

Fire & Life Safety Report

Battalion Headquarters Complex (UEPH)

Location Unknown



Fire Protection Consultant

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Statement of Disclaimer

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Key Words:

Life Safety Code

RSET

ASET

Performance Based Design

Fire Dynamics Simulator (FDS)

Abstract

This fire and life safety report covers a Battalion Headquarters Complex that is used for housing military troops. This is a complete review of the building with prescriptive based fire protection along with performance base review of the building. The prescriptive fire protection covers egress analysis of the space, passive fire protection (i.e. fire walls and doors) and active fire protection (i.e. fire alarm and fire sprinklers). The performance based section looks at the prescriptive requirements and sees if these would be enough for the application at hand.

The building fire protection and life safety are covered by three different codes. The Uniform Facility Code (UFC), National Fire Protection Associate (NFPA) and International Building Code (IBC). With the UFC being the driving code because it is a military based project and the others being derivatives there of. The building is a 3 story barracks housing approximately 296 military personnel. The location of the building is at an undisclosed location.

In looking at the building height and area requirements it was determined that the building was too large in area based on the requirements of the IBC. To become code compliant the best solution was to break the building up into five separate areas using 2-hour fire walls at strategic locations. The building was primarily of an R-2 occupancy classification with some other areas. The travel distances, common paths and dead ends in the building were all code compliant. The exit capacity for the building was compliant with the number of occupants based on the egress analysis. Along those lines the evacuation time was also looked at for how long a general evacuation of the building would take.

The water based fire protection and fire alarm for the building were designed in accordance with their applicable codes NFPA 13R and NFPA 72 respectively. The water supply for the building was sufficient enough that the building would not require a fire pump to supplant. There was a 4 head sprinkler calculation that was performed in the most remote location to show that there would be a sufficient supply of water and pressure. The fire alarm system is of an addressable type with mass notification for the building. There are horns and strobes with smoke detection throughout the building. There is a smoke detector in each sleeping room with a sounder base along with a horn.

The performance based section consisted of using FDS model to show a worse case fire scenario for the building. For this building a dorm room with a trash can fire was looked at to see how this would affect the building with its protection features and see if there will be enough time to egress from the building. The parameters for the fire were a 100 kW slow growth trash can fire. The visibility for the building was set at 4 meters as the occupants will be familiar with the building at the 6 ft mark. The fractional effective dose (FED) at the 6 ft mark was set to 3500 ppm CO. The smoke temperature at the 6ft mark was set to 200 F. The model was then ran for 5 minutes. It was determined after examining the model that current design would be enough to meet all parameters that applied to it.

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Introduction

Description of Project

This design-build project will construct housing facilities for approximately 296 persons. The project is a 3-story building with a footprint total of 38,574 square feet and with a total of 113,381 square feet. The facility will be constructed at unknown location on a military base.

The picture below is a rendering/model of the building to illustrate the layout.



Figure 1 Project Design layout

Applicable Codes and Standards

1. NFPA 101 (2012 Edition) – Life Safety Code
2. NFPA 13R (2013 Edition) – Installation of Fire Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height
3. NFPA 72 (2013 Edition) - National Fire Alarm and Signaling Code
4. NFPA 1 (2012 Edition) – Fire Code
5. NFPA 10 (2010 Edition) – Portable Fire Extinguishers
6. NFPA 70 (2011 Edition) – National Electric Code
7. NFPA 90A (2012 Edition) - Installation of Air Conditioning and Ventilation Systems
8. NFPA 25 (2014 Edition) – Standard for the inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
9. UFC 1-200-01(Change 1, 01 July 2013) - General Building Requirements
10. UFC 3-600-01 (Change 2, 01 February 2013) – Fire Protection Engineering for Facilities
11. UFC 3-601-02 (Change 2, 08 September 2010) – Operation and Maintenance: Inspection, Testing, and Maintenance of Fire Protection Systems.
12. UFC 4-021-01 (January 2010) – Design O&M: Mass Notification Systems
13. International Building Code (2012 Edition)
14. Factory Mutual Loss Prevention Data Sheet 3-26 (July 2011 with Engineering Bulletin 04-12) – Fire Protection Water Demand for Non-storage Sprinklered Properties

Report objectives

The purpose of this report is to give an over view of the fire and life safety requirements for this building. This report will assist in the design and layout of the building.

This project was designed with the guidelines of the Cal Poly FPE program.

Building Fire Protection and Life Safety Features

Classification of areas/rooms in project

In this section each floor has been represented and broken up into different colors. This will show all the different types of areas/rooms in the project.

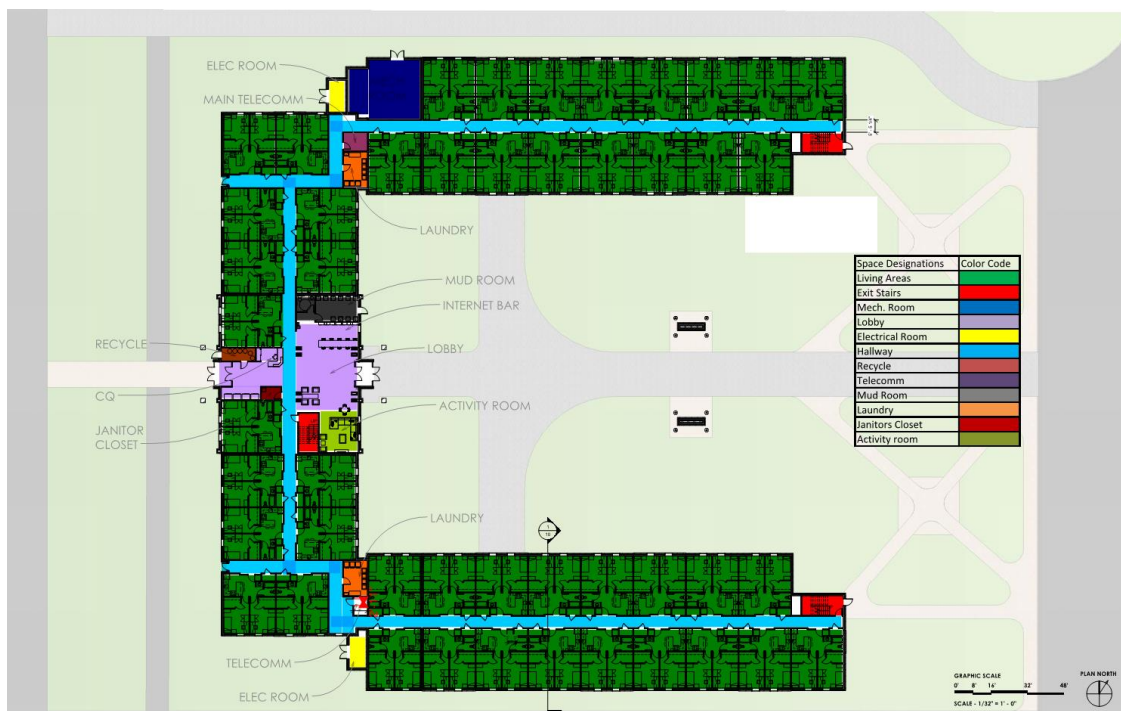


Figure 2 First Floor (NTS)

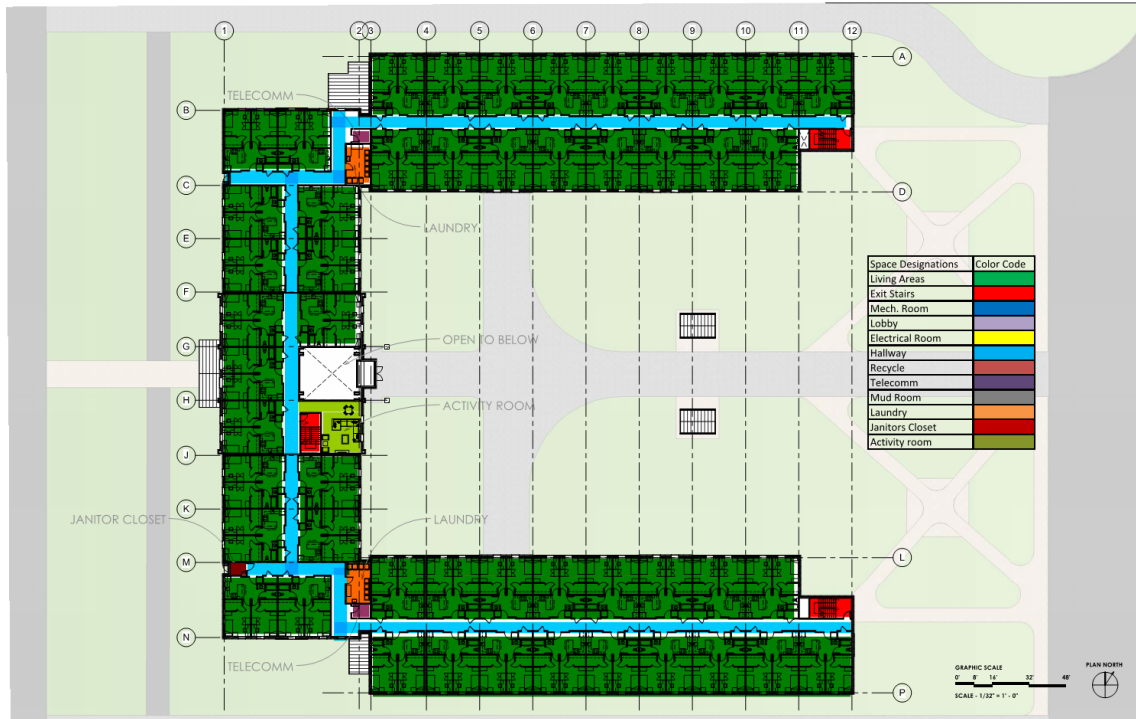


Figure 3 Second Floor (NTS)

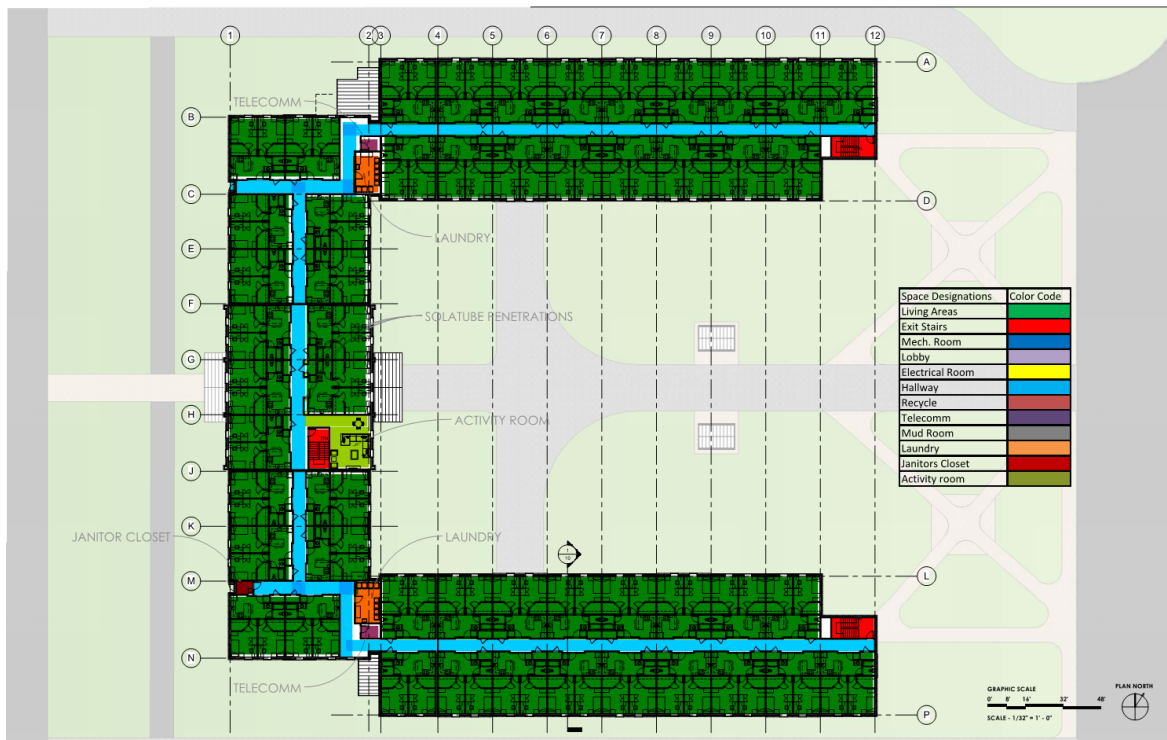


Figure 4 Third Floor (NTS)

Occupancy Classification

Note that military projects require the building size, height and area to be in accordance with IBC requirements and the life safety and egress features to be in accordance with NFPA 101.

IBC: Residential (R-2)

Section 310 Residential Group R

- 310.4 Residential Group R-2
"Residential occupancies containing sleeping units or more than two dwelling units where the occupants are primarily permanent in nature..."
- Apartment Houses

IBC: Storage (S-1)

Section 311 Storage Group S

- 311.2 Moderate-hazard storage Group S-1
"Buildings occupied for storage uses that are not classified as group S-2, ..."
- Mechanical room
- Electrical room

IBC: Storage (S-2)

Section 311 Storage Group S

- 311.3 Low-hazard storage Group S-2
"Includes, among others, buildings used for storage of noncombustible material such as products on wood pallets or in paper cartons with or without single thickness divisions; or in paper wrappings. Such products are permitted to have a negligible amount of plastic trim, such as door knobs, handles or film wrapping..."
- Washers and dryers
- Recycle
- Janitors room

IBC: Section 509 Incidental Uses

Table 509 Incidental Uses

Laundry rooms over 100 square feet

- 1 hour separations
OR
- Provide automatic sprinkler system

Waste and linen collection rooms over 100 Square feet

- 1 hour separations
Or
- Provide automatic sprinkler system

NFPA 101: Classification of occupancy an Hazard of Contents (Chapter 6)

6.1.8 Residential

- 6.1.8.1.5 Definitions- Apartment Building
"A building or portion thereof containing three or more dwelling units with independent cooking and bathroom facilities."

NFPA 101: New Apartment Building (Chapter 30)

All sections of this chapter are applicable to this project.

| Floor | Gross Floor Area (SF) | Occupancy Descriptions |
|-----------------|-----------------------|--------------------------------|
| 1 st | 38,574 | R-2, S-1, S-2, Incidental Uses |
| 2 nd | 37,029 | R-2, S-2, Incidental uses |
| 3 rd | 37,778 | R-2, S-2, Incidental uses |

Table 1 Occupancy overview of building

Construction Type

IBC Type V-B

- IBC: Section 602.5 Type V-B
Is to comply with Table 601 in the IBC 2012 and Chapter 23.

NFPA 101 section 30.1.6 Minimum Construction Requirements.

"(No Special Requirements)"

Fire-Resistance Rating Requirements

Structural Fire- Resistance Rating Requirements

IBC Type V-B

- IBC: Section 602.5 Type V-B
Type V construction is that type of construction in which the structural elements, exterior walls and interior walls are of any material permitted by this code.

For a Type V-B there are no special requirements that are being put on this building. The building elements do not require any fire resistive rating based on the code and table 601 below. There are fire walls in the building that will be required to have a rating and that is covered in another section of this report. This building is not close to other buildings (greater than 30 ft.) so the separation requirements are met as well.

**TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)**

| BUILDING ELEMENT | TYPE I | | TYPE II | | TYPE III | | TYPE IV | TYPE V | |
|---|-------------------------------|------------------|------------------|----------------|------------------|---|---------------------|------------------|---|
| | A | B | A ^c | B | A ^d | B | HT | A ^c | B |
| Primary structural frame ^a (see Section 202) | 3 ^a | 2 ^a | 1 | 0 | 1 | 0 | HT | 1 | 0 |
| Bearing walls | | | | | | | | | |
| Exterior ^{c, g} | 3 | 2 | 1 | 0 | 2 | 2 | 2 | 1 | 0 |
| Interior | 3 ^a | 2 ^a | 1 | 0 | 1 | 0 | 1/HT | 1 | 0 |
| Nonbearing walls and partitions | See Table 602 | | | | | | | | |
| Exterior | | | | | | | | | |
| Nonbearing walls and partitions | | | | | | | | | |
| Interior ^e | 0 | 0 | 0 | 0 | 0 | 0 | See Section 602.4.6 | 0 | 0 |
| Floor construction and associated secondary members (see Section 202) | 2 | 2 | 1 | 0 | 1 | 0 | HT | 1 | 0 |
| Roof construction and associated secondary members (see Section 202) | 1 ^{1/2} ^b | 1 ^{b,c} | 1 ^{b,c} | 0 ^c | 1 ^{b,c} | 0 | HT | 1 ^{b,c} | 0 |

Table 2 IBC Table 601 Fire Resistance Rating Requirements Building Elements

**TABLE 602
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE^{a, h}**

| FIRE SEPARATION DISTANCE = X (feet) | TYPE OF CONSTRUCTION | OCCUPANCY GROUP H ^f | OCCUPANCY GROUP F-1, M, S-1 ^g | OCCUPANCY GROUP A, B, E, F-2, I, R, S-2 ^g , U ^h |
|-------------------------------------|----------------------|--------------------------------|--|---|
| X < 5 ^c | All | 3 | 2 | 1 |
| 5 ≤ X < 10 | IA | 3 | 2 | 1 |
| | Others | 2 | 1 | 1 |
| 10 ≤ X < 30 | IA, IB | 2 | 1 | 1 ^d |
| | IIB, VB | 1 | 0 | 0 |
| | Others | 1 | 1 | 1 ^d |
| X ≥ 30 | All | 0 | 0 | 0 |

Table 3 IBC Table 602 Fire Resistance rating Requirements for Exterior Walls

Interior Finishes Fire- Resistance Rating Requirements

Interior finishes need to comply with Chapter 8 of the IBC. IBC Table 803.9 gives interior wall and ceiling flame spread finish requirements by occupancy type for the room or area. As a general rule, the installation of a fire sprinkler system usually allows for a one “class” reduction for the IBC Table 803.9 requirements.

Interior finishes are classified according to the ASTM E 84 or UL 723 standard according to three classes for ASTM E 84 or UL 723 flame spread and smoke developed indices:

- Class A: flame spread 0-25, smoke developed 0-450.
- Class B: flame spread 26-75, smoke developed 0-450.
- Class C: flame spread 76-200, smoke developed 0-450.

**TABLE 803.9
INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY^a**

| GROUP | SPRINKLERED ^d | | | NONSPRINKLERED | | |
|-----------------------------|---|---|--|---|---|--|
| | Interior exit stairways, interior exit ramps and exit passageways ^{a, b} | Corridors and enclosure for exit access stairways and exit access ramps | Rooms and enclosed spaces ^c | Interior exit stairways, interior exit ramps and exit passageways ^{a, b} | Corridors and enclosure for exit access stairways and exit access ramps | Rooms and enclosed spaces ^c |
| A-1 & A-2 | B | B | C | A | A ^e | B ^e |
| A-3 ^f , A-4, A-5 | B | B | C | A | A ^e | C |
| B, E, M, R-1 | B | C | C | A | B | C |
| R-4 | B | C | C | A | B | B |
| F | C | C | C | B | C | C |
| H | B | B | C ^g | A | A | B |
| I-1 | B | C | C | A | B | B |
| I-2 | B | B | B ^{h, i} | A | A | B |
| I-3 | A | A ^j | C | A | A | B |
| I-4 | B | B | B ^{h, i} | A | A | B |
| R-2 | C | C | C | B | B | C |
| R-3 | C | C | C | C | C | C |
| S | C | C | C | B | B | C |
| U | No restrictions | | | No restrictions | | |

Table 4 IBC Table 803.9 Interior Wall and Ceiling Finish Requirements

The building in case is required to have all class C interior finishes based on the fact it will be fully sprinklered. So as long as the finishes meet the class C rating it will be good to go.

Area, Height and Stories

Based on the current building design and assumptions, the following is a breakdown of the areas by occupancy for the building:

Group R-2

38,574 square feet each

IBC Table 503 allows a basic allowable area per story of 7,000 square feet, 2 stories, and a maximum building height of 40 feet for an R-2 Occupancy of Type V-B Construction. The number of stories can be increased by 1-story, for a total of 3 stories in accordance with IBC Section 504.2 because the building will be provided with a NFPA 13R automatic sprinkler system. The basic allowable area can be increased in accordance with IBC Section 506. See Below Area Calculations:

$$A_a = [A_t + (A_t \times I_f) + (A_t \times I_s)]$$

Where: A_a = Allowable Building Area Per Story

A_t = Tabular Building Area per story per IBC Table 503 = 7,000 sf

I_f = Area Increase due to frontage (see below) = .75

I_s = Area Increase due to sprinkler protection per IBC Section 506.3 =
0 (no sprinkler increase for NFPA 13R sprinklr system)

$$I_f = (F/P - 0.25) \frac{W}{30}$$

Where:

F = Building Perimeter that fronts a public way or open space having 20 feet open minimum width

P = Perimeter of entire Building

W = Width of Public way or open space in accordance with IBC Section 506.2.1. = 30 because all sides front a maximum 30 foot public way

Note: the value of F/P = 1 because the entire building fronts a minimum 20 foot public way

Applying the above:

$A_a = [7,000sf + (7,000sf \times .75) + (7,000sf \times 0)] = 12,250sf$ = Allowable building area per floor for the R-2 Occupancy.

The maximum area of a building equipped throughout with an automatic sprinkler system in accordance with NFPA 13R can be determined by multiplying the allowable area per story (Aa), as determined in Section 506.1, by the number of stories above grade plane (3) in accordance with IBC Section 506.4.1 Exception 2.

The allowable building area is determined to be 36,750 square feet. Therefore, the building is not in compliance with allowable height, area and story limitations.

This building will need to be broken up into multiple buildings by adding fire walls in multiple locations to meet the allowable building area requirements. The fire walls shall be in accordance with IBC section 706 Fire Walls. In accordance to IBC Table 706.4 group R-2 occupancies will need to have a 2 hour rated fire wall with exception (a) which allows the 2 hour rating for type V construction. This is also in accordance with UFC 3-600-01 section 2-2.3 where the minimum rated fire wall shall be two hours.

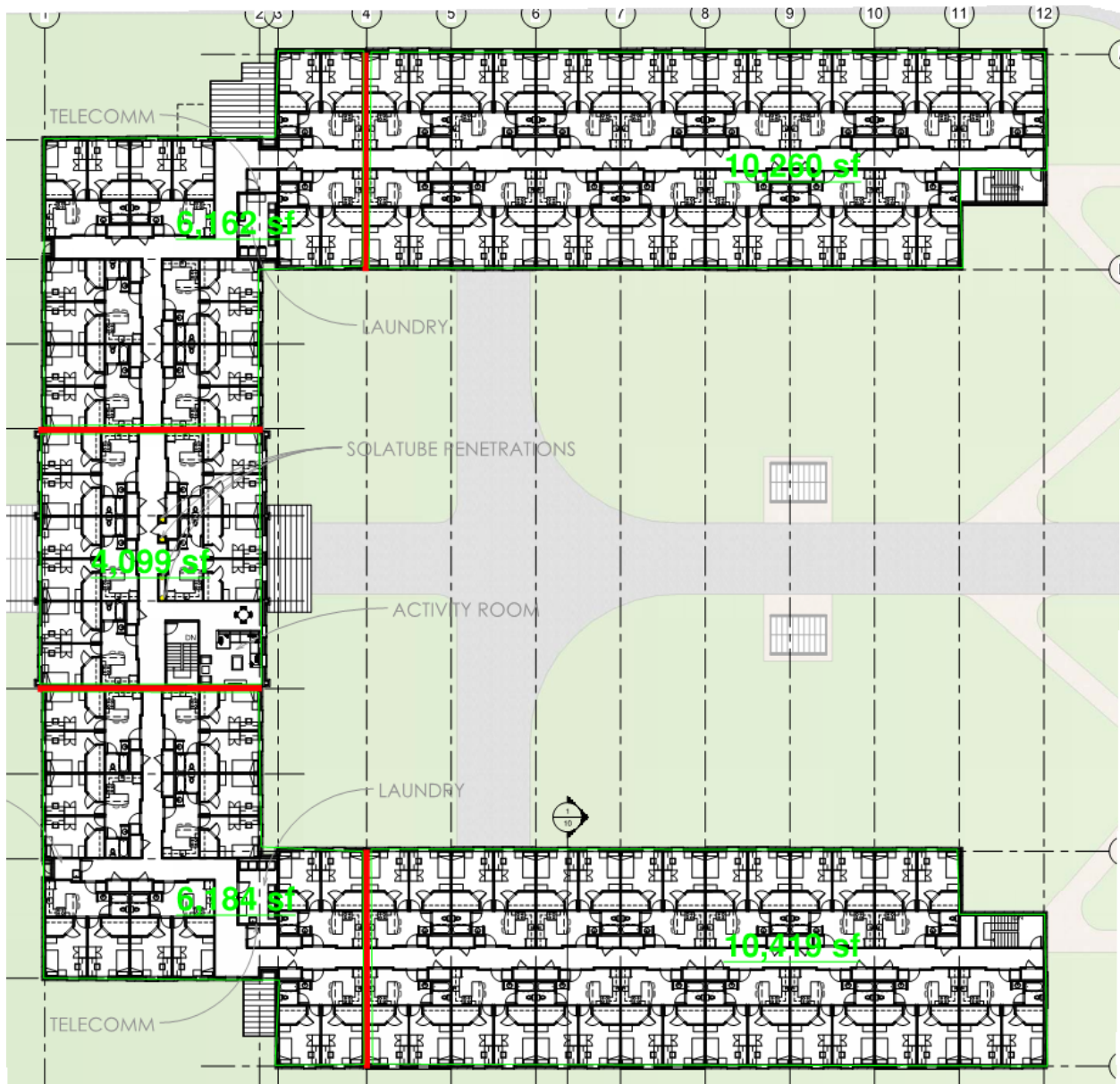


Figure 5 The Figure represents all floors

With the Fire walls in place the recycle and laundry areas become incidental uses and comply with IBC Section 509.3 That these areas are not more than 10 percent of the floor area. Along with following IBC Table 509 They will be permitted.

Group S-1

IBC Table 503 allows a basic allowable area per story of 9,000 square feet, 1 stories, and a maximum building height of 40 feet for an S-1 Occupancy of Type V-B Construction. The basic allowable area can be increased in accordance with IBC Section 506. This area is in compliance with allowable height, area and story limitations without increases.

Group S-2

IBC Table 503 allows a basic allowable area per story of 13,500 square feet, 2 stories, and a maximum building height of 40 feet for an S-2 Occupancy of Type V-B Construction. The basic allowable area can be increased in accordance with IBC Section 506. This area is in compliance with allowable height, area and story limitations without increases.

Mixed Use and Occupancy

Group S-1 and Group S-2 shall be classified as an Accessory occupancies in accordance with IBC section 508.2. Along with IBC section 508.2.1 where the area does not exceed 10 percent of the building and meets IBC table 503 without any increase. These areas meet all of these requirements.

Occupancy Separations

Interior Separations

- Vertical shafts are required to be provided with a 1-hour fire resistance rating and 1-hour fire rated doors (automatic-closing doors) in accordance with NFPA 101 section 8.6.5 & 8.6.6.
- Dwelling units are required to be separated from each other and other spaces by walls, floors and ceilings constructed as fire barriers having a minimum ½ hour rating in accordance to NFPA 101 section 30.3.7.2.
- Mechanical and electrical rooms are required to be 1-hour fire rated per NFPA 101 Table 30.3.2.1.1.
- 1-hour fire rated separation and sprinklers between laundry room > 100 square feet and the rest of the building in accordance with NFPA 101 Table 30.3.2.1.1.
- 1-hour fire rated separation and sprinklers between Trash collection rooms and the rest of the building in accordance with NFPA 101 Table 30.3.2.1.1.
- 1-hour fire rated separation between exits paths and the rest of the building in accordance with NFPA 101 section 7.1.3.2.
- Draft stopping shall, be provided in the attic spaces of this building in accordance with IBC section 718.3.2. There will be one draft stop in the attic for every 3,000 sq. ft. or every 2 living units whichever is less.

Exterior separations:

- IBC Table 602 does not require the exterior walls to be rated based on R-2 Occupancy and Type V-B construction. The exterior walls for all buildings are located a minimum of 10 feet from assumed property lines.

Special Situations:

- It is the understanding that “solar light tubes” will be installed through the roof and into the apartments on the 3rd floor. Because the ceiling assembly is rated, the team will be required to install a minimum ½ hour rated fire damper at the ceiling of the 3rd floor unit at the base of the light tube.



Figure 6 First floor wall separations

All other walls are ½ hour separation.



Figure 7 Second floor wall separations

All other walls are ½ hour separation.

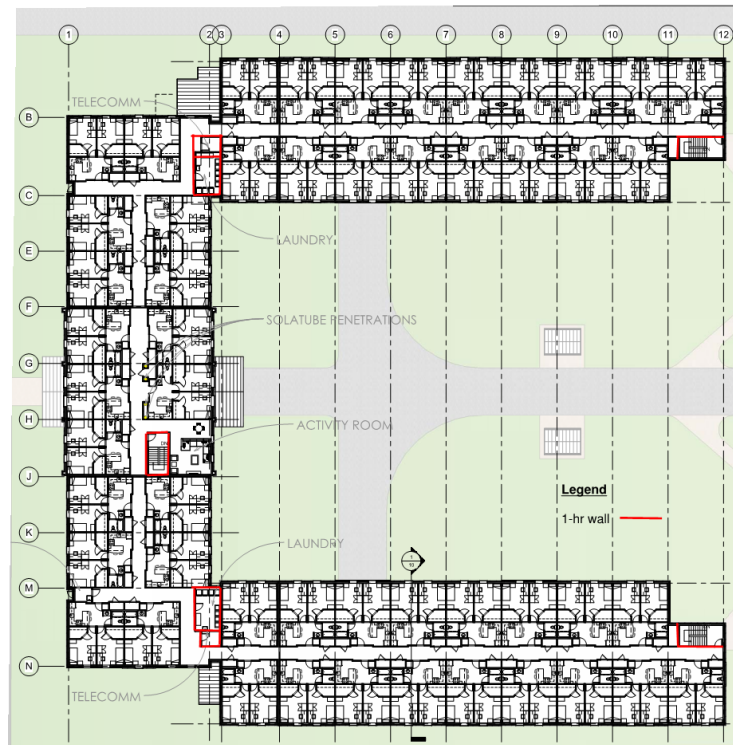


Figure 8 Third floor wall separations

All other walls are ½ hour separation.

- There is a vertical opening connecting the first and second floor together in the center of the building. This for this structure is being called a communication space as defined in NFPA 101 2012 section 8.6.6. This section is sometimes referred to as the mini atrium. This section allows for these openings with less strict rules as a full atrium. Below are the requirements that were required to be met. Also note Figure 9 of the second floor showing the space. The red lines in the space show a 2-hour rated fire wall. Meeting this will save the project many features from being added and being able to keep the look.

NFPA 101 2012

8.6.6 Communicating Space. Unless prohibited by Chapters 11 through 43, unenclosed floor openings forming a communicating space between floor levels shall be permitted, provided that the following conditions are met:

- (1) The communicating space does not connect more than three contiguous stories.*
- (2) The lowest or next-to-lowest story within the communicating space is a street floor.*
- (3) The entire floor area of the communicating space is open and unobstructed, such that a fire in any part of the space will be readily obvious to the occupants of the space prior to the time it becomes an occupant hazard.*
- (4) The communicating space is separated from the remainder of the building by fire barriers with not less than a 1-hour fire resistance rating, unless one of the following is met:*
 - (b) The requirement of 8.6.6(4) shall not apply to fully sprinklered residential housing units of detention and correctional occupancies in accordance with 22.3.1(2) and 23.3.1.1(2).*
- (5) The communicating space has ordinary hazard contents protected throughout by an approved automatic sprinkler system in accordance with Section 9.7 or has only low hazard contents. (See 6.2.2.)*
- (6) Egress capacity is sufficient to allow all the occupants of all levels within the communicating space to simultaneously egress the communicating space by considering it as a single floor area in determining the required egress capacity.*
- (7)*Each occupant within the communicating space has access to not less than one exit without having to traverse another story within the communicating space.*
- (8) Each occupant not in the communicating space has access to not less than one exit without having to enter the communicating space.*

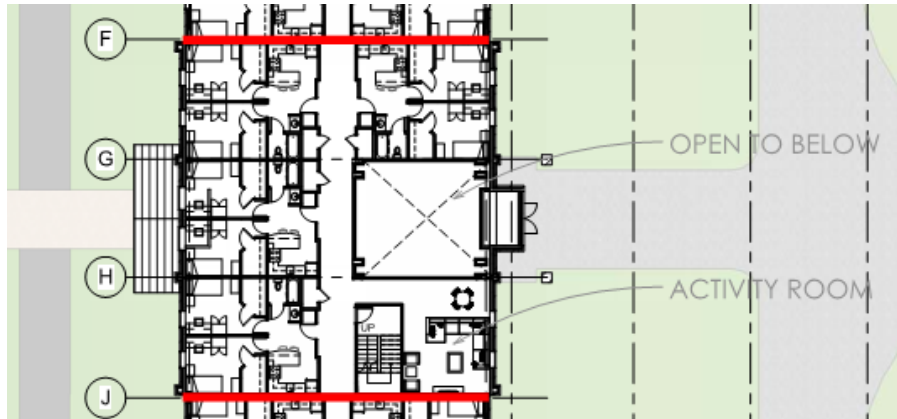


Figure 9 Communicating Space

Means of Egress

Occupant Loads

NFPA 101 code requirements

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.2.3 Capacity of Means of Egress
 - Section 30.2.3.1
"The capacity of means of egress shall be in accordance with section 7.3."
 - Section 30.2.3.2
"Street floor exits shall be sufficient for the occupant load of the street floor plus the required capacity of the stairs and ramps discharging onto the street floor."
 - Section 30.2.3.3
"Corridors with a required capacity of more than 50 persons, as defined in section 7.3, shall be of sufficient width to accommodate the required occupant load but have a width of not less than 44 in."
 - Section 30.2.3.4
"Corridors with a required capacity of not more than 50 persons, as defined in section 7.3, shall be not less than 36 in."

Occupancy Type Storage Ch. 42:

- Section 42.2.3 Capacity of Means of Egress
"The capacity of means of egress shall be in accordance with section 7.3."

General:

- Section 7.3.1.2 Occupant Load Factor
"The occupant load in any building or portion thereof shall be not less than the number of persons determined by dividing the floor area assigned to that use by the occupant load factor for that use as specified in table 7.3.1.2, Figure 7.3.1.2(a), and Figure 7.3.1.2(b). Where both gross and net area figures are given for the same occupancy, calculations shall be made by applying the gross area figure to the gross area of the portion of the building devoted to the use

for which the gross area figure is specified and by applying the net area figure to the net area of the portion of the building devoted to the use for which the net figure is specified.”

Table 7.3.1.2 Occupant Load Factor

| Use | (ft ² /person) ^a | (m ² /person) ^a |
|--|--|---------------------------------------|
| Assembly Use | | |
| Concentrated use, without fixed seating | 7 net | 0.65 net |
| Less concentrated use, without fixed seating | 15 net | 1.4 net |
| Bench-type seating | 1 person/ 18 linear in. | 1 person/ 455 linear mm |
| Fixed seating | Use number of fixed seats | Use number of fixed seats |
| Waiting spaces | See 12.1.7.2 and 13.1.7.2. | See 12.1.7.2 and 13.1.7.2. |
| Kitchens | 100 | 9.3 |
| Library stack areas | 100 | 9.3 |
| Library reading rooms | 50 net | 4.6 net |
| Swimming pools | 50 (water surface) | 4.6 (water surface) |
| Swimming pool decks | 30 | 2.8 |
| Exercise rooms with equipment | 50 | 4.6 |
| Exercise rooms without equipment | 15 | 1.4 |
| Stages | 15 net | 1.4 net |
| Lighting and access catwalks, galleries, gridirons | 100 net | 9.3 net |
| Casinos and similar gaming areas | 11 | 1 |
| Skating rinks | 50 | 4.6 |
| Educational Use | | |
| Classrooms | 20 net | 1.9 net |
| Shops, laboratories, vocational rooms | 50 net | 4.6 net |
| Day-Care Use | 35 net | 3.3 net |
| Health Care Use | | |
| Inpatient treatment departments | 240 | 22.3 |
| Sleeping departments | 120 | 11.1 |
| Ambulatory health care | 100 | 9.3 |
| Detention and Correctional Use | 120 | 11.1 |
| Residential Use | | |
| Hotels and dormitories | 200 | 18.6 |
| Apartment buildings | 200 | 18.6 |
| Board and care, large | 200 | 18.6 |
| Industrial Use | | |
| General and high hazard industrial | 100 | 9.3 |
| Special-purpose industrial | NA | NA |
| Business Use (other than below) | 100 | 9.3 |
| Air traffic control tower observation levels | 40 | 3.7 |

Table 7.3.1.2 Continued

| Use | (ft ² /person) ^a | (m ² /person) ^a |
|---|---|---------------------------------------|
| Storage Use | | |
| In storage occupancies | NA | NA |
| In mercantile occupancies | 300 | 27.9 |
| In other than storage and mercantile occupancies | 500 | 46.5 |
| Mercantile Use | | |
| Sales area on street floor ^{b,c} | 30 | 2.8 |
| Sales area on two or more street floors ^c | 40 | 3.7 |
| Sales area on floor below street floor ^c | 30 | 2.8 |
| Sales area on floors above street floor ^c | 60 | 5.6 |
| Floors or portions of floors used only for offices | See business use. | See business use |
| Floors or portions of floors used only for storage, receiving, and shipping, and not open to general public | 300 | 27.9 |
| Mall buildings ^d | Per factors applicable to use of space ^e | |

Table 5 NFPA 101, 2012- Table 7.3.1.2 Occupant Load Factor

The below calculations reference NFPA 101 2012 section 7.3.1.2 along with table 7.3.1.2 .

Living Areas floor: $23ft * 27ft = 621 ft^2$

Occupant load Factor: $200 \frac{ft^2}{person}$ (Residential use- dormitories)

Living Areas 1st floor occupant load: $621 ft^2 \div 200 \frac{ft^2}{person} = 3.1 = 4 people$

Electrical Room: $8ft * 17ft = 136 ft^2$

Occupant load Factor: $100 \frac{ft^2}{person}$ NET (Industrial- General)

Electrical Room occupant load: $136 ft^2 \div 100 \frac{ft^2}{person} = 1.36 = 2 people$

$$\text{Telecomm Room: } 8ft * 6ft = 48 ft^2$$

$$\text{Occupant load Factor: } 100 \frac{ft^2}{person} \text{ NET (Industrial- General)}$$

$$\text{Telecomm Room occupant load: } 48 ft^2 \div 100 \frac{ft^2}{person} = 0.48 = 1 person$$

$$\text{Mechanical Room: } 34ft * 26ft = 884 ft^2$$

$$\text{Occupant load Factor: } 100 \frac{ft^2}{person} \text{ NET (Industrial- General)}$$

$$\text{Mechanical Room occupant load: } 884 ft^2 \div 100 \frac{ft^2}{person} = 8.84 = 9 people$$

$$\text{Janitors Closet: } 9ft * 6ft = 54 ft^2$$

$$\text{Occupant load Factor: } 500 \frac{ft^2}{person} \text{ (Storage use- In Other)}$$

$$\text{Janitors Closet occupant load: } 54 ft^2 \div 500 \frac{ft^2}{person} = 0.1 = 1 person$$

$$\text{Recycle Room: } 15ft * 6ft = 90 ft^2$$

$$\text{Occupant load Factor: } 500 \frac{ft^2}{person} \text{ (Storage use- In Other)}$$

$$\text{Recycle Room occupant load: } 90 ft^2 \div 500 \frac{ft^2}{person} = 0.18 = 1 person$$

$$\text{Mud Room: } 27ft * 12ft = 324 ft^2$$

$$\text{Occupant load Factor: } 15 \frac{ft^2}{person} \text{ NET (Assembly use-less concentrated)}$$

$$\text{Mud Room occupant load: } 324 ft^2 \div 15 \frac{ft^2}{person} = 21.6 = 22 people$$

Lobby: 1494 ft^2

Occupant load Factor: $15 \frac{\text{ft}^2}{\text{person}}$ NET (Assembly use-less concentrated)

Lobby occupant load: $1494 \text{ ft}^2 \div 15 \frac{\text{ft}^2}{\text{person}} = 100 = 100 \text{ people}$

Activity Room: 432 ft^2

Occupant load Factor: $15 \frac{\text{ft}^2}{\text{person}}$ NET (Assembly use-less concentrated)

Activity room occupant load: $432 \text{ ft}^2 \div 15 \frac{\text{ft}^2}{\text{person}} = 28.8 = 29 \text{ people}$

Laundry Room: $11 \text{ ft} * 16 \text{ ft} = 176 \text{ ft}^2$

Occupant load Factor: $100 \frac{\text{ft}^2}{\text{person}}$ (Business use)

Laundry Room occupant load: $176 \text{ ft}^2 \div 100 \frac{\text{ft}^2}{\text{person}} = 1.76 = 2 \text{ people}$

Building Total

| Occupancy Type | Room | Occupant Load (People) |
|----------------|-----------------|------------------------|
| Residential | Living Areas | 4 each= 592 |
| Industrial | Electrical Room | 2 each =4 |
| Industrial | Telecomm Room | 1 each =6 |
| Assembly | Mud Room | 22 |
| Industrial | Mech. Room | 9 |
| Storage | Janitors Closet | 1 each=3 |
| Assembly | Lobby | 100 |
| Storage | Recycle Room | 1 |
| Assembly | Activity Room | 29 each=87 |
| Business | Laundry Room | 2 each=12 |
| | Total | 836 |

Table 6 Building Occupant Load

1st floor Total

| Occupancy Type | Room | Occupant Load (People) |
|----------------|-----------------|------------------------|
| Residential | Living Areas | 4 each= 188 |
| Industrial | Electrical Room | 2 each =4 |
| Industrial | Telecomm Room | 1 each =2 |
| Assembly | Mud Room | 22 |
| Industrial | Mech. Room | 9 |
| Storage | Janitors Closet | 1 each=1 |
| Assembly | Lobby | 100 |
| Storage | Recycle Room | 1 |
| Business | Laundry Room | 2 each=4 |
| Assembly | Activity Room | 29 each=29 |
| | Total | 360 |

Table 7 Building occupant load 1st floor

2nd floor Total

| Occupancy Type | Room | Occupant Load (People) |
|----------------|-----------------|------------------------|
| Residential | Living Areas | 4 each= 200 |
| Industrial | Telecomm Room | 1 each =2 |
| Assembly | Activity Room | 29 each=29 |
| Business | Laundry Room | 2 each=4 |
| Storage | Janitors Closet | 1 each=1 |
| | Total | 236 |

Table 8 Building occupant load 2nd floor

3rd floor Total

| Occupancy Type | Room | Occupant Load (People) |
|----------------|-----------------|------------------------|
| Residential | Living Areas | 4 each= 204 |
| Industrial | Telecomm Room | 1 each =2 |
| Assembly | Activity Room | 29 each=29 |
| Assembly | Laundry Room | 2 each=4 |
| Storage | Janitors Closet | 1 each=1 |
| | Total | 240 |

Table 9 Building occupant load 3rd floor

Egress Capacity

NFPA 101, 2012 code requirements.

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.2.3 Capacity of Means of Egress
 - Section 30.2.3.1

“The capacity of means of egress shall be in accordance with section 7.3.”

Occupancy Type Storage Ch. 42:

- Section 42.2.3 Capacity of Means of Egress

“The capacity of means of egress shall be in accordance with section 7.3.”

General:

- Section 7.3.3 Egress Capacity
 - Section 7.3.3.1

“Egress capacity for approved components of means of egress shall be based on the capacity factors shown in Table 7.3.3.1, unless otherwise provided in 7.3.3.2.”
 - Section 7.3.3.2

“For stairways wider than 44 in. and subject to the 0.3 in width per person capacity factor, the capacity shall be permitted to be increased using the following equation:

$$C = 146.7 + \left(\frac{W_n - 44}{0.218} \right)$$

Where:

C = capacity, in person, rounded to the nearest integer

W_n = nominal width of the stair as permitted by 7.3.2.2(in.)”

Table 7.3.3.1 Capacity Factors

| Area | Stairways (width/person) | | Level Components and Ramps (width/person) | |
|--------------------------------|-----------------------------|-----|--|----|
| | in. | mm | in. | mm |
| Board and care | 0.4 | 10 | 0.2 | 5 |
| Health care, sprinklered | 0.3 | 7.6 | 0.2 | 5 |
| Health care, nonsprinklered | 0.6 | 15 | 0.5 | 13 |
| High hazard contents | 0.7 | 18 | 0.4 | 10 |
| All others | 0.3 | 7.6 | 0.2 | 5 |

Table 10 NFPA 101 2012 – Table 7.3.3.1 Capacity Factors

- Section 7.3.3.3

“The required capacity of the corridor shall be the occupant load that utilizes the corridor for exit access divided by the required number of exits to which the corridor connects,

but the corridor capacity shall be not less than the required capacity of the exit to which the corridor leads.”

- Section 7.3.4 Minimum Width
 - Section 7.3.4.1

“The width of any means of egress, unless otherwise provided in 7.3.4.1.1 through 7.3.4.1.3, shall be as follows:

(1) Not less than that required for a given egress component in this chapter or Chapters 11 through 43

(2) Not less than 36 in. where another part of this chapter and Chapters 11 through 43 do not specify a minimum width”

The below calculations reference NFPA 101 2012 section 7.3.3.1 along with table 7.3.3.1

Hall Ways 60”=60”/0.2=300 people (Level Compartment-other)

Doors 72”= 72”/0.2=360 people (Level Compartment-other)

Doors 36”= 36”/0.2=180 people (Level Compartment-other)

Stairs 48”= $C = 146.7 + \left(\frac{W_n - 44}{0.218}\right) = C = 146.7 + \left(\frac{48 - 44}{0.218}\right) = 165$ people (Stairs- other)

1st Floor Egress

Doors 72”=360*2=720

Doors 36”=180*5=900

1st Floor total=1620

2nd Floor Egress

Stairs 48”= 165*3=495

2nd Floor total=495

3rd Floor Egress

Stairs 48”= 165*3=495

3rd Floor total=495

The exit capacity does meet the occupant load in accordance to section LSC 7.3.1.1.1 *“The total capacity of the means of egress for any, ..., shall be sufficient for the occupant load thereof.”* The total occupant load of 896 and the egress capacity is 1620 on the first floor. Each floor on its own also meets the egress capacity. The hallways also meet the minimum width requirement as well.

Number of Exits

NFPA 101 code requirements

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.2.4 Number of Means of Egress
 - Section 30.2.4.1

“The number of mean of egress shall comply with section 7.4.”
 - Section 30.2.4.3

“Every dwelling unit shall have access to at least two separate exits remotely located from each other as required by 7.5.1.”

Occupancy Type Storage Ch. 42:

- Section 42.2.5 Number of Means of Egress
"The number of mean of egress shall comply with any of the following:
 - (1) In low hazard storage occupancies, a single means of egress shall be permitted from any story or section.*
 - (2) In ordinary hazard storage occupancies, a single means of egress shall be permitted from any story or section, provided that the exit can be reached within the distance permitted as a common path of travel.*
 - (3) All buildings or structures not complying with 42.2.1 (1) or (2) and used for storage, and every section thereof considered separately , shall have not less hat two separate means of egress as remotely located from each other as practicable."*

General:

- Section 7.4.1.1
"The number of means of egress from any balcony, mezzanine, story, or portion thereof shall be not less than two except under one of the following conditions:
 - (1) A single means of egress shall be permitted where permitted in Chapters 11 through 43.*
 - (2) A single means of egress shall be permitted for a mezzanine or balcony where the common path of travel limitations of Chapter 11 through 43 are met."*
- Section 7.4.1.2
"The number of means of egress from any story or portion thereof, other than for existing buildings as permitted in Chapters 11 through 43 , shall be as follows:
 - (1) Occupant load more than 500 but not more that 1000 - not less than 3*
 - (2) Occupant load more than 1000 – not less than 4"*
- Section 7.4.1.4
"The occupant load of each story considered individually shall be required to be used in computing the number of means of egress at each story, provided that the required number of means of egress is not decreased in the direction of travel."
- 7.4.2 Spaces About Electrical Equipment
 - Section 7.4.2.1 600 Volts, Nominal, or less
"The minimum number of means of egress for working space about electrical equipment, other than existing electrical equipment, shall be in accordance with NFPA 70, National Electrical Code, Section 110.26(C)"
 - Section 7.4.2.2 Over 600 Volts, Nominal
"The minimum number of means of egress for working space about electrical equipment, other than existing electrical equipment, shall be in accordance with NFPA 70, National Electrical Code, Section 110.33(A)"

Number of exits table.

| Occupancy Type | Room | Occupant Load (People) | Number of Exits | Exits Required |
|----------------|-----------------|------------------------|-----------------|----------------|
| Residential | Living Areas | 4 each= 592 | 1 per | 1 per |
| Industrial | Electrical Room | 2 each =4 | 1 | 1 |
| Industrial | Telecomm Room | 1 each =6 | 1 | 1 |
| Assembly | Mud Room | 22 | 2 | 1 |
| Industrial | Mech. Room | 9 | 1 | 1 |
| Storage | Janitors Closet | 1 each=3 | 1 | 1 |
| Assembly | Lobby | 100 | 4 | 2 |
| Storage | Recycle Room | 1 | 2 | 1 |
| Assembly | Activity Room | 29 each=87 | 1 | 1 |
| Floor | Total | 896 | 6 | 3 |

Table 11 Number of exits per occupancy

Project overview:

Occupancy Type New Apartment Buildings CH. 30:

All areas of this building meet the requirements listed above. The main floor is in accordance with Section 7.4.1.2 and has more than 3 exits. The main floor has the highest occupant load of 380 and has 6 exits from the building. Each section requires at least 2 means of egress and 3 is the minimum number of exits on each floor.

Occupancy Type Storage Ch. 42:

These occupancies meet the required Section 42.2.5 1 and 2 for their respective hazards. The electrical room is still an unknown due to the fact the electrical equipment being put in is not known yet.

Arrangement of Exits

NFPA 101 code requirements

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.2.5 Arrangement of Egress
 - Section 30.2.5.1

"Access to all required exits shall be in accordance with section 7.5 and modified by 30.2.5.2."

Occupancy Type Storage Ch. 42:

- Section 42.2.5 Arrangement of Means of Egress

"Means of egress, arranged in accordance with section 7.5, shall not exceed that provided by table 42.2.5."

Table 42.2.5 Arrangements of Means of Egress

| Level of Protection | Low Hazard Storage Occupancy | Ordinary Hazard Storage Occupancy | | High Hazard Storage Occupancy |
|--|------------------------------|-----------------------------------|----|---|
| | | ft | m | |
| Dead-End Corridor | | | | |
| Protected throughout by an approved, supervised automatic sprinkler system in accordance with 9.7.1.1(1) | NL | 100 | 30 | Prohibited, except as permitted by 7.11.4 |
| Not protected throughout by an approved, supervised automatic sprinkler system in accordance with 9.7.1.1(1) | NL | 50 | 15 | Prohibited, except as permitted by 7.11.4 |
| Common Path of Travel | | | | |
| Protected throughout by an approved, supervised automatic sprinkler system in accordance with 9.7.1.1(1) | NL | 100 | 30 | Prohibited, except as permitted by 7.11.4 |
| Not protected throughout by an approved, supervised automatic sprinkler system in accordance with 9.7.1.1(1) | NL | 50 | 15 | Prohibited, except as permitted by 7.11.4 |

NL: Not limited.

Table 12 NFPA 101, 2012 – Table 42.2.5 Arrangements of means of egress

General:

- Section 7.5.1.3.3
"In buildings protected throughout by an approved, supervised automatic sprinkler system in accordance with section 9.7, the minimum separation distance between two exits, exit accesses, or exit discharges, measured in accordance with 7.5.1.3.2, shall be not less than one-third the length of the maximum overall dimension of the building or area to be served."

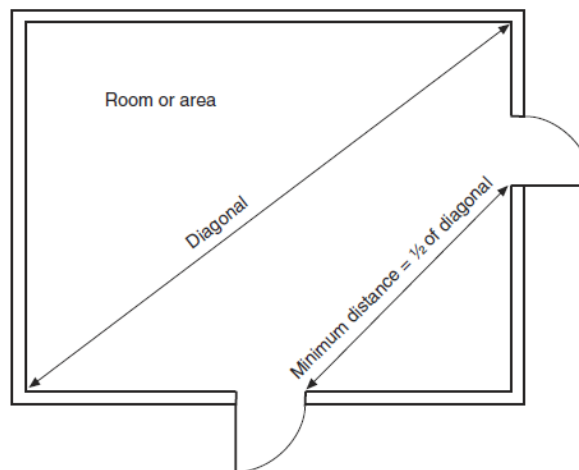


Figure 10 Example of how to calculate the diagonal rule.

Project overview:

Occupancy Type New Apartment Buildings CH. 30:

There are two areas in the building that these rules apply to. The lobby area and the stairwell exits. Both of these areas meet the one-third rule for remoteness of exits.

Occupancy Type Storage Ch. 42:

All of these occupancies have only a single exit and are in compliance in the above code.

Travel Distance to Exits

NFPA 101 code requirements

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.2.6 travel Distance of Exits
 - Section 30.2.6.2 *“Travel distance within a dwelling unit (apartment) to a corridor door shall not exceed 125 ft. in buildings protected throughout by an approved, supervised automatic sprinkler system installed in accordance with 30.3.5.”*
 - Section 30.2.6.3.2 *“In buildings protected throughout by an approved, supervised automatic sprinkler system installed in accordance with 30.3.5, the travel distance from a dwelling unit (apartment) entrance door to the nearest exit shall not exceed 200ft.”*
 - Section 30.2.6.4 *“The travel distance, from areas other than those within living units, to an exit, shall not exceed 200 ft. or 250 ft. in buildings protected throughout by an approved supervised automatic sprinkler system installed in accordance with 30.3.5.5.”*

Occupancy Type Storage Ch. 42:

- Section 42.2.6 Travel Distance to Exits
 - “Travel distance, measured in accordance with Section 7.6, shall not exceed that provided by table 42.2.6.”*

Table 42.2.6 Maximum Travel Distance to Exits

| Level of Protection | Low Hazard Storage Occupancy | Ordinary Hazard Storage Occupancy | | High Hazard Storage Occupancy | |
|--|------------------------------|-----------------------------------|-----|-------------------------------|----|
| | | ft | m | ft | m |
| Protected throughout by an approved, supervised automatic sprinkler system in accordance with 9.7.1.1(1) | NL | 400 | 122 | 100 | 30 |
| Not protected throughout by an approved, supervised automatic sprinkler system in accordance with 9.7.1.1(1) | NL | 200 | 61 | 75 | 23 |
| Flammable and combustible liquid products stored and protected in accordance with NFPA 30, <i>Flammable and Combustible Liquids Code</i> | NA | NA | NA | 150 | 46 |

NL: Not limited. NA: Not applicable.

Table 13 NFPA 101, 2012 – Table 42.2.6 Maximum travel distance to Exits

Project overview:

Occupancy Type New Apartment Buildings CH. 30:

The travel distance in this building from the most remote unit is 100 ft. This meets the requirements listed above. All other areas for the building that are not units meet the above requirements as well. They are located centrally in the building next to exits.

Occupancy Type Storage Ch. 42:

All storage areas meet the requirements above for travel distances. These areas are located centrally next to an exit or are exiting directly out of the building.

Common Paths

NFPA 101 code requirements

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.2.5 Arrangement of Egress
 - Section 30.2.5.3.2 *“No Common Path of travel shall exceed 50 ft. in buildings protected throughout by an approved, supervised automatic sprinkler system installed in accordance with 30.3.5. Travel within a dwelling unit shall not be included when determining common path of travel.”*

Occupancy Type Storage Ch. 42:

- Please refer to Table 42.2.5 for lengths.

General:

- Section A7.5.1.5 “...A common path of travel exists where a space is arranged so that occupants within that space are able to travel in only one direction to reach any of the exits or to reach the point at which occupants have the choice of two paths of travel to remote exits....”

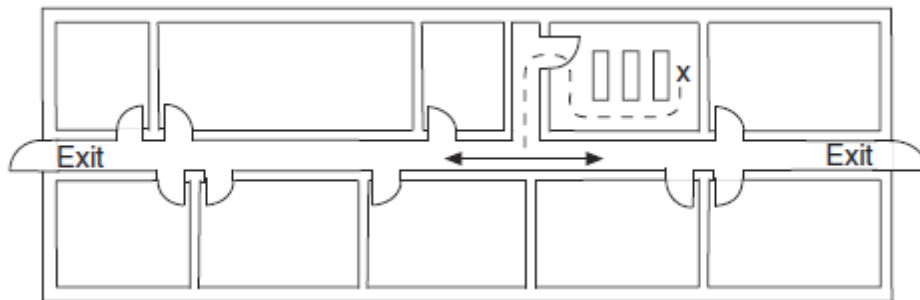


Figure 11 Common Path Example

There is a common path on the North West and South East side of the building the hallway leads to a path where a choice between two exits occurs on the 2nd and 3rd floor.

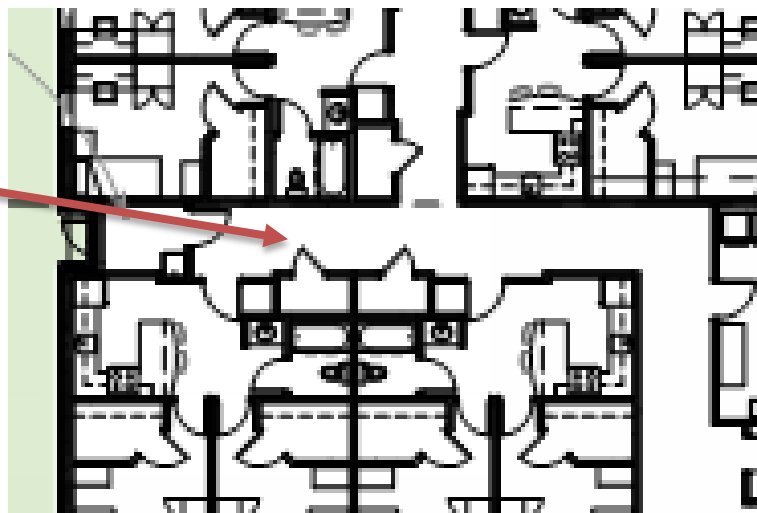


Figure 12 Section of building showing common path

Project overview:

Occupancy Type New Apartment Buildings CH. 30:

For our project all the New Apartment Buildings Occupancies meet the common path of travel requirement.

Occupancy Type Storage Ch. 42:

For our project all the Storage Occupancies meet the common path of travel requirement.

Dead-Ends

NFPA 101 code requirements

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.2.5 Arrangement of Egress
 - Section 30.2.5.4.2 *"Dead-end corridors shall not exceed 50 ft. in buildings protected throughout by an approved, supervised automatic sprinkler system in accordance with 30.3.5."*

Occupancy Type Storage Ch. 42:

- Please refer to Table 42.2.5 for lengths.

General:

- Section A7.5.1.5 *"...a dead end is similar to a common path of travel, a dead end can exist where there is no path of travel from an occupied space but can also exist where an occupant enters a corridor thinking there is and exit at the end and, finding none, is forced to retrace his or her path to reach a choice of exits."*

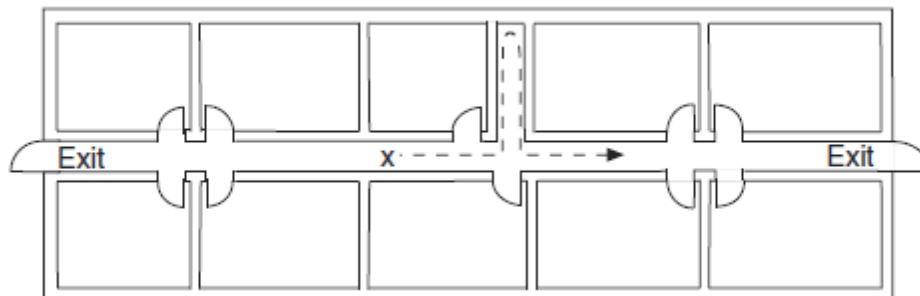


Figure 13 Dead-End Example

The Activity room is a dead end area on the 1st, 2nd, and 3rd floor.

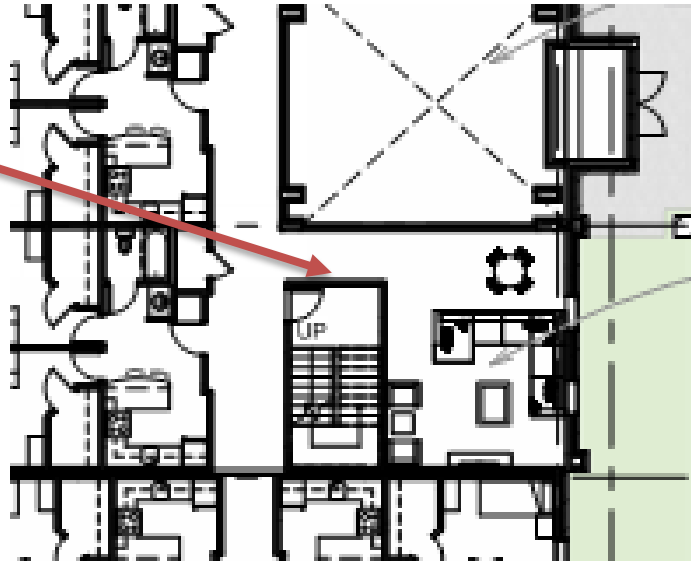


Figure 14 Section of the building showing a dead end

There is a dead-end on the North West and South East side of the building the hallway lead to no exits on the 2nd and 3rd floor.

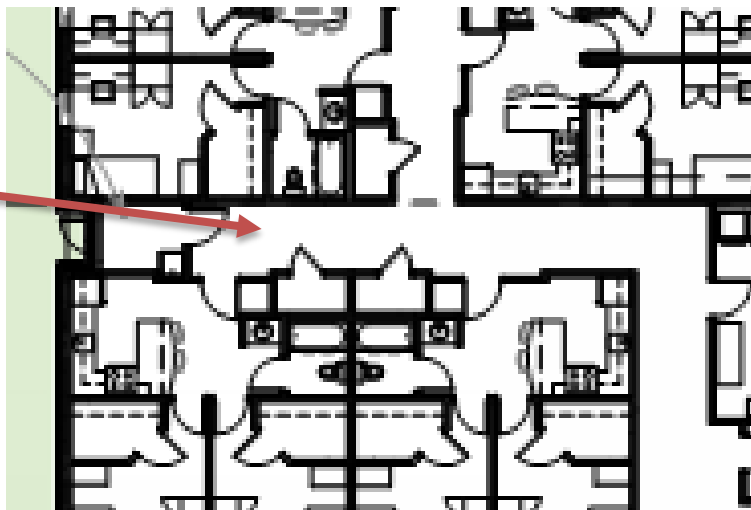


Figure 15 Section of building showing a dead end

Project overview:

Occupancy Type New Apartment Buildings CH. 30:

For out project all the R-2 Occupancies meet the dead-end path of travel requirement.

Occupancy Type Storage Ch. 42:

For out project all the S-1 and S-2 Occupancies meet the dead-end path of travel requirement.

Discharge from Exits

NFPA 101 code requirements

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.2.7 Discharge from Exits
"Exit discharge shall comply with Section 7.7"

Occupancy Type Storage Ch. 42:

- Section 42.2.7 Discharge from Exits
"Discharge from exits shall be in accordance with Section 7.7"

General:

- Section 7.7.1 Exit Termination
"Exits shall terminate directly, at a public way or at an exterior exit discharge, unless otherwise proved in 7.7.1.2 through 7.7.1.4."
- Section 7.7.1.1
"Yards, courts, open spaces, or other portions of the exit discharge shall be of the required width and size to provide all occupants with a safe access to a public way."
- Section 7.7.1.2
"The requirement of 7.7.1 shall not apply to interior exit discharge as otherwise provided in 7.7.2."
- Section 7.7.1.3
"The requirement of 7.7.1 shall not apply to rooftop exit discharges as otherwise provided in 7.7.6."
- Section 7.7.2 Exit Discharge through the Interior Building Area
"Exits shall be permitted to discharge through interior building areas, provided that all of the following are met:
 - (1) *Not more than 50 percent of the required number of exits, and not more than 50 percent of the required egress capacity, shall discharge through areas of any level of discharge, except as otherwise permitted by one of the following:*
 - (a) *Once hundred percent of the exits shall be permitted to discharge through areas of any level of discharge in detention and correctional occupancies as otherwise provided in chapters 22 and 23.*
 - (b) *In existing buildings, the 50 percent limit on egress capacity shall not apply in the 50 percent limit on the required number of exits is met.*

- (2) Each level of discharge shall discharge directly outside at the finished ground level or discharge directly outside and provide access to the finished ground level by outside stairs or outside ramps.*
- (3) The interior exit discharge shall lead to a free and unobstructed way to the exterior of the building, and such way shall be readily visible and identifiable from the point of discharge from the exit.*
- (4) The interior exit discharges shall be protected by one of the following methods:*
 - (a) The level of discharge shall be protected throughout by an approved automatic sprinkler system in accordance with section 9.7, or the portion of the level discharge used for interior exit discharge shall be protected by an approved automatic sprinkler system in accordance with section 9.7 and shall be separated from the nonsprinklered portion of the floor by fire barriers with a fire resistance rating meeting the requirements for the enclosure of exits. (See 7.1.3.2.1)*
 - (b) The interior exit discharge area shall be in a vestibule or foyer that meets all of the following criteria:*
 - i. The depth from the exterior of the building shall be not more than 10 ft., and the length shall be not more than 30ft.*
 - ii. The foyer shall be separated from the remainder of the level discharge by construction providing protection not less than the equivalent of wired glass steel frames or 45 minutes fire resistive construction.*
 - iii. The foyer shall serve only as a means of egress and shall include an exit directly to the outside.*
- (5) The entire area on the level discharge shall be separated from areas below contrition having a fire resistance rating not less than that required from the exit enclosure, unless otherwise specified in 7.7.2(6).*
- (6) Levels below the level of discharge in an atrium shall be permitted to be open to the level of discharge where such level of discharge is protected in accordance with 8.6.7.”*

This is the interior exit discharge.
This is one of three stairwells in the
building. This exit meets all the
requirements posted by section 7.7.2
of NFPA 101 2012.

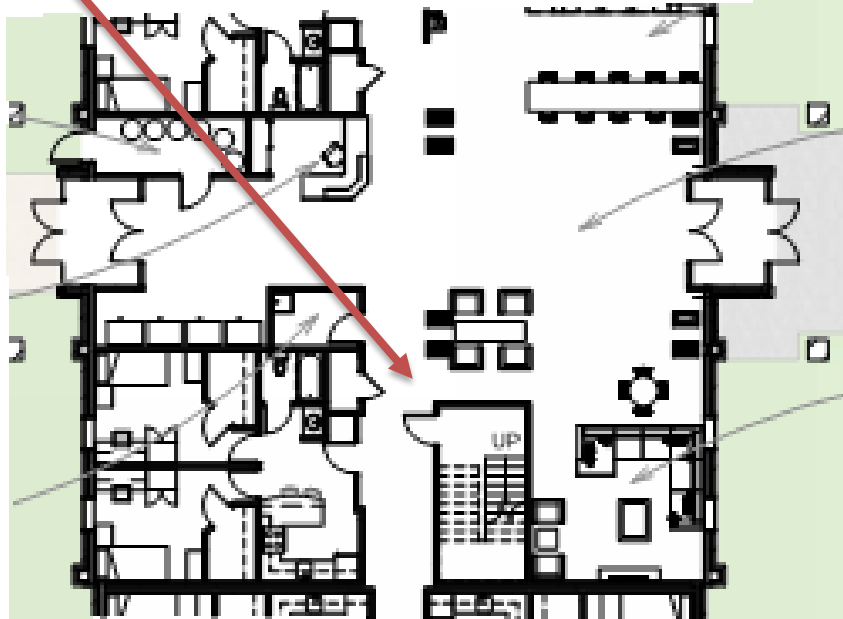


Figure 16 Interior exit discharge

The Exit discharge requirements above have all been met by this building.

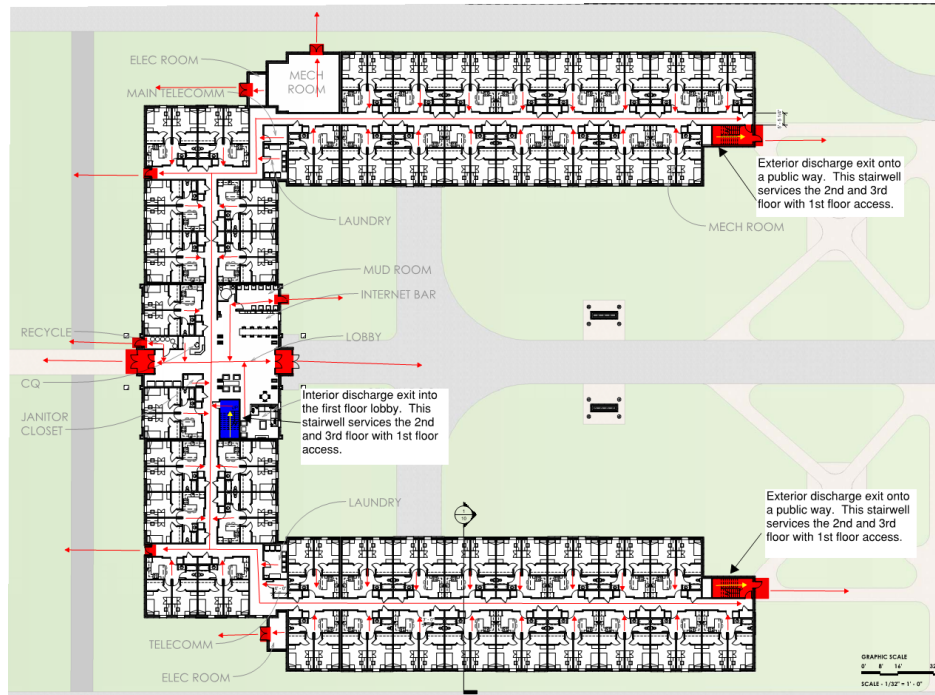


Figure 17 First Floor Exit Plan

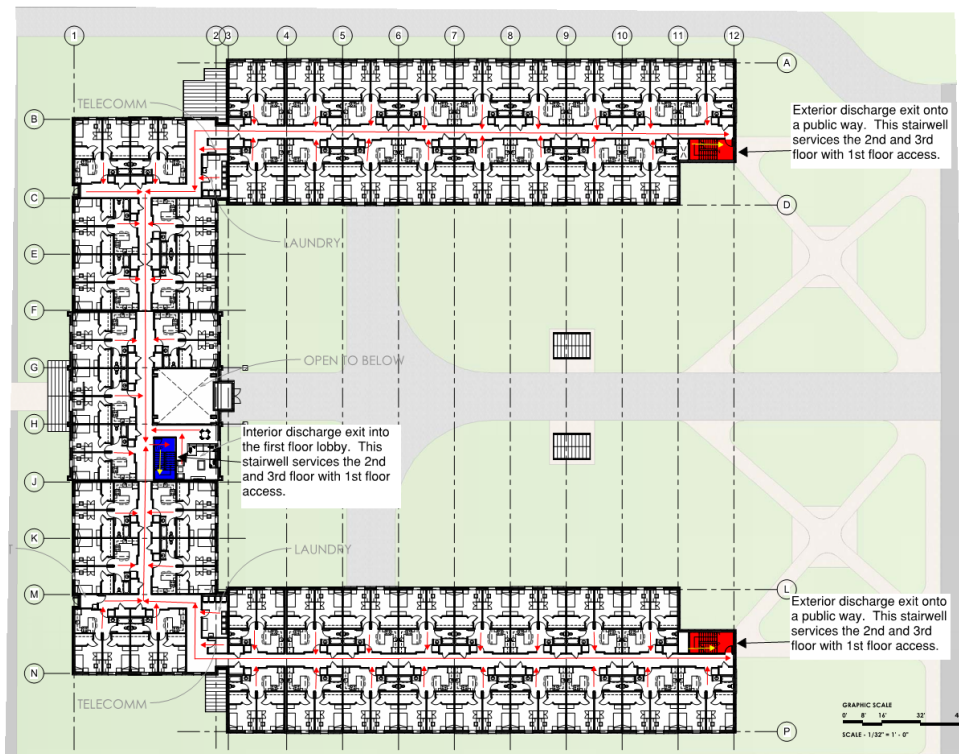


Figure 18 Second Floor Exit Plan

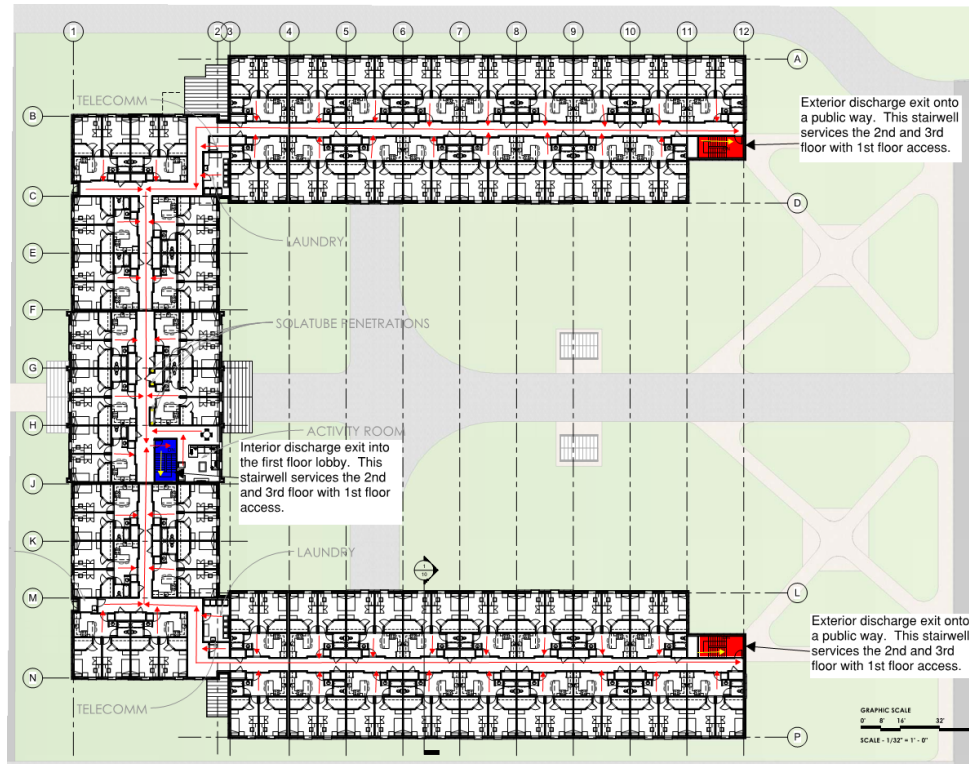


Figure 19 Third Floor Exit Plan

Exit Sign Locations

NFPA 101 code requirements

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.2.10 Marking of Means of Egress
"Mean of egress shall have signs in accordance with Section 7.10 in all buildings requiring more than one exit."

Occupancy Type Storage Ch. 42:

- Section 42.2.10 Marking of Means of Egress
"Mean of egress shall have signs in accordance with Section 7.10"

General:

- Section 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."*
- Section 7.10.1.2.2 *"Horizontal components of the egress path within an exit enclosure shall be marked by approved exit or directional exit signs where the continuation of the egress path is not obvious."*

- Section 7.10.1.5.1 *“Access to exits shall be marked by approved, readily visible signs in all cases where the exit or way to reach the exit is not readily apparent to the occupants.”*
- Section 7.10.1.5.2 *“New Sign placement shall be such that no point in an exit access corridor is in excess of the rated viewing distance or 100ft, whichever is less, from the nearest sign.”*

IBC Code Requirements

- Section 1011 Exit Signs
 - Section 1011.1 Where required

“Exits and exit access doors shall be marked by an approved exit sign readily visible from any direction of egress of travel. The path of egress travel to exits and within exits shall be marked by readily visible exit signs to clearly indicate the direction of egress travel in cases where the exit or path of egress travel is not immediately visible to occupants. Intervening means of egress doors within exits shall be marked by exit signs. Exit sign placement shall be such that no point in an exits access corridor or exit passageway is more than 100 feet or the listed viewing distance for the sign, whichever is less, from the nearest visible exit sign.”

