APPENDIX

Student Exercises and Supplemental Material

Fire Safe Design

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Appendix

Occupancy Classification Exercise
Using Chapter 3 of the Building Code list the appropriate occupancy designation

What is the Occupancy?

• Cell phone tower
• Hotel (transient)
• Movie theater
• Elementary school
• Mental hospital
• College basketball arena
• Building department offices
• Clothing store
• Explosives manufacturing plant
• Café seating 65 people
• Infant day care center with 15 children
• Masonry block manufacturing plant
Appendix

Occuancy Classification Exercise
Using Chapter 3 of the Building Code list the appropriate occupancy designation

Motor Vehicle Related Occupancies

What is the Occupancy?

Public parking garage
Automobile showroom
Repair garage
Car factory
Motor fuel dispensing station
Appendix

Type of Construction Exercise

**Exercise #1.** This building is proposed to be Type II-B, Non-combustible. What are the minimum fire-resistive ratings for the building elements?

- **Roof:** _____ hour rating
- **Exterior bearing walls:** _____ hour rating
- **Floor/ceiling:** _____ hour rating
- **Structural frame:** ____ hour rating

**Exercise #2.** Does this building satisfy Type III-A Construction requirements?

- **Non-combustible Roof:** 1 hour
- **Non-combustible exterior bearing walls:** 2 hours
- **Combustible, non-load bearing partition, nonrated**
- **Wood framed floor/ceiling:** 1 hour
- **Structural frame or interior bearing wall:** 1 hour
Appendix

Type of Construction Exercise

**Exercise #3.** Does this building satisfy Type IV Construction requirements?

- Roof heavy timber
- Non-combustible exterior bearing walls, 1 hour
- Non-bearing partition, solid wood
- Floor/ceiling heavy timber

**Exercise #4.** This building is proposed to be Type I-A, Non-combustible. What are the minimum fire-resistive ratings for the building elements?

- Roof: ____ hour rating
- Exterior bearing walls: ____ hour rating
- Floor/ceiling: ____ hour rating
- Non-bearing partition: ____ hour rating
## Building Story, Height and Area Exercise
Using Tables 504.3 Height in Feet, 504.4 Height in Stories, and 506.2 Allowable Area Factor.

<table>
<thead>
<tr>
<th>Occupancy Group</th>
<th>Type of Construction</th>
<th>Height in Feet</th>
<th>Height in Stories</th>
<th>Other details</th>
<th>Allowable Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department store</td>
<td>Noncombustible elements, no additional fire resistance</td>
<td></td>
<td></td>
<td>Sprinklered</td>
<td>2 Story</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleepy Time Motel transient</td>
<td>Masonry exterior walls, 2 hour rated, and unrated wood frame interior</td>
<td></td>
<td></td>
<td>Nonsprinklered</td>
<td>1 Story</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bob’s Bar and Grill</td>
<td>Log Cabin</td>
<td></td>
<td></td>
<td>Sprinklered</td>
<td>2 Story</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Veterinary Hospital</td>
<td>Wood frame, no fire resistance rating</td>
<td></td>
<td></td>
<td>Nonsprinker</td>
<td>3 Story</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Appendix - 6
Exercise 1:

M Occupancy of Type IIIIB construction
Three stories - Fully Sprinklered

Is this correct? Do these Two numbers verify?

\[ A_a = A_t + (NS \times I_f) \]
\[ A_a = 37,500 + (18,500 \times I_f) \]

Exercise 2:

B Occupancy of Type VB construction
Four stories - Fully Sprinklered

Is this correct? Do these Two numbers verify?

\[ A_a = A_t + (NS \times I_f) \]
\[ A_a = 27,500 + (9,000 \times I_f) \]
Appendix

Exercise 3:
R-2 Occupancy of Type VB construction
two stories - NFPA 13-R Sprinkler

Is this correct? Do these Two numbers verify?

\[ A_a = A_t + (NS \times I_f) \]
\[ A_a = 7,000 + (7,000 \times I_f) \]

Exercise 4:
E Occupancy of Type IIB construction
One story - partially Sprinklered

Is this correct? Do these Two numbers verify?

\[ A_a = A_t + (NS \times I_f) \]
\[ A_a = 58,000 + (14,500 \times I_f) \]
Exercise 5:
Is this correct? Do these Two numbers verify?

\[ I_f = \left[ \frac{F}{P} - 0.25 \right] \times \frac{W}{30} \]

\[ I_f = \frac{395}{480} - 0.25 \times \frac{W}{30} \]
Exercise 6:

Does this verify? Compare all the Numbers?

\[ W = \frac{(L_1 \times W_1) + (L_2 \times W_2) + (L_3 \times W_3)}{F} \]

\[ W = \frac{(80 \times 30) + (150 \times 30) + (80 \times 30)}{80 + 150 + 80} \]
Appendix

Exercise - Uses and Separations:

Proposed: Type II-B Construction, No Sprinkler

First step: is to calculate the sizes of each separate use.

Second step: is to determine which use(s) qualifies as an “Accessory” Use (Section 508.2)?

Third step: is to determine which uses are considered a mixed use.

Fourth step: is to determine which type of separation is required between the mixed use(s). The choices are:

- Non rated wall
- Fire Partition
- Fire Barrier

Answer questions on next page using this diagram

Appendix - 11
Appendix

Exercise - Uses and Separations

Answer questions using diagram on previous page.

