiral stairs are permitted in the means of escape.
6. Ladders are permitted in the means of egress.

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**SECTION 1015**

**EXIT ACCESS TRAVEL DISTANCE**

1015.1 Travel distance limitations. Exits shall be so located on each story such that the maximum length of exit access travel, measured from the most remote point within a story to the entrance to an exit along the natural and unobstructed path of egress travel, shall not exceed the distances given in Table 1015.1.

Where the path of exit access includes unenclosed stairways or ramps within the exit access or includes unenclosed exit ramps or stairways as permitted in Section 1019.1, the distance of travel on such means of egress components shall also be included in the travel distance measurement. The measurement along stairways shall be made on a plane parallel and tangent to the stair tread nosings in the center of the stairway.

**Exceptions:**

1. Travel distance in open parking garages is permitted to be measured to the closest riser of open stairs.
2. In outdoor facilities with open exit access components and open exterior stairs or ramps, travel distance is permitted to be measured to the closest riser of a stair or the closest slope of the ramp.

3. Where an exit stair is permitted to be unenclosed in accordance with Exception 8 or 9 of Section 1019.1, the travel distance shall be measured from the most remote point within a building to an exit discharge.

### TABLE 1015.1
EXIT ACCESS TRAVEL DISTANCE

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>WITHOUT SPRINKLER SYSTEM (feet)</th>
<th>WITH SPRINKLER SYSTEM (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, E, F-1, I-1, M, R, S-1</td>
<td>200</td>
<td>250⁰</td>
</tr>
<tr>
<td>B</td>
<td>200</td>
<td>300⁰</td>
</tr>
<tr>
<td>F-2, S-2, U</td>
<td>300</td>
<td>400⁰</td>
</tr>
<tr>
<td>H-1</td>
<td>Not Permitted</td>
<td>75⁰</td>
</tr>
<tr>
<td>H-2</td>
<td>Not Permitted</td>
<td>100⁰</td>
</tr>
<tr>
<td>H-3</td>
<td>Not Permitted</td>
<td>150⁰</td>
</tr>
<tr>
<td>H-4</td>
<td>Not Permitted</td>
<td>175⁰</td>
</tr>
<tr>
<td>H-5</td>
<td>Not Permitted</td>
<td>200⁰</td>
</tr>
<tr>
<td>I-2, I-3, I-4</td>
<td>150</td>
<td>200⁰</td>
</tr>
</tbody>
</table>

For SI: 1 foot = 304.8 mm.

a. See the following sections for modifications to exit access travel distance requirements:

   - Section 402: For the distance limitation in malls.
   - Section 404: For the distance limitation through an atrium space.
   - Section 1015.2: For increased limitation in Groups F-1 and S-1.
   - Section 1024.7: For increased limitation in assembly seating.
   - Section 1018.2: For buildings with one exit.
   - Chapter 31: For the limitation in temporary structures.

b. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2. See Section 903 for occupancies where sprinkler systems according to Section 903.3.1.2 are permitted.

c. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

### 1015.2 Roof vent increase. In buildings which are one story in height, equipped with automatic heat and smoke roof vents complying with Section 910 and equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, the maximum exit access travel distance shall be 400 feet (122 m) for occupancies in Group F-1 or 5.

### 1015.3 Exterior egress balcony increase. Travel distances specified in Section 1015.1 shall be increased up to an additional 100 feet (30 480 mm) provided the last portion of the exit access leading to the exit occurs on an exterior egress balcony constructed in accordance with Section 1013.5. The length of such balcony shall not be less than the amount of the increase taken.

### SECTION 1016
CORRIDORS

#### 1016.1 Construction. Corridors shall be fire-resistance rated in accordance with Table 1016.1. The corridor walls required to be fire-resistance rated shall comply with Section 708 for fire partitions.

**Exceptions:**

1. A fire-resistance rating is not required for corridors in an occupancy in Group E where each room that is used for instruction has at least one door directly to the exterior and rooms for assembly purposes have at least one-half of the required means of egress doors opening directly to the exterior. Exterior doors specified in this exception are required to be at ground level.

2. A fire-resistance rating is not required for corridors contained within a dwelling or sleeping unit in an occupancy in Group R.

3. A fire-resistance rating is not required for corridors in open parking garages.

4. A fire-resistance rating is not required for corridors in an occupancy in Group B which is a space requiring only a single means of egress complying with Section 1014.1.