Exceptions:

 1. *Exit signs shall not required in rooms or areas that require only one exit or exit access.*
 2. *Main exterior exit doors or gates that are obviously and clearly identifiable as exits need not have exit signs where approved by the building official.*
 3. *Exit signs are not required in occupancies in Group U and individual sleeping units or dwelling units in Group R-1, R-2, or R-3.*
 4. *.....”*

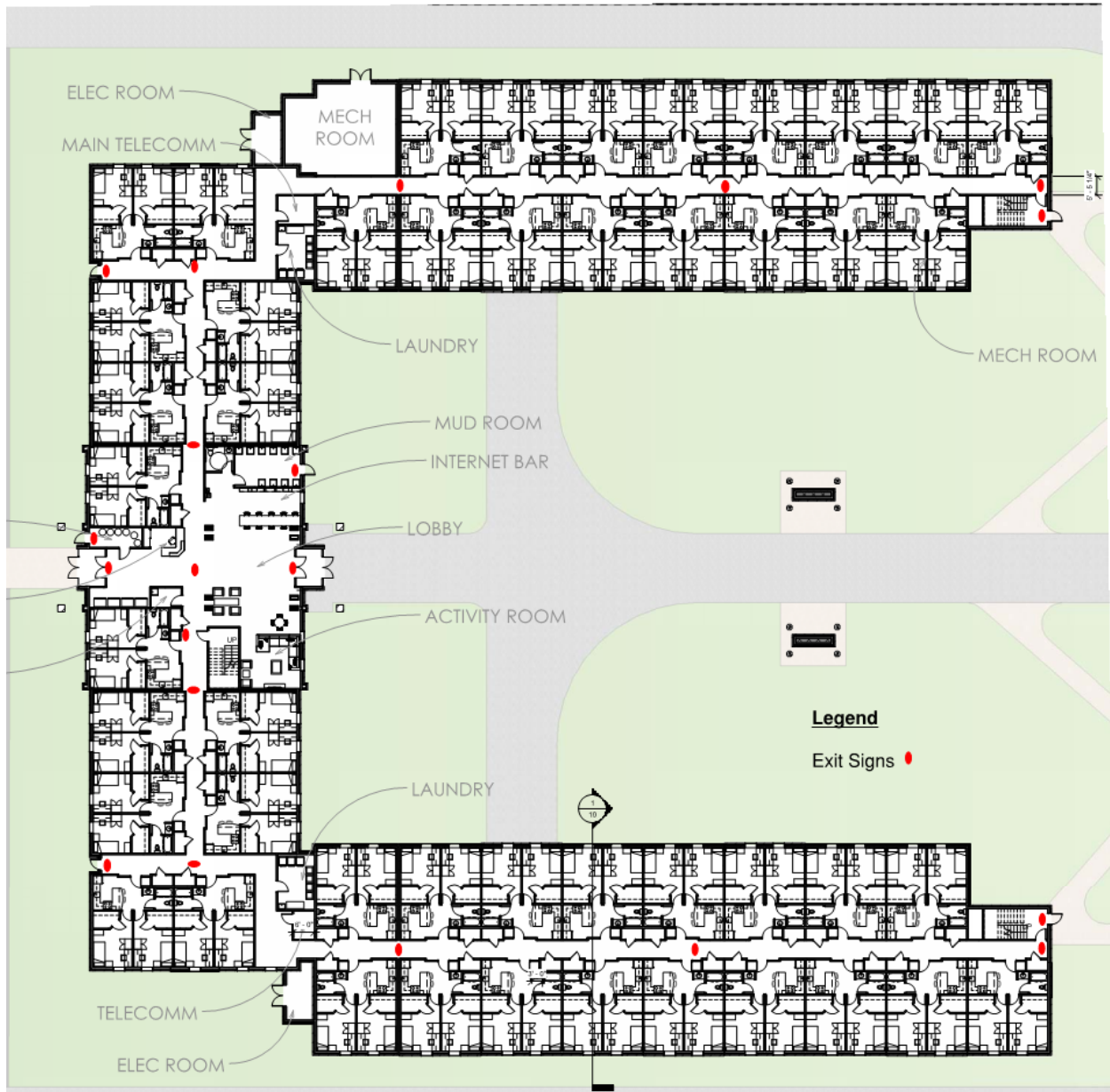


Figure 20 First floor exit sign locations



Figure 21 Second floor exit sign locations

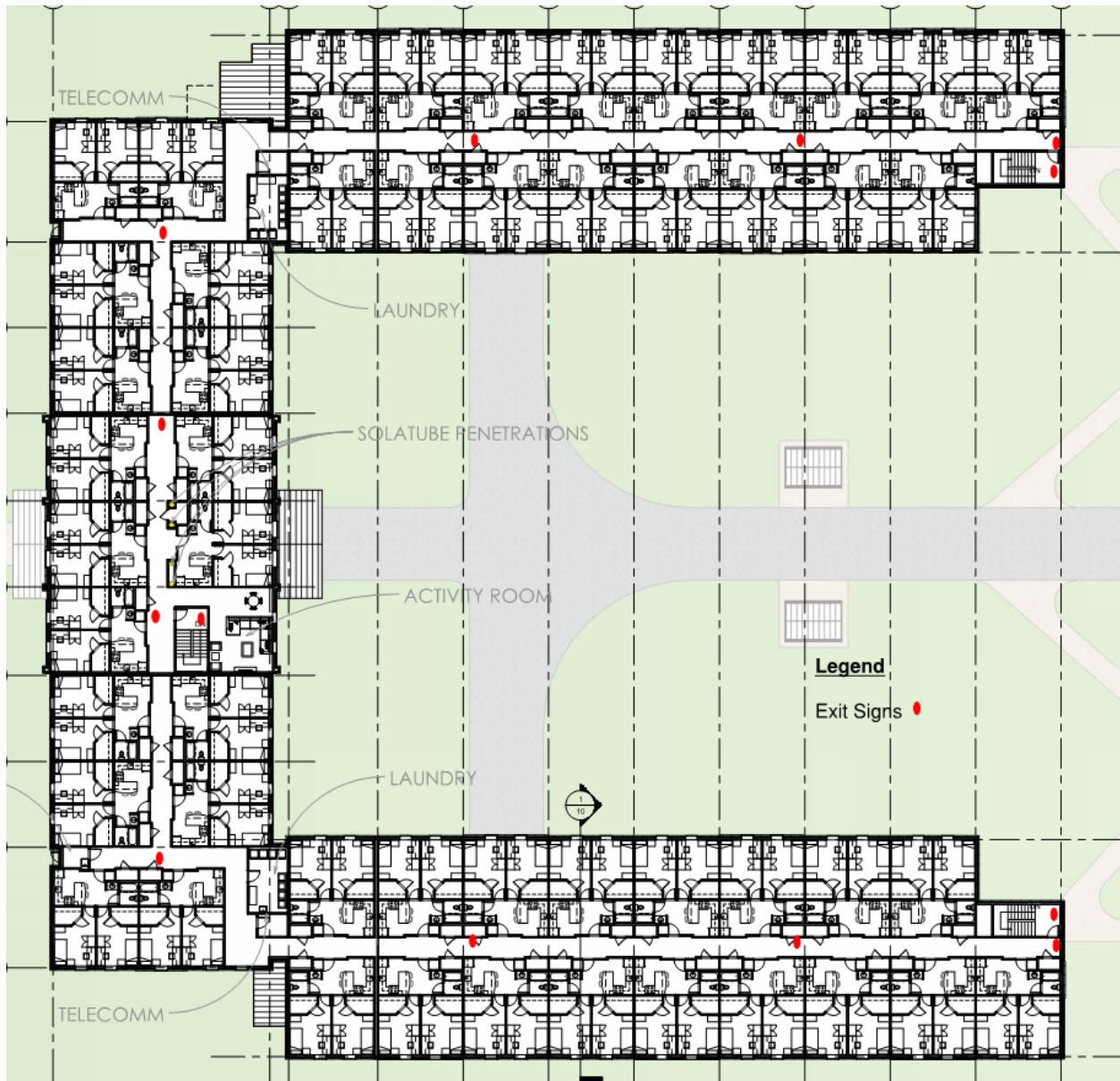


Figure 22 Third floor exit sign locations

Doors

NFPA 101 code requirements

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.2.2.1 Doors
"Doors complying with 7.2.1 shall be permitted."
- Section 30.2.2.2.4
"Apartment occupancies shall be exempt from the re-entry provisions of 7.2.1.5.8 where the exit enclosure serves only one dwelling unit per floor, and such exit is smokeproof enclosure in accordance with 7.2.3."

Occupancy Type Storage Ch. 42:

- Section 42.2.2.2.1 Doors
"Doors complying with 7.2.1 shall be permitted."

Stairs

NFPA 101 code requirements

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.2.2.3.1 Stairs
"Stairs complying with 7.2.2 shall be permitted."

Occupancy Type Storage Ch. 42:

- Section 42.2.2.3.1 Stairs
"Stairs complying with 7.2.2 shall be permitted."

General:

- Section 7.2.2.2.1.1 *"Stairs shall meet the following criteria:*
1) New stairs shall be in accordance with Table 7.2.2.2.1.1(a) and 7.2.2.2.1.2.

Table 7.2.2.2.1.1(a) New Stairs

| Feature | Dimensional Criteria | |
|---------------------------------|--|------|
| | ft/in. | mm |
| Minimum width | See 7.2.2.2.1.2. | |
| Maximum height of risers | 7 in. | 180 |
| Minimum height of risers | 4 in. | 100 |
| Minimum tread depth | 11 in. | 280 |
| Minimum headroom | 6 ft 8 in. | 2030 |
| Maximum height between landings | 12 ft | 3660 |
| Landing | See 7.2.1.3, 7.2.1.4.3.1, and 7.2.2.3.2. | |

Table 14 New stairs

- Section 7.2.2.2.1.2 Minimum New Stair Width
 - A) “Where the total occupant load of all stories served by the stair is fewer than 50, the minimum width clear of all obstructions, except projections not more than 4 ½ in. at or below hand rail height on each side, shall be 36 in.
 - B) Where stairs serve occupant loads exceeding that permitted by 7.2.2.2.1.2(A), the minimum width clear of all obstructions, except projections not more than 4 ½ in. at or below handrail height on each side shall be in accordance with Table 7.2.2.2.1.2(B) and the requirements of 7.2.2.2.1.2(C), 7.2.2.2.1.2(D), 7.2.2.2.1.2(E), and 7.2.2.2.1.2(F).
 - C) The total cumulative occupant load assigned to a particular stair shall be that stairs prorated share of the total occupant load, as stipulated in 7.2.2.2.1.2(C), and 7.2.2.2.1.2(E), calculated in proportion to the stair width.
 - D) For downward egress travel, stair width shall be based on the total number occupants from stories above the level where the width is measured.
 - E) For upward egress travel, stair width shall be based on the total number of occupants from stories below the level there the width is measured.
 - F) The clear width of the door openings discharging form stairways required to be a minimum of 56 in. wide in accordance with 7.2.2.2.1.2(B) shall be in accordance with 7.2.1.2.32(9).

Table 7.2.2.2.1.2(B) New Stair Width

| Total Cumulative Occupant Load Assigned to the Stair | Width | |
|--|-------|------|
| | in. | mm |
| <2000 persons | 44 | 1120 |
| ≥2000 persons | 56 | 1420 |

Table 15 New stair width

Landings

- Section 7.2.2.3.2.1
“Stairs shall have landings at door openings, except as permitted in 7.2.2.3.2.5.”
- Section 7.2.2.3.2.2
“Stairs and intermediate landings shall continue with no decrease in width along the direction of egress.”
- Section 7.2.2.3.2.3
“In new buildings, every landing shall have a dimension, measured in the direction of travel, that is not less than the width of the stair.”

Handrails

- Section 7.2.2.4.1.1
“Stairs and ramps shall have handrails on both sides, unless otherwise permitted in 7.2.2.4.1.5 or 7.2.2.4.1.6.”
- Section 7.2.2.4.1.2
“In addition to the handrails required at the sides of stairs by 7.2.2.4.1.1, both of the following provisions shall apply:
 - 1) *For new stairs, handrails shall be provided within 30 in. of all portions of the required egress width.”*

Interior Finish Requirements

NFPA 101 code requirements

Occupancy Type New Apartment Buildings CH. 30:

- Section 30.3.3 Interior Finish

- Section 30.3.3.1 General
"Interior finish shall be in accordance with section 10.2"
- Section 30.3.3.2 Interior wall and ceiling Finish
"Interior wall and ceiling finish material complying with section 10.2 shall be permitted as follows:
 - (1) *Exit enclosures – Class A*
 - (2) *Lobbies and corridors - Class A or Class B*
 - (3) *Other Spaces – Class A, Class B, or Class C"*

Occupancy Type Storage Ch. 42:

- Section 42.3.3 Interior Finish
 - Section 42.3.3.1 General
"Interior finish shall be in accordance with section 10.2"
 - Section 42.3.3.2 Interior wall and ceiling Finish
"Interior wall and ceiling finish material complying with section 10.2 shall be Class A, Class B, or Class C in storage areas and shall be as required by 7.1.4 in exit enclosures."

General:

- Table A10.2.2 Interior Finish Classifications limitations recommends for storage occupancies are as follows:
 - Exit enclosures – Class A or Class B
 - Lobbies and corridors - Class A, Class B, or Class C
 - Other Spaces – Class A, Class B, or Class C
- Section 10.2.3.4 summarizes the Class A, Class B, and Class C requirements that each category will need to meet to be classified in one of those classes.

Pre-Movement Behavioral Response and Timed Evacuation

Psychological Characteristics

In the SFPE handbook Chapter 11 Section 3 outlines seven psychological and physical processes that are related to pre-movement time. Below is a brief description of each:

- **Recognition** – This is when the individual identifies the ambiguous fire cues as an indication of a fire incident. These cues may be wither audio or visual. These cues may not be clear on what type of incident is occurring as well.
- **Validation** – This is when the individual seeks more information regarding the initial ambiguous fire ques. This is in order to confirm or deny the cues that have been given to them. It also consists of attempts by an individual to determine the seriousness of the threat cues

- **Definition** – Consists of attempts by the individual to relate the information concerning the threat to some of the variables, such as the qualitative nature of the threat, the magnitude of deprivation of the threat, and the time context.
- **Evaluation** – May be described as the cognitive and psychological activities required for the individual to respond to the threat. The individual's ability to reduce his or her stress and anxiety levels becomes the essential psychological factor. In the threat situation created by a fire, evaluation is the process involved in the decision to react by fight or flight. In the evaluation process, an individual's cultural influences and assumption of a particular role may be very important in formulating defense or escape plans.
- **Commitment** – Consists of the mechanisms the individual uses to initiate the behavior required to fulfill defense plans conceptualized in the evaluation process. This is when the individual decides whether to stay and fight the fire or evacuate.
- **Reassessment** – The process of reassessments and over commitment may be the most stressful. This is when they realize what they have tried earlier did not work and will need to formulate a new plan.
- **Individual** – This one factor that differs from person to person. Based on their background, age, gender, and life experiences. This has a major influence on how they go through the other six factors.

Building Characteristics

There are six building characteristics that can help reduce the pre-movement times of the occupants. These are outlined in the SFPE handbook Chapter 12 Section 3:

- **Types of warning systems** – The typical fire alarm is the least effective when trying to notify occupants of a fire. This is often due to false alarms. The best way to achieve a quicker response is with a live voice communication system. This will provide more clear information of the fire and allow people to make decisions quicker.
- **Building layout and Wayfinding** – This is based on the complexity in the building layout. The more complex the layout the more time an occupant will have to take to decide on their action based on trying to find their way out.
- **Visual Access** – This is the action of being able to see how others in the building are reacting to the cues and or strobe lighting that goes off. Not all buildings are laid out so others can see how other occupants are reacting, but adding this in the design should help speed up egress.
- **Focal Point** – This could be a stage or movie screen for example. In the event of a fire the full lighting will need to go on and the activities are to stop and let the occupants focus on the emergency and how to exit.
- **Training** – having occupants well trained can lead to fast response times for the building. The building will need to have a sufficient number of well-trained occupants to make this effective. Having these people throughout the building will speed up response times because they will be able to give direction to people.

- **Frequency of False Alarms** – The number of false alarms in a building and the frequency of them could affect response times. This can make the occupants not want to respond due to the fact it could be perceived as a waste of time and will be less receptive of cues.

Occupant Characteristics

There are six occupant characteristics that can help reduce the pre-movement times of the occupants. These are outlined in the SFPE handbook Chapter 12 Section 3:

- **Familiarity** – Occupants who are familiar with the building and have participated in evacuation drills before and are aware of the evacuation procedure are more likely to evacuate more quickly.
- **Responsibility** – If the occupant feels like it is their responsibility they are more likely to respond more quickly. Usually in public places people don't feel it is their responsibility to act they will wait to be told what to do.
- **Social Affiliation** – Occupants tend to find the people there with or know closely before they evacuate the building. This could delay the response time depending on how spread out they are.
- **Commitment** – Occupants who are committed into an activity take a long time to react toward an unexpended situation. The occupants don't want to lose where they are, so if the activity is stopped people will respond more quickly.
- **Alertness and limitation** – this is due to occupants either having a lowered level of alertness (Sleeping) or having a disability that would hinder their ability for a quick response. It is good to know the approximate number of these people in a building at any given time of the day to know how long response times may take.
- **Staff or warden** – The training of staff or wardens in the building will help speed along the process. They will need to be easily recognizable so other occupants are aware of who they are.

Pre-Movement Evaluation

For this project the building in question will be filled with trained military personnel. These people are trained to react and respond accordingly to their protocols. This building will be equipped with a NFPA 72 fire alarm system, which will include audio and visual notification. This will aid in the pre-movement times of the occupants. Since these people will live in this building they will feel responsible for what happens in the building as well. The layout of the building is very simple and easy to find ways out. The alertness of these individuals is good even when they are sleeping. For their psychological responses they have been trained on how to deal with fires. They will also be aware of the evacuation procedures in the building.

Timed Evacuation

Evacuation of a building is a crucial part of a building design. On top of having enough exits to be able to handle the occupant load we also need to do it efficiently in a timely manner. Using the NFPA

Handbook and SFPE Handbook for the following Hydraulic timed egress calculations we are able to see how long it will take to exit the building in question.

| Floor | Floor Area | Occupancy | | | | | |
|--------------|----------------------|--|--------------------------|------------------------|-----------------------------------|-------------------------|----------------------------------|
| 1st | 38,574 | 380 | | | | | |
| 2nd | 37,029 | 256 | | | | | |
| 3rd | 37,778 | 260 | | | | | |
| | | | | | | | |
| | | | | | | | |
| Egress Paths | Clear Width (Inches) | Boundry Layer (Inches) | Effective Width (Inches) | Effective Width (Feet) | Max Spec. Flow Rate (Table 4.2.8) | Max Flow (persons /Min) | Speed Between Floors (min/Floor) |
| Stair wells | 48 | 12 | 36 | 3 | 18.50 | 56 | 0.36 |
| Door #1 | 36 | 12 | 24 | 2 | 24.00 | 48 | 0.36 |
| Door #2 | 72 | 12 | 60 | 5 | 24.00 | 120 | 0.36 |
| Corridors | 60 | 16 | 44 | 3.67 | 24.00 | 88 | 0.36 |
| | | | | | | | |
| | | | | | | | |
| | | Constants | | | | | |
| | | a-Constant | 2.86 | Table 4.2.5 | | | |
| | | K-Egress Constant | 212 | Table 4.2.5 | | | |
| | | Max Specific Flow | 0.175 | persons/min/ft | | | |
| | | Stair conversion Factor | 1.85 | Table 4.2.6 | | | |
| | | Floor to Floor Height | 11 | ft | | | |
| | | | | | | | |
| | | Total occupancy on 3rd & 2nd floor | 520 | People | | | |
| | | Discharge rate | 48 | Persons/Min | | | |
| | | Number of exits | 3 | | | | |
| | | Occupants per exit | 173 | People | | | |
| | | Time to exit third floor to stairs | 3.61 | Min | | | |
| | | Stairwell travel time | 0.36 | Min | | | |
| | | Pre-Movement time | 2.5 | Min | SFPE Handbook Table 3-12.2 | | |
| | | Total time to evacuate 3rd & 2nd floor | 6.47 | Min | | | |

Table 16 Egress time calculations

From the above calculation we are able to see that the total time need to evacuate the building is 6.47 minutes. The first floor did not need to be calculated due to the fact that in the NFPA and SFPE Handbooks it is referenced that the first floor would be completely evacuated by the time the other floors would be evacuated. The assumptions were made to be conservative in the times. From the SFPE Handbook Section 3 Chapter 12 Evacuation Times I used Table 3-12.2 “Delay times derived from actual fires” for the pre-movement time. I used the Mean value for the Mid-rise apartment buildings with a good fire alarm because that most closely relates to the structure under review. This will help in giving a more realistic egress values. There is a possibility pre-movement times could be larger due to the fact an occupant may not awake for the alarm. The density is greater than what would be present to cover a worst case scenario. This building is also separated into three buildings with fire walls and would be able to shelter the other buildings occupants and would allow for this time to be able to egress. The limitations of this calculations is that everyone would be up and ready for this. This building has sleeping accommodations and will add to increase times at night when people are sleeping.

Water Based Fire Suppression

Water Supply

The water supply for the building was supplied by CH2M Hill and was performed on February 07, 2012.

Static Pressure (psi): 47

Flow Pressure (psi): 46

Discharge Flow Rate (gpm): 1190

10% reduced Static Pressure (psi): 42.3

10% reduced Flow Pressure (psi): 41.4

The underground feed main is a 12" ductile iron line. The size of the Fire Sprinkler Lateral, which will feed the sprinkler system has not been designed yet. It was assumed that a 6" line was used and placed at a distance of 350 ft away from the building. This is because UFC 3-600-01 Section 3-7.1.7 states that a minimum of a 6" pipe will be used. It was also assumed that the depth of the frost line was 48" and placed the branch line at a depth of 72". That will be in acceptance to NFPA 13R Section 10.4.2 "The top of the pipe shall be buried not less than 1 ft. below the frost line for the locality.

There will be one Fire Department connection provided on this building in accordance with NFPA 13R 2010.

NFPA 13R 2010 Section 6.11.1

"At least one fire department connection shall be provided for buildings, accessible by fire department, that exceed 2000 ft² or are more than a single story."

NFPA 13R 2010 Section 6.11.2

"Fire Department connections shall be at least 1 ½ in."

Automatic Sprinkler System

The automatic sprinkler systems is going to be a standard wet pipe system. The design of the system will be based on UFC 3-600-01, NFPA 13R, and NFPA 13. Appendix A contains the drawings for the design of the system and has all the general note, specific notes, and details for the project.

The main design of the system is first covered by UFC 3-600-01 4-2 for Automatic Sprinkler Systems. Below is a list of some of the requirements that are coming from this code. All other requirements that are not listed in UFC 3-600-1 will come from NFPA 13R and NFPA 13 when directed to.

Section 4-2.3.1 Sprinkler Density and Hose Stream Requirements

"Building and structures requiring sprinkler protection must be provided with sprinkler systems that are designed using the Area/Density Method of NFPA 13, \2\ except the design density, design area, hose stream allowance and duration of supply requirements for non-storage occupancies must be in accordance with FM Global Loss Prevention Data Sheet 3-26, Fire Protection Water Demand for Non-

Storage Sprinklered Properties Tables 1 through 4, including the revised Table 2 in FM Engineering Bulletin 04-12. /2/ “

Section 4-2.3.6 Sprinkler Coverage

“In buildings protected by automatic sprinklers, sprinklers must provide coverage throughout 100 percent of the building except as permitted by NFPA 13. This includes, but is not limited to, telephone rooms, electrical equipment rooms, boiler rooms, switchgear rooms, transformer rooms, and other electrical and mechanical spaces. Coverage per sprinkler must be in accordance with NFPA 13, except that it must not exceed 225 sq ft (21 sq m) for light hazard occupancies or 130 sq ft (12.1 sq m) for ordinary hazard.

Exception 1: Facilities that are designed in accordance with \2\ NFPA 13R, Installation of Sprinkler Systems in Low-Rise Residential Occupancies /2/ up to and Including Four Stories in Height and NFPA 13D, Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes.

Exception 2: Sprinklers may be omitted from small rooms in specific occupancies in accordance with NFPA 101.”

Section 4-2.4.3

“Provide a minimum clearance of 3 feet (915 mm) in front of all equipment and 6 inches (152 mm) behind the equipment, i.e., control valves, backflow preventer, check valves, floor control valve assemblies, etc.”

System Components

There are many components that make up an automatic wet sprinkler system. Below is a list and descriptions of some major components of the system.

Sprinklers

- Tyco rapid response residential sprinkler head (TY4234).
 - K-Factor: 6.9
 - Wet Pipe
 - Max Coverage: 20 ft. x 20 ft.
 - Temperature rating: 155 F
 - Minimum flow: 22 GPM
 - Minimum Pressure: 10.2 PSI
 - Recessed type installation
 - Minimum spacing 8ft.
 - Deflector to ceiling: 1-1/4 to 4 inches
- Tyco Pendent sprinkler (TY4951)
 - K-Factor: 8.0

- Wet Pipe
- Temperature rating: 155 F
- Minimum spacing 8ft.

Pipe

- The pipe used in this system is BlazeMaster CPVC.
 - Riser: 3" pipe
 - Main Line: 3" Pipe
 - Main Branch Line: 2"
 - Branch Line: 1.5"
- The underground pipe will be Blue Brute C-900 PVC.
 - Underground: 6" pipe

Hardware

- Backflow Preventer
 - Watts Series 709 Double Check Valve
- Check Valve
 - Viking Easy Riser Swing Check Valve

Attached in Appendix E are components cut sheets with more in-depth details about each component along with a few others.

Hydraulic Calculations

The hydraulic calculations will be in accordance with UFC 3-600-01. The UFC code for the type of building I am using requires that we use FM Global Engineering Bulletin 04-12 for the Area/Density method. This is referenced in UFC 3-600-01 Section 4-2.3.1. The apartments and lobby areas are classified as a hazard category HC-1. The Utility and equipment rooms are classified as hazard category HC-2.

HC-1

WET 0.1/1500, Hose demand 250, K-factor 5.6 or greater, Max area of 225 ft²

HC-2

WET 0.2/2500, Hose demand 250, K-factor 8.0 or greater, Max area of 130 ft²

These codes for government jobs that use the UFC code take precedence over NFPA 13.

Calculation 1 Third floor

Occupancy: HC-1

Density: 0.1 gpm/ sq. ft.

Area of operation: both Bedrooms and Closets totaling 408 sq. ft.

Hose Demand: 250 GPM

Sprinkler

Tyco

Ty2234

K-Factor: 6.9

Temperature: 155 F

The Manual Calculation showed that a demand of 372 GPM @ 37.7 PSI. See Appendix B for full calculation.

The Computer Aided Calculation showed a demand of 338.4 GPM @ 39.36 PSI. See Appendix C for full calculation.

These values are based on the most remote area. Both of these calculations prove that the water supply provided will be enough for this project.

Calculation 2 First floor

Occupancy: HC-2

Density: 0.20 gpm/ sq. ft.

Area of operation: Entire mechanical room totaling 595 sq. ft.

Hose Demand: 250 GPM

Sprinkler

Tyco

Ty4951

K-Factor: 8.0

Temperature: 175 F

The Manual Calculation showed that a demand of 392 GPM @ 29.9 PSI. See Appendix B for full calculation.

The Computer Aided Calculation showed a demand of 355.1GPM @ 28.51 PSI. See Appendix C for full calculation.

These values are based on the most remote area. Both of these calculations prove that the water supply provided will be enough for this project.

Inspection, Testing and Maintenance

The inspection, testing and maintenance is governed by UFC 3-601-02. The system shall be maintained in accordance to UFC 3-601-02, which reference that it will be covered by NFPA 25. Typically the system is maintained by the building personal on a day to day basis and a sprinkler contactor is brought in for the more involved portions.

Attached in Appendix F are references from NFPA 25 for the frequency of system and components inspection, testing, and maintenance schedule.

Below are the Tables that can be found in UFC 3-601-02

Table 2-2. Wet Pipe Sprinkler Systems ITM Tasks

| Frequency | Component | Tasks |
|-----------|---|--|
| Monthly | 1. Control Valves (without seal, lock, or electric supervision) | 1. Verify valve position. |
| Annual | 1. Control Valves (sealed, locked, or electrically supervised) | 1. Verify valve position. |
| | 2. Waterflow Alarm Devices | 1. Operate to verify initiation and receipt of alarm. 2. Verify alarm test valve alignment and tamper switch (if sealed or electrically supervised). |
| | 3. Alarm Valve and Trim | 1. Visually check the exterior of valves, gauges, trim alignment. 2. Verify valve pressure and legibility of the hydraulic nameplate. |
| | 4. Main Drain | 1. Conduct a main drain test to verify supply (valve position). 2. Document static and residual pressure readings on a 3- by 5-inch (3x5) tag and secure it to the system pressure gauge. 3. Compare results with results from previous main drain tests and original acceptance test. 4. Verify that the results are within acceptable limits or identify corrective measures. |

Table 2-2. Wet Pipe Sprinkler Systems ITM Tasks (Continued)

| Frequency | Component | Tasks |
|---|--|--|
| Annual (Continued) | 5. Fire Department Connection | 1. Verify accessibility and condition. 2. If caps are removed or missing, check for obstructions. |
| 2 Years | 1. Control Valves | 1. Operate valve through entire travel to verify function. 2. Lubricate valves and stems to ensure operability. |
| 5 Years | 1. Alarm Valve | 1. Clean and inspect internally to verify condition. |
| | 2. Anti-freeze Loops | 1. Confirm correct solution mixture. |
| 10 Years | 1. Gauges | 1. Recalibrate or replace gauges. |
| 20 Years | 1. Fast Response Sprinklers and Extra High Temperature Sprinklers | 1. Test sample sprinklers to verify response characteristics. |
| 50 Years | 1. Standard Sprinklers | 1. Replace or test a sample of sprinklers to verify response characteristics. |
| Following System Modification or Repair | 1. Main Drain (following maintenance or repair action requiring the water supply to be shut off) | 1. Conduct main drain test to verify supply (valve position). |
| As Part of Building Inspection | Entire System | Visually check: 1. Pipe hangers. 2. Sprinklers for obstruction. 3. Piping for leaks. 4. Riser condition. |

Fire Detection, Alarm and Communication Systems

Overview of Fire Alarm System

The fire alarm system design will be based on UFC 3-600-01, NFPA 72, NFPA 70 and NFPA 101. Appendix G contains the drawings for the design of the system and has all the general note, specific notes, and details for the project. The Fire alarm will be designed around a fully addressable system containing detection, notification, signaling and mass notification components.

The main design of the system is first covered by UFC 3-600-01 section 5 for Fire Alarm Systems. Below is a list of some of the requirements that are coming from this code. All other requirements that are not listed in UFC 3-600-1 will come from NFPA 72, NFPA 70 and NFPA 101 when directed to.

Section 5-1.1 Standard

“Facility emergency notification systems including fire alarm (detection, notification, and signaling) and/or mass notification shall be addressable voice notification systems. \3\ Class B pathways for addressable detection, notification, and signaling circuits meet all minimum/necessary DOD performance requirements. /3/ Class C, D, and E pathways are not approved for use.”

Section 5-2.1 Fire Alarm Reporting Systems Applications

“Fire alarm reporting systems are the base-wide reporting systems that connect the building fire alarm control panel(s) to \2\ a constantly attended location staffed with qualified operators for the receipt and processing of emergency communications. /2/ Required systems are to be digital, telephonic, radio, or supervised conductor types. Consider compatibility of extensions of fire reporting systems with existing equipment.”

Section 5-3 Fire Alarm Evacuation Systems

“These systems consist primarily of manual pull stations and notification appliances. Combination systems (evacuation, detection, and/or mass notification) shall comply with the requirements of this paragraph entitled “Fire Alarm Evacuation Systems” and the paragraph entitled, “Automatic Fire Detection Systems”.”

Section 5-3.1 Applications

“Fire alarm evacuation systems must be provided in the following locations:

- *Buildings required by NFPA 101.*
- *Buildings requiring automatic detection or suppression systems.”*

Section 5-4 Automatic Fire Detection Systems

“Combination systems (evacuation, detection, and/or mass notification) shall comply with the requirements of the paragraph entitled “Fire Alarm Evacuation Systems” and this paragraph entitled, “Automatic Fire Detection Systems”.”

Section 5-4.1 Automatic Fire Detection Systems Applications

“Fire detection systems must be provided in areas required by this UFC and should be limited to these applications. Detection systems must be provided in areas requiring fire detection by NFPA standards and specific criteria contained in this UFC. Where automatic sprinklers are provided other/additional initiating devices are only provided when specifically required by this UFC, referenced documented, or when an exemption is approved by the service AHJ. “

Section 5-6.7 Sleeping Rooms and Duty Rooms

“Provide 24 Vdc photoelectric analog/addressable smoke detectors in all barracks, dormitories, lodges, temporary or transient living facilities sleeping rooms and entry/common area to bedrooms, and duty rooms located in business or other occupancies.

The smoke detectors shall be provided with sounder bases.

Smoke detectors in sleeping rooms must cause the sounder base to activate for all smoke detectors in that suite and an alarm signal to activate at the FACP, but must not activate the building’s evacuation alarm.”

Fire Signatures and Detection Devices

There are for this project two types of fire detection devices. The first is the fire sprinkler heads. The sprinkler system is described in the water based fire suppression system. The sprinkler head that is being used in the majority of the facility is a Tyco 2234 with a K-factor of 6.9 at a temperature rating of 155 degrees Fahrenheit, which is a fast response style. The spacing for this was based on NFPA 13 and NFPA 13R. Once the sprinkler head is activated the water will flow from the head and will allow the water flow device to activate and put the fire alarm system into alarm.

The second type of device is a ceiling mounted smoke detector. The smoke detectors are placed in sleeping areas and hallways primarily. The type of smoke detector is a Siemens (S54320-F4-A2) photoelectric smoke detector with a sounder base. This detector uses light scattering detection principle. This is the main type of smoke detection in the building. The location, spacing and placement of this device was in compliance with NFPA 72.

Fire Alarm System Type and Requirements

The Fire alarm panel that is being used for this project is a Siemens FireFinder XLSV. It is a fully addressable digital emergency voice alarm and communication system. This panel is going to be located in the mechanical room. The panel receives alarm, supervisory, and trouble signals from all parts of the facility. The panel contains a digital alarm communicator transmitter (DACT) that connects the building with a remote supervisory station for the transmissions of signals to the remote station. This panel will then be remotely monitored at a 24 hour staffed location on base. The requirements of that have been set forth by the UFC and NFPA have been met by this panel. In general it covers the rules of clearing a trouble, supervisory or alarm signal on the panel. The fire alarm matrix is included in the fire alarm drawings to see how the sequencing will work for this system.

Alarm Notification Appliances

There are three types of notification devices in this building the speaker, speaker/strobe and strobe. These are both provided by Cooper. These speakers allow for three audible settings 90, 95, and 99 db. The location, spacing and placement of these devices were in compliance with NFPA 72. The speakers are placed in each bedroom unit and the speaker strobes are placed in all public areas. The speaker setting that would be used in the application would be the 90 db. Based on table A18.4.3 of NFPA 72 the ambient sound for a residential occupancy would approximately be 35 db. To ensure that occupant will hear the alarm NFPA 72 section 18.4.3. requires that the speaker be at least 15 db over the ambient noise level at the furthest point. The rule of thumb is that every time the distance double you lose 6 db. The level that needs to be reached in this facility is 50 db in all residential areas. With the device being set a 90 db at 10 ft. the total distance that these can be spaced is well over what they will actually be spaced. The spacing in this project will be based on the spacing of the light which will be every 45 ft. At 45 ft. the speaker level will be above 78 db which is well above the required 50 db. Therefore this speaker/strobe is acceptable.

The only other area of concern is the mechanical room. The max distance in the room is 20ft and would make the speaker need to be at least 85 db and using the higher rated speaker setting at 90 allows for this area to be in compliance. The third is just the mass notification strobe. For the army they are required to use amber strobes for the mass notification system. These will be placed in the same locations of the clear strobes and be of the same intensity. These strobes will also need to be synchronized together per the code.

Mass Notification System

The mass notification system provided for the building is intended to provide real-time information to building occupants and personnel in the immediate vicinity of the building. The MNS is covered in UFC 4-021-01 and the following comes from section of the code.

4-3.4 Notification Appliance Network. A notification appliance network consists of a set of audio speakers, strobes, and text signs (when required) that are located to alert occupants and provide intelligible voice and visual instructions.

4-3.4.1 Audio Appliance Network. Speakers are provided at all locations in the building and also around the building at entrances/exits and other outdoor areas (such as courtyards) commonly used by the building occupants. Important design considerations for the audio speakers include intelligibility and audio intensity.

4-3.4.2.2 Army and Air Force installations shall use a clear strobe for fire and an amber strobe for MNS. Use of text signs is optional and at the discretion of the DOD installation. If provided, text signs shall be located over the door to each egress stairwell and over (or adjacent to) the substantial means of egress from the level of discharge. Exterior exit doors from a single room (e.g., mechanical or electrical rooms) do not require a text sign.

4-4.2 The mass notification system is allowed to temporarily override fire alarm audible/visible notification appliances to provide intelligible voice commands during simultaneous fire and terrorist events. All other features of the fire alarm system, including transmission of signals, are required to function properly. MNS messages take priority and continue to override the fire alarm until the MNS message is either manually or automatically ended. If not manually ended, the MNS message will automatically end after 10 minutes. If the MNS is used to override the fire alarm, supervisory signal is required to be annunciated at the ACU and LOC, and transmitted to the government monitoring station.

Power Requirements for Fire Alarm and Communication Systems

UFC-3-600-01

5-3.2.8 Notification Appliances.

Provide a minimum of 1 notification appliance circuit per floor. Each notification appliance circuit loading must not exceed 80% of its rated output.

5-3.5 Secondary Power

Provide rechargeable sealed lead acid type batteries to operate the fire alarm system under supervisory conditions for 48 hours and audible and all alarm devices for an additional 10 minutes. Where the fire alarm system also serves as a Mass Notification System refer to UFC 4-021-01, Design and O&M: Mass Notification Systems, for additional requirements

5-4.5 Panels Used for the Control and/or Release of Fire Suppression Systems

5-4.5.4 Provide rechargeable lead calcium or sealed lead acid type batteries to operate the releasing panel under supervisory conditions for 48 hours and alarm conditions for an additional 15 minutes. Include the full current draw of the solenoid in the battery calculations.

UFC-4-021-01

3-6.11 Battery Backup Power. Each HPSA site shall be equipped with backup batteries to supply power for a minimum of 72 hours of electrical supervision following the loss of normal charging power, followed by a total of 60 minutes of full load operation at the end of the supervisory period.

Below in the table is the longest and worst case scenario for Voltage drop on the third floor. Using 12 gauge wire we are able to use 68 speakers.

| Appliance number | Appliance description | Appliance current draw | Distance from previous appliance | Wire Gauge | Voltage @ Appliance | Voltage Drop | % Drop |
|------------------|-----------------------|------------------------|----------------------------------|------------|---------------------|--------------|--------|
| 1 | Speaker | 0.021 | 40 | 12 | 20.18 | 0.22 | 1.08 |
| 2 | Speaker | 0.021 | 12 | 12 | 20.11 | 0.29 | 1.40 |
| 3 | Speaker | 0.021 | 12 | 12 | 20.05 | 0.35 | 1.71 |
| 4 | Speaker | 0.021 | 12 | 12 | 19.98 | 0.41 | 2.02 |
| 5 | Speaker | 0.021 | 25 | 12 | 19.85 | 0.54 | 2.66 |
| 6 | Speaker | 0.021 | 12 | 12 | 19.79 | 0.60 | 2.96 |
| 7 | Speaker | 0.021 | 12 | 12 | 19.73 | 0.66 | 3.26 |
| 8 | Speaker | 0.021 | 12 | 12 | 19.67 | 0.72 | 3.55 |
| 9 | Speaker | 0.021 | 12 | 12 | 19.61 | 0.78 | 3.83 |
| 10 | Speaker | 0.021 | 25 | 12 | 19.49 | 0.90 | 4.42 |
| 11 | Speaker | 0.021 | 12 | 12 | 19.43 | 0.96 | 4.70 |
| 12 | Speaker | 0.021 | 12 | 12 | 19.37 | 1.01 | 4.97 |
| 13 | Speaker | 0.021 | 12 | 12 | 19.32 | 1.07 | 5.24 |
| 14 | Speaker | 0.021 | 12 | 12 | 19.26 | 1.12 | 5.50 |
| 15 | Speaker | 0.021 | 25 | 12 | 19.15 | 1.23 | 6.03 |
| 16 | Speaker | 0.021 | 12 | 12 | 19.10 | 1.28 | 6.29 |
| 17 | Speaker | 0.021 | 12 | 12 | 19.05 | 1.33 | 6.53 |
| 18 | Speaker | 0.021 | 12 | 12 | 19.00 | 1.38 | 6.78 |
| 19 | Speaker | 0.021 | 12 | 12 | 18.95 | 1.43 | 7.02 |
| 20 | Speaker | 0.021 | 25 | 12 | 18.85 | 1.53 | 7.50 |
| 21 | Speaker | 0.021 | 12 | 12 | 18.80 | 1.58 | 7.73 |
| 22 | Speaker | 0.021 | 12 | 12 | 18.75 | 1.62 | 7.96 |
| 23 | Speaker | 0.021 | 50 | 12 | 18.56 | 1.81 | 8.87 |
| 24 | Speaker | 0.021 | 50 | 12 | 18.38 | 1.99 | 9.76 |
| 25 | Speaker | 0.021 | 12 | 12 | 18.33 | 2.03 | 9.97 |
| 26 | Speaker | 0.021 | 12 | 12 | 18.29 | 2.08 | 10.18 |
| 27 | Speaker | 0.021 | 12 | 12 | 18.25 | 2.12 | 10.38 |
| 28 | Speaker | 0.021 | 12 | 12 | 18.21 | 2.16 | 10.57 |
| 29 | Speaker | 0.021 | 25 | 12 | 18.12 | 2.24 | 10.97 |
| 30 | Speaker | 0.021 | 50 | 12 | 17.96 | 2.40 | 11.75 |
| 31 | Speaker | 0.021 | 12 | 12 | 17.92 | 2.43 | 11.93 |
| 32 | Speaker | 0.021 | 12 | 12 | 17.89 | 2.47 | 12.10 |
| 33 | Speaker | 0.021 | 12 | 12 | 17.85 | 2.50 | 12.28 |
| 34 | Speaker | 0.021 | 12 | 12 | 17.82 | 2.54 | 12.44 |
| 35 | Speaker | 0.021 | 12 | 12 | 17.78 | 2.57 | 12.60 |
| 36 | Speaker | 0.021 | 12 | 12 | 17.75 | 2.60 | 12.76 |
| 37 | Speaker | 0.021 | 12 | 12 | 17.72 | 2.63 | 12.91 |
| 38 | Speaker | 0.021 | 12 | 12 | 17.68 | 2.66 | 13.06 |
| 39 | Speaker | 0.021 | 12 | 12 | 17.65 | 2.69 | 13.21 |
| 40 | Speaker | 0.021 | 12 | 12 | 17.63 | 2.72 | 13.34 |
| 41 | Speaker | 0.021 | 12 | 12 | 17.60 | 2.75 | 13.48 |
| 42 | Speaker | 0.021 | 12 | 12 | 17.57 | 2.78 | 13.61 |
| 43 | Speaker | 0.021 | 12 | 12 | 17.54 | 2.80 | 13.73 |
| 44 | Speaker | 0.021 | 12 | 12 | 17.52 | 2.83 | 13.85 |
| 45 | Speaker | 0.021 | 12 | 12 | 17.49 | 2.85 | 13.96 |
| 46 | Speaker | 0.021 | 12 | 12 | 17.47 | 2.87 | 14.07 |
| 47 | Speaker | 0.021 | 12 | 12 | 17.45 | 2.89 | 14.18 |
| 48 | Speaker | 0.021 | 12 | 12 | 17.43 | 2.91 | 14.28 |
| 49 | Speaker | 0.021 | 12 | 12 | 17.41 | 2.93 | 14.37 |
| 50 | Speaker | 0.021 | 12 | 12 | 17.39 | 2.95 | 14.46 |
| 51 | Speaker | 0.021 | 12 | 12 | 17.37 | 2.97 | 14.55 |
| 52 | Speaker | 0.021 | 12 | 12 | 17.35 | 2.98 | 14.63 |
| 53 | Speaker | 0.021 | 12 | 12 | 17.33 | 3.00 | 14.71 |
| 54 | Speaker | 0.021 | 12 | 12 | 17.32 | 3.01 | 14.78 |
| 55 | Speaker | 0.021 | 12 | 12 | 17.30 | 3.03 | 14.85 |
| 56 | Speaker | 0.021 | 12 | 12 | 17.29 | 3.04 | 14.91 |
| 57 | Speaker | 0.021 | 12 | 12 | 17.28 | 3.05 | 14.97 |
| 58 | Speaker | 0.021 | 12 | 12 | 17.27 | 3.06 | 15.02 |
| 59 | Speaker | 0.021 | 12 | 12 | 17.26 | 3.07 | 15.07 |
| 60 | Speaker | 0.021 | 12 | 12 | 17.25 | 3.08 | 15.11 |
| 61 | Speaker | 0.021 | 12 | 12 | 17.24 | 3.09 | 15.15 |
| 62 | Speaker | 0.021 | 12 | 12 | 17.23 | 3.10 | 15.18 |
| 63 | Speaker | 0.021 | 12 | 12 | 17.22 | 3.10 | 15.21 |
| 64 | Speaker | 0.021 | 12 | 12 | 17.22 | 3.11 | 15.23 |
| 65 | Speaker | 0.021 | 12 | 12 | 17.21 | 3.11 | 15.25 |
| 66 | Speaker | 0.021 | 12 | 12 | 17.21 | 3.11 | 15.27 |
| 67 | Speaker | 0.021 | 12 | 12 | 17.21 | 3.12 | 15.28 |
| 68 | Speaker | 0.021 | 12 | 12 | 17.20 | 3.12 | 15.28 |
| Total | | 1.428 | 1023 | | 17.20 | 3.12 | 15.28 |

This Table below is the worst case scenario

| Appliance number | Appliance description | Appliance current draw | Distance from previous appliance | Wire Gauge | Voltage @ Appliance | Voltage Drop | % Drop |
|------------------|-----------------------|------------------------|----------------------------------|------------|---------------------|--------------|--------|
| 1 | Strobe | 0.3 | 45 | 12 | 19.83 | 0.57 | 2.81 |
| 2 | Strobe | 0.3 | 45 | 12 | 19.25 | 1.09 | 5.36 |
| 3 | Strobe | 0.3 | 45 | 12 | 18.73 | 1.56 | 7.66 |
| 4 | Strobe | 0.3 | 45 | 12 | 18.26 | 1.98 | 9.71 |
| 5 | Strobe | 0.3 | 45 | 12 | 17.85 | 2.34 | 11.49 |
| 6 | Strobe | 0.3 | 45 | 12 | 17.48 | 2.66 | 13.03 |
| 7 | Strobe | 0.3 | 45 | 12 | 17.17 | 2.92 | 14.30 |
| 8 | Strobe | 0.3 | 45 | 12 | 16.91 | 3.13 | 15.33 |
| 9 | Strobe | 0.3 | 45 | 12 | 16.70 | 3.28 | 16.09 |
| 10 | Strobe | 0.3 | 45 | 12 | 16.54 | 3.39 | 16.60 |
| 11 | Strobe | 0.3 | 45 | 12 | 16.44 | 3.44 | 16.86 |
| Total | | 3.3 | 495 | | 16.44 | 3.44 | 16.86 |

Below is the table for worst case scenario voltage drop for the strobes.

| Appliance number | Appliance description | Appliance current draw | Distance from previous appliance | Wire Gauge | Voltage @ Appliance | Voltage Drop | % Drop |
|------------------|-----------------------|------------------------|----------------------------------|------------|---------------------|--------------|--------|
| 1 | Strobe | 0.3 | 45 | 12 | 19.827 | 0.573 | 2.810 |
| 2 | Strobe | 0.3 | 45 | 12 | 19.254 | 1.094 | 5.364 |
| 3 | Strobe | 0.3 | 45 | 12 | 18.732 | 1.563 | 7.663 |
| 4 | Strobe | 0.3 | 45 | 12 | 18.263 | 1.980 | 9.707 |
| 5 | Strobe | 0.3 | 45 | 12 | 17.847 | 2.345 | 11.495 |
| 6 | Strobe | 0.3 | 45 | 12 | 17.482 | 2.658 | 13.028 |
| 7 | Strobe | 0.3 | 45 | 12 | 17.169 | 2.918 | 14.305 |
| 8 | Strobe | 0.3 | 45 | 12 | 16.909 | 3.127 | 15.326 |
| 9 | Strobe | 0.3 | 45 | 12 | 16.700 | 3.283 | 16.093 |
| 10 | Strobe | 0.3 | 45 | 12 | 16.544 | 3.387 | 16.604 |
| 11 | Strobe | 0.3 | 45 | 12 | 16.440 | 3.439 | 16.859 |
| Total | | 3.3 | 495 | | 16.440 | 3.439 | 16.859 |

Below is the table for worst case scenario battery calculations for the system.

| ITEM | DESCRIPTION | STANDBY CURRENT PER UNIT (AMPS) | | QTY | | TOTAL STANDBY CURRENT PER ITEM | ALARM CURRENT PER UNIT (AMPS) | | QTY | | TOTAL ALARM CURRENT PER ITEM | |
|--|-------------------------|--|---|---|---|--|--|---|---|---|--|--------|
| FACU | Fire Alarm Control Unit | 0.2300 | X | 1 | = | 0.2300 | 0.2300 | X | 1 | = | 0.2300 | |
| SD | Smoke Detector | 0.0003 | X | 20 | = | 0.0050 | 0.0041 | X | 20 | = | 0.0820 | |
| HD | Heat Detector | 0.0000 | X | 6 | = | 0.0000 | 0.0000 | X | 6 | = | 0.0000 | |
| RLY | Strobe | 0.0500 | X | 11 | = | 0.5500 | 0.3000 | X | 1 | = | 0.3000 | |
| RLY | Relay (not failsafe) | 0.0000 | X | 15 | = | 0.0000 | 0.0210 | X | 15 | = | 0.3150 | |
| HS | Speaker-Strobe | 0.0000 | X | 11 | = | 0.0000 | 0.0750 | X | 11 | = | 0.8250 | |
| DH | Door Holder | 0.0650 | X | 0 | = | 0.0000 | 0.0000 | X | 0 | = | 0.0000 | |
| ANN | Annunciator | 0.1000 | X | 1 | = | 0.1000 | 0.2000 | X | 1 | = | 0.2000 | |
| MS | Manual Station | 0.0014 | X | 4 | = | 0.0056 | 0.0014 | X | 4 | = | 0.0056 | |
| WF | Waterflow Switch | 0.0000 | X | 1 | = | 0.0000 | 0.0000 | X | 1 | = | 0.0000 | |
| TS | Tamper Switch | 0.0000 | X | 1 | = | 0.0000 | 0.0000 | X | 1 | = | 0.0000 | |
| 0 | 0 | 0.0000 | X | 0 | = | 0.0000 | 0.0000 | X | 0 | = | 0.0000 | |
| 0 | 0 | 0.0000 | X | 0 | = | 0.0000 | 0.0000 | X | 0 | = | 0.0000 | |
| TOTAL SYSTEM STANDBY CURRENT (AMPS) | | | | | | 0.8906 | TOTAL SYSTEM ALARM CURRENT (AMPS) | | | | | 1.9576 |
| | | | | | | | | | | | | |
| Prepared for: | | REQUIRED STANDBY TIME (HRS) | | TOTAL SYSTEM STANDBY CURRENT (AMPS) | | REQUIRED STANDBY CAPACITY (AMP-HOURS) | REQUIRED ALARM TIME (HOURS) | | TOTAL SYSTEM ALARM CURRENT (AMPS) | | REQUIRED ALARM CAPACITY (AMP-HOURS) | |
| | | 24 | X | 0.8906 | = | 21.3744 | 0.083 | X | 1.9576 | = | 0.1625 | |
| | | | | | | | | | | | | |
| Prepared by: | | REQUIRED STANDBY CAPACITY (AMP-HOURS) | | REQUIRED ALARM CAPACITY (AMP-HOURS) | | TOTAL CAPACITY (AMP-HOURS) | TOTAL CAPACITY (AMP-HOURS) | | SAFETY FACTOR | | ADJUSTED BATTERY CAPACITY (AMP-HOURS) | |
| | | 21.37 | + | 0.1625 | = | 21.5369 | 21.5369 | X | 120% | = | 26 | |

For this case we will use a 26 AMP-Hour battery at all locations.

System Commissioning and Inspection, Testing and Maintenance

The inspection, testing and maintenance is governed by UFC 3-601-02. The system shall be maintained in accordance to UFC 3-601-02, which reference that it will be covered by NFPA 72. Typically the system is maintained by the building personal on a day to day basis and a fire alarm contactor is brought in for the more involved portions.

2-2.2 Fire Detection and Alarm Systems (out of UFC 3-601-02)

The type and frequency of ITM tasks for fire detection and alarm systems depend on whether the system is monitored or not. Guidance on the tasks in Table 2-1 is contained in the "Inspection, Testing, and Maintenance" section of NFPA Standard 72 (NFPA 72). Residential smoke detectors are addressed in Chapter 3 of this UFC.

Below are the Tables that can be found in UFC 3-601-02

Table 2-1. Fire Detection and Alarm System ITM Tasks

| Frequency | Component | Tasks |
|-----------|--|--|
| Monthly | 1. Control Panels and Annunciator Equipment (unmonitored only) | 1. Inspect panel condition (connections, fuses, light-emitting diodes [LED]). |
| Annual | 1. Control Panel and Annunciator Equipment (monitored) | 1. Test to verify proper receipt of alarm, supervisory, and trouble signals (inputs) and operation of notification appliances and auxiliary functions (outputs). 2. Verify that all lamps and LEDs are illuminated. 3. Load test backup batteries (when provided). |
| | 2. Initiating Devices: a. Manual Fire Alarm Stations | 1. Verify station is accessible (visual). |
| | b. Radiant Energy Detectors (Optical Detectors) | 1. Test to verify alarm initiation and receipt. 2. Verify no facility change that affects performance. |
| | c. Gas Detectors | 1. Test to verify alarm initiation and receipt. 2. Verify no facility change that affects performance. |
| | 3. Notification Appliances and Voice Communication (telephone, speakers, horns, and strobe lights) | 1. Test to verify operability. |
| | 4. Digital Alarm Transmitters and Receivers | 1. Test to verify operability. |

Table 2-1. Fire Detection and Alarm System ITM Tasks (Continued)

| Frequency | Component | Tasks |
|--------------------------------|---|--|
| 2 Years | 1. Initiating Devices: | |
| | a. Manual Fire Alarm Stations | 1. Operate to verify alarm receipt. |
| | b. Heat Detectors (restorable) (Remove devices not required by UFC 3-600-01.) | 1. Test with a heat source to verify alarm initiating and receipt. 2. Verify no facility change that affects performance. |
| | c. Smoke Detectors (single-station detectors, system detectors, and air sampling detectors) (Remove devices not required by UFC 3-600-01 or other directives.) | 1. Test with manufacturer-approved smoke simulant to verify smoke entry and alarm initiation and receipt. 2. Verify no facility change that affects performance. |
| | d. Supervisory Devices (low air pressure, temperature, water level) | 1. Test to verify initiation and receipt of supervisory alarm. |
| 5 Years | 1. Smoke Detectors (Remove devices not required by UFC 3-600-01.) | 1. Test detector sensitivity to ensure that the detector has remained within its listed and marked sensitivity range (or 4 percent obscuration light gray smoke, if not marked). |
| As Part of Building Inspection | Entire System | 1. Visually check: a. Detectors unblocked and uncovered. b. Panels secured and indicator lamps functional. c. Notification appliances in place. d. Manual stations in place and unobstructed. 2. Exercise evacuation notification appliances for audibility, clarity, and visibility. |

Performance Based Fire Protection

A performance-based design is used to create a unique set of requirements for a building based on specific assumptions derived from the project design goals. Performance-based designs use a worst case scenario to the building. The design assumptions can still restrict the future use of a facility based on the outcome of the results. Implementing performance-based design requires close cooperation with the authority having jurisdiction (AHJ) throughout the design and construction process.

Tenability Performance Criteria

This building's tenability performance criteria will come from NFPA 101 2012 section 5.2 Performance Criteria, since the IBC does not outline this. In section 502 they outline 4 methods to which to design to. For the building in consideration Method 2 would be the best. Method 2 is stated as follows:

“For each design fire scenario and the design specifications, conditions, and assumptions, the design team can demonstrate that each room or area will be fully evacuated before the smoke and toxic gas layer in that room descends to a level lower than 6 ft above the floor. The timing of such evacuation means that no occupant is exposed to fire effects. Such an evacuation requires calculation of the locations, movement, behavior of occupants, because fire effects and occupants are separated by moving the occupants.”

This method is best for this project for the following reasons:

- Since this building will have residence living in them the fire load will vary from each unit. This would make it very difficult to ensure that the fire effects would not reach the occupants or stay above 6 ft. This building will have a NFPA 72 alarm system to notify the occupants of any hazard. This will give the occupants ample time to escape prior to the effects reaching 6ft.
- This building is going to be equipped with a NFPA 13R Sprinkler system. This will also allow more time for egress when the sprinkler is activated and will slow the fire effect when reaching the 6 ft limit.
- The location from the farthest point in a unit is 30ft from the exit and once in the hallway it is no more than 90 ft to a stairwell or protected occupancy by a fire wall. That is a short distance to travel with the occupant load that would be within those areas.
- The movement of the people will be relatively quick due to the fact there will not be any handicapped people within the building. This building will also be kept orderly and will not have an excess of standard obstacles.
- The Behavior of the occupants can be predictable because they will be trained on how to evacuate and how to listen to orders very well.
- The above points should ensure that this method would be reasonable and can be reached.

Fractional Effective Doses (FED)

This is outlined in the SFPE Handbook, Section 2 Chapter 6 “Assessment of Hazards to Occupants from Smoke, Toxic Gases and Heat”. Fractional effective doses is when the occupant after a determinate time of exposure from gases would be rendered incapacitated due to these effects. This would need to be considered for if the FED comes sooner than possible egress then people may not be able to evacuate. We would want to make sure that $ASET > RSET$. ASET is the Available Safe Egress Time, and RSET is the Required Safe Egress Time. So for this project based on how quickly it reached the FED could change the number of exits or how egress is done. Occupants mind sets can change when they are exposed to toxins.

As stated in Purser’s chapter:

“The behavioral and physiological effects of exposure to toxic smoke and heat in fires results in varying degrees of incapacitation, which also may lead to death or permanent injury. These incapacitating effects include the following:

- 1) Behavior-modifying effect of smoke and irritants on willingness to use escape routes.*
- 2) Impaired vision resulting from the optical opacity of smoke and from the painful effects of irritant smoke products and heat on the eyes.*
- 3) Respiratory tract pain and breathing difficulties or even respiratory tract injury resulting from the inhalation of irritant smoke, which may be hot. In extreme cases this effect can lead to collapse within a few minutes from asphyxia due to laryngeal spasm and / or bronchoconstriction. Lung inflammation may also occur, usually after some hours, which can also lead to varying degrees or respiratory distress.*
- 4) Asphyxia from the inhalation of toxic gases, resulting in confusion and loss of consciousness.*
- 5) Pain to exposed skin and the upper respiratory tract followed by burns, or hyperthermia, due to the effects of heat preventing escape, which can lead to collapse.”*

So we would want to make sure the occupants are out of the hazard area before any of the above effects take effect. The LSC outlines the FED value for incapacitation as 0.8 for non-lethal exposure, and an FED value of 0.3 for non-incapacitating exposure. Purser suggests a value of 1.0 for incapacitation using the FED concept. For the FDS model we will use 3500 PPM CO from SFPE table 2-6.7 and 2-6.8. This will lend to the ease of the program as it will calculate in that figure. In order to figure out in a fire scenario when an occupant has inhaled a toxic dose the equation one would want to apply would be the following equation given by Purser.

$$F_{IN} = [(F_{ICO} + F_{ICN} + FLD_{irr}) \times VCO_2 + FED_{IO}] \text{ or } F_{ICO_2}$$

where

F_{IN} = fraction of an incapacitating dose of all asphyxiant gases

F_{ICO} = fraction of an incapacitating dose of CO

F_{ICN} = fraction of an incapacitating dose of HCN (and nitriles, corrected for NO₂)

FLD_{irr} = fraction of an irritant dose contributing to hypoxia (This term represents a correction for the effects of irritants on lung function and is developed in the section on irritants. This term may be omitted if the effects of asphyxiant gases only are under consideration)

VCO_2 = multiplication factor for CO₂-induced hyperventilation

FED_{IO} = fraction of an incapacitating dose of low-oxygen hypoxia

FED_{ICO_2} = fraction of an incapacitating dose of CO₂

Figure 23 Fractional Effective Doses Equation

Analysis of Fire Detector Response

The two detectors that are used in this project are the sprinkler and smoke detector. For the sprinkler I used the Nuclear Regulatory Commission (NRC) estimating sprinkler response time sheet and the DETACT (DETECTOR ACTivation, time squared growth). The NRC model is a steady state model that uses the Alpert ceiling jet model and the DETACT is a time squared growth. The fire scenario that is used is carpet catching on fire in the bedroom. The bed room is roughly a 10' X 10' room that has a bed, desk and not included in the space is a walk in closet. According to SFPE Handbook carpets have a HRR range of 100 kW to 3 MW. For the NRC model I started with a 100 KW fire and the sprinkler would not activate if the fire stayed at that steady state. The HRR that the sprinkler would activate at would be 450 kW steady state fire. This is in the range of carpet material. The sprinkler would activate at approximately 3.29 minutes with a Convection HRR of 315 kW. Going along with this same fire scenario in the DETACT model the sprinkler would activate at 3.85 minutes. The parameters in the DETACT model was that it was slow growth curve with a RTI value of 50 for the quick response head. This makes sense because the fire has a HRR 645 and is close to the value obtained in the NRC model. See the below Table 17 for graphical analysis.

The smoke detector used the NRC model only. Now that we know the sprinkler response times and at what HRR, we can use those values for the smoke detector to see the time difference. Plugging in the value of 450 kW steady state fire, the response time would be 0.53 seconds. This is almost instantaneous and a perfect condition and the room door is closed. I then ran the model with a larger radius than the 10 ft. and maxed out the distance of the smoke detector of 30 ft and the response time then moves to 1.84 sec. This is still a really quick response to the fire. Then looking at the Sprinkler DETACT model at 3 minutes the HRR is roughly 100 kW and that would bring the sprinkler response time

to 9 sec. This is a more ideal model for it is more realistic since the fire will grow slowly and not just be a 450 kW right away unless tampering is involved. Between the two detectors there should be able amount of time to escape and the one sprinkler head should be able to extinguish the fire based on a normal fire load of the room.

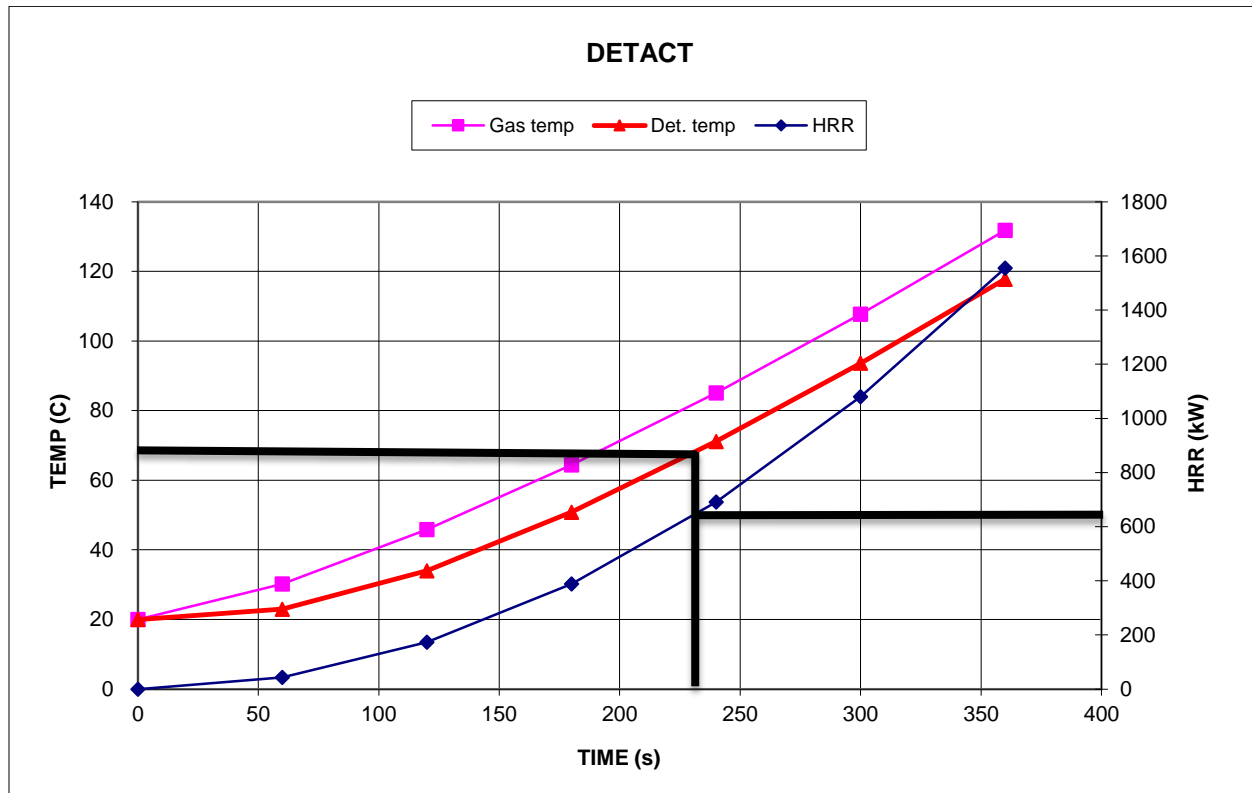


Table 17 Sprinkler DETACT Model

FDS Model Criteria (Dorm Room)

For the purpose of this project a performance based model will be designed. Typically a project of this type would not have any performance based fire protection. It would be based solely on prescriptive based fire protection. This is due to cost and time. For this situation I did a dorm room fire with a source of ignition as a trash can fire with 100 kW on a slow curve fire growth. We are going to evaluate the time of smoke detection, time of sprinkler activation and smoke height. In order to get a realistic model you need to run the model with the initial parameters as the inputs with all the devices active. Then you will run the model to see when the sprinkler activates. At the time of activation you will then hold that heat release rate out until the end of the duration of the model time. This will prevent the growth of the fire during time of sprinkler activation. Once the second model is run with the new updated criteria, one will run a 3rd model with the sprinkler devices not active and see how the fire spreads and grows without them. The criteria that we were looking for in this model was the following:

- Smoke Visibility at the 6ft mark
 - SFPE Table 2-4.2
 - Familiar with building **Visibility 4m**
- FED at the 6ft mark
 - SFPE Table 2-6.7 and Table 2-6.8
 - Incapacitation occurs at **3500 PPM CO**
- Temperature at the 6ft mark
 - SFPE Section 2 Chapter 6
 - **Temperature of 200 C**

From here we will see how the models performed. We had the sprinkler in the dorm room sleeping area activate at 145 seconds with an initial smoke detection of 38 sec. In these types of fires at this time the fire will either be suppressed to where it is located or completely extinguished. See the following figures:



Figure 24 Smoke Detector Activation (38 Sec)

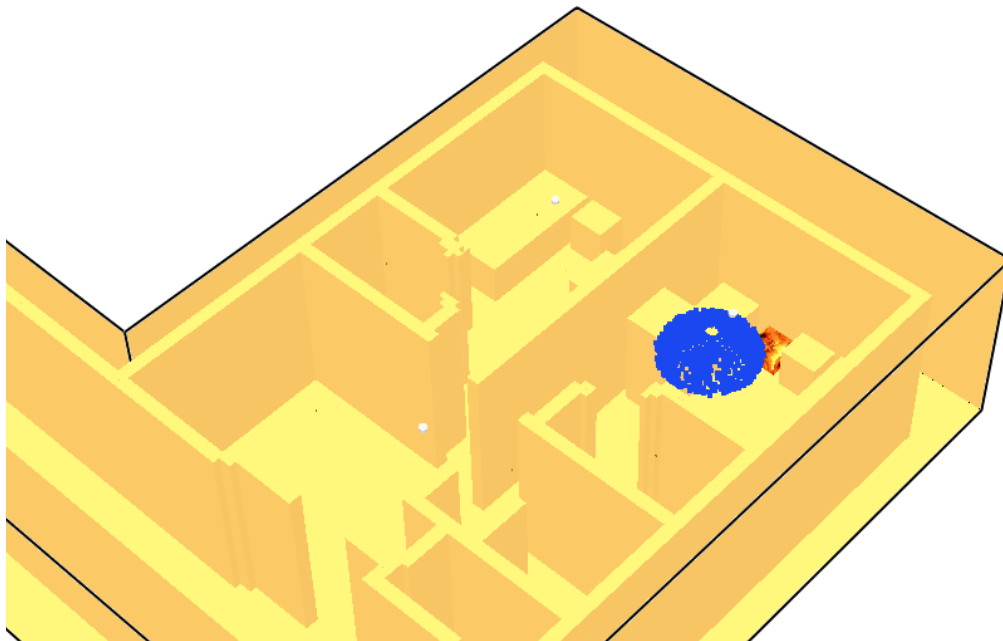


Figure 25 Sprinkler Activation (145 Sec)

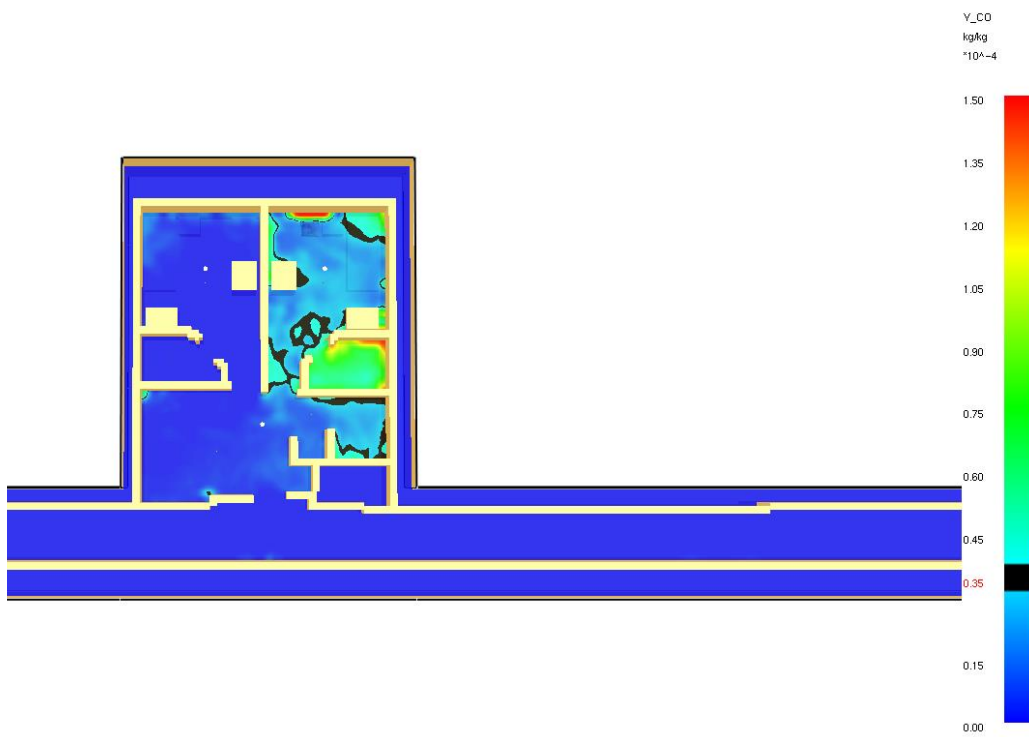


Figure 26 CO levels @ 145 Sec above 3500 PPM

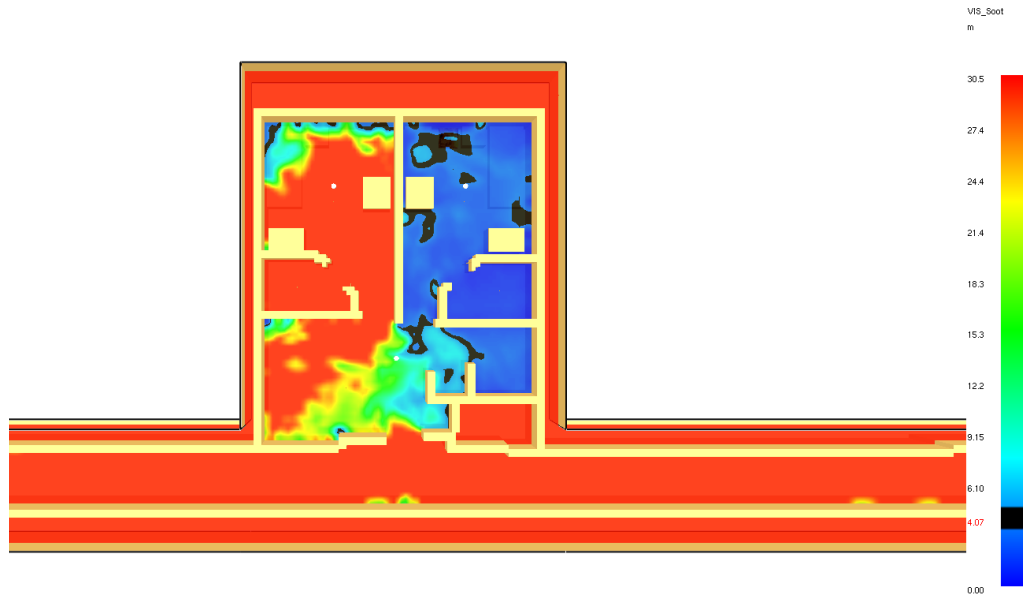


Figure 27 Smoke Visibility @ 145 Sec, 6ft (4m under black line)

From these photos and the model we can see that the building and its fire protection features are working as designed. This will allow for proper time to evacuate the building. Now comparing the hand calculations to the fire model. In the hand calculations I was able to get the smoke detector to activate at 9 sec and the model at 38 sec. The model time appears to be more accurate by the eye test. The sprinkler activation is 231 sec to the model time of 145 sec. These both appear too accurate based on the fire can grow a different rates with the same fire. This is possible due to maybe the location of the fire. We had successful model performance based models based on our results.

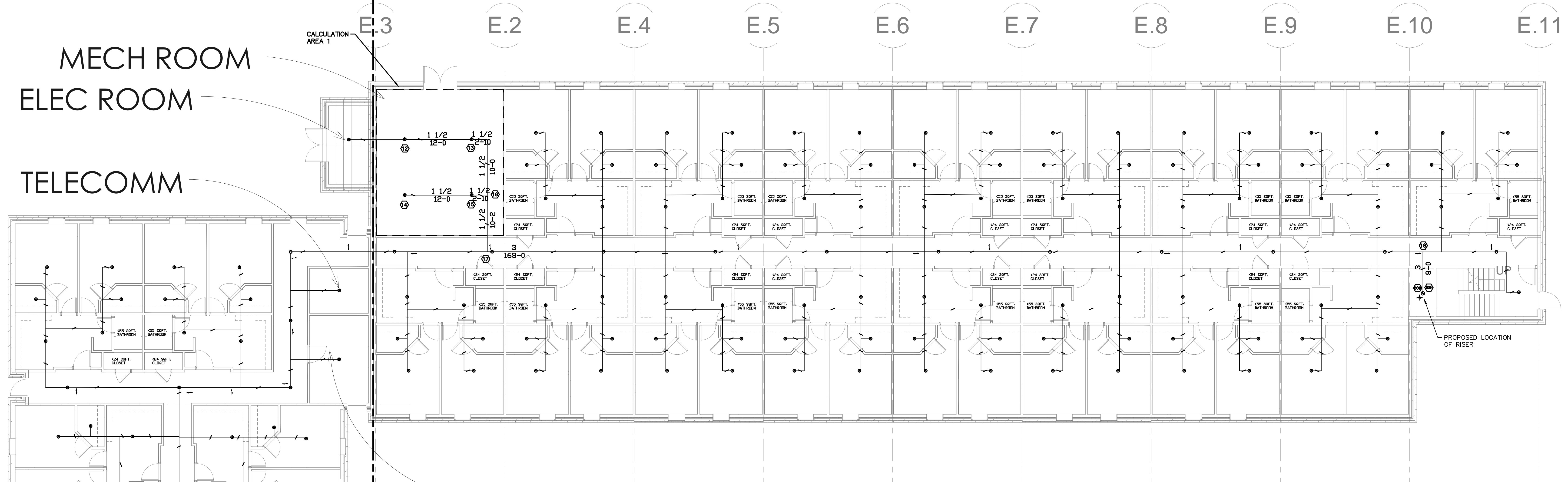
The third model ran the fire without the sprinklers. I compared the fire at 300 sec for both with sprinklers and without. It was almost equal in all areas except temperature. There was a large temperature difference between the models. Both model still passed and I believe this is due to the size of the room and the ability for the fire not to grow as rapidly as it could if it was put in a different situation. But it is still shown that sprinklers had a great effect on the final outcome.




There is another possible model scenario for the building. It is the communicating space on the first and second floor. This is not a likely scenario due to the fact there is very little items in this area and ignition sources should not be present. But to see how the smoke would move in the space could be helpful if there ever was a fire to see how it traveled between the two spaces.

Conclusion and Recommendations

After all the research, design and modeling this Battalion Headquarters Complex building will be code compliant. There were some unique issues like the 2-hr fire wall to meet the area requirement for the building and the convenience opening “aka the mini atrium” connecting the first and second floor. These issues were all easily resolved by the code that was being applied to it. This building and its features would only warrant using the prescriptive based code based on the information that was gathered for this building. There is one analysis that could be done to see if the building would meet all the necessary requirements. This would be to do a fire model of the convenience opening connecting the first and second floor. This would allow us to see if the prescriptive code would be enough to protect that area of the building. My recommendation would be to perform a FDS model of that area and see if the heat, visibility and FED would meet the requirements and allow the occupants enough time to evacuate the building. The other option would be to seal that area as this is not absolutely necessary feature to have and would add some additional floor space that could be used to add another room or feature for the occupants. This R-2 structure has extra features that a typical R-2 would not have since this one is military use. It has a mass notification system along with the normal addressable fire alarm and sprinkler system. This extra feature will help in properly notifying the occupants of what to do in each emergency situation. Since this building is of new construction there are not really any other recommendations that could be given other than adding more cost and over designing the fire protection features. We will have to see what changes there are over the years to see how we will progress and then at that time we can see what could have been done better.

