This building is located in Delaware, USA. It is a mixed use building that contains office space to support a population of 700 people and dining facilities to accommodate approximately 400 people.

The building is composed of two major components; a five (5) story office wing and a one (1) and two (2) story amenities wing that mainly houses the food service, dining, kitchen and conference areas. The gross square footage of the building is 222,014 GSF.
Third and Fourth Floor
## Applicable Codes & Standards

<table>
<thead>
<tr>
<th>Year</th>
<th>Code/Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>International Building Code (IBC)</td>
</tr>
<tr>
<td>2006</td>
<td>International Plumbing Code (IPC)</td>
</tr>
<tr>
<td>2006</td>
<td>International Fire Code (IFC)</td>
</tr>
<tr>
<td>2006</td>
<td>International Mechanical Code (IMC)</td>
</tr>
<tr>
<td>2008</td>
<td>National Electrical Code (NEC)</td>
</tr>
<tr>
<td>2010</td>
<td>NFPA 10 Standard for Portable Fire Extinguishers</td>
</tr>
<tr>
<td>2010</td>
<td>NFPA 13 Installation of Sprinkler Systems</td>
</tr>
<tr>
<td>2010</td>
<td>NFPA 14 Installation of Standpipe and Hose Systems</td>
</tr>
<tr>
<td>2010</td>
<td>NFPA 24 Standard for the Installation of Private Fire Service Mains</td>
</tr>
<tr>
<td>2010</td>
<td>NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems</td>
</tr>
<tr>
<td>2010</td>
<td>NFPA 72 National Fire Alarm Code</td>
</tr>
</tbody>
</table>
## Occupancy and Use Group

<table>
<thead>
<tr>
<th>Occupancy</th>
<th>IBC</th>
<th>LSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office, Support and Accessory Spaces</td>
<td>Business (B)</td>
<td>Business</td>
</tr>
<tr>
<td>Dining, Servery and Kitchen Areas</td>
<td>Assembly (A-2)</td>
<td>Assembly</td>
</tr>
</tbody>
</table>

### BUSINESS, B

**IBC 2006, 304.1**

**304.1 Business Group B.** Business Group B occupancy includes, among others, the use of a building or structure, or a portion thereof, for office, professional or service-type transactions, including storage of records and accounts.

### ASSEMBLY, A-2

**IBC 2006, 303**

**A-2 Assembly uses intended for food and/or drink consumption including, but not limited to: Banquet halls, Night clubs, Restaurants and Taverns and bars**

**LSC 2009, 6.1.2.1**

**Definition — Assembly Occupancy.** An occupancy (1) used for a gathering of 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar uses; or (2) used as a special amusement building, regardless of occupant load.

**LSC 2009, 6.1.11.1**

**Definition — Business Occupancy.** An occupancy used for the transaction of business other than mercantile.
## Structural Fire Protection

### Structural Fire Rating

<table>
<thead>
<tr>
<th>Building Element</th>
<th>IBC (Table 601) Type IIA</th>
<th>LSC (Table 4.1) Type II (111)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Frame</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Bearing Walls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Exterior</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>• Interior</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Non-bearing Walls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Exterior (&gt; 30 ft. for Fire Separation)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>• Interior</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Floor Construction</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Roof Construction</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Structural Fire Protection

Mixed Occupancies

**IBC 2006, 508.3.3**

**Separated Uses:** Provide 1-Hour Fire Barrier Separation between Use Groups B & A-2 per Table 508.3.3 and Exception to Section 508.3.3.

**LSC 2009, 6.1.14.4**

**Separated Occupancies:** Provide 1-Hour Fire Resistive Separation Assembly between Occupancy Classes per Table 6.1.14.4.1 & Section 6.1.14.4.3.