Question (1) Can Wall “A” be non-rated?

Question (2) IF the proposal is a SEPARATED MIXED USE can the wall be a Fire Partition?

Question (3) IF the proposal is a SEPARATED MIXED USE can the wall be a Fire Barrier?
Fire Separation Distance

705.3 Buildings on the Same Lot

Using table 602 determine the following:

1) Distance from the EXISTING building to the imaginary line

2) Distance from the NEW building to the imaginary line.
Allowable Area of Opening Exercise

- Exterior wall 12’ from interior property line
- Protected/unprotected openings as shown
- Determine if the areas of unprotected openings are permitted

\[
\frac{A_p}{a_p} + \frac{A_u}{a_u} < 1
\]

Step 1) determine wall area (L x W)
Step 2) determine allowable area of windows and Doors based on table 705.8.
Step 3) determine area of proposed openings
Step 4) plug numbers into formula above.
Appendix

Fire-resistance Rated Assemblies

1. Find at least 10 situations where the Code requires a FIRE BARRIER.
   1) __________________________________________________________
   2) __________________________________________________________
   3) __________________________________________________________
   4) __________________________________________________________
   5) __________________________________________________________
   6) __________________________________________________________
   7) __________________________________________________________
   8) __________________________________________________________
   9) __________________________________________________________
  10) __________________________________________________________

2. What are the non-sprinklered and sprinklered hourly values between Groups H-3 and I-3 in a Type III-A building, per Table 508.4?
   A) ______________________________
   B) ______________________________

3. What are the non-sprinklered and sprinklered hourly values between fire areas within Group M in a Type V-B building, per Table 508.4?
   A) ______________________________
   B) ______________________________
Sprinkler Systems: Where Required. Please list answers in the space provided

For the following examples, indicate that a sprinkler is required or not required for new construction. Indicate where the sprinklers must be installed and cite the appropriate code section.

1. Single story, office building, 30,000 SF in area.
   - Occupancy classification: __________
   - Required or Not-required: __________
   - Where in the building: ______________________________
   - Code citation: ______________________________

   - Occupancy classification: __________
   - Required or Not-required: __________
   - Where in the building: ______________________________
   - Code citation: ______________________________

3. A single story motel.
   - Occupancy classification: __________
   - Required or Not-required: __________
   - Where in the building: ______________________________
   - Code citation: ______________________________

4. A Woodworking Factory, 10,000 SF at grade.
   - Occupancy classification: __________ Required or Not-required: __________
   - Where in the building: ______________________________
   - Code citation: ______________________________

5. A semi-conductor manufacturing facility using HPM (Hazardous production materials).
   - Occupancy classification: __________
   - Required or Not-required: __________
   - Where in the building: ______________________________
   - Code citation: ______________________________

6. A four story department store.
   - Occupancy classification: __________
   - Required or Not-required: __________
   - Where in the building: ______________________________
   - Code citation: ______________________________
Extra Credit: A 10 story office building design for 100 people on each story.

| Occupancy classification: | _____________________________ |
| Required or Not-required: | _____________________________ |
| Where in the building: | _____________________________ |
| Code citation: | _____________________________ |

Standpipe System: Where Required

If this Agency Building was constructed today, would a Standpipe system be required?

If so, what are the important details? Please list in the space below.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Alarm and Detection: Where Required

In a GROUP F occupancy:
• When is a system required? ______________________________
• What type of system is required? ______________________________

In a GROUP R-1 Occupancy:
• When is a system required? ______________________________
• What type of system is required? ______________________________

In a GROUP R-2 Occupancy – Student Housing
• When is a system required? ______________________________
• What type of system is required? ______________________________
• Where is it required? ______________________________
Student Research

Fire Apparatus Access Road (FAAR)

*Using 503, find the specifications for:*

- Minimum width
- Vertical clearance
- Surface characteristics
- Turning radius
- Dead ends
**Appendix**

**Egress: Design Occupant Load**

*Retail sales/mercantile*

Calculate size of space and Occupant load here:

---

**Office occupancy**

Calculate size of space and Occupant load here:
Appendix

**Egress: Multiple Levels and Convergence**

**GIVEN:**
- 4 Story, Non-sprinklered Office Building
- Occupants from each level into 44” stair enclosure as indicated
- First floor has independent exit without entering stair enclosure

Complete the information on the Table below.

<table>
<thead>
<tr>
<th>Exit Element</th>
<th>Occupant Load Served</th>
<th>Required Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stair at ‘A’</td>
<td>200 people</td>
<td></td>
</tr>
<tr>
<td>Stair at ‘B’</td>
<td>150 people</td>
<td></td>
</tr>
<tr>
<td>Stair at ‘C’</td>
<td>240 people</td>
<td></td>
</tr>
<tr>
<td>Stair at ‘D’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door at ‘E’</td>
<td>150 people</td>
<td></td>
</tr>
</tbody>
</table>
Appendix

Find and list the Requirements for Ramps

- Maximum Slope
- Maximum Rise
- Minimum Width
- Minimum Headroom
- Minimum Dimensions for Landings

Where are Exit Signs required?
- ALL doors shown are required access or exit doors.
- Indicate on the drawing below where the exit signs should be placed.