Appendix A – Sprinkler System layout

[illegible]

| SPRINKLER LEGEND | | | | | | | | | | |
|---|--------------|--------|-------------------|----------|---------|----------|------------|--------|------------|------|
| SYMBOL | MANUFACTURER | MODEL | TYPE | RESPONSE | ORIFICE | K-FACTOR | TEMP. (°F) | FINISH | ESCUTCHEON | QTY. |
|  | TYCO | TY4234 | CONCEALED PENDENT | FR | 1/2" | 6.9 | 155 | WHITE | WHITE | 284 |
|  | TYCO | TY4951 | PENDENT | FR | 1/2" | 8.0 | 175 | CHROME | NONE | 8 |
|  | TYCO | TY4234 | PENDENT | FR | 1/2" | 6.9 | 155 | CHROME | CHROME | 47 |

| HYDRANT WATERFLOW TEST RESULTS | | | |
|--------------------------------|--------------------------|------------------|--------------------|
| TEST DATE: | <u>FEBRUARY 07, 2012</u> | HYDRANT LOCATION | 35th & INDIANA AVE |
| PERFORMED BY: | <u>CHEM HILL</u> | | HYDRANT 47-35 |
| STATIC: | <u>47 PSI</u> | | |
| RESIDUAL: | <u>46 PSI</u> | | |
| FLOW: | <u>1150 GPM</u> | | |

| |
|---|
| D |
| F |
| F |

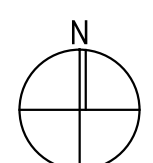
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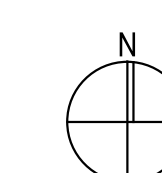
Fire Protection Drawings

Drawn: M. Mershimer
Design:
Review:
Date:
Scale: 1/8" = 1'-0"

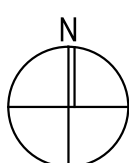
AREA-1
ST FLOOR FIRE PLAN

FP1.0

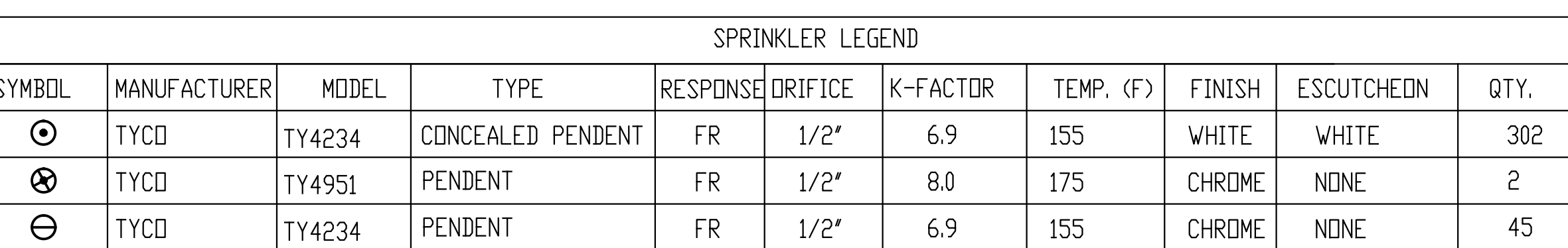




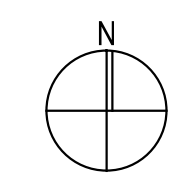
FP1.1

[illegible]

FP1.2

[illegible]

| HYDRANT WATERFLOW TEST RESULTS | | | |
|--------------------------------|-------------------|-------------------|--------------------|
| TEST DATE: | FEBRUARY 07, 2012 | HYDRANT LOCATION: | 35th & INDIANA AVE |
| PERFORMED BY: | CH2M HILL | | HYDRANT 47-35 |
| STATIC: | 42.3 PSI | | |
| RESIDUAL: | 41.4 PSI | | |
| FLOW: | 1190 GPM | | |

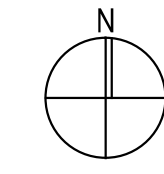


Fire Protection Drawings

| | |
|---------|--------------|
| Drawn: | M. Mershimer |
| Design: | |
| Review: | |
| Date: | |
| Scale: | 1/8" = 1'-0" |

AREA-1
2ND FLOOR FIRE PLAN

FP2.0



Fire Protection Drawings

AREA-2
2ND FLOOR FIRE PLAN

FP2.1

[illegible]

1

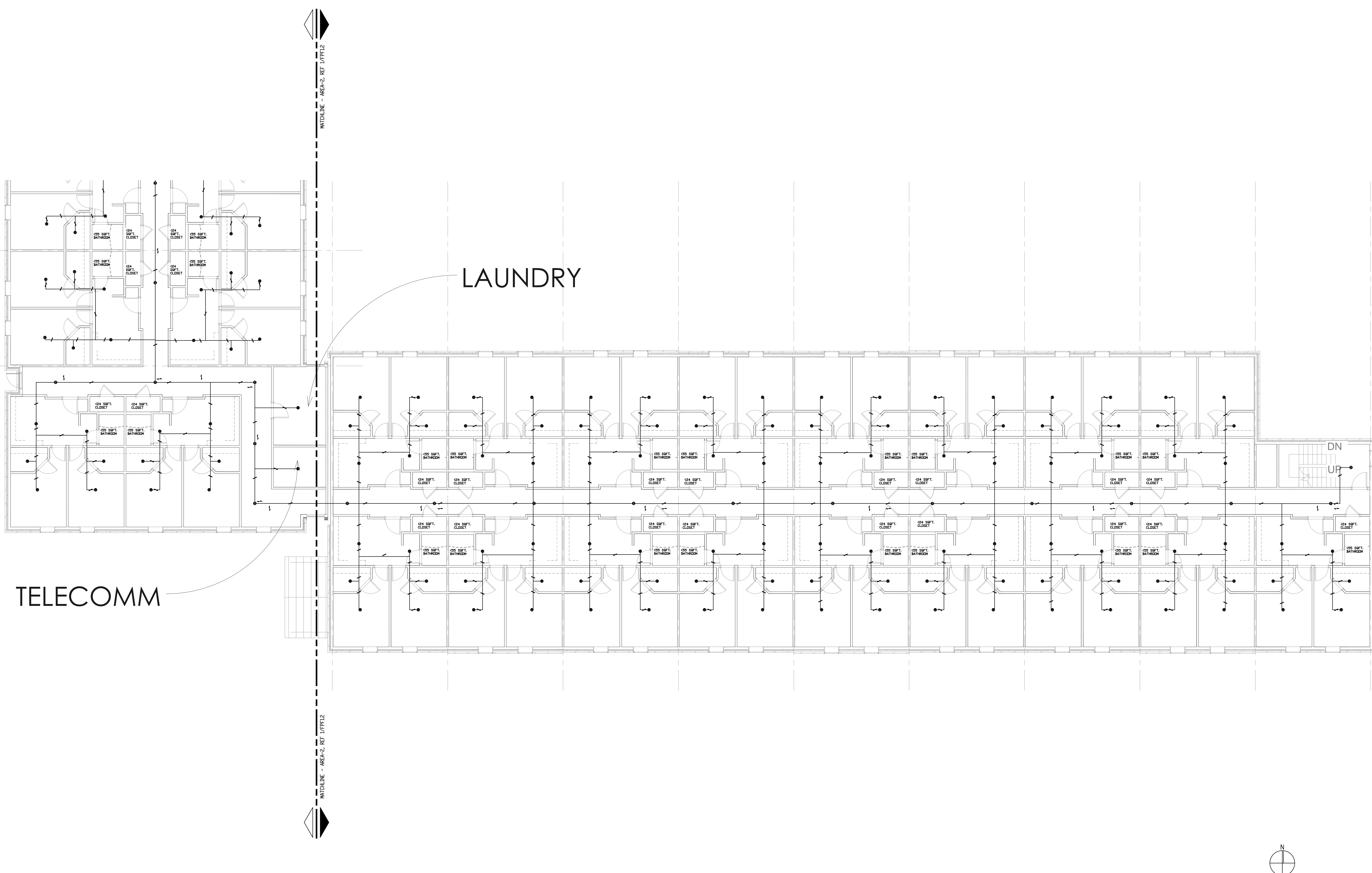
KEY PLAN

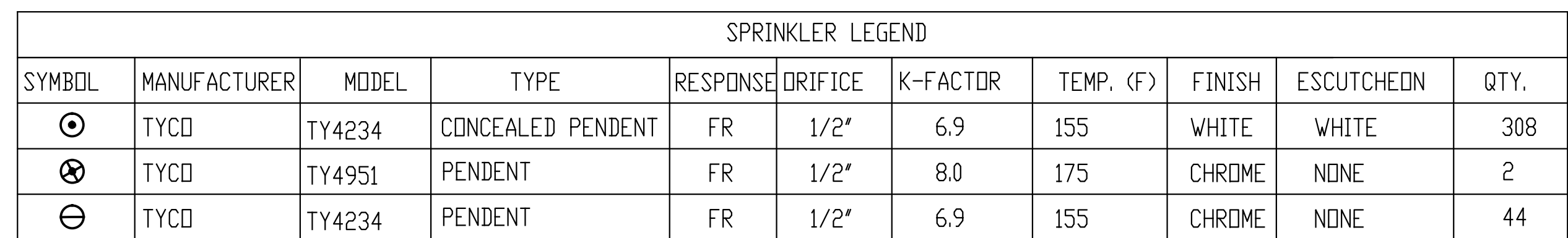
Fire Protection Drawings

| |
|---------------------|
| Drawn: M. Mershimer |
| Design: |
| Review: |
| Date: |
| Scale: 1/8" = 1'-0" |

AREA-3
2ND FLOOR FIRE PLAN

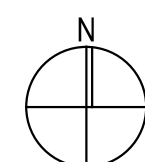
| | |
|-------------|-------|
| Drawing No. | FP2.2 |
|-------------|-------|

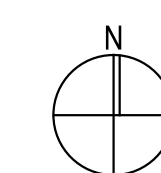


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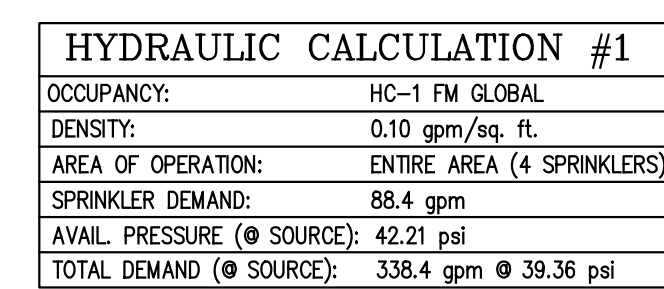
| HYDRANT WATERFLOW TEST RESULTS | | | |
|--------------------------------|--------------------------|-------------------|--------------------|
| TEST DATE: | <u>FEBRUARY 07, 2012</u> | HYDRANT LOCATION: | 35th & INDIANA AVE |
| PERFORMED BY: | <u>CH2M HILL</u> | | HYDRANT 47-35 |
| STATIC: | <u>42.3 PSI</u> | | |
| RESIDUAL: | <u>41.4 PSI</u> | | |
| FLOW: | <u>1190 GPM</u> | | |

FP3.0





FP3.1

[illegible]

**CALCULATION -
AREA 1**

KEY PLAN

Fire Protection Drawings

| | |
|---------|----------------------|
| Design: | Drawn: M. Mershimier |
| | Design: |
| | Review: |
| | Date: |
| | Scale: 1/8" = 1'-0" |

AREA-3
3RD FLOOR FIRE PLAN

FP3.2

Appendix B – Manual Hydraulic Calculations

| Project name: FPE 523 Calculation 2 First Floor | | | | | | | | | | Date: 16-Feb-14 | | | | |
|---|---------------------------|-------------|--------|-----------|---------------------------|------------------------|-----|------------------------|-----|------------------|------|-----------------|---|----|
| Step No. | Nozzle Ident and Location | Flow in gpm | | Pipe size | Pipe Fittings and Devices | Equivalent Pipe Length | | Friction loss (psi/ft) | | Pressure Summary | | Normal Pressure | Notes K= 8.0, D= 0.20 gpm/ft2 | |
| 1 | 12 SP | q | | 1.5 | | L | 12 | C= | 150 | Pt | 10.6 | Pt | Q=130*0.2 P=(26/8.0)^2 | |
| | | | | | | | F | | | | Pe | Pv | | |
| | | Q | 26.0 | | | 1.61 | T | 12 | pf | 0.017 | Pf | 0.2 | | Pn |
| 2 | 13 SP | q | 24.2 | 1.5 | E | L | 13 | C= | 150 | Pt | 10.8 | Pt | q=5.6*18.7^0.5 | |
| | | | | | | | F | 2 | | | Pe | Pv | | |
| | | Q | 48.2 | | | 1.61 | T | 15 | pf | 0.054 | Pf | 0.8 | | Pn |
| 3 | 14 SP | q | | 1.5 | | L | 12 | C= | 150 | Pt | 10.6 | Pt | Q=130*0.2 P=(26/8.0)^2 | |
| | | | | | | | F | 0 | | | Pe | Pv | | |
| | | Q | 26.0 | | | 1.61 | T | 12 | pf | 0.017 | Pf | 0.2 | | Pn |
| 4 | 15 SP | q | 24.2 | 1.5 | T | L | 3 | C= | 150 | Pt | 10.8 | Pt | q=5.6*18.7^0.5 | |
| | | | | | | | F | 8 | | | Pe | Pv | | |
| | | Q | 48.2 | | | 1.61 | T | 11 | pf | 0.054 | Pf | 0.6 | | Pn |
| 5 | 16 | q | | 1.5 | | L | 10 | C= | 150 | Pt | 11.6 | Pt | | |
| | | | | | | | F | 0 | | | Pe | Pv | | |
| | | Q | 96.4 | | | 1.61 | T | 10 | pf | 0.196 | Pf | 2.0 | | Pn |
| 6 | 17 | q | | 3 | E | L | 168 | C= | 150 | Pt | 13.6 | Pt | K=96.4/13.6^0.5=26.2 q=26.2*13.6^0.5 | |
| | | | | | | | F | 4 | | | Pe | Pv | | |
| | | Q | 96.6 | | | 3.068 | T | 172 | pf | 0.009 | Pf | 1.5 | | Pn |
| 7 | 18 TOR1 | q | | 3 | E | L | 8 | C= | 150 | Pt | 15.0 | Pt | q=26.2*15.0^0.5 | |
| | | | | | | | F | 4 | | | Pe | Pv | | |
| | | Q | 101.5 | | | 3.068 | T | 12 | pf | 0.009 | Pf | 0.1 | | Pn |
| 8 | TOR1 BOR | q | | 4 | C G | L | 11 | C= | 150 | Pt | 15.1 | Pt | q=26.2*15.1^0.5 Pe=11*0.433 | |
| | | | | | | | F | 5 | | | Pe | 4.8 | | Pv |
| | | Q | 1001.8 | | | 4.026 | T | 16 | pf | 0.172 | Pf | 2.7 | | Pn |
| 9 | BF | q | | | | L | | C= | | Pt | 22.7 | Pt | | |
| | | | | | | | F | | | | Pe | 7.0 | | Pv |
| | | Q | 99.8 | | | | T | | pf | | Pf | | | Pn |
| 10 | UG1 UG2 | q | | 6 | 4E | L | 350 | C= | 150 | Pt | 29.7 | Pt | q=26.2*29.7^0.5 | |
| | | | | | | | F | 88 | | | Pe | Pv | | |
| | | Q | 142.8 | | | 6.28 | T | 438 | pf | 0.001 | Pf | 0.2 | | Pn |
| 11 | | q | | | | L | | C= | | Pt | 29.9 | Pt | Add 250 GPM Hose Supply @ 392 GPM | |
| | | | | | | | F | | | | Pe | Pv | | |
| | | Q | | | | | T | | pf | | Pf | | | Pn |
| 12 | | q | | | | L | | C= | | Pt | | Pt | | |
| | | | | | | | F | | | | Pe | Pv | | |
| | | Q | | | | | T | | pf | | Pf | | | Pn |
| 13 | | q | | | | L | | C= | | Pt | | Pt | | |
| | | | | | | | F | | | | Pe | Pv | | |
| | | Q | | | | | T | | pf | | Pf | | | Pn |
| 14 | | q | | | | L | | C= | | Pt | | Pt | | |
| | | | | | | | F | | | | Pe | Pv | | |
| | | Q | | | | | T | | pf | | Pf | | | Pn |
| 15 | | q | | | | L | | C= | | Pt | | Pt | | |
| | | | | | | | F | | | | Pe | Pv | | |
| | | Q | | | | | T | | pf | | Pf | | | Pn |
| 16 | | q | | | | L | | C= | | Pt | | Pt | | |
| | | | | | | | F | | | | Pe | Pv | | |
| | | Q | | | | | T | | pf | | Pf | | | Pn |

| Project name: FPE 523 Calculation 1 Third Floor | | | | | Date: 16-Feb-14 | | | | |
|---|---------------------------|-------------|-----------|---------------------------|------------------------|------------------------|------------------|-----------------|---------------------------------------|
| Step No. | Nozzle Ident and Location | Flow in gpm | Pipe size | Pipe Fittings and Devices | Equivalent Pipe Length | Friction loss (psi/ft) | Pressure Summary | Normal Pressure | Notes K= 6.9, D= 0.10 gpm/ft2 |
| 1 | 1 SP | q | 1.5 | | L 7.5 | C= 150 | Pt 16.7 | Pt | Q=20.0 P=16.7 From data sheet |
| | | | | | F | | Pe | Pv | |
| | | Q 20.0 | 1.61 | | T 7.5 | pf 0.011 | Pf 0.1 | Pn | |
| 2 | 2 SP | q | 1.5 | | L 3.5 | C= 150 | Pt 16.8 | Pt | Q=20.0 P=16.7 From data sheet |
| | | | | | F | | Pe | Pv | |
| | | Q 20.0 | 1.61 | | T 3.5 | pf 0.011 | Pf 0.0 | Pn | |
| 3 | 3 | q | 1.5 | | L 16 | C= 150 | Pt 16.8 | Pt | |
| | | | | | F | | Pe | Pv | |
| | | Q 40.0 | 1.61 | | T 16 | pf 0.039 | Pf 0.6 | Pn | |
| 4 | 5 SP | q | 1.5 | | L 6 | C= 150 | Pt 16.7 | Pt | Q=20.0 P=16.7 From data sheet |
| | | | | | F 0 | | Pe | Pv | |
| | | Q 20.0 | 1.61 | | T 6 | pf 0.011 | Pf 0.1 | Pn | |
| 5 | 7 SP | q | 1.5 | | L 2 | C= 150 | Pt 16.8 | Pt | Q=20.0 P=16.7 From data sheet |
| | | | | | F 8 | | Pe | Pv | |
| | | Q 20.0 | 1.61 | | T 10 | pf 0.011 | Pf 0.1 | Pn | |
| 6 | 6 | q | 1.5 | T | L 6 | C= 150 | Pt 16.9 | Pt | |
| | | | | | F 8 | | Pe | Pv | |
| | | Q 40.0 | 1.61 | | T 14 | pf 0.039 | Pf 0.5 | Pn | |
| 7 | 4 | q | 2 | E T | L 11 | C= 150 | Pt 18.0 | Pt | |
| | | | | | F 12 | | Pe | Pv | |
| | | Q 80.0 | 2.067 | | T 23 | pf 0.041 | Pf 0.9 | Pn | |
| 8 | 8 | q | 3 | E T | L 248 | C= 150 | Pt 18.9 | Pt | K=80/18.9^0.5=18.4 q=18.4*18.9^0.5 |
| | | | | | F 12 | | Pe | Pv | |
| | | Q 80.0 | 3.068 | | T 260 | pf 0.006 | Pf 1.6 | Pn | |
| 9 | 9 | q | 3 | | L 168 | C= 150 | Pt 20.5 | Pt | q=18.4*20.5^0.5 |
| | | | | | F 0 | | Pe | Pv | |
| | | Q 83.3 | 3.068 | | T 168 | pf 0.006 | Pf 1.1 | Pn | |
| 10 | 10 | q | 3 | 3E | L 248 | C= 150 | Pt 21.6 | Pt | q=18.3*21.8^0.5 |
| | | | | | F 12 | | Pe | Pv | |
| | | Q 85.4 | 3.068 | | T 260 | pf 0.007 | Pf 1.8 | Pn | |
| 11 | 11 | q | 3 | E | L 8 | C= 150 | Pt 23.4 | Pt | q=18.3*23.4^0.5 |
| | | | | | F 4 | | Pe | Pv | |
| | | Q 88.9 | 3.068 | | T 12 | pf 0.007 | Pf 0.1 | Pn | |
| 12 | TOR BOR | q | 4 | C G | L 32 | C= 150 | Pt 23.5 | Pt | Pe=32^0.218 q=18.3*23.5^0.5 |
| | | | | | F 5 | | Pe | Pv | |
| | | Q 89.0 | 4.026 | | T 37 | pf 0.002 | Pf 0.1 | Pn | |
| 13 | BF | q | | | L | C= | Pt 30.5 | Pt | |
| | | | | | F | | Pe | Pv | |
| | | Q 89.0 | | | T | pf | Pf 7.0 | Pn | |
| 15 | UG1 UG2 | q | 6 | 4E | L 350 | C= 150 | Pt 37.5 | Pt | q=18.3*37.5^0.5 |
| | | | | | F 88 | | Pe | Pv | |
| | | Q 112.7 | 6.28 | | T 438 | pf 0.000 | Pf 0.2 | Pn | |
| 16 | | q | | | L | C= | Pt 37.7 | Pt | Add 250 GPM Hose Supply @ 372 GPM |
| | | | | | F | | Pe | Pv | |
| | | Q | | | T | pf | Pf | Pn | |
| 17 | | q | | | L | C= | Pt | Pt | |
| | | | | | F | | Pe | Pv | |
| | | Q | | | T | pf | Pf | Pn | |

Appendix C – Computer-Based Hydraulic Calculations

HUGHES ASSOCIATES, INC.
6 CENTERPOINTE DRIVE, SUITE 760
LA PALMA, CA 90623

HYDRAULIC CALCULATIONS

FOR

FPE 523 Project
Third Floor

FILE NUMBER:
DATE: FEB 20, 2014

-DESIGN DATA-

| | |
|--|-------------------|
| OCCUPANCY CLASSIFICATION: | HC-1 FM Global |
| DENSITY: | 0.10 gpm/sq. ft. |
| AREA OF APPLICATION: | 408 sq. ft. |
| COVERAGE PER SPRINKLER: | 225 sq. ft. |
| NUMBER OF SPRINKLERS CALCULATED: | 4 sprinklers |
| TOTAL SPRINKLER WATER FLOW REQUIRED: | 88.3 gpm |
| TOTAL WATER REQUIRED (including hose): | 338.4 gpm |
| FLOW AND PRESSURE (@ BOR): | 1190 gpm @ 46 psi |
| SPRINKLER ORIFICE SIZE: | 1/2 inch |
| DESIGN/LAYOUT BY: | M. Mershimer |

CALCULATIONS BY HASS COMPUTER PROGRAM (LICENSE # 27050933)
HRS SYSTEMS, INC.

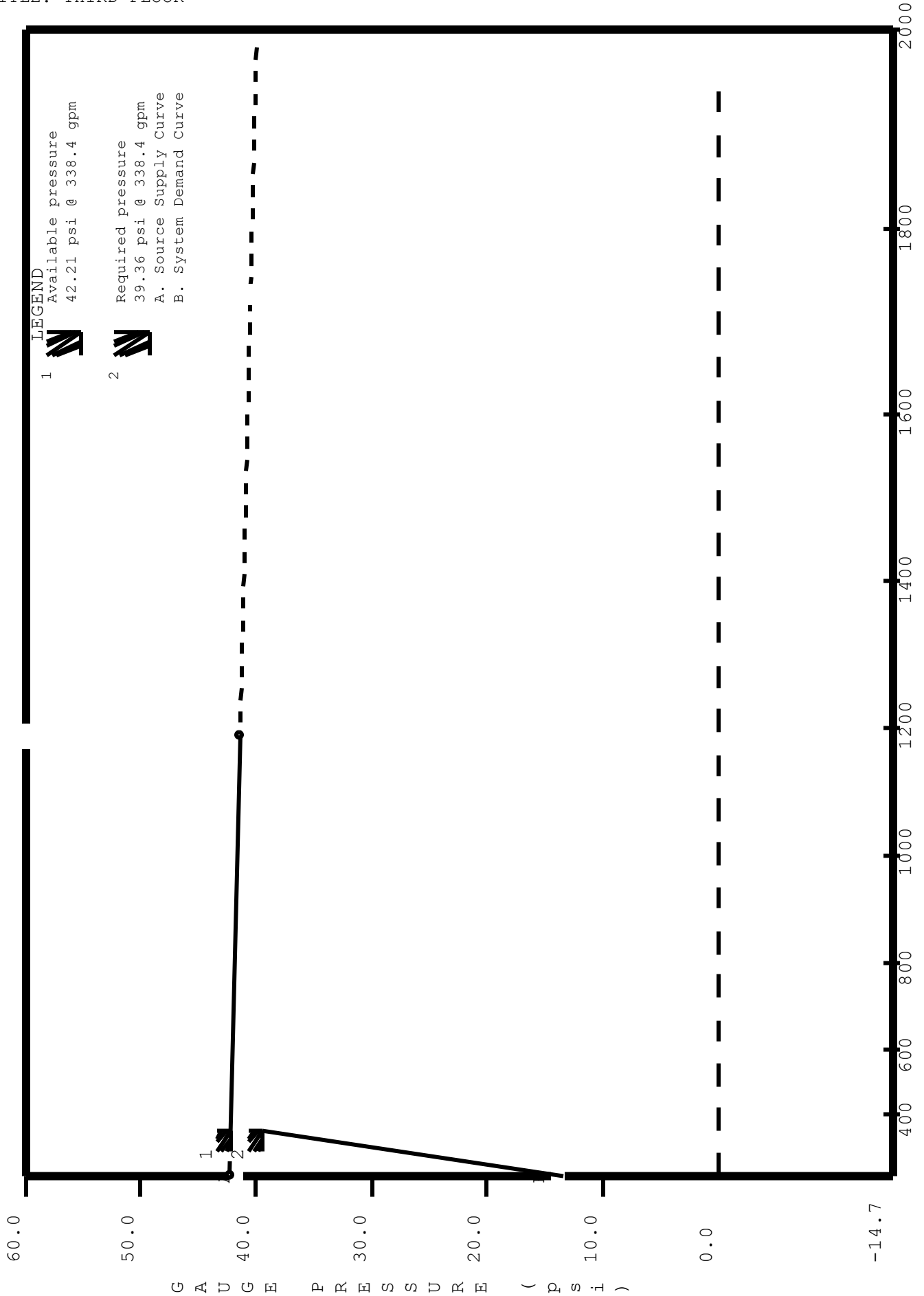
DATE: 2/20/2014

U:\MMERSHIMER\FPE 523 HASS CALCUALTIONS\THIRD FLOOR.SDF

JOB TITLE: THIRD FLOOR

WATER SUPPLY ANALYSIS

Static: 42.30 psi Resid: 41.40 psi Flow: 1190.0 gpm



DATE: 2/20/2014 U:\MMERSHIMER\FPE 523 HASS CALCUALTIONS\THIRD FLOOR.SDF
 JOB TITLE: THIRD FLOOR

NFPA WATER SUPPLY DATA

| SOURCE NODE TAG | STATIC PRESS. (PSI) | RESID. PRESS. (PSI) | FLOW @ (GPM) | AVAIL. PRESS. (PSI) | TOTAL @ DEMAND (GPM) | REQ'D PRESS. (PSI) |
|-----------------------|---------------------------|---------------------------|--------------------|---------------------------|-------------------------------|--------------------------|
| SRCE | 42.3 | 41.4 | 1190.0 | 42.2 | 338.4 | 39.4 |

AGGREGATE FLOW ANALYSIS:

| | |
|--|-----------|
| TOTAL FLOW AT SOURCE | 338.4 GPM |
| TOTAL HOSE STREAM ALLOWANCE AT SOURCE | 250.0 GPM |
| OTHER HOSE STREAM ALLOWANCES | 0.0 GPM |
| TOTAL DISCHARGE FROM ACTIVE SPRINKLERS | 88.4 GPM |

NODE ANALYSIS DATA

| NODE TAG | ELEVATION (FT) | NODE TYPE | PRESSURE (PSI) | DISCHARGE (GPM) | NOTES |
|----------|-------------------|-----------|-------------------|--------------------|-------|
| SRCE | 0.0 | SOURCE | 39.4 | 88.4 | |
| 2 | 31.0 | K= 6.90 | 10.2 | 22.1 | |
| 3 | 32.0 | - - - - | 9.8 | - - - | |
| 4 | 32.0 | - - - - | 10.6 | - - - | |
| 5 | 31.0 | K= 6.90 | 10.3 | 22.1 | |
| 6 | 32.0 | - - - - | 9.9 | - - - | |
| 7 | 31.0 | K= 6.90 | 10.3 | 22.2 | |
| 8 | 32.0 | - - - - | 11.9 | - - - | |
| 9 | 32.0 | - - - - | 14.2 | - - - | |
| 10 | 32.0 | - - - - | 15.7 | - - - | |
| 11 | 32.0 | - - - - | 17.9 | - - - | |
| TOR | 32.0 | - - - - | 18.0 | - - - | |
| BOR | 4.0 | - - - - | 30.5 | - - - | |
| UG1 | -6.0 | - - - - | 41.8 | - - - | |
| UG2 | -6.0 | - - - - | 42.0 | - - - | |
| 1 | 31.0 | K= 6.90 | 10.2 | 22.0 | |
| BF1 | 4.0 | - - - - | 37.5 | - - - | |
| BF2 | 4.0 | - - - - | 30.5 | - - - | |

DATE: 2/20/2014 U:\MMERSHIMER\FPE 523 HASS CALCUALTIONS\THIRD FLOOR.SDF

JOB TITLE: THIRD FLOOR

NFPA PIPE DATA

| Pipe Tag | K-fac | Add Fl | Add Fl | To | Fit: | L | C | (Pt) | |
|----------|---------|--------|---------|-------|----------------------------|----------|----------|--------|-------|
| Frm Node | El (ft) | PT | (q) | Node/ | Nom ID | Eq.Ln. | F | (Pe) | Notes |
| To Node | El (ft) | PT | Tot.(Q) | Disch | Act ID | (ft.) | T | Pf/ft. | (Pf) |
| Pipe: 1 | | Source | 0.0 | | | | 6.00 | 150 | 2.6 |
| SRCE | 0.0 | 39.4 | 88.3 | UG1 | E6.000 | E:22.0 | 22.00 | | 2.6 |
| UG2 | -6.0 | 42.0 | 88.4 | | 6.080 | | 28.00 | 0.000 | 0.0 |
| Pipe: 2 | | 0.0 | 0.0 | | | | 350.00 | 150 | 0.1 |
| UG2 | -6.0 | 42.0 | 88.3 | BF1 | E6.000 | 4E:88.0 | 88.00 | | 0.0 |
| UG1 | -6.0 | 41.8 | 88.3 | | 6.080 | | 438.00 | 0.000 | 0.1 |
| Pipe: 2A | | 0.0 | 0.0 | | | | 10.00 | 150 | 4.3 |
| UG1 | -6.0 | 41.8 | 88.3 | BF2 | E6.000 | ---- | 0.00 | | -4.3 |
| BF1 | 4.0 | 37.5 | 88.3 | | 6.080 | | 10.00 | 0.000 | 0.0 |
| Pipe: 2B | | | 0.0 | | Fixed Pressure Loss Device | | | | |
| BF1 | 4.0 | 37.5 | 88.3 | BOR | | 7.0 psi, | 88.3 gpm | | |
| BF2 | 4.0 | 30.5 | 88.3 | | | | | | |
| Pipe: 3 | | 0.0 | 0.0 | | | | 6.00 | 150 | 0.0 |
| BF2 | 4.0 | 30.5 | 88.3 | TOR | E6.000 | E:22.0 | 22.00 | | 0.0 |
| BOR | 4.0 | 30.5 | 88.3 | | 6.080 | | 28.00 | 0.000 | 0.0 |
| Pipe: 4 | | 0.0 | 0.0 | | | | 32.00 | 150 | 12.5 |
| BOR | 4.0 | 30.5 | 88.3 | 11 | F3.000 | C: 2.0 | 5.00 | | -12.1 |
| TOR | 32.0 | 18.0 | 88.3 | | 2.950 | G: 3.0 | 37.00 | 0.009 | 0.3 |
| Pipe: 5 | | 0.0 | 0.0 | | | | 8.00 | 150 | 0.1 |
| TOR | 32.0 | 18.0 | 88.3 | 10 | F3.000 | E: 4.0 | 4.00 | | 0.0 |
| 11 | 32.0 | 17.9 | 88.3 | | 2.950 | | 12.00 | 0.009 | 0.1 |
| Pipe: 6 | | 0.0 | 0.0 | | | | 248.00 | 150 | 2.3 |
| 11 | 32.0 | 17.9 | 88.3 | 9 | F3.000 | 3E:12.0 | 12.00 | | 0.0 |
| 10 | 32.0 | 15.7 | 88.3 | | 2.950 | | 260.00 | 0.009 | 2.3 |
| Pipe: 7 | | 0.0 | 0.0 | | | | 168.00 | 150 | 1.5 |
| 10 | 32.0 | 15.7 | 88.3 | 8 | F3.000 | ---- | 0.00 | | 0.0 |
| 9 | 32.0 | 14.2 | 88.3 | | 2.950 | | 168.00 | 0.009 | 1.5 |
| Pipe: 8 | | 0.0 | 0.0 | | | | 248.00 | 150 | 2.3 |
| 9 | 32.0 | 14.2 | 88.3 | 4 | F3.000 | 3E:12.0 | 12.00 | | 0.0 |
| 8 | 32.0 | 11.9 | 88.3 | | 2.950 | | 260.00 | 0.009 | 2.3 |
| Pipe: 9 | | 0.0 | 44.1 | 3 | | | 11.00 | 150 | 1.3 |
| 8 | 32.0 | 11.9 | 44.3 | 6 | F2.000 | E: 2.0 | 12.00 | | 0.0 |
| 4 | 32.0 | 10.6 | 88.3 | | 2.003 | B:10.0 | 23.00 | 0.058 | 1.3 |
| Pipe: 10 | | 0.0 | 22.1 | 5 | | | 6.00 | 150 | 0.7 |
| 4 | 32.0 | 10.6 | 22.2 | 7 | F1.500 | B: 8.0 | 8.00 | | 0.0 |
| 6 | 32.0 | 9.9 | 44.3 | | 1.598 | | 14.00 | 0.048 | 0.7 |

DATE: 2/20/2014 U:\MMERSHIMER\FPE 523 HASS CALCUALTION\THIRD FLOOR.SDF

JOB TITLE: THIRD FLOOR

| Pipe Tag | K-fac | Add Fl | Add Fl | To | Fit: | L | C | (Pt) | |
|----------|---------|--------|---------|-------|--------|--------|-------|--------|-------|
| Frm Node | El (ft) | PT | (q) | Node/ | Nom ID | Eq.Ln. | F | (Pe) | Notes |
| To Node | El (ft) | PT | Tot.(Q) | Disch | Act ID | (ft.) | T | Pf/ft. | (Pf) |
| Pipe: 11 | | 6.90 | 22.2 | Disch | | | 2.00 | 150 | 0.4 |
| 6 | 32.0 | 9.9 | 0.0 | | F1.500 | ---- | 0.00 | 0.4 | |
| 7 | 31.0 | 10.3 | 22.2 | | 1.598 | | 2.00 | 0.013 | 0.0 |
| Pipe: 12 | | 6.90 | 22.1 | Disch | | | 6.00 | 150 | 0.4 |
| 6 | 32.0 | 9.9 | 0.0 | | F1.500 | ---- | 0.00 | 0.4 | |
| 5 | 31.0 | 10.3 | 22.1 | | 1.598 | | 6.00 | 0.013 | 0.1 |
| Pipe: 13 | | 0.0 | 22.0 | 1 | | | 16.00 | 150 | 0.8 |
| 4 | 32.0 | 10.6 | 22.1 | 2 | F1.500 | ---- | 0.00 | 0.0 | |
| 3 | 32.0 | 9.8 | 44.1 | | 1.598 | | 16.00 | 0.048 | 0.8 |
| Pipe: 14 | | 6.90 | 22.1 | Disch | | | 3.50 | 150 | 0.4 |
| 3 | 32.0 | 9.8 | 0.0 | | F1.500 | ---- | 0.00 | 0.4 | |
| 2 | 31.0 | 10.2 | 22.1 | | 1.598 | | 3.50 | 0.013 | 0.0 |
| Pipe: 15 | | 6.90 | 22.0 | Disch | | | 7.50 | 150 | 0.3 |
| 3 | 32.0 | 9.8 | 0.0 | | F1.500 | ---- | 0.00 | 0.4 | |
| 1 | 31.0 | 10.2 | 22.0 | | 1.598 | | 7.50 | 0.013 | 0.1 |

NOTES (HASS):

- Calculations were performed by the HASS 8.4 computer program under license no. 27050933 granted by
HRS Systems, Inc.
208 Southside Square
Petersburg, TN 37144
(931) 659-9760
- The system has been calculated to provide an average imbalance at each node of 0.006 gpm and a maximum imbalance at any node of 0.095 gpm.
- Total pressure at each node is used in balancing the system. Maximum water velocity is 9.0 ft/sec at pipe 9.
- Items listed in bold print on the cover sheet

are automatically transferred from the calculation report.
- Available pressure at source node SRCE under full flow conditions is 42.21 psi compared to the minimum required pressure of 20.00 psi.
- PIPE FITTINGS TABLE

Pipe Table Name: STANDARD.PIP

HUGHES ASSOCIATES, INC.
6 CENTERPOINTE DRIVE, SUITE 760
LA PALMA, CA 90623

HYDRAULIC CALCULATIONS

FOR

FPE 523 Project
First Floor

FILE NUMBER:
DATE: FEB 20, 2014

-DESIGN DATA-

| | |
|--|-------------------|
| OCCUPANCY CLASSIFICATION: | HC-2 FM Global |
| DENSITY: | 0.20 gpm/sq. ft. |
| AREA OF APPLICATION: | 600 sq. ft. |
| COVERAGE PER SPRINKLER: | 130 sq. ft. |
| NUMBER OF SPRINKLERS CALCULATED: | 4 sprinklers |
| TOTAL SPRINKLER WATER FLOW REQUIRED: | 105.1 gpm |
| TOTAL WATER REQUIRED (including hose): | 355.1 gpm |
| FLOW AND PRESSURE (@ BOR): | 1190 gpm @ 46 psi |
| SPRINKLER ORIFICE SIZE: | 1/2 inch |
| DESIGN/LAYOUT BY: | M. Mershimer |

CALCULATIONS BY HASS COMPUTER PROGRAM (LICENSE # 27050933)
HRS SYSTEMS, INC.

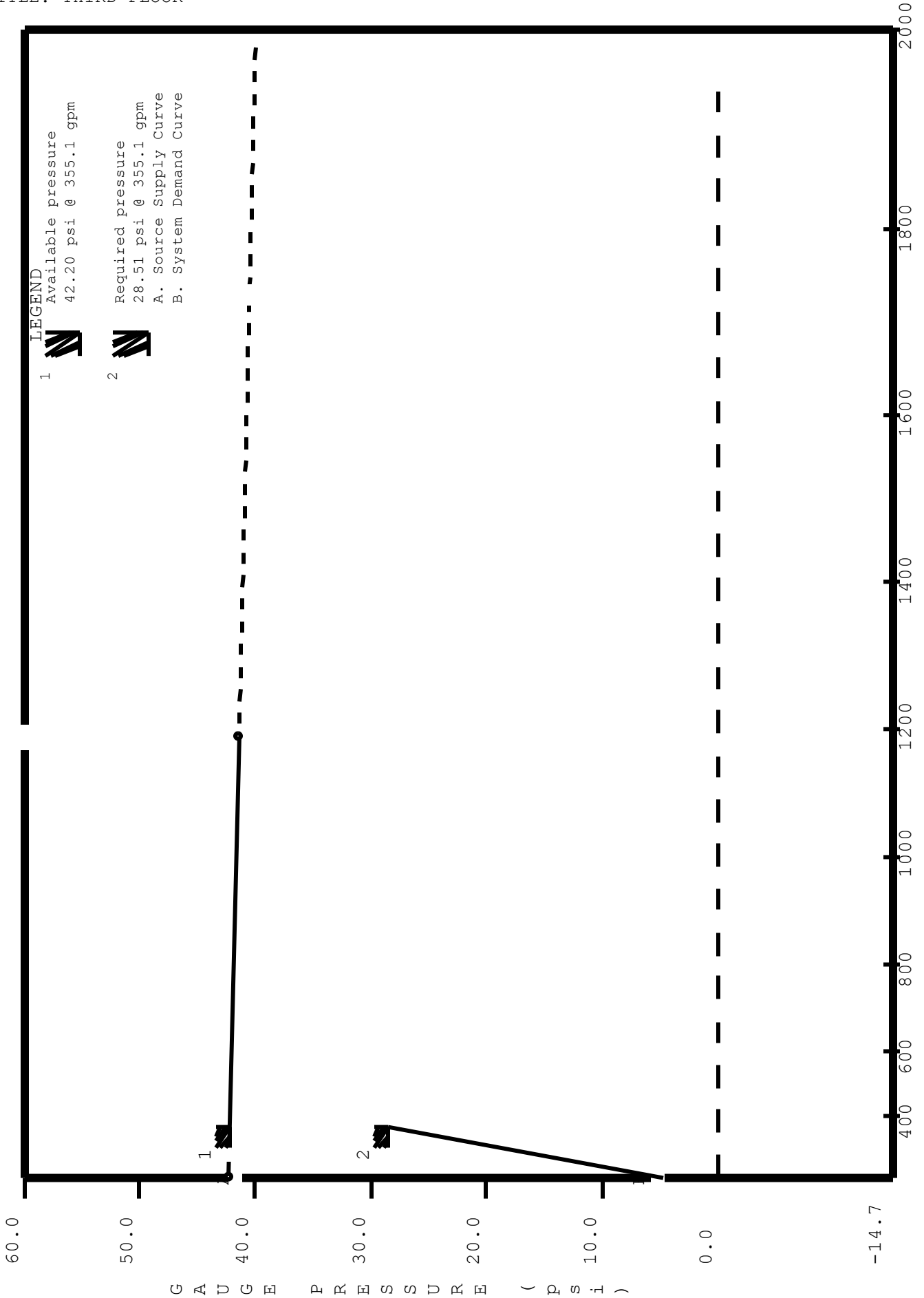
DATE: 2/20/2014

U:\MMERSHIMER\FPE 523 HASS CALCUALTIONS\FIRST FLOOR.SDF

JOB TITLE: THIRD FLOOR

WATER SUPPLY ANALYSIS

Static: 42.30 psi Resid: 41.40 psi Flow: 1190.0 gpm



DATE: 2/20/2014 U:\MMERSHIMER\FPE 523 HASS CALCUALTIONS\FIRST FLOOR.SDF
 JOB TITLE: THIRD FLOOR

NFPA WATER SUPPLY DATA

| SOURCE NODE TAG | STATIC PRESS. (PSI) | RESID. PRESS. (PSI) | FLOW @ (GPM) | AVAIL. PRESS. (PSI) | TOTAL @ DEMAND (GPM) | REQ'D PRESS. (PSI) |
|-----------------------|---------------------------|---------------------------|--------------------|---------------------------|----------------------------|--------------------------|
| SRCE | 42.3 | 41.4 | 1190.0 | 42.2 | 355.1 | 28.5 |

AGGREGATE FLOW ANALYSIS:

| | |
|--|-----------|
| TOTAL FLOW AT SOURCE | 355.1 GPM |
| TOTAL HOSE STREAM ALLOWANCE AT SOURCE | 250.0 GPM |
| OTHER HOSE STREAM ALLOWANCES | 0.0 GPM |
| TOTAL DISCHARGE FROM ACTIVE SPRINKLERS | 105.1 GPM |

NODE ANALYSIS DATA

| NODE TAG | ELEVATION (FT) | NODE TYPE | PRESSURE (PSI) | DISCHARGE (GPM) | NOTES |
|----------|-------------------|-----------|-------------------|--------------------|-------|
| SRCE | 0.0 | SOURCE | 28.5 | 105.1 | |
| 12 | 11.0 | K= 8.00 | 10.6 | 26.0 | |
| 13 | 11.0 | K= 8.00 | 10.8 | 26.3 | |
| 14 | 11.0 | K= 8.00 | 10.8 | 26.3 | |
| 15 | 11.0 | K= 8.00 | 11.0 | 26.6 | |
| 16 | 11.0 | - - - - | 11.8 | - - - | |
| 17 | 11.0 | - - - - | 14.2 | - - - | |
| 18 | 11.0 | - - - - | 16.2 | - - - | |
| TOR1 | 11.0 | - - - - | 16.4 | - - - | |
| BOR | 4.0 | - - - - | 19.6 | - - - | |
| UG1 | -6.0 | - - - - | 30.9 | - - - | |
| UG2 | -6.0 | - - - - | 31.1 | - - - | |
| BF1 | 4.0 | - - - - | 26.6 | - - - | |
| BF2 | 4.0 | - - - - | 19.6 | - - - | |

DATE: 2/20/2014 U:\MMERSHIMER\FPE 523 HASS CALCUALTIONS\FIRST FLOOR.SDF

JOB TITLE: THIRD FLOOR

NFPA PIPE DATA

| Pipe Tag | K-fac | Add Fl | Add Fl | To | Fit: | L | C | (Pt) | Notes |
|----------|---------|--------|----------|-------|----------------------------|--------------------|--------|--------|-------|
| Frm Node | El (ft) | PT | (q) | Node/ | Nom ID | Eq.Ln. | F | (Pe) | |
| To Node | El (ft) | PT | Tot. (Q) | Disch | Act ID | (ft.) | T | Pf/ft. | |
| | | | | | | | | (Pf) | |
| Pipe: 1 | Source | 0.0 | | | | | 6.00 | 150 | 2.6 |
| SRCE | 0.0 | 28.5 | 105.1 | UG1 | E6.000 | E:22.0 | 22.00 | | 2.6 |
| UG2 | -6.0 | 31.1 | 105.1 | | 6.080 | | 28.00 | 0.000 | 0.0 |
| Pipe: 2 | 0.0 | 0.0 | | | | | 350.00 | 150 | 0.2 |
| UG2 | -6.0 | 31.1 | 105.1 | BF1 | E6.000 | 4E:88.0 | 88.00 | | 0.0 |
| UG1 | -6.0 | 30.9 | 105.1 | | 6.080 | | 438.00 | 0.000 | 0.2 |
| Pipe: 3 | 0.0 | 0.0 | | | | | 10.00 | 150 | 4.3 |
| UG1 | -6.0 | 30.9 | 105.1 | BF2 | E6.000 | E:22.0 | 22.00 | | -4.3 |
| BF1 | 4.0 | 26.6 | 105.1 | | 6.080 | | 32.00 | 0.000 | 0.0 |
| Pipe: 3A | | 0.0 | | | Fixed Pressure Loss Device | | | | |
| BF1 | 4.0 | 26.6 | 105.1 | BOR | | 7.0 psi, 105.1 gpm | | | |
| BF2 | 4.0 | 19.6 | 105.1 | | | | | | |
| Pipe: 3B | 0.0 | 0.0 | | | | | 6.00 | 150 | 0.0 |
| BF2 | 4.0 | 19.6 | 105.1 | TOR1 | E6.000 | ---- | 0.00 | | 0.0 |
| BOR | 4.0 | 19.6 | 105.1 | | 6.080 | | 6.00 | 0.000 | 0.0 |
| Pipe: 4 | 0.0 | 0.0 | | | | | 11.00 | 150 | 3.2 |
| BOR | 4.0 | 19.6 | 105.1 | 18 | F3.000 | C: 2.0 | 5.00 | | -3.0 |
| TOR1 | 11.0 | 16.4 | 105.1 | | 2.950 | G: 3.0 | 16.00 | 0.012 | 0.2 |
| Pipe: 5 | 0.0 | 0.0 | | | | | 8.00 | 150 | 0.1 |
| TOR1 | 11.0 | 16.4 | 105.1 | 17 | F3.000 | E: 4.0 | 4.00 | | 0.0 |
| 18 | 11.0 | 16.2 | 105.1 | | 2.950 | | 12.00 | 0.012 | 0.1 |
| Pipe: 6 | 0.0 | 0.0 | | | | | 168.00 | 150 | 2.1 |
| 18 | 11.0 | 16.2 | 105.1 | 16 | F3.000 | E: 4.0 | 4.00 | | 0.0 |
| 17 | 11.0 | 14.2 | 105.1 | | 2.950 | | 172.00 | 0.012 | 2.1 |
| Pipe: 7 | 0.0 | 52.3 | 13 | | | | 10.00 | 150 | 2.4 |
| 17 | 11.0 | 14.2 | 52.9 | 15 | F1.500 | ---- | 0.00 | | 0.0 |
| 16 | 11.0 | 11.8 | 105.1 | | 1.598 | | 10.00 | 0.239 | 2.4 |
| Pipe: 8 | 8.00 | 26.6 | Disch | | | | 3.00 | 150 | 0.7 |
| 16 | 11.0 | 11.8 | 26.3 | 14 | F1.500 | B: 8.0 | 8.00 | | 0.0 |
| 15 | 11.0 | 11.0 | 52.9 | | 1.598 | | 11.00 | 0.067 | 0.7 |
| Pipe: 9 | 8.00 | 26.3 | Disch | | | | 12.00 | 150 | 0.2 |
| 15 | 11.0 | 11.0 | 0.0 | | F1.500 | ---- | 0.00 | | 0.0 |
| 14 | 11.0 | 10.8 | 26.3 | | 1.598 | | 12.00 | 0.018 | 0.2 |
| Pipe: 10 | 8.00 | 26.3 | Disch | | | | 13.00 | 150 | 1.0 |
| 16 | 11.0 | 11.8 | 26.0 | 12 | F1.500 | E: 2.0 | 2.00 | | 0.0 |
| 13 | 11.0 | 10.8 | 52.3 | | 1.598 | | 15.00 | 0.066 | 1.0 |

Appendix D – Water Flow Data

APPENDIX D

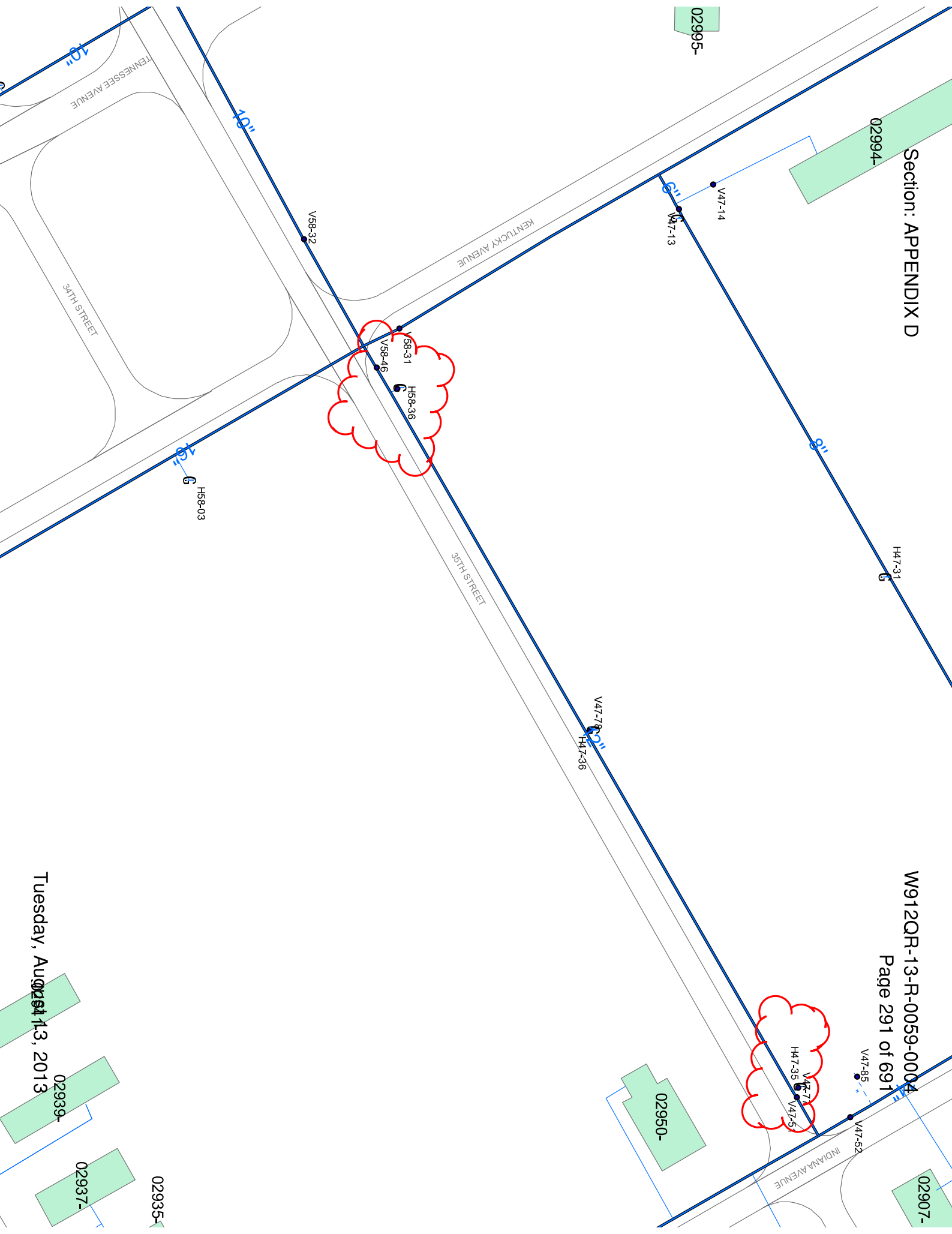
Results of Fire Flow Tests

| Test Location <u>35th and ind ave</u> Date of Test <u>2/7/12</u> Time of Test <u>1030</u> CH2M HILL Staff <u>Hill / Richardson</u> | | | | | Flow Test Information | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|------|------------|----------------|-----------------------------------|---|------|------------|----------------|-----------------------------------|------------|-----------|--|--|--|--|--|----------------|--|--|--|--|--|------------|--|--|--|--|--|----------|--|--|--|--|--|---|--|--|--|--|
| System Information | | | | | Flow Hydrant # <u>47-25</u> <small>file by this hydrant number</small> Size of Hydrant Opening <u>2.5</u> No. of Openings Flowed <u>1</u> Hydrant Opening Coefficient <u>.90</u> Discharge Flow Rate (gpm) <u>1190</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tank Elevations _____ WTP Clearwell _____ ft ET2 (Parade Field) _____ ft Destiny Tank _____ ft ET4 (Sommers) _____ ft Sabre Tank _____ ft | | | | | Residual Hydrant # <u>58-36</u> Static Pressure (psi) <u>47</u> Flow Pressure (psi) <u>46</u> Post Flow Static Pressure (psi) <u>47</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Pump Stations</th> <th style="width: 10%;">Time</th> <th style="width: 10%;">ON/ OFF</th> <th style="width: 15%;">Pressure (psi)</th> <th style="width: 10%;">How Many Pumps Are Running?</th> <th style="width: 35%;">Flow (gpm)</th> </tr> </thead> <tbody> <tr> <td>WTP Pumps</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Morgan Road PS</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Destiny PS</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Sabre PS</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | | | | | Pump Stations | Time | ON/ OFF | Pressure (psi) | How Many Pumps Are Running? | Flow (gpm) | WTP Pumps | | | | | | Morgan Road PS | | | | | | Destiny PS | | | | | | Sabre PS | | | | | | Theoretical Calculated Hydrant Flow at 20 psi $Q_R = Q_F \times (h_R^{0.54}) / h_F^{0.54} = \text{flow at 20 psi}$ $Q_F = \text{observed flow at measured residual pressure.}$ $h_R = \text{difference between normal pressure and 20 psi}$ $h_F = \text{difference between normal pressure and observed residual pressure during test}$ Color Codes: <input checked="" type="checkbox"/> BLUE ≥ 1500 GPM <input type="checkbox"/> GREEN 1000-1499 GPM <input type="checkbox"/> ORANGE 500-999 GPM <input type="checkbox"/> RED < 500 GPM | | | | |
| Pump Stations | Time | ON/ OFF | Pressure (psi) | How Many Pumps Are Running? | Flow (gpm) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WTP Pumps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Morgan Road PS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Destiny PS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sabre PS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

CHECK ALL THAT APPLY:

- ☐ Hydrant needs work order to fix: _____
☐ Hydrant has isolation valve
☐ Hydrant has dog tag
☐ Hydrant in GIS (in map book)
☐ No test due to traffic concerns
☐ No test due to restricted access
☐ No test due to erosion concerns
☐ Other (frost free hydrant, hydrant removed, washrack, etc. Explain: _____)

The information provided on this data sheet represents performance for the referenced fire hydrant at the date and time of day, and under the conditions indicated. Guarantees of fire hydrant performance at other times and conditions are not stated or implied.



Appendix E – Component Cut Sheets



Worldwide
Contacts

www.tyco-fire.com

Series TY-B — 2.8, 5.6, and 8.0 K-factor Upright, Pendent, and Recessed Pendent Sprinklers Standard Response, Standard Coverage

General Description

The TYCO Series TY-B, 2.8, 5.6, and 8.0 K-factor, Upright and Pendent Sprinklers described in this data sheet are standard response - standard coverage, decorative 5 mm glass bulb type spray sprinklers designed for use in light, ordinary, or extra hazard, commercial occupancies such as banks, hotels, shopping malls, factories, refineries, and chemical plants.

The recessed version of the Series TY-B Pendent Sprinkler, where applicable, is intended for use in areas with a finished ceiling. It uses a two-piece Style 10 (1/2 inch NPT) or Style 40 (3/4 inch NPT) Recessed Escutcheon. The Recessed Escutcheon provides 1/2 inch (12,7 mm) of recessed adjustment or up to 3/4 inch (19,1 mm) of total adjustment from the flush pendent position. The adjustment provided by the Recessed Escutcheon reduces the accuracy to which the fixed pipe drops to the sprinklers must be cut.

Corrosion resistant coatings, where applicable, are utilized to extend the life of copper alloy sprinklers beyond that which would otherwise be obtained when exposed to corrosive atmospheres. Although corrosion resistant coated sprinklers have passed the standard corrosion tests of the applicable approval agencies, the testing is not representative of all possible corrosive atmospheres. Consequently, it is recommended that the end user

be consulted with respect to the suitability of these coatings for any given corrosive environment. The effects of ambient temperature, concentration of chemicals, and gas/chemical velocity, should be considered, as a minimum, along with the corrosive nature of the chemical to which the sprinklers will be exposed.

An intermediate level version of the Series TY-B Pendent Sprinkler can be obtained by utilizing the Series TY-B Pendent Sprinkler in combination with the Model S2 Shield.

NOTICE

The TYCO Series TY-B Sprinklers described herein must be installed and maintained in compliance with this document, as well as with the applicable standards of the National Fire Protection Association, in addition to the standards of any other authorities having jurisdiction. Failure to do so may impair the performance of these devices.

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. The installing contractor or sprinkler manufacturer should be contacted with any questions.

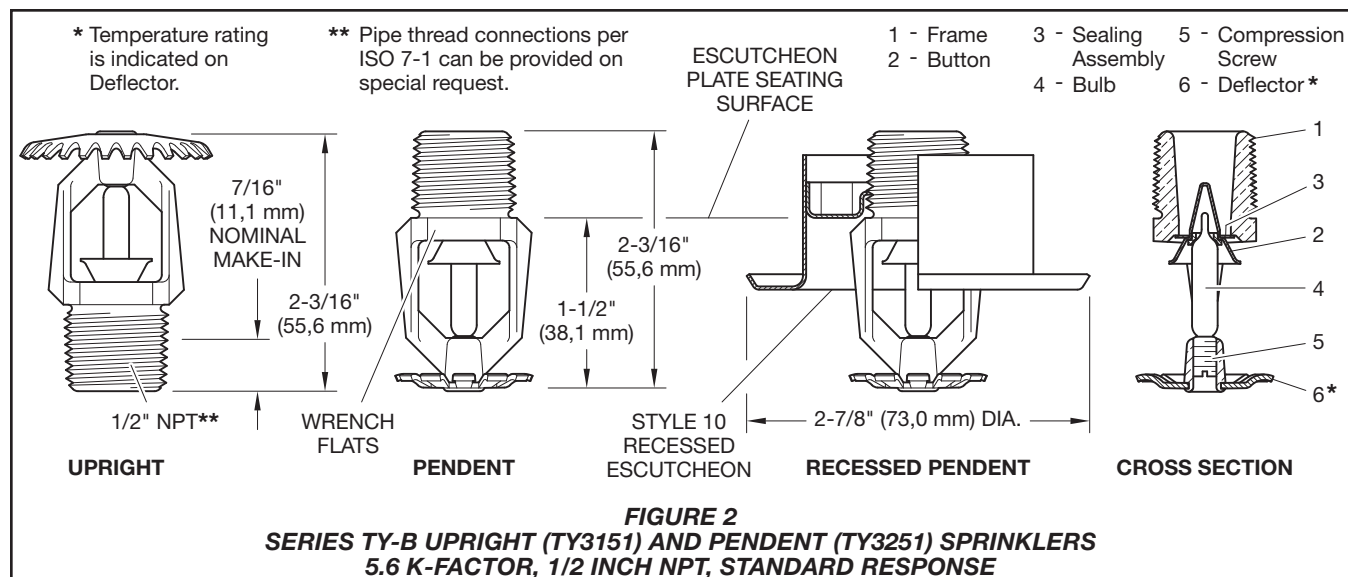
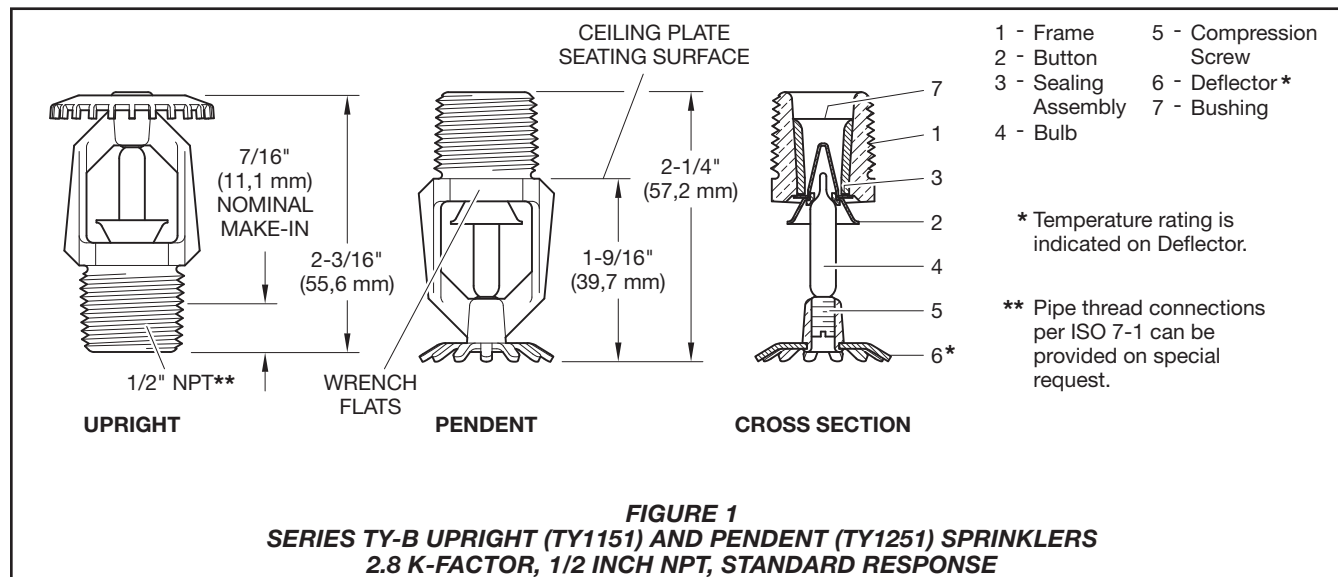
Sprinkler Identification Numbers

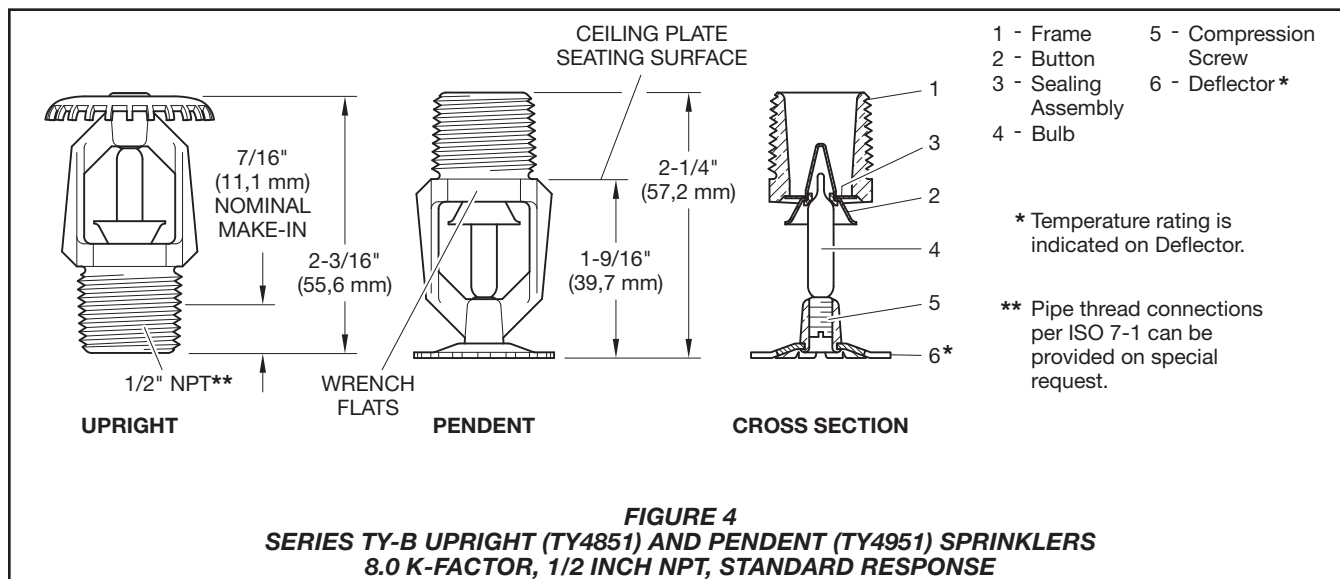
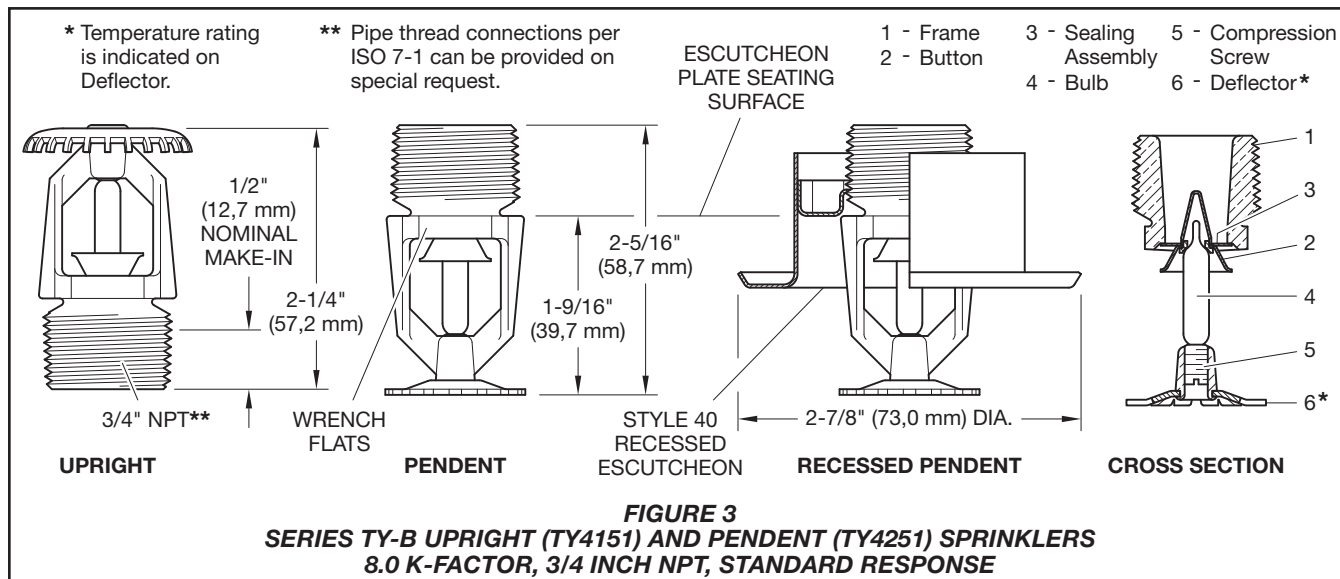
| | |
|--------|------------------------------|
| TY1151 | Upright 2.8K, 1/2" NPT |
| TY1251 | Pendent 2.8K, 1/2" NPT |
| TY3151 | Upright 5.6K, 1/2" NPT |
| TY3251 | Pendent 5.6K, 1/2" NPT |
| TY4151 | Upright 8.0K, 3/4" NPT |
| TY4251 | Pendent 8.0K, 3/4" NPT |
| TY4851 | Upright 8.0K, 1/2" NPT |
| TY4951 | Pendent 8.0K, 1/2" NPT |

IMPORTANT

Always refer to Technical Data Sheet TFP700 for the "INSTALLER WARNING" that provides cautions with respect to handling and installation of sprinkler systems and components. Improper handling and installation can permanently damage a sprinkler system or its components and cause the sprinkler to fail to operate in a fire situation or cause it to operate prematurely.







| K | TYPE | TEMP. | BULB LIQUID | SPRINKLER FINISH (See Note 8) | | | | | |
|-------------------------------------|--|-----------------|--|-------------------------------|---------------|---------------------|-------------|--------------------|----------------------|
| | | | | NATURAL BRASS | CHROME PLATED | WHITE*** POLYESTER | LEAD COATED | WAX COATED | WAX OVER LEAD COATED |
| 2.8 1/2" NPT | UPRIGHT (TY1151) and PENDENT (TY1251) Figure 1 | 135°F (57°C) | Orange | 1, 2, 3 | | | N/A | | |
| | | 155°F (68°C) | Red | | | | | | |
| | | 175°F (79°C) | Yellow | | | | | | |
| | | 200°F (93°C) | Green | | | | | | |
| | | 286°F (141°C) | Blue | | | | | | |
| | | 360°F (182°C) | Mauve | 1, 2 | | | | | |
| 5.6 1/2" NPT | UPRIGHT (TY3151) and PENDENT (TY3251) Figure 2 | 135°F (57°C) | Orange | 1, 2, 3, 4, 5, 6, 7 | | | 1, 2, 3, 5 | 1, 2, 3, 5 | 1, 2, 3, 5 |
| | | 155°F (68°C) | Red | | | | | | |
| | | 175°F (79°C) | Yellow | | | | | | |
| | | 200°F (93°C) | Green | | | | | | |
| | | 286°F (141°C) | Blue | | | | | 1**, 2**, 3**, 5** | 1**, 2**, 3**, 5** |
| | | 360°F (182°C) | Mauve | | | | | N/A | |
| | RECESSED PENDENT (TY3251)* Figure 5 | 135°F (57°C) | Orange | 1, 2, 3, 4, 5 | | | N/A | | |
| | | 155°F (68°C) | Red | | | | | | |
| | | 175°F (79°C) | Yellow | | | | | | |
| | | 200°F (93°C) | Green | | | | | | |
| | | 286°F (141°C) | Blue | | | | | | |
| | | 8.0 3/4" NPT | UPRIGHT (TY4151) and PENDENT (TY4251) Figure 3 | 135°F (57°C) | Orange | 1, 2, 3, 4, 5, 6, 7 | | | |
| 155°F (68°C) | Red | | | | | | | | |
| 175°F (79°C) | Yellow | | | | | | | | |
| 200°F (93°C) | Green | | | | | | | | |
| 286°F (141°C) | Blue | | | 1**, 2**, 3**, 5** | 1**, 2**, 5** | | | | |
| 360°F (182°C) | Mauve | | | N/A | | | | | |
| RECESSED PENDENT (TY4251)* Figure 6 | 135°F (57°C) | | Orange | 1, 2, 3, 4, 5 | | | N/A | | |
| | 155°F (68°C) | | Red | | | | | | |
| | 175°F (79°C) | | Yellow | | | | | | |
| | 200°F (93°C) | | Green | | | | | | |
| | 286°F (141°C) | | Blue | | | | | | |
| | 8.0 1/2" NPT | | UPRIGHT (TY4851) and PENDENT (TY4951) Figure 4 | 135°F (57°C) | Orange | 1, 2, 3, 4, 5, 6 | | | |
| 155°F (68°C) | | Red | | | | | | | |
| 175°F (79°C) | | Yellow | | | | | | | |
| 200°F (93°C) | | Green | | | | | | | |
| 286°F (141°C) | | Blue | | | | | | | |
| 360°F (182°C) | | Mauve | | | | | | | |

NOTES

- Listed by Underwriters Laboratories, Inc. (UL)
 - Listed by Underwriters Laboratories, Inc. for use in Canada (C-UL)
 - Approved by Factory Mutual Research Corporation (FM)
 - Approved by the Loss Prevention Certification Board (LPCB Ref. No. 007k/03)
 - Approved by the City of New York under MEA 354-01-E
 - VdS Approved (For details contact Tyco Fire Suppression & Building Products, Enschede, Netherlands, Tel. 31-53-428-4444/Fax 31-53-428-3377)
 - Approved by the Loss Prevention Certification Board (LPCB Ref. No. 094a/05)
 - Where Polyester Coated, Lead Coated, Wax Coated, and Wax over Lead Coated Sprinklers are noted to be UL and C-UL Listed, the sprinklers are UL and C-UL Listed as Corrosion Resistant Sprinklers. Where Lead Coated, Wax Coated, and Wax over Lead Coated Sprinklers are noted to be FM Approved, the sprinklers are FM Approved as Corrosion Resistant Sprinklers.
- * Installed with Style 10 (1/2" NPT) or Style 40 (3/4" NPT) 3/4" Total Adjustment Recessed Escutcheon, as applicable
- ** 150°F (66°C) Maximum Ceiling Temperature
- *** Frame and deflector only. Listings and approvals apply to color (Special Order)

TABLE A
SERIES TY-B UPRIGHT AND PENDENT SPRINKLERS
LABORATORY LISTINGS AND APPROVALS

| K | TYPE | SPRINKLER FINISH | | | | | |
|--------------------|---|--|---------------|-----------------|--------------------|------------|----------------------|
| | | NATURAL BRASS | CHROME PLATED | WHITE POLYESTER | LEAD COATED | WAX COATED | WAX OVER LEAD COATED |
| 2.8 1/2" NPT | UPRIGHT (TY1151) and PENDENT (TY1251) | 175 PSI (12, 1 BAR) | | | N/A | | |
| 5.6 1/2" NPT | UPRIGHT (TY3151) and PENDENT (TY3251) | 250 PSI (17,2 BAR) OR 175 PSI (12,1 BAR) (SEE NOTE 1) | | | 175 PSI (12,1 BAR) | | |
| | RECESSED PENDENT (TY3251) | | | | N/A | | |
| 8.0 3/4" NPT | UPRIGHT (TY4151) and PENDENT (TY4251) | 175 PSI (12,1 BAR) | | | | | |
| | RECESSED PENDENT (TY4251) | 175 PSI (12,1 BAR) | | | N/A | | |
| 8.0 1/2" NPT | UPRIGHT (TY4851) and PENDENT (TY4951) | 175 PSI (12,1 BAR) | | | | | |

NOTE

1. The maximum working pressure of 250 psi (17,2 bar) only applies to the Listing by Underwriters Laboratories, Inc. (UL); the Listing by Underwriters Laboratories, Inc. for use in Canada (C-UL); and, the Approval by the City of New York

TABLE B

SERIES TY-B UPRIGHT AND PENDENT SPRINKLERS

MAXIMUM WORKING PRESSURE

Technical Data

Approvals

UL and C-UL Listed
FM, LPCB, VdS, and NYC Approved
(Refer to Table A for complete approval information including corrosion resistant status.)

Maximum Working Pressure

Refer to Table B

Discharge Coefficient

K = 2.8 GPM/psi^{1/2} (40,3 LPM/bar^{1/2})
K = 5.6 GPM/psi^{1/2} (80,6 LPM/bar^{1/2})
K = 8.0 GPM/psi^{1/2} (115,2 LPM/bar^{1/2})

Temperature Ratings

Refer to Table A

Finishes

Sprinkler: Refer to Table A
Recessed Escutcheon: Signal or Pure White, Jet Black, Chrome Plated, or Natural Brass

Physical Characteristics

Frame Bronze
Button Brass/Copper
Sealing Assembly . . . Beryllium Nickel w/TEFLON
Bulb Glass
Compression Screw Bronze
Deflector Copper
Bushing (K=2.8) Bronze

Operation

The glass bulb contains a fluid which expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the glass bulb, allowing the sprinkler to activate and water to flow.

Design Criteria

The TYCO Series TY-B, 2.8, 5.6, and 8.0 K-factor, Upright and Pendent Sprinklers are intended for fire protection systems designed in accordance with the standard installation rules recognized by the applicable Listing or Approval agency (for example, UL Listing is based on the requirements of NFPA 13, and FM Approval is based on the requirements of the FM Loss Prevention Data Sheets). Only the Style 10 or 40 Recessed Escutcheon, as applicable, is to be used for recessed pendent installations.

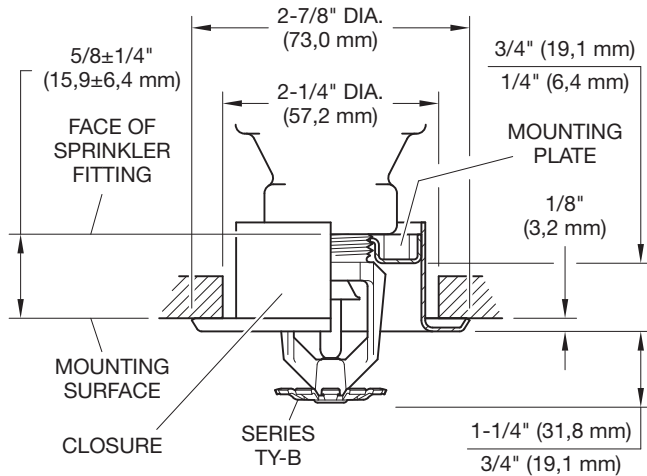


FIGURE 5
SERIES TY-B RECESSED PENDENT SPRINKLER ASSEMBLY
WITH TWO-PIECE 3/4 INCH TOTAL ADJUSTMENT
STYLE 10 RECESSED ESCUTCHEON 5.6 K-FACTOR, 1/2 INCH NPT

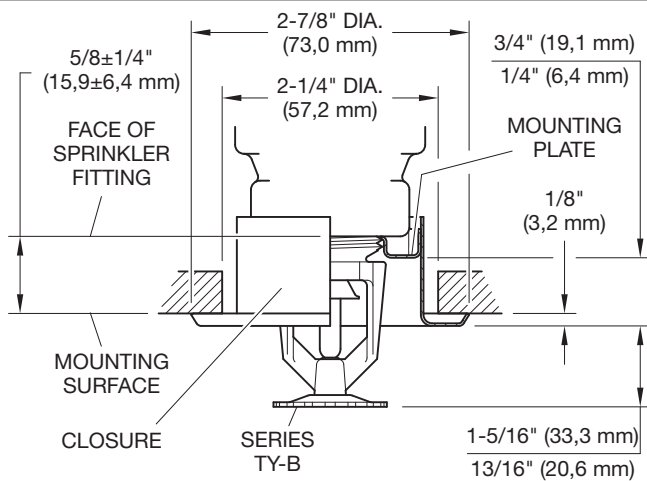


FIGURE 6
SERIES TY-B RECESSED PENDENT SPRINKLER ASSEMBLY
WITH TWO-PIECE 3/4 INCH TOTAL ADJUSTMENT
STYLE 40 RECESSED ESCUTCHEON 8.0 K-FACTOR, 3/4 INCH NPT

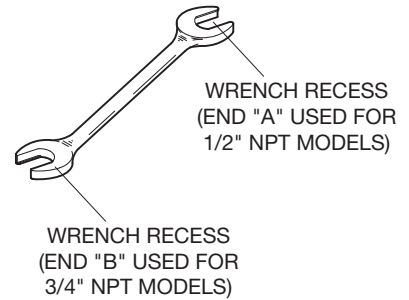


FIGURE 7
W-TYPE 6
SPRINKLER WRENCH

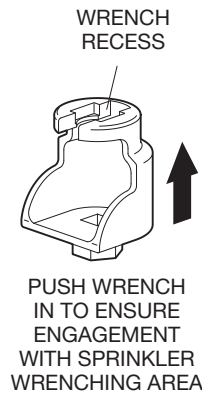


FIGURE 8
W-TYPE 7 RECESSED
SPRINKLER WRENCH

Installation

The TYCO Series TY-B, 2.8, 5.6, and 8.0 K-factor, Upright and Pendent Sprinklers must be installed in accordance with this section.

NOTICE

Do not install any bulb type sprinkler if the bulb is cracked or there is a loss of liquid from the bulb. With the sprinkler held horizontally, a small air bubble should be present. The diameter of the air bubble is approximately 1/16 inch (1,6 mm) for the 135°F (57°C) to 3/32 inch (2,4 mm) for the 360°F (182°C) temperature ratings.

A leak-tight 1/2 inch NPT sprinkler joint should be obtained by applying a minimum-to-maximum torque of 7 to 14 ft.-lbs. (9,5 to 19,0 Nm). Obtain a leak-tight 3/4 inch NPT sprinkler joint by applying a minimum to maximum torque of 10 to 20 ft.-lbs. (13,4 to 26,8 Nm). Higher levels of torque may distort the sprinkler inlet and cause leakage or impairment of the sprinkler.

Do not attempt to make-up for insufficient adjustment in the escutcheon plate by under- or over-tightening the sprinkler. Readjust the position of the sprinkler fitting to suit.

Upright and Pendent Sprinklers

The Series TY-B Upright and Pendent Sprinklers must be installed in accordance with the following instructions.

Step 1. Install pendent sprinklers in the pendent position; install upright sprinklers in the upright position.

Step 2. With pipe-thread sealant applied to the pipe threads, hand-tighten the sprinkler into the sprinkler fitting.

Step 3. Tighten the sprinkler into the sprinkler fitting using only the W-Type 6 Sprinkler Wrench (Figure 7). For wax-coated sprinklers, use an 8 or 10 inch adjustable Crescent wrench. With reference to Figures 1 through 4, apply the W-Type 7 Sprinkler Wrench or the adjustable Crescent wrench, as applicable is to be applied to the wrench flats.

When installing wax-coated sprinklers with the adjustable Crescent wrench, exercise care to prevent damage to the wax coating on the sprinkler wrench flats or frame arms and, consequently, exposure of bare metal to the corrosive environment. Open the jaws of the wrench sufficiently wide to pass over the wrench flats without damaging the wax coating. Before wrench tightening the sprinkler, adjust the jaws of the wrench to contact only the sprinkler wrench flats. After wrench tightening the sprinkler, loosen the wrench jaws before removing the wrench.

After installation, inspect the sprinkler wrench flats and frame arms and retouch (repair) the wax coating whenever the coating has been damaged and bare metal is exposed. Retouch the wax coating on the wrench flats by gently applying a heated 1/8 inch diameter steel rod to the damaged areas of wax, to smooth it back over areas where bare metal is exposed.

NOTICE

Only retouching of the wax coating applied to the wrench flats and frame arms is permitted, and the retouching is to be performed only at the time of the initial sprinkler installation.

The steel rod should be heated only to the point at which it can begin to melt the wax, and appropriate precautions need to be taken when handling the heated rod in order to prevent the installer from being burned.

Recessed Pendent Sprinklers

The Series TY-B Recessed Pendent Sprinklers must be installed in accordance with the following instructions.

Step A. After installing the Style 10 or 40 Mounting Plate, as applicable, over the sprinkler threads and with pipe-thread sealant applied to the pipe threads, hand-tighten the sprinkler into the sprinkler fitting.

Step B. Tighten the sprinkler into the sprinkler fitting using only the W-Type 7 Recessed Sprinkler Wrench (Figure 8). With reference to Figure 3 or 4, the W-Type 7 Recessed Sprinkler Wrench to the sprinkler wrench flats.