**Table 6.1.14.4.1 (b) Required Separation of Occupancies (hours)**

<table>
<thead>
<tr>
<th>Occupancy</th>
<th>Board &amp; Care, Small</th>
<th>Board &amp; Care, Large</th>
<th>Mercantile, Mall</th>
<th>Mercantile, Bulk Retail</th>
<th>Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly</td>
<td>≤ 300</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Assembly ≥300 to ≤1000</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Fire Resistance Rating. The fire resistance rating is permitted to be reduced by 1 hour, but in no case to less than 1 hour, where the building is protected throughout by an approved automatic sprinkler system in accordance with 6.7.1.1(1) and supervised in accordance with 5.7.2.
Atrium: An opening connecting two or more stories other than enclosed stairways, elevators, hoistways, escalators, plumbing electrical, air-conditioning or other equipment which is closed at the top.

Smoke Control - IBC 2006, 404.4

Per the exception to the IBC 2006 Building Code, a smoke control system installed in accordance with Section 909 is not required for an atrium that connects only two stories.

Atrium Enclosure - IBC 2006, 404.5

Atrium spaces will be separated from adjacent spaces by a 1-hour fire barrier wall.

Exception 1:

A glass wall forming a smoke partition where automatic sprinklers are spaced 6 feet or less along both sides of the separation wall, or on the room side only if there is not a walkway on the atrium side, and between 4 inches and 12 inches away from the glass and designed so that the entire surface of the glass is wet upon activation of the sprinkler system without obstruction.
Vertical Exit Enclosures - IBC 2006, 1020.1

Fire Resistance Rating:

- Vertical Exit Enclosures connecting four (4) stories or more
  - 2 Hours

- Vertical Exit Enclosures connecting less than four (4) stories
  - 1 Hour

Exception 9:

In other than Group H and I occupancies, interior egress stairways serving only the first and second stories of a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 are not required to be enclosed, provided at least two means of egress are provided from both floors served by the unenclosed stairways. Such interconnected stories shall not be open to other stories. Unenclosed exit stairways shall be remotely located as required in Section 1015.2.
Structural Fire Protection

Shaft Enclosure

IBC 2006, 707

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

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.

LSC 2009, 8.6.5

Required Fire Resistance Rating. The minimum fire resistance rating for the enclosure of floor openings shall be as follows (see 7.1.3.2.1 for enclosure of exits):

(1) Enclosures connecting four or more stories in new construction — 2-hour fire barriers
# Building Egress

## Occupant Load

### Allowable Occupant Loads

<table>
<thead>
<tr>
<th>Occupancy</th>
<th>Floor Area Per Occupant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Area</td>
<td>100 gross</td>
</tr>
<tr>
<td>Assembly Area (w/o fixed seats)</td>
<td></td>
</tr>
<tr>
<td>- Concentrated (chairs only)</td>
<td>7 net</td>
</tr>
<tr>
<td>- Unconcentrated (tables and chairs)</td>
<td>15 net</td>
</tr>
<tr>
<td>Kitchen (IBC)</td>
<td>200 gross</td>
</tr>
<tr>
<td>Kitchens (LSC)</td>
<td>100 gross</td>
</tr>
<tr>
<td>Storage, Mechanical and Equipment Rooms</td>
<td>300 gross</td>
</tr>
</tbody>
</table>

### Calculated Occupant Load

<table>
<thead>
<tr>
<th>Floor</th>
<th>Occupancy</th>
<th>Area (SF)</th>
<th>Occupant Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Business</td>
<td>46,045</td>
<td>461</td>
</tr>
<tr>
<td></td>
<td>Servery</td>
<td>2,800</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Dining</td>
<td>5,500</td>
<td>564</td>
</tr>
<tr>
<td></td>
<td>Kitchen</td>
<td>8,450</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td>Business</td>
<td>40,594</td>
<td>406</td>
</tr>
<tr>
<td>3</td>
<td>Business</td>
<td>38,880</td>
<td>389</td>
</tr>
<tr>
<td>4</td>
<td>Business</td>
<td>38,880</td>
<td>389</td>
</tr>
<tr>
<td>5</td>
<td>Business</td>
<td>33,832</td>
<td>339</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>3003</td>
</tr>
</tbody>
</table>
## Building Egress