### TABLE 1016.1
CORRIDOR FIRE-RESISTANCE RATING

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>OCCUPANT LOAD SERVED BY CORRIDOR</th>
<th>REQUIRED FIRE-RESISTANCE RATING (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1, H-2, H-3</td>
<td>All</td>
<td>Without sprinkler system</td>
</tr>
<tr>
<td>H-4, H-5</td>
<td>Greater than 30</td>
<td>Not Permitted</td>
</tr>
<tr>
<td>A, B, E, F, M, S, U</td>
<td>Greater than 30</td>
<td>Not Permitted</td>
</tr>
<tr>
<td>R</td>
<td>Greater than 10</td>
<td>1</td>
</tr>
<tr>
<td>I-2, I-4</td>
<td>All</td>
<td>Not Permitted</td>
</tr>
<tr>
<td>I-1, I-3</td>
<td>All</td>
<td>Not Permitted</td>
</tr>
</tbody>
</table>

a. For requirements for occupancies in Group I-2, see Section 407.3.

b. For a reduction in the fire-resistance rating for occupancies in Group I-3, see Section 408.7.

c. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 where allowed.
smokeproof enclosure by ductwork enclosed by 2-hour fire-resistance-rated fire barriers.

2. Equipment and ductwork shall be located within the smokeproof enclosure with intake or exhaust directly from and to the outside or through ductwork enclosed by 2-hour fire-resistance-rated fire barriers.

3. Equipment and ductwork shall be located within the building if separated from the remainder of the building, including other mechanical equipment, by 2-hour fire-resistance-rated fire barriers.

909.20.6.2 Standby power. Mechanical vestibule and stair shaft ventilation systems and automatic fire detection systems shall be powered by an approved standby power system conforming to Section 403.10.1 and Chapter 27.

909.20.6.3 Acceptance and testing. Before the mechanical equipment is approved, the system shall be tested in the presence of the building official to confirm that the system is operating in compliance with these requirements.

909.21 Underground building smoke exhaust system. Where required in accordance with Section 405.5 for underground buildings, a smoke exhaust system shall be provided in accordance with this section.

909.21.1 Exhaust capability. Where compartmentation is required, each compartment shall have an independent, automatically activated smoke exhaust system capable of manual operation. The system shall have an air supply and smoke exhaust capability that will provide a minimum of six air changes per hour.

[F] 909.21.2 Operation. The smoke exhaust system shall be operated in the compartment of origin by the following, independently of each other:

1. Two cross-zoned smoke detectors within a single protected area of a single smoke detector monitored by an alarm verification zone or an approved equivalent method.
2. The automatic sprinkler system.
3. Manual controls that are readily accessible to the fire department.

[F] 909.21.3 Alarm required. Activation of the smoke exhaust system shall activate an audible alarm at a constantly attended location.

SECTION 910
SMOKE AND HEAT VENTS

[F] 910.1 General. Where required by this code or otherwise installed, smoke and heat vents or mechanical smoke exhaust systems and draft curtains shall conform to the requirements of this section.

Exception: Frozen-food warehouses used solely for storage of Class I and II commodities where protected by an approved automatic sprinkler system.

[F] 910.2 Where required. Approved smoke and heat vents shall be installed in the roofs of one-story buildings or portions thereof occupied for the uses set forth in Sections 910.2.1 through 910.2.4.

[F] 910.2.1 Groups F-1 and S-1. Buildings and portions thereof used as a Group F-1 or S-1 occupancy having more than 50,000 square feet (4645 m²) in undivided area.

Exception: Group S-1 aircraft repair hangars.

[F] 910.2.2 Group H. Buildings and portions thereof used as a Group H occupancy as shown:

1. In occupancies classified as Group H-2 or H-3, any of which are over 15,000 square feet (1394 m²) in single floor area.

Exception: Buildings of noncombustible construction containing only noncombustible materials.

2. In areas of buildings in Group H used for storing Class 2, 3, and 4 liquid and solid oxidizers, Class 1 and unclassified detonable organic peroxides, Class 3 and 4 unstable (reactive) materials, or Class 2 or 3 water-reactive materials as required for a high-hazard commodity classification.

Exception: Buildings of noncombustible construction containing only noncombustible materials.

[F] 910.2.3 High-piled combustible storage. Buildings and portions thereof containing high-piled combustible stock or rack storage in any occupancy group in accordance with Section 413 and the International Fire Code.

[F] 910.2.4 Exit access travel distance increase. Buildings and portions thereof used as a Group F-1 or S-1 occupancy where the maximum exit access travel distance is increased in accordance with Section 1015.2.