Step C. After the ceiling is installed or the finish coat is applied, slide on the Style 10 or 40 Closure over the Series TY-B Sprinkler and push the Closure over the Mounting Plate until its flange contacts the ceiling.

Care and Maintenance

The TYCO Series TY-B, 2.8, 5.6, and 8.0 K-factor, Upright and Pendent Sprinklers must be maintained and serviced in accordance with this section.

Before closing a fire protection system main control valve for maintenance work on the fire protection system that it controls, obtain permission to shut down the affected fire protection system from the proper authorities and notify all personnel who may be affected by this action.

Owners must ensure that sprinklers are not used for hanging any objects. Otherwise, non-operation in the event of a fire or inadvertent operation may result.

Absence of an escutcheon, which is used to cover a clearance, may delay the time to sprinkler operation in a fire situation.

Sprinklers which are found to be leaking or exhibiting visible signs of corrosion must be replaced.

Automatic sprinklers must never be painted, plated, coated, or otherwise altered after leaving the factory. Modified sprinklers must be replaced. Sprinklers that have been exposed to corrosive products of combustion, but have not operated, should be replaced if they cannot be completely cleaned by wiping the sprinkler with a cloth or by brushing it with a soft bristle brush.

Care must be exercised to avoid damage to the sprinklers - before, during, and after installation. Sprinklers damaged by dropping, striking, wrench twist/slippage, or the like, must be

replaced. Also, replace any sprinkler that has a cracked bulb or that has lost liquid from its bulb. (Ref. Installation Section.)

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (for example, NFPA 25), in addition to the standards of any other authorities having jurisdiction. Contact the installing contractor or sprinkler manufacturer regarding any questions.

Automatic sprinklers are recommended to be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national codes.

| P/N 57 - XXX - X - XXX | | | | | | | |
|------------------------|-------------------------|--------|------------------|------------------------------------|---------------------|---------------|--|
| | | SIN | SPRINKLER FINISH | | TEMPERATURE RATINGS | | |
| 530 | 2.8K UPRIGHT (1/2" NPT) | TY1151 | 1 | NATURAL BRASS | 135 | 135°F (57°C) | |
| 531 | 2.8K PENDENT (1/2" NPT) | TY1251 | 3 | PURE WHITE (RAL9010)* | 155 | 155°F (68°C) | |
| 570 | 5.6K UPRIGHT (1/2" NPT) | TY3151 | 4 | SIGNAL WHITE (RAL9003) | 175 | 175°F (79°C) | |
| 571 | 5.6K PENDENT (1/2" NPT) | TY3251 | X | JET BLACK (RAL9005)** | 200 | 200°F (93°C) | |
| 590 | 8.0K UPRIGHT (3/4" NPT) | TY4151 | 6 | WAX COATED 286°F (141°C) MAX | 286 | 286°F (141°C) | |
| 591 | 8.0K PENDENT (3/4" NPT) | TY4251 | 7 | LEAD COATED | 360 | 360°F (182°C) | |
| 560 | 8.0K UPRIGHT (1/2" NPT) | TY4851 | 8 | WAX OVER LEAD 286°F (141°C) MAX | | | |
| 561 | 8.0K PENDENT (1/2" NPT) | TY4951 | 9 | CHROME PLATED | | | |

* Eastern Hemisphere sales only.

** Available in only 8.0K, 155°F (68°C) or 200°F (93°C); requires lead time to manufacture.

TABLE C
SERIES TY-B UPRIGHT AND PENDENT SPRINKLERS
PART NUMBER SELECTION

Ordering Procedure

Contact your local distributor for availability. When placing an order, indicate the full product name and Part Number (P/N).

Sprinkler Assemblies with NPT Thread Connections

Specify: Series TY-B (specify SIN), (specify K-factor), (specify Upright or Pendent) Sprinkler with (specify) temperature rating, (specify) finish or coating, P/N (Refer to Table C).

Recessed Escutcheon

Specify: Style (10 or 40) Recessed Escutcheon with (specify) finish, P/N*.

* Refer to Technical Data Sheet TFP770.

Sprinkler Wrench

Specify: W-Type 6 Sprinkler Wrench, P/N 56-000-6-387.

Specify: W-Type 7 Sprinkler Wrench, P/N 56-850-4-001.

RAPID RESPONSE Series LFII Residential Sprinklers 6.9 K-factor, Pendent/Recessed Pendent/Concealed, NFPA 13 Optimized Wet Pipe Systems

General Description

The TYCO RAPID RESPONSE Series LFII Residential Pendent, Recessed Pendent, and Concealed Pendent Sprinklers (TY4234) are decorative, fast response, frangible bulb sprinklers designed for use in residential occupancies such as homes, apartments, dormitories, and hotels. When enhanced flow characteristics for residential portions of any occupancy per NFPA 13 is the major consideration, the Series LFII (TY4234) should be the first choice.

When higher flow demands are required for residential sprinklers used in an NFPA 13 design, the large 6.9 K-factor of the Series LFII (TY4234) is an attractive choice. Although mostly intended where residential sprinklers are to be used in an NFPA 13 design, the Series LFII (TY4234) can also be used in wet pipe residential sprinkler systems for one- and two-family dwellings and mobile homes per NFPA 13D, and wet pipe residential sprinkler systems for residential occupancies up to and including four stories in height per NFPA 13R.

The recessed version of the sprinkler is intended for use in areas with finished ceilings. It employs a two-piece Style 30 Recessed Escutcheon. The Recessed Escutcheon provides 1/4 inch (6,4 mm) of recessed adjustment or up to 1/2 inch (12,7 mm) of total adjustment from the flush mounting surface position. The adjustment provided by the Recessed Escutcheon

or Concealed Cover Plate provides a measure of flexibility with regard to which the length of fixed pipe drops to the sprinklers must be cut.

The concealed version utilizes a cover plate assembly that conceals the sprinkler operating components above the ceiling. The separable two-piece design of the Cover Plate and Support Cup Assemblies allows installation of the sprinklers and pressure testing of the fire protection system prior to the installation of the ceiling or application of a finish coating.

Also, the separable “push-on and thread-off” two-piece design of the concealed version provides for 1/2 inch (12,7 mm) of vertical adjustment.

The Series LFII Residential Pendent, Recessed Pendent, and Concealed Pendent Sprinklers have been designed with heat sensitivity and water distribution characteristics proven to help in the control of residential fires and to improve the chance for occupants to escape or be evacuated.

The Series LFII Residential Concealed Pendent Sprinklers (TY4234) are shipped with a Disposable Protective Cap. The Protective Cap is temporarily removed for installation, and it must be replaced to protect the sprinkler while the ceiling is being installed or finished. The tip of the Protective Cap can also be used to mark the center of the ceiling hole into plaster board, ceiling tiles, etc. by gently pushing the ceiling product against the Protective Cap. When ceiling installation is complete, the Protective Cap must be removed and the Cover Plate Assembly installed. The Protective Cap must be removed to ensure proper performance of the sprinklers.



IMPORTANT

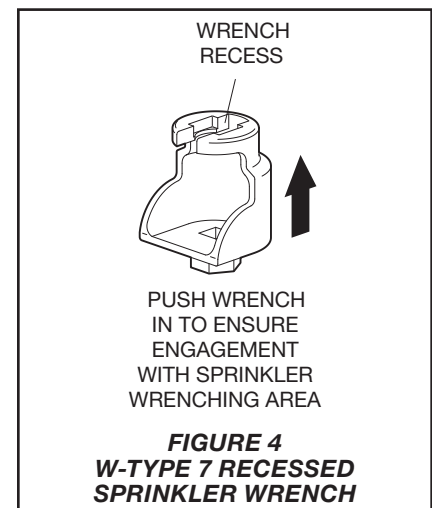
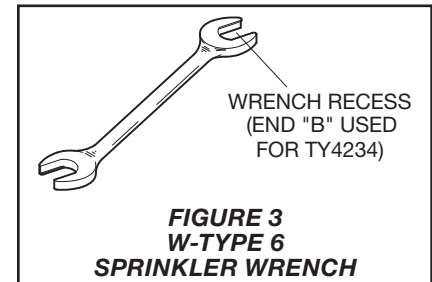
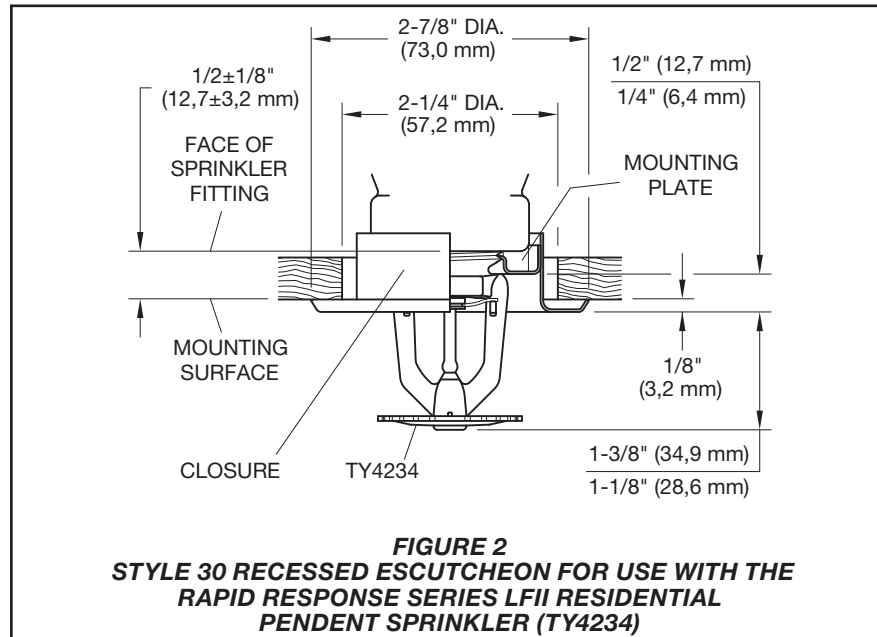
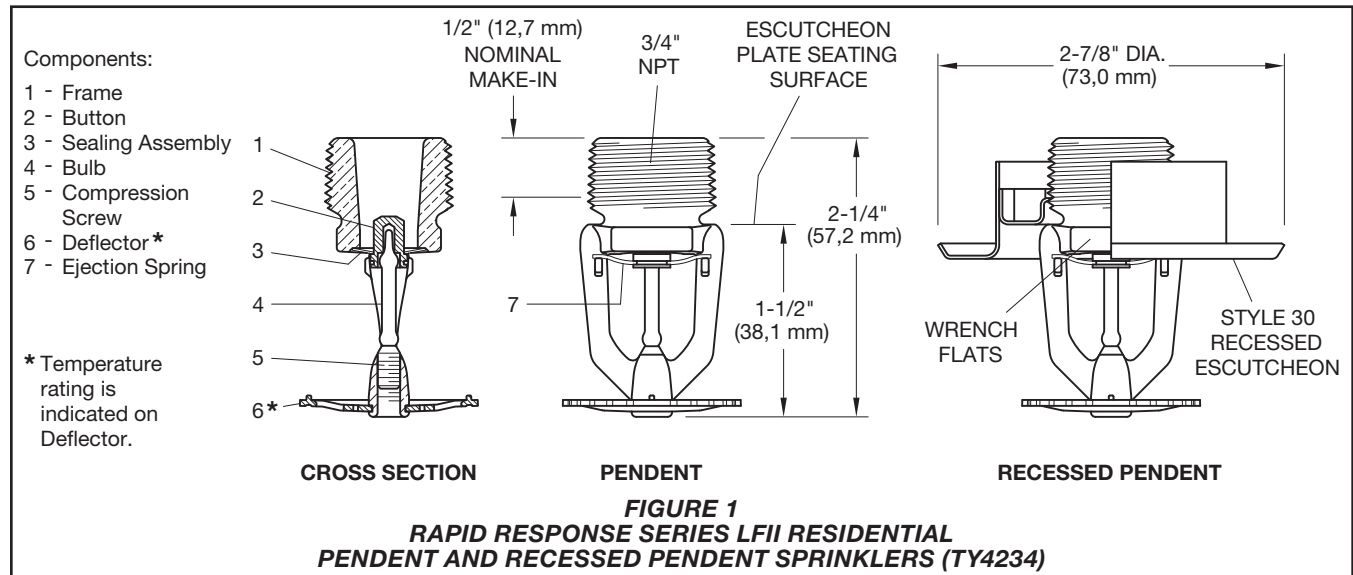
Always refer to Technical Data Sheet TFP700 for the “INSTALLER WARNING” that provides cautions with respect to handling and installation of sprinkler systems and components. Improper handling and installation can permanently damage a sprinkler system or its components and cause the sprinkler to fail to operate in a fire situation or cause it to operate prematurely.

NOTICE

The Series LFII (TY4234) Residential Pendent, Recessed Pendent, and Concealed Pendent Sprinklers described herein must be installed and maintained in compliance with this document and with the applicable standards of the National Fire Protection Association, in addition to the standards of any authorities having ju-

risdiction. Failure to do so may impair the performance of these devices.

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. The installing contractor or sprinkler manufacturer should be contacted with any questions.



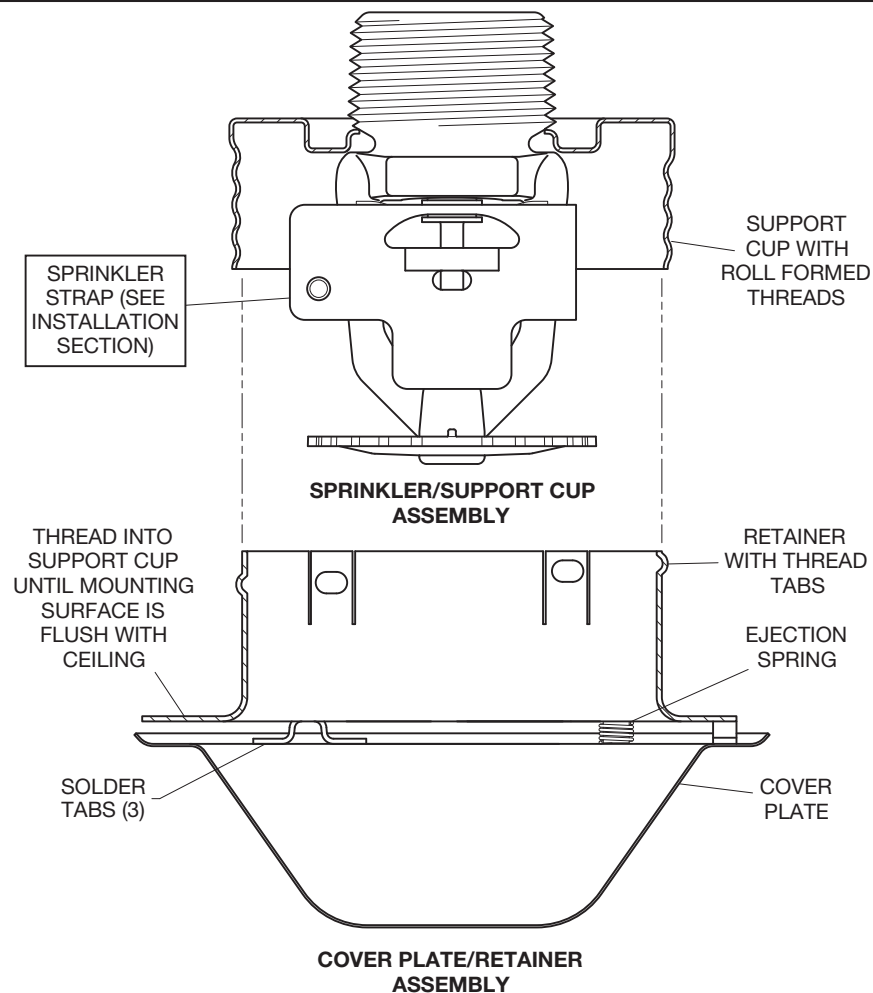


FIGURE 5
RAPID RESPONSE SERIES LFII RESIDENTIAL
CONCEALED PENDENT SPRINKLER (TY4234)
(Shown with Sprinkler Strap)

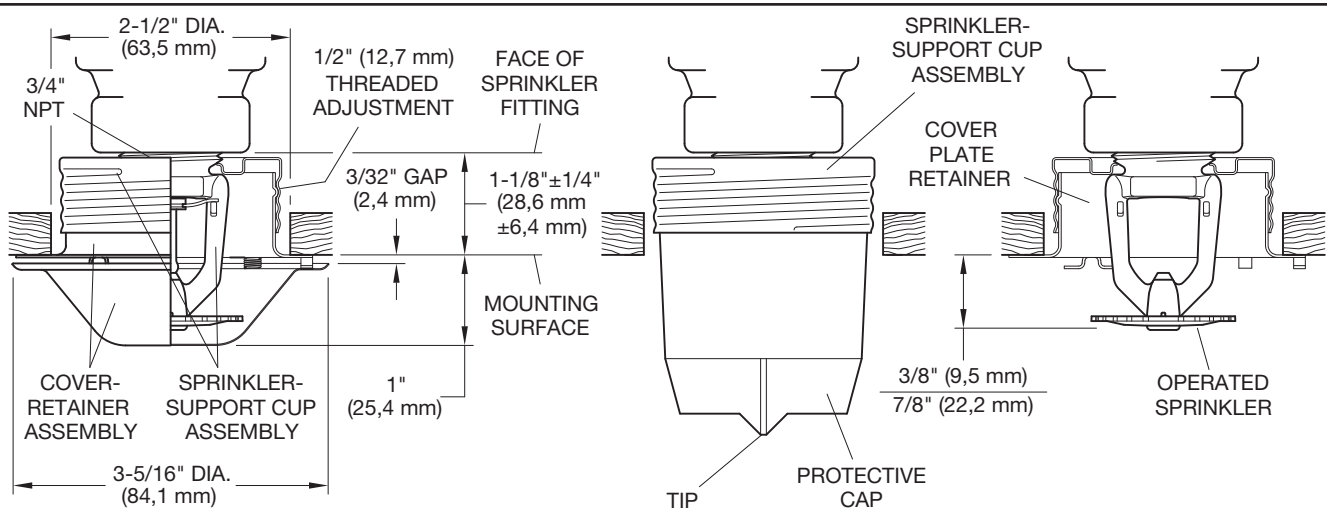


FIGURE 6
DOMED CONCEALED COVER FOR USE WITH THE RAPID RESPONSE SERIES LFII
RESIDENTIAL CONCEALED PENDENT SPRINKLER (TY4234)
(Shown with Protective Cap)

| Max. Coverage Area ^(a) Ft. x Ft. (m x m) | Maximum Spacing Ft. (m) | WET PIPE SYSTEM Minimum Flow and Residual Pressure ^(b, c) | | | | | | Deflector to Ceiling | Installation Type | Minimum Spacing Ft. (m) | |
|---|----------------------------|---|--------------------------|---|--------------------------|---|--|----------------------|-------------------|----------------------------|--|
| | | Pendent and Recessed Pendent | | | | | | | | | |
| | | Ordinary Temp. Rating 155°F (68°C) | | Intermediate Temp. Rating 175°F (79°C) | | | | | | | |
| | | Flow GPM (L/min) | Pressure PSI (bar) | Flow GPM (L/min) | Pressure PSI (bar) | | | | | | |
| 12 x 12 (3,7 x 3,7) | 12 (3,7) | 19 (71,9) | 7.6 (0,52) | 19 (71,9) | 7.6 (0,52) | Smooth Ceilings 1-1/4 to 4 inches Beamed Ceilings per NFPA 13D, 13R, or 13 Pendent and Recessed Pendent 1-1/4 to 1-3/4 inches below bottom of beam. | Recessed using Style 30 Escutcheon or non-recessed per NFPA 13D, 13R, or 13 | 8 (2,4) | | | |
| 14 x 14 (4,3 x 4,3) | 14 (4,3) | 19 (71,9) | 7.6 (0,52) | 19 (71,9) | 7.6 (0,52) | | | | | | |
| 16 x 16 (4,9 x 4,9) | 16 (4,9) | 19 (71,9) | 7.6 (0,52) | 19 (71,9) | 7.6 (0,52) | | | | | | |
| 18 x 18 (5,5 x 5,5) | 18 (5,5) | 19 (71,9) | 7.6 (0,52) | 19 (71,9) | 7.6 (0,52) | | | | | | |
| 20 x 20 (6,1 x 6,1) | 20 (6,1) | 22 (83,3) | 10.2 (0,70) | 22 (83,3) | 10.2 (0,70) | | | | | | |

- (a) For coverage area dimensions less than or between those indicated, use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.
- (b) Requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design under the Design Criteria section.
- (c) For NFPA 13 residential applications, the greater of 0.1 gpm/ft² over the design area or the flow in accordance with the criteria in this table must be used.

TABLE A
WET PIPE SYSTEM
SERIES LFII RESIDENTIAL PENDENT AND RECESSED PENDENT SPRINKLERS (TY4234)
NFPA 13D, 13R AND 13 HYDRAULIC DESIGN CRITERIA

Sprinkler Identification Number (SIN)

TY4234

Technical Data

Approvals

UL and C-UL Listed
NSF Certified to NSF/ANSI 61
NYC Approved under MEA 44-03-E-2.
FM Approved (Pendent and Recessed Pendent Only)

The Series LFII Concealed Pendent Sprinklers are only listed and approved with the Series LFII Concealed Cover Plates having a factory applied finish.

For details on these approvals, refer to the Design Criteria section.

Maximum Working Pressure
175 psi (12,1 bar)

Discharge Coefficient
K=6.9 GPM/psi^{1/2} (99,4 LPM/bar^{1/2})

Pipe Thread Connection:
3/4 NPT

Sprinkler Temperature Rating
• Pendent and Recessed Pendent:
155°F (68°C) or 175°F (79°C)

- Concealed Pendent:
155°F (68°C)
w/139°F (59°C) Cover Plate*
- 175°F (79°C)
w/139°F (59°C) Cover Plate*

*Suitable for use with maximum
100°F (38°C) ceiling temperature.

Finishes

- Sprinkler:
Natural Brass, Pure or Signal White, or Chrome Plated
- Recessed Escutcheon:
Brass, Pure or Signal White, or Chrome
- Concealed Cover Plate:
Refer to Ordering Procedure section.

Physical Characteristics

Frame Brass
Button Copper
Sealing Assembly Beryllium
Nickel w/TEFLON
Bulb 3 mm Glass
Compression Screw Bronze
Deflector Bronze
Ejection Spring Stainless Steel
Support Cup Steel
Cover Plate Brass
Retainer Brass
Cover Plate Ejection Spring Stainless Steel

Design Criteria

UL AND C-UL LISTING CRITERIA

The TYCO RAPID RESPONSE Series LFII Residential Pendent, Recessed Pendent, and Concealed Pendent Sprinklers (TY4234) are UL and C-UL Listed for installation in accordance with the following criteria.

Residential Sprinkler Design Guide
When conditions exist that are outside the scope of the provided criteria, refer to the Residential Sprinkler Design Guide TFP490 for the manufacturer's recommendations that may be acceptable to the local authority having jurisdiction.

| Max. Coverage Area (a) Ft. x Ft. (m x m) | Maximum Spacing Ft. (m) | WET PIPE SYSTEM Minimum Flow and Residual Pressure ^(b, c) | | | | | | Deflector to Ceiling | Installation Type | Minimum Spacing Ft. (m) | |
|--|-------------------------|---|--------------------------|---|--------------------------|---|-----------|----------------------|-------------------|-------------------------|--|
| | | Concealed Pendent | | | | | | | | | |
| | | Ordinary Temp. Rating 155°F (68°C) | | Intermediate Temp. Rating 175°F (79°C) | | | | | | | |
| | | Flow GPM (L/min) | Pressure PSI (bar) | Flow GPM (L/min) | Pressure PSI (bar) | | | | | | |
| 12 x 12 (3,7 x 3,7) | 12 (3,7) | 19 (71,9) | 7.6 (0,52) | 19 (71,9) | 7.6 (0,52) | Smooth Ceilings 3/8 to 7/8 inches. Beamed Ceilings per NFPA 13D, 13R, or 13 installed in beam 3/8 to 7/8 inches below bottom of beam | Concealed | 8 (2,4) | | | |
| 14 x 14 (4,3 x 4,3) | 14 (4,3) | 19 (71,9) | 7.6 (0,52) | 19 (71,9) | 7.6 (0,52) | | | | | | |
| 16 x 16 (4,9 x 4,9) | 16 (4,9) | 19 (71,9) | 7.6 (0,52) | 19 (71,9) | 7.6 (0,52) | | | | | | |
| 18 x 18 (5,5 x 5,5) | 18 (5,5) | 21 (79,5) | 9.3 (0,64) | 21 (79,5) | 9.3 (0,64) | | | | | | |
| 20 x 20 (6,1 x 6,1) | 20 (6,1) | 24 (90,8) | 12.1 (0,83) | 24 (90,8) | 12.1 (0,83) | | | | | | |

- (a) For coverage area dimensions less than or between those indicated, use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.
- (b) Requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design under the Design Criteria section.
- (c) For NFPA 13 residential applications, the greater of 0.1 gpm/ft² over the design area or the flow in accordance with the criteria in this table must be used.

TABLE B
WET PIPE SYSTEM
SERIES LFII RESIDENTIAL CONCEALED PENDENT SPRINKLERS (TY4234)
NFPA 13D, 13R AND 13 HYDRAULIC DESIGN CRITERIA

System Type

Only wet pipe systems may be utilized.

Ceiling Types

Smooth flat horizontal, or beamed, or sloped, in accordance with the 2013 Edition of NFPA 13D, 13R, or 13 as applicable.

Hydraulic Design (NFPA 13D and 13R)

The minimum required sprinkler flow rate for systems designed to NFPA 13D or NFPA 13R are given in Tables A and B as a function of temperature rating and the maximum allowable coverage areas. The sprinkler flow rate is the minimum required discharge from each of the total number of "design sprinklers" as specified in NFPA 13D or NFPA 13R.

Hydraulic Design (NFPA 13)

For systems designed to NFPA 13, the number of design sprinklers is to be the four most hydraulically demanding sprinklers. The minimum required discharge from each of the four sprinklers is to be the greater of the following:

- The flow rates given in Tables A and B for NFPA 13D and 13R as a function of temperature rating and the maximum allowable coverage area
- A minimum discharge of 0.1 gpm/ft², over the "design area" comprised of the four most hydraulically demanding sprinklers for the actual coverage areas being protected by the four sprinklers

Example No. 1: A corridor being protected is 8 ft. wide; consequently, an actual coverage area of 8 ft. x 20 ft. is being contemplated. Based on using the LFII (TY4234) Residential Pendent Sprinkler, the flow rate provided in Table A and B for a 20 ft. x 20 ft. coverage area is 22 GPM. However based on minimum discharge of 0.1 gpm/ft², the flow rate would be 16 GPM. In this case a minimum flow rate of 22 GPM for this design sprinkler must be utilized.

Example No. 2: A long narrow room being protected is 12 ft. wide; consequently, an actual coverage area of 12 ft. x 20 ft. is being contemplated. Based on using the LFII (TY4234) Residential Pendent Sprinkler, the flow rate provided in Table A for a 20 ft. x

20 ft. coverage area is 22 GPM. However based on minimum discharge of 0.1 gpm/ft², the flow rate would be 24 GPM. In this case a minimum flow rate of 24 GPM for this design sprinkler must be utilized.

Obstruction to Water Distribution

Sprinklers are to be located in accordance with the obstruction rules of NFPA 13D, 13R, and 13 as applicable for residential sprinklers as well as with the obstruction criteria described within the TYCO Technical Data Sheet TFP490.

Operational Sensitivity

Sprinklers are to be installed with a deflector-to-ceiling distance of 1-1/4 to 4 inches or in the recessed position using only the Style 30 escutcheon as shown in Figure 2.

For concealed pendent sprinkler installations, the sprinklers relative to the ceiling mounting surface are to be installed per Figure 6.

The concealed pendent sprinkler must not be used in applications where the air pressure above the ceiling is greater than that below. Down drafts through the Support Cup could delay sprinkler operation in a fire situation.

| Max. Coverage Area (a) Ft. x Ft. (m x m) | Maximum Spacing Ft. (m) | WET PIPE SYSTEM Minimum Flow and Residual Pressure(b, c) | | | | | | |
|---|----------------------------|---|--------------------------|---|--------------------------|--|---|----------------------------|
| | | Ordinary Temp. Rating 155°F (68°C) | | Intermediate Temp. Rating 175°F (79°C) | | Deflector to Ceiling | Installation Type | Minimum Spacing Ft. (m) |
| | | Flow GPM (L/min) | Pressure PSI (bar) | Flow GPM (L/min) | Pressure PSI (bar) | | | |
| 12 x 12 (3,7 x 3,7) | 12 (3,7) | 20 (75,7) | 8.4 (0,58) | 20 (75,7) | 8.4 (0,58) | Smooth Ceilings 1-1/4 to 4 inches Beamed Ceilings 1-1/4 to 1-3/4 inches below bottom of beam. | Recessed using Style 30 Escutcheon or non-recessed | 8 (2,4) |
| 14 x 14 (4,3 x 4,3) | 14 (4,3) | 20 (75,7) | 8.4 (0,58) | 20 (75,7) | 8.4 (0,58) | | | |
| 16 x 16 (4,9 x 4,9) | 16 (4,9) | 20 (75,7) | 8.4 (0,58) | 20 (75,7) | 8.4 (0,58) | | | |
| 18 x 18 (5,5 x 5,5) | 18 (5,5) | 20 (75,7) | 8.4 (0,58) | 20 (75,7) | 8.4 (0,58) | | | |
| 20 x 20 (6,1 x 6,1) | 20 (6,1) | 23 (87,1) | 11.1 (0,76) | 23 (87,1) | 11.1 (0,76) | | | |

- (a) For coverage area dimensions less than or between those indicated, use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.
- (b) Requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design under the Design Criteria section.
- (c) For FM residential applications, the greater of 0.1 gpm/ft² over the design area (i.e., SxL) or the flow in accordance with the criteria in this table must be used.

TABLE C
FM APPROVAL
WET PIPE SYSTEM
SERIES LFII RESIDENTIAL PENDENT AND RECESSED PENDENT SPRINKLERS (TY4234)
HYDRAULIC DESIGN CRITERIA

Sprinkler Spacing

The minimum spacing between sprinklers is 8 feet (2,4 m). The maximum spacing between sprinklers cannot exceed the length of the coverage area (Ref. Tables A and B) being hydraulically calculated (e.g., maximum 12 feet for a 12 ft. x 12 ft. coverage area, or 20 feet for a 20 ft. x 20 ft. coverage area).

FM APPROVAL CRITERIA

The Series LFII (TY4234) Residential Pendent and Recessed Pendent Sprinklers are FM Approved for installation in accordance with the applicable Factory Mutual Loss Prevention Data Sheet FM 2-5. Criteria provided by FM may differ from UL and/or NFPA, therefore the designer should review and become familiar with Factory Mutual requirements before proceeding with design.

The following information pertaining to System Type, Hydraulic Design, and Sprinkler spacing are provided for reference and are not intended to provide complete installation criteria as provide in the applicable Factory Mutual Loss Prevention Data Sheet.

Residential Sprinkler Design Guide

When conditions exist that are outside the scope of the provided criteria, refer to the Residential Sprinkler Design Guide TFP490 for the manufacturer's recommendations that may be acceptable to the local authority having jurisdiction.

System Type

Only wet pipe systems may be utilized.

Hydraulic Design

The number of design sprinklers is to be the greater of the four most hydraulically demanding sprinklers, or 1500 sq. ft. as per FM Data Sheet 2-5. The minimum required discharge from each of the four sprinklers is to be the greater of the following:

- The flow rates given in Table C as a function of the maximum allowable coverage area
- A minimum discharge of 0.1 gpm/ft² over the "design area" comprised of the four most hydraulically demanding sprinklers for the actual coverage areas being protected by the four sprinklers

Example No. 1: A corridor being protected is 10 ft. wide; consequently, an actual coverage area of 10 ft. x 20 ft. is being contemplated. Based on using the LFII (TY4234) Residential Pen-

dent Sprinkler, the flow rate provided in Table C for a 20 ft. x 20 ft. coverage area is 23 GPM. However, based on minimum discharge of 0.1 gpm/ft², the flow rate would be 20 GPM. In this case, a minimum flow rate of 23 GPM for this design sprinkler must be utilized.

Example No. 2: A long narrow room being protected is 12 ft. wide; consequently, an actual coverage area of 12 ft. x 20 ft. is being contemplated. Based on using the LFII (TY4234) Residential Pendent Sprinkler, the flow rate provided in Table C for a 20 ft. x 20 ft. coverage area is 23 GPM. However, based on minimum discharge of 0.1 gpm/ft², the flow rate would be 24 GPM. In this case, a minimum flow rate of 24 GPM for this design sprinkler must be utilized. (In no case shall the design pressure be less than 7 psi.)

Sprinkler Spacing

The minimum spacing between sprinklers is 8 feet (2,4 m). The maximum spacing between sprinklers cannot exceed the length of the coverage area (Ref. Table C) being hydraulically calculated (e.g., maximum 12 feet for a 12 ft. x 12 ft. coverage area, or 20 feet for a 20 ft. x 20 ft. coverage area).

Operation

For pendent and recessed pendent sprinklers, the glass bulb contains a fluid that expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the glass bulb allowing the sprinkler to activate and flow water.

For the concealed pendent sprinkler, the cover plate which is soldered to the support cup at three places, first falls away when exposed to heat from a fire. The sprinkler then operates similar to pendent and recessed pendent sprinklers described above.

Installation

The TYCO RAPID RESPONSE Series LFII Residential Pendent, Recessed Pendent, and Concealed Pendent Sprinklers (TY4234) must be installed in accordance with this section.

General Instructions

Do not install any bulb type sprinkler if the bulb is cracked or there is a loss of liquid from the bulb. With the sprinkler held horizontally, a small air bubble should be present. The diameter of the air bubble is approximately 1/16 inch (1,6 mm).

A leak-tight 3/4 inch NPT sprinkler joint should be obtained by applying a minimum to maximum torque of 10 to 20 ft.-lbs. (13,4 to 26,8 Nm). Higher levels of torque may distort the sprinkler inlet with consequent leakage or impairment of the sprinkler.

Do not attempt to compensate for insufficient adjustment in an Escutcheon Plate by under or over-tightening the Sprinkler. Re-adjust the position of the sprinkler fitting to suit.

Series LFII Residential Pendent Sprinklers

The Series LFII Residential Pendent Sprinklers must be installed in accordance with the Steps 1P through 3P.

Step 1P. Install pendent sprinklers in the pendent position with the deflector parallel to the ceiling.

Step 2P. With pipe thread sealant applied to the pipe threads, hand-tighten the sprinkler into the sprinkler fitting.

The sprinkler has been provided with a Sprinkler Strap similar to that shown in Figure 5 for the concealed sprinkler assembly. Refer to NFPA 13 for guidance regarding removal of protective straps and caps. As long as the Sprinkler Strap remains in place, the system is considered to be "Out Of Service".

Step 3P. Tighten the sprinkler into the sprinkler fitting using only the W-Type 6 Sprinkler Wrench (Figure 3). With reference to Figure 1, apply the W-Type 6 Sprinkler Wrench to the wrench flats.

Refer to Technical Data Sheet TFP700 regarding instructions for the removal of the Sprinkler Strap.

Series LFII Residential Recessed Pendent Sprinklers

The Series LFII Residential Recessed Pendent Sprinklers must be installed in accordance with Steps 1R through 4R.

Step 1R. Install recessed pendent sprinklers in the pendent position with the deflector parallel to the ceiling.

Step 2R. After installing the Style 30 Mounting Plate over the sprinkler threads and with pipe thread sealant applied to the pipe threads, hand-tighten the sprinkler into the sprinkler fitting.

The recessed sprinkler has been provided with a Sprinkler Strap similar to that shown in Figure 5 for the concealed sprinkler assembly. Refer to NFPA 13 for guidance regarding removal of protective straps and caps. As long as the Sprinkler Strap remains in place, the system is considered to be "Out Of Service".

Step 3R. Tighten the sprinkler into the sprinkler fitting using only the W-Type 7 Recessed Sprinkler Wrench (Figure 4). With reference to Figure 1, apply the W-Type 7 Recessed Sprinkler Wrench to the sprinkler wrench flats.

Step 4R. After the ceiling has been installed or the finish coat has been applied, slide on the Style 30 Closure over the Series LFII Sprinkler and push the Closure over the Mounting Plate until its flange comes in contact with the ceiling.

Refer to Technical Data Sheet TFP700 regarding instructions for the removal of the Sprinkler Strap.

Series LFII Residential Concealed Pendent Sprinklers

The Series LFII Residential Concealed Pendent Sprinklers must be installed in accordance with Steps 1C through 6C.

Step 1C. Install the sprinkler in the pendent position and with the center-line of the sprinkler perpendicular to the mounting surface.

Step 2C. Remove the Protective Cap. Refer to NFPA 13 for guidance regarding removal of protective straps and caps

Step 3C. With pipe thread sealant applied to the pipe threads, and using the W-Type 7 Wrench shown in Figure 4, install and tighten the Sprinkler/Support Cup Assembly into the fitting. The W-Type 7 Wrench will accept a 1/2 inch ratchet drive.

Step 4C. Replace the Protective Cap by pushing it upwards until it bottoms out against the Support Cup. The Protective Cap helps prevent damage to the Deflector and Arms during ceiling installation and/or during application of the finish coating of the ceiling. It may also be used to locate the center of the clearance hole by gently pushing the ceiling material against the center point of the Cap.

As long as the Sprinkler Strap (Fig. 5) or the Protective Cap (Fig. 6) remains in place, the system is considered to be "Out Of Service".

Step 5C. After the ceiling has been completed with the 2-1/2 inch (63 mm) diameter clearance hole and in preparation for installing the Cover Plate/Retainer Assembly, remove and discard the Protective Cap and the Sprinkler Strap.

Refer to Technical Data Sheet TFP700 regarding instructions for the removal of the Sprinkler Strap.

Step 6C. Push the Cover Plate/Retainer Assembly into the Support Cup, and as necessary, make the final adjustment of the Cover Plate with respect to the ceiling by turning the Cover Plate/Retainer Assembly clockwise until its flange just comes in contact with the ceiling.

If it becomes necessary to remove the Cover Plate, it can be removed by unscrewing in a counter-clockwise direction.

If the Cover Plate/Retainer Assembly cannot be engaged with the Support Cup or the Cover Plate/Retainer Assembly cannot be engaged sufficiently to contact the ceiling, the Sprinkler Fitting must be repositioned.

Care and Maintenance

The TYCO RAPID RESPONSE Series LFII Residential Pendent, Recessed Pendent, and Concealed Pendent Sprinklers (TY4234) must be maintained and serviced in accordance with this section.

Before closing a fire protection system main control valve for maintenance work on the fire protection system that it controls, obtain permission to shut down the affected fire protection system from the proper authorities and notify all personnel who may be affected by this action.

Absence of a Cover Plate can delay the sprinkler operation in a fire situation.

The owner must assure that the sprinklers are not used for hanging any objects and that the sprinklers are only cleaned by means of gently dusting with a feather duster; otherwise, non-operation in the event of a fire or inadvertent operation may result.

When properly installed, there is a nominal 3/32 inch (2,4 mm) air gap between the lip of the Cover Plate and the ceiling, as shown in Figure 6. This air gap is necessary for proper operation of the sprinkler by allowing heat flow from a fire to pass below and above the Cover Plate to help assure appropriate release of the Cover Plate in a fire situation. If the ceiling needs repainting after sprinkler installation, exercise care to ensure that the new paint does not seal off any of the air gap. Failure to do so may impair sprinkler operation.

Factory painted Cover Plates must not be repainted. They should be replaced, if necessary, by factory painted units. Non-factory applied paint may adversely delay or prevent sprinkler operation in the event of a fire.

Do not pull the Cover Plate relative to the Retainer. Separation may result.

Sprinklers which are found to be leaking or exhibiting visible signs of corrosion must be replaced.

Automatic sprinklers must never be painted, plated, coated, or otherwise altered after leaving the factory. Modified sprinklers must be replaced. Sprinklers that have been exposed to corrosive products of combustion, but have not operated, should be replaced if they cannot be completely cleaned by wiping the sprinkler with a cloth or by brushing it with a soft bristle brush.

Care must be exercised to avoid damage to the sprinklers - before, during, and after installation. Sprinklers damaged by dropping, striking, wrench twist/slippage, or the like, must be replaced. Also, replace any sprinkler that has a cracked bulb or that has lost liquid from its bulb. (Ref. Installation Section.)

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (e.g., NFPA 25), in addition to the standards of any other authorities having jurisdiction. Contact the installing contractor or sprinkler manufacturer regarding any questions.

Automatic sprinkler systems are recommended to be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national codes.

Ordering Procedure

Contact your local distributor for availability. When placing an order, indicate the full product name and Part Number (P/N).

- For pendent sprinkler, order pendent sprinkler assembly plus sprinkler wrench.
- For recessed pendent sprinkler, order pendent sprinkler assembly plus separately ordered recessed escutcheon plus sprinkler wrench.
- For concealed pendent sprinkler, order concealed pendent sprinkler assembly plus separately ordered cover plate assembly plus sprinkler wrench.

Pendent Sprinkler Assembly

Specify: Series LFII (TY4234), K=6.9, Residential Pendent Sprinkler, (specify) temperature rating, (specify) finish, P/N (specify).

155°F (68°C)

Natural Brass P/N 51-069-1-155
Pure White (RAL9010) (a) P/N 51-069-3-155
Signal White (RAL9003) P/N 51-069-4-155
Chrome Plated P/N 51-069-9-155

175°F (79°C)

Natural Brass P/N 51-069-1-175
Pure White (RAL9010) (a) P/N 51-069-3-175
Signal White (RAL9003) P/N 51-069-4-175
Chrome Plated P/N 51-069-9-175

(a) Eastern Hemisphere sales only.

Concealed Pendent Sprinkler Assembly:

Specify: Series LFII (TY4234), K=6.9, Residential Concealed Pendent Sprinkler, (specify) temperature rating without Cover Plate Assembly, P/N (specify).

155°F (68°C) P/N 51-068-1-155

175°F (79°C) P/N 51-068-1-175

Separately Ordered Recessed Escutcheon:

Specify: Style 30 Recessed Escutcheon with (specify*) finish, P/N (specify*).

*Refer to Technical Data Sheet TFP770.

Separately Ordered Cover Plate Assembly:

Specify: 139°F (58°C), Cover Plate Assembly having a (specify) finish for the Series LFII (TY4234), K=6.9, Residential Concealed Pendent Sprinkler, P/N (specify).

Grey White (RAL9002) P/N 56-873-0-135
Pure White (RAL 9010) (a) P/N 56-873-3-135
Signal White (RAL 9003) P/N 56-873-4-135
Chrome P/N 56-873-9-135
Custom P/N 56-873-X-135

(a) Eastern Hemisphere sales only.

Separately Ordered Sprinkler Wrench:

Specify: W-Type 6 Sprinkler Wrench, P/N 56-000-6-387. (For pendent sprinklers.)

Specify: W-Type 7 Sprinkler Wrench, P/N 56-850-4-001. (For recessed pendent sprinklers and concealed pendent sprinklers.)

BLUE BRUTE™

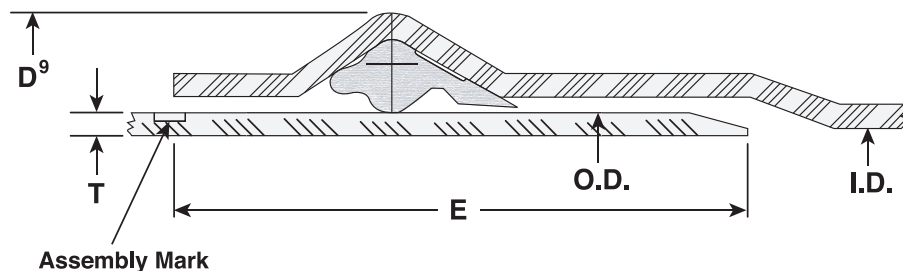
SUBMITTAL AND DATA SHEET

| PIPE SIZE (IN) | AVERAGE O.D. (IN) | NOM. I.D. (IN) | MIN. T. (IN) | MIN. E (IN) | APPROX. D ⁹ (IN) | APPROX. WEIGHT (LBS/FT) |
|--|----------------------|-------------------|-----------------|----------------|--------------------------------|----------------------------|
| PRESSURE CLASS 165 psi (DR 25) | | | | | | |
| 4 | 4.80 | 4.39 | 0.192 | 5.25 | 5.57 | 1.9 |
| 6 | 6.90 | 6.31 | 0.276 | 6.40 | 8.00 | 3.9 |
| 8 | 9.05 | 8.28 | 0.362 | 7.05 | 10.50 | 6.7 |
| 10 | 11.10 | 10.16 | 0.444 | 8.20 | 12.88 | 10.1 |
| 12 | 13.20 | 12.08 | 0.528 | 8.80 | 15.31 | 14.4 |
| PRESSURE CLASS 235 psi (DR 18)* | | | | | | |
| 4 | 4.80 | 4.23 | 0.267 | 5.25 | 5.87 | 2.6 |
| 6 | 6.90 | 6.09 | 0.383 | 6.40 | 8.43 | 5.3 |
| 8 | 9.05 | 7.98 | 0.503 | 7.05 | 11.06 | 9.2 |
| 10 | 11.10 | 9.79 | 0.617 | 8.20 | 13.57 | 13.9 |
| 12 | 13.20 | 11.65 | 0.733 | 8.80 | 16.13 | 19.7 |
| PRESSURE CLASS 305 psi (DR 14)* | | | | | | |
| 4 | 4.80 | 4.07 | 0.343 | 5.25 | 6.17 | 3.2 |
| 6 | 6.90 | 5.86 | 0.493 | 6.40 | 8.87 | 6.7 |
| 8 | 9.05 | 7.68 | 0.646 | 7.05 | 11.63 | 11.6 |
| 10 | 11.10 | 9.42 | 0.793 | 8.20 | 14.27 | 17.6 |
| 12 | 13.20 | 11.20 | 0.943 | 8.80 | 16.97 | 25.1 |

Consult JM Eagle™ for CSA and other listing availability prior to shipment.

Note: *FM Approvals Pressure Class 150 psi for DR 18 and 200 psi for DR 14.

* Contact your JM eagle™ sales representative for location availability.



I.D. : Inside Diameter

O.D. : Outside Diameter

T : Wall Thickness

D⁹ : Bell Outside Diameter

E : Distance between Assembly Mark to the end of spigot.

Product Standard: ANSI/AWWA C900
 Pipe Compound: ASTM D1784 Cells Class 12454
 Gasket: ASTM F477
 Integral Bell Joint: ASTM D3139
 Certifications: ANSI/NSF Standard 61
 UL Standard 1285
 Pipe Length: 20 feet laying length
 Installation: AWWA C605
 JM Eagle™ Installation Guide

JM Eagle™ also manufactures this pipe in green for sewer force main applications and purple, specifically for reclaimed water systems. This pipe is made to the same requirements as our standard products. The only difference is that the pigment used is green or purple. These products will not be marked with UL or NSF listing marks. Additionally, the green pipe will be marked "Forced Sewer" and the purple pipe will be marked: "Reclaimed Water... Do Not Drink."

BlazeMaster® CPVC Fire Sprinkler Pipe & Fittings Submittal Sheet

General Description

Tyco Fire & Building Products (TFBP) BlazeMaster CPVC Pipe and Fittings are designed exclusively for use in wet pipe automatic fire sprinkler systems. They are made from a specially developed thermoplastic compound composed of post chlorinated polyvinyl chloride (CPVC) resin and state of the art additives. TFBP BlazeMaster CPVC products are easier to install than traditional steel pipe systems, and at the same time, provide superior heat resistance and strength as compared to traditional CPVC and PVC piping materials used in the plumbing trade. Various adapters are available to connect CPVC pipe to metallic piping. All female pipe thread adapters have brass inserts for durability. Grooved adapters connect directly to grooved end valves and metallic pipe, with flexible grooved end couplings.

WARNING

*Tyco Fire & Building Products (TFBP) BlazeMaster CPVC Pipe and Fittings described herein must be installed and maintained in compliance with this document, as well as with the applicable standards of the National Fire Protection Association, in addition to the standards of any other authorities having jurisdiction. **Failure to do so may impair the performance of these devices.***

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. The installing contractor or sprinkler manufacturer should be contacted with any questions.

Technical Data

Sizes

3/4" to 3"

Maximum Working Pressure

175 psi

Approvals

UL, FM, CUL, NSF, Dade County, LPCB, MEA, and the City of Los Angeles. (Refer to IH-1900, Rev. 0, January 2005 "Installation Instruction & Technical Handbook" for exact listing/approval information.)

Manufacture Source

U.S.A.

Material

- Pipe: ASTM F442, SDR 13.5
- Fittings: ASTM F438 (Sch. 40) and ASTM F439 (Sch. 80), ASTM F1970

Color

Orange



| NOMINAL SIZE | AVERAGE O.D. | AVERAGE I.D. | WEIGHT lbs./ft. | WATER FILLED WEIGHT lbs./ft. | FT. OF PIPE PER LIFT | WEIGHT PER LIFT lbs. |
|--------------|--------------|--------------|-----------------|------------------------------|----------------------|----------------------|
| 3/4" | 1.050" | 0.874" | 0.18 | 0.44 | 7875 | 1339 |
| 1" | 1.315" | 1.101" | 0.26 | 0.67 | 5040 | 1320 |
| 1-1/4" | 1.660" | 1.394" | 0.42 | 1.08 | 2835 | 1191 |
| 1-1/2" | 1.900" | 1.598" | 0.54 | 1.41 | 2205 | 1213 |
| 2" | 2.375" | 2.003" | 0.84 | 2.20 | 1260 | 1084 |
| 2-1/2" | 2.875" | 2.423" | 1.26 | 3.26 | 1215 | 1531 |
| 3" | 3.500" | 2.952" | 1.87 | 4.83 | 720 | 1344 |

FIGURE 1 — PIPE DIMENSIONS

Installation

Tyco Fire and Building Products (TFBP) BlazeMaster CPVC Pipe and Fittings are to be installed in accordance with IH-1900, Rev. 0, January 2005 "Installation Instruction & Technical Handbook".

Care and Maintenance

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (e.g., NFPA 25), in addition to the standards of any authority having jurisdiction. The installing contractor or product manufacturer should be contacted relative to any questions.

It is recommended that automatic sprinkler systems be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national codes.

NOTES

Before closing a fire protection system control valve for inspection or maintenance work on the fire protection system that it controls, permission to shut down the affected fire protection system must first be obtained from the proper authorities and all personnel who may be affected by this action must be notified.

After placing a fire protection system in service, notify the proper authorities and advise those responsible for monitoring proprietary and/or central station alarms.

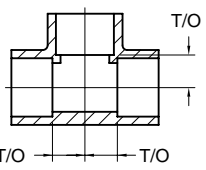
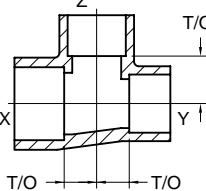
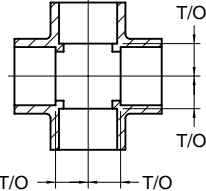
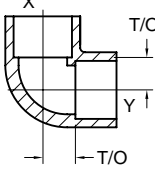
| FITTING TYPE | PART NUMBER | NOMINAL SIZE | NOMINAL TAKE-OUT (T/O) | | | SCHD. | WEIGHT (lb.) |
|--|-------------|--------------------------|------------------------|----------|----------|-------|--------------|
| TEE  | 80000 | 3/4" | 5/8" | | | 40 | 0.11 |
| | 80001 | 1" | 11/16" | | | 40 | 0.19 |
| | 80002 | 1-1/4" | 7/8" | | | 40 | 0.26 |
| | 80003 | 1-1/2" | 1-1/16" | | | 80 | 0.51 |
| | 80004 | 2" | 1-3/8" | | | 80 | 0.90 |
| | 80005 | 2-1/2" | 1-9/16" | | | 80 | 1.59 |
| | 80006 | 3" | 1-13/16" | | | 80 | 2.41 |
| REDUCING TEE  | | X x Y x Z | X | Y | Z | | |
| | 80132 | 3/4" x 3/4" x 1" | 3/4" | 3/4" | 5/8" | 40 | 0.14 |
| | 80133 | 1" x 3/4" x 3/4" | 9/16" | 9/16" | 3/4" | 40 | 0.14 |
| | 80134 | 1" x 3/4" x 1" | 3/4" | 11/16" | 3/4" | 40 | 0.17 |
| | 80260 | 1" x 1" x 3/4" | 5/8" | 5/8" | 13/16" | 40 | 0.16 |
| | 80135 | 1-1/4" x 1" x 3/4" | 5/8" | 5/8" | 15/16" | 40 | 0.21 |
| | 80136 | 1-1/4" x 1" x 1" | 3/4" | 3/4" | 15/16" | 40 | 0.22 |
| | 80137 | 1-1/4" x 1" x 1-1/4" | 15/16" | 15/16" | 7/8" | 40 | 0.26 |
| | 80261 | 1-1/4" x 1-1/4" x 3/4" | 5/8" | 5/8" | 7/8" | 40 | 0.23 |
| | 80262 | 1-1/4" x 1-1/4" x 1" | 3/4" | 3/4" | 7/8" | 40 | 0.26 |
| | 80138 | 1-1/4" x 1-1/4" x 1-1/2" | 1" | 1" | 1" | 80 | 0.43 |
| | 80140 | 1-1/2" x 1-1/4" x 3/4" | 9/16" | 9/16" | 1" | 80 | 0.36 |
| | 80141 | 1-1/2" x 1-1/4" x 1" | 9/16" | 9/16" | 1-1/16" | 80 | 0.38 |
| | 80263 | 1-1/2" x 1-1/2" x 3/4" | 9/16" | 9/16" | 1" | 80 | 0.36 |
| | 80264 | 1-1/2" x 1-1/2" x 1" | 9/16" | 9/16" | 1-1/16" | 80 | 0.38 |
| | 80275 | 1-1/2" x 1-1/2" x 1-1/4" | 7/8" | 7/8" | 1" | 80 | 0.45 |
| | 80265 | 2" x 2" x 3/4" | 3/4" | 3/4" | 1-3/8" | 80 | 0.61 |
| | 80266 | 2" x 2" x 1" | 7/8" | 7/8" | 1-3/8" | 80 | 0.66 |
| | 80274 | 2" x 2" x 1-1/4" | 1-1/16" | 1-1/16" | 1-3/8" | 80 | 0.74 |
| | 80267 | 2" x 2" x 1-1/2" | 1-1/8" | 1-1/8" | 1-3/8" | 80 | 0.78 |
| | 80271 | 2-1/2" x 2-1/2" x 1" | 1-9/16" | 1-9/16" | 1-9/16" | 80 | 1.43 |
| | 80272 | 2-1/2" x 2-1/2" x 1-1/4" | 1-9/16" | 1-9/16" | 1-9/16" | 80 | 1.46 |
| | 80273 | 2-1/2" x 2-1/2" x 1-1/2" | 1-9/16" | 1-9/16" | 1-9/16" | 80 | 1.48 |
| | 80276 | 2-1/2" x 2-1/2" x 2" | 1-9/16" | 1-9/16" | 1-9/16" | 80 | 1.50 |
| | 80270 | 3" x 3" x 1-1/2" | 1-13/16" | 1-13/16" | 1-13/16" | 80 | 2.28 |
| | 80268 | 3" x 3" x 2" | 1-13/16" | 1-13/16" | 1-3/4" | 80 | 2.25 |
| | 80269 | 3" x 3" x 2-1/2" | 1-13/16" | 1-13/16" | 1-13/16" | 80 | 2.44 |
| CROSS & REDUCING CROSS  | 80009 | 3/4" | 9/16" | | | 40 | 0.13 |
| | 80010 | 1" | 11/16" | | | 40 | 0.23 |
| | 80011 | 1-1/4" | 15/16" | | | 40 | 0.34 |
| | 80012 | 1-1/2" | 1-1/16" | | | 80 | 0.67 |
| | 80013 | 2" | 1-5/16" | | | 80 | 1.00 |
| | 80014 | 2-1/2" | 1-9/16" | | | 80 | 1.91 |
| | 80008 | 3" | 1-13/16" | | | 80 | 2.89 |
| | 80015 | 1" x 1" x 3/4" x 3/4" | 7/8" | | | 40 | 0.28 |
| | 80025 | 3/4" | 5/8" | | | 40 | 0.09 |
| | 80026 | 1" | 3/4" | | | 40 | 0.14 |
| 90° ELBOW & REDUCING ELBOW  | 80027 | 1-1/4" | 7/8" | | | 40 | 0.21 |
| | 80028 | 1-1/2" | 1-1/16" | | | 80 | 0.40 |
| | 80029 | 2" | 1-5/16" | | | 80 | 0.79 |
| | 80030 | 2-1/2" | 1-9/16" | | | 80 | 1.14 |
| | 80031 | 3" | 1-13/16" | | | 80 | 1.82 |
| | | X x Y | X | Y | | | |
| | 80032 | 1" x 3/4" | 11/16" | 13/16" | | 40 | 0.16 |

FIGURE 2 — FITTING DIMENSIONS (Part 1 of 4)

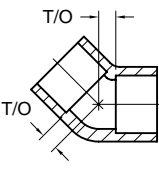
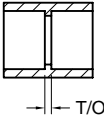
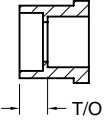
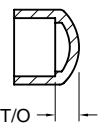
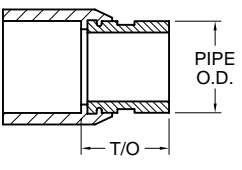
| FITTING TYPE | PART NUMBER | NOMINAL SIZE | NOMINAL TAKE-OUT (T/O) | | SCHD. | WEIGHT (lb.) |
|--|-------------|-------------------------|------------------------|------------------|-------|--------------|
| 45° ELBOW  | 80050 | 3/4" | 3/8" | | 40 | 0.08 |
| | 80051 | 1" | 3/8" | | 40 | 0.11 |
| | 80052 | 1-1/4" | 3/4" | | 40 | 0.20 |
| | 80053 | 1-1/2" | 1/2" | | 80 | 0.31 |
| | 80054 | 2" | 3/4" | | 80 | 0.56 |
| | 80055 | 2-1/2" | 13/16" | | 80 | 0.89 |
| | 80056 | 3" | 1" | | 80 | 1.19 |
| COUPLING & REDUCING COUPLING  | 80075 | 3/4" | 1/8" | | 40 | 0.07 |
| | 80076 | 1" | 1/8" | | 40 | 0.11 |
| | 80077 | 1-1/4" | 3/16" | | 40 | 0.12 |
| | 80078 | 1-1/2" | 3/16" | | 80 | 0.25 |
| | 80079 | 2" | 3/16" | | 80 | 0.38 |
| | 80080 | 2-1/2" | 1/4" | | 80 | 0.67 |
| | 80081 | 3" | 3/16" | | 80 | 0.91 |
| | 80220 | 1" x 3/4" | 1/8" | | 40 | 0.08 |
| REDUCER BUSHING  | 80200 | 1" x 3/4" | 7/16" | | 40 | 0.04 |
| | 80201 | 1-1/4" x 3/4" | 1/2" | | 40 | 0.11 |
| | 80202 | 1-1/4" x 1" | 5/16" | | 40 | 0.12 |
| | 80203 | 1-1/2" x 3/4" | 5/8" | | 80 | 0.16 |
| | 80204 | 1-1/2" x 1" | 1/2" | | 80 | 0.14 |
| | 80205 | 1-1/2" x 1-1/4" | 3/8" | | 80 | 0.17 |
| | 80206 | 2" x 3/4" | 13/16" | | 80 | 0.27 |
| | 80207 | 2" x 1" | 11/16" | | 80 | 0.26 |
| | 80208 | 2" x 1-1/4" | 9/16" | | 80 | 0.24 |
| | 80209 | 2" x 1-1/2" | 7/16" | | 80 | 0.19 |
| | 80215 | 2-1/2" x 1" | 15/16" | | 80 | 0.42 |
| | 80214 | 2-1/2" x 1-1/4" | 13/16" | | 80 | 0.45 |
| | 80213 | 2-1/2" x 1-1/2" | 11/16" | | 80 | 0.46 |
| | 80211 | 2-1/2" x 2" | 5/8" | | 80 | 0.29 |
| | 80210 | 3" x 2" | 3/4" | | 80 | 0.72 |
| | 80212 | 3" x 2-1/2" | 1/2" | | 80 | 0.47 |
| CAP  | 80100 | 3/4" | 5/16" | | 40 | 0.04 |
| | 80101 | 1" | 3/8" | | 40 | 0.06 |
| | 80102 | 1-1/4" | 7/16" | | 40 | 0.10 |
| | 80103 | 1-1/2" | 11/16" | | 80 | 0.20 |
| | 80104 | 2" | 5/8" | | 80 | 0.31 |
| | 80105 | 2-1/2" | 7/8" | | 80 | 0.58 |
| | 80106 | 3" | 1" | | 80 | 0.88 |
| GROOVED COUPLING ADAPTER  | 80160 | 1-1/4" x 1-1/4" Groove | T/O | PIPE O.D. | 40 | 0.78 |
| | 80161 | 1-1/2" x 1-1/2" Groove | 2-5/16" | 1-1/4" (1.660") | | |
| | 80162 | 2" x 2" Groove | 2-5/16" | 1-1/2" (1.900") | | |
| | 80163 | 2-1/2" x 2-1/2" Groove | 2-5/16" | 2" (2.375") | | |
| | 80164 | 3" x 3" Groove | 2-5/16" | 2-1/2" (2.875") | | |
| | 80164 | 3" x 3" Groove | 2-1/4" | 3" (3.500") | | |
| | 80169 | 2-1/2" x 76,1 mm Groove | 2-5/16" | 76,1 mm (3.000") | | |

FIGURE 2 — FITTING DIMENSIONS (Part 2 of 4)

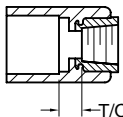
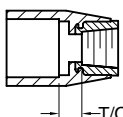
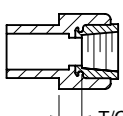
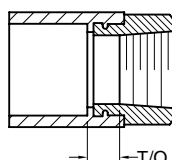
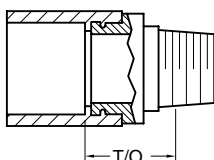
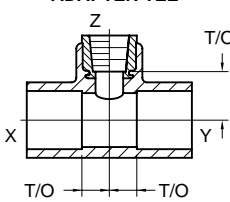
| FITTING TYPE | PART NUMBER | NOMINAL SIZE | NOMINAL TAKE-OUT (T/O) | | | SCHD. | WEIGHT (lb.) |
|---|-------------|----------------------------|------------------------|----------|----------|-------|--------------|
| SPRINKLER HEAD ADAPTER  | 80175E | 3/4" x 1/2" NPT | 7/16" | | | 80 | 0.20 |
| | 80176E | 1" x 1/2" NPT | 7/16" | | | 80 | 0.22 |
| | 80175WL | 3/4" x 1/2" NPT | 7/16" | | | 40 | 0.16 |
| | 80179 | 1" x 3/4" NPT | 13/16" | | | 40 | 0.43 |
| SPRINKLER HEAD ADAPTER  | 80175W | 3/4" x 1/2" NPT | 1/2" | | | 40 | 0.19 |
| | 80176W | 1" x 1/2" NPT | 1/2" | | | 40 | 0.18 |
| SPRINKLER HEAD ADAPTER (SPIGOT)  | 80177L | 3/4" x 1/2" NPT | 1/2" | | | 40 | 0.16 |
| | 80178 | 1" x 1/2" NPT | 9/16" | | | 40 | 0.20 |
| | 80180 | 1" x 3/4" NPT | 7/8" | | | 40 | 0.40 |
| FEMALE ADAPTER  | 80142 | 3/4" x 3/4" NPT | 13/16" | | | 40 | 0.41 |
| | 80145 | 1" x 1" NPT | 7/8" | | | 40 | 0.63 |
| | 80146 | 1-1/4" x 1-1/4" NPT | 1-1/8" | | | 40 | 1.03 |
| | 80147 | 1-1/2" x 1-1/2" NPT | 1-3/8" | | | 80 | 1.42 |
| | 80148 | 2" x 2" NPT | 1-11/16" | | | 80 | 2.66 |
| | | | | | | | |
| MALE ADAPTER  | 80157 | 3/4" x 3/4" NPT | 1-5/16" | | | 40 | 0.33 |
| | 80158 | 1" x 1" NPT | 1-3/8" | | | 40 | 0.56 |
| SPRINKLER HEAD ADAPTER TEE  | | X x Y x Z | X | Y | Z | | |
| | 80250 | 3/4" x 3/4" x 1/2" NPT | 9/16" | 9/16" | 1" | 40 | 0.22 |
| | 80251 | 1" x 1" x 1/2" NPT | 11/16" | 11/16" | 1-3/16" | 40 | 0.29 |
| | 80249 | 1" x 1" x 1" NPT | 15/16" | 15/16" | 1-9/16" | 40 | 0.73 |
| | 80256 | 1-1/4" x 1" x 1/2" NPT | 7/16" | 9/16" | 1-5/16" | 40 | 0.30 |
| | 80252 | 1-1/4" x 1-1/4" x 1/2" NPT | 7/16" | 7/16" | 1-5/16" | 40 | 0.31 |
| | 80257 | 1-1/2" x 1-1/4" x 1/2" NPT | 1/2" | 11/16" | 1-7/16" | 80 | 0.43 |
| | 80254 | 1-1/2" x 1-1/2" x 1/2" NPT | 1/2" | 1/2" | 1-7/16" | 80 | 0.46 |
| | 80258 | 2" x 1-1/2" x 1/2" NPT | 1/2" | 5/8" | 1-11/16" | 80 | 0.56 |
| | 80253 | 2" x 2" x 1/2" NPT | 1/2" | 1/2" | 1-11/16" | 80 | 0.62 |
| | | | | | | | |

FIGURE 2 — FITTING DIMENSIONS (Part 3 of 4)

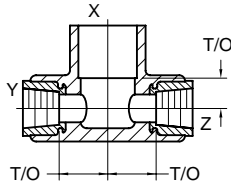
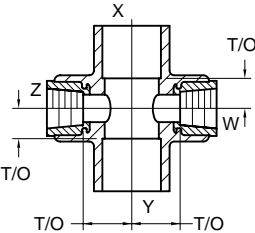
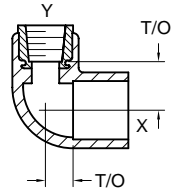
| FITTING TYPE | PART NUMBER | NOMINAL SIZE | NOMINAL TAKE-OUT (T/O) | | SCHD. | WEIGHT (lb.) |
|---|-------------------------|--|------------------------|--------------------|----------------|----------------------|
| BACK-TO-BACK TEE  | 80459 80460 | X x Y x Z | X | Y, Z | 40 40 | 0.48 0.46 |
| | | 1" x 1/2" NPT x 1/2" NPT 1" x 1/2" NPT x 1/2" NPT | 5/8" 5/8" | 1-5/16" 1-3/16" | | |
| BACK-TO-BACK CROSS  | 80462 80463 | X x Y x Z x W | X, Y | Z, W | 40 40 | 0.46 0.47 |
| | | 1" x 1" x 1/2" NPT x 1/2" NPT 1" x 1" x 1/2" NPT x 1/2" NPT | 5/8" 5/8" | 1-3/16" 1-5/16" | | |
| SPRINKLER HEAD ADAPTER 90° ELBOW  | 80199 80198 80196 | X x Y | X | Y | 40 40 40 | 0.20 0.26 0.26 |
| | | 3/4" x 1/2" NPT | 9/16" | 1" | | |
| | | 1" x 1/2" NPT 1" x 3/4" NPT | 3/4" 1-1/16" | 1-1/4" 1-7/16" | | |

FIGURE 2 — FITTING DIMENSIONS (Part 4 of 4)

Limited Warranty

Products manufactured by Tyco Fire & Building Products (TFBP) are warranted solely to the original Buyer for ten (10) years against defects in material and workmanship when paid for and properly installed and maintained under normal use and service. This warranty will expire ten (10) years from date of shipment by TFBP. No warranty is given for products or components manufactured by companies not affiliated by ownership with TFBP or for products and components which have been subject to misuse, improper installation, corrosion, or which have not been installed, maintained, modified or repaired in accordance with applicable Standards of the National Fire Protection Association, and/or the standards of any other Authorities Having Jurisdiction. Materials found

by TFBP to be defective shall be either repaired or replaced, at TFBP's sole option. TFBP neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of products or parts of products. TFBP shall not be responsible for sprinkler system design errors or inaccurate or incomplete information supplied by Buyer or Buyer's representatives.

In no event shall TFBP be liable, in contract, tort, strict liability or under any other legal theory, for incidental, indirect, special or consequential damages, including but not limited to labor charges, regardless of whether TFBP was informed about the possibility of such damages, and in no event shall TFBP's liability exceed an amount equal to the sales price.

The foregoing warranty is made in lieu of any and all other warranties, express or implied, including warranties

of merchantability and fitness for a particular purpose.

This limited warranty sets forth the exclusive remedy for claims based on failure of or defect in products, materials or components, whether the claim is made in contract, tort, strict liability or any other legal theory.

This warranty will apply to the full extent permitted by law. The invalidity, in whole or part, of any portion of this warranty will not affect the remainder.

For Non-Health Hazard Applications

Job Name _____ Contractor _____
 Job Location _____ Approval _____
 Engineer _____ Contractor's P.O. No. _____
 Approval _____ Representative _____

Series 709

Double Check Valve Assemblies

Sizes: 2½" – 10" (65 – 250mm)

Series 709 Double Check Valve Assemblies are designed to prevent the reverse flow of polluted water from entering into the potable water system. This series can be applied, where approved by the local authority having jurisdiction, on non-health hazard installations. Series 709 features a modular check design concept to facilitate easy maintenance. Check with local jurisdictional authority as to installation requirements.

Features

- Replaceable bronze seats
- Maximum flow at low pressure drop
- Design simplicity for easy maintenance
- No special tools required for servicing
- Captured spring assemblies for safety
- Approved for vertical flow up installation

Models

Suffix:

NRS – non-rising stem resilient seated gate valves

OSY – UL/FM outside stem and yoke resilient seated gate valves

S-FDA – FDA epoxy coated strainer

BB – bronze body - 2½" – 3" (64 – 76mm)

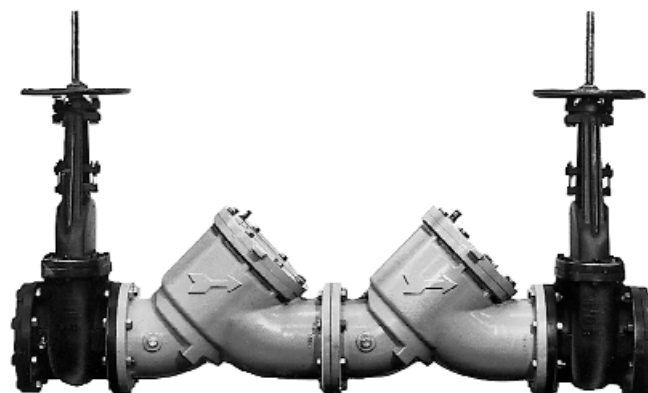
QT – quarter-turn ball valves

QT-FDA – FDA epoxy coated ball valve shutoffs

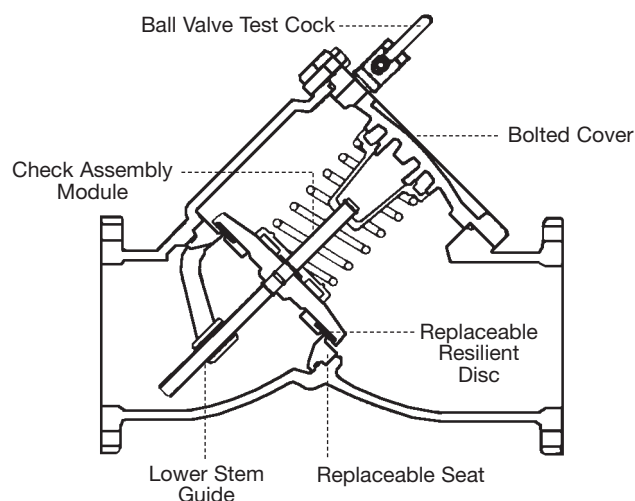
LF – without shutoff valves

Specifications

A Double Check Valve Assembly shall be installed at referenced cross-connections to prevent the backflow of polluted water into the potable water supply. The cross-connections shall be determined by local inspection authority for use where a high hazard situation does not exist. Valve shall feature modular check assemblies with center stem guiding. Each check module shall have a captured spring and be accessible through a bolted cover plate. Seats shall be replaceable without special tools. It shall be a complete assembly including tight-closing resilient seated shutoff valves, test cocks, and a strainer is recommended. The assembly shall meet the requirements of ASSE No. 1015; AWWA C510-92; CSA B64.5 and UL Classified File No. EX3185. Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California. Assembly shall be a Watts Regulator Company Series 709.



709 OSY



Check Assembly Module

Series 709 features a modular design concept which facilitates complete maintenance and assembly by retaining the spring load. Also, the first and second check module are identical and can be interchanged.

IMPORTANT: INQUIRE WITH GOVERNING AUTHORITIES
FOR LOCAL INSTALLATION REQUIREMENTS

Now Available
WattsBox Insulated Enclosures.

For more information, send for literature ES-WB.

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

WATTS®

Materials

Check Valve Bodies: Epoxy coated cast iron

Seats: Bronze

Pressure — Temperature

Temperatures Range: 33°F – 110°F (0.5°C – 43°C) continuous,
140°F (60°C) intermittent

Maximum Working Pressure: 175psi (12.1 bar)

Standards

AWWA C510-92

IAPMO PA 31

USC Manual for Cross-Connection Control, 8th Edition

Approvals

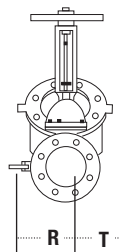
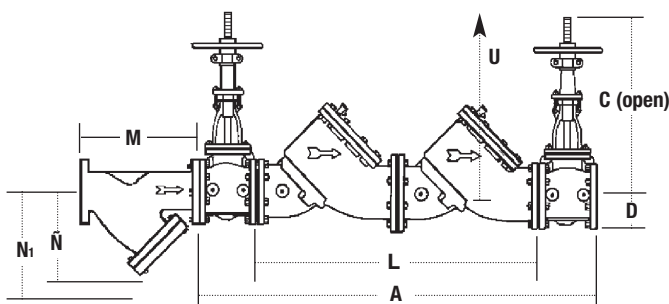


Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California. Sizes 4" – 10" (100 – 250mm) approved horizontal and vertical "flow up". Size 2½" and 3" (65 – 80mm) approved horizontal only.

Factory Mutual approved 4" – 10" (80 – 250mm) vertical "flow up" with OSY gate valves only.

Note: Model "S" not listed

Dimensions — Weights



| SIZE (DN) | | | | DIMENSIONS | | | | | | | | | | | | | |
|------------|-----------|------------|-----------|------------|-----------|----------------------------------|-----------|------------|-----------|------------|-----------|------------|-----------|------------|-----------|------------|-----------|
| | | A | | C (OSY) | | C (NRS) | | D | | L | | U* | | M | | N | |
| <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> |
| 2½ | 65 | 39⅜ | 1000 | 16⅜ | 416 | 9⅜ | 238 | 3½ | 89 | 24⅞ | 613 | 11 | 279 | 10 | 254 | 6½ | 165 |
| 3 | 80 | 40⅜ | 1025 | 18⅞ | 479 | 10¼ | 260 | 3¾ | 95 | 24⅞ | 613 | 14 | 356 | 10⅞ | 257 | 7 | 178 |
| 4 | 100 | 52⅜ | 1330 | 22¾ | 578 | 12¾ ₁₆ | 310 | 4½ | 114 | 34⅞ | 867 | 14 | 356 | 12⅞ | 308 | 8¼ | 210 |
| 6 | 150 | 62⅞ | 1597 | 30⅞ | 765 | 16 | 406 | 5½ | 140 | 41⅞ | 1057 | 16 | 406 | 18½ | 470 | 13½ | 343 |
| 8 | 200 | 75 | 1905 | 37¾ | 959 | 19 ¹⁵ / ₁₆ | 506 | 6½ | 165 | 52 | 1321 | 21 | 533 | 21⅞ | 549 | 15½ | 394 |
| 10 | 250 | 90 | 2286 | 45¾ | 1162 | 23 ¹³ / ₁₆ | 605 | 8 | 203 | 64 | 1626 | 25 | 635 | 26 | 660 | 18½ | 470 |

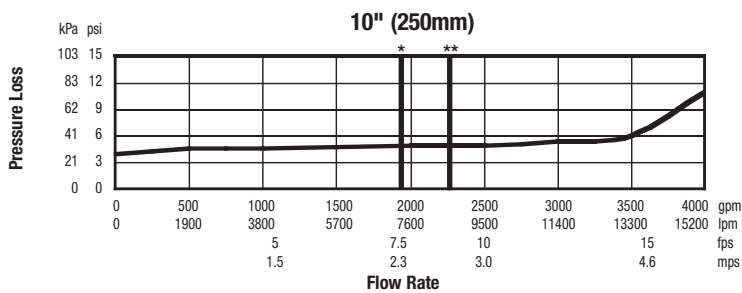
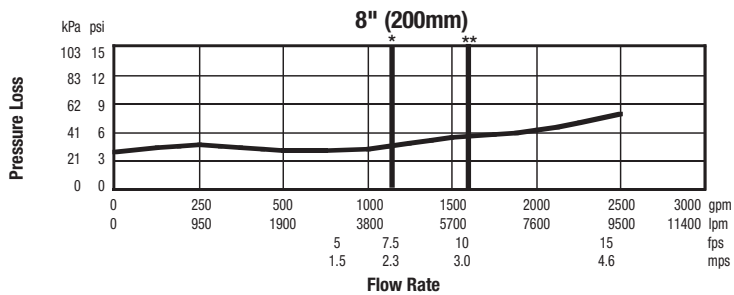
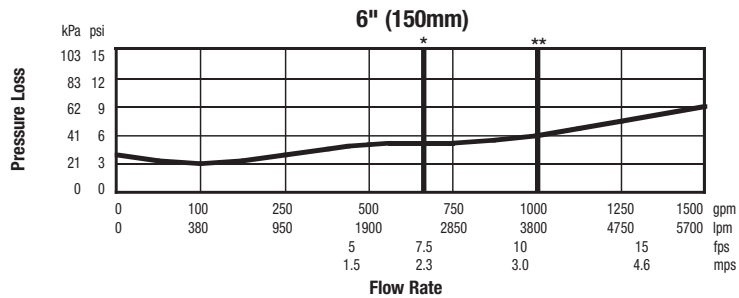
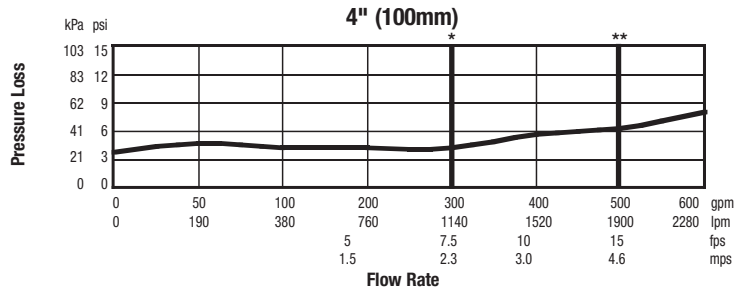
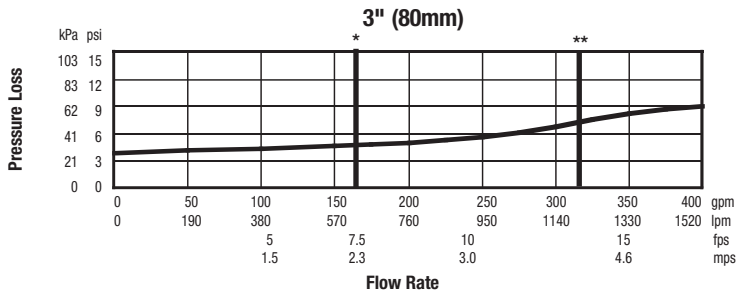
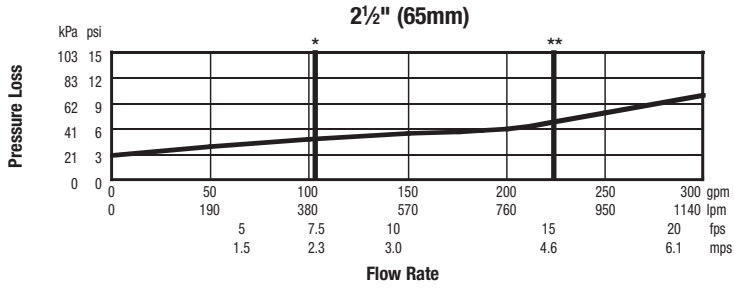
| SIZE (DN) | | DIMENSIONS | | | | | | | | WEIGHT | | | | STRAINER | | | |
|------------|-----------|------------|-----------|------------|-----------|------------|-----------|------------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | | N1† | | R | | R❖ | | T | | NRS | | OSY | | QT | | Weight | |
| <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> | <i>in.</i> | <i>mm</i> | <i>lbs.</i> | <i>kgs.</i> | <i>lbs.</i> | <i>kgs.</i> | <i>lbs.</i> | <i>kgs.</i> | <i>lbs.</i> | <i>kgs.</i> |
| 2½ | 65 | 10 | 254 | 4 | 102 | 16 | 406 | 3 | 76 | 167 | 76 | 170 | 77 | 154 | 70 | 28 | 13 |
| 3 | 80 | 10 | 254 | 5 | 127 | 16 | 406 | 3 | 76 | 167 | 76 | 170 | 77 | 162 | 73 | 34 | 15 |
| 4 | 100 | 12 | 305 | 6 | 152 | 19¾ | 502 | 6 | 152 | 368 | 167 | 383 | 174 | 275 | 125 | 60 | 27 |
| 6 | 150 | 20 | 508 | 11 | 279 | 26 | 660 | 7½ | 191 | 627 | 284 | 707 | 321 | 611 | 277 | 122 | 55 |
| 8 | 200 | 22¾ | 578 | 11¼ | 286 | 11¼ | 286 | 9 | 229 | 1201 | 545 | 1307 | 593 | 1419 | 644 | 247 | 112 |
| 10 | 250 | 28 | 711 | 12½ | 318 | 12½ | 318 | 10¼ | 260 | 2003 | 909 | 2073 | 940 | 2466 | 1119 | 370 | 168 |

† - Dimension required for screen removal. ❖Quarter-turn (QT) valve dimensions.