### Egress Widths

<table>
<thead>
<tr>
<th>Allowable Egress Widths</th>
<th>Egress Width (inches per occupant)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IBC Table 1005.1</td>
</tr>
<tr>
<td>Stairways</td>
<td>0.2</td>
</tr>
<tr>
<td>All Other Egress Components</td>
<td>0.15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Calculated Egress Widths</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Floor</strong></td>
<td><strong>Occupancy</strong></td>
<td><strong>Component</strong></td>
</tr>
<tr>
<td>1</td>
<td>Business</td>
<td>Stairways</td>
</tr>
<tr>
<td></td>
<td>Assembly</td>
<td>Level Components</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Business</td>
<td>Stairways</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level Components</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Business</td>
<td>Stairways</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level Components</td>
</tr>
<tr>
<td>4</td>
<td>Business</td>
<td>Stairways</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level Components</td>
</tr>
<tr>
<td>5</td>
<td>Business</td>
<td>Stairways</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level Components</td>
</tr>
</tbody>
</table>
Building Egress

Accessible Means of Egress

IBC 2006, 1007.1 / LSC 2009, 7.5.4

For each accessible space within the building at least two accessible means of egress shall be provided. Where more than one means of egress is required from an accessible space, all of the additional means of egress shall also be accessible.

Common Path of Travel

IBC 2006, 1014.3 / LSC 2009, 7.6, Table A.7.6

Maximum length of Common Path of Egress Travel

Assembly, A-2 – 75 feet
Business, B – 100 feet

LSC 2009, 7.12.1

In buildings equipped with automatic sprinkler systems complying with NFPA 13, the maximum length of Common Path of Egress Travel from a mechanical room or similar space shall be 100 feet.
Building Egress

Exit Access Travel Distance

IBC 2006, 1016, Table 1016.1 / LSC 2009, 7.6, Table A.7.6

- Assembly, A-2 Maximum Travel Distance = 250 feet
- Business, B Maximum Travel Distance = 300 feet

IBC 2006, 1016, Table 1016.1

In other than the lowest level of the atrium, where the required means of egress is through the atrium space, the portion of exit access travel distance within the atrium space shall not exceed 200 feet.

Corridors

Widths

IBC 2006, 1017.2
LSC 2009, 12.2.3.8 and 38.2.3.2

The minimum clear width of corridors shall be 44”

Dead Ends

IBC 2006, 1017.3
LSC 2009, 7.6, Table A.7.6

Assembly, A-2 – Maximum 20 feet
Business, B – Maximum 50 feet
Building Egress

Number of Exits

IBC 2006, 1019, Table 1019.1
LSC 2009, 7.4.1.2

Minimum Number of Exits For Occupant Load

1-500 Occupants = **Minimum 2 Exits**
500-1000 Occupants = **Minimum 3 Exits**

LSC 2009, 12.2.3.6

The main entrance of the Assembly Occupancy shall be of a width that accommodates one-half of the total occupant load.

LSC 2009, 12.2.3.7

Each level of assembly occupancy shall have access to the main entrance/exit and shall be provided with additional exits of a width to accommodate not less than one-half of the total occupant load served by that level.

LSC 2009, 38.2.4.1

For a Business Occupancy, not less than two (2) separate exits shall be provided on every story.
Building Egress

Elevators

IBC 2006, 1007.2.1

Elevators required. In buildings where a required accessible floor is four or more stories above or below a level of exit discharge, at least one required accessible means of egress shall be an elevator complying with Section 1007.4.