[F] 910.3 Design and installation. The design and installation of smoke and heat vents and draft curtains shall be as specified in this section and Table 910.3.

[F] 910.3.1 Vent operation. Smoke and heat vents shall be approved and labeled and shall be capable of being operated by approved automatic and manual means. Automatic operation of smoke and heat vents shall conform to the provisions of this section.

[F] 910.3.1.1 Gravity-operated drop-out vents. Automatic smoke and heat vents containing heat-sensitive glazing designed to shrink and drop out of the vent opening when exposed to fire shall be fully open within 5 minutes after the vent cavity is exposed to a simulated fire, represented by a time-temperature gradient that reaches an air temperature of 500°F (260°C) within 5 minutes.

[F] 910.3.1.2 Sprinklered buildings. Where installed in buildings provided with an approved automatic sprinkler system, smoke and heat vents shall be designed to operate automatically.

[F] 910.3.1.3 Nonsprinklered buildings. Where installed in buildings not provided with an approved automatic sprinkler system, smoke and heat vents shall operate automatically by actuation of a heat-responsive
CHAPTER 27
ELECTRICAL

SECTION 2701
GENERAL

2701.1 Scope. This chapter governs the electrical components, equipment and systems used in buildings and structures covered by this code. Electrical components, equipment and systems shall be designed and constructed in accordance with the provisions of the ICC Electrical Code.

[F] SECTION 2702
EMERGENCY AND STANDBY POWER SYSTEMS

2702.1 Installation. Emergency and standby power systems shall be installed in accordance with the ICC Electrical Code, NFPA 110 and NFPA 111.

2702.1.1 Stationary generators. Emergency and standby power generators shall be listed in accordance with UL 2200.

2702.2 Where required. Emergency and standby power systems shall be provided where required by Sections 2702.2.1 through 2702.2.19.

2702.2.1 Group A occupancies. Emergency power shall be provided for voice communication systems in Group A occupancies in accordance with Section 907.2.1.2.

2702.2.2 Smoke control systems. Standby power shall be provided for smoke control systems in accordance with Section 909.11.

2702.2.3 Exit signs. Emergency power shall be provided for exit signs in accordance with Section 1011.5.3.

2702.2.4 Means of egress illumination. Emergency power shall be provided for means of egress illumination in accordance with Section 1006.3.

2702.2.5 Accessible means of egress elevators. Standby power shall be provided for elevators that are part of an accessible means of egress in accordance with Section 1007.4.

2702.2.6 Horizontal sliding doors. Standby power shall be provided for horizontal sliding doors in accordance with Section 1008.1.3.3.

2702.2.7 Semiconductor fabrication facilities. Emergency power shall be provided for semiconductor fabrication facilities in accordance with Section 415.9.10.

2702.2.8 Membrane structures. Standby power shall be provided for auxiliary inflation systems in accordance with Section 3102.8.2. Emergency power shall be provided for exit signs in temporary tents and membrane structures in accordance with the International Fire Code.

2702.2.9 Hazardous materials. Emergency or standby power shall be provided in occupancies with hazardous materials in accordance with Section 414.5.4.

2702.2.10 Highly toxic and toxic materials. Emergency power shall be provided for occupancies with highly toxic or toxic materials in accordance with the International Fire Code.

2702.2.11 Organic peroxides. Standby power shall be provided for occupancies with silane gas in accordance with the International Fire Code.

2702.2.12 Pyrophoric materials. Emergency power shall be provided for occupancies with silane gas in accordance with the International Fire Code.

2702.2.13 Covered mall buildings. Standby power shall be provided for voice/alarm communication systems in covered mall buildings in accordance with Section 402.12.

2702.2.14 High-rise buildings. Emergency and standby power shall be provided in high-rise buildings in accordance with Sections 403.10 and 403.11.

2702.2.15 Underground buildings. Emergency and standby power shall be provided in underground buildings in accordance with Sections 405.9 and 405.10.

2702.2.16 Group I-3 occupancies. Emergency power shall be provided for doors in Group I-3 occupancies in accordance with Section 408.4.2.

2702.2.17 Airport traffic control towers. Standby power shall be provided in airport traffic control towers in accordance with Section 412.1.5.

2702.2.18 Elevators. Standby power for elevators shall be provided as set forth in Section 3003.1.

2702.2.19 Smokeproof enclosures. Standby power shall be provided for smokeproof enclosures as required by Section 909.20.

2702.3 Maintenance. Emergency and standby power systems shall be maintained and tested in accordance with the International Fire Code.