*Service clearance for check assembly from center.

Capacity

*Typical maximum system flow rate (7.5 feet/sec.) **UL rated flow





A Watts Water Technologies Company

ES-709L 0639



USA: 815 Chestnut St., No. Andover, MA 01845-6098; www.watts.com
Canada: 5435 North Service Rd., Burlington, ONT. L7L 5H7; www.wattscanada.ca

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TECHNICAL DATA

WATERFLOW INDICATOR

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

1. DESCRIPTION

The Waterflow Indicator is a vane-type waterflow switch designed to detect a sustained flow of 10 gpm or more. It is intended for use on wet-pipe sprinkler systems only. The Model VSR has a built-in adjustable pneumatic retard device delays actuation of the electrical switches to reduce the possibility of false alarms caused by one or more transient flow surges. The unit includes two single-pole double-throw snap action switches used to operate local alarms, indicate signals to annunciator panels, trip municipal fire alarm boxes, start fire pumps, or any other function that can be initiated or controlled by the opening or closing of an electrical switch. The device may be installed on the main riser to give a system waterflow signal or on branch feed mains, cross mains, or branch lines to give a waterflow signal by zone or area.



2. LISTINGS AND APPROVALS

Model VSR-S

- UL Listed - Guide No. USQT.S309
- ULC Listed - Guide No. USQTC.S309
- CSFM Listed - 7770-0328:001
- NYC MEA Accepted - BSA-1033-83

Model VSR

- UL Listed - Guide No. USQT.S309
- ULC Listed - Guide No. USQTC.S309
- FM Approved - Waterflow Detectors, Vane Type
- CSFM Listed - 7770-0328:001
- LPCB Approved
- CE Certified - Standard EN-12259-5

Model VSR-10

- UL Listed - Guide No. USQT.S309
- ULC Listed - Guide No. USQTC.S309

3. TECHNICAL DATA

Manufactured by:

Potter Electric Signal Company, LLC
2081 Craig Drive
St. Louis, Missouri 63146

Specifications:

Water Working Pressure:

Model VSR-S rated for water working service pressure up to 300 psi (20.7 bar) for size 1", 1-1/4", 1-1/2" & 2" (25 mm, 32 mm, 38 mm & 50 mm)

Model VSR rated for water working service pressure up to 450 psi (31 bar) for sizes 2" (50 mm) to 8" (200 mm) - UL

Model VSR-10 rated for water working service pressure up to 300 psi (20.7 bar) for size 10" (250 mm)

Maximum Surge: 18 FPS (5.5 m/s)

Flow Sensitivity Range for Signal: 4-10 GPM (15-38 LPM) - UL

Contact Ratings:

Two single-pole double-throw switches with Form C contacts rated at 10 Amps @ 125/250 VAC, 2.0 Amps @ 0-30 VDC, 10m Amps min. @ 24VDC. Each switch can be wired for open or closed circuit operation. See Figure 8.

Conduit Entrances: Two knockouts provided for 1/2" conduit. Individual switch compartments suitable for dissimilar voltages.

Usage: Listed plastic, copper and schedule 40 iron pipe.

VSR-S - Fits pipe sizes 1" (25 mm), 1-1/4" (32 mm), 1-1/2" (38 mm) and 2" (50 mm) Note: 12 paddles are furnished with each unit, one for each pipe size of threaded and sweat TEE, one for 1" (25 mm) CPVC, one for 1" (25 mm) CPVC (Central), one for 1" threaded NIBCO CPVC, and one for 1-1/2" (38 mm) threaded (Japan).

Material Standards:

Body: Cast Aluminum

Base: Cast aluminum.

Enclosure: Die-cast, red enamel finish

Cover held in place with tamper-resistant screws

Viking Technical Data may be found on
The Viking Corporation's Web site at
<http://www.vikinggroupinc.com>.
The Web site may include a more recent
edition of this Technical Data Page.



TECHNICAL DATA

WATERFLOW INDICATOR

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Ordering Information:

See Table 1.

4. INSTALLATION

VSR-S Model

These devices may be mounted in horizontal or vertical pipe. On horizontal pipe they should be installed on the top side of the pipe where they will be accessible. The units should not be installed within 6" (15 cm) of a valve, drain or fitting that changes the direction of the waterflow. Select the proper paddle for the pipe size and type of TEE used; see Figure 1 for instructions on changing paddle. The unit has a 1" NPT bushing for threading into a non-corrosive TEE. See Figure 2 for proper TEE size, type and installation. Use no more than three wraps of Teflon tape.

Screw the device into the TEE fitting as shown in Figure 2. Care must be taken to properly orient the device for the direction of waterflow. The vane must not rub the inside of the TEE or bind in any way. The stem should move freely when operated by hand. The device can also be used in copper or plastic pipe installations with the proper adapters so that the specified TEE fitting may be installed on the pipe run.

VSR and VSR-10 Model

These devices may be mounted on horizontal or vertical pipe. On horizontal pipe they should be installed on the top side of the pipe where they will be accessible. The device should not be installed within 6" (15 cm) of a fitting which changes the direction of the waterflow or within 24" (60 cm) of a valve or drain. Drain the system and drill a hole in the pipe using a hole saw in a slow speed drill (see Figure 1). Clean the inside pipe of all growth or other material for a distance equal to the pipe diameter on either side of the hole. Roll the vane so that it may be inserted into the hole; do not bend or crease it. Insert the vane so that the arrow on the saddle points in the direction of the waterflow. Install the saddle strap and tighten nuts alternately to required torque (see Figure 4). The vane must not rub the inside of the pipe or bind in any way.

Place the system back in service and test the waterflow indicator using the system inspector's test valve. If necessary, adjust the pneumatic retard and/or equipment and perform quarterly inspection.

Adjustments

- A. The pneumatic retard is adjustable from 0 to approximately 90 seconds. To increase the time delay, turn the dial to the next higher letter. Normal setting is between 30 and 45 seconds. In no case should the time be set less than 20 seconds nor more than 90 seconds.
- B. The flow sensitivity is set at approximately 10 gpm. A small coil spring holds the vane in its normal position against the waterflow. The spring can be adjusted to increase or decrease sensitivity, if necessary, but it must not be over-tightened. Too much tension will decrease the sensitivity of the device. The pneumatic retard must be checked after adjusting the flow sensitivity. All testing and adjusting of the waterflow indicator must be done using the remote inspector's test valve.

5. OPERATION

The Waterflow Indicator detects a flow of water exceeding 10 gpm in the piping when the flexible vane is deflected. This motion activates the field-adjustable pneumatic retard device. The pneumatic retard device delays activation of the electrical switches to reduce the possibility of false alarms caused by a single or series of transient flow surges. The retard device instantly resets during a series of surges to prevent a cumulative effect. After a sustained flow, the two switches operate to open or close electrical contacts.

6. INSPECTIONS, TESTS AND MAINTENANCE

WARNING: Any system maintenance or testing that involves placing a control valve or detection system out of service may eliminate the fire protection of that system. Prior to proceeding, notify all authorities having jurisdiction. Consideration should be given to employment of a fire patrol in the affected area. Ascertain what alarms and equipment are connected to the waterflow indicator and take necessary precautions to protect connected equipment.

Testing

The frequency of inspection and testing for the Model VSR-S, VSR and VSR-10 and its associated protective monitoring system should be in accordance with applicable NFPA Codes and Standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently.) An inspector's test valve (usually located at the end of the most remote branch line) should always be used for test purposes. If there are no provisions for testing the operation of the flow detection device on the system, application of the VSR-S is not recommended or advisable. A minimum flow of 10 gpm (38 Lpm) is required to activate this device.

Maintenance

Inspect detectors monthly for leaks. If leaks are found, replace the detector. The VSR-S, VSR and VSR-10 waterflow switch should provide years of trouble-free service. The retard and switch assembly are easily field replaceable. There is no maintenance required, only periodic testing and inspection.



TECHNICAL DATA

WATERFLOW INDICATOR

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Removal

- To prevent accidental water damage, all control valves should be shut tight and the system completely drained before waterflow detectors are removed or replaced.
- Turn off electrical power to the detector, then disconnect wiring.
- Use a wrench on the flats of the bushing. Turn the switch counterclockwise to disengage the pipe threads.
- Gently lift with your fingers, roll the vane so it will fit through the hole while continuing to lift the waterflow detector.
- Lift detector clear of pipe.

7. AVAILABILITY & SERVICE

Viking Waterflow Indicators are available through a network of domestic and international distributors. See the Viking web site or contact The Viking Corporation for closet distributor.

8. GUARANTEES

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

| Nominal Pipe Size | Hole Size | Friction Loss | Part Number | Model |
|--|-------------------|---------------|-------------|-----------|
| Inches | Inches | PSI | | |
| 1" (25 mm) | See Note 1 below | 3 | VSRF0100 | VSR-S |
| 1-1/4" (32 mm) | See Note 1 below | 3 | VSRF0100 | VSR-S |
| 1-1/2" (38 mm) | See Note 1 below | 3 | VSRF0100 | VSR-S |
| 2" (50 mm) | 1-1/4" (32 mm) | 3 | VSRF0200 | VSR-2 |
| 2-1/2" (63.5 mm) | 1-1/4" (32 mm) | 3 | VSRF0250 | VSR-2 1/2 |
| 3" (80 mm) | 2" (50 mm) | 3 | VSRF0300 | VSR-3 |
| 3-1/2" (88.9 mm) | 2" (50 mm) | 3 | VSRF0350 | VSR-3 1/2 |
| 4" (101.6 mm) | 2" (50 mm) | 3 | VSRF0400 | VSR-4 |
| 5" (127 mm) | 2" (50 mm) | 1 | VSRF0500 | VSR-5 |
| 6" (150 mm) | 2" (50 mm) | 1 | VSRF0600 | VSR-6 |
| 8" (200 mm) | 2" (50 mm) | 1 | VSRF0800 | VSR-8 |
| 10" (254 mm) | 2" (50 mm) | 1 | VSRF1000 | VSR-10 |
| Notes: ¹ 1" through 1-1/2" is installed in a tee in the piping rather than a hole in the piping. The waterflow indicator has a 1" male NPT fitting that screws into a 1" tee. See Figure 3. | | | | |

Table 1



TECHNICAL DATA

WATERFLOW INDICATOR

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

VSR-S MODEL

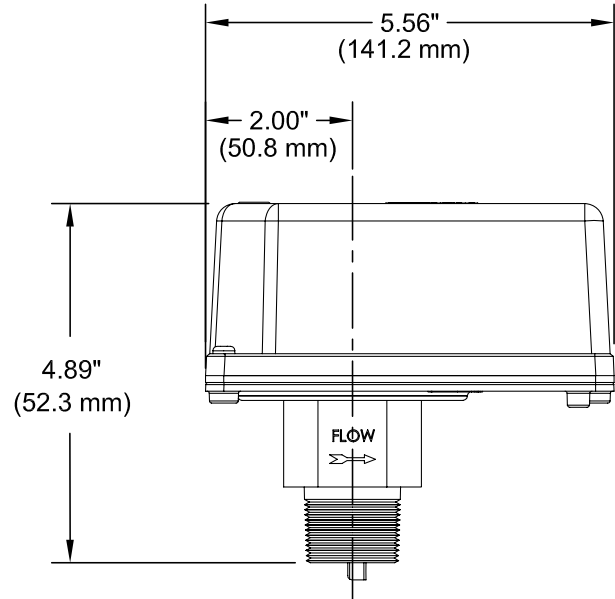
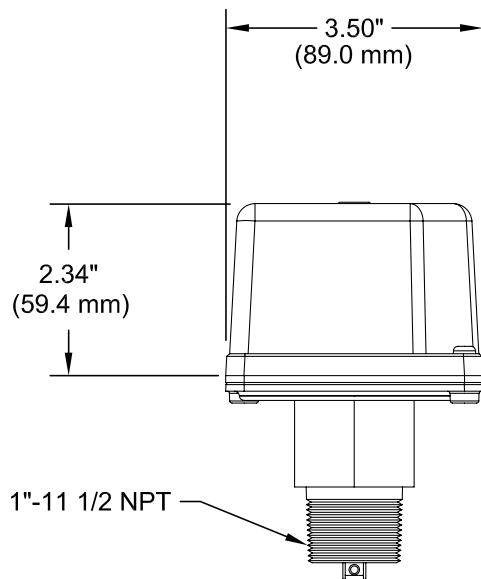


Figure 1

OPTIONAL COVER TAMPER SWITCH

DO NOT LEAVE COVER
OFF FOR EXTENDED
PERIOD OF TIME

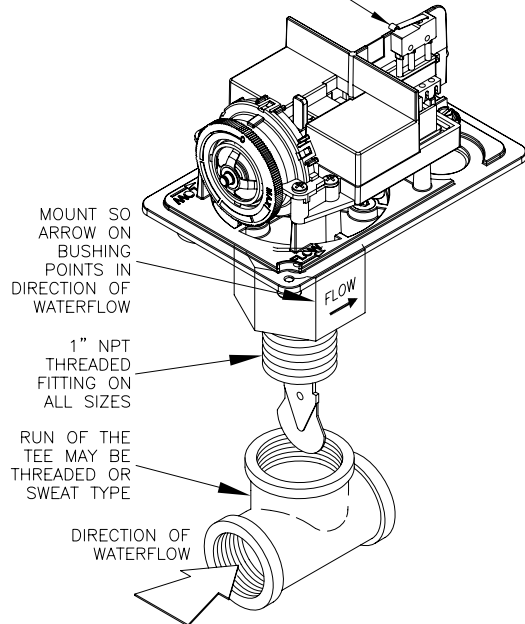
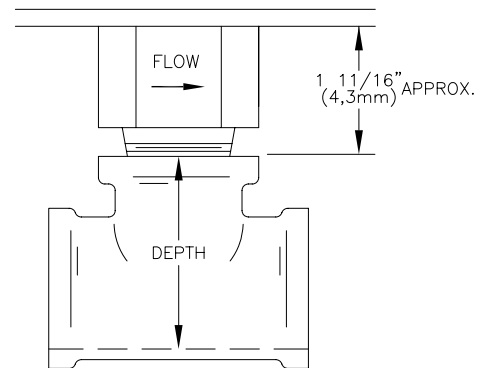


Figure 2



Screw the device into the TEE fitting as shown. Care must be taken to properly orient the device for the direction of the waterflow.

Important - The depth to the inside bottom of the TEE should have the following dimensions:

| APPROXIMATE DEPTH REQUIREMENT | | | |
|-------------------------------|----------|---------|---------|
| TEE SIZE | THREADED | SWEAT | CPVC |
| 1" x 1" x 1" | 2 1/16" | 1 3/4" | 2 7/16" |
| 1 1/4" x 1 1/4" x 1" | 2 7/16" | 2 7/16" | N/A |
| 1 1/2" x 1 1/2" x 1" | 2 11/16" | 2 1/4" | N/A |
| 2" x 2" x 1" | 3 3/16" | 2 3/4" | N/A |

Figure 3



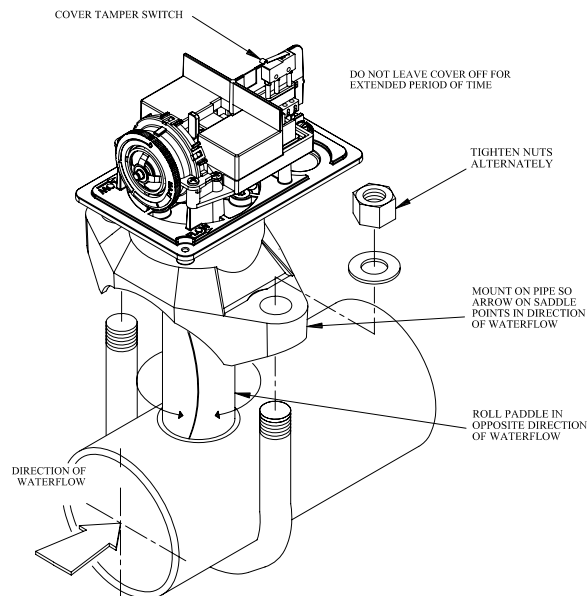
TECHNICAL DATA

WATERFLOW INDICATOR

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-948-4686 Email: techsvcs@vikingcorp.com

VSR MODEL



| INSTALLATION REQUIREMENTS | | | | | | | | | | |
|---------------------------|-------------------|-------|-------------------|-------|--------------------|------------|--------------------|-----|--|--|
| Model | Nominal Pipe Size | | Nominal Pipe O.D. | | Hole Size | | U-Bolt Nuts Torque | | | |
| | inch | mm | inch | mm | inch | mm | ft-lb | n-m | | |
| VSR-2 | 2 | DN50 | 2.375 | 60.3 | 1.25 + .125/- .062 | 33.0 ± 2.0 | 20 | 27 | | |
| VSR-2 1/2 | 2 1/2 | | 2.875 | 73 | | | | | | |
| VSR-2 1/2 | 2 1/2 | DN65 | 3.000 | 76.1 | | | | | | |
| VSR-3 | 3 | DN80 | 3.500 | 88.9 | | | | | | |
| VSR-3 1/2 | 3 1/2 | | 4.000 | 101.6 | 2.00 ± .125 | 50.8 ± 2.0 | | | | |
| VSR-4 | 4 | DN100 | 4.500 | 114.3 | | | | | | |
| VSR-5 | 5 | | 5.563 | 141.3 | | | | | | |
| VSR-6 | 6 | DN150 | 6.625 | 168.3 | | | | | | |
| VSR-8 | 8 | DN200 | 8.625 | 219.1 | | | | | | |

Figure 4

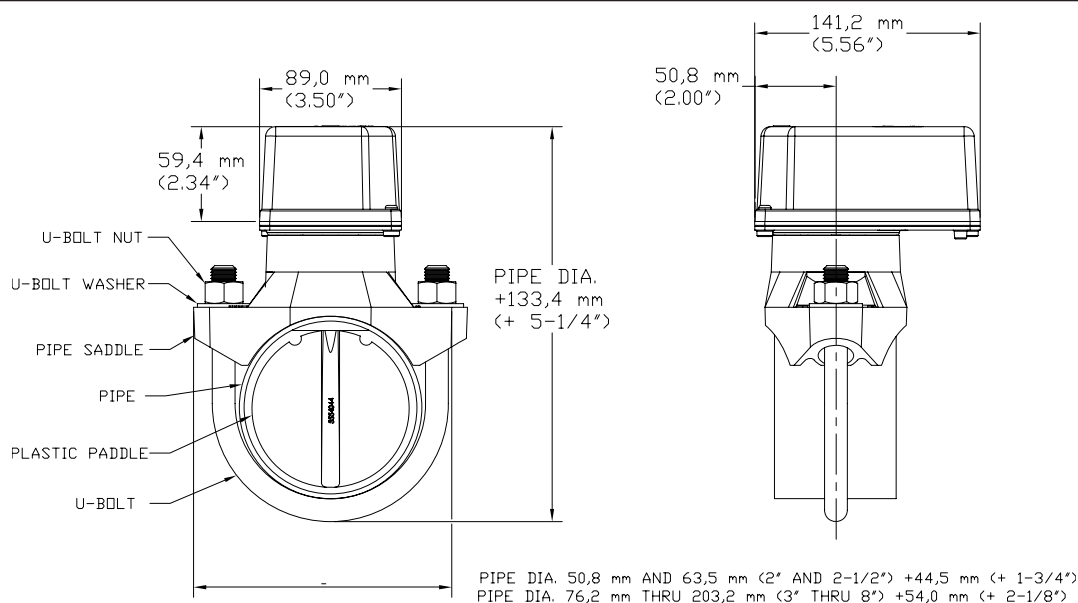


Figure 5



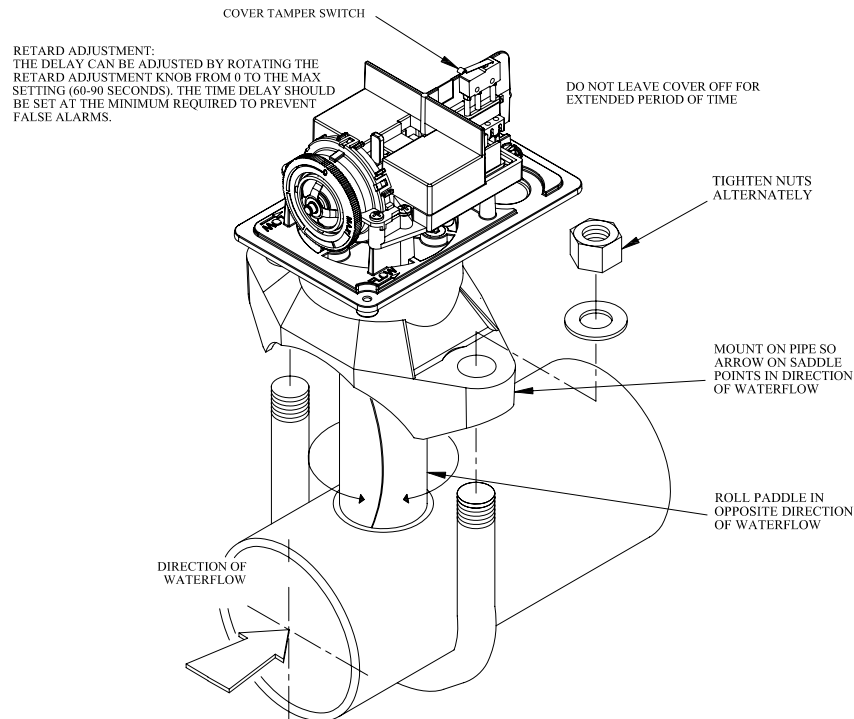
TECHNICAL DATA

WATERFLOW INDICATOR

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

VSR-10 MODEL



| INSTALLATION REQUIREMENTS | | | | | | | | |
|---------------------------|-------------------|-------|-------------------|-------|-------------|------------|--------------------|-----|
| Model | Nominal Pipe Size | | Nominal Pipe O.D. | | Hole Size | | U-Bolt Nuts Torque | |
| | inch | mm | inch | mm | inch | mm | ft-lb | n-m |
| VSR-10 | 10 | DN250 | 10.750 | 273.0 | 2.00 ± .125 | 50.8 ± 2.0 | 20 | 27 |

Figure 6

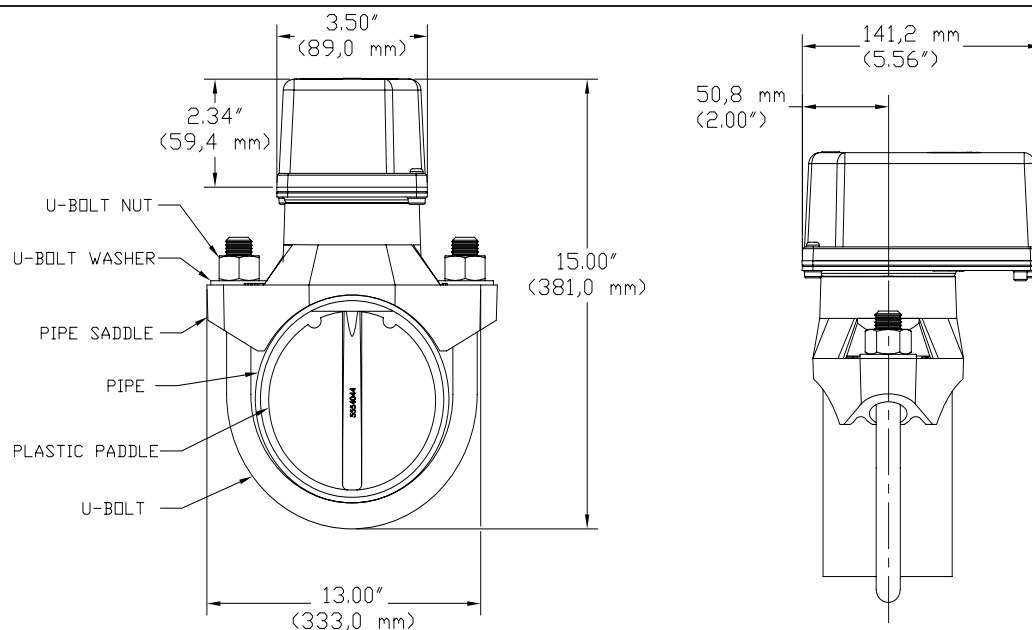


Figure 7



TECHNICAL DATA

WATERFLOW INDICATOR

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

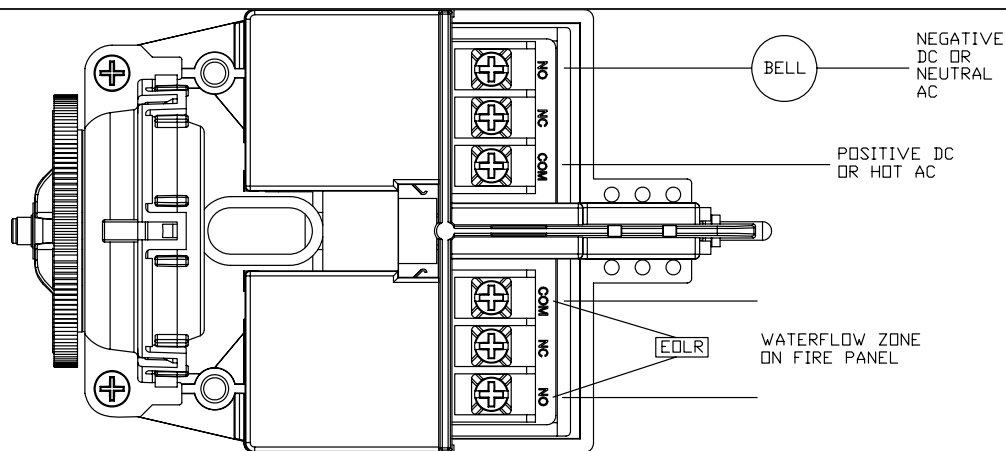


Figure 8: Typical Electrical Connections

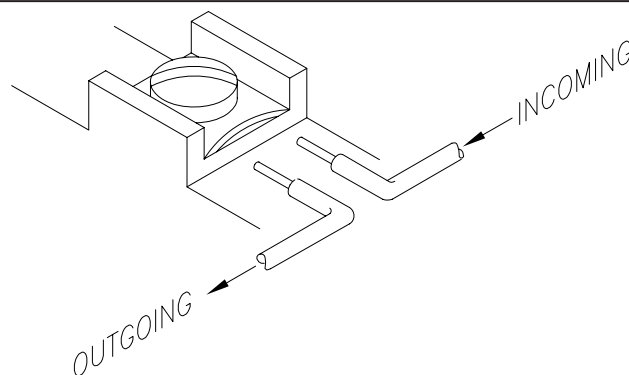


Figure 9: Switch Terminal Connections Clamping Plate Terminal

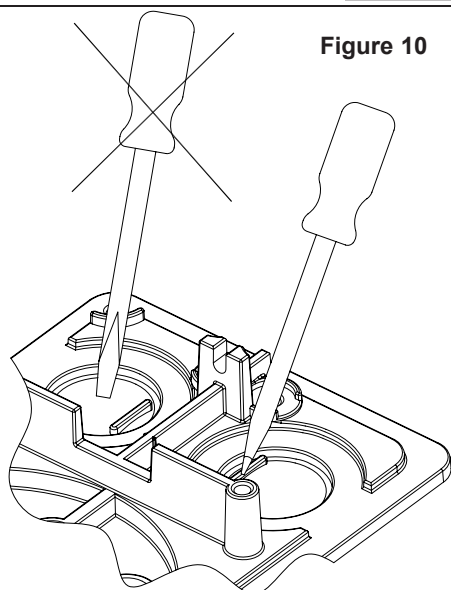


Figure 10

To remove knockouts: Place screwdriver at inside edge of knockouts, not in the center.

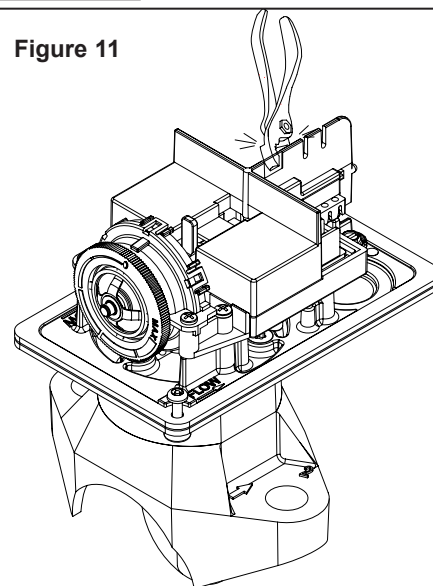


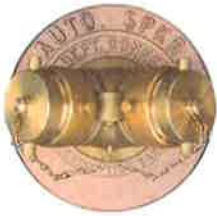
Figure 11

Break out thin section of cover when wiring both switches from one conduit entrance.

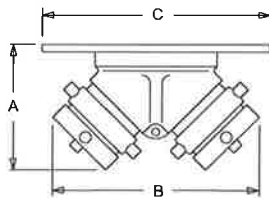
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6100 Series Projecting Fire Dept. Inlet Connections

GUARDIAN
FIRE EQUIPMENT, INC.



6114



Function

- Used as auxiliary connections through which the fire department can pump water to supplement existing water supplies
- Provides 250 GPM flow (minimum), per 2½" inlet

Features/Components

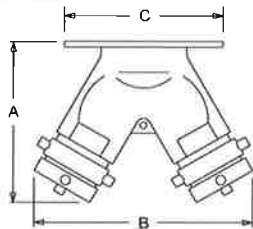
- **Two and three-way** inlet connections feature clappered brass bodies (straight pattern), with female hose thread swivel inlets and female NPT outlets
- **Standard components, all connections:**
Plugs with chains and identification plate
- Cast brass construction*, standard

*Optional brass finishes, add suffix to model no.

-B Polished; -C Rough Chrome Plated; -D Polished Chrome Plated



6124/6126

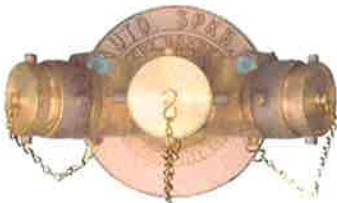


Two and Three-Way Connections

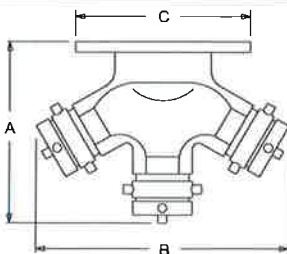
| Model No. | Size | Clappers | A | B | C |
|-----------|----------------------|----------|------|------|------|
| 6114 | 4" x 2½" x 2½" | 1 | 5⅞" | 8⅞" | 10" |
| 6124 | 4" x 2½" x 2½" | 2 | 7⅝" | 10½" | 10" |
| 6126 | 6" x 2½" x 2½" | 2 | 8" | 10½" | 11¼" |
| 6136 | 6" x 2½" x 2½" x 2½" | 3 | 11¼" | 13¾" | 11¼" |

Identification Plate Lettering:

- AUTO SPKR
- STANDPIPE
- AUTO SPKR & STANDPIPE
- DRY STANDPIPE



6136



Notes

- Always specify hose threads and identification plate lettering
- Contact factory for current UL listing/FM approvals and special requirements



TECHNICAL DATA

EASY RISER® SWING CHECK VALVE MODELS E-1 & F-1

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

1. DESCRIPTION

The Viking Easy Riser® Swing Check Valve is a general purpose rubber-faced check valve approved for use in fire service systems. The valve is for use in wet system risers, preaction system risers and wherever a check valve with a drain connection and gauge connections can be utilized. When used with a flow switch on wet pipe systems not requiring a mechanical alarm, the Easy Riser® Swing Check Valve may replace an alarm check valve.

1-A Features

1. Ductile iron body for less weight and extra strength.
2. Rated to 300 psi (20.7 bar) water working pressure.
3. Rubber-faced clapper hinged to access cover for quick removal and easy servicing. All moving parts can be serviced without removing the valve from the installed position.
4. With the cover/clapper assembly removed, clapper rubber replacement requires removal of only one screw.
5. Valve housing tapped for inlet and outlet pressure gauges, and system main drain.

1-B Accessories

1. 300 PSI (20.7 bar) Trim Packages
Trim Packages include:
A. All necessary nipples and fittings
B. Main Drain Ball Valve
C. Necessary gauges
2. 175 psi (12 bar) ESFR Preprimed Preaction System Trim for use when the F-1 Easy Riser Check Valve is installed with the ESFR Cold Storage System.
3. 175 psi (12 bar) ESFR Bypass and Drain Trim for use when the F-1 Easy Riser Check Valve is installed with the ESFR Cold Storage System.



2. LISTINGS AND APPROVALS:

For Cold Storage application, use Easy Riser Preprimed Preaction Trim and Bypass and Drain Trim, see page 48a-d.

cULus Listed: HMER

FM Approved: Single Check Valves

NYC Department of Buildings: MEA 89-92-E, Vol. XI

VNIPO (250 psi (17.2 bar) MWP)

CE: Pressure Equipment Directive 97/23/EC (250 psi (17.2 bar) MWP)

3. TECHNICAL DATA

Specifications:

Standard Flanged Connections: ANSI B16.42 Class 150 (mates with ANSI Class 125 and Class 150 flanges).

Standard Grooved Connections: ANSI/AWWA C606

Drain outlet: 2-1/2" and 3" valves - one 1-1/4" (32 mm) NPT; 4", 6" & 8" valves - 2" (50 mm) NPT

Gauge Outlets: two 1/4" (8 mm) NPT

Other Outlets: two 1/2" (15 mm) NPT

Systems with water working pressures above 175 psi (12 bar) may require extra-heavy pattern fittings. Viking Easy Riser® Swing Check Valve flanges are Ductile Iron ANSI B16.42, Class 150, with a maximum water working pressure of 300 psi (20.7 bar). ANSI B16.42, Class 150 flanges are NOT compatible with ANSI Class 250 or Class 300 flanges. To mate the Easy Riser® Swing Check Valve with ANSI Class 250 or Class 300 flanges, use the grooved-inlet/grooved-outlet style installed with listed grooved/flanged adapters of the appropriate pressure rating. For piping with grooved connections, the grooved-inlet and/or grooved-outlet style Easy Riser® Swing Check Valve may be installed with listed grooved couplings of the appropriate pressure rating.

FOR THE VIKING ESFR COLD STORAGE SYSTEM:

- Uses only 4", 6", or 8" size Model F-1 Easy Riser Check Valve
- Uses Easy Riser Preprimed Preaction Trim and Bypass and Drain Trim (refer to data page 48a-d for trim sets used in this application).
- Uses the Viking Automatic Pressure Control System

Viking Technical Data may be found on
The Viking Corporation's Web site at
<http://www.vikinggroupinc.com>.
The Web site may include a more recent
edition of this Technical Data Page.



TECHNICAL DATA

EASY RISER® SWING CHECK VALVE MODELS E-1 & F-1

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

- System is designed so maximum operating pressures of the system does not exceed 175 PSI (12 bar).
- Refer to technical data page 47a-c: Automatic Pressure Control System

Material Standards:

Refer to Figure 1.

Ordering Information:

See Table 1 for part numbers and shipping weights.

4. INSTALLATION

FOR THE VIKING ESFR COLD STORAGE SYSTEM, REFER TO DATA PAGE 45a-j FOR INSTRUCTIONS ON PLACING THE SYSTEM IN SERVICE.

The Easy Riser® Swing Check Valve must be installed in an area not subject to freezing temperatures or physical damage. When corrosive atmospheres and/or contaminated water supplies are present, it is the owner's responsibility to verify compatibility with the Easy Riser® Swing Check Valve, trim, and associated equipment.

Prior to installing the valve, thoroughly flush the water supply piping to verify that no foreign matter is present.

The Easy Riser® Swing Check Valve may be installed in the vertical position with direction of flow up, or in the horizontal position with the access cover up.

1. Remove all plastic thread protectors from the openings of the Easy Riser® Swing Check Valve.
2. Apply a small amount of pipe-joint compound or tape to the external threads of all pipe connections required. Take care not to allow any compound, tape, or other foreign matter inside any of the nipples or openings of the valve or trim components.
3. Easy Riser® Swing Check Valve Trim Charts are provided with Trim Packages and in the *Viking Engineering and Design Data* book.
4. Verify that all system components are rated for the water working pressure of the system.

Hydrostatic Test:

The Easy Riser® Swing Check Valve is manufactured and listed for use at a maximum water working pressure of 300 psi (20.7 bar). The valve is factory tested at 600 psi (41.4 bar). Easy Riser® Swing Check Valves may be hydrostatically tested at 350 psi (24.1 bar) and/or 50 psi (3.5 bar) above the normal water working pressure for limited periods of time (two hours) for the purpose of acceptance by the Authority Having Jurisdiction. If air testing is required, DO NOT exceed 40 psi (2.8 bar) air pressure.

5. OPERATION (Refer to Figure 1.)

Water flowing through the Viking Easy Riser® Swing Check Valve lifts the rubber-gasketed clapper (8 and 9) off the seat (12) and flows into the sprinkler piping. When flow through the valve stops, the clapper (8) closes quickly. The rubber gasket (9) forms a tight seal against the brass water seat (12), trapping pressurized water above the clapper and preventing reverse flow from the sprinkler piping.

6. INSPECTIONS, TESTS, AND MAINTENANCE

FOR THE VIKING ESFR COLD STORAGE SYSTEM, REFER TO DATA PAGE 45 a-j FOR INSPECTIONS AND TESTS

NOTICE: THE OWNER IS RESPONSIBLE FOR MAINTAINING THE FIRE-PROTECTION SYSTEM AND DEVICES IN PROPER OPERATING CONDITION.

The Viking Easy Riser® Swing Check Valve and trim must be kept free of foreign matter, freezing conditions, corrosive atmospheres, contaminated water supplies, and any condition that could impair its operation or damage the device.

It is imperative that the system be inspected and tested on a regular basis. The frequency of the inspections may vary due to contaminated water supplies, corrosive water supplies, and corrosive atmospheres. For minimum maintenance and inspection requirements, refer to NFPA 25. In addition, the Authority Having Jurisdiction may have additional maintenance, testing, and inspection requirements that must be followed.

WARNING: ANY SYSTEM MAINTENANCE WHICH INVOLVES PLACING A CONTROL VALVE OR DETECTION SYSTEM OUT OF SERVICE MAY ELIMINATE THE FIRE-PROTECTION CAPABILITIES OF THAT SYSTEM. PRIOR TO PROCEEDING, NOTIFY ALL THE AUTHORITY HAVING JURISDICTION. CONSIDERATION SHOULD BE GIVEN TO EMPLOYMENT OF A FIRE PATROL IN THE AFFECTED AREAS.

6-A. Five-Year Internal Inspection

Internal inspection of check valves is recommended every five years unless inspections and tests indicate more frequent inspections are required. (Refer to Figure 1.)

1. Notify the Authority Having Jurisdiction, remote station alarm monitors, and those in the area affected that the system will be taken out of service. Consideration should be given to employment of a fire patrol in the affected areas.
2. Close the water supply main control valve, placing the system out of service.
3. Open the main drain. If necessary, open the system test valve to vent and completely drain the system.



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4. Use the appropriate wrench to loosen and remove cover screws (14), and remove cover and clapper assembly (2-11).
5. Inspect water seat (12). Wipe away all contaminants, dirt, and mineral deposits. DO NOT use solvents or abrasives.
6. Inspect cover and clapper assembly (2-11) and cover gasket (13). Test the hinged clapper (8) for freedom of movement. Renew or replace damaged or worn parts as required.

CAUTION: NEVER APPLY ANY LUBRICANT TO SEATS, GASKETS, OR ANY INTERNAL OPERATING PARTS OF THE VALVE. PETROLEUM-BASED GREASE OR OIL WILL DAMAGE RUBBER COMPONENTS AND MAY PREVENT PROPER OPERATION.

7. When internal inspection of the Easy Riser® Swing Check Valve is complete, perform step 6 of paragraph 11. MAINTENANCE to re-install cover and clapper assembly (2-11).

6-B. Maintenance (Refer to Figure 1.)

FOR THE VIKING ESFR COLD STORAGE SYSTEM, REFER TO DATA PAGE 45a-j FOR MAINTENANCE INSTRUCTIONS.

1. Perform steps 1 through 5 of paragraph 6-A, FIVE-YEAR INTERNAL INSPECTION.
2. To replace clapper assembly (3, 6-11):
 - a. Remove the cover screws (14) from the cover (2) using a Socket Wrench with a 9/16" socket.
 - b. Remove the cover and clapper assembly (2-11) from the valve.
 - c. Remove the cover gasket (13) by sliding it over the clapper assembly.
 - d. Remove the existing clapper assembly (3, 6-11) from the cover assembly (2):
 - i. Remove one of the retaining rings (5) from the clapper hinge pin (4) using a flat head screwdriver.
 - ii. Remove the clapper hinge pin (4) from the cover and clapper assembly. This will allow the clapper assembly (3, 6-11) to be removed from the cover assembly (2).
 - e. Install the new clapper assembly (3, 6-11) onto the cover assembly (2):
 - i. Make sure the clapper rubber (9) is facing opposite the direction of the flow arrow on the inside of the cover (2).
 - ii. Line up the holes of the cover assembly (2) and the clapper assembly (3, 6-11) and insert the hinge pin (4).
 - iii. Install the retaining ring (5) onto the hinge pin (4).
 - iv. Install the cover gasket (13) onto the new cover and clapper assembly (2-11) by sliding the cover gasket (13) over the clapper assembly (3, 6-11) and lining up the holes with the cover (2).
 - v. To install the new cover and clapper assembly (2-11) into the valve, slide the clapper assembly into the valve with the clapper rubber (9) lined up with the water seat (12). Ensure the rubber retainer (10) fits inside the seat of the valve (pull back slightly and there should be some resistance).
 - vi. Line up the holes of the cover (2) and cover gasket (13) with the valve body (1) and replace the cover screws (14) using a Socket Wrench with a 9/16" socket.
3. To replace the clapper rubber (9):
 - i. Remove the cover screws (14) from the cover (2) using a Socket Wrench with a 9/16" socket.
 - ii. Remove the cover and clapper assembly (2-11) from the valve.
 - iii. Remove the cover gasket (13) by sliding it over the clapper assembly (3, 6-11).
 - iv. Use a 7/32" Allen wrench to hold the button head socket screw (11) in place and remove the jam nut (6) from the clapper rubber (9) using a Socket Wrench with a 9/16" socket.
 - v. Remove the button head socket screw (11) and sealing washer (7) from the clapper assembly (3, 6-11).
 - vi. Remove the clapper rubber retainer (10) from the clapper (8) to free the clapper rubber (9).
 - vii. To install the new clapper rubber (9), position the clapper rubber (9) on the clapper assembly so the grooved edge is facing down. This will allow the clapper rubber retainer (10) to fit up into the grooved edge of the clapper rubber (9).
 - viii. Install the button head socket screw (11) and sealing washer assembly (7) and the jam nut (6) using a 7/32" Allen wrench and a Socket Wrench with a 9/16" socket.
 - ix. Install the cover gasket (13) onto the cover (2) by sliding it over the clapper assembly (3, 6-11).
 - x. Re-install the cover and clapper assembly (2-11) back into the valve, with the clapper rubber (9) lined up with the water seat (12). Ensure the clapper rubber retainer (10) fits inside the seat of the valve (pull back slightly and there should be some resistance).
 - xi. Line up the holes of the cover (2) and cover gasket (13) with the valve body (1) and replace the cover screws (14) using a Socket Wrench with a 9/16" socket.
4. To replace the cover gasket (13):
 - i. Remove the cover screws (14) from the cover (2) using a Socket Wrench with a 9/16" socket.
 - ii. Remove the cover and clapper assembly (2-11) from the valve.
 - iii. Remove the cover gasket (13) by sliding it over the clapper assembly (3, 6-11).
 - iv. Install the new cover gasket (13) by sliding it over the clapper assembly (3, 6-11), onto the cover (2).



TECHNICAL DATA

EASY RISER® SWING CHECK VALVE MODELS E-1 & F-1

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5. Reinstall the cover and clapper assembly (2-11) into the valve:
 - i. Line up the clapper rubber (9) with the water seat (12). Ensure the clapper rubber retainer (10) fits inside the seat of the valve (pull back slightly and there should be some resistance).
 - ii. Line up the holes of the cover (2) and cover gasket (13) with the valve body (1) and replace the cover screws (14) using a Socket Wrench with a 9/16" socket.

7. AVAILABILITY

The Viking Easy Riser® Swing Check Valve is available through a network of domestic and international distributors. See the Viking Corp. Web site for closest distributor or contact The Viking Corporation.

8. GUARANTEES

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

Table 1 - Valve Part Numbers and Specifications

| Description | Nominal Size | Part Number | Friction Loss* | Shipping Weight |
|-----------------------------|------------------|-------------|----------------|------------------|
| Flange/Flange | | | | |
| Flange Drilling | Model F-1 | | | |
| ANSI 3" | | 08505 | 10 ft. (3.1m) | 35 lbs. (16 kg) |
| ANSI 4" | | 08508 | 13 ft. (4.0 m) | 27 lbs. (12 kg) |
| ANSI 6" | | 08511 | 20 ft. (6.0 m) | 75 lbs. (34 kg) |
| ANSI/Japan DN100 | | 09039 | 13 ft. (4.0 m) | 27 lbs. (12 kg) |
| ANSI/Japan DN150 | | 09385 | 20 ft. (6.0 m) | 75 lbs. (34 kg) |
| ANSI/Japan DN200 | | 14023 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| PN10/16 DN80 | | 08796 | 10 ft. (3.1m) | 35 lbs. (16 kg) |
| PN10/16 DN100 | | 08797 | 13 ft. (4.0 m) | 27 lbs. (12 kg) |
| PN10/16 DN150 | | 08835 | 20 ft. (6.0 m) | 75 lbs. (34 kg) |
| PN10 DN200 | | 08836 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| PN16 DN200 | | 12355 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| Flange/Groove | | | | |
| Flange Drilling / Pipe O.D. | Model F-1 | | | |
| ANSI / 89mm 3" | | 08506 | 10 ft. (3.1m) | 27 lbs. (12 kg) |
| ANSI / 114mm 4" | | 08509 | 13 ft. (4.0 m) | 37 lbs. (17 kg) |
| ANSI / 168mm 6" | | 08512 | 20 ft. (6.0 m) | 64 lbs. (29 kg) |
| ANSI / 219mm 8" | | 08515 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| PN10/16 / 89mm DN80 | | 12648 | 10 ft. (3.1m) | 27 lbs. (12 kg) |
| PN10/16 / 114mm DN100 | | 12649 | 13 ft. (4.0 m) | 37 lbs. (17 kg) |
| PN10/16 / 165mm DN150 | | 12652 | 20 ft. (6.0 m) | 64 lbs. (29 kg) |
| PN10/16 / 168mm DN150 | | 08512 | 20 ft. (6.0 m) | 64 lbs. (29 kg) |
| PN10 / 219mm DN200 | | 12651 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| PN16 / 219mm DN200 | | 12650 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| Groove/Groove | | | | |
| Pipe O.D. | Model E-1 | | | |
| 73mm 2½" / DN65 | | 07929 | 6 ft. (1.8m) | 16 lbs. (7kg) |
| | Model F-1 | | | |
| 89mm 3" / DN80 | | 08507 | 10 ft. (3.1m) | 20 lbs. (9 kg) |
| 114mm 4" / DN100 | | 08510 | 13 ft. (4.0 m) | 27 lbs. (12 kg) |
| 165mm DN150 | | 12356 | 20 ft. (6.0 m) | 51 lbs. (23 kg) |
| 168mm 6" / DN150 | | 08513 | 20 ft. (6.0 m) | 51 lbs. (23 kg) |
| 219mm 8" / DN200 | | 08516 | 23 ft. (7.0 m) | 106 lbs. (48 kg) |

*Expressed in equivalent length of Schedule 40 pipe based on Hazen & Williams formula: C = 120.

Table 2 - Torque Values for Easy Riser Swing Check Valve Cover Screws

| Valve Size | Screw Size | Torque Value |
|---------------|----------------|----------------------|
| 2-1/2" (DN65) | 3/8"-16 H.H.C. | 19 ft-lb (2.63 kg-m) |
| 3" (DN80) | 3/8"-16 H.H.C. | 19 ft-lb (2.63 kg-m) |
| 4" (DN100) | 3/8"-16 H.H.C. | 19 ft-lb (2.63 kg-m) |
| 6" (DN150) | ½"-13 H.H.C. | 45 ft-lb (6.23 kg-m) |
| 8" (DN200) | 5/8"-11 H.H.C. | 93 ft-lb (12.9 kg-m) |

Table 3 - Trim Package Part Numbers

| Valve Size | Part Number |
|---|-------------|
| Wet System Trim Packages | |
| 2-1/2", 3" (DN65), (DN80) | 07236 |
| 4", 6", 8", (DN100), (DN150), (DN200) | 07237 |
| Preaction System Trim Packages | |
| 2-1/2", 3" (DN65) | 13776 |
| 4", 6", 8", (DN80), (DN100), (DN150), (DN200) | 13777 |

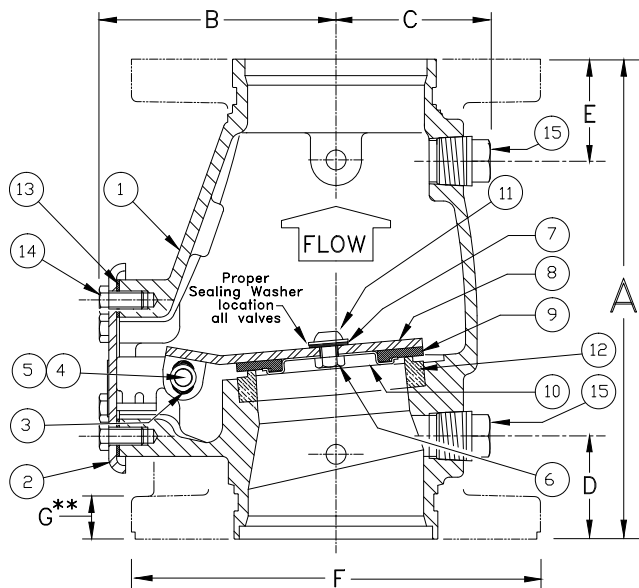


TECHNICAL DATA

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| SIZE | A | B | C | D | E | F | G** |
|------------------|--------------------|---------------------|--------------------|-------------------|-------------------|--------------------------|-------------------|
| 2-1/2" (65mm) | 9" (228,6) | 4-1/2" (114,3) | 2-5/8" (66,7) | 2" (50,8) | 2" (50,8) | Flg-Flg Not Available | |
| 3" (80mm) | 10-1/8" (257) | 4-13/16" (122,2) | 2-11/16" (68,3) | 2-9/32" (58,1) | 2-9/32" (58,1) | 7-7/8" (200) | 25/32" (20) |
| 4" (100mm) | 10-5/8" (269,9) | 5-3/16" (131,8) | 3-1/8" (79,4) | 2-1/4" (57,2) | 2-1/4" (57,2) | 9" (228,6) | 15/16" (23,81) |
| 6" (150mm) | 13-3/8" (340) | 6-13/16" (173,3) | 4-1/16" (103,2) | 2-1/4" (57,2) | 2-1/4" (57,2) | 11" (279,4) | 1" (25,4) |
| 8" (200mm) | 17" (431,8) | 8-13/16" (223,4) | 5" (127) | 2-1/2" (63,4) | 2-7/8" (73,0) | 13-1/2" (342,9) | 1-1/8" (28,58) |

Dimensions shown in parentheses are millimeter.

* For availability of Flg X Flg, Flg X Grv, or Grv X Grv options refer to Table 1.

** 4", 6", and 8" valves are manufactured with sculptured flanges. Dimension indicates thickness of flange at bolt holes.

Figure 1 - Replacement Parts

| ITEM NO. | PART NUMBER | | | | | DESCRIPTION | MATERIAL | NO. REQ'D | | | | |
|----------|-------------------------|---------------------|----------------------|----------------------|----------------------|---|---|-----------|----|----|----|----|
| | E-1 2-1/2" (DN65) | F-1 3" (DN80) | F-1 4" (DN100) | F-1 6" (DN150) | F-1 8" (DN200) | | | 2-1/2" | 3" | 4" | 6" | 8" |
| 1 | -- | -- | -- | -- | -- | Body | Ductile Iron, ASTM A536 (65-45-12) | 1 | 1 | 1 | 1 | 1 |
| 2 | -- | -- | -- | -- | -- | Cover Assembly | E-Coated HSLA Steel, A715 and Stainless Steel, UNS-S30400 | 1 | 1 | 1 | 1 | 1 |
| 3 | 07576 | 07576 | 07576 | 07576 | None | Bushing | Lubricomp 189 Ryton | 2 | 2 | 2 | 2 | 0 |
| 4 | 05355A | 05355A | 04900A | 04991A | 05334A | Clapper Hinge Pin | Stainless Steel, UNS-S30400 | 1 | 1 | 1 | 1 | 1 |
| 5 | 05445A | 05445A | 05445A | 05445A | 05369A | Hinge Pin Retaining Ring | Stainless Steel, UNS-S15700 | 2 | 2 | 2 | 2 | 2 |
| 6 | 01755A | | | | | Clapper Hex Jam Nut #10-24 UNC | Stainless Steel, UNS-S30400 | 1 | 0 | 0 | 0 | 0 |
| | | 08159 | 08159 | | | Clapper Hex Jam Nut 3/8"-24 UNF | Stainless Steel, UNS-S30400 | 0 | 1 | 1 | 0 | 0 |
| | | | | 08144 | 08144 | Clapper Hex Jam Nut 1/2"-20 UNF | Stainless Steel, UNS-S30400 | 0 | 0 | 0 | 1 | 1 |
| 7 | -- | 08158 | 08158 | 08143 | 08143 | Sealing Washer | EPDM and Stainless Steel | 1 | 1 | 1 | 1 | 1 |
| 8 | * | * | * | * | * | Clapper | PTFE Coated HR Steel UNS-G10180 | 1 | 1 | 1 | 1 | 1 |
| 9 | * | * | * | * | * | Clapper Rubber | EPDM, ASTM D2000 | 1 | 1 | 1 | 1 | 1 |
| 10 | * | * | * | * | * | Clapper Rubber Retainer | Stainless Steel, UNS-S30400 | 1 | 1 | 1 | 1 | 1 |
| 11 | 06595A | | | | | H.H.C. Screw, #10-24 UNC x 1/2" (12.7 mm) lg. | Stainless Steel, UNS-S30400 | 1 | 0 | 0 | 0 | 0 |
| | | 10194 | 10194 | | | Screw, Button Head, Socket, 3/8" - 24 UNF x 1/2 (12.7 mm) lg. | Stainless Steel, UNS-S30400 | 0 | 1 | 1 | 0 | 0 |
| | | | | 10308 | | Screw, Button Head, Socket, 1/2" - 20 UNF x 3/4 (19.1 mm) lg. | Stainless Steel, UNS-S30400 | 0 | 0 | 0 | 1 | 0 |
| | | | | | 10686 | Screw, Button Head, Socket, 1/2" - 20 UNF x 7/8 (22.2 mm) lg. | Stainless Steel, UNS-S30400 | 0 | 0 | 0 | 0 | 1 |
| 12 | -- | -- | -- | -- | -- | Seat | Brass, UNS-C84400 | 1 | 1 | 1 | 1 | 1 |
| 13 | 05354B | 05354B | 04649B | 04992B | 05339C | Cover Gasket | EPDM, ASTM D2000 | 1 | 1 | 1 | 1 | 1 |
| 14 | 01517A | 01517A | 01517A | | | Screw, Hex Head Cap, 3/8" - 16 UNC x 3/4 (19.1 mm) lg. | Steel, Zinc Plated | 4 | 4 | 6 | 0 | 0 |
| | | | | 04993A | | Screw, Hex Head Cap, 1/2" - 13 x 7/8 (22.2 mm) lg. | Steel, Zinc Plated | 0 | 0 | 0 | 6 | 0 |
| | | | | | 01922A | Screw, Hex Head Cap, 5/8" - 11 UNC x 1-1/4" (31.8 mm) lg. | Steel, Zinc Plated | 0 | 0 | 0 | 0 | 6 |
| 15 | -- | -- | -- | -- | -- | 1/2" (15 mm) NPT Pipe Plug | Steel | 2 | 2 | 2 | 2 | 2 |

-- Indicates replacement part is not available

* Indicates replacement part only available in a Sub-Assembly listed below.

Sub-Assemblies

| | | | | | | |
|----------------|--------|-------|-------|-------|-------|------------------------|
| 3, 6-11 | 05499B | 08518 | 08519 | 08520 | 08521 | Clapper Assembly |
| 6, 7, 9-11, 13 | 06343A | 08522 | 08523 | 08524 | 08525 | Replacement Rubber Kit |



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For ESFR Cold Storage Systems, use Preprimed Preaction Trim and Bypass and Drain Trim. See page 48a-d for trim arrangements.

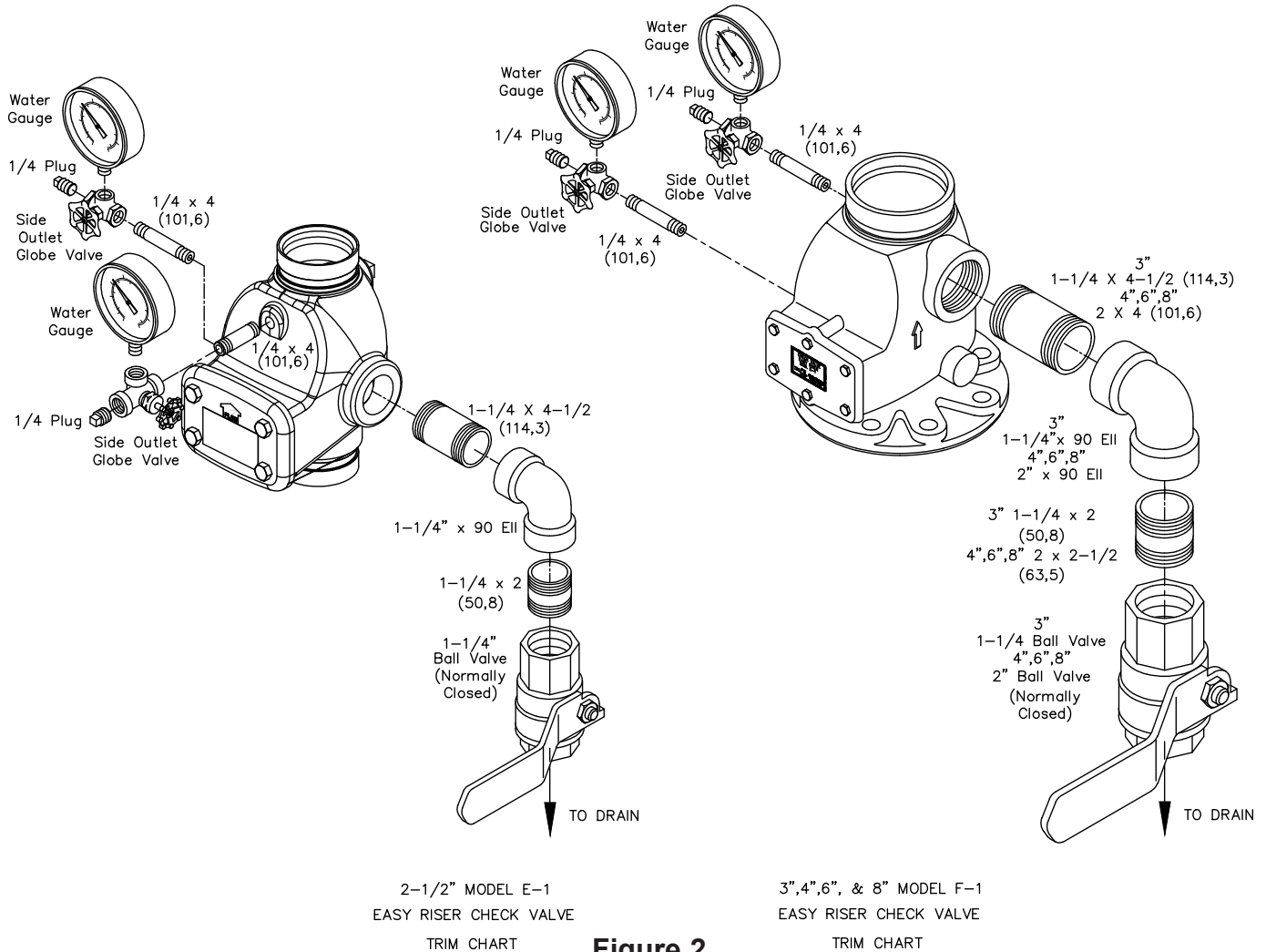


Figure 2

Note 1: 300 psi (20.7 bar) water pressure gauges are provided with trim. 600 psi (41.4 bar) water pressure gauges are available. Order separately when needed*. Refer to Viking's current price schedule.

* NFPA 13 requires gauges to have a minimum limit not less than twice the normal water working pressure at the point where the gauges are installed. When normal water working pressure exceeds 150 psi (10.3 bar), order 600 psi (41.4 bar) water pressure gauges separately.

Note 2: System Drain Ball Valve is UL Listed and FM Approved for 300 psi (20.7 bar) water working pressure.



TECHNICAL DATA

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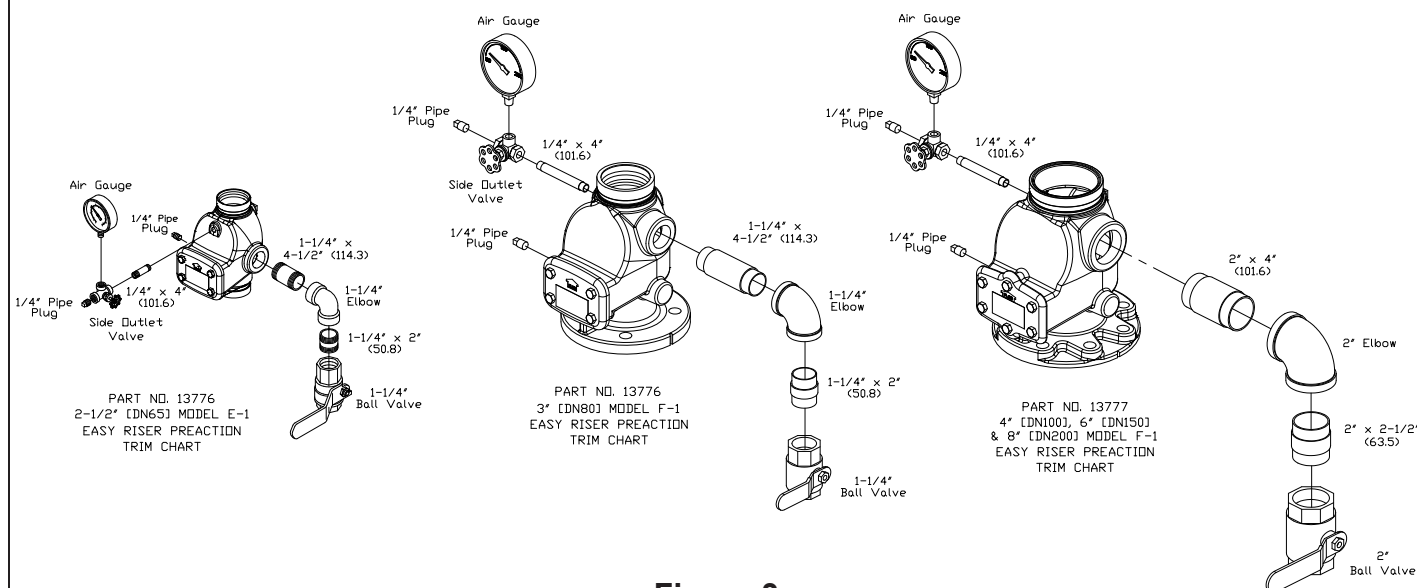


Figure 3
For use on Praction Systems

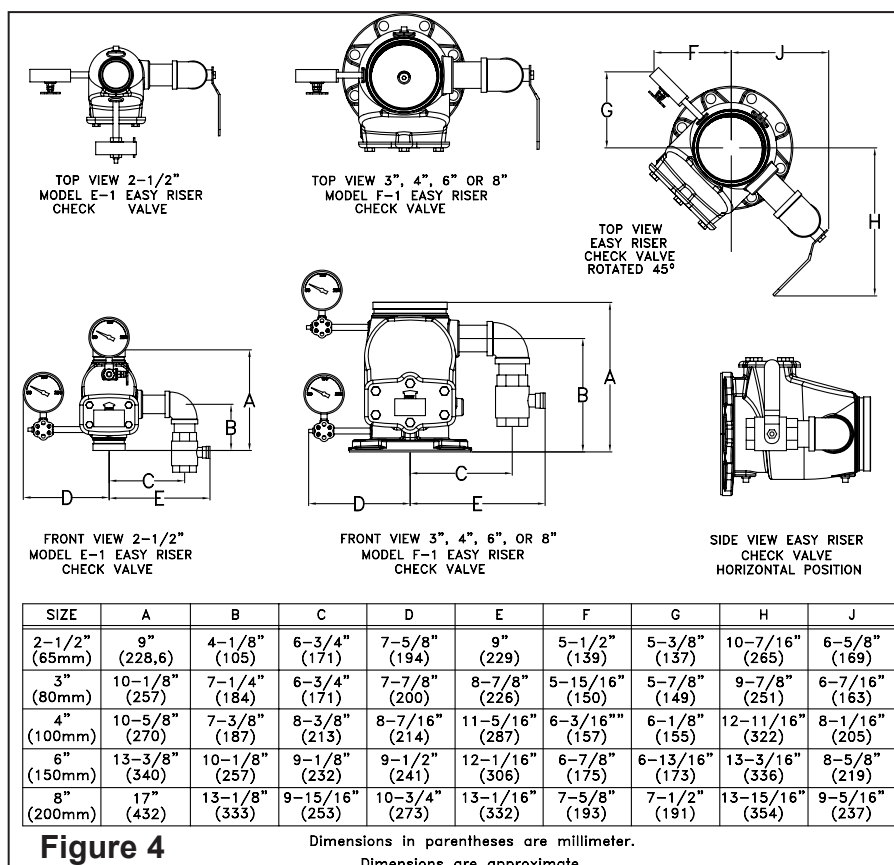


Figure 4

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Fig. 81 - Epoxy Copper Tec™ Tubing Clevis Hanger

Fig. 81PVC - PVC Coated Copper Tec™ Tubing Clevis Hanger

Size Range — Size 1/2" thru 6" copper tubing

Material — Carbon Steel

Function — Recommended for the suspension of non-insulated stationary copper tubing line.

Approvals — Conforms to Federal Specification WW-H-171E, Type 12 and Manufacturers Standardization Society SP-69 Type 1.

Finish — Epoxy Copper Tec™ Plated

Note — Available with plastic coating, specify by ordering Fig. 81PVC

Order By — Figure number and nominal tubing size

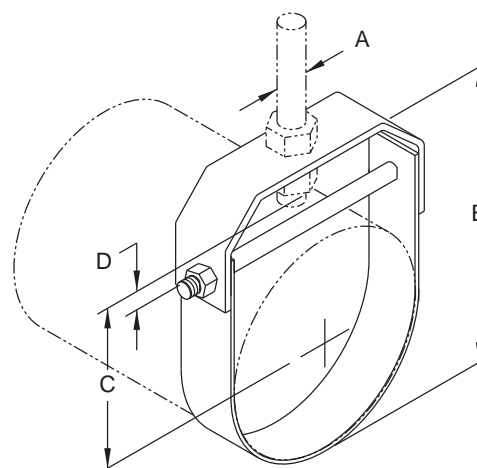


Fig. 81

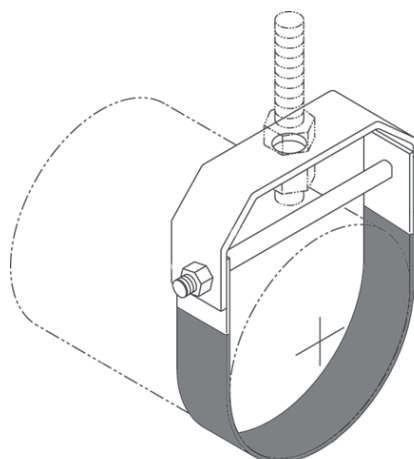


Fig. 81PVC

Dimensions • Weights

| Copper Tube Size | A | B | C | D | Max. Rec. Load Lbs. | Approx. Wt./100 |
|------------------|-----|--------|---------|---------|---------------------|-----------------|
| 1/2 | 3/8 | 2 5/8 | 1 11/16 | 5/8 | 150 | 27 |
| 3/4 | 3/8 | 2 5/8 | 1 11/16 | 5/8 | 250 | 29 |
| 1 | 3/8 | 2 7/8 | 1 13/16 | 3/4 | 250 | 32 |
| 1 1/4 | 3/8 | 3 | 1 7/8 | 13/16 | 250 | 34 |
| 1 1/2 | 3/8 | 3 5/8 | 2 5/16 | 1 1/16 | 250 | 36 |
| 2 | 3/8 | 4 1/2 | 3 | 1 5/8 | 250 | 44 |
| 2 1/2 | 1/2 | 6 | 3 1/4 | 2 1/8 | 350 | 96 |
| 3 | 1/2 | 6 1/8 | 3 7/8 | 2 | 350 | 105 |
| 3 1/2 | 1/2 | 6 5/8 | 4 1/4 | 1 13/16 | 350 | 110 |
| 4 | 1/2 | 7 1/16 | 4 3/8 | 1 9/16 | 400 | 151 |
| 5 | 1/2 | 8 1/2 | 5 5/16 | 1 7/8 | 550 | 220 |
| 6 | 5/8 | 9 3/4 | 5 9/16 | 1 11/16 | 550 | 265 |

Fig. 20 - Standard Pipe Strap

Fig. 20S - Flush Mount Pipe Strap

Size Range — 1/2" thru 8" pipe

Material — Carbon Steel

Function — Recommended for supporting pipe with fittings vertically or horizontally to walls or ceiling. Fig. 20S will support pipe flush with mounting surface.

Approvals — Conforms to Federal Specification WW-H-171E, Type 26 and Manufacturers Standardization Society SP-69, Type 26.

Finish — Plain

Note — Available in Electro-Galvanized and HDG finish or Stainless Steel materials.

Order By — Figure number, pipe size, material and finish

Data Table for Fig. 20S

| Dimensions • Weights | | | | | | | |
|----------------------|---------|--------|--------|--------|-----------|---------------------|-----------------|
| Pipe Sizes | A | B | C | D | Hole Size | Max. Rec. Load Lbs. | Approx. Wt./100 |
| 1/2 | 4 1/8 | 5/16 | 2 7/8 | 3/4 | 7/16 | 410 | 21 |
| 3/4 | 4 5/16 | 7/16 | 3 | 15/16 | 7/16 | 410 | 24 |
| 1 | 4 9/16 | 9/16 | 3 3/8 | 1 1/8 | 7/16 | 410 | 26 |
| 1 1/4 | 4 15/16 | 1 1/16 | 3 3/4 | 1 1/2 | 7/16 | 410 | 30 |
| 1 1/2 | 5 3/16 | 1 3/16 | 4 1/4 | 1 5/8 | 7/16 | 410 | 33 |
| 2 | 5 3/4 | 1 1/2 | 4 3/4 | 2 1/4 | 7/16 | 410 | 38 |
| 2 1/2 | 6 1/4 | 1 9/16 | 5 1/4 | 2 3/4 | 7/16 | 610 | 102 |
| 3 | 6 7/8 | 1 5/8 | 5 7/8 | 3 3/8 | 7/16 | 610 | 118 |
| 3 1/2 | 7 3/8 | 1 7/8 | 6 3/8 | 3 7/8 | 7/16 | 610 | 130 |
| 4 | 8 3/8 | 2 1/8 | 7 | 4 3/8 | 9/16 | 725 | 159 |
| 5 | 9 7/16 | 2 5/8 | 7 7/8 | 5 3/8 | 9/16 | 725 | 191 |
| 6 | 10 1/2 | 3 3/16 | 8 7/8 | 6 7/16 | 9/16 | 725 | 234 |
| 8 | 14 | 4 1/4 | 11 1/2 | 8 3/8 | 1 1/16 | 900 | 446 |

Data Table for Fig. 20

| Dimensions • Weights | | | | | | | |
|----------------------|---------|---------|--------|---------|-----------|---------------------|-----------------|
| Pipe Sizes | A | B | C | D | Hole Size | Max. Rec. Load Lbs. | Approx. Wt./100 |
| 1/2 | 3 7/8 | 3/4 | 3 1/16 | 15/32 | 7/16 | 410 | 16 |
| 3/4 | 4 | 13/16 | 3 1/8 | 1 5/16 | 7/16 | 410 | 21 |
| 1 | 4 9/16 | 7/8 | 3 3/8 | 1 1/2 | 7/16 | 410 | 26 |
| 1 1/4 | 4 15/16 | 1 | 3 3/4 | 1 7/8 | 7/16 | 410 | 30 |
| 1 1/2 | 5 3/16 | 1 3/16 | 4 1/4 | 2 1/8 | 7/16 | 410 | 33 |
| 2 | 5 3/4 | 1 7/16 | 4 3/4 | 2 5/8 | 7/16 | 410 | 38 |
| 2 1/2 | 6 1/4 | 1 11/16 | 5 1/4 | 3 1/8 | 7/16 | 610 | 102 |
| 3 | 6 7/8 | 2 | 5 7/8 | 3 3/4 | 7/16 | 610 | 118 |
| 3 1/2 | 7 3/8 | 2 1/4 | 6 3/8 | 4 1/4 | 7/16 | 610 | 130 |
| 4 | 8 3/8 | 2 1/2 | 7 | 4 3/4 | 9/16 | 725 | 159 |
| 5 | 9 7/16 | 3 1/16 | 7 7/8 | 5 13/16 | 9/16 | 725 | 191 |
| 6 | 10 1/2 | 3 5/8 | 8 7/8 | 6 7/8 | 9/16 | 725 | 234 |
| 8 | 14 | 4 5/8 | 11 1/2 | 9 | 1 1/16 | 900 | 446 |

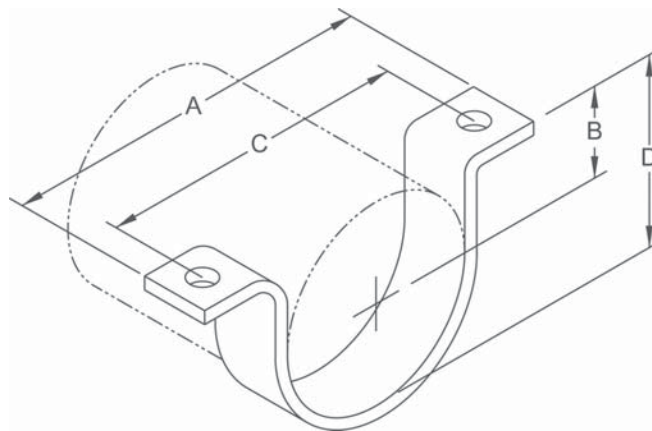


FIG. 21 - "Tin Strap"

Size Range — 1/2" thru 2" pipe

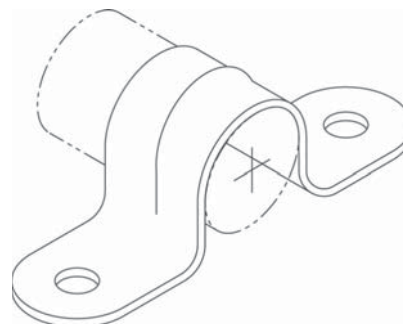
Material — Pre-Galvanized Steel

Function — Light duty strap that attaches pipe or copper tubing to horizontal or vertical structure.

Finish — Pre-Galvanized

Note — Available with felt lining, order TOLCO® Fig. 21F.

Order By — Figure number and pipe size



Appendix F – Inspection, Testing, and Maintenance

Table 5.1.1.2 Summary of Sprinkler System Inspection, Testing, and Maintenance

| Item | Frequency | Reference |
|--|---|---------------------------|
| Inspection | | |
| Gauges (dry, preaction, and deluge systems) | Weekly/quarterly | 5.2.4.2, 5.2.4.3, 5.2.4.4 |
| Control valves | | Table 13.1.1.2 |
| Waterflow alarm devices | Quarterly | 5.2.5 |
| Valve supervisory signal devices | Quarterly | 5.2.5 |
| Supervisory signal devices (except valve supervisory switches) | Quarterly | 5.2.5 |
| Gauges (wet pipe systems) | Quarterly | 5.2.4.1 |
| Hydraulic nameplate | Quarterly | 5.2.6 |
| Buildings | Annually (prior to freezing weather) | 4.1.1.1 |
| Hanger/seismic bracing | Annually | 5.2.3 |
| Pipe and fittings | Annually | 5.2.2 |
| Sprinklers | Annually | 5.2.1 |
| Spare sprinklers | Annually | 5.2.1.4 |
| Information sign | Annually | 5.2.8 |
| Fire department connections | | Table 13.1.1.2 |
| Valves (all types) | | Table 13.1.1.2 |
| Obstruction, internal inspection of piping | 5 years | 14.2 |
| Heat trace | Per manufacturer's requirements | 5.2.7 |
| Test | | |
| Waterflow alarm devices | | |
| Mechanical devices | Quarterly | 5.3.3.1 |
| Vane and pressure switch-type devices | Semiannually | 5.3.3.2 |
| Valve supervisory signal devices | | Table 13.1.1.2 |
| Supervisory signal devices (except valve supervisory switches) | | Table 13.1.1.2 |
| Main drain | | Table 13.1.1.2 |
| Antifreeze solution | Annually | 5.3.4 |
| Gauges | 5 years | 5.3.2 |
| Sprinklers (extra-high or greater temperature solder type) | 5 years | 5.3.1.1.1.4 |
| Sprinklers (fast-response) | At 20 years and every 10 years thereafter | 5.3.1.1.1.3 |
| Sprinklers | At 50 years and every 10 years thereafter | 5.3.1.1.1 |
| Sprinklers | At 75 years and every 5 years thereafter | 5.3.1.1.1.5 |
| Sprinklers (dry) | At 10 years and every 10 years thereafter | 5.3.1.1.1.6 |
| Sprinklers (in harsh environments) | 5 years | 5.3.1.1.2 |
| Valves (all types) | | Table 13.1.1.2 |
| Valve status test | | 13.3.1.2.1 |
| Maintenance | | |
| Valves (all types) | | Table 13.1.1.2 |
| Low-point drains (dry pipe system) | | 13.4.4.3.2 |
| Sprinklers and automatic spray nozzles protecting commercial cooking equipment and ventilation systems | Annually | 5.4.1.9 |
| Investigation | | |
| Obstruction | | 14.3 |



Chapter 6 Standpipe and Hose Systems

6.1 General.

6.1.1 Minimum Requirements.

6.1.1.1 This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of standpipe and hose systems.

6.1.1.2 Table 6.1.1.2 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

6.1.2 Table 6.1.2 shall be used for the inspection, testing, and maintenance of all classes of standpipe and hose systems.