IBC 2006, 1007.4

Elevators. In order to be considered part of an accessible means of egress, an elevator 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 Sections 2702 and 3003. The elevator shall be accessed from either an area of refuge complying with Section 1007.6 or a horizontal exit.
Building Egress

Exit Signs

IBC 2006, 1011

1011.1 Exits and exit access doors shall be marked by an approved exit sign readily visible from any direction of egress travel. Access to exits shall be marked by readily visible exit signs in cases where the exit or the path of egress travel is not immediately visible to the occupants. Exit sign placement shall be such that no point in a corridor is more than 100 feet (30 480 mm) or the listed viewing distance for the sign, whichever is less, from the nearest visible exit sign.

LSC 2009, 7.10.1.2

7.10.1.2.1 Exits, other than main exterior exit doors that obviously and clearly are identifiable as exits, shall be marked by an approved sign that is readily visible from any direction of exit access.

7.10.1.2.2 Horizontal components of the egress path with in an exit enclosure shall be marked by approved exit or directional exit sign.
Fire Suppression Systems

Site Water/Incoming Service

Date: July 30, 2010

Static Pressure (psig): 128
Residual Pressure (psig): 99
Flow (gpm): 1216
Fire Suppression Systems

Building Riser Diagram
### Fire Suppression Systems

#### Sprinkler System Criteria

<table>
<thead>
<tr>
<th>WET SYSTEM</th>
<th>Occupancy/Area</th>
<th>Design Density (GPM/SQ. FT)</th>
<th>Design Area (SQ. FT)</th>
<th>Area Per Sprinkler (SQ. FT)</th>
<th>Hose Stream (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Areas</td>
<td>0.15</td>
<td>2000</td>
<td>130</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Mechanical/Electrical</td>
<td>0.15</td>
<td>2000</td>
<td>130</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Storage Rooms</td>
<td>0.15</td>
<td>2000</td>
<td>130</td>
<td>500</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PREACTION SYSTEM</th>
<th>Occupancy/Area</th>
<th>Design Density (GPM/SQ. FT)</th>
<th>Design Area (SQ. FT)</th>
<th>Area Per Sprinkler (SQ. FT)</th>
<th>Hose Stream (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Electrical Room</td>
<td>0.15</td>
<td>2000</td>
<td>130</td>
<td>500</td>
<td></td>
</tr>
</tbody>
</table>
## Fire Suppression Systems

### Sprinklers

<table>
<thead>
<tr>
<th>Area</th>
<th>Response</th>
<th>Type</th>
<th>Orifice (inches)</th>
<th>Temperature (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Common Areas</td>
<td>Quick</td>
<td>Pendent/Upright/Sidewall</td>
<td>0.5</td>
<td>165</td>
</tr>
<tr>
<td>Mechanical/Electrical</td>
<td>Standard</td>
<td>Upright</td>
<td>0.5</td>
<td>286</td>
</tr>
<tr>
<td>Storage Rooms</td>
<td>Standard</td>
<td>Upright</td>
<td>11/32</td>
<td>286</td>
</tr>
<tr>
<td>Loading Dock Canopy</td>
<td>Standard</td>
<td>Dry Sidewall</td>
<td>0.5</td>
<td>165</td>
</tr>
</tbody>
</table>
Fire Suppression Systems

Sprinkler Demand

- Pressure Demand: 91.67 PSIG
- Sprinkler Demand: 616.9 GPM
- Hose Stream Demand: 500 GPM
- Total Flow Demand: 1116.9 GPM
### IBC 2009

#### 905.3.1 Required installations. Standpipe systems shall be installed where required by Sections 905.3.1 through 905.3.7 and in the locations indicated in Sections 905.4, 905.5 and 905.6. Standpipe systems are allowed to be combined with automatic sprinkler systems.

#### 905.3.1 Building height. Class III standpipe systems shall be installed throughout buildings where the floor level of the highest story is located more than 30 feet (9144 mm) above the lowest level of fire department vehicle access, or where the floor level of the lowest story is located more than 30 feet (9144 mm) below the highest level of fire department vehicle access.

**Exceptions:**

Class I standpipes are allowed in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2.