6.1.3 Checkpoints and corrective actions outlined in Table 6.1.2 shall be followed to determine that components are free of corrosion, foreign material, physical damage, tampering, or other conditions that adversely affect system operation.

6.1.4 Valves and fire department connections shall be inspected, tested, and maintained in accordance with Chapter 13.

6.1.5 The procedures outlined in Chapter 14 shall be followed where there is a need to conduct an obstruction investigation.

6.1.6 Where the inspection, testing, and maintenance of standpipe and hose systems results or involves a system that is out of service, the impairment procedures outlined in Chapter 15 shall be followed.

6.1.7 Where approved by the authority having jurisdiction, existing hose shall be permitted to be removed and shall not be recorded as a deficiency.

6.2 Inspection.

6.2.1 Components. Components of standpipe and hose systems shall be visually inspected annually or as specified in Table 6.1.1.2.

6.2.2 Gauges.

6.2.2.1 Gauges on automatic wet and semiautomatic dry standpipe systems shall be inspected quarterly to ensure that they are in good condition and that normal water supply pressure is being maintained.

Table 6.1.1.2 Summary of Standpipe and Hose Systems Inspection, Testing, and Maintenance

| Item | Frequency | Reference |
|--|-----------------------------|------------------|
| Inspection | | |
| Control valves | | Table 13.1.1.2 |
| Pressure-regulating devices | | Table 13.1.1.2 |
| Piping | Annually | 6.2.1 |
| Hose connections | | Table 13.1.1.2 } |
| Cabinet | Annually | NFPA 1962 |
| Gauges | Weekly/quarterly | 6.2.2 |
| Hose | Annually | NFPA 1962 |
| Hose storage device | Annually | NFPA 1962 |
| Hose nozzle | Annually and after each use | NFPA 1962 |
| Hydraulic design information sign | Annually | 6.2.3 |
| Hose valves | | Table 13.1.1.2 |
| Hose connection | | Table 13.1.1.2 |
| Test | | |
| Waterflow alarm devices | | Table 13.1.1.2 |
| Valve supervisory devices | | Table 13.1.1.2 |
| Supervisory signal devices (except valve supervisory switches) | | Table 13.1.1.2 |
| Hose storage device | Annually | NFPA 1962 |
| Hose | 5 years/3 years | NFPA 1962 |
| Pressure control valve | | Table 13.1.1.2 |
| Pressure-reducing valve | | Table 13.1.1.2 |
| Hydrostatic test | 5 years | 6.3.2 |
| Flow test | 5 years | 6.3.1 |
| Main drain test | | Table 13.1.1.2 |
| Hose valves | | Table 13.1.1.2 |
| Hose connections | | Table 13.1.1.2 |
| Valve status test | | 13.3.1.2.1 |
| Maintenance | | |
| Hose connections | Annually | Table 6.1.2 |
| Valves (all types) | Annually/as needed | Table 13.1.1.2 |
| Hose valves | | Table 13.1.1.2 |

Table 7.1.1.2 Summary of Private Fire Service Main Inspection, Testing, and Maintenance

| Item | Frequency | Reference |
|--|--|------------|
| Inspection | | |
| Hose houses | Quarterly | 7.2.2.7 |
| Hydrants (dry barrel and wall) | Annually and after each operation | 7.2.2.4 |
| Monitor nozzles | Semiannually | 7.2.2.6 |
| Hydrants (wet barrel) | Annually and after each operation | 7.2.2.5 |
| Mainline strainers | Annually and after each significant flow | 7.2.2.3 |
| Piping (exposed) | Annually | 7.2.2.1 |
| Piping (underground) | See 7.2.2.2 | 7.2.2.2 |
| Test | | |
| Monitor nozzles | Flow, annually (range and operation) | 7.3.3 |
| Hydrants | Flow, annually | 7.3.2 |
| Piping (exposed and underground) (flow test) | 5 years | 7.3.1 |
| Valve status test | | 13.3.1.2.1 |
| Maintenance | | |
| Mainline strainers | Annually and after each operation | 7.2.2.3 |
| Hose houses | Annually | 7.2.2.7 |
| Hydrants | Annually | 7.4.2 |
| Monitor nozzles | Annually | 7.4.3 |

7.1.4 Fire Hose. Fire hose shall be maintained in accordance with NFPA 1962, *Standard for the Care, Use, Inspection, Service Testing, and Replacement of Fire Hose, Couplings, Nozzles, and Fire Hose Appliances*.

7.1.5 Impairments. The procedures outlined in Chapter 15 shall be followed wherever such an impairment to protection occurs.

7.2 Inspection and Corrective Action.

7.2.1 General. Private fire service mains and their appurtenances shall be inspected at the intervals specified in Table 7.1.1.2.

7.2.2* Procedures. All procedures shall be carried out in accordance with the manufacturer's instructions, where applicable.

7.2.2.1 Exposed Piping.

7.2.2.1.1 Exposed piping shall be inspected annually.

7.2.2.1.2 Piping shall be inspected, and the necessary corrective action shall be taken as specified in Table 7.2.2.1.2.

Table 7.2.2.1.2 Exposed Piping

| Condition | Corrective Action |
|-------------------|---|
| Leaks | Repair |
| Physical damage | Repair or replace |
| Corrosion | Clean or replace and coat with corrosion protection |
| Restraint methods | Repair or replace |

7.2.2.1.3 Piping installed in areas that are inaccessible for safety considerations due to process operations shall be inspected during each scheduled shutdown.

7.2.2.2* Underground Piping.

7.2.2.3* Mainline Strainers. Mainline strainers shall be inspected and cleaned after each system flow exceeding that of a nominal 2 in. (50 mm) orifice and shall be removed and inspected annually for failing, damaged, and corroded parts, with the necessary corrective action taken as specified in Table 7.2.2.3.

Table 7.2.2.3 Mainline Strainers

| Condition | Corrective Action |
|---------------------|-------------------|
| Plugging or fouling | Clean |
| Corrosion | Replace or repair |

7.2.2.4 Dry Barrel and Wall Hydrants. Dry barrel and wall hydrants shall be inspected annually and after each operation, with the necessary corrective action taken as specified in Table 7.2.2.4.

7.2.2.5 Wet Barrel Hydrants. Wet barrel hydrants shall be inspected annually and after each operation, with the necessary corrective action taken as specified in Table 7.2.2.5.

7.2.2.6 Monitor Nozzles. Monitor nozzles shall be inspected semiannually, with the necessary corrective action taken as specified in Table 7.2.2.6.

7.2.2.7 Hose Houses. Hose houses shall be inspected quarterly, with the necessary corrective action taken as specified in Table 7.2.2.7.

7.3 Testing.

7.3.1* Underground and Exposed Piping Flow Tests. Underground and exposed piping serving hydrants shall be flow tested at minimum 5-year intervals.

Table 7.2.2.4 Dry Barrel and Wall Hydrants

| Condition | Corrective Action |
|---|---|
| Inaccessible | Make accessible |
| Barrel contains water or ice (presence of water or ice could indicate a faulty drain, a leaky hydrant valve, or high groundwater table) | Repair and drain; for high groundwater it could be necessary to plug the drain and pump out the barrel after each use |
| Improper drainage from barrel | Repair drain |
| Leaks in outlets or at top of hydrant | Repair or replace gaskets, packing, or parts as necessary |
| Cracks in hydrant barrel | Repair or replace |
| Tightness of outlet caps | Lubricate if necessary; tighten if necessary |
| Worn outlet threads | Repair or replace |
| Worn hydrant operating nut | Repair or replace |
| Availability of operating wrench | Make sure wrench is available |

Table 7.2.2.5 Wet Barrel Hydrants

| Condition | Corrective Action |
|---------------------------------------|---|
| Inaccessible | Make accessible |
| Leaks in outlets or at top of hydrant | Repair or replace gaskets, packing, or parts as necessary |
| Cracks in hydrant barrel | Repair or replace |
| Tightness of outlet caps | Lubricate if necessary; tighten if necessary |
| Worn outlet threads | Repair or replace |
| Worn hydrant operating nut | Repair or replace |
| Availability of operating wrench | Make sure wrench is available |

Table 7.2.2.6 Monitor Nozzles

| Condition | Corrective Action |
|-----------------|---|
| Leakage | Repair |
| Physical damage | Repair or replace |
| Corrosion | Clean or replace, and lubricate or protect as necessary |

Table 7.2.2.7 Hose Houses

| Condition | Corrective Action |
|-------------------|-------------------|
| Inaccessible | Make accessible |
| Physical damage | Repair or replace |
| Missing equipment | Replace equipment |

7.3.1.1 Any flow test results that indicate deterioration of available waterflow and pressure shall be investigated to the complete satisfaction of the authority having jurisdiction to ensure that the required flow and pressure are available for fire protection.

7.3.1.2 Where underground piping supplies individual fire sprinkler, standpipe, water spray, or foam-water sprinkler systems and there are no means to conduct full flow tests, tests generating the maximum available flows shall be permitted.

7.3.2 Hydrants. Hydrants shall be tested annually to ensure proper functioning.

7.3.2.1 Each hydrant shall be opened fully and water flowed until all foreign material has cleared.

7.3.2.2 Flow shall be maintained for not less than 1 minute.

7.3.2.3 After operation, dry barrel and wall hydrants shall be observed for proper drainage from the barrel.

7.3.2.4 Full drainage shall take no longer than 60 minutes.

7.3.2.5 Where soil conditions or other factors are such that the hydrant barrel does not drain within 60 minutes, or where the groundwater level is above that of the hydrant drain, the hydrant drain shall be plugged and the water in the barrel shall be pumped out.

7.3.2.6 Dry barrel hydrants that are located in areas subject to freezing weather and that have plugged drains shall be identified clearly as needing pumping after operation.

7.3.3 Monitor Nozzles.

7.3.3.1 Monitor nozzles that are mounted on hydrants shall be tested as specified in 7.3.2.

7.3.3.2 All monitor nozzles shall be oscillated and moved throughout their full range annually to ensure proper operability.

7.4 Maintenance.

7.4.1 General. All equipment shall be maintained in proper working condition, consistent with the manufacturer's recommendations.

7.4.2 Hydrants.

7.4.2.1 Hydrants shall be lubricated annually to ensure that all stems, caps, plugs, and threads are in proper operating condition.

7.4.2.2* Hydrants shall be kept free of snow, ice, or other materials and protected against mechanical damage so that free access is ensured.

7.4.3 Monitor Nozzles. Monitor nozzles shall be lubricated annually to ensure proper operating condition.

7.5 Component Action Requirements.

7.5.1 Whenever a component in a private fire service system is adjusted, repaired, reconditioned, or replaced, the action required in Table 7.5.1 shall be performed.

7.5.2 Where the original installation standard is different from the cited standard, the use of the appropriate installing standard shall be permitted.

7.5.3* Where a main drain is not provided, other equivalent means of flow testing shall be permitted.

7.5.4 The actions of 7.5.1 shall not require a design review, which is outside the scope of this standard.



Table 13.1.1.2 Summary of Valves, Valve Components, and Trim Inspection, Testing, and Maintenance

| Item | Frequency | Reference |
|---|------------------------|----------------------------|
| Inspection | | |
| <i>Control Valves</i> | | |
| Sealed | Weekly | 13.3.2.1 |
| Locked or electrically supervised | Monthly | 13.3.2.1.1 |
| <i>Valve Supervisory Signal Initiating Device</i> | Quarterly | 13.3.2.1.2 |
| <i>Alarm Valves</i> | | |
| Exterior | Monthly | 13.4.1.1 |
| Interior | 5 years | 13.4.1.2 |
| Strainers, filters, orifices | 5 years | 13.4.1.2 |
| <i>Check Valves</i> | | |
| Interior | 5 years | 13.4.2.1 |
| <i>Preaction/Deluge Valves</i> | | |
| Enclosure (during cold weather) | Daily/weekly | 13.4.3.1 |
| Exterior | Monthly | 13.4.3.1.6 |
| Interior | Annually/5 years | 13.4.3.1.7 |
| Strainers, filters, orifices | 5 years | 13.4.3.1.8 |
| <i>Dry Pipe Valves/ Quick-Opening Devices</i> | | |
| Gauges | Weekly/monthly | 13.4.4.1.2.4, 13.4.4.1.2.5 |
| Enclosure (during cold weather) | Daily/weekly | 13.4.4.1.1 |
| Exterior | Monthly | 13.4.4.1.4 |
| Interior | Annually | 13.4.4.1.5 |
| Strainers, filters, orifices | 5 years | 13.4.4.1.6 |
| <i>Pressure-Reducing and Relief Valves</i> | | |
| Sprinkler systems | Quarterly | 13.5.1.1 |
| Hose connections | Annually | 13.5.2.1 |
| Hose racks | Annually | 13.5.3.1 |
| Fire pumps | | |
| Casing relief valves | Weekly | 13.5.7.1, 13.5.7.1.1 |
| Pressure-relief valves | Weekly | 13.5.7.2, 13.5.7.2.1 |
| <i>Backflow Prevention Assemblies</i> | | |
| Reduced pressure | Weekly/monthly | 13.6.1 |
| Reduced-pressure detectors | Weekly/monthly | 13.6.1 |
| <i>Fire Department Connections</i> | Quarterly | 13.7.1 |
| Testing | | |
| <i>Main Drains</i> | Annually/quarterly | 13.2.5, 13.2.5.1, 13.3.3.4 |
| <i>Gauges</i> | 5 years | 13.2.7.2 |
| <i>Waterflow Alarms</i> | Quarterly/semiannually | 13.2.6 |
| <i>Control Valves</i> | | |
| Position | Annually | 13.3.3.1 |
| Operation | Annually | 13.3.3.1 |
| Supervisory | Semiannually | 13.3.3.5 |
| <i>Preaction/Deluge Valves</i> | | |
| Priming water | Quarterly | 13.4.3.2.1 |
| Low air pressure alarms | Quarterly/annually | 13.4.3.2.13, 13.4.3.2.14 |
| Full flow | Annually | 13.4.3.2.2 |
| Air leakage | 3 years | 13.4.3.2.6 |



Table 13.1.1.2 Continued

| Item | Frequency | Reference |
|---|-----------|--------------|
| <i>Dry Pipe Valves/ Quick-Opening Devices</i> | | |
| Air leakage | 3 years | 13.4.4.2.9 |
| Priming water | Quarterly | 13.4.4.2.1 |
| Low air pressure alarm | Quarterly | 13.4.4.2.6 |
| Quick-opening devices | Quarterly | 13.4.4.2.4 |
| Trip test | Annually | 13.4.4.2.2 |
| Full flow trip test | 3 years | 13.4.4.2.2.2 |
| <i>Pressure-Reducing and Relief Valves</i> | | |
| Sprinkler systems | 5 years | 13.5.1.2 |
| Circulation relief | Annually | 13.5.7.1.2 |
| Pressure relief valves | Annually | 13.5.7.2.2 |
| Hose connections | 5 years | 13.5.2.2 |
| Hose racks | 5 years | 13.5.3.2 |
| <i>Backflow Prevention Assemblies</i> | Annually | 13.6.2 |
| Maintenance | | |
| <i>Control Valves</i> | Annually | 13.3.4 |
| <i>Precision/Deluge Valves</i> | Annually | 13.4.3.3.2 |
| <i>Dry Pipe Valves/ Quick-Opening Devices</i> | Annually | 13.4.4.3 |

13.2 General Provisions.

13.2.1 The property owner or designated representative shall have manufacturers' literature available to provide specific instructions for inspecting, testing, and maintaining the valves and associated equipment.

13.2.2 All pertinent personnel, departments, authorities having jurisdiction, or agencies shall be notified that testing or maintenance of the valve and associated alarms is to be conducted.

13.2.3* All system valves shall be protected from physical damage and shall be accessible.

13.2.4 Before opening a test or drain valve, it shall be verified that adequate provisions have been made for drainage.

13.2.5* Main Drain Test. A main drain test shall be conducted annually for each water supply lead-in to a building water-based fire protection system to determine whether there has been a change in the condition of the water supply.

13.2.5.1 Where the lead-in to a building supplies a header or manifold serving multiple systems, a single main drain test shall be permitted.

13.2.5.2 In systems where the sole water supply is through a backflow preventer and/or pressure-reducing valves, the main drain test of at least one system downstream of the device shall be conducted on a quarterly basis.

13.2.5.3 When there is a 10 percent reduction in full flow pressure when compared to the original acceptance test or previously performed tests, the cause of the reduction shall be identified and corrected if necessary.

13.2.6 Alarm Devices.

13.2.6.1 Mechanical waterflow alarm devices, including but not limited to water motor gongs, shall be tested quarterly.

13.2.6.2 Vane-type and pressure switch-type waterflow devices shall be tested semiannually.

13.2.7 Gauges.

13.2.7.1 Gauges shall be inspected monthly to verify that they are in good condition and that normal pressure is being maintained.

13.2.7.1.1 Where other sections of this standard have different frequency requirements for specific gauges, those requirements shall be used.

13.2.7.2 Gauges shall be replaced every 5 years or tested every 5 years by comparison with a calibrated gauge.

13.2.7.3 Gauges not accurate to within 3 percent of the full scale shall be recalibrated or replaced.

13.2.8 Records. Records shall be maintained in accordance with Section 4.3.

13.3 Control Valves in Water-Based Fire Protection Systems.

13.3.1* Each control valve shall be identified and have a sign indicating the system or portion of the system it controls.

13.3.1.1 Systems that have more than one control valve that must be closed to work on a system shall have a sign on each affected valve referring to the existence and location of other valves.

13.3.1.2* When a normally open valve is closed, the procedures established in Chapter 15 shall be followed.

13.3.1.2.1 When the valve is returned to service, a valve status test (either main or sectional drain, as appropriate) shall be conducted to determine that the valve is not closed.

13.3.1.3 Each normally open valve shall be secured by means of a seal or a lock or shall be electrically supervised in accordance with the applicable NFPA standards.

Appendix G – Fire Alarm Drawings

1. ALL EQUIPMENT SHALL BE UL LISTED.
2. ALL WIRING SHALL BE IN ACCORDANCE WITH THE N.E.C. AND AUTHORITIES HAVING JURISDICTION.
3. ALL JUNCTION BOXES SHALL BE SIZED IN ACCORDANCE WITH THE N.E.C. AND SHALL HAVE THEIR COVERS PAINTED RED WHERE APPLICABLE.
4. ELECTRICAL CONTRACTOR SHALL FURNISH ACCESS PANELS TO AREAS THAT REQUIRE SERVING, TROUBLE SHOOTING, ETC.
5. DO NOT DEVIATE FROM CONDUIT RUNS AS SHOWN ON FLOOR PLANS WITHOUT PRIOR APPROVAL FROM SYSTEM SUPPLIER (DIVERSIFIED PROTECTION SYSTEMS, INC.). FACTORS SUCH AS EXCESSIVE VOLTAGE DROP, ADDITIONAL PARS, ENGINEERING, ETC., THAT ARE A RESULT OF CONDUIT RUN DEVIATIONS SHALL BE THE SOLE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.
6. ALL FAN DOWN DOWNS, DAMPER CLOSURES, AND ASSOCIATED MECHANICAL SYSTEMS FIRE ALARM INTERFACE SHALL BE BY MECHANICAL CONTRACTOR.
7. ALL 120VAC POWER REQUIREMENTS FOR THE FIRE ALARM SYSTEM SHALL BE FURNISHED BY THE ELECTRICAL CONTRACTOR AND SHALL MEET ALL REQUIREMENTS OF THE AUTHORITIES HAVING JURISDICTION.
8. ALL THE FIRE ALARM DEVICES BACKGROUND CABINETS, GUTTERS, JUNCTION BOXES AND ASSOCIATED CONDUITS SHALL BE FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED. REFER TO FIRE ALARM SYMBOL LIST AND/OR MOUNTING DETAILS FOR ADDITIONAL INFORMATION. SYSTEM SUPPLIER PROVIDED BACKBOXES SHALL BE INSTALLED BY ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED.
9. ALL WIRING SHALL BE OUT FOR IN AND OUT. WIRING SHALL NOT BE LOOPED THROUGH DEVICES.
10. POINT AND COMMON ANNUNCIATION AND T-TAPPING ARE PROHIBITED. (T-TAPPING IS ALLOWABLE ON ADDRESSABLE STYLE 4 SLC LOOPS).
11. ALL CONDUITS ARE 3/4" UNLESS OTHERWISE NOTED.
12. ALL DEVICES IN THE ALARM SYSTEM SHALL BE COMPATIBLE AND INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
13. SYSTEM SHALL BE FURNISHED AND INSTALLED BY AN AUTHORIZED SIGNIFICANT DISTRIBUTOR.
14. FIRE ALARM SYSTEM INSTALLATION COMPANY SHALL BE UL LISTED (ULUS/ULXF).
15. TAMPER OR ALARM OF THE COVER OR OTHER APPROPRIATE MEANS SHALL BE PROVIDED ON ALL COVERS OF EXTERIOR ELECTRICAL JUNCTION BOXES IN LEU OF ELECTRICAL SUPERVISION OF THE COVERS, PER THE 2010 NFPA 72 23.8.5.11.1.
16. ELECTRICAL POWER SERVICE SHALL BE ON A DEDICATED BRANCH CIRCUIT(S). THE CIRCUIT(S) AND CONNECTIONS SHALL BE MECHANICALLY PROTECTED (CIRCUIT BREAKERS SHALL BE LOCKED IN THE ON POSITION WITH AN APPROVED MECHANICAL CLIP). CIRCUIT DISCONNECTING MEANS SHALL HAVE A RED MARKING, SHALL BE ACCESSIBLE ONLY TO AUTHORIZED PERSONNEL, AND SHALL BE IDENTIFIED AS "FIRE ALARM CIRCUIT". CIRCUIT IDENTIFICATION OF THE CIRCUIT IS CONNECTING MEANS SHALL BE PERMANENTLY IDENTIFIED AT THE FIRE ALARM JUNCTION UNIT. (NFPA 72, 210.5.5.2)
17. UPON COMPLETION OF ALL INSTALLATION AND TESTING, THE CONTRACTOR SHALL PROVIDE TO THE AUTHORITY HAVING JURISDICTION AND THE BUILDING OWNER A COMPLETED AND SIGNED NFPA 72 CERTIFICATE OF COMPLETION.
18. SECTION 17.1.11.1.3 OF THE 2010 EDITION OF NFPA 72 STATES THAT "WHERE DETECTION IS NOT REQUIRED DURING CONSTRUCTION, DETECTORS SHALL NOT BE INSTALLED UNTIL AFTER ALL OTHER CONSTRUCTION TRADES HAVE COMPLETED CLEANUP."
19. MASS' FIRE ALARM SECTION SHALL MEET THE INTELLIGIBILITY REQUIREMENTS OF UFC 4-620-01 SECTION 4-6.1.1.2.
20. ALL ELECTRICAL SERVICE FOR THE PANELS WILL BE SUPPLIED THROUGH A DEDICATED PANEL IN ACCORDANCE WITH UFC 3-620-01 SECTION 3-2.4.

CLASS A CIRCUITS/SURVIVABILITY PER NFPA 72 2010 EDITION

6.4.2.2.2 ALL TYPES OF CLASS A CIRCUITS USING PHYSICAL CONDUCTORS (E.G. METALLIC, OPTICAL FIBER) SHALL BE INSTALLED SUCH THAT THE OUTGOING AND RETURN CONDUCTORS, EXITING FROM AND RETURNING TO THE CONTROL UNIT, RESPECTIVELY, ARE ROUTED SEPARATELY. THE OUTGOING AND RETURN (REDUNDANT) CIRCUIT CONDUCTORS SHALL NOT BE RUN IN THE SAME CABLE ASSEMBLY (E.G. MULTI-CONDUCTOR CABLE), EITHER IN A RACEWAY.

EXCEPTION: THE OUTGOING AND RETURN (REDUNDANT) CIRCUIT CONDUCTORS SHALL BE PERMITTED TO BE RUN IN THE SAME CABLE ASSEMBLY, ENCLOSURE, OR RACEWAY UNDER ANY OF THE FOLLOWING CONDITIONS:

- (1) FOR A DISTANCE NOT TO EXCEED 30 (10 FT) WHERE THE OUTGOING AND RETURN CONDUCTORS ENTER OR EXIT THE INITIATING DEVICE, TO NOTIFICATION APPLIANCE, OR CONTROL UNIT COMPONENT.
- (2) SINGLE CONDUIT/RACEWAY DROPS TO INDIVIDUAL DEVICES OR APPLIANCES.
- (3) SINGLE CONDUIT/RACEWAY DROPS TO MULTIPLE DEVICES OR APPLIANCES INSTALLED WITHIN A SINGLE ROOM NOT EXCEEDING 92.9 M2 (1000 FT2) IN AREA.

6.4.2.2.2.2 A GOAL OF 6.4.2.2.2 IS TO ADEQUATELY SEPARATE THE OUTGOING AND RETURN CABLES. THIS SEPARATION IS REQUIRED TO HELP ENSURE PROTECTION OF THE CABLES FROM PHYSICAL DAMAGE. THE RECOMMENDED MINIMUM SEPARATION TO PREVENT PHYSICAL DAMAGE IS 305 MM (1FT) WHERE THE CABLE IS INSTALLED VERTICALLY AND 120MM (4FT) WHERE THE CABLE IS INSTALLED HORIZONTALLY.

6.9.4 SURVIVABILITY FROM ATTACK BY FIRE

6.9.4.1 SUBSECTION 6.9.4 SHALL APPLY ONLY TO SYSTEMS USED FOR PARTIAL EVACUATION OR RELOCATION OF OCCUPANTS. THE REQUIREMENTS OF 6.9.4 SHALL APPLY TO BOTH AREA (TONE AND VOICE) AND VISIBLE NOTIFICATION CIRCUITS.

6.9.4.2 SURVIVABLE FIRE ALARM SYSTEMS SHALL BE DESIGNED AND INSTALLED SUCH THAT ATTACK BY FIRE WITHIN AN EVACUATION SIGNALING ZONE SHALL NOT IMPAIR CONTROL AND OPERATION OF THE NOTIFICATION APPLIANCES OUTSIDE THE EVACUATION SIGNALING ZONE. PERFORMANCE FEATURES PROVIDED TO ASSURE SURVIVABILITY SHALL BE DESCRIBED AND TECHNICAL JUSTIFICATION PROVIDED IN THE DOCUMENTATION SUBMITTED TO THE AUTHORITY HAVING JURISDICTION WITHIN EACH JURISDICTION REQUIRED.

6.9.4.2.1 ONE OR MORE OF THE FOLLOWING MEANS MUST BE CONSIDERED ACCEPTABLE TO PROVIDE A LEVEL OF SURVIVABILITY CONSISTENT WITH THE INTENT OF THIS REQUIREMENT:

- (1) INSTALLING A FIRE ALARM SYSTEM IN A SPRINKLERED BUILDING
- (2) ROUTING NOTIFICATION APPLIANCE CIRCUITS SEPARATELY
- (3) USING SHORT-CIRCUIT FAULT TOLERANT SIGNALING LINE CIRCUITS FOR CONTROLLING EVACUATION SIGNALS

THE REQUIREMENT FOR NOTIFICATION APPLIANCES TO OPERATE IN THOSE EVACUATION SIGNALING ZONES THAT ARE NOT ATTACKED BY FIRE WILL ALSO REQUIRE THAT CIRCUITS AND EQUIPMENT THAT ARE COMMON TO MORE THAN ONE EVACUATION SIGNALING ZONE BE DESIGNED AND INSTALLED SUCH THAT THE FIRE WILL NOT DISRUBE THEM. FOR INSTANCE, A SIGNALING LINE CIRCUIT USED TO CONTROL NOTIFICATION APPLIANCE IN MULTIPLE EVACUATION SIGNALING ZONES SHOULD BE EQUIPPED WITH SHORT-CIRCUIT TOLERANT CENTRAL CIRCUIT EQUIPMENT, THE SIGNALING LINE CIRCUIT RENDERING THE NOTIFICATION APPLIANCES SERVING MORE THAN ONE EVACUATION SIGNALING ZONE INOPERATIVE. POWER SUPPLIES, INCLUDING REMOTE POWER SUPPLIES, SHOULD BE ADDRESSED AS PART OF THE DESIGN.

6.9.4.3 ALL CIRCUITS NECESSARY FOR THE OPERATION OF THE NOTIFICATION APPLIANCES SHALL BE PROTECTED UNTIL THEY ENTER THE EVACUATION SIGNALING ZONE THEY SERVE. ANY OF THE FOLLOWING METHODS SHALL BE CONSIDERED ACCEPTABLE AS MEETING THE REQUIREMENTS OF THIS SUBSECTION:

- (1) A 2-HOUR RATED CABLE OR CABLE SYSTEM
- (2) A 2-HOUR ENCASED CABLE
- (3) PERFORMANCE ALTERNATIVES APPROVED BY THE AUTHORITY HAVING JURISDICTION

6.9.4.3(3) PERFORMANCE 6.9.4.3 REQUIRES THE PROTECTION OF CIRCUITS AS THEY PASS THROUGH FIRE AREAS OTHER THAN THE ONE SERVED. THIS IS TO INCREASE THE LIKELIHOOD THAT CIRCUITS SERVING AREAS REMOTE FROM THE ORIGINAL FIRE WILL HAVE THE OPPORTUNITY TO BE ACTIVATED AND SERVE THEIR PURPOSE. NOTE THAT THE PROTECTION REQUIREMENT WOULD ALSO APPLY TO SIGNALING LINE CIRCUIT THAT EXTENDS FROM A MASTER FIRE ALARM CONTROL UNIT TO ANOTHER FIRE ALARM CONTROL UNIT WHERE NOTIFICATION APPLIANCE CIRCUITS MUST ORIGINATE.

6.9.4.3(4) THE FIRE PROTECTION REQUIREMENT DOES NOT APPLY TO CENTRAL CIRCUIT EQUIPMENT, THE INTERCONNECTING WIRING SHALL BE INSTALLED WITH RESISTANCE TO ATTACK FROM A FIRE USING ONE OF THE FOLLOWING METHODS:

- (1) A 2-HOUR RATED CABLE OR CABLE SYSTEM
- (2) A 2-HOUR ENCASED CABLE
- (3) PERFORMANCE ALTERNATIVES APPROVED BY THE AUTHORITY HAVING JURISDICTION

EXCEPTION: BUILDINGS PROTECTED BY AN AUTOMATIC SPRINKLER SYSTEM INSTALLED PER NFPA 13, STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS, AND THE INTERCONNECTING CABLES BETWEEN THE FIRE COMMAND CENTER AND THE STANDARD IN METAL RACEWAY.

NAVFAC FIRE VARIANCE: CONTRACTOR SHALL PROVIDE CLASS A WIRING FOR THE FIRE ALARM SYSTEM NOTIFICATION APPLIANCE CIRCUITS AS IDENTIFIED IN PART 3 SECTION 6 ESR 040 OF THE RFP FOR THIS PROJECT. IN ACCORDANCE WITH NFPA 72 THE TWO RACEWAYS SHALL BE SEPARATED EACH OTHER BY AT LEAST 12 INCHES FOR VERTICAL CONDUIT INSTALLATIONS, BASED ON A SITE VISIT TO 8320 THIS AFTERNOON THESE SEPARATION DISTANCES SHOULD NOT BE AN ISSUE FOR CONDUITS ON FLOORS 2-4, BUT THE 48-INCH SEPARATION WILL BE DIFFICULT TO ACCOMPLISH ON THE GROUND FLOOR DUE TO EXISTING MECHANICAL AND ELECTRICAL UTILITIES ABOVE THE GROUND FLOOR. THE ASSUMPTION IS THAT THE CONTRACTOR SHALL PROVIDE CLASS A WIRING AND PROVIDE 48 INCHES OF SEPARATION WHERE SPACE IS AVAILABLE, BUT NOT LESS THAN 36 INCHES WHERE SPACE IS NOT AVAILABLE. ALSO, THE CONTRACTOR IS PERMITTED TO USE UP TO 5 FEET OF FLEXIBLE METALLIC CONDUIT FROM THE CORRIDOR JUNCTION BOXES TO NOTIFICATION APPLIANCES INSIDE THE ROOMS. THE CONTRACTOR STATED THAT THE 36 INCHES OF SEPARATION AND THE USE OF FLEXIBLE METAL CONDUIT SHOULD BE SUFFICIENT TO HELP THEM MEET THE CLASS A WIRING REQUIREMENT. THE FINAL NAVFAC FIRE INSPECTION OF THE NEW FIRE ALARM SYSTEM WILL DETERMINE IF THE CONTRACTOR COMPLIED WITH THE CONDITIONS DISCUSSED DURING TODAY'S SITE VISIT AND IDENTIFIED IN THIS RFI RESPONSE.

| | |
|--|---|
| 1. IBC | INTERNATIONAL BUILDING CODE, 2012 |
| 2. UFC 3-600-01 | FIRE PROTECTION ENGINEERING FOR FACILITIES, CHANGE 3 MARCH 2013 |
| 3. UFC 3-600-10N | FIRE PROTECTION ENGINEERING (FINAL DRAFT), AUGUST 2007 |
| 4. UFC 4-021-01 | DESIGN AND CONSTRUCTION NOTIFICATION SYSTEMS, 9 APRIL 2008 |
| 5. NFPA 70 | NATIONAL ELECTRICAL CODE. (2011 EDITION) |
| 6. NFPA 72 | NATIONAL FIRE ALARM CODE. (2013 EDITION) |
| 7. NFPA 101 | LIFE SAFETY CODE. (2012 EDITION) |
| 8. RFP | REQUEST FOR PROPOSAL AND AMENDMENTS |
| 9. THE SYSTEM SHALL BE DESIGNED AND INSTALLED IN ACCORDANCE WITH U.L. AND NFPA GUIDELINES, THE EQUIPMENT MANUFACTURER, AND OTHER APPLICABLE STANDARDS AS ADOPTED BY THE AUTHORITY HAVING JURISDICTION. | |

ALL BUILDINGS ARE THE SAME AMOUNT OF STORIED, HAVE THE SAME SQUARE FOOTAGE AND OCCUPANCY. THE BELOW BUILDING INFORMATION HOLDS TRUE FOR ALL THREE BUILDINGS:

| | |
|----------------------------|--|
| BUILDING CONSTRUCTION TYPE | TYPE V-B (IBC 602.2) |
| OCCUPANCY CLASSIFICATION | RESIDENTIAL R-2 (310.4) |
| TOTAL BUILDING HEIGHT | 3 STORY / 40 FT MAXIMUM |
| AREA OF BUILDING | 38,574 SQ. FT. 1st Floor 37,029 SQ. FT. 2nd Floor 37,778 SQ. FT. 3rd Floor |
| FIRE PROTECTION | FULLY SPRINKLERED |

N3 EMERGENCY RESPONSE MANAGEMENT NRSW
PRIMARY PHONE LINE: XXX-XXX-XXXX
SECONDARY PHONE LINE: XXX-XXX-XXX

THE EXISTING FIRE ALARM SYSTEM WHICH INCLUDING SINGLE STATION 120VAC SMOKE DETECTORS IN EACH ROOM, PULL STATIONS, SMOKE DETECTORS, CONDUIT, CONDUCTORS, AND PANELS WILL BE DEMOLISHED AND REMOVED

A NEW FIRE ALARM/MASS NOTIFICATION AND DETECTION SYSTEM WILL BE PROVIDED FOR THE BUILDING/COMPLEX. THE SYSTEM WILL INCLUDE MANUAL PULL STATIONS AT BUILDING EXITS, SPRINKLER WATER FLOW AND TAMPER SWITCHES, AND AUTOMATIC ADDRESSABLE SMOKE DETECTORS (PHOTO-ELECTRIC DETECTORS) IN ELEVATORS BASED ON THE FOLLOWING:

THE SMOKE DETECTORS LOCATED IN THE LIVING QUARTERS WILL SOUND A LOCAL ALARM ONLY THROUGH THE USE OF SMOKE DETECTOR SOUNDER BELLERS, AND WILL SEND A SUPERVENSORY SIGNAL TO THE BUILDING FIRE ALARM CONTROL PANEL. THESE DETECTORS WILL NOT INITIATE A TOTAL BUILDING ALARM. AUDIBLE AND VISUAL NOTIFICATION APPLIANCES (INCLUDING TEXTUAL SIGNS) WILL BE PROVIDED THROUGHOUT THE PUBLIC AREAS OF THE FACILITY IN ACCORDANCE WITH THE REQUIREMENTS OF THE UFC AND NFPA 72. F.A./M.S. SPEAKERS WILL BE PROVIDED IN ALL LIVING QUARTERS.

THE MNS AND FIRE ALARM STROBES WILL BE SYNCHRONIZED.

THE EXISTING FIRE ALARM SYSTEM WILL UTILIZE CLASS B WIRING FOR INITIATING DEVICE CIRCUITS AND SIGNALING DEVICE CIRCUITS. THE FIRE ALARM SYSTEM WILL UTILIZE CLASS A WIRING FOR NOTIFICATION APPLIANCE CIRCUITS.

THE FIRE ALARM CONTROL PANEL (FACP) WILL BE LOCATED IN THE MAIN LOBBY ON THE QUARTER DECK. THE FIRE ALARM SYSTEM IN THE BUILDING WILL BE ARRANGED TO TRANSMIT SIGNALS TO THE EXISTING BASE WIDE FIRE ALARM REPORTING SYSTEM (BOSCH D6600 DACTR) VIA DACT RECEIVER.

FIRE ALARM CONDUIT AND JUNCTION BOXES WILL BE PAINTED AND MARKED IN ACCORDANCE WITH U.S. 3-600-10N

A MASS NOTIFICATION TRANSCEIVER (MNT) IN A MINIMUM 18X10X10 ENCLOSURE WITH ALUMINUM BACK PLATE TO WHICH THE MNT IS MOUNTED WILL BE PROVIDED ADJACENT TO THE FIRE ALARM / MASS NOTIFICATION PANEL. THE MNT WILL BE COMPATIBLE WITH THE FIRE ALARM / MASS NOTIFICATION PANEL AND THE EXISTING WAYS BASED MASS NOTIFICATION SYSTEM MANUFACTURED BY MADAOHOM. IT SHOULD BE NOTED THAT MADAOHOM HAS BEEN PURCHASED BY COOPER NOTIFICATION. THE MNT WILL BE PRE-PROGRAMMED FOR CONNECTION TO THE BASE-WIDE MASS NOTIFICATION SYSTEM.

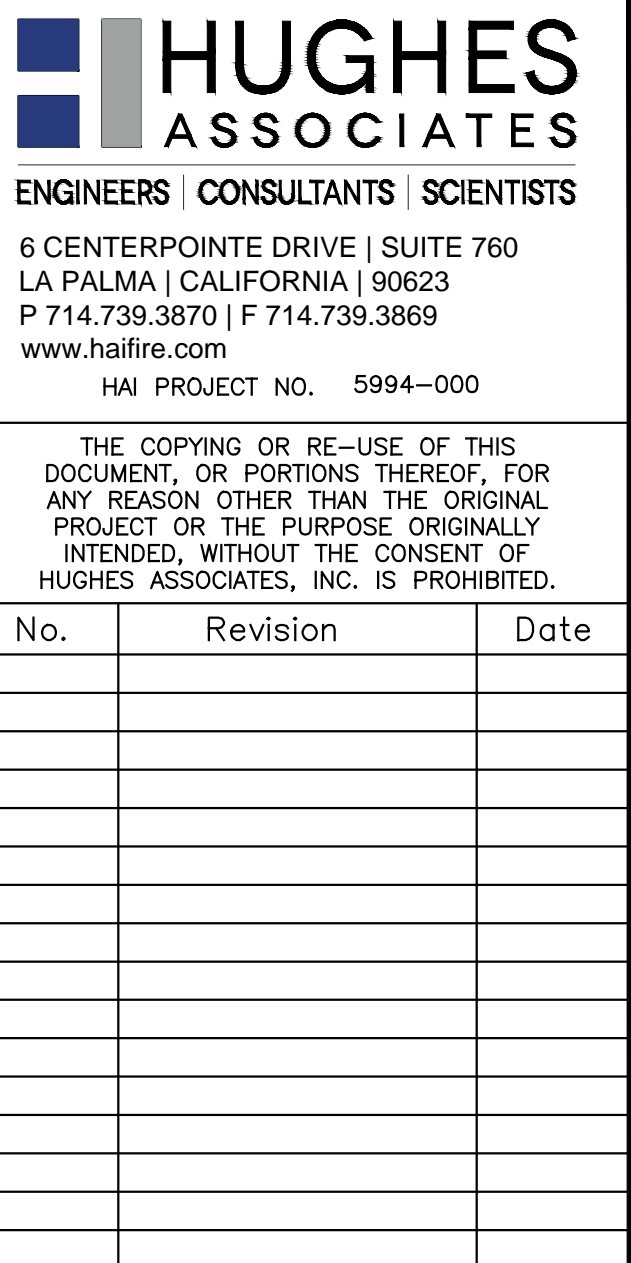
ALL MATERIALS AND LABOR NECESSARY TO INTERFACE THE BUILDING MNS WITH THE EXISTING WIDE AREA MNS SYSTEM, INCLUDING THE TRANSDUCER, ANTENNA, AND INTERCONNECTIONS WILL BE PROVIDED AND INSTALLED IN ACCORDANCE WITH THE DIRECTION GIVEN IN THE RESPONSE TO RFI 0010.

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|------|--|
| AFI | = ABOVE FINISHED FLOOR |
| AHJ | = AUTHORITY HAVING JURISDICTION |
| AL | = ALARM |
| APPX | = APPROXIMATELY |
| AWG | = AMERICAN WIRE GAUGE |
| BLDG | = BUILDING |
| CALC | = CALCULATION(S) |
| CD | = CANDLE |
| EMT | = ELECTRICAL METALLIC TUBING |
| F | = END OF LINE RESISTOR |
| FI | = FIRE ALARM |
| FACP | = BUILDING FIRE ALARM CONTROL PANEL |
| FATC | = FIRE ALARM TERMINAL CABINET |
| FBIO | = FURNISHED BY OTHERS |
| GA | = GAS ALARM |
| NAC | = NOTIFICATION APPLIANCE CIRCUIT |
| QTY | = QUANTITY |
| SLC | = FIRE ALARM LINE CIRCUIT (ADDRESSABLE LOOP) |
| SUPV | = SUPERVISORY |
| TEMP | = TEMPERATURE |
| TRBL | = TROUBLE |
| TY | = TYPICAL |
| UNO | = UNLESS OTHERWISE NOTED |
| VL | = VERIFY LOCATION (IN FIELD) |
| WP | = WEATHERPROOF |

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|--------|---|
| FA02.1 | SYSTEM NOTES, INFORMATION, AND BILL OF MATERIALS |
| FA02.2 | FIRE ALARM SYSTEM SEQUENCE OF OPERATIONS |
| FA02.3 | BUILDING 320 – FIRE ALARM SYSTEM CALCULATIONS AND RISER DIAGRAM |
| FA02.4 | BUILDING 321 – FIRE ALARM SYSTEM CALCULATIONS AND RISER DIAGRAM |
| FA02.5 | BUILDING 322 – FIRE ALARM SYSTEM CALCULATIONS AND RISER DIAGRAM |
| FA02.6 | BUILDING 323 – FIRE ALARM SYSTEM CALCULATIONS AND RISER DIAGRAM |
| FA01.0 | BUILDING 320 – ALARM SYSTEM FLOOR PLANS – BUILDING OVERVIEW |
| FA01.1 | BUILDING 320 – ALARM SYSTEM FLOOR PLANS – 1ST FLOOR |
| FA01.2 | BUILDING 320 – ALARM SYSTEM FLOOR PLANS – 2ND FLOOR |
| FA01.3 | BUILDING 320 – ALARM SYSTEM FLOOR PLANS – 3RD FLOOR |
| FA01.4 | BUILDING 320 – ALARM SYSTEM FLOOR PLANS – 4TH FLOOR |
| FA01.5 | BUILDING 321 – ALARM SYSTEM FLOOR PLANS – BUILDING OVERVIEW |
| FA01.6 | BUILDING 321 – ALARM SYSTEM FLOOR PLANS – 1ST FLOOR |
| FA01.7 | BUILDING 321 – ALARM SYSTEM FLOOR PLANS – 2ND FLOOR |
| FA01.8 | BUILDING 321 – ALARM SYSTEM FLOOR PLANS – 3RD FLOOR |
| FA01.9 | BUILDING 321 – ALARM SYSTEM FLOOR PLANS – 4TH FLOOR |
| FA02.0 | BUILDING 322 – ALARM SYSTEM FLOOR PLANS – BUILDING OVERVIEW |
| FA02.1 | BUILDING 322 – ALARM SYSTEM FLOOR PLANS – 1ST FLOOR |
| FA02.2 | BUILDING 322 – ALARM SYSTEM FLOOR PLANS – 2ND FLOOR |
| FA02.3 | BUILDING 322 – ALARM SYSTEM FLOOR PLANS – 3RD FLOOR |
| FA02.4 | BUILDING 322 – ALARM SYSTEM FLOOR PLANS – 4TH FLOOR |
| FA02.5 | BUILDING 323 – ALARM SYSTEM FLOOR PLANS – BUILDING OVERVIEW |
| FA02.6 | BUILDING 323 – ALARM SYSTEM FLOOR PLANS – 1ST FLOOR |
| FA02.7 | BUILDING 323 – ALARM SYSTEM FLOOR PLANS – 2ND FLOOR |
| FA02.8 | BUILDING 323 – ALARM SYSTEM FLOOR PLANS – 3RD FLOOR |
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| FA03.0 | FIRE ALARM SYSTEM PANEL DETAIL |
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| FA03.2 | FIRE ALARM SYSTEM MESSAGE NOTIFICATION DETAILS |
| FA03.3 | FIRE ALARM SYSTEM DEVICE DETAILS AND MOUNTING ELEVATIONS |

| NUMBER | SYM | DESCRIPTION | QTY. | MANUFACTURER | PART NO. |
|--------|-------|---|------|--------------|-----------------|
| 1 | LTAP | CAB2-BB – Two Row Back Box, Black | 3 | SIEMENS | 500-63309 |
| 2 | | CAB2-BD – Two Row Inner & Outer Door Set, Black | 3 | SIEMENS | 500-633008 |
| 3 | | CAB2-TK – Two Row Trim Kit Cabinet, Black | 3 | SIEMENS | 500-633014 |
| 4 | | PMI – Person Machine Interface | 3 | SIEMENS | 500-033070 |
| 5 | | CC5 – Five Slot Card Cage | 6 | SIEMENS | 500-633037 |
| 6 | | DLC – Device Loop Card | 3 | SIEMENS | 500-033090 |
| 7 | | DAC-NET – Digital Audio Card | 3 | SIEMENS | 500-035100 |
| 8 | | NIC-C – Network Interface Card | 3 | SIEMENS | 500-033240 |
| 9 | | ZIC-4A – Four Circuit Zone Indicating Card | 3 | SIEMENS | 500-033050 |
| 10 | | ZAC-40 – Zone Amplifier Card 40W | 6 | SIEMENS | 500-035400 |
| 11 | | LVM – Live Voice Module | 6 | SIEMENS | 315-034090 |
| 12 | | IDMP – Inner-Door Enclosure Mounting Plate | 3 | SIEMENS | 500-633027 |
| 13 | | PSC-12 – Power Supply with Battery Charger | 3 | SIEMENS | 500-033340 |
| 14 | BATT | CAB-BATT – Field Enclosure for 100AH Batteries | 3 | SIEMENS | 500-633917 |
| 15 | | PS-121000 – Rechargeable Sealed Batteries | 6 | POWERSONIC | PS-121000 |
| 16 | LOC | REMBOX4 – Four Module Remote Lobby Enclosure | 3 | SIEMENS | 500-633914 |
| 17 | | SSD-C-REM – System Status Display w/Control | 3 | SIEMENS | 500-634773 |
| 18 | PS | PSN-106 10 Amp Auxiliary Power Supply | 12 | POTTER | PSN-106 |
| 19 | | PS-1270 – Rechargeable Sealed Batteries | 24 | POWERSONIC | PS-1270 |
| 20 | | 120V Surge Suppressor | 15 | DITEK | DTK-120S15A |
| 21 | | Mass Notification Controller | 3 | L.E.D. | MNS-Cntr |
| 22 | LEDXT | Alphanumeric LED Display Sign | 27 | L.E.D. | LEDArray |
| 23 | Q | OP921 – Photo Smoke Detector | 253 | SIEMENS | SS4320-F4-A2 |
| 24 | Q | HI921 – Heat Detector | 3 | SIEMENS | SS4320-F5-A2 |
| 25 | | DB-11 – Detector Base | 45 | SIEMENS | 500-094151 |
| 26 | Q | ADB-11 – Audible Base for Photo Smoke Detector | 211 | SIEMENS | 500-033370 |
| 27 | IM | HTRI-S – Single Input Monitor Module | 1 | SIEMENS | 500-033370 |
| 28 | IM | HTRI-D – Dual Input Monitor Module | 24 | SIEMENS | 500-033360 |
| 29 | IM | HTRI-R – Single Input Module w/ Relay Output | 1 | SIEMENS | 500-033300 |
| 30 | IM | HCP – Intelligent Control Point Device | 12 | SIEMENS | 500-034860 |
| 31 | IM | HMS-D – Dual Action Manual Pull Station | 3 | SIEMENS | 500-033400 |
| 32 | EX | E90-W – Ceiling mount Speaker (White) | 190 | COOPER | E90-W |
| 33 | EX | E90-24MCC-FW – Ceiling mount Speaker/Strobe (White) | 100 | COOPER | E90-24MCC-FW |
| 34 | EX | RSS-24MCC-FW – Ceiling mount Strobe (White) | 12 | COOPER | RSS-24MCC-FW |
| 35 | WE | ET70WP-2475W-FR – Weatherproof Speaker/Strobe | 12 | COOPER | ET70WP-2475W-FR |
| 36 | WE | ET1010-R – Weatherproof Speaker | 15 | COOPER | ET1010-R |

| SHEET INDEX | |
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| NUMBER | TITLE |
| FA0.0 | FIRE ALARM NOTES AND DETAILS |
| FA0.1 | FIRE ALARM SEQUENCE OF OPERATIONS |
| FA0.2 | FIRE ALARM SINGLE LINE DIAGRAM AND CALCULATIONS |
| FA0.3 | FIRE ALARM DEVICE DETAILS & MOUNTING ELEVATIONS |
| FA0.4 | FIRE ALARM PANEL DETAILS |
| FA0.5 | FIRE ALARM LOC AND APS DETAIL |
| FA1.0 | AREA 1 FIRST FLOOR FIRE ALARM |
| FA1.1 | AREA 2 FIRST FLOOR FIRE ALARM |
| FA1.2 | AREA 3 FIRST FLOOR FIRE ALARM |
| FA2.0 | AREA 1 SECOND FLOOR FIRE ALARM |
| FA2.1 | AREA 2 SECOND FLOOR FIRE ALARM |
| FA2.2 | AREA 3 SECOND FLOOR FIRE ALARM |
| FA3.0 | AREA 1 THIRD FLOOR FIRE ALARM |
| FP3.1 | AREA 2 THIRD FLOOR FIRE ALARM |
| FA3.2 | AREA 3 THIRD FLOOR FIRE ALARM |



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the 1990s, the number of people in the United States who are 65 years of age or older has increased by 50 percent, and the number of people 75 years of age or older has increased by 100 percent. The number of people 85 years of age or older has increased by 200 percent. The number of people 95 years of age or older has increased by 400 percent. The number of people 100 years of age or older has increased by 1,000 percent. The number of people 105 years of age or older has increased by 2,000 percent. The number of people 110 years of age or older has increased by 4,000 percent. The number of people 115 years of age or older has increased by 8,000 percent. The number of people 120 years of age or older has increased by 16,000 percent. The number of people 125 years of age or older has increased by 32,000 percent. The number of people 130 years of age or older has increased by 64,000 percent. The number of people 135 years of age or older has increased by 128,000 percent. The number of people 140 years of age or older has increased by 256,000 percent. The number of people 145 years of age or older has increased by 512,000 percent. The number of people 150 years of age or older has increased by 1,024,000 percent. The number of people 155 years of age or older has increased by 2,048,000 percent. The number of people 160 years of age or older has increased by 4,096,000 percent. The number of people 165 years of age or older has increased by 8,192,000 percent. The number of people 170 years of age or older has increased by 16,384,000 percent. The number of people 175 years of age or older has increased by 32,768,000 percent. The number of people 180 years of age or older has increased by 65,536,000 percent. The number of people 185 years of age or older has increased by 131,072,000 percent. The number of people 190 years of age or older has increased by 262,144,000 percent. The number of people 195 years of age or older has increased by 524,288,000 percent. The number of people 200 years of age or older has increased by 1,048,576,000 percent. The number of people 205 years of age or older has increased by 2,097,152,000 percent. The number of people 210 years of age or older has increased by 4,194,304,000 percent. The number of people 215 years of age or older has increased by 8,388,608,000 percent. The number of people 220 years of age or older has increased by 16,777,216,000 percent. The number of people 225 years of age or older has increased by 33,554,432,000 percent. The number of people 230 years of age or older has increased by 67,108,864,000 percent. The number of people 235 years of age or older has increased by 134,217,728,000 percent. The number of people 240 years of age or older has increased by 268,435,456,000 percent. The number of people 245 years of age or older has increased by 536,870,912,000 percent. The number of people 250 years of age or older has increased by 1,073,741,824,000 percent. The number of people 255 years of age or older has increased by 2,147,483,648,000 percent. The number of people 260 years of age or older has increased by 4,294,967,296,000 percent. The number of people 265 years of age or older has increased by 8,589,934,592,000 percent. The number of people 270 years of age or older has increased by 17,179,869,184,000 percent. The number of people 275 years of age or older has increased by 34,359,738,368,000 percent. The number of people 280 years of age or older has increased by 68,719,476,736,000 percent. The number of people 285 years of age or older has increased by 137,438,953,472,000 percent. The number of people 290 years of age or older has increased by 274,877,906,944,000 percent. The number of people 295 years of age or older has increased by 549,755,813,888,000 percent. The number of people 300 years of age or older has increased by 1,099,511,627,776,000 percent. The number of people 305 years of age or older has increased by 2,199,023,255,552,000 percent. The number of people 310 years of age or older has increased by 4,398,046,511,104,000 percent. The number of people 315 years of age or older has increased by 8,796,093,022,208,000 percent. The number of people 320 years of age or older has increased by 17,592,186,044,416,000 percent. The number of people 325 years of age or older has increased by 35,184,372,088,832,000 percent. The number of people 330 years of age or older has increased by 70,368,744,177,664,000 percent. The number of people 335 years of age or older has increased by 140,737,488,355,328,000 percent. The number of people 340 years of age or older has increased by 281,474,976,710,656,000 percent. The number of people 345 years of age or older has increased by 562,949,953,421,312,000 percent. The number of people 350 years of age or older has increased by 1,125,899,906,842,624,000 percent. The number of people 355 years of age or older has increased by 2,251,799,813,685,248,000 percent. The number of people 360 years of age or older has increased by 4,503,599,627,370,496,000 percent. The number of people 365 years of age or older has increased by 9,007,199,254,740,992,000 percent. The number of people 370 years of age or older has increased by 18,014,398,509,481,984,000 percent. The number of people 375 years of age or older has increased by 36,028,797,018,963,968,000 percent. The number of people 380 years of age or older has increased by 72,057,594,037,927,936,000 percent. The number of people 385 years of age or older has increased by 144,115,188,075,855,872,000 percent. The number of people 390 years of age or older has increased by 288,230,376,151,711,744,000 percent. The number of people 395 years of age or older has increased by 576,460,752,303,423,488,000 percent. The number of people 400 years of age or older has increased by 1,152,921,504,606,846,976,000 percent. The number of people 405 years of age or older has increased by 2,305,843,009,213,693,952,000 percent. The number of people 410 years of age or older has increased by 4,611,686,018,427,387,904,000 percent. The number of people 415 years of age or older has increased by 9,223,372,036,854,775,808,000 percent. The number of people 420 years of age or older has increased by 18,446,744,073,709,551,616,000 percent. The number of people 425 years of age or older has increased by 36,893,488,147,419,103,232,000 percent. The number of people 430 years of age or older has increased by 73,786,976,294,838,206,464,000 percent. The number of people 435 years of age or older has increased by 147,573,952,589,676,412,928,000 percent. The number of people 440 years of age or older has increased by 295,147,905,179,352,825,856,000 percent. The number of people 445 years of age or older has increased by 590,295,810,358,705,651,712,000 percent. The number of people 450 years of age or older has increased by 1,180,591,620,717,411,303,424,000 percent. The number of people 455 years of age or older has increased by 2,361,183,241,434,822,606,848,000 percent. The number of people 460 years of age or older has increased by 4,722,366,482,869,645,213,696,000 percent. The number of people 465 years of age or older has increased by 9,444,732,965,739,290,427,392,000 percent. The number of people 470 years of age or older has increased by 18,889,465,931,478,580,854,784,000 percent. The number of people 475 years of age or older has increased by 37,778,931,862,957,161,709,568,000 percent. The number of people 480 years of age or older has increased by 75,557,863,725,914,323,419,136,000 percent. The number of people 485 years of age or older has increased by 151,115,727,451,828,646,838,272,000 percent. The number of people 490 years of age or older has increased by 302,231,454,903,657,293,676,544,000 percent. The number of people 495 years of age or older has increased by 604,462,909,807,314,587,353,088,000 percent. The number of people 500 years of age or older has increased by 1,208,925,819,614,629,174,706,176,000 percent. The number of people 505 years of age or older has increased by 2,417,851,639,229,258,349,412,352,000 percent. The number of people 510 years of age or older has increased by 4,835,703,278,458,516,698,824,704,000 percent. The number of people 515 years of age or older has increased by 9,671,406,556,917,033,397,649,408,000 percent. The number of people 520 years of age or older has increased by 19,342,813,113,834,066,795,298,816,000 percent. The number of people 525 years of age or older has increased by 38,685,626,227,668,133,590,597,632,000 percent. The number of people 530 years of age or older has increased by 77,371,252,455,336,267,181,195,264,000 percent. The number of people 535 years of age or older has increased by 154,742,504,910,672,534,362,390,528,000 percent. The number of people 540 years of age or older has increased by 309,485,009,821,345,068,724,781,056,000 percent. The number of people 545 years of age or older has increased by 618,970,019,642,690,137,449,562,112,000 percent. The number of people 550 years of age or older has increased by 1,237,940,039,285,380,274,899,124,224,000 percent. The number of people 555 years of age or older has increased by 2,475,880,078,570,760,549,798,248,448,000 percent. The number of people 560 years of age or older has increased by 4,951,760,157,141,521,099,596,496,896,000 percent. The number of people 565 years of age or older has increased by 9,903,520,314,283,042,199,193,993,792,000 percent. The number of people 570 years of age or older has increased by 19,807,040,628,566,084,398,387,

the 1990s, the number of people in the United States who are 65 years of age or older has increased by 50 percent, and the number of people 75 years of age or older has increased by 100 percent. The number of people 85 years of age or older has increased by 200 percent. The number of people 95 years of age or older has increased by 400 percent. The number of people 100 years of age or older has increased by 1,000 percent. The number of people 105 years of age or older has increased by 2,000 percent. The number of people 110 years of age or older has increased by 4,000 percent. The number of people 115 years of age or older has increased by 8,000 percent. The number of people 120 years of age or older has increased by 16,000 percent. The number of people 125 years of age or older has increased by 32,000 percent. The number of people 130 years of age or older has increased by 64,000 percent. The number of people 135 years of age or older has increased by 128,000 percent. The number of people 140 years of age or older has increased by 256,000 percent. The number of people 145 years of age or older has increased by 512,000 percent. The number of people 150 years of age or older has increased by 1,024,000 percent. The number of people 155 years of age or older has increased by 2,048,000 percent. The number of people 160 years of age or older has increased by 4,096,000 percent. The number of people 165 years of age or older has increased by 8,192,000 percent. The number of people 170 years of age or older has increased by 16,384,000 percent. The number of people 175 years of age or older has increased by 32,768,000 percent. The number of people 180 years of age or older has increased by 65,536,000 percent. The number of people 185 years of age or older has increased by 131,072,000 percent. The number of people 190 years of age or older has increased by 262,144,000 percent. 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The number of people 535 years of age or older has increased by 154,742,504,910,672,534,362,390,528,000 percent. The number of people 540 years of age or older has increased by 309,485,009,821,345,068,724,781,056,000 percent. The number of people 545 years of age or older has increased by 618,970,019,642,690,137,449,562,112,000 percent. The number of people 550 years of age or older has increased by 1,237,940,039,285,380,274,899,124,224,000 percent. The number of people 555 years of age or older has increased by 2,475,880,078,570,760,549,798,248,448,000 percent. The number of people 560 years of age or older has increased by 4,951,760,157,141,521,099,596,496,896,000 percent. The number of people 565 years of age or older has increased by 9,903,520,314,283,042,199,193,993,792,000 percent. The number of people 570 years of age or older has increased by 19,807,040,628,566,084,398,387,

Fire Protection Drawings

| |
|-----------------------|
| Drawings |
| Drawn: M. Mershimer |
| Design: |
| Review: |
| Date: |
| Scale: $1/8" = 1'-0"$ |

| |
|-------------------------------|
| Fire Alarm Notes & Details |
| FA0.0 |

[illegible][illegible]

Project Description

Design

anil Kumar

| | |
|--|----------|
| | wing No. |
|--|----------|

Fire Protection Drawings

Drawn: M. Mershimer

Design:

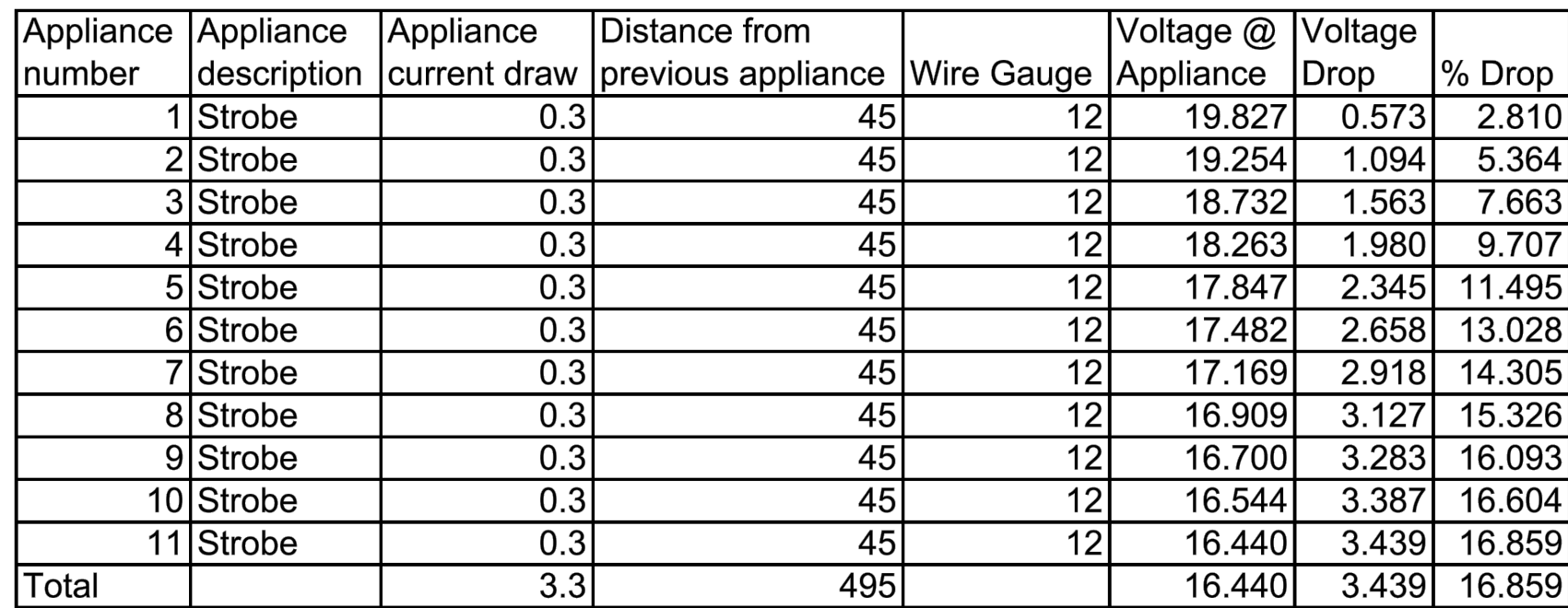
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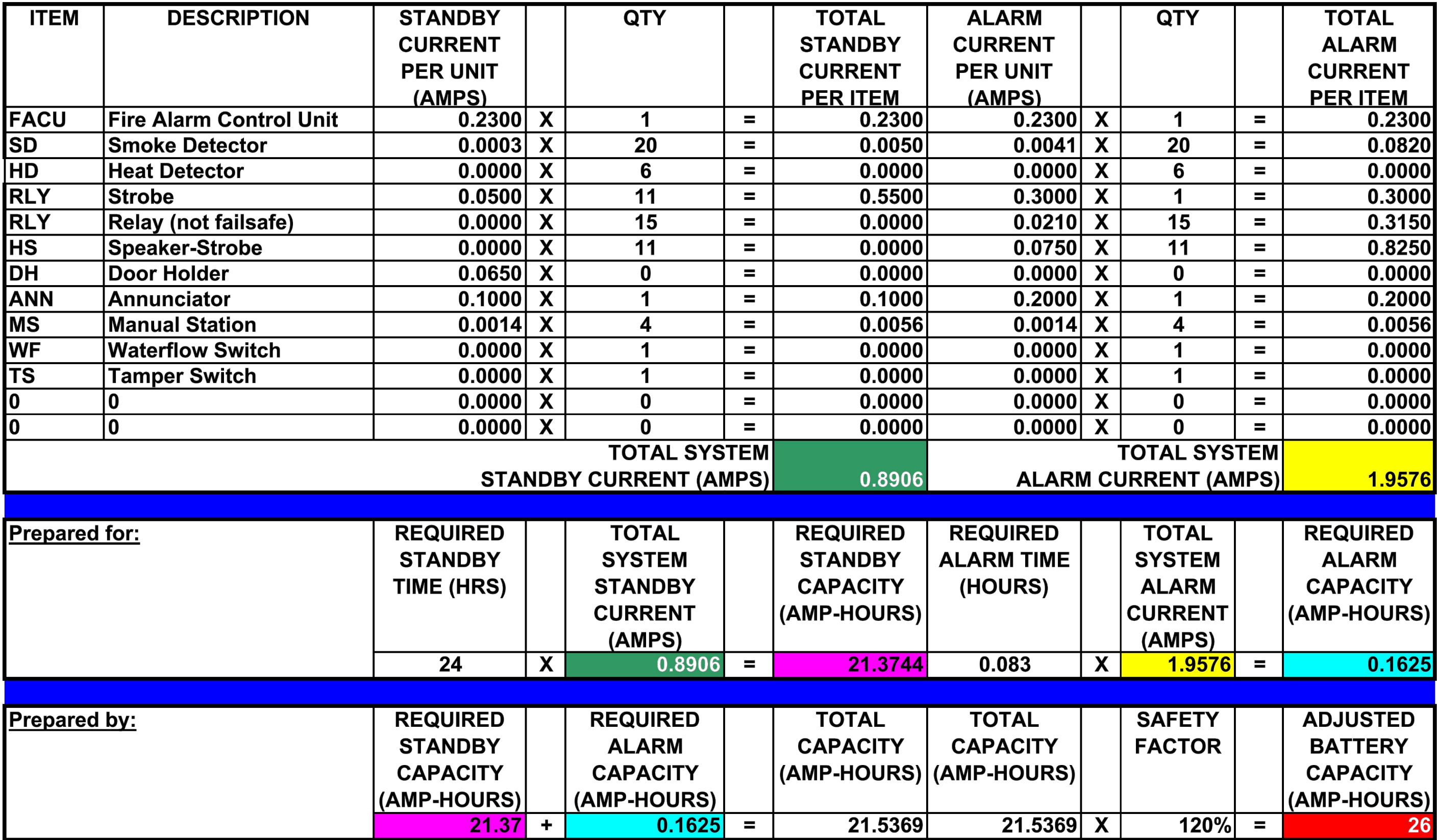
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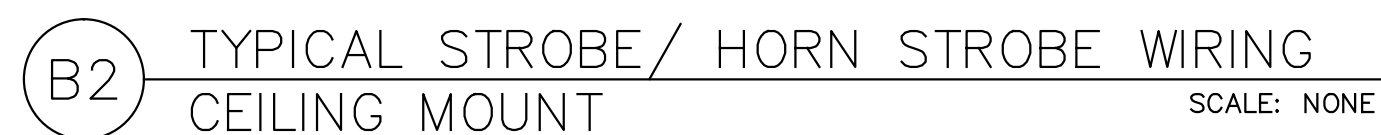
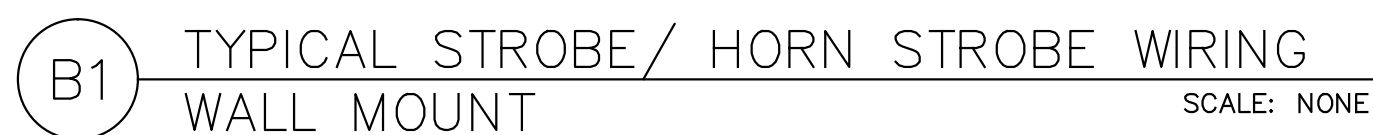
Fire Alarm Sequence of Operations

FA0.1



| Appliance number | Appliance description | Appliance current draw | Distance from previous appliance | Wire Gauge | Voltage @ Appliance | Voltage Drop | % Drop |
|------------------|-----------------------|------------------------|----------------------------------|------------|---------------------|--------------|--------|
| 1 | Speaker | 0.021 | 40 | 12 | 20.180 | 0.220 | 1.081 |
| 2 | Speaker | 0.021 | 12 | 12 | 20.113 | 0.286 | 1.400 |
| 3 | Speaker | 0.021 | 12 | 12 | 20.048 | 0.350 | 1.715 |
| 4 | Speaker | 0.021 | 12 | 12 | 19.984 | 0.414 | 2.025 |
| 5 | Speaker | 0.021 | 25 | 12 | 19.852 | 0.543 | 2.661 |
| 6 | Speaker | 0.021 | 12 | 12 | 19.790 | 0.604 | 2.961 |
| 7 | Speaker | 0.021 | 12 | 12 | 19.729 | 0.664 | 3.257 |
| 8 | Speaker | 0.021 | 12 | 12 | 19.668 | 0.724 | 3.548 |
| 9 | Speaker | 0.021 | 12 | 12 | 19.609 | 0.782 | 3.834 |
| 10 | Speaker | 0.021 | 25 | 12 | 19.488 | 0.902 | 4.420 |
| 11 | Speaker | 0.021 | 12 | 12 | 19.430 | 0.958 | 4.696 |
| 12 | Speaker | 0.021 | 12 | 12 | 19.374 | 1.013 | 4.968 |
| 13 | Speaker | 0.021 | 12 | 12 | 19.318 | 1.068 | 5.235 |
| 14 | Speaker | 0.021 | 12 | 12 | 19.264 | 1.121 | 5.497 |
| 15 | Speaker | 0.021 | 25 | 12 | 19.152 | 1.231 | 6.034 |
| 16 | Speaker | 0.021 | 12 | 12 | 19.100 | 1.282 | 6.287 |
| 17 | Speaker | 0.021 | 12 | 12 | 19.048 | 1.333 | 6.534 |
| 18 | Speaker | 0.021 | 12 | 12 | 18.998 | 1.383 | 6.778 |
| 19 | Speaker | 0.021 | 12 | 12 | 18.948 | 1.431 | 7.016 |
| 20 | Speaker | 0.021 | 25 | 12 | 18.847 | 1.531 | 7.503 |
| 21 | Speaker | 0.021 | 12 | 12 | 18.799 | 1.577 | 7.732 |
| 22 | Speaker | 0.021 | 12 | 12 | 18.752 | 1.623 | 7.956 |
| 23 | Speaker | 0.021 | 50 | 12 | 18.562 | 1.805 | 8.870 |
| 24 | Speaker | 0.021 | 50 | 12 | 18.375 | 1.960 | 9.643 |
| 25 | Speaker | 0.021 | 12 | 12 | 18.322 | 2.005 | 9.974 |
| 26 | Speaker | 0.021 | 12 | 12 | 18.289 | 2.076 | 10.179 |
| 27 | Speaker | 0.021 | 12 | 12 | 18.247 | 2.117 | 10.379 |
| 28 | Speaker | 0.021 | 12 | 12 | 18.206 | 2.157 | 10.574 |
| 29 | Speaker | 0.021 | 25 | 12 | 18.123 | 2.238 | 10.972 |
| 30 | Speaker | 0.021 | 50 | 12 | 17.961 | 2.396 | 11.747 |
| 31 | Speaker | 0.021 | 12 | 12 | 17.923 | 2.433 | 11.928 |
| 32 | Speaker | 0.021 | 12 | 12 | 17.886 | 2.469 | 12.104 |
| 33 | Speaker | 0.021 | 12 | 12 | 17.850 | 2.504 | 12.276 |
| 34 | Speaker | 0.021 | 12 | 12 | 17.815 | 2.538 | 12.443 |
| 35 | Speaker | 0.021 | 12 | 12 | 17.781 | 2.571 | 12.605 |
| 36 | Speaker | 0.021 | 12 | 12 | 17.748 | 2.603 | 12.762 |
| 37 | Speaker | 0.021 | 12 | 12 | 17.716 | 2.635 | 12.915 |
| 38 | Speaker | 0.021 | 12 | 12 | 17.685 | 2.665 | 13.063 |
| 39 | Speaker | 0.021 | 12 | 12 | 17.655 | 2.694 | 13.206 |
| 40 | Speaker | 0.021 | 12 | 12 | 17.625 | 2.722 | 13.344 |
| 41 | Speaker | 0.021 | 12 | 12 | 17.597 | 2.749 | 13.477 |
| 42 | Speaker | 0.021 | 12 | 12 | 17.570 | 2.776 | 13.606 |
| 43 | Speaker | 0.021 | 12 | 12 | 17.544 | 2.801 | 13.730 |
| 44 | Speaker | 0.021 | 12 | 12 | 17.518 | 2.826 | 13.849 |
| 45 | Speaker | 0.021 | 12 | 12 | 17.494 | 2.849 | 13.964 |
| 46 | Speaker | 0.021 | 12 | 12 | 17.471 | 2.871 | 14.073 |
| 47 | Speaker | 0.021 | 12 | 12 | 17.448 | 2.892 | 14.178 |
| 48 | Speaker | 0.021 | 12 | 12 | 17.427 | 2.913 | 14.278 |
| 49 | Speaker | 0.021 | 12 | 12 | 17.407 | 2.932 | 14.374 |
| 50 | Speaker | 0.021 | 12 | 12 | 17.387 | 2.951 | 14.464 |
| 51 | Speaker | 0.021 | 12 | 12 | 17.369 | 2.968 | 14.550 |
| 52 | Speaker | 0.021 | 12 | 12 | 17.351 | 2.985 | 14.631 |
| 53 | Speaker | 0.021 | 12 | 12 | 17.335 | 3.000 | 14.708 |
| 54 | Speaker | 0.021 | 12 | 12 | 17.319 | 3.015 | 14.779 |
| 55 | Speaker | 0.021 | 12 | 12 | 17.304 | 3.029 | 14.846 |
| 56 | Speaker | 0.021 | 12 | 12 | 17.291 | 3.041 | 14.908 |
| 57 | Speaker | 0.021 | 12 | 12 | 17.278 | 3.053 | 14.965 |
| 58 | Speaker | 0.021 | 12 | 12 | 17.266 | 3.064 | 15.018 |
| 59 | Speaker | 0.021 | 12 | 12 | 17.256 | 3.073 | 15.065 |
| 60 | Speaker | 0.021 | 12 | 12 | 17.246 | 3.082 | 15.108 |
| 61 | Speaker | 0.021 | 12 | 12 | 17.237 | 3.090 | 15.146 |
| 62 | Speaker | 0.021 | 12 | 12 | 17.230 | 3.097 | 15.180 |
| 63 | Speaker | 0.021 | 12 | 12 | 17.223 | 3.102 | 15.208 |
| 64 | Speaker | 0.021 | 12 | 12 | 17.217 | 3.107 | 15.232 |
| 65 | Speaker | 0.021 | 12 | 12 | 17.212 | 3.111 | 15.251 |
| 66 | Speaker | 0.021 | 12 | 12 | 17.208 | 3.114 | 15.266 |
| 67 | Speaker | 0.021 | 12 | 12 | 17.205 | 3.116 | 15.275 |
| 68 | Speaker | 0.021 | 12 | 12 | 17.203 | 3.117 | 15.280 |
| Total | | 1.428 | 1023 | | 17.203 | 3.117 | 15.280 |

[illegible]

[illegible]

| TOTAL AREAS OF ELECTRICAL METALLIC TUBING | | | | | | (BASED |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------|
| ON TABLE 4, CHAPTER 9, 2010 DEC) | | | | | | |
| | ½" CONDUIT | ¾" CONDUIT | 1" CONDUIT | 1 ½" CONDUIT | 2" CONDUIT | |
| TOTAL AREA | 0.304 IN ² | 0.533 IN ² | 0.864 IN ² | 1.496 IN ² | 2.036 IN ² | |
| 40% FILL | ¾" CONDUIT | ¾" CONDUIT | 1" CONDUIT | 1 ½" CONDUIT | 2" CONDUIT | |

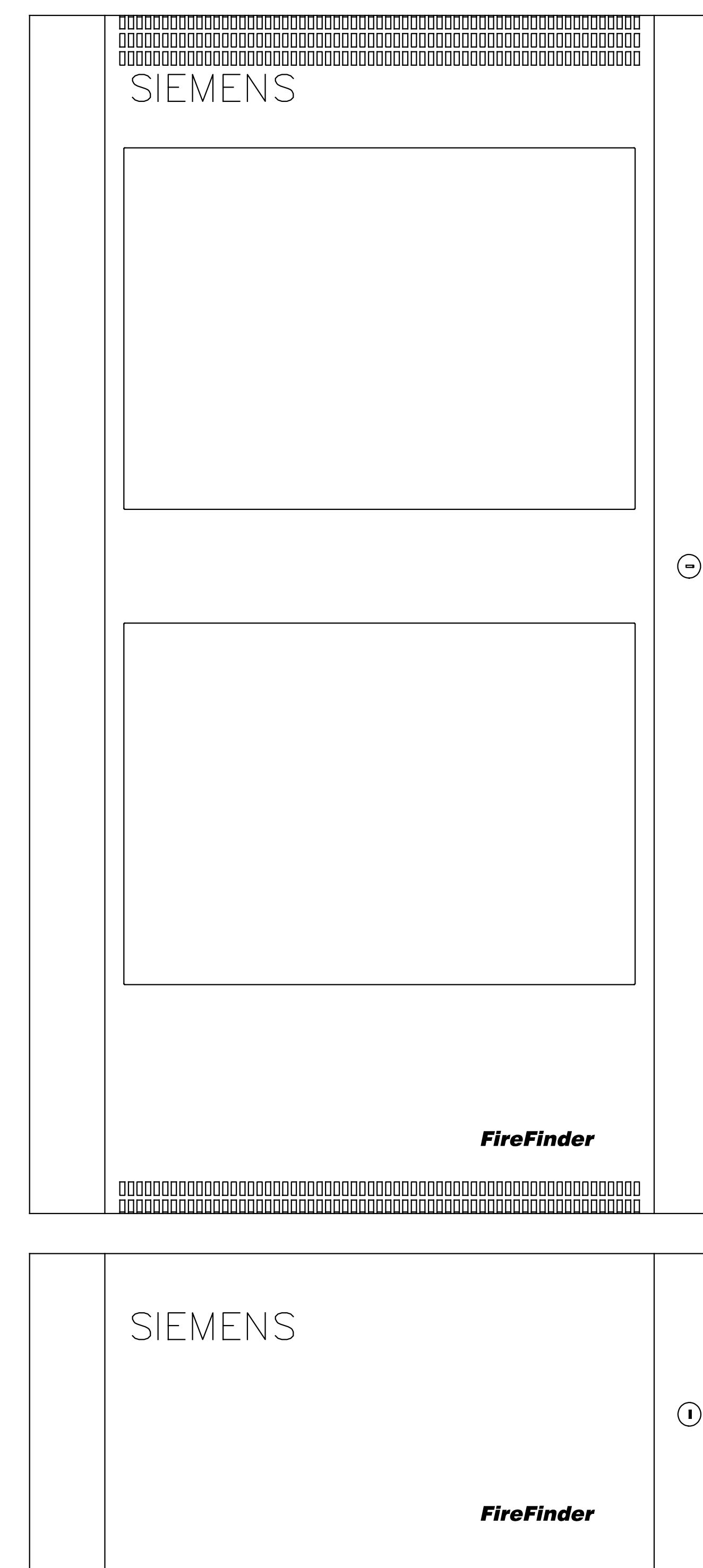
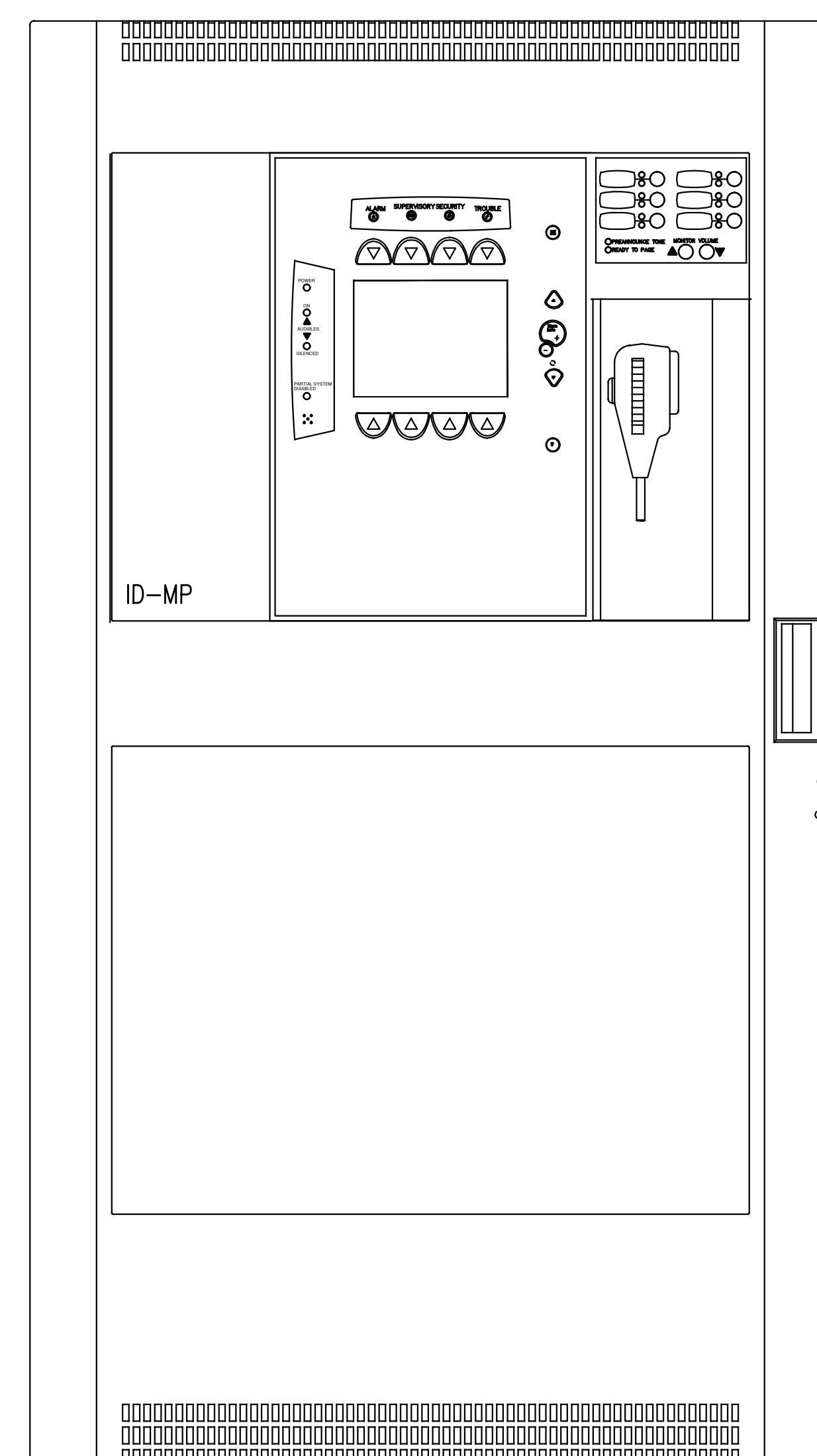
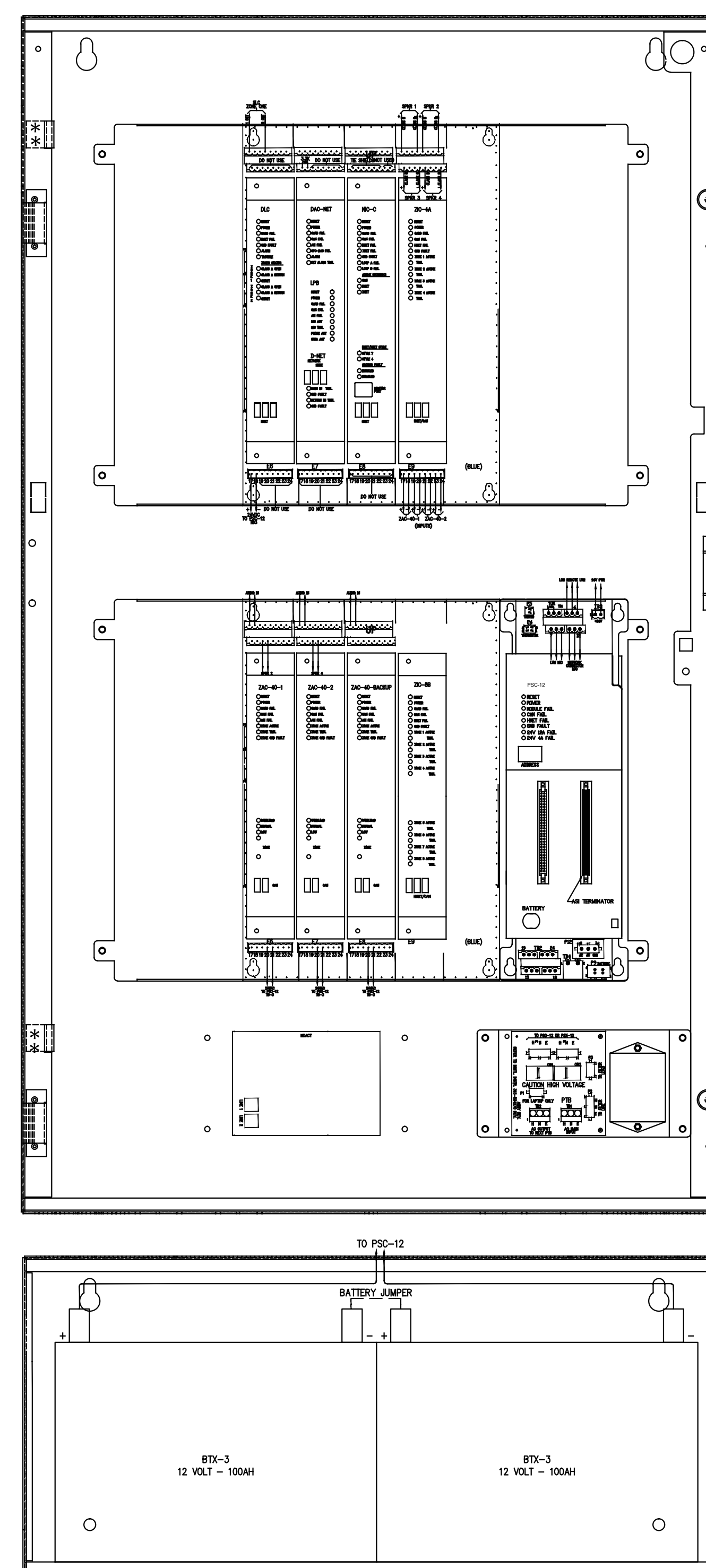
C4 CONDUIT FILL CHART

Fire Protection Drawings

| | |
|---------------------|---------------------|
| Design | Drawn: M. Mershimar |
| | Design: |
| | Review: |
| | Date: |
| Scale: 1/8" = 1'-0" | |

Fire Alarm Device Details & Mounting Elevations

FA0.3

[illegible]

2 FIRE ALARM CONTROL PANEL DETAIL
FACP

SCALE: NONE

Graphics

Project Description

Design

Drawing Title

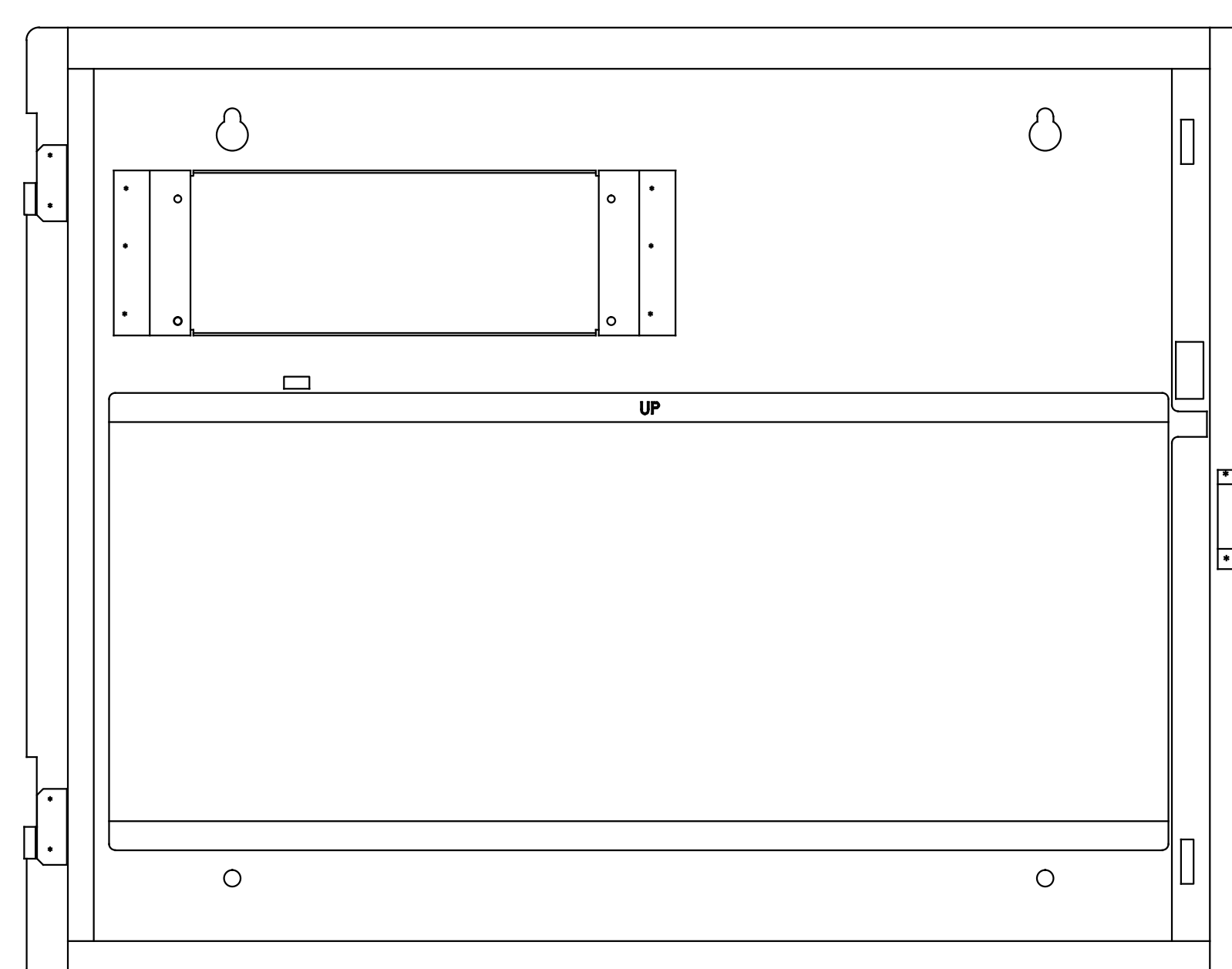
Drawing No.

Fire Protection Drawings

| | |
|--------|---------------------|
| Design | Drawn: M. Mershimer |
| | Design: |
| | Review: |
| | Date: |
| | Scale: 1/8" = 1'-0" |

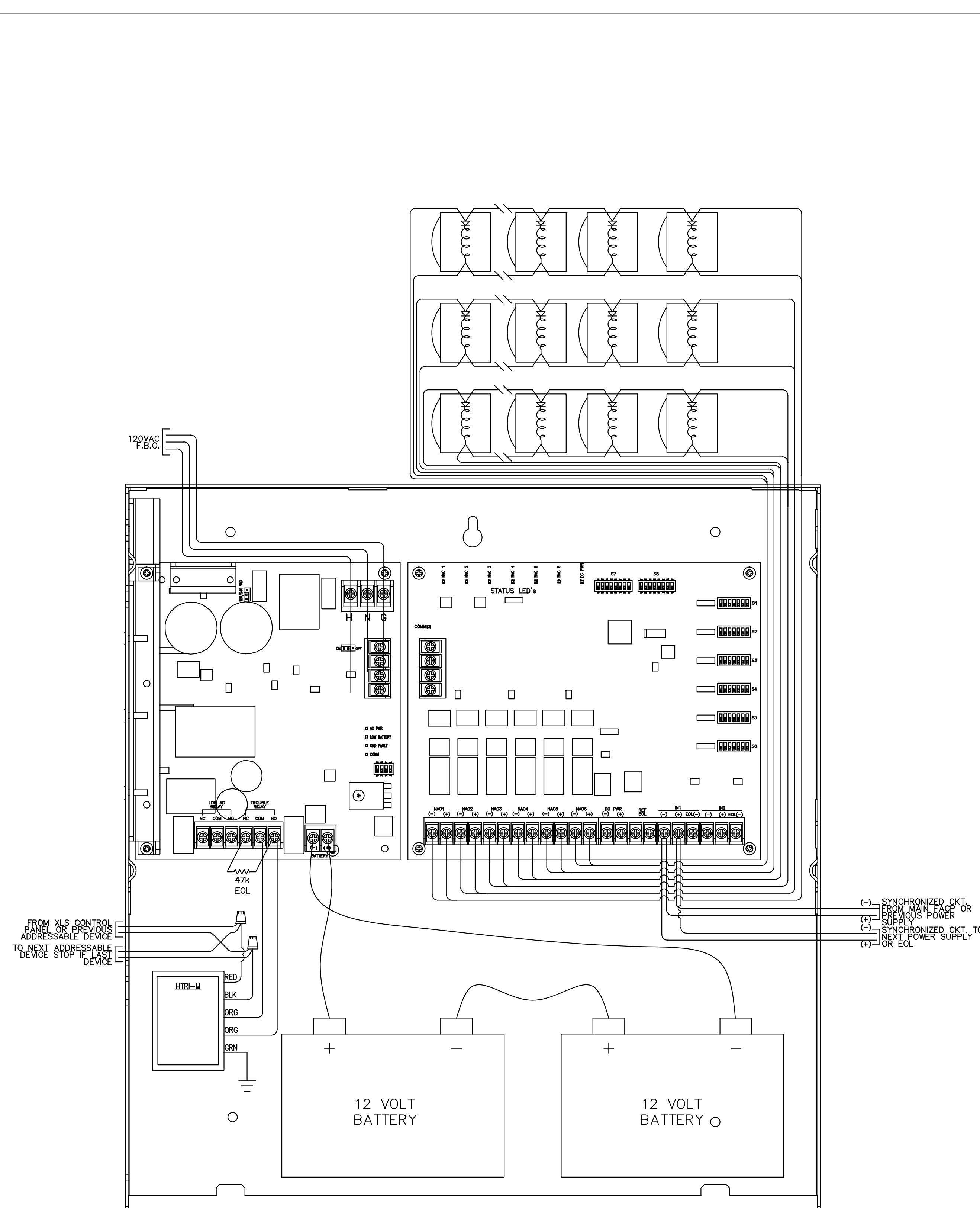
Fire Alarm Panel Details

FA0.4

[illegible]

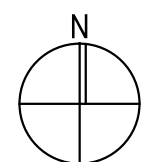
2 FIRE ALARM CONTROL PANEL DETAIL
FACP

SCALE: NONE



1 AUXILLIARY POWER SUPPLY
APS

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[illegible]

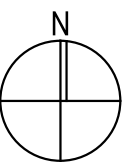
KEY PLAN

Fire Protection Drawings

| |
|---------------------|
| Drawn: M. Mershimer |
| Design: |
| Review: |
| Date: |
| Scale: 1/8" = 1'-0" |

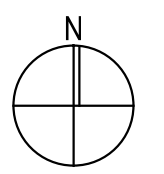
AREA-1
1ST FLOOR FIRE ALARM

FA1.0



| Drawing No. | Drawing Title |
|-------------|---------------|
|-------------|---------------|

FA1.2

[illegible]

Fire Protection Drawings

AREA-1
2ND FLOOR FIRE ALARM

FA2.0

[illegible]

1

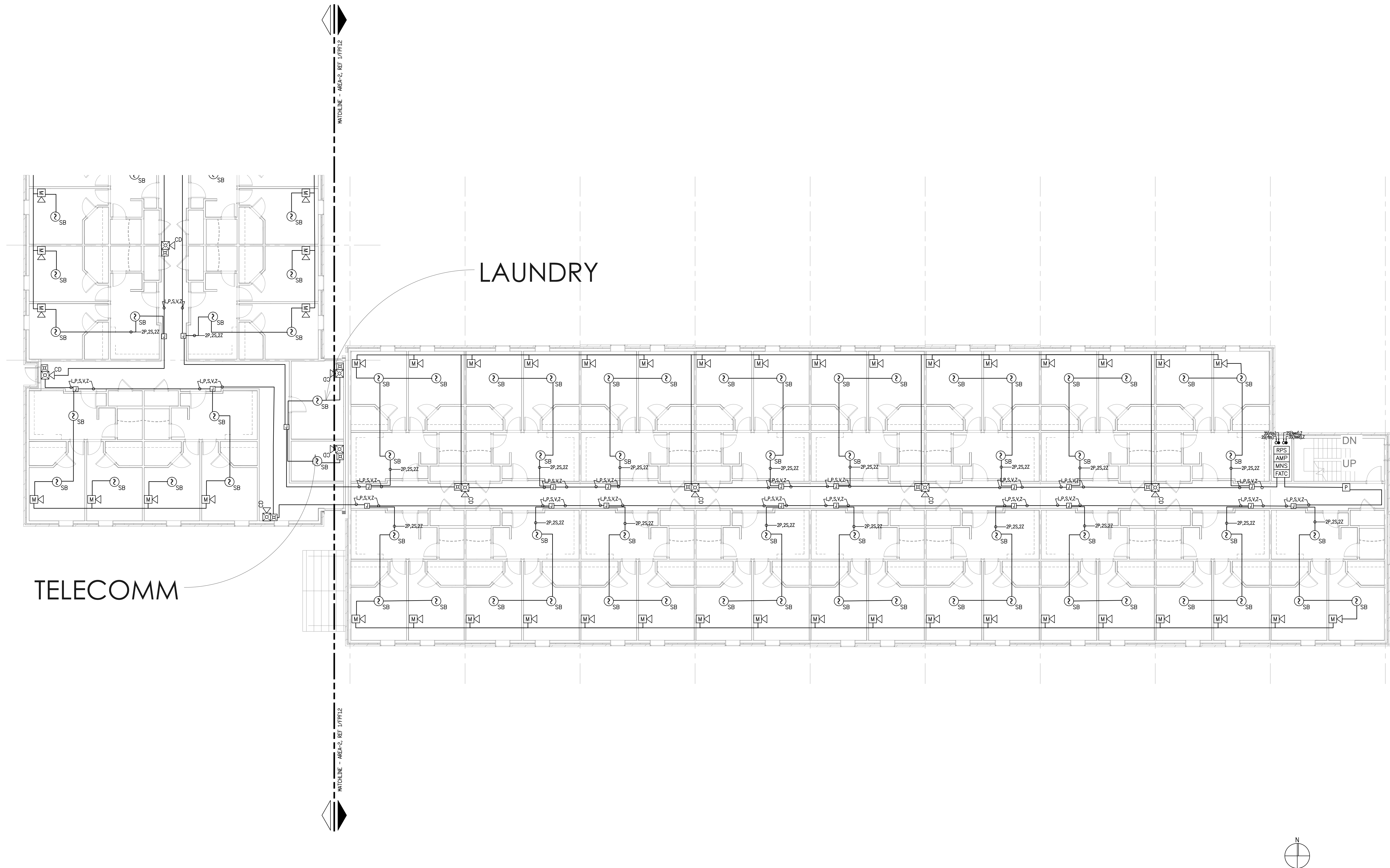
KEY PLAN

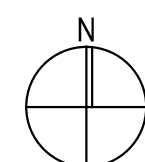
Fire Protection Drawings

| |
|---------------------|
| Drawn: M. Mershimer |
| Design: |
| Review: |
| Date: |
| Scale: 1/8" = 1'-0" |

AREA-3
2ND FLOOR FIRE ALARM

| |
|-------|
| FA2.2 |
|-------|





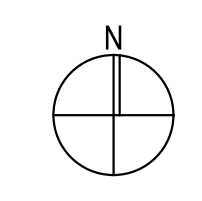
Fire Protection Drawings

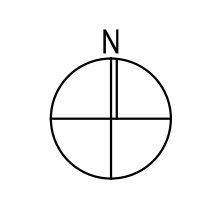
AREA-1
3RD FLOOR FIRE ALARM

FA3.0

| | |
|---------------------|-----------------------------------|
| Project Description | <h1>Fire Protection Drawings</h1> |
|---------------------|-----------------------------------|

| | |
|---------------|--------------------------------|
| drawing title | AREA-2 3RD FLOOR FIRE ALARM |
| drawing no. | FA3.1 |



[illegible]

Fire Protection Drawings

AREA-3
3RD FLOOR FIRE ALARM

FA3.2

Appendix H – Fire Alarm Calculations

| Appliance number | Appliance description | Appliance current draw | Distance from previous appliance | Wire Gauge | Voltage @ Appliance | Voltage Drop | % Drop |
|------------------|-----------------------|------------------------|----------------------------------|------------|---------------------|--------------|--------|
| 1 | Strobe | 0.3 | 45 | 12 | 19.827 | 0.573 | 2.810 |
| 2 | Strobe | 0.3 | 45 | 12 | 19.254 | 1.094 | 5.364 |
| 3 | Strobe | 0.3 | 45 | 12 | 18.732 | 1.563 | 7.663 |
| 4 | Strobe | 0.3 | 45 | 12 | 18.263 | 1.980 | 9.707 |
| 5 | Strobe | 0.3 | 45 | 12 | 17.847 | 2.345 | 11.495 |
| 6 | Strobe | 0.3 | 45 | 12 | 17.482 | 2.658 | 13.028 |
| 7 | Strobe | 0.3 | 45 | 12 | 17.169 | 2.918 | 14.305 |
| 8 | Strobe | 0.3 | 45 | 12 | 16.909 | 3.127 | 15.326 |
| 9 | Strobe | 0.3 | 45 | 12 | 16.700 | 3.283 | 16.093 |
| 10 | Strobe | 0.3 | 45 | 12 | 16.544 | 3.387 | 16.604 |
| 11 | Strobe | 0.3 | 45 | 12 | 16.440 | 3.439 | 16.859 |
| Total | | 3.3 | 495 | | 16.440 | 3.439 | 16.859 |

| Appliance number | Appliance description | Appliance current draw | Distance from previous appliance | Wire Gauge | Voltage @ Appliance | Voltage Drop | % Drop |
|------------------|-----------------------|------------------------|----------------------------------|------------|---------------------|--------------|--------|
| 1 | Speaker | 0.021 | 40 | 12 | 20.180 | 0.220 | 1.081 |
| 2 | Speaker | 0.021 | 12 | 12 | 20.113 | 0.286 | 1.400 |
| 3 | Speaker | 0.021 | 12 | 12 | 20.048 | 0.350 | 1.715 |
| 4 | Speaker | 0.021 | 12 | 12 | 19.984 | 0.413 | 2.025 |
| 5 | Speaker | 0.021 | 25 | 12 | 19.852 | 0.543 | 2.661 |
| 6 | Speaker | 0.021 | 12 | 12 | 19.790 | 0.604 | 2.961 |
| 7 | Speaker | 0.021 | 12 | 12 | 19.729 | 0.664 | 3.257 |
| 8 | Speaker | 0.021 | 12 | 12 | 19.668 | 0.724 | 3.548 |
| 9 | Speaker | 0.021 | 12 | 12 | 19.609 | 0.782 | 3.834 |
| 10 | Speaker | 0.021 | 25 | 12 | 19.488 | 0.902 | 4.420 |
| 11 | Speaker | 0.021 | 12 | 12 | 19.430 | 0.958 | 4.696 |
| 12 | Speaker | 0.021 | 12 | 12 | 19.374 | 1.013 | 4.968 |
| 13 | Speaker | 0.021 | 12 | 12 | 19.318 | 1.068 | 5.235 |
| 14 | Speaker | 0.021 | 12 | 12 | 19.264 | 1.121 | 5.497 |
| 15 | Speaker | 0.021 | 25 | 12 | 19.152 | 1.231 | 6.034 |
| 16 | Speaker | 0.021 | 12 | 12 | 19.100 | 1.282 | 6.287 |
| 17 | Speaker | 0.021 | 12 | 12 | 19.048 | 1.333 | 6.534 |
| 18 | Speaker | 0.021 | 12 | 12 | 18.998 | 1.383 | 6.778 |
| 19 | Speaker | 0.021 | 12 | 12 | 18.948 | 1.431 | 7.016 |
| 20 | Speaker | 0.021 | 25 | 12 | 18.847 | 1.531 | 7.503 |
| 21 | Speaker | 0.021 | 12 | 12 | 18.799 | 1.577 | 7.732 |
| 22 | Speaker | 0.021 | 12 | 12 | 18.752 | 1.623 | 7.956 |
| 23 | Speaker | 0.021 | 50 | 12 | 18.562 | 1.809 | 8.870 |
| 24 | Speaker | 0.021 | 50 | 12 | 18.375 | 1.992 | 9.764 |
| 25 | Speaker | 0.021 | 12 | 12 | 18.332 | 2.035 | 9.974 |
| 26 | Speaker | 0.021 | 12 | 12 | 18.289 | 2.076 | 10.179 |
| 27 | Speaker | 0.021 | 12 | 12 | 18.247 | 2.117 | 10.379 |
| 28 | Speaker | 0.021 | 12 | 12 | 18.206 | 2.157 | 10.574 |
| 29 | Speaker | 0.021 | 25 | 12 | 18.123 | 2.238 | 10.972 |
| 30 | Speaker | 0.021 | 50 | 12 | 17.961 | 2.396 | 11.747 |
| 31 | Speaker | 0.021 | 12 | 12 | 17.923 | 2.433 | 11.928 |
| 32 | Speaker | 0.021 | 12 | 12 | 17.886 | 2.469 | 12.104 |
| 33 | Speaker | 0.021 | 12 | 12 | 17.850 | 2.504 | 12.276 |
| 34 | Speaker | 0.021 | 12 | 12 | 17.815 | 2.538 | 12.443 |
| 35 | Speaker | 0.021 | 12 | 12 | 17.781 | 2.571 | 12.605 |
| 36 | Speaker | 0.021 | 12 | 12 | 17.748 | 2.603 | 12.762 |
| 37 | Speaker | 0.021 | 12 | 12 | 17.716 | 2.635 | 12.915 |
| 38 | Speaker | 0.021 | 12 | 12 | 17.685 | 2.665 | 13.063 |
| 39 | Speaker | 0.021 | 12 | 12 | 17.655 | 2.694 | 13.206 |
| 40 | Speaker | 0.021 | 12 | 12 | 17.625 | 2.722 | 13.344 |
| 41 | Speaker | 0.021 | 12 | 12 | 17.597 | 2.749 | 13.477 |
| 42 | Speaker | 0.021 | 12 | 12 | 17.570 | 2.776 | 13.606 |
| 43 | Speaker | 0.021 | 12 | 12 | 17.544 | 2.801 | 13.730 |
| 44 | Speaker | 0.021 | 12 | 12 | 17.518 | 2.825 | 13.849 |
| 45 | Speaker | 0.021 | 12 | 12 | 17.494 | 2.849 | 13.964 |
| 46 | Speaker | 0.021 | 12 | 12 | 17.471 | 2.871 | 14.073 |
| 47 | Speaker | 0.021 | 12 | 12 | 17.448 | 2.892 | 14.178 |
| 48 | Speaker | 0.021 | 12 | 12 | 17.427 | 2.913 | 14.278 |
| 49 | Speaker | 0.021 | 12 | 12 | 17.407 | 2.932 | 14.374 |
| 50 | Speaker | 0.021 | 12 | 12 | 17.387 | 2.951 | 14.464 |

| | | | | | | | |
|-------|---------|-------|------|----|--------|-------|--------|
| 51 | Speaker | 0.021 | 12 | 12 | 17.369 | 2.968 | 14.550 |
| 52 | Speaker | 0.021 | 12 | 12 | 17.351 | 2.985 | 14.631 |
| 53 | Speaker | 0.021 | 12 | 12 | 17.335 | 3.000 | 14.708 |
| 54 | Speaker | 0.021 | 12 | 12 | 17.319 | 3.015 | 14.779 |
| 55 | Speaker | 0.021 | 12 | 12 | 17.304 | 3.029 | 14.846 |
| 56 | Speaker | 0.021 | 12 | 12 | 17.291 | 3.041 | 14.908 |
| 57 | Speaker | 0.021 | 12 | 12 | 17.278 | 3.053 | 14.965 |
| 58 | Speaker | 0.021 | 12 | 12 | 17.266 | 3.064 | 15.018 |
| 59 | Speaker | 0.021 | 12 | 12 | 17.256 | 3.073 | 15.065 |
| 60 | Speaker | 0.021 | 12 | 12 | 17.246 | 3.082 | 15.108 |
| 61 | Speaker | 0.021 | 12 | 12 | 17.237 | 3.090 | 15.146 |
| 62 | Speaker | 0.021 | 12 | 12 | 17.230 | 3.097 | 15.180 |
| 63 | Speaker | 0.021 | 12 | 12 | 17.223 | 3.102 | 15.208 |
| 64 | Speaker | 0.021 | 12 | 12 | 17.217 | 3.107 | 15.232 |
| 65 | Speaker | 0.021 | 12 | 12 | 17.212 | 3.111 | 15.251 |
| 66 | Speaker | 0.021 | 12 | 12 | 17.208 | 3.114 | 15.266 |
| 67 | Speaker | 0.021 | 12 | 12 | 17.205 | 3.116 | 15.275 |
| 68 | Speaker | 0.021 | 12 | 12 | 17.203 | 3.117 | 15.280 |
| Total | | 1.428 | 1023 | | 17.203 | 3.117 | 15.280 |

DETECT.XLS: Estimate of the response time of ceiling mounted fire detectors

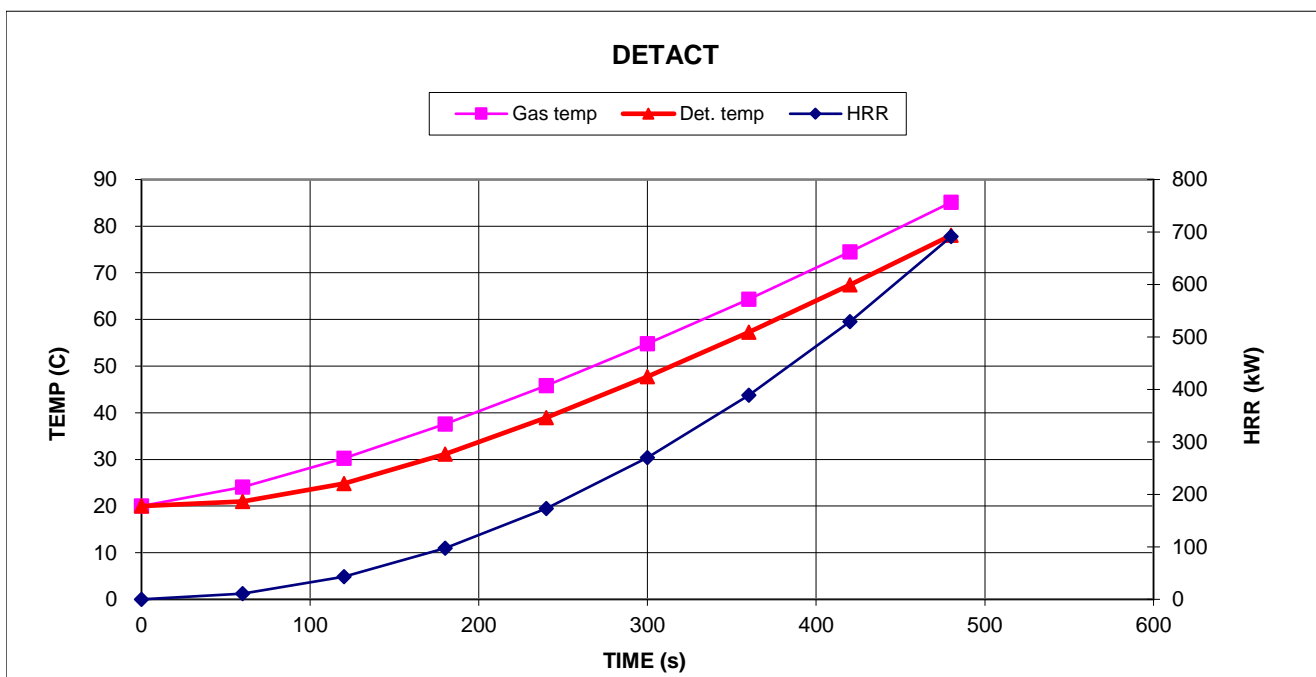
| INPUT PARAMETERS | | | CALCULATED PARAMETERS | | |
|-----------------------------|-------|----------------------|-----------------------|--------|-------|
| Calculation reset | 1 | 0 or 1 | R/H | 1 | - |
| Ceiling height (H) | 3 | m | W/H | 1.0667 | - |
| Room width (W) | 3.2 | m | Temperature factor | 0.3075 | - |
| Radial distance (R) | 3 | m | Velocity factor | 0.2545 | - |
| Ambient temperature (To) | 20 | C | Calculation time (t) | 501 | s |
| Actuation temperature (Ta) | 68 | C | Fire HRR (Q) | 753 | kW |
| Rate of rise rating (ROR) | 8.3 | C/min | Gas temperature (Tg) | 88.93 | C |
| Response time index (RTI) | 50 | (m-s) ^{1/2} | Gas velocity (Ug) | 1.6052 | m/s |
| Fire growth power (n) | 2 | - | ROR at detector | 11.01 | C/min |
| Fire growth coefficient (k) | 0.003 | kW/s ⁿ | Detector temp (Td) | 81.872 | C |
| Fire location factor (kLF) | 1 | - | Detection trigger | 78 | 267 |

| Representative t2 coeff. | k |
|--------------------------|-------|
| Slow | 0.003 |
| Medium | 0.012 |
| Fast | 0.047 |
| Ultrafast | 0.400 |

| CALCULATION RESULTS | FT | ROR | |
|----------------------------|-----|-----|----|
| Transport lag time (tl) | 25 | 25 | s |
| Detection time (td) | 424 | 235 | s |
| HRR at detection (Qd) | 539 | 166 | kW |
| HRR w/transport lag (Ql+d) | 605 | 203 | kW |

< Press PgDn key for additional results >

| Calculation time (s) | HRR | Gas temp | Det. temp |
|----------------------|-----|----------|-----------|
| 0 | 0 | 20 | 20 |
| 60 | 11 | 24 | 21 |
| 120 | 43 | 30 | 25 |
| 180 | 97 | 38 | 31 |
| 240 | 173 | 46 | 39 |
| 300 | 270 | 55 | 48 |
| 360 | 389 | 64 | 57 |
| 420 | 529 | 74 | 67 |
| 480 | 691 | 85 | 78 |





CHAPTER 10 ESTIMATING SPRINKLER RESPONSE TIME

Version 1805.1
(English Units)

The following calculations estimate the full-scale cable tray heat release rate.

Parameters in YELLOW CELLS are Entered by the User.

Parameters in GREEN CELLS are Automatically Selected from the DROP DOWN MENU for the Cable Type Selected.

All subsequent output values are calculated by the spreadsheet and based on values specified in the input parameters. This spreadsheet is protected and secure to avoid errors due to a wrong entry in a cell(s). The chapter in the NUREG should be read before an analysis is made.

Project / Inspection
Title:

Sprinkler Bedroom

INPUT PARAMETERS

Heat Release Rate of the Fire (Q) (Steady State)

450.00 kW

Sprinkler Response Time Index (RTI)

42 (m-sec)^{1/2}

Activation Temperature of the Sprinkler (T_{activation})

165 °F

Height of Ceiling above Top of Fuel (H)

10.00 ft

Radial Distance to the Detector (r) **never more than 0.707 or 1/2√2 of the listed spacing**

10.00 ft

Ambient Air Temperature (T_a)

77.00 °F

Convective Heat Release Rate Fraction (χ_c)

0.70

r/H =

1.00

Calculate

GENERIC SPRINKLER RESPONSE TIME INDEX (RTI)*

| Common Sprinkler Type | Generic Response Time Index (RTI) (m-sec) ^{1/2} |
|------------------------|---|
| Standard response bulb | 235 |
| Standard response link | 130 |
| Quick response bulb | 42 |
| Quick response link | 34 |
| User Specified Value | Enter Value |

Select Type of Sprinkler

Quick response bulb

Scroll to desired sprinkler type then Click on selection

Reference: Madrzykowski, D., "Evaluation of Sprinkler Activation Prediction Methods"
ASIAFLAM95, International Conference on Fire Science and Engineering, 1st Proceeding,
March 15-16, 1995, Kowloon, Hong Kong, pp. 211-218.

*Note: The actual RTI should be used when the value is available.

GENERIC SPRINKLER TEMPERATURE RATING (T_{activation})*

| Temperature Classification | Range of Temperature Ratings (°F) | Generic Temperature Ratings (°F) |
|----------------------------|--------------------------------------|-------------------------------------|
| Ordinary | 135 to 170 | 165 |
| Intermediate | 175 to 225 | 212 |
| High | 250 to 300 | 275 |
| Extra high | 325 to 375 | 350 |
| Very extra high | 400 to 475 | 450 |
| Ultra high | 500 to 575 | 550 |
| Ultra high | 650 | 550 |
| User Specified Value | — | Enter Value |

Select Sprinkler Classification

Ordinary

Scroll to desired sprinkler class
then Click on selection

Reference: Automatic Sprinkler Systems Handbook, 6th Edition, National Fire Protection
Association, Quincy, Massachusetts, 1994, Page 67.

*Note: The actual temperature rating should be used when the value is available.



CHAPTER 10 ESTIMATING SPRINKLER RESPONSE TIME

Version 1805.1
(English Units)

ESTIMATING SPRINKLER RESPONSE TIME

Reference: NFPA Fire Protection Handbook, 19th Edition, 2003, Page 3-140.

$$t_{\text{activation}} = (RTI/(\sqrt{u_{\text{jet}}})) (\ln ((T_{\text{jet}} - T_a)/(T_{\text{jet}} - T_{\text{activation}})))$$

Where

$t_{\text{activation}}$ = sprinkler activation response time (sec)

RTI = sprinkler response time index (m-sec)^{1/2}

u_{jet} = ceiling jet velocity (m/sec)

T_{jet} = ceiling jet temperature (°C)

T_a = ambient air temperature (°C)

$T_{\text{activation}}$ = activation temperature of sprinkler (°C)

Ceiling Jet Temperature Calculation

$$T_{\text{jet}} - T_a = 16.9 (Q)^{2/3} / H^{5/3}$$

for $r/H \leq 0.18$

$$T_{\text{jet}} - T_a = 5.38 (Q/r)^{2/3} / H$$

for $r/H > 0.18$

Where

T_{jet} = ceiling jet temperature (°C)

T_a = ambient air temperature (°C)

Q = heat release rate of the fire (kW)

H = height of ceiling above top of fuel (m)

r = radial distance from the plume centerline to the sprinkler (m)

Convective Heat Release Rate Calculation

$$Q_c = \chi_c Q$$

Where

Q_c = convective portion of the heat release rate (kW)

Q = heat release rate of the fire (kW)

χ_c = convective heat release rate fraction

$$Q_c = 315 \text{ kW}$$



CHAPTER 10 ESTIMATING SPRINKLER RESPONSE TIME

Version 1805.1
(English Units)

Radial Distance to Ceiling Height Ratio Calculation

$$\begin{aligned} r/H &= 1.00 \quad r/H > 0.18 \\ &> 0.18 \quad 49.31 \quad < 0.18 \quad 154.88 \\ T_{\text{jet}} - T_a &= \{5.38 (Q/r)^{2/3}\}/H \\ T_{\text{jet}} - T_a &= 49.31 \\ T_{\text{jet}} &= 74.31 \text{ (}^\circ\text{C)} \end{aligned}$$

Ceiling Jet Velocity Calculation

$$\begin{aligned} u_{\text{jet}} &= 0.96 (Q/H)^{1/3} && \text{for } r/H \leq 0.15 \\ u_{\text{jet}} &= (0.195 Q^{1/3} H^{1/2})/r^{5/6} && \text{for } r/H > 0.15 \end{aligned}$$

Where

u_{jet} = ceiling jet velocity (m/sec)

Q = heat release rate of the fire (kW)

H = height of ceiling above top of fuel (m)

r = radial distance from the plume centerline to the sprinkler (m)

Radial Distance to Ceiling Height Ratio Calculation

$$\begin{aligned} r/H &= 1.00 \quad r/H > 0.15 \\ &> 0.15 \quad 1.03 \quad < 0.15 \quad 5.073843686 \\ u_{\text{jet}} &= (0.195 Q^{1/3} H^{1/2})/r^{5/6} \\ u_{\text{jet}} &= 1.031 \quad \text{m/sec} \end{aligned}$$



CHAPTER 10 ESTIMATING SPRINKLER RESPONSE TIME

Version 1805.1
(English Units)

SPRINKLER ACTIVATION TIME CALCULATION

$$t_{\text{activation}} = (RTI/(\sqrt{u_{\text{jet}}})) (\ln (T_{\text{jet}} - T_a)/(T_{\text{jet}} - T_{\text{activation}}))$$

$t_{\text{activation}}$: 197.45 sec

Answer

The sprinkler will respond in approximately

3.29 minutes

NOTE: If $t_{\text{activation}}$ = "NUM" Sprinkler does not activate

NOTE:

The above calculations are based on principles developed in the SFPE Handbook of Fire Protection Engineering, 3rd Edition, 2002. Calculations are based on certain assumptions and have inherent limitations. The results of such calculations may or may not have reasonable predictive capabilities for a given situation and should only be interpreted by an informed user. Although each calculation in the spreadsheet has been verified with the results of hand calculation, there is no absolute guarantee of the accuracy of these calculations. Any questions, comments, concerns and suggestions or to report an error(s) in the spreadsheets, please send an email to David.Stroup@nrc.gov or Naeem.Iqbal@nrc.gov.

Prepared by:

Date:

Organization:

Checked by:

Date:

Organization:

Additional Information:



CHAPTER 10 ESTIMATING SPRINKLER RESPONSE TIME

Version 1805.1
(English Units)

The following calculations estimate the full-scale cable tray heat release rate.

Parameters in YELLOW CELLS are Entered by the User.

All subsequent output values are calculated by the spreadsheet and based on values specified in the input parameters. This spreadsheet is protected and secure to avoid errors due to a wrong entry in a cell(s). The chapter in the NUREG should be read before an analysis is made.

Project / Inspection
Title:

Smoke Detectors Bedroom (2)

INPUT PARAMETERS

Heat Release Rate of the Fire (Q) (Steady State)
Radial Distance to the Detector (r) ****never more than 0.707 or 1/2√2 of the listed spacing****
Height of Ceiling above Top of Fuel (H)
Activation Temperature of the Smoke Detector ($T_{\text{activation}}$)
Smoke Detector Response Time Index (RTI)
Ambient Air Temperature (T_a)

| | |
|--------|------------------------|
| 100.00 | kW |
| 30.00 | ft |
| 10.00 | ft |
| 86.00 | °F |
| 5.00 | (m-sec) ^{1/2} |
| 77.00 | °F |

Convective Heat Release Rate Fraction (χ_c)
Plume Leg Time Constant (C_{pl}) (Experimentally Determined)
Ceiling Jet Lag Time Constant (C_{cl}) (Experimentally Determined)
Temperature Rise of Gases Under the Ceiling (ΔT_c)
for Smoke Detector to Activate
r/H = 3.00

| |
|----------|
| 0.70 |
| 0.67 |
| 1.2 |
| 18.00 °F |

Calculate



CHAPTER 10 ESTIMATING SPRINKLER RESPONSE TIME

Version 1805.1
(English Units)

ESTIMATING SMOKE DETECTOR RESPONSE TIME METHOD OF ALPERT

Reference: NFPA Fire Protection Handbook, 19th Edition, 2003, Page 3-140.

$$t_{\text{activation}} = (RTI/(\sqrt{u_{\text{jet}}})) (\ln ((T_{\text{jet}} - T_a)/(T_{\text{jet}} - T_{\text{activation}})))$$

This method assume smoke detector is a low RTI device with a fixed activation temperature

Where

$t_{\text{activation}}$ = detector activation time (sec)

RTI = detector response time index (m-sec)^{1/2}

u_{jet} = ceiling jet velocity (m/sec)

T_{jet} = ceiling jet temperature (°C)

T_a = ambient air temperature (°C)

$T_{\text{activation}}$ = activation temperature of detector (°C)

Ceiling Jet Temperature Calculation

$$T_{\text{jet}} - T_a = 16.9 (Q)^{2/3} / H^{5/3}$$

for $r/H \leq 0.18$

$$T_{\text{jet}} - T_a = 5.38 (Q/r)^{2/3} / H$$

for $r/H > 0.18$

Where

T_{jet} = ceiling jet temperature (°C)

T_a = ambient air temperature (°C)

Q = heat release rate of the fire (kW)

H = height of ceiling above top of fuel (m)

r = radial distance from the plume centerline to the detector (m)

Convective Heat Release Rate Calculation

$$Q_c = \chi_c Q$$

Where

Q_c = convective portion of the heat release rate (kW)

Q = heat release rate of the fire (kW)

χ_c = convective heat release rate fraction

$$Q_c =$$

70 kW



CHAPTER 10 ESTIMATING SPRINKLER RESPONSE TIME

Version 1805.1
(English Units)

Radial Distance to Ceiling Height Ratio Calculation

$$\begin{aligned}
 r/H &= 3.00 & r/H > 0.18 \\
 &>0.18 & 8.70 & <0.18 & 56.82 \\
 T_{jet} - T_a &= 5.38 ((Q/r)^{2/3})/H \\
 T_{jet} - T_a &= 8.70 \\
 T_{jet} &= 33.70 \text{ (}^\circ\text{C)}
 \end{aligned}$$

Ceiling Jet Velocity Calculation

$$\begin{aligned}
 u_{jet} &= 0.96 (Q/H)^{1/3} & \text{for } r/H \leq 0.15 \\
 u_{jet} &= (0.195 Q^{1/3} H^{1/2})/r^{5/6} & \text{for } r/H > 0.15
 \end{aligned}$$

Where

u_{jet} = ceiling jet velocity (m/sec)

Q = heat release rate of the fire (kW)

H = height of ceiling above top of fuel (m)

r = radial distance from the plume centerline to the detector (m)

Radial Distance to Ceiling Height Ratio Calculation

$$\begin{aligned}
 r/H &= 3.00 & r/H > 0.15 \\
 &>0.15 & 0.25 & <0.15 & 3.07 \\
 u_{jet} &= (0.195 Q^{1/3} H^{1/2})/r^{5/6} \\
 u_{jet} &= 0.250 & \text{m/sec}
 \end{aligned}$$

Smoke Detector Response Time Calculation

$$t_{activation} = (RTI/(\sqrt{u_{jet}})) (\ln (T_{jet} - T_a)/(T_{jet} - T_{activation}))$$

$$t_{activation} = 8.56 \text{ sec}$$

NOTE: If $t_{activation} = \text{"NUM"}$ Detector does not activate



CHAPTER 10 ESTIMATING SPRINKLER RESPONSE TIME

Version 1805.1
(English Units)

METHOD OF MOWRER

References: Mowrer, F., "Lag Times Associated With Fire Detection and Suppression," *Fire Technology*, August 1990, p. 244.

$$t_{\text{activation}} = t_{\text{pl}} + t_{\text{cj}}$$

Where

$t_{\text{activation}}$ = detector activation time (sec)

t_{pl} = transport lag time of plume (sec)

t_{cj} = transport lag time of ceiling jet (sec)

Transport Lag Time of Plume Calculation

$$t_{\text{pl}} = C_{\text{pl}} (H)^{4/3} / (Q)^{1/3}$$

Where

t_{pl} = t_{pl} = transport lag time of plume (sec)

C_{pl} = C_{pl} = plume lag time constant

H = H = height of ceiling above top of fuel (m)

Q = Q = heat release rate of the fire (kW)

$$t_{\text{pl}} = 0.64 \text{ sec}$$

Transport Lag Time of Ceiling Jet Calculation

$$t_{\text{cj}} = (r)^{11/6} / (C_{\text{cj}} (Q)^{1/3} (H)^{1/2})$$

Where

t_{cj} = t_{cj} = transport lag time of ceiling jet (sec)

C_{cj} = C_{cj} = ceiling jet lag time constant

r = r = radial distance from the plume centerline to the detector (m)

H = H = height of ceiling above top of fuel (m)

Q = Q = heat release rate of the fire (kW)

$$t_{\text{cj}} = 5.95 \text{ sec}$$

Smoke Detector Response Time Calculation

$$t_{\text{activation}} = t_{\text{pl}} + t_{\text{cj}}$$

$$t_{\text{activation}} = 6.58 \text{ sec}$$



CHAPTER 10 ESTIMATING SPRINKLER RESPONSE TIME

Version 1805.1
(English Units)

METHOD OF MILKE

References: Milke, J., "Smoke Management for Covered Malls and Atria," *Fire Technology*, August 1990, p. 223.
NFPA 92B, "Guide for Smoke Management Systems in Mall, Atria, and Large Areas," 2000 Edition, Section A.3.4.

$$t_{\text{activation}} = X H^{4/3} / Q^{1/3}$$

Where

$t_{\text{activation}}$ = detector activation time (sec)

$$X = 4.6 \cdot 10^{-4} Y^2 + 2.7 \cdot 10^{-15} Y^6$$

H = height of ceiling above top of fuel (ft)

Q = heat release rate from steady fire (Btu/sec)

Where

$$Y = \Delta T_c H^{5/3} / Q^{2/3}$$

ΔT_c = ΔT_c = temperature rise of gases under the ceiling for smoke detector to activate (°F)

Before estimating smoke detector response time, stratification effects can be calculated.

NFPA 92B, 2000 Edition, Section A.3.4 provides following correlation to estimate smoke stratification in a compartment.

$$H_{\text{max}} = 74 Q_c^{2/5} / \Delta T_{f \rightarrow c}^{3/5}$$

Where

H_{max} = H_{max} = the maximum ceiling clearance to which a plume can rise (ft)

Q_c = Q_c = convective portion of the heat release rate (Btu/sec)

$\Delta T_{f \rightarrow c}$ = $\Delta T_{f \rightarrow c}$ = difference in temperature due to fire between the fuel location and ceiling level (°F)

Convective Heat Release Rate Calculation

$$Q_c = Q \chi_c$$

Where

Q_c = convective portion of the heat release rate (Btu/sec)

Q = heat release rate of the fire (Btu/sec)

χ_c = convective heat release rate fraction

$$Q_c = 66.35 \text{ Btu/sec}$$



CHAPTER 10 ESTIMATING SPRINKLER RESPONSE TIME

Version 1805.1
(English Units)

Difference in Temperature Due to Fire Between the Fuel Location and Ceiling Level

$$\Delta T_{f \rightarrow c} = 1300 Q_c^{2/3} / H^{5/3}$$

Where

$\Delta T_{f \rightarrow c}$ = difference in temperature due to fire between the fuel location and ceiling level (°F)

Q_c = convective portion of the heat release rate (Btu/sec)

H = ceiling height above the fire source (ft)

$$\Delta T_{f \rightarrow c} = 459.01 \text{ } ^\circ\text{F}$$

Smoke Stratification Effects

$$H_{\max} = 74 Q_c^{2/5} / \Delta T_{f \rightarrow c}^{3/5}$$

$$H_{\max} = 10.02 \text{ ft}$$

In this case the highest point of smoke rise is estimated to be

10.02 ft

Thus, the smoke would be expected to reach the ceiling mounted smoke detector.

$$Y = \Delta T_c H^{5/3} / Q^{2/3}$$

$$Y = 40.19$$

$$X = 4.6 \cdot 10^{-4} Y^2 + 2.7 \cdot 10^{-15} Y^6$$

$$X = 0.74$$

Smoke Detector Response Time Calculation

$$t_{\text{activation}} = X H^{4/3} / Q^{1/3}$$

$$t_{\text{activation}} = 3.51 \text{ sec}$$



CHAPTER 10 ESTIMATING SPRINKLER RESPONSE TIME

Version 1805.1
(English Units)

| | Calculation Method | Smoke Detector Response Time (sec) |
|--------------------|--------------------|------------------------------------|
| Summary of Results | METHOD OF ALPERT | 8.56 |
| | METHOD OF MOWRER | 6.58 |
| | METHOD OF MILKE | 3.51 |

NOTE:

The above calculations are based on principles developed in the SFPE Handbook of Fire Protection Engineering, 3rd Edition, 2002. Calculations are based on certain assumptions and have inherent limitations. The results of such calculations may or may not have reasonable predictive capabilities for a given situation and should only be interpreted by an informed user. Although each calculation in the spreadsheet has been verified with the results of hand calculation, there is no absolute guarantee of the accuracy of these calculations. Any questions, comments, concerns and suggestions or to report an error(s) in the spreadsheets, please send an email to David.Stroup@nrc.gov or Naeem.Iqbal@nrc.gov.

Prepared by:

Date:

Organization:

Checked by:

Date:

Organization:



Additional Information:

Appendix I – Fire Alarm Equipment Data Sheets

FireFinder™ XLSV

Digital Emergency Voice Alarm / Communication System

ARCHITECT AND ENGINEER SPECIFICATIONS

- Eight (8) digital audio channels
- Live and pre-recorded message capability
- Warden's page
- Modular design
- 25 or 70VRMS audio signals
- Central or distributed amplification
- Flexible system architecture
- Style Y (Class B) or Z (Class A) speaker circuits
- LED annunciator modules
- Style Y or Z audio risers
- High-quality amplifiers
- Back-up amplification
- Selectable tones with backup, auxiliary audio input
- Remote, intelligent audio, strobe and telephone-zone modules
- Optional firefighters' telephone system
- Separate call-in & telephone zone-fault indication
- Fan-control modules
- Custom recordable messages
- Background music and convenience paging
- Seismic Certified
-  UL864 9th Edition Listed &  ULC Listed;
FM, CSFM & NYMEA Approved



System Overview

The FireFinder XLSV is a digital emergency, voice-alarm and communication system designed to be used with the Siemens — Fire Safety FireFinder XLS Life-Safety System. XLSV is programmed via a Windows® laptop computer, using the ZEUS software application.

XLSV will respond rapidly to either automatic or manual commands from system logic or switch modules located on the command console(s). Digital audio signals, such as: *Evacuation 1*, *Evacuation 2*, *Alert 1*, *Alert 2*, or *Page* can be routed to any number of speaker circuits. A wide selection of microcontroller-controlled tones with backup is available.

One (1) or more notification-appliance circuits (NACs) can be mapped to switches through the Zeus Windows-based programming software. Switches can be used to manually activate or deactivate any zone. Through the use of multicolor LEDs, a clear indication is provided to show which zones are active and linked to the respective audio channel.

The Live Voice Module (Model LVM) includes a dynamic microphone with a push-to-talk switch and ready-to-page indicator light, as well as a small local speaker and volume control for monitoring audio signals.

An optional, pre-announce tone is also available.

FireFinder™ XLSV 6340

System Overview – (continued)

In addition, the XLSV panel meets current NFPA code requirements by providing another two (2) digital audio channels that are available for background music and convenience paging.

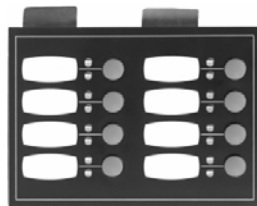
As an option, the system can provide a Firefighters' Telephone with both an *acknowledge* tone and *busy* signal. Clear indication is provided at the command console as to which telephone zones are active. The Firefighters' Master Telephone provides a **red**, master telephone with retractable coil cord and push-to-talk button.

Remote paging can be provided from any telephone zone (warden's page) with selection at the command console. In addition, specific telephone zones can be pre-selected as automatic page zones on a selective or 'all-call' basis.

Speaker zones are selectable for either 25 Volt or 70.7 Volt operation, as well as either Style Y (Class B) or Style Z (Class A) wiring configuration. Strobe circuits may also be wired as Style Y or Style Z.

Speaker, strobe and firefighters' telephone zones can be provided as either modules or plug-in type cards, installed in the main enclosure or remote voice system transponders. The cards are plugged into the standard XLS Model CC-5 / CC-2 card cages.

The XLS Control Point Module (Model HCP) can also be used to provide a remote telephone zone, speaker zone or notification appliance circuit.



SCM-8

SCM-8 Switch Control Module

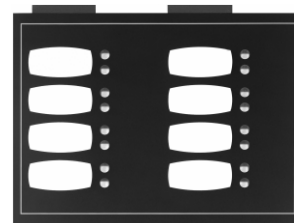
Model SCM-8 is a FireFinder XLS-option module, which provides manual control of the Emergency Voice Evacuation System or manual fire system control. Each Model SCM-8 module provides eight (8) momentary push-button switches and 16 LEDs to indicate their status. Each switch is assigned two (2) LEDs and a label to indicate the Model SCM-8 switch's programmed usage.

The label slides behind a clear, protective membrane, and one of the LEDs assigned to each switch is a dual-color LED used to indicate what type of signal is active. Each Model SCM-8 and switch is fully programmable, and may be used to control speaker circuits and a wide range of general-system functions such as: *All Call*, *All Evac*, *Warden's Page*, *Speaker*, etc.

Any number of circuits may be grouped and controlled by a single switch. Switch usage and zone groupings are assigned using the Zeus programming software.

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Each Model SCM-8 is mounted on a hinged panel, as part of the FireFinder XLS Command Console enclosure.

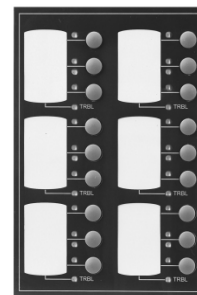


LCM-8

LCM-8 LED Control Module

Model LCM-8 is a FireFinder XLS option module that provides LED annunciation for system activity. Each Model LCM-8 module contains eight (8) groups of two (2) LEDs – each of which can be assigned to desired outputs using the ZEUS programming software. Eight (8) LEDs are dual-color capable of being lighted either **Red-or-green flashing** or **Steady**. The remaining LEDs are **Amber-flashing** or **Steady**. A space is provided for labeling of LED functions.

The label slides behind a clear, protective membrane. Model LCM-8 dimensions are identical to Model SCM-8, and Model LCM-8 is mounted on the same hinged panel as a part of the FireFinder XLS Command Console enclosure.



FCM-6

FCM-6 Fan, Damper Control Module

Model FCM-6 is a FireFinder XLS command console option module that provides manual control of building HVAC system fans and dampers. Each Model FCM-6 module provides six (6) sets of three (3) push-button switches for manual system control. Each switch has three (3) associated LEDs to indicate Fan / Damper / Motor status: **Off (Red LED)**, **On (Green LED)**, **Trouble (Yellow LED)**.



LVM

LVM Live Voice Module

Model LVM provides a supervised, high-quality and dynamic microphone as a means of sending live voice messages to specified audio zones. Model LVM mounts on the inner door of a Model CAB1, Model CAB2, Model CAB3 or remote lobby enclosure. Model LVM includes a microphone with a push-to-talk switch and retractable coiled cord. The microphone and push-to-talk switch are fully supervised.

Model LVM also provides a **green** pre-announce LED that indicates the pre-announce signal is active at the selected zones and a **green** ready to page LED, which indicates selected zones are ready to be paged. The pre-announce signal can be programmed as a tone or message and the duration is adjustable from 0 to 10 seconds in one-second increments. A built-in speaker with volume control allows the monitoring of the audio channels.

The front panel of Model LVM contains six (6) switches and six (6) pairs of LEDs. Each pair contains one (1) dual-color (**red / green**) and one **yellow** LED. These switches can be programmed for manual voice functions as well as generic system functions. When the switches are used as generic switches, all LEDs can be programmed for ON, OFF or FLASHING.



DAC-NET

DAC-NET Digital Audio Card

Model DAC-NET provides the audio source for the FireFinder XLS Voice Evacuation System, as well as D-NET network communication to and from Model PMI and between enclosures. Model DAC-NET is able to transmit eight (8) digital channels of audio, via two (2) pairs of wire.

One (1) Model DAC-NET is required in each XLS Voice enclosure. A maximum of 32 Model DAC-NET cards are allowed on a single XLS FireFinder system. Model DAC-NET can be wired Class A (Style 7) (four [4] pairs of wires) or Class B (Style 4) (two [2] pairs of wires). Model DAC-NET card plugs into one (1) slot in the Model CC-5 or CC-2 card cage, and has on-board LEDs for system status and troubleshooting.

Indication of power, communication, internal operation, ground fault, and trouble conditions are provided. Model DAC-NET Card contains an on-board microprocessor that provides communication with switch modules, LED modules, microphone, telephone zone cards, and zone amplifiers across the Control Area Network CAN Bus.

Model DAC-NET can supervise up to 99 CAN address modules, and contains on-board tones and pre-recorded EVAC and ALERT messages. In addition, custom messages or tones can be downloaded to the DAC-NET using the XLS software tool, ZEUS, for a total of five (5) minutes of storage memory.

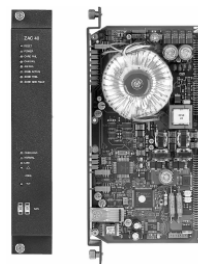


LPB

LPB Local Page Board

The Local Page Board (Model LPB) is used to connect the microphone — mounted inside the Live Voice Module (Model LVM) — and the voice-internal telephone system. Model LPB is a plug-on board to Model DAC-NET, and converts the two (2) analog input signals into the system's internal digital format.

Up to five (5) Model LVMs can be connected to Model LPB. Additionally, Model LPB provides one (1) analog output to connect to the monitor speaker, which is mounted inside Model LVM. The one (1) analog output is one (1) of eight (8) voice-internal audio channels selectable at the XLSV fire-alarm panel.



ZAC-40

ZAC-40 Zone Amplifier Card (40 Watt)

Model ZAC-40 is a combination 40-watt, amplifier / speaker zone for use with FireFinder XLS. Style Y, Z or "A / B" speaker-zone wiring configurations are supported. Model ZAC-40 is power limited, and can be configured to provide 40 watts of audio at 25VRMS or 70VRMS. Model ZAC-40 is a plug-in card that mounts in a Model CC-5 or CC-2 card cage.

Model ZAC-40 is capable of amplifying any of the eight (8) digital audio channels that are transmitted from Model DAC-NET, via the digital audio bus: Model ASI (Audio Serial Interface).

Model ZAC-40 is supervised for functionality, and provides a single, 40-watt speaker zone that supports two (2) speaker circuits. Model ZAC-40 can be used for (1) one-to-eight (8) channel applications, or as a bulk amplifier for (1) one-or-two (2) channel applications — feeding high-level audio to Models ZIC-4A and ZIC-8B. Model ZAC-40 can also be used for single-channel applications feeding high-level audio to Model HCP.



ZAM -180

ZAM-180 Zone Amplifier Module (180 Watt)

Model ZAM-180 is a combination 180-watt, amplifier / speaker zone for use with FireFinder XLS. Style Y or Z speaker-zone wiring is supported, as well as split-zone (A / B) speaker zone wiring configurations on Style "Y".

Model ZAM-180 can be configured to provide 150 watts of audio at 25VRMS or 180 watts of audio at 70VRMS.

Model ZAM-180 mounts in one (1) module space directly on the back box or optional Model CAB-MP mounting plate. Model ZAM-180 is capable of amplifying any one (1) of the eight (8) digital-audio channels that are transmitted from Model DAC-NET (Digital Audio Card), via the digital audio bus: Model ASI (Audio Serial Interface). Model ZAM-180 amplifier is supervised for functionality.

Model ZAM-180 can be used as a single 180 Watt speaker zone for (1) one-to-eight (8) channel applications or as a bulk amplifier for (1) one-or-two (2) channel applications feeding high-level audio to Model ZIC-4A or Model ZIC-8B.



FMT

FMT Fireman's Master Telephone

Model FMT provides firefighters with an emergency telephone system for communication with remote locations. Model FMT mounts to the rear of the inner door of a Model CAB 1, Model CAB2, Model CAB3, or Model REMBOX4 Enclosure. Model FMT includes a handset for the operator of the telephone system.

The XLSV firefighters' telephone unit is designed for maximum performance in communication. The circuitry for Model FMT allows the master telephone and, at least five (5) telephone stations, to be off hook simultaneously with no degradation of audio quality.

Model FMT also supports a 'warden's page' function, which allows live voice announcements from any remote telephone. Telephone zone call-ins are annunciated on the appropriate Model SCM-8 switch module.

Remote stations receive an *acknowledge* tone when dialing into the command center prior to the call being answered, indicating a call-in in progress and a busy tone if calling into the command center and another telephone zone is already on line.

Diagnostic LEDs are located on the back of Model FMT to indicate power is applied to the module and failure of the card, CAN communication or phone.



TZC-8B

TZC-8B Firefighter's Telephone Zone Card

Model TZC-8B provides a way for emergency-response personnel located throughout a building to speak to one another during emergency situations.

Model TZC-8B is a FireFinder XLSV option module that plugs into a Model CC-2 or CC-5 card cage, providing eight (8) firefighters telephone zones. The zones have an off-hook acknowledge tone, as well as a command-console 'busy' tone.

Each telephone zone uses a single pair of wires, and is individually supervised in a Class B type mode. Field wires are connected to one or more phone jacks or stations. Zones are also individually power limited, per NEC 760, and each zone also contains transient protection.


A maximum five (5) telephone stations may be off-hook simultaneously in a party line mode with no loss of audio quality.



HCP

HCP Control Point Module

Model HCP provides an intelligent control point for the FireFinder XLS Control Panel. Model HCP can be programmed as an independent, remotely located telephone zone, speaker zone or notification appliance circuit.

Model HCP is designed to be used with the Siemens — Fire Safety notification-appliance circuits (NACs) product line. Model HCP communicates through the Model DLC analog loop and can be wired — either Class A (Style Z) or Class B (Style Y). The 24 VDC power input comes from either the control panel or from any UL Listed, power-limited auxiliary power supply.



AIC

AIC Audio Input Card

The Audio Input Card (Model AIC) provides two (2) external, isolated analog inputs to the FireFinder XLS voice system. Model AIC also provides two (2) dry-contact inputs, used to separately activate the two (2) audio inputs. The two (2) external, isolated analog inputs connect to the voice system for external sources, such as: tape recorder, CD player, PBX interface (for convenience paging from the telephone system).

The two (2) dry-contact inputs can activate the two (2) audio inputs separately. The aforementioned connectivity permits each input to be controlled automatically, via system logic or manually through switches on the voice control panel.

The maximum number of Model AIC cards on a single FireFinder XLSV System (single node) is two.



PFT

Portable Firefighter's Telephones

Portable Firefighters' Telephones (Models PFT and PFT-P) are available for field connection to the emergency telephone system. Each phone consists of a rugged, high-impact plastic handset with a red, coiled phone cord attached to the PFT. A 1/4" phone-plug assembly is attached to the end of the phone cord for connection to the field-mounted phone jacks.

Model PFT-P includes a momentary spring-action, push-to-talk switch mounted in the handset. Hence, Model PFT-P allows users to depress the button to activate the mouthpiece of the handset when speaking, in order to reduce background noise on the system.

The Model MTE-2 Telephone Enclosure includes the enclosure and door with clear lens, and can be used to store a maximum six PFT or PFT-P telephone handsets in a locked cabinet.

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FJ-304

Remote Telephone Jacks

Remote Telephone Jacks, (Models FJ-303, FJ-303SS, FJ-304, and FJ-304SS) which are connected to the emergency telephone system, are wired to the telephone zone circuits on the Model TZC-8B Telephone Zone Card, located in the FireFinder XLS system enclosure. There is no limit to the number of remote telephone jacks that can be connected to a single telephone zone circuit. The remote telephone jacks are mounted to a single-gang electrical box.

Models FJ-303 and FJ-303SS have flying leads connected to the phone jack, while Models FJ-304 and FJ-304SS have screw terminals. Models FJ-303 and FJ-304 have a red-baked, enamel finish with a white, silk-screened telephone handset icon, and Models FJ-303SS and FJ-304SS have a brushed, stainless-steel finish with the handset icon.



FB-300 with FTS

Remote Telephone Stations

Remote telephone stations for the emergency telephone system consist of a handset / hook assembly, a wall-mounted back box, and a locked door with a breakable glass panel. Models FTS, FTS-P, FTS-C, FTS-CL, and FTS-PLC Remote Telephone Stations consist of a handset (similar to the PFT), a back plate, handset cradle with magnetic switch mounted to the back plate, and a connection cable from the handset to the back plate.

The -P designates that a momentary, push-to-talk button is included in the handset. The -C designates that an armored cable is used in place of a coiled retractable cord between the handset and the back plate. The 'L' designates that an integral LED is mounted to the back plate to indicate two-way communication is established between the phone and Model FMT.

Remote Telephone Stations – (continued)

The remote telephone station must be used with either the FB-300 or FB-301S remote telephone-station back box. The FB-300 is used for flush-mount configurations, and the FB301S is used for surface-mount configurations. The remote station / back box assembly also requires the FC-300S cover with key-lock door and breakable glass.



FT-GLS

Additional replacement glass for the FC300S is available as the Model FT-GLS.



ALCC

Audio Level Conversion Card

FM approval pending, the Audio Level Conversion Card (Model ALCC) provides the capability of conducting a global-emergency page across multiple, remote FireFinder XLSV nodes with each audio riser holding a maximum of 63 nodes. The emergency page originates at a FireFinder XLSV or MXLV global-paging station, where it is broadcast at 70VRMS over an audio riser by Model ZAC-40 (FireFinder XLSV) or Model ZAC-30 (MXLV) amplifier.

Temperature and Humidity Range

Products are @UL 864 9th Edition listed for indoor dry locations within a temperature range of 120+/-3°F (49+/-2°C) to 32+/-3°F (0+/-2°C) and at a relative humidity of 93+/-2% at a temperature of 90+/-3°F (32+/-2°C).

Details for Ordering

| Model Number | Part Number | Description |
|--------------|-------------|---|
| AIC | 500-035300 | Audio-Input Card |
| DAC-NET | 500-035100 | Digital Audio Card |
| FB-300 | 500-680587 | Remote Telephone Stations |
| FCM-6 | 500-033140 | Fan Control Module Switches (On / Off / Auto) |
| FJ-304 | 500-692670 | Remote Telephone Jacks |
| FMT | 500-034100 | Fireman's Master Telephone |
| HCP | 500-034860 | Intelligent Control Point |
| LCM-8 | 500-033100 | LED Annunciator Module (8 LED Sets) |
| LPB | 500-035200 | Local Page Board |
| LVM | 500-034090 | Live Voice Module |
| PFT | 500-699427 | Portable Firefighters' Telephones |
| PMI | 500-033070 | Operator Interface/ System CPU |
| SCM-8 | 500-033040 | Switch Module (8 Switches) |
| TZC-8B | 500-034110 | Firefighter's Telephone Zone Card |
| ZAC-40 | 500-035400 | Zone Amplifier Card (40 Watt) |
| ZAM-180 | 500-035600 | Zone Amplifier Module (180 Watt) |
| ALCC | 500-650127 | Audio Level Conversion Card |

Note: Equipment for FireFinder XLSV is listed and approved as part of the FireFinder XLS system.

- See data sheet: 6300 for ordering information on additional FireFinder XLS equipment.



Notice: This marketing data sheet is not intended to be used for system design or installation purposes. For the most up-to-date information, refer to each product's installation instructions.

FireFinder™ XLS

Fire Alarm Enclosures & Equipment

Models: CAB1, CAB-BATT, CAB-BATT-R, CAB2-BB, CAB2-BD, CAB3-BB, CAB3-BD, CAB-MP, ID-MP, ID-SP, ID-FP, BCM, OD-LP, OD-BP, OD-GP, REMBOX2, REMBOX4, XLS-MLE6-ADPT, XLS-MME3-ADPT, XLS-MSE2-ADPT, XLS-MSE3-ADPT and XLS-RCC13F-ADPT

ARCHITECT AND ENGINEER SPECIFICATIONS

- One (1), two (2), and (3) three-row enclosures for the FireFinder XLS system
- Blank plates for inner and outer doors
- Lens and grill plates for outer door
-  UL 864 9th Edition Listed and  ULC Listed; FM, CSFM & NYMEA Approved



CAB1



CAB2



CAB3

Product Overview

The FireFinder XLS fire alarm enclosures (Models CAB1, CAB2, and CAB3) and their accessories provide a complete set of hardware for mounting all FireFinder XLS main system and remote transponder cards and modules.

The hardware allows the FireFinder XLS system to be configured for a wide variety of applications, and allows for future system upgrades. Included in the enclosure series are backbox and door sets, removable mounting plates and clear lenses, louvered ventilation grill plates, and blank plates for use with the enclosure doors.

All enclosures come with ground straps for the inner and outer doors, shield termination lugs, grounding lugs, and tie wrap lances for securing wire. All enclosures can also mount system backup batteries up to 31AH in capacity.

Enclosures, Doors & Plates

CAB1 – Single-Row Enclosure

Model CAB1, the smallest of the FireFinder XLS enclosures, can house a single Model CAB-MP cabinet mounting plate for mounting card cages, power supplies and bulk amplifiers. Model CAB1 also has four (4) mounting slots on the inner door for mounting a Model PMI interface and Model ID-MP switch module brackets.

Model CAB1 comes complete with a black back box, with black inner and outer doors, a single lock and key set on the outer door, and a single OD-LP outer door lens plate (installed). A red version (Model CAB1-R) is also available. Approximate size is 27" (68.6cm.) high, 26" (66cm.) wide, and 8" (20.3cm.) deep.

Enclosures, Doors & Plates – (cont.'d)



CAB1 Enclosure

CAB2 – Two-Row Enclosure

Model CAB2 is the mid-sized FireFinder XLS enclosure capable of housing a maximum two (2) Model CAB-MP cabinet mounting plates. The inner door has two (2) rows of four (4) mounting slots. The outer door has space for mounting two (2) outer door plates (Models OD-LP, OD-BP or OD-GP). The outer door can be configured to open from either side. Model CAB2 consists of the Model CAB2-BB back box; the Model CAB2-BD black inner and outer door package, and one (1) Model OD-LP lens plate. The outer door has a single lock and key set installed. Red doors are available in Model CAB2-RD. Additional door mounting plates must be ordered separately. Approximate size is 45" (114.3cm.) high, 26" (66cm.) wide, and 8" (20.3cm.) deep.



CAB2 Enclosure

CAB3 – Three-Row Enclosure

Model CAB3, the largest single FireFinder XLS enclosure available, can house a maximum three (3) Model CAB-MP cabinet mounting plates in the enclosure, and three (3) rows of inner door mounting slots. The outer door can be configured to open from either side. Model CAB3 consists of the Model CAB3-BB back box; the Model CAB3-BD black inner and outer door package, and one (1) Model OD-LP lens plate. The outer door has two (2) locks and key sets installed. Red doors are available via Model CAB3-RD.

Additional door mounting plates must be ordered separately. Approximate size is 63" (160cm.) high, 26" (66cm.) wide, and 8" (20.3cm.) deep.



CAB3 Enclosure

Enclosure Trim Kits

Trim kits are available for all system enclosures for semi-flush mounting applications. Model CAB1-TK (for black enclosures) and Model CAB1R-TK (for red enclosures) fit Models CAB1 and CAB1-R enclosures. Similarly, Models CAB2-TK and CAB2R-TK fit the Model CAB2 enclosure, and Models CAB3-TK and CAB3R-TK fit the Model CAB-3 enclosure.

Door Remote Transponders

The FireFinder XLS system can use remote transponders for mounting additional modules such as amplifiers without requiring a Model PMI or any control switches. Special doors are available for systems using Model CAB2 or Model CAB3 remote transponders. These doors, Models CAB2-XBD and CAB3-XBD, omit the unused inner door and come complete with ventilation louvers built into the door. Model CAB2-XBD fits on Model CAB2-BB, and Model CAB3-XBD fits on Model CAB3-BB. The transponder doors are supplied in black.

Complete box and door kits are available as Models CAB2-X and CAB3-X.



CAB2-XBD Door



CAB3-XBD Door

OD-GP – Outer-Door Grill Plate

Model OD-GP also covers an entire row on the outer door of a system cabinet, but has four rows of ventilation louvers on it. Model OD-GP is mounted in front of system bulk amplifiers, card amplifiers, or other modules that generate heat. Using Model OD-GP will permit airflow across these modules to aid in heat dissipation. A single grill plate is included with each Model OG-GP.



OD-GP

Remote System Enclosures

Models REMBOX2 and REMBOX4 are FireFinder XLS system enclosures that are used for remotely mounting inner-door modules, such as the Model PMI interface, switch modules, Model LVM live-voice modules, and Model FMT Firefighters' Master Telephone modules.

Enclosures, Doors & Plates — (cont.'d)

REMBOX4 are FireFinder XLS system are thinner than the regular CAB enclosures (just 5" deep overall), and are perfect for mounting in places where space is limited (such as lobbies or behind a receptionist's desk).

Due to their smaller depth, no card cages, power supplies or bulk amplifiers can be mounted in a REMBOX. However, modules such as the Remote Network Interface Module (Model RNI); the Output-Control Module (Model OCM-16) and the Supervised Input Module (Model SIM-16) can be mounted in a REMBOX. Due to the depth of the live-voice module and the firefighters' master telephone, no Model OCM-16 or Model SIM-16 modules can be used simultaneously with Model LVM or Model FMT.

Both Models REMBOX2 and REMBOX4 are designed for flush mounting with no trim kit required. Both enclosures also come with a clear lens plate on the cover.