#### 3.3.14.1 Class I Systems. A system that provides 2 ½ in. hose connections to supply water for use by fire departments.
Fire Suppression Systems

Ansul System
Fire Suppression Systems

Fire Extinguishers

Wet Chemical Type:

6.6 Installations for Class K Hazards.
6.6.1 Class K fire extinguishers shall be provided for hazards where there is a potential for fires involving combustible cooking media (vegetable or animal oils and fats).
6.6.2 Maximum travel distance shall not exceed 30 ft (9.15 m) from the hazard to the extinguishers.

Carbon Dioxide Type:

6.4 Installations for Class C Hazards.
6.4.1 Fire extinguishers with Class C ratings shall be required where energized electrical equipment can be encountered.

Dry Chemical Multi-Purpose Type:

8.2.1 Fire Extinguisher Size and Placement for Class A Hazards.
8.2.1.1 Minimal sizes of fire extinguishers for the listed grades of hazards shall be provided on the basis of Table 6.2.1.1, except as modified by 6.2.1.3.1 and 6.2.1.4.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Light Hazard Occupancy</th>
<th>Ordinary Hazard Occupancy</th>
<th>Extra Hazard Occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum rated single extinguisher</td>
<td>2-A</td>
<td>2-A</td>
<td>4-A</td>
</tr>
<tr>
<td>Maximum floor area per unit of A</td>
<td>3000 ft²</td>
<td>1500 ft²</td>
<td>1060 ft²</td>
</tr>
<tr>
<td>Maximum floor area for extinguisher</td>
<td>11,250 ft²</td>
<td>11,250 ft²</td>
<td>11,250 ft²</td>
</tr>
<tr>
<td>Maximum travel distance to extinguisher</td>
<td>75 ft</td>
<td>75 ft</td>
<td>75 ft</td>
</tr>
</tbody>
</table>
Fire Detection and Alarm Systems

Building Fire Alarm
Fire Detection and Alarm Systems

Initiating Devices

- Manual Pull Stations
- Smoke Detectors
- Heat Detectors
- Duct Detectors
- Water Flow Switch
- Pressure Switch
- Tamper Switch
Fire Detection and Alarm Systems

Notification Devices

<table>
<thead>
<tr>
<th>Location</th>
<th>Average Ambient Sound Level (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Occupancies</td>
<td>55</td>
</tr>
<tr>
<td>Mechanical Rooms</td>
<td>85</td>
</tr>
<tr>
<td>Places of Assembly</td>
<td>56</td>
</tr>
<tr>
<td>Storage Occupancies</td>
<td>30</td>
</tr>
</tbody>
</table>

Room Spacing for Ceiling-Mounted Visible Appliances. Not all inclusive (NFPA 72, Table 18.4.3.1(b))

<table>
<thead>
<tr>
<th>Maximum Room Size (ft)</th>
<th>Maximum Lens Height (ft)</th>
<th>Minimum Required Light Output (Effective Intensity): One Light (cd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 x 20</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>30 x 30</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>40 x 40</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>44 x 44</td>
<td>10</td>
<td>75</td>
</tr>
<tr>
<td>50 x 50</td>
<td>10</td>
<td>85</td>
</tr>
<tr>
<td>53 x 53</td>
<td>10</td>
<td>110</td>
</tr>
<tr>
<td>55 x 55</td>
<td>10</td>
<td>115</td>
</tr>
</tbody>
</table>
Smoke Control System

Duct Detectors

Fire/Smoke Damper
Performance Based Design
Building Egress

*Calculated Evacuation Time*

Assumptions:

- Occupants utilize both exit stairways in optimum balance
- Occupants start egress at the same time
- The first floor occupants fully evacuate the building prior to the occupants on the floors above reaching the ground level.

**Flow Capacity Stairway**

Flow capacity = 74 persons/min

**Flow Capacity Door**

Flow Capacity = 60 persons/min

*The exit doors are the most restrictive egress component

**Speed of movement:**

Speed of movement \((S) = 106 \text{ ft/min}\)

**Travel Distance between floors**

Total travel distance per floor = 47.5 ft

Travel time = \(47.5/106 = 0.44 \text{ min (26 seconds)}\)

**Estimated Building Evacuation:**

Total Population above first floor = 1523

Evacuation Time = \((1523/60)/2 + 0.44 = 13 \text{ minutes}\)
Building Egress

Pathfinder

Assumptions

- All occupants travel at the same speed.
- First floor fully evacuates prior to all other occupants reaching the ground floor.
- Each floor includes the maximum number of occupants.
- All occupants start egress at the same time.

Full Evacuation Time

- 11 Minutes
Design Fires

Tenability Criteria

Visibility

- 10 m (32.8 ft)

CO Concentration

- 1000 ppm

Temperature

- 60 °C (140 °F)

Note: All criteria will be measure at 1.8 m (6 ft) above the highest occupied level.
Design Fire A

- Polypropylene Chairs
- 12 Chairs in 2 Stacks
- Adjacent Egress Door Propped Open
- Sprinklers are Operational
Design Fire A

- Max HRR – 2.2 MW
- Soot Yield – 0.059 (SFPE, Table 3-4.16)
- CO Yield – 0.024 (SFPE, Table 3-4.16)

Figure 3-1.18. HRR of stackable chairs, polypropylene with steel frame, no padding.
Design Fire A

Smoke Detector Activation
313 seconds

Sprinkler Activation
400 seconds

Heat Detector Activation
455 seconds
Design Fire A

Temperature at 10 minutes (600 s)

CO Concentration at 10 minutes (600 s)
Design Fire A

Visibility at 7.5 minutes (450 s)

Visibility at 10 minutes (600 s)
Design Fire B

- Sofa And Chair Fire in Atrium
- Upholstered Polyurethane (1) Sofa and (2) Chairs
- Second Floor Door is Closed
- Sprinklers are Operational
Design Fire B

- Max Combined HRR – 6.2 MW
- Soot Yield – 0.198 (SFPE, Table 3-4.16)
- CO Yield – 0.042 (SFPE, Table 3-4.16)

Design Fire B

Smoke Detector Activation
1.9 minutes (116 seconds)

Sprinkler Activation
3.3 minutes (200 seconds)
Design Fire B

- Average Max Combined HRR – 4 MW

**Chair HRR (Sprinkler)**

**Sofa HRR (Sprinkler)**

**Combined HRR**
Design Fire B

Temperature at 12.5 minutes (750 s)

CO Concentration at 12.5 minutes (750 s)
Design Fire B

Second Floor
Visibility at 2.1 minutes (126 s)

First Floor
Visibility at 12.5 minutes (750 s)
Design Fire C

- Kitchen Fire
- Single pallet of packaged fruit/berry baskets
- Ignition Source – Grease Fire
- Ansul system not operational
- Sprinklers are operational
Design Fire C

- Max HRR – 5 MW
- Soot Yield – 0.05 (SFPE, Table 3-4.16)
- CO Yield – 0.053 (SFPE, Table 3-4.16)
Design Fire C

Sprinkler Activation

Revised HRR

Temperature (°C)

Time (s)

0.00 200.00 400.00 600.00 800.00 1000.00

Left of Fire

Right of Fire
Design Fire C

Temperature at 3.3 minutes (200 s)

CO Concentration at 6.6 minutes (400 s)
Design Fire C

Visibility at 1.5 minutes (90 s)

Visibility at 5 minutes (300 s)
Recommendations

• Provide door prop alarms for doors exiting into egress corridors.
• Keep up with required inspection, maintenance and testing as required by NFPA 25.
• Limit pallets to only the loading dock area.

Summary

• Building complies with the prescriptive codes as originally mandated.
• Performance-based analysis proved that the building fire protection features provide adequate time for the occupants to evacuate.
• Building is a safe and functional building for all occupants.
Questions / Comments

Thank You!

Cal Poly
Fire Protection Engineering