REMBOX2 – Two-Module Remote Enclosure

Model REMBOX2 has two (2) inner door module spaces, and can hold a single Model PMI, up to two (2) switch module brackets, one (1) Model LVM live voice module. Combinations are also allowed. Model REMBOX2 can also mount a single Model RNI on a bracket included in the backbox. A bracket (Model REMBOX2-MP) can be used to mount up to four (4) Model OCM-16s or Model SIM-16 enclosures. Model REMBOX2-MP must be purchased separately. Approximate size of Model REMBOX2 is 14-1/2" (36.8cm.) wide, 18-1/2" (47cm.) high and 5" (12.7cm.) deep.



REMBOX2
(with doors closed)



REMBOX2
(with doors open)

Note: A red, (2) two-module remote lobby enclosure (Model REMBOX2R) is also available.

REMBOX4 – Four-Module Remote Enclosures

Model REMBOX4 has space for mounting four (4) inner door modules. Any combination of Model PMI (two-module spaces), switch module brackets, Model LVM or Model FMT (one-module space each) can be used. Unused module spaces can be covered with Model ID-SP blank plates.

Model REMBOX4 can also mount to a single Model RNI on a bracket included in the backbox. A bracket known as Model REMBOX4-MP can be used to mount a maximum eight (8) Model OCM-16s or Model SIM-16s. Model REMBOX4-MP must be purchased separately. Approximate size of Model REMBOX4 is 24" (61cm.) wide, 18-1/2" (47cm.) high and 5" (12.7cm.) deep.



REMBOX4
(with doors closed)



REMBOX4
(with doors open)

Note: A red, (4) four-module remote lobby enclosure (Model REMBOX4R) is also available.

CAB-MP – Cabinet Mounting Plate

The cabinet mounting plate (Model CAB-MP) provides mounting for a single row of modules in a FireFinder XLS cabinet. Four (4)-module spaces are available on Model CAB-MP. Model CAB-MP is used to mount the Model CC-5 card cage, the Model CC-2 card cage, the Model PSC-12 power supply, the Model PSX-12 power supply extender, and the Model ZAM-80 / 180 zone amplifiers.



CAB-MP

ID-MP – Inner Door Mounting Plate

The inner door mounting plate (Model ID-MP) is mounted on the inner door of a CAB enclosure. Model ID-MP plates are used to mount Model SCM-8 switch control modules; Model LCM-8 LED control modules, or with Model FCM-6.

Four (4) mounting plates are included in each Model ID-MP. Each mounting plate has four (4) spaces for control modules, and can hold either four (4) Model SCM-8 modules {one [1] control module space each}; four (4) Model LCM-8 modules {one [1] control module space each}; or two (2) Model FCM-6 modules {two [2] module spaces each}.

Combinations are also allowed. Blank spaces in Model ID-MP can be covered using the Model BCM blank control module plate. A maximum four (4) Model ID-MP plates can be mounted in a single row on the inner door.



ID-MP

Enclosures, Doors & Plates — (cont.'d)

ID-SP – Inner-Door Single Blank Plate

Model ID-SP is used to cover any single module blank spaces on the inner door not used to mount the Model PMI or a Model ID-MP. Up to four (4) Model ID-SP plates can be mounted in a single row on the inner door. Two (2) blank plates are included in each Model ID-SP.



ID-SP

ID-FP – Inner-Door Full Blank Plate

Model ID-FP, which is a blank plate that covers the full opening of the row on an inner door, is used for applications requiring full dead-front protection. A single full blank plate is included with Model ID-FP.

BCM – Blank Control Module plate

Model BCM is used on Model ID-MP to cover any blank areas where control modules are not used. A maximum four (4) Model BCM plates can be mounted on a single Model ID-MP. Four (4), blank-module plates are included in each Model BCM.



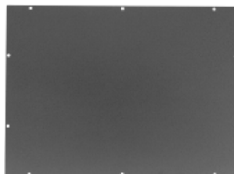
BCM

OD-LP – Outer Door Lens Plate

Model OD-LP is a clear plastic lens plate mounted on the outer door of a system cabinet. Model OD-LP is used to allow operators to see the system interface and controls mounted on the inner door, but restricts access to unauthorized users. Model OD-LP covers an entire row on the outer door. A single lens plate is included with each Model OD-LP.

OD-BP – Outer-Door Blank Plate

Model OD-BP is used to cover an entire row on the outer door of a system cabinet. Model OD-BP is used when there is no Model PMI or control modules mounted on the adjacent row of the inner door. A single blank plate is included in each Model OD-BP.



OD-BP

XLS-MSE2/R-ADPT – XLS MSE-2/R Enclosure Adapter

Model XLS-MSE2-ADPT, which must be used in conjunction with Model CAB-MP, is an adapter that allows FireFinder XLS cards to be mounted in older-generation MXL Model MSE-2 small black enclosures.

Model XLS-MSE2R-ADPT, which must be used in conjunction with Model CAB-MP, is an adapter that allows FireFinder XLS cards to be mounted in older-generation MXL Model MSE-2R small red enclosures.



XLS-MSE2-ADPT

XLS-MME3/R-ADPT – XLS MME-3/R or MBR-2 Enclosure Adapters

Model XLS-MME3-ADPT, which must be used in conjunction with Model CAB-MP, is an adapter that allows FireFinder XLS cards to be mounted in older-generation MXL Model MME-3 or Model MBR-2 medium black enclosures.

Model XLS-MME3R-ADPT, which must be used in conjunction with Model CAB-MP, is an adapter that allows FireFinder XLS cards to be mounted in older-generation MXL Model MME-3R medium red enclosures.

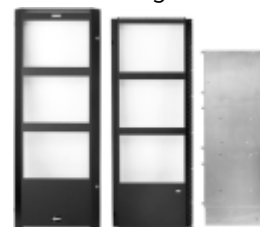


XLS-MME3-ADPT

XLS-MLE6/R-ADPT – XLS MLE-6/R Enclosure Adapter

Model XLS-MLE6-ADPT, which must be used in conjunction with Model CAB-MP, is an adapter that allows FireFinder XLS cards to be mounted in older-generation MXL Model MLE-6 large black enclosures.

Model XLS-MLE6R-ADPT, which must be used in conjunction with Model CAB-MP, is an adapter that allows FireFinder XLS cards to be mounted in older-generation MXL MLE-6R large red enclosures.



XLS-MLE6-ADPT

Enclosures, Doors & Plates – (cont.'d)

XLS-MSE3/R-ADPT – XLS MSE-3L/R or MSE-3M/R Enclosure Adapters

Model XLS-MSE3-ADPT is an adapter that allows FireFinder XLS cards to be mounted in the older generation MXL-IQ Model MSE-3L or Model MSE-3M black enclosure.

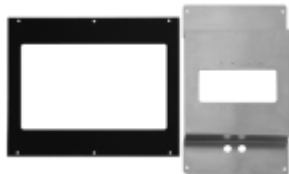
Model XLS-MSE3R-ADPT is an adapter that allows FireFinder XLS cards to be mounted in the older generation MXL-IQ Model MSE-3LR or Model MSE-3MR red enclosure.



XLS-MSE3-ADPT

XLS-RCC-1-ADPT – XLS RCC-1 Enclosure Adapter

Model XLS-RCC1-ADPT is an adapter that allows the FireFinder XLS Model SSD/-C series remote annunciator to be mounted in the older generation Model RCC-1 surface-mount enclosure.



XLS-RCC1-ADPT

XLS-RCC13F/R-ADPT – XLS RCC-1F/R or RCC-3F/R Enclosure Adapters

Model XLS-RCC13F-ADPT is an adapter that allows the FireFinder XLS Model SSD/-C series remote annunciator to be mounted in the older generation Model RCC-1F or Model RCC-3F black, flush-mount enclosure.

Model XLS-RCC13FR-ADPT is an adapter that allows the Model SSD/-C series to be mounted in the older generation RCC-1FR red and RCC-3FR red flush-mount enclosure.



XLS-RCC13F-ADPT

Temperature and Humidity Range

Products are UL 864 9th Edition listed for indoor / dry locations within a temperature range of 120+/-3°F (49+/-2°C) to 32+/-3°F (0+/-2°C) and a relative humidity of 93+/-2% at a temperature of 90+/-3°F (32+/-2°C).

Details for Ordering

| Model Number | Part Number | Description |
|------------------|---------------|---|
| BCM | 500-033320 | Blank control module plate, four [4] per package |
| CAB-1 | 500-633007 | Complete single-row cabinet, black |
| CAB-1R | 500-633728 | Complete single-row cabinet, red |
| CAB1-TK | 500-633013 | Single-row trim-kit cabinet, black |
| CAB1R-TK | 500-633729 | Single-row trim-kit cabinet, red |
| CAB2-BB | 500-633009 | (2) Two-row back box, black |
| CAB2-RB | 500-634941 | (2) Two-row back box, red |
| CAB2-BD | 500-633008 | (2) Two-row inner & outer door set, black |
| CAB2-RD | 500-633755 | (2) Two-row inner & outer door set, red |
| CAB2-TK | 500-633014 | (2) Two-row trim-kit cabinet, black |
| CAB2R-TK | 500-633753 | (2) Two-row trim-kit cabinet, red |
| CAB2-XBD | 599-633768 | CAB2 transponder door |
| CAB2-X | 599-034252 | Complete CAB2 w/ transponder door [no inner door] |
| CAB3-BB | 500-633011 | (3) Three-row back box, black |
| CAB3-RB | 500-634942 | (3) Three-row back box, red |
| CAB3-BD | 500-633010 | (3) Three-row inner & outer door set, black |
| CAB3-RD | 500-633757 | (3) Three-row inner & outer door set, red |
| CAB3-TK | 500-633015 | (3) Three-row trim-kit cabinet, black |
| CAB3R-TK | 500-633754 | (3) Three-row trim-kit cabinet, red |
| CAB3-XBD | 599-633769 | CAB3 transponder door |
| CAB3-X | 599-034253 | Complete CAB3 w/ transponder door [no inner door] |
| CAB-BATT | 500-633917 | Field-mounted enclosure for 100AH batteries, black |
| CAB-BATT-R | 500-634925 | Field-mounted enclosure for 100AH batteries, red |
| CAB-MP | 500-633012 | Back box module mounting plate |
| ID-FP | 500-633029 | (4) Four module inner-door blank plate |
| ID-MP | 500-633027 | Inner-door enclosure mounting plate, four [4] per package |
| ID-SP | 500-633028 | Single-module inner-door enclosure mounting plate [two (2) per package] |
| OD-BP | 500-633017 | Outer door blank plate |
| OD-BP-R | 500-634919 | Outer door blank plate, red |
| OD-GP | 500-633018 | Outer door grill plate |
| OD-GP-R | 500-634920 | Outer door grill plate, red |
| OD-LP | 500-633016 | Outer door lens plate |
| REMBX2 | 500-633772 | (2) Two-module remote lobby enclosure, black |
| REMBX2R | 500-650612 | (2) Two-module remote lobby enclosure, red |
| REMBX2-MP | 500-634211 | Mounting plate for Models OCM-16 / SIM-16 in Model REMBOX2 |
| REMBX4 | 500-633914 | (4) Four-module remote lobby enclosure, black |
| REMBX4R | 500-650613 | (4) Four-module remote lobby enclosure, red |
| REMBX4-MP | 500-634212 | Mounting plate for Models OCM-16 / SIM-16 in Model REMBOX4 |
| XLS-MLE6-ADPT | S54430-C9-A1 | MLE-6 enclosure adapter for XLS, black |
| XLS-MLE6R-ADPT | S54430-C9-A2 | MLE-6R enclosure adapter for XLS, red |
| XLS-MME3-ADPT | S54430-C8-A1 | MME-3 and MBR-2 enclosure adapters for FireFinder XLS, black |
| XLS-MME3R-ADPT | S54430-C8-A2 | MME-3R enclosure adapter for XLS, red |
| XLS-MSE2-ADPT | S54430-C7-A1 | MSE-2 enclosure adapter for XLS, black |
| XLS-MSE2R-ADPT | S54430-C7-A2 | MSE-2R enclosure adapter for XLS, red |
| XLS-MSE3-ADPT | S54430-C14-A1 | MXL-IQ MSE-3L and MSE-3M enclosure adapters for XLS, black |
| XLS-MSE3R-ADPT | S54430-C14-A2 | MXL-IQ MSE-3LR & MSE-3MR enclosure adapters for XLS, red |
| XLS-RCC1-ADPT | S54430-Z14-A1 | RCC-1 enclosure adapter, black |
| XLS-RCC13F-ADPT | S54430-Z13-A1 | RCC-1F & RCC-3F enclosure adapters, black |
| XLS-RCC13FR-ADPT | S54430-Z13-A2 | RCC-1FR & RCC-3FR enclosure adapters, red |

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For the most up-to-date information, refer to each product's installation instructions.

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October 2011
Supersedes sheet dated 8/11
(Rev. 7)

FireFinder™ XLS

System-Status Display Series Models SSD, SSD-C and SSD-C-REM

ARCHITECT AND ENGINEER SPECIFICATIONS

- 4 x 40" backlit LCD screen
- Event and audible status LEDs
- Scroll buttons to view additional events
- Local sounder
- Supports Style 4 or Style 7 wiring
- Built-in transient protection
- Mounts in its own enclosure or REMBOX
- Optional local-system control
- Downloadable firmware
-  UL 864 9th Edition Listed and  ULC Listed;
FM, CSFM & NYMEA Approved



SSD



SSD-C with Control

Product Overview

The System-Status Display (SSD Series) is a remote light-emitting diode (LED) / liquid-crystal display (LCD) display unit that shows the local status of a FireFinder XLS system. A LED will illuminate when *Alarm*, *Supervisory*, *Trouble* and *Security* events occur on the system. A (4) four-line LCD will give details of the event in alphanumeric form. The display can be toggled to display additional events. Optional remote-system-control capabilities are available.

Specifications

The SSD Series display has separate LEDs for *Alarm*, *Supervisory*, *Trouble* and *Security* events on the FireFinder XLS system. Each LED will flash when unacknowledged events of that type are present on the system. The LED will change to steady, upon acknowledgment of the event. Also, there are two (2) LEDs that indicate the state of audible circuits on the system: one (1) LED to indicate that the circuits are active and one (1) LED to indicate the circuits have been silenced.

The LCD display on the Model SSD-series display has four (4) rows – 40 characters for each row. When the FireFinder XLS system is in its normal *supervisory* state with no events present, the display will annunciate the system ID information, the date and the time of day.


When an event occurs on the system, the LCD display will show the event type and address, the time of the event, the custom message for that address, the usage of the device, and whether the event is acknowledged or not. Additionally, the display will show the total number of all types of events present on the system. The display has a backlight feature that operates upon receiving any event information or when any operator buttons are pressed.

A local sounder is included with the Model SSD-series display that operates when any events are displayed on the system. The sounder can be optionally disabled through software programming. Pressing any operator buttons will silence the local sounder when an event is present.

Specifications – (continued)

The SSD Series display has two (2) display-control buttons that are used to display the next or the previous event information in the sequence, and a local sounder silence button. Programming for the SSD Series display is done with the Zeus programming tool.


Models SSD-C and Model SSD-C-REM have three (3) additional control buttons for acknowledging events, silencing audible circuits, and resetting the system. Model SSD-C has an integral key switch that enables these control buttons to operate. Model SSD-C-REM is located within a locked cabinet, so no additional key switch is required for enabling the control buttons.

The SSD Series display is remotely connected to the H-Net communication bus from any Model NIC-C interface in a FireFinder XLS system enclosure using Class B, Style 4 or Class A, Style 7 wiring. 24VDC is required to run the SSD Series display, and can be provided from a Model PSC-12 Power Supply or PSX-12 Power Supply Extender in the FireFinder XLS system enclosure. Power from other UL Listed 24VDC power sources is also acceptable.

The SSD Series display has screw terminals capable of supporting 12 to 22-gage wires. The H-Net communication from the FireFinder XLS system can be terminated on the SSD Series display, or may pass through for communication with other modules. Diagnostic LEDs on the SSD Series display indicate power and communication status.

Models SSD and SSD-C can be mounted in a (2) two-gang electrical box or a (4) four-inch square electrical box. No flush-trim kit is required. The unit is approximately 10-1/2" (26.7cm.) wide, 6-1/8" (15.2cm.) high, and 1-1/2" (3.8cm.) deep.

The Model SSD-C-REM is mounted in a Model REMBOX2 or Model REMBOX4 Remote Lobby Enclosure, or any CAB enclosure inner door. Model SSD-C-REM requires two (2) module spaces in the remote lobby enclosure, and its bracket supports the mounting of four (4) inner door modules (such as Model SCM-8 or Model LCM-8 modules) below the display. The inner door module spaces are arranged in two (2) rows of (2) two-module spaces.


Products are UL 864 9th Edition listed for indoor dry locations within a temperature range of 120+/-3°F (49+/-2°C) to 32+/-3°F (0+/-2°C) and at a relative humidity of 93+/-2% at a temperature of 90+/-3°F (32+/-2°C).

Details for Ordering


| Model Number | Part Number | Description |
|--------------|-------------|---|
| SSD | 500-034170 | System-Status Display |
| SSD-C | 500-648733 | System-Status Display [with control] |
| SSD-C-REM | 500-634773 | System-Status Display [with control for remote-lobby enclosure] |
| REMBX2 | 500-633772 | Small Remote-Lobby Enclosure |
| REMBX4 | 500-633914 | Large Remote-Lobby Enclosure |
| BCM | 500-033320 | Blank Control Module Plate |

Electrical Ratings



| SSD-C | |
|---------------|--|
| Typical | 200mA (max.) at 24 VDC |
| Input Voltage | 24 VDC (Nominal) (31 VDC max.) filtered |

Notes: An auxiliary-regulated, power-limited power supply may be used to provide power to Model SSD. The power supply must be UL Listed for Fire-Protection Signaling Application. Be sure to also include Model SSD-C in the battery calculations.

| SSD / SSD-INTL | |
|----------------|--|
| Typical | 200mA (max.) at 24 VDC |
| Input Voltage | 24 VDC (Nominal) (31 VDC max.) filtered |

Notes: An auxiliary-regulated, power-limited power supply may be used to provide power to Model SSD. The power supply must be UL Listed for Fire-Protection Signaling Application.

| SSD-C-REM | |
|---------------|--|
| Typical | 200mA (max.) at 24 VDC |
| Input Voltage | 24 VDC (Nominal) (31 VDC max.) filtered |

Notes: An auxiliary-regulated, power-limited power supply may be used to provide power to Model SSD-C-REM. The power supply must be UL / ULC approved for Fire Protection Signaling Application. Be sure to also include Model SSD-C-REM in the battery calculations.

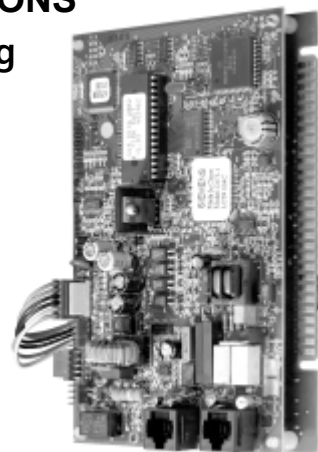
Notice: This marketing data sheet is not intended to be used for system design or installation purposes. For the most up-to-date information, refer to each product's installation instructions.

MXL / MXLV

MXL Multi-Point Digital Alarm Communicator Transmitter Model MDACT

ARCHITECT AND ENGINEER SPECIFICATIONS

- Meets NFPA Chapter 4 central-remote-station monitoring
- Contact ID and SIA communication protocols
- Five (5) discrete, supervised input points
- 2040-point capacity
- Automatic 24-hour test
- Line-fault monitoring
- Built-in clock
- Dual-phone-line interface



- **UL 864 9th Edition Listed, UL C Listed; CSFM, NYMEA and City of Chicago Approved**

Product Overview

The multi-point digital-alarm communication transmitter (Model MDACT) from Siemens Industry – Fire Safety is used in MXL and FireFinder™ XLS systems where point identification of *Alarm, Supervisory, Security and Trouble* events is required at central or remote Receiving Stations.

An intelligent RS-485 communications protocol transmits all system information to Model MDACT. The installer selects the specific events – or groups of events – that are transmitted from Model MDACT over phone lines to listed receiving-station equipment.

Each device in a MXL or FireFinder XLS system can be assigned an individual group number and custom message – up to 2080 groups. Alternatively, multiple devices of similar event types can be assigned the same group number. The group number, event type and time of event are transmitted to the receiving station where the custom message is attached to the event. This particular process allows an individual device to be reported at the receiving station with a custom message.

Alternatively, a group of devices (such as all smoke detectors on one floor) can report at the receiving station with the same message. Group numbers and custom messages are programmed in the MXL custom-software

generating tool (Model CSGM) and via the Zeus programming tool for FireFinder XLS. Account and phone numbers – along with other dialer specific options – are programmed in the dialer via the Model DCT-P Programmer.

Communications

Model MDACT can transmit point information via the Ademco Contact ID and the SIA protocol. Contact ID can transmit events for up to 999 individual points. SIA can transmit up to 2040 individual points. The central station must have the capability to receive point information from Model MDACT.

Model MDACT uses two (2) supervised phone lines in accordance with typical system requirements, and follows all UL requirements for monitoring and testing those lines. Model MDACT also follows requirements for properly transmitting signals in the event of a line failure. The module is equipped with phone-line seizure for shared phone-line service.

Model MDACT is supervised by the MXL or XLS system. *Trouble* commands in Model MDACT will be reported on the system and transmitted to the central station on a single phone line.

MDACT 5074

Communications — (continued)

Model MDACT does not include a separate audible device for *Trouble*-event annunciation, but does include on-board, *Trouble*-event light-emitting diodes (LEDs) for any of the following events: 'heartbeat', 'system-trouble', and individual phone-line *trouble*.

Installation

For MXL or MXLV systems, Model MDACT is installed in a one-half ($1/2$) slot of a Model MOM-2 / MOM-4 slot (MXL card cage). For FireFinder XLS systems, a Model MOM2-XMP mounting plate, a Model MOM-2 card cage, and a Model XMI Interface Card are required. Model MOM2-XMP uses one (1) module space in the back of a Model CAB-series enclosure. Model MOM-2 mounts directly to that plate. Model XMI is then installed in the top slot of the card cage — the Model MDACT in the bottom slot.

The two (2) phone lines are landed on phone jacks mounted on Model MDACT. No other connections are required to complete the installation. Model MDACT obtains all required power from the system through the Model MOM-series card cage.

The MXL or FireFinder XLS system assumes the responsibility for monitoring AC power. In the event of AC power failure, the system will create a local *trouble* signal. The signal transmission to the Central Station will be delayed, per UL requirements.

The dialer, which also includes five (5) discrete, supervised input points, can be used during installation for simple alarm monitoring — until the custom programming at the time of installation has been completed. The required cables are included with Model MDACT.

Installation and Operation Manual

[IOM]

| Model Number | Part Number | Description |
|---------------------|-------------|--|
| MDACT | 315-099351 | Multi-Point Digital Alarm Communicator Transmitter |
| MDACT [Programming] | 315-099378 | Multi-Point Digital Alarm Communicator Transmitter |

Note: For further details, refer to MXL IOM manual: 315-092036.

Related Documentation

| Product | Data Sheet Number |
|---------|-------------------|
| MXL | 5000 |
| MXLV | 5035 |
| XLS | 6300 |

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Temperature and Humidity Range

Model MDACT is UL 864 9th Edition Listed for indoor dry locations within a temperature range of 120+/-3°F (49+/-2°C) to 32+/-3°F (0+/-2°C) and a relative humidity of 93+/-2% at a temperature of 90+/-3°F (32+/-2°C).

Details for Ordering

| Model Number | Part Number | Description |
|--------------|-------------|--|
| MDACT | 500-699254 | MXLV Visual Switch Annunciator Module |
| DCT-P | 500-699291 | Four (4) conductor, 40" cable for inter-cabinet and inter-row connection |
| MOM2-XMP | 500-634822 | Mounting Plate for Model MOM-2 in FireFinder XLS systems |
| MOM-2 | 500-892766 | MXL Module Card Cage (1 full slot) |
| XMI | 500-034870 | FireFinder XLS-MXL Interface Card |

Electrical Ratings

| | |
|------------------------------|---------------|
| Standby Current Draw: | 220mA @ 24VDC |
| Alarm Current Draw: | 260mA @ 24VDC |

MDACT Compatibility

— For MXL Systems —

- MXL Firmware Revision 10.14 or higher
- Model CSGM Software Revision 11.07 or higher

— For FireFinder XLS systems —

- Model PMI Firmware Revision 4.0 or higher
- Zeus Software Rev 4.0 or higher



patent pending



7315-0328-0189

Product includes a 5 year warranty

Dimensions: 16 1/8"W x 16 3/4"H x 3 1/2"D

Stock Number: 3006436 PSN-64 Red Enclosure
3006437 PSN-106 Red Enclosure
3006446 PSN-106 Black Enclosure

Description

The PSN series of notification power supplies offers reliable notification power with unprecedented versatility. The power supplies offer either 6 or 10 amps of continuous power through 4 or 6 outputs respectively. Each output is rated at 3 amps and it may be used continuously without any derating.

The power supply operates on either 120 VAC or 220 VAC power input and has a regulated 24 VDC output. In addition, the panel can charge up to 55 AH batteries and leads the industry in housing up to 18 AH batteries. The cabinet is constructed out of 18 gauge cold rolled steel and has a durable red powder coat finish. In addition, a key lock is provided for securing the door. Ample electrical knockouts are provided on the sides and the top, allowing the installer options for running wires and maintaining the correct separations.

The power supply offers an industry leading Quadrasync function that allows for multiple strobe circuits of different brands to be synchronized to flash at the same time. The panel can have four different brands each connected to its own circuit and all of the strobes flash together.

Each output can independently be configured to provide one of four synchronizations or steady power. This provides unequivocal flexibility in new and retrofit installations. The panel can be configured to synchronize Potter/AMSECO®, Gentex®, Wheelock® and System

UL, cUL, CSFM Listed

- PSN-64 has 6 amps regulated with 4 Outputs
- PSN-106 has 10 amps regulated with 6 Outputs
- Outputs Rated at 3 amps maximum each
- May be configured as up to three class "A" Style "Z" notification circuits
- 3 amp, 24 VDC programmable output power
- Supervised Battery Charger: 27.3 @ 1A (supports 7-55 AH batteries)
- Easy to install cabinet with leveling mounts and key lock
- Wiring knockouts provided on sides and top of cabinet
- Two Trouble Relays (5A at 30VDC)
 - General System Trouble (programmable for AC delay)
 - Low AC Trouble with optional delay settings

Diagnostic LED's

Status LED's for Active NAC and NAC trouble conditions
Status LED's for Earth Fault (Amber), AC (Green), Battery Fault (Amber)

- Trouble Memory feature captures troubles which have previously restored
- Synchronized notification appliance circuits
 - Potter/AMSECO®, Wheelock®, Gentex®, System Sensor®
- Configurable output circuits (DIP switch sets options for each circuit)
- 15 mA at 8-33 VDC input trigger
- Reference EOL allows 2K – 27K EOL value to be used
- Quadrasync provides panel wide synchronization of same or multiple brands
- PassThru mode allows the Outputs to match the Input Signal

Electrical Specs:

- 120/240 VAC 50-60 Hz input
- 5.1 Amps @ 120 VAC or 2.5 Amps @ 240 VAC
- Standby Current 60 mA
- Alarm Current 200 mA*

*no external load

Sensor® strobe devices. Each output can be configured the same sync protocol or set independently.

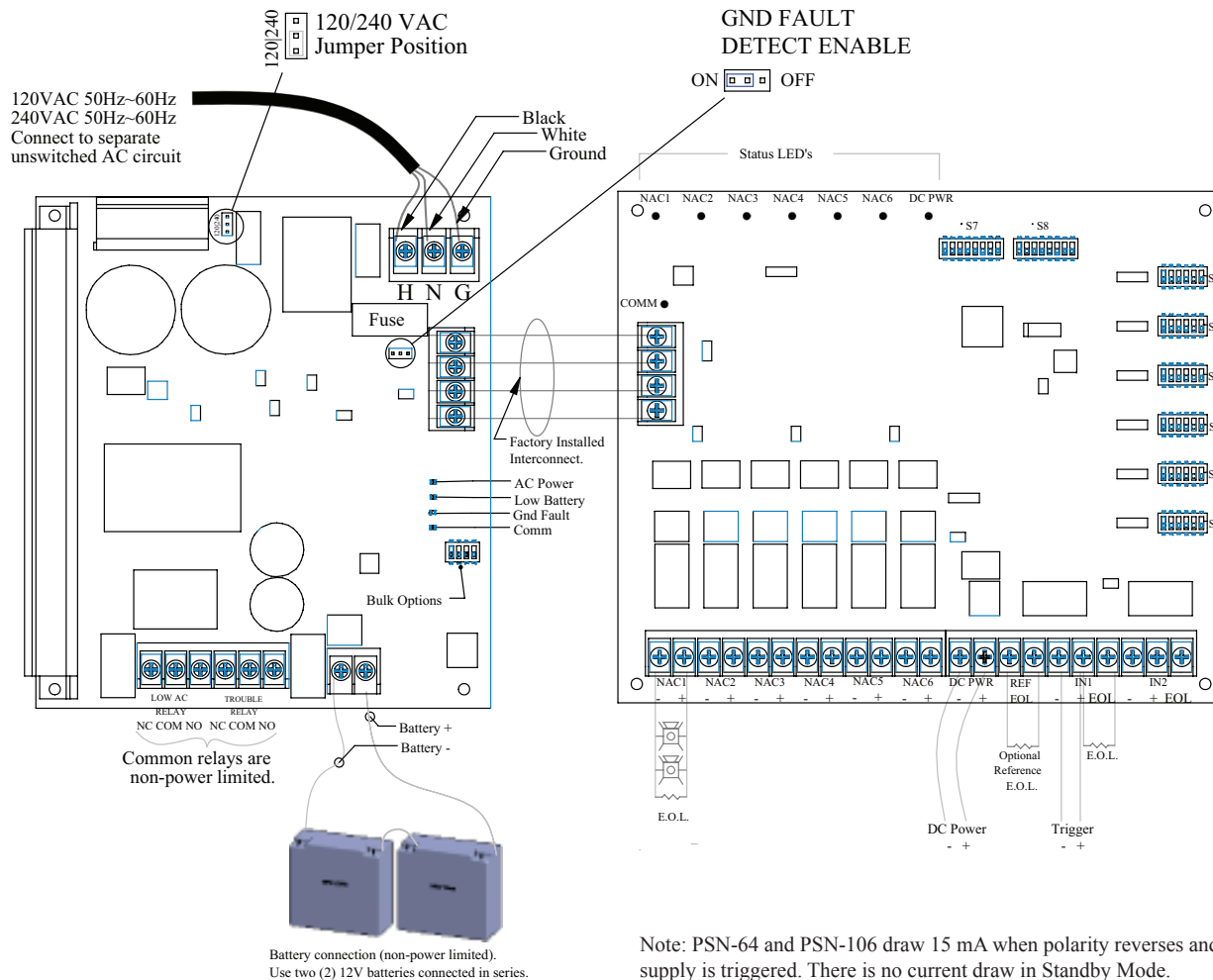
In addition, the panel has an input PassThru mode allows the outputs to follow the input signal and sync up the input flash. The panel will recognize the type of input being supplied and pass this through to the outputs with the same pattern. This input pass through can be selected on each output independently.

The power supply contains simple dipswitch programming and LED indications providing the installer indications of the operation and the ability to correct any faults. A Trouble Memory is provided to allow an installer to review past troubles and make the necessary repairs. Each output has an LED to pin point the exact circuit where a problem may have occurred. Relays are provided for monitoring the general system and AC failure.

Each output can be independently configured for various applications and installations. Each output can be independently configured for Class A or Class B operation, constant power, ANSI Temporal Code 3, Single, Multiple or Combo Inputs or Door Holder Power.

Potter Electric Signal Co., LLC • St. Louis, MO • Cust Service: 866-240-1870 • Tech Support: 866-956-1211 • Canada 888-882-1833 • www.pottersignal.com

PSN-106 Wiring Diagram



Note: PSN-64 and PSN-106 draw 15 mA when polarity reverses and the power supply is triggered. There is no current draw in Standby Mode.

Engineering Specification

The contractor shall supply and install the Potter PSN power supply. The power supply shall operate on either 120 or 240 VAC input. The panel shall be capable of continuous load power without any degradation to the main supply or the distribution board. The cabinet shall be capable of housing up to 18 AH batteries and the panel shall be capable of charging up to 55 AH batteries in an external cabinet.

The panel shall have dip switches for simplistic configuration of the system and LEDs to provide visual indication to the installer of the status of the system. The dip switches shall allow for AC power delay selection, Class A/B operation per output, Door Holder Power options, constant auxiliary power, trigger input type, ANSI Code 3 Temporal Code, Pass Thru (input tracking), Potter/AMSECO® sync, Gentex® Sync, System Sensor® Sync or Wheelock® sync. The LEDs shall provide indication of communication between the power supply and distribution circuit

assemblies. The LEDs shall have distinct flash patterns to provide further indication of the troubles present. The panel shall have selectable Trouble Memory to provide the installer an indication that a past trouble existed on a circuit for diagnostic purposes.

Each output of the power supply shall be capable of 3 amps of continuous power without degradation over time. The power supply shall provide for multiple circuits of strobe appliances. The power supply shall synchronize the flashes of any of the above listed strobe appliances on a per circuit basis. Up to four different strobe circuits may be connected and all of the strobes shall flash in unison as required by UL 864. In addition to this Quadrasync feature, the panel shall allow any of the four above mentioned sync patterns as an input and pass this signal through and synchronize the outputs to match the input flash pattern.



TRX-401

The WAVES network is comprised of a secure and robust collection of intelligent digital wireless transceivers (TRX-401) that drive audio, visual and data devices.

Description



TRX-401 Front View

The TRX-401 can act as an end-node as well as a relay, thereby extending the reach of the network to cover all areas of interest of the threatened facility or area. The TRX-401 transceiver is capable of driving audible, visual and other data devices.

The TRX-401 is a fully-integrated unit with integral power supply and audio amplifiers. Each TRX-401 unit receives and transmits digital signals to and from the CRLU-201 and other TRX-401 units within the network. Each TRX-401 unit has a unique address in the WAVES network, and is individually software controlled from the base station PC. Up to 15,376 TRX-401 units can be individually addressed in a 16 X 16 X 64 (Zone X Sub-Zone X Unit) structure.

The TRX-401 provides outputs for two channels of wideband amplified audio, two channels of wideband line-level audio, one full-duplex RS-232 data channel (at up to 9.6 kbps), one analog input, one digital input, and two digital I/O data pins. Built-in drivers for specific data devices are available, including LED signs for visual text and graphics displays.

Each TRX-401 unit conducts supervisory built-in self-tests (BIT) that are reported periodically or on-demand to the base station where they are displayed and logged. Changes in supervised variables trigger alert or alarm conditions at the base station PC, and can be further programmed to initiate messaging events throughout the system.

The TRX-401 is housed in a weather-resistant, extruded aluminum enclosure with ABS plastic covers. It mounts easily to an included back plate. The TRX-401 unit is powered from either AC or DC power sources. An optional battery backup unit (UPS-901) can provide up to five hours of operation. UPS-901 units are stackable to extend backup time.

Features & Benefits

- Delivers announcements originating from the IBS via digital Frequency Hopping Spread Spectrum (FHSS) radios
- World-wide, license-free operation @ 2.4GHz
- Total-Site-Coverage™ of any size facility
- Synchronized audio and visual message output
- External gain antennas
- Two wideband audio output channels: available as line-level (bal. or unbal.) and 2 x 15 WRMS
- Zone and individual unit controls from base PC
- Full-duplex, assignable RS-232 data channel
- Three logic (high/low) plus one analog I/O pins to monitor and control external devices
- Auto-sensing 100-240V AC or 12-16V DC
- Auto-diagnostics, fully supervised operation
- UPS rechargeable battery backup (UPS-901) available
- Rugged enclosure with easy back plate mounting

Codes and Standards

FCC Part 15.247, 15.209
license-free

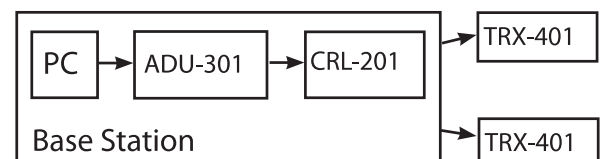
European-ETS 300-328,
300-399

CE Declaration of
Conformity

Military Frequency
Allocation JF12 #7787



TRX-401 Connector Panel



Specifications

Performance

Radio Frequency

Band:
Modulation:
RF Power Output:
Receiver Sensitivity:
Antenna Impedance:
Licensing Required:
Typical Range:

2.4 GHz, ISM band
Digital FM, FHSS
+20dBm, +/-1dB
-90dBm
50 ohms
None
Indoors: 1,000 ft/300m; Outdoors: 2 miles/3 km; Extended range antennas available

Indicators & Connectors

Power/Sync:
RS-232 Interface:
Line-level Audio/I/O Port:
Speaker-level Audio:

LED Indicator, Red
DB-9M
3.5 mm, 11 pin socket
3.81 mm, 5 pin socket

Controls

Audio Gain:
Bass & Treble
Audio Mute:

(internal to the unit, adjusted remotely from PC)
Music & Voice Channels
Music Channels
Music & Voice Channels

Data

Format:
Data Rate:
Max Cable Length:

Full duplex RS-232 8 data bits, 1 stop bit, no parity
Up to 9.6 kbps
200 ft/61 m

Audio Output

Output Levels:

Amps A&B: 15 WRMS each into 4 ohms with 52dB overall gain report, 1 dB resolution
Line A&B: +dBv with 55dB overall gain control, 1dB resolution

Output Impedance:
Frequency Response:

Amps: 4-16 ohms per channel; Line-level: 600 ohms per channel
35Hz-20kHz/-4.5 dB (Tone Tested)

Equalization:

Bass: +15dB to -12dB, 1dB resolution; Treble: +/-12dB, 1 dB resolution

THD:

Less than 0.1% @1 watt, less than 0.5% @ 15 watts

Amplifier Protection:

Short, thermal and overload

Digital Format:

ISO/MPEG, layer II: 48 kbps, 16 bit

I/O Pins

One continuous analog output (0-10V); One TTL level logic (hi/lo), fixed input;
Two TTL level logic (hi/lo), programmable as input or output

Electrical

AC input connector:
DC input connector:
AC:
DC:
Power Consumption:
Backup power (optional):
Battery:

Standard 3-pin
5-pin DIN connects to UPS-901 or other DC Source
100-240V, 47-63 HZ, 70W (Universal auto-sensing)
12-16V, 70W
8W (Stand-by)
UPS-901, Solar
UPS rechargeable battery backup (UPS-901) available

Environmental

Operating Temperatures:
Humidity:

-10°C to 50°C
10% to 90%, non-condensing

Physical (without backplate)

Dimensions:
Weight:
Color and Finish:

14.4 x 9.6 x 3.5 in/36.7 x 24.3 x 9cm
6.4 lbs/2.9 kg
Silver or black; anodized extruded aluminum, black ABS plastic covers, weather-resistant enclosure. (NEMA enclosures available)

Back Plate:

Provided for wall or mast mounting

Antenna:

External Antenna required

Various Connectorization:

TRX-401-N: N-type (F) connector

NJ Location
273 Branchport Ave.
Long Branch, NJ 07740
P: 800-631-2148
F: 732-222-2588
www.coopernotification.com

Florida
(WAVES)
7246 16th Street East, Ste 105
Bradenton, FL 34243
P: (941) 487-2300
F: (941) 487-2389

Virginia
(Roam Secure - RSAN)
103 West Broad Street, Suite 500
Falls Church, VA 22046
P: (877) 459-7726
F: (703) 294-6560

[MODULES]

FireFinder XLS and FS-250 Panels

HTRI Series Interface Modules

Models HTRI-D, HTRI-R and HTRI-S

ARCHITECT AND ENGINEER SPECIFICATIONS

- Interfacing and supervising normally open (NO) or normally closed (NC) contacts
- Integral SPDT relay on Model HTRI-R (up to 4 amps)
- Dual input on Model HTRI-D, using a single address
- Polarity insensitive with *SureWire™* technology
- Multi-color light-emitting diode (LED) indicates status [green / amber / red]
- Easy front access to programming port and wiring terminals
- Mounts 4-inch square, 2-1/4"-deep box (or double-gang box)
- Dynamic supervision
- Comes with 5-x-5" faceplate
- Two-wire operation
- Model DPU programs and verifies address of the device and tests for proper functionality
- Electronic address programming is easy and dependable
- UL Listed & ULC Listed;
FM, CSFM and NYMEA Approved



Product Overview

The Siemens Industry, Inc. — Fire Safety HTRI Series Intelligent interface modules are designed to provide the means of interfacing direct shorting devices to the FireFinder XLS and FS-250 Fire Alarm Control Panel loop circuit.

The HTRI Series modules provide the most advanced method of address programming and supervision on the market — combined with sophisticated control panel communication. Each HTRI Series interface module incorporates a microcomputer chip. The HTRI Series microcomputer chip technology and its sophisticated bi-directional communication capabilities with the control panel, achieve the state of an 'intelligent device.'

Specifications

The HTRI Series intelligent interface modules are available in three (3) models. Models HTRI-S and HTRI-R are designed to monitor a (NO) or (NC) dry contact.

The interface module reports the status of the (NO) or (NC) contact to the control panel. Model HTRI-S can only monitor and report the status of the contact, while Model HTRI-R incorporates an addressable Form C relay.

The Model HTRI-R relay and contact device input are controlled at the same address. For the control panel system, the relay and input contact can be controlled as a separate function. The relay is typically used where control or shunting of external equipment is required.

The Model HTRI-D is a dual-input module that is designed to supervise and monitor two (2) sets of dry contacts. Model HTRI-D only requires one (1) address, but responds independently to each input. Model HTRI-D is ideal for monitoring a water-flow switch and its respective valve tamper switch.

Model HTRI has a multi-color LED that flashes 'green' when operating in *normal*; 'amber' if unit is in *trouble* condition, and 'red' to indicate a change of state.

Specifications (continued)

Model HTRI-D flashes twice — once for each address, and Model HTRI-R LED indicates a change of state in the relay. The device's microcomputer chip has the capacity of storing, in memory, identification information; as well as important operating-status information.

Siemens Industry, Inc., — Fire Safety innovative technology allows all HTRI Series intelligent interface modules to be programmed by using the Device Programming / Test Unit. Model DPU is a compact, portable and menu-driven accessory that makes programming and testing an interface device faster, easier and more dependable than previous methods.

Model DPU eliminates the need for mechanical addressing mechanisms, such as: program jumpers, DIP switches or rotary dials, since Model DPU electronically sets the HTRI Series interface address into the interface microcomputer-chip non-volatile memory. Vibration, corrosion and other conditions that deteriorate mechanical addressing mechanisms are no longer a cause for concern.

The HTRI Series is fitted with screw terminals for connection to an addressable circuit. The HTRI Series is fully compatible on the same FireFinder XLS and FS-250 circuits with all intelligent H-Series detectors, HMS Series addressable manual stations, or any other addressable intelligent modules, such as Model HZM or Model HCP.

All HTRI Series intelligent interface modules are ®UL listed. Environmental operating conditions for all HTRI Series modules are 32°F (°C) to 120°F (49°C) with a relative humidity of no greater than 93%, non-condensing.

Electrical Ratings

Current Draw

(Active or Standby) 1mA

Model HTRI-R Relay Ratings

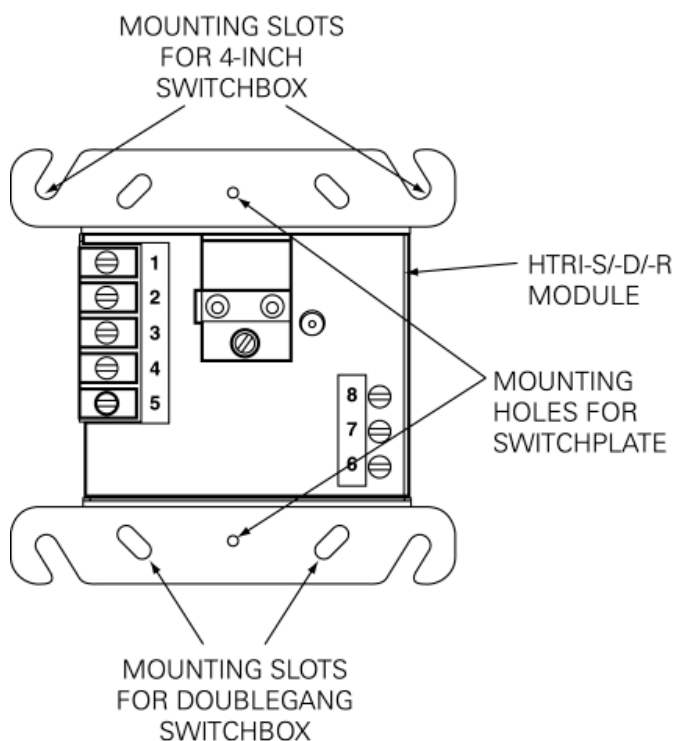
Resistive: 4 Amps, 125 VAC
4 Amps, 30 VDC

Inductive: 3.5A, 120 VAC (0.6P.F.)
3.0A, 30 VDC (0.6P.F.)
2.0A, 120 VAC (0.4P.F.)
2.0A, 120 VAC (0.35P.F.)
2.0A, 30 VDC (0.35P.F.)

Notice: This marketing catalog sheet is not intended to be used for system design or installation purposes. For the most up-to-date information, refer to each product's installation instructions.

Mounting Diagram

Models HTRI-S, HTRI-D and HTRI-R mount directly into a 4-inch square, 2 ¼-inch deep box or a double-gang box (user supplied). A 5-inch square, off-white faceplate is included with each HTRI Series module.



Details for Ordering

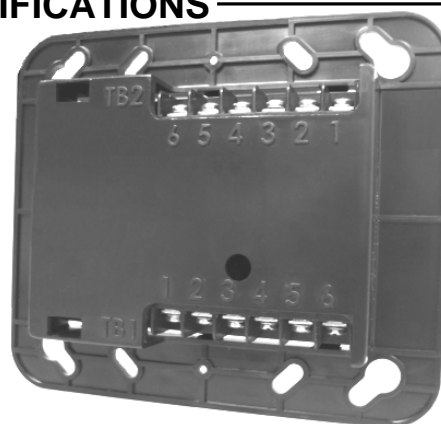
| Model Number | Part Number | Description | Shipping Wgt. | |
|--------------|-------------|----------------------|---------------|-----|
| | | | Lb. | Kg. |
| HTRI-S | 500-033370 | Single Input | 7 oz. | 2 |
| HTRI-R | 500-033300 | Single Input w/Relay | 7 oz. | 2 |
| HTRI-D | 500-033360 | Dual Input | 7 oz. | 2 |

FireFinder XLS and FS-250 Panels

Intelligent Control Point Device Model HCP

ARCHITECT AND ENGINEER SPECIFICATIONS

- Intelligent device for use with FireFinder™ XLS and FS-250 fire-alarm control panels (FACPs)
- Used as a telephone zone, speaker zone or notification appliance circuit (NAC)
 - Provides 24VDC NACs when used with FireFinder XLS and FS-250
 - Used as a NAC under the Siemens – Fire Safety NAC product line
 - Provides either a 25V (35 Watts) or 70.7V (25 Watts) single-channel speaker zone (XLS panel only)
 - Provides firefighters' telephone circuit (used with XLS only)
- Polarity insensitive with SureWire™ technology
- Mounts on standard electrical box
 - 4" square or double gang
- No mechanical-address programming required
- Includes a dial-tone generator for telephone usage



- Outputs and input power are supervised
- UL Listed, ULC Listed; CSFM and NYMEA Approved

Product Overview

Model HCP from Siemens – Fire Safety is an intelligent control point device designed for use with FireFinder XLS and FS-250 FACPs, as well as the Siemens Notification Appliances product line.

Model HCP can be configured (via the Zeus system software-programming tool) as an independent, remotely located telephone zone, speaker zone or NAC. Model HCP is programmed and tested using the Device Programming / Test Unit (Model DPU), eliminating the need for mechanical-addressing mechanisms, such as program jumpers, DIP switches or rotary dials.

Model HCP is supervised for loss of 24VDC input power, as well as short-or-open output-zone wiring. Model HCP mounts in a standard double-gang or 4" square electrical box.

When Model HCP is programmed as a speaker zone, the high-power audio risers are supervised using the Model ZAC-40 zone amplifiers. Programmed as a telephone zone, the telephone riser is supervised by the (8) Eight-Zone Telephone Card (Model TZC-8).

Note: Telephone application is not approved for use in Canada.

Specifications

Model HCP communicates through the analog loop of Models DLC and FS-DLC, and can be wired either Class A (Style Z) or Class B (Style Y). The 24 VDC power input comes from either the FACP or from any UL Listed power-limited, auxiliary power supply.

For FireFinder XLS systems, compatible power supplies for Model HCP are as follows:

- Model PSC-12
- Model PSX-12
- Model PAD-3, or
- Any power-limited, 24 VDC power supply that is UL Listed for fire-protective signaling use

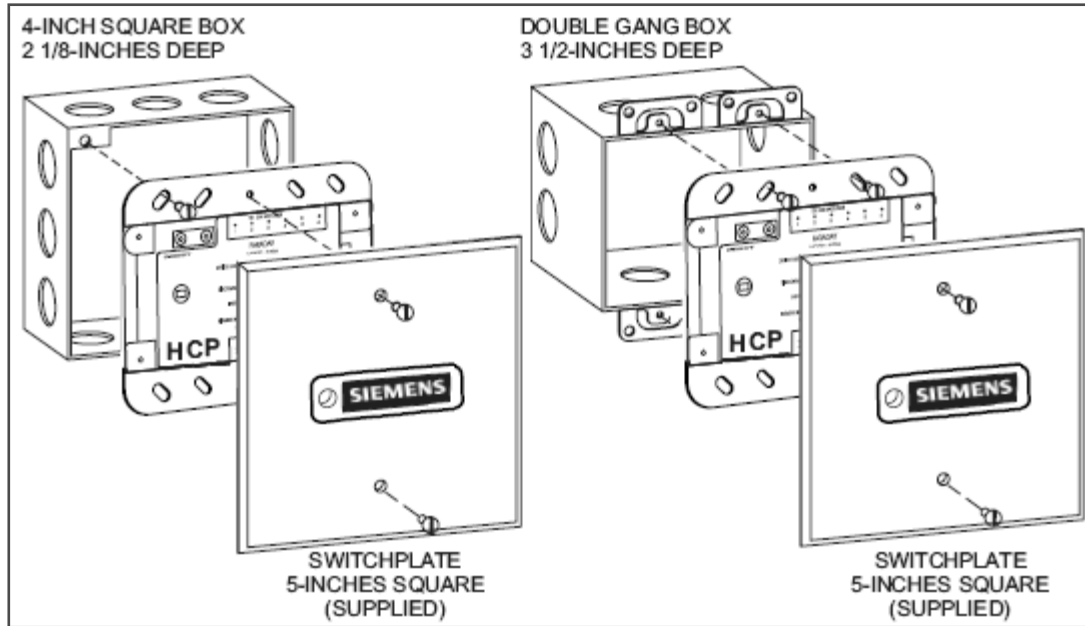
For FS-250 FACPs, compatible power supplies for Model HCP are as follows:

- Siemens NAC circuits
- PAD-3, or
- Any power-limited, 24 VDC power supply that is UL Listed for fire-protective-signaling use

Up to 60 Model HCP devices can be wired to a given loop on a FireFinder XLS or FS-250 panel.

Note: The maximum NAC load that may be connected to a Model HCP device is 1.5 Amps at 24VDC.

Mounting Diagram



1. Use a standard 3--1/2"-deep, double-gang electrical switchbox or a 4"-square electrical box that is 2--1/8" deep with either a 1--1/2"-deep extension or a 1--1/4"-deep plaster-ring extension.
2. Connect the field wiring. Insert Model HCP into the box and fasten the device plate to the box.
3. Cover the device front plate with the 5" switchplate (supplied) and fasten with two (2) plate screws.

Temperature and Humidity Range

Model HCP is UL 864 9th Edition Listed for indoor dry locations within a temperature range of 120+/-3°F (49+/-2°C) to 32+/-3°F (0+/-2°C) and a relative-humidity range of 93+/-2% at a temperature of 90+/-3°F (32+/-2°C).

Details for Ordering

| Model Number | Part Number | Description |
|--------------|-------------|----------------------------------|
| HCP | 500-034860 | Intelligent Control Point Device |



Note: Refer to Siemens P/N: 315-096363 for the list of compatible Siemens notification appliances.

Notice: This marketing catalog sheet is not intended to be used for system design or installation purposes. For the most up-to-date information, refer to each product's installation instructions.

FireFinder XLS

HMS Series Intelligent Initiating Devices Manual Fire Alarm Boxes

ARCHITECT AND ENGINEER SPECIFICATIONS

- Durable design
- Shock-and-vibration resistant
- Pull-down lever is down, until manually reset
 - Reset with Allen Key
 - No break rods necessary
- Custom microcomputer-chip technology
- Dynamic supervision to the fire-alarm control panel (FACP)
- Polarity insensitive via *SureWire™* technology
- Two-wire operation
- Surface or semi-flush installation
- Model DPU programs and verifies address and tests functionality of the each device
 - Electronic-address programming is easier, more efficient and more dependable
- Comes in single-action (Model HMS-S) and double-action (Model HMS-D) stations
-  UL Listed and  ULC Listed; FM, CSFM & NYMEA Approved



Model HMS-D
Dual-Action Station



Model HMS-S
Single-Action Station

Product Overview

Models HMS-S and HMS-D intelligent manual fire-alarm boxes provide the most advanced method of address programming and supervision; combined with sophisticated control-panel communication. Each HMS-series manual fire-alarm box achieves the state of an 'intelligent-initiating device' by incorporating custom microcomputer-chip technology with sophisticated, bi-directional communication capabilities with the FACP.

Specifications

Models HMS-S and HMS-D are constructed of durable, molded polycarbonate material that is matte finished in red with raised white lettering. The housing accommodates a 'pull-down' lever, which — when operated — locks into position; indicating the manual fire-alarm box has been activated.

The pull down lever remains down / in the 'locked' position, until the fire-alarm box is manually reset. The manual fire alarm box can only be reset by opening the hinged housing cover with an Allen key; followed by closing and locking the cover.

Models HMS-S and HMS-D operate with FireFinder XLS-series control panels. The microcomputer chip to the manual fire-alarm box has the capacity of storing — in memory — identification information; as well as important operating-status data.

Innovative technology from Siemens Industry Inc. — Fire Safety also allows all HMS-series intelligent manual fire-alarm boxes to be programmed by using the Programmer / Test Unit (Model DPU). Model DPU is a compact, portable and menu-driven accessory that makes programming and testing of a manual fire-alarm box device faster, easier and more dependable than previous methods.

Model DPU eliminates the need for mechanical-addressing mechanisms of a device because Model DPU electronically sets the address of the manual fire-alarm box into its microcomputer chip, non-volatile memory. Hence, vibration, corrosion and other conditions that can compromise or even deteriorate mechanical-addressing mechanisms are no longer a cause for concern.

FireFinder XLS 6306

Specifications — (continued)

Models HMS-S and HMS-D are fitted with screw terminals for connection to an addressable circuit, and can be either surface or semi-flush mounted.

The HMS Series manual fire-alarm boxes derive their power, communicate information and receive commands over a single pair of wires.

The HMS Series is compatible on the same circuit with all 'H'-series detectors, interfaces or addressable, conventional zone modules.

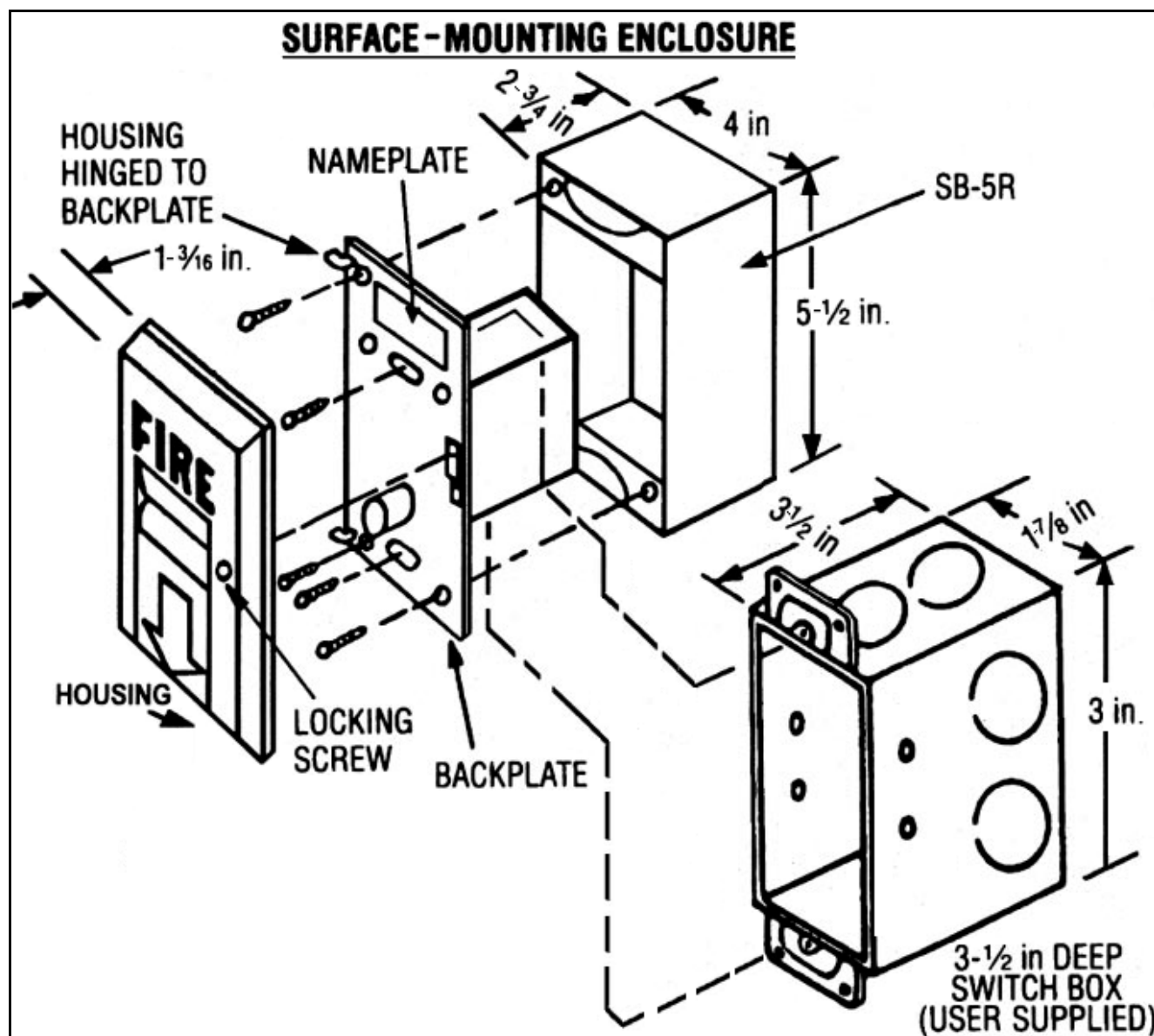
Details for Ordering

| Model Number | Part Number | Shipping Lbs. | Weight kg. | Description |
|--------------|-------------|---------------|------------|--|
| HMS-S | 500-033200 | 2.0 | .90 | Addressable Manual Fire Alarm Box Single Action |
| HMS-D | 500-033400 | 2.5 | 1.13 | Addressable Manual Fire Alarm Box, Double Action |
| SB-SR | 310-019860 | 1.5 | .68 | Surface Mounting Box |
| LTP | 500-620490 | .5 | .23 | Reset Tool Package (Contains 2 tools) |

Electrical Ratings

Current Draw (Active or Standby): 1.5mA

Mounting Diagram




Notice: This marketing catalog sheet is not intended to be used for system design or installation purposes. For the most up-to-date information, refer to each product's installation instructions.


Intelligent Detection Devices

Photoelectric Smoke Detector Model OP921

ARCHITECT AND ENGINEER SPECIFICATIONS

- Compatible with Siemens Model 'H'-series devices on the same loop (with Cerberus PRO fire-alarm control panels [FACPs] or FireFinder® XLS FACPs)
- Compatible with Model 8720 / DPU (device programmer / loop tester)
- Utilizes advanced microprocessor-based signal processing
- Extended temperature and humidity operating range
- Each detector is self-testing:
 - Self monitored for sensitivity within UL Listed limits
 - Complete diagnostics performed every 10 seconds
- Polarity insensitive utilizing SureWire™ technology
- Compatible with Model DB-11-series mounting bases
- Tri-color detector-status LED with 360° viewing
- Field-selectable application sensitivity profiles
- Remote sensitivity-measurement capability
- Utilizes advanced signal processing
- Superior EMI / RFI immunity
- RoHS compliant



- Automatic environment compensation
- UL268A Listed [for direct air-duct use],
ULC Listed; FM and CSFM Approved

Product Overview

The Photoelectric Smoke Detector (Model OP921) uses state-of-the-art microcontroller circuitry and surface-mount technology for maximum reliability. Model OP921 incorporates an optical sensor using a light-scattering detection principle. The device utilizes advanced software algorithms to analyze the signals, and provides highly stable and accurate smoke detection.

Further, Model OP921 uses state-of-the-art microprocessor circuitry with error check; detector self-diagnostics, and supervision programs.

Field-Device Programmer / Test Unit

Model OP921 is compatible with the Siemens field-device programmer / test unit (Model 8720 / DPU), which is a compact, portable, menu-driven accessory for electronically programming and testing detectors easily and reliably.

Model 8720 / DPU eliminates the need for cumbersome, unreliable mechanical programming methods, such as dials or switches, and reduces installation and service costs by electronically programming and testing the detector prior to installation.

For proper operation of the field-device programmer / test unit, the technician selects the accessory's program mode, and enters the desired address. In turn, Model 8720 / DPU automatically sets and verifies the address, as well as tests the detector. When in the 'test' mode, Model 8720 / DPU will perform a series of diagnostic tests without altering the address or other stored data, allowing technicians to determine if the detector is operating properly.

Model 8720 / DPU operates on AC power or rechargeable batteries, providing flexibility and convenience in programming and testing equipment from practically any location.

Cerberus™ PRO



Fire Safety & Security Products

9902

Photoelectric Smoke Detector

Product Overview — (continued)

Model 8720 / DPU operates on AC power or rechargeable batteries, providing flexibility and convenience in programming and testing equipment from practically any location.

Model OP921 is a plug-in, two-wire and addressable photoelectric smoke detector. Model OP921 is  Underwriters' Laboratories Listed [ UL268A Listed for direct in-air duct usage].

Each detector consists of a dust-resistant photoelectric chamber and microprocessor-based electronics with a low-profile plastic housing. Every Model OP921 fire detector is shipped with a protective dust cover:

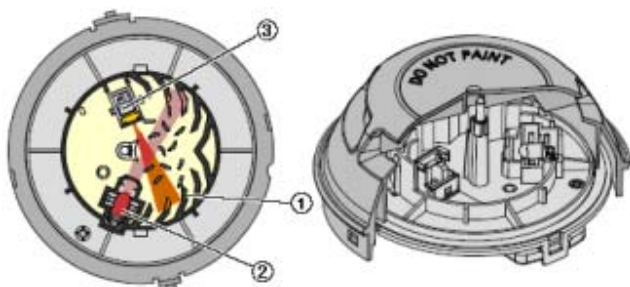


1. Dust cover
2. Smoke detector

Operation

Model OP921 is a wide-spectrum, photoelectric smoke detector incorporating an infrared light-emitting diode (IRLED), and infrared light-sensing photodiode. Under normal conditions, light transmitted by the LED is directed away from the photodiode and scattered through the smoke chamber in a controlled pattern.

The smoke chamber is designed to manage light dissipation and extraneous reflections from dust particles or other non-smoke, airborne contaminants in such a way as to maintain stable, consistent detector operation. When smoke enters the detector chamber, light emitted from the IRLED is scattered by the smoke particles, and is received by the photodiode:



1. Labyrinth
2. Optical transmitter
3. Optical receiver

Sensitivity Settings

Application Parameter Sets


Model OP921 provides four (4) pre-programmed sensitivity parameter sets that can be selected by the FACP to match the expected application or environmental conditions:


- Sensitive
- Standard
- Robust
- Air-duct

Sensitive: This application parameter set is practically suitable for areas where few misleading sources of false alarm are present, and is appropriate where priority is given to detecting open fires as soon as possible (e.g. – typically a clean application with controlled environmental conditions.)

Standard: This application parameter set is practically apt for normal office, hotel-lobby-type applications, and is the default setting.

Robust: This application parameter set offers improved resistance to false alarms in areas where misleading sources, such as cigarette smoke or exhaust fumes, may cause a nuisance alarm.

Air-Duct: This application parameter set is used when the detector is used a  UL268A (DI) compliant direct in-air duct application without a duct housing.

Model OP921 does not require a field sensitivity test. Model OP921 is  UL Listed as a self-testing device and complies with NFPA 72 as a self monitoring detector and control panel arrangement. This parameter set is also used when Model OP921 is used in air-duct housings (Models FDBZ492 and FDBZ492-HR).

The visible LED flashes **green** every 10 seconds to indicate communication with the FACP, and to notify Model OP921 has passed its self-test. Should Model OP921 sense a fault or failure within its system, the LED will flash **amber**, and the detector will transmit the data to the FACP.

A quick visual inspection is sufficient to indicate the condition of Model OP921 at any time. If more detailed information is required, a printed report can be provided from the compatible FACP, indicating the status and settings assigned to each individual detector. When Model OP921 moves to *Alarm* mode, the detector will flash **red** and continue flashing until the system is reset at the FACP. At that same time, any user-defined, system-alarm functions programmed into the system are activated.

Model OP921 contains a tri-color LED indicator, capable of flashing any one (1) of three (3) distinct colors: **green**, **yellow**, or **red**. During each flash interval, the microprocessor-based detector monitors the following:

Operation — (continued)

- Smoke sensitivity is within the range indicated on the nameplate label
- Smoke in its sensing chamber
- Internal sensors and electronics are functional

Based on the monitoring results, the LED indicator flashes the following colors based on the following conditions:

| Flash Color | Condition | Flash Interval (in seconds) |
|------------------|---|-----------------------------|
| Green*: | Normal supervisory operation. Smoke sensitivity is within rated limits. | 10 |
| Yellow: | Detector is in trouble and needs replacement. | 4 |
| Red: | Alarm condition. | 1 |
| No Flash: | Detector is not powered. | — — |

* LED can be turned OFF.

Please follow the corresponding description of the panel used.

A quick, visual inspection is sufficient to indicate the condition of the detector at any time. If more detailed information is required, a printed report can be provided from the respective Cerberus PRO FACP that indicates the status and settings assigned to each individual detector.

Installation

All Model OP921 detectors use a surface-mounting base, Model DB-11 or Model DB-11E, which mounts on a 4-inch octagonal, square or single-gang electrical box. The base utilizes screw-clamp contacts for electrical connections and self-wiping contacts for increased reliability.

The Model DB-11 base can be used with the optional Model LK-11 detector locking kit, which contains 50 detector locks and an installation tool to prevent unauthorized removal of the detector head. Model DB-11 has decorative plugs to cover the outer-mounting screw holes.



Model OP921 may be installed on the same initiating circuit with the Siemens Model 'H'-series detectors [when used with the Cerberus PRO FACPs] —

- Model HFP-11
- Model 'HMS'-series manual stations
- Model 'HTRI'-series interfaces
- Model HCP output-control devices
- Model 'HZM'-series of addressable, conventional zone modules

Application Data

Installation of Model OP921 detectors requires a two-wire circuit. In many retrofit cases, existing wiring may be used. 'T-tapping' is permitted only for Style 4 (Class B) wiring. Model OP921 is polarity insensitive, which can greatly reduce installation and debugging time.

Model OP921 can be applied within the maximum 30-foot center spacing (900 sq. ft. areas), as referenced in NFPA 72. This application guideline is based on ideal conditions — specifically, smooth ceiling surfaces, minimal air movement, and no physical obstructions between potential fire sources and the actual detector. Do not mount detectors in close proximity to ventilation or heating and air-conditioning outlets. Exposed joints or beamed ceilings may also affect safe spacing limitations for detectors.

Should questions arise regarding detector placement, observe NFPA 72 guidelines. Good fire-protection system engineering and common sense dictate how and when fire detectors are installed and used. Contact your local Siemens — Fire Safety distributor or sales office whenever you need assistance applying Model OP921 in unusual applications. Be sure to follow NFPA guidelines and UL Listed / ULC Listed installation instructions — included with every Siemens — Fire Safety detector — and local codes as for all fire-protection equipment.

Note: For Model OP921 compatibility to FireFinder® XLS, the XLS FACP requires Model PMI-2 (no firmware upgrade is required), or Model PMI (firmware Rev. 9 or higher is required). The detector's compatibility also requires both of following:

- Rev. 9 (or higher) ZEUS custom-configuration software
- Rev. 6 (or higher) Device Loop Card (DLC) firmware

Technical Data

Operating Temperature Range: +32°F (0°C) to 120°F (49°C)

Relative Humidity: 0 — 95%; non-condensing

Air Pressure: No effect

Air Velocity: 0 — 4,000 ft. / min (0-20m / sec)

Input Voltage Range: 16VDC — 30VDC

Alarm Current (max.): 410µA

Standby Current (max.): 250µA, max. (average)

Maximum Spacing: 30-foot centers (900 sq. ft.), per NFPA 72

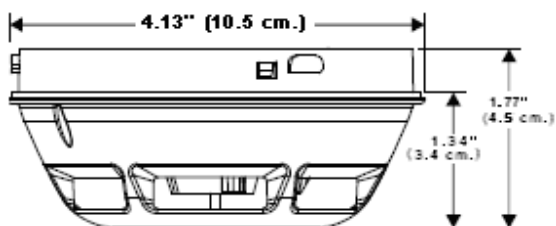
Detector Weight: 0.317 lbs. (0.144 kg.)

Mechanical Protection Guard:

UL Listed / ULC Listed
[with STI Guard Model STI-9604]

Mounting Diagram

Dimensions



Detector Compatibility Table

| Model Number | Data Sheet Number | Description |
|--------------|-------------------|-----------------------------------|
| — | 6300 | FireFinder® XLS (system overview) |
| DLC | 6312 | Device Loop Card |
| FC901 | 9813 | 50-point panel |
| FC922 | 9815 | 252-point system (networkable) |
| FC924 | 9815 | 504-point system (networkable) |

Details for Ordering

| Model Number | Part Number | Description |
|--------------|---------------|--|
| OP921 | S54320-F4-A2 | Photoelectric Smoke Detector |
| DB-11 | 500-094151 | Detector Mounting Base |
| DB-11E | 500-094151E | Detector Base {small} |
| DB2-HR | S54320-F12-A1 | Relay Base |
| RL-HC | 500-033230 | Remote Alarm Indicator: 4" octagon-box mount, red |
| RL-HW | 500-033310 | Remote Alarm Indicator: single-gang box mount, red |
| FDBZ492 | S54319-B22-A1 | Addressable Air-Duct Housing |
| FDBZ492-HR | S54319-B23-A1 | Addressable Air-Duct Detector with Relay |
| LK-11 | 500-695350 | Base Locking Kit |

| | | |
|----------|-----|---------------------------------|
| STI-9604 | — — | STI Mechanical Protection Guard |
|----------|-----|---------------------------------|

See: www.STI-USA.com for further details on ordering Model STI-9604.

In Canada, order:

| Model Number | Part Number | Description |
|--------------|-------------|---|
| DB-11C | 500-095687 | Detector Mounting Base for ULC (Listed) |

SIEMENS Cerberus™ PRO

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NOTICE — The information contained in this data-sheet document is intended only as a summary, and is subject to change without notice. The devices described here have specific instruction sheets that cover various technical, limitation and liability information.

Copies of these instruction sheets and the *General Product Warning and Limitations* document, which also contains important information, are provided with the product and, are available from the Manufacturer.


Information contained in these documents should be consulted before specifying or using the product. For further information or assistance concerning particular problems contact the Manufacturer.

Conventional Detection Devices

Audible Bases

Models ADB-11, ADBH-11 and ADBX-11


ARCHITECT AND ENGINEER SPECIFICATIONS

- Model ADB-11 is compatible with conventional Series 11 detectors
- Model ADBX-11 is compatible with Model FP Series detectors
- Model ADBH-11 is compatible with Model HFP Series detectors
- Models produce 85db audible signal
 - Temporal or Steady
- Surface mounting
- UL Listed; FM, CSFM and NYMEA Approved



Product Overview

Models ADB-11 and ADBX-11 are audible-base detectors that contain a pre-wired, audible and piezo-electric device that produces an 85db signal for localized annunciation. Model ADB-11 is designed to be used with conventional Series 11 plug-in detectors, and Model ADBX-11 is designed for use with addressable, analog Model FP-11 and Model FPT-11 detectors.

Typical application includes all areas that normally would require localized, audible annunciation, such as: hotel, motel, apartment, condominium, and dormitory rooms. Model ADB-11 and Model ADBX-11 are UL listed.

Specifications

ADB-11


Model ADB-11 is powered by a conventional zone of the system control panel with operation of the piezo-electric device being controlled by the detector. During the *supervision* or *non-alarm* condition, circuit ground to Model ADB-11 is absent, and there is zero current flow.

Upon *alarm* to its detector, circuit ground is provided to Model ADB-11, via the base contact, and the audible

device is activated, producing an 85db audible signal, which serves as the local alarm.

Model ADB-11 is turned off by the *reset* of the system control panel. The system control panel guarantees that only one (1) auxiliary or remote device will activate per zone. The addition of a jumper wire between terminals 7 and 8 on the audible base changes the tone from steady to temporal. Model ADB-11 operates with an input-zone power of 17 VDC – 31 VDC, and requires a 4" square, 2½"-deep electrical box.

ADBH-11

There is a smoke-detector accessory, Model ADBH-11, that combines detector-base and audible-device functions. Typical applications for use of Model ADBH-11 include: dormitories, hotels, motels, apartments, etc. ADBH-11 meets the audibility requirements for smoke alarms as specified in UL217: 'Single and Multiple Station Smoke Alarms.'

When used in conjunction with listed, compatible equipment, Model ADBH-11 may be used – in lieu of single / multiple-station smoke alarms – to achieve enhanced system-level functionality.


Specifications — (continued)

ADBX-11

The Audible Base Model ADBX-11 consists of a standard Series 11 base combined with supportive circuitry for the FP Series Detectors and an audible device. All field wiring terminates at two (2) of the (4) four-position terminal blocks located on the back of the unit. Model ADBX-11 can be used with the MXL family of control panels.

Several different configurations can provide audible signal-circuit power to Model ADBX-11 at terminals 1 through 4. During the *supervision* state (no alarms), the polarity of the power to all Model ADBX-11 devices is in reversed normal state, resulting in zero current flow to each base.

When any *alarm* is reported to the system, the power to all Model ADBX-11 devices reverses polarity with no audible sound. Hence, the system may then selectively command Model ADBX-11 — under programmed control — to become audible. All Model ADBX-11 bases are capable of sounding simultaneously, individually or in any combination — depending upon the system program and control panel.

Model ADBX-11 is UL 268 Listed, and achieves the audibility sound output of 85 decibels at 10 feet. The installation of a jumper wire between terminals 3 and 4 of Model ADBX-11 changes the tone output from steady to temporal.

Note: Model ADBX-11 is not to be used for primary building evacuation; only as a supplemental, audible signal device.

Application Data

ADB-11 / ADBX-11

Model ADB-11 is fully compatible with Series 11 plug-in detectors. When a Model ADB-11 detector is used with a compatible detector, no remote relay or lamp device can be used with that same detector. Further, no more than 30 compatible detectors of any type or combination [other than thermals or manual stations] may be used on any one (1) conventional system detector circuit.

Model ADBX-11 is compatible only with the FP Series addressable detectors. No more than 60 detectors on MXL or loops may be used on any individual, addressable initiating circuit.

The smoke detectors used with Models ADB-11 and ADBX-11 are subject to the maximum 30 ft. center spacing (900 sq. ft.), as referred to in the National Fire Protection Association Standard 72.

This NFPA-guideline spacing; however, is based on ideal conditions — namely: smooth ceiling, no air movement, and no physical obstructions between the fire source and the detector.

The aforementioned spacing requirement should be used as the guide for detector-installation layout.

Do not mount detectors in areas close to ventilating or air-conditioning outlets. Exposed joists or beamed ceilings may also effect safe spacing limitations for detectors. It is mandatory to precisely follow NFPA 72 regulations, as well as applying professional engineering judgment, regarding detector locations and spacing.

Technical Data

| | |
|---|--|
| Audible Output: (Models ADB-11 and ADBX-11) | 85dB @ 10 feet / min. |
| Voltage Rating: (Model ADB-11) | 17VDC — 31VDC (zone power) |
| Supervisory Current: (Model ADB-11) | 0mA |
| Alarm Current: (Model ADB-11) | 24mA @ 25VDC |
| Constraint: (Model ADB-11) | Only one (1) device is guaranteed to activate per zone. |
| Voltage Rating: (Model ADBX-11) | 17VDC — 31VDC (AC power) 20VDC — 27VDC (full wave on battery) |
| Supervisory Current: (Model ADBX-11) | 0mA |
| Alarm Current: (Model ADBX-11) | 24mA @ 25VDC |

Compatibility

ADB-11

- DT-11
- PE-11
- PE-11T

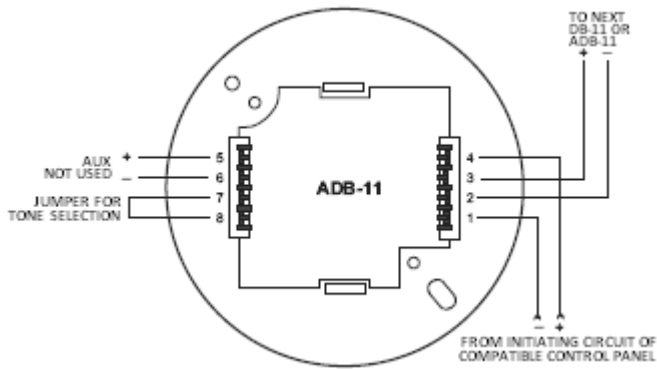
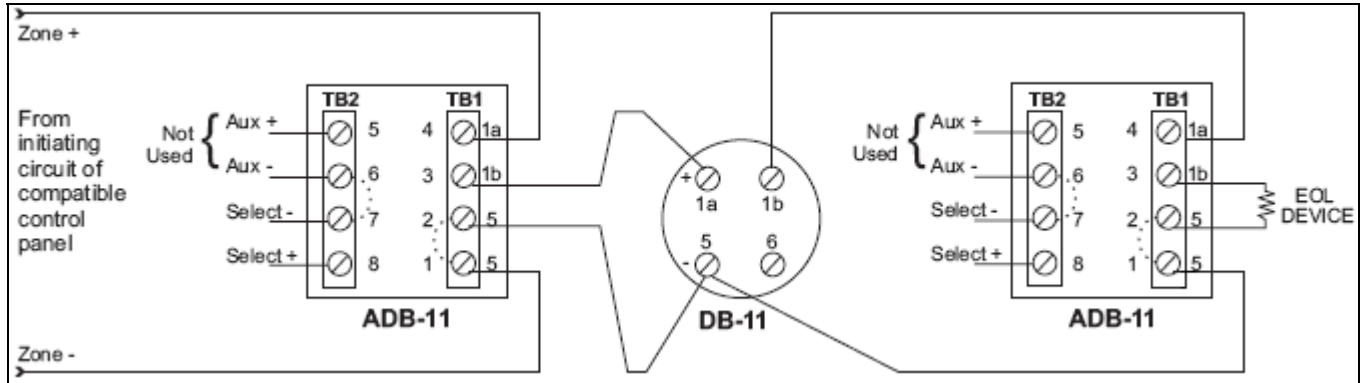
ADBH-11

- HFP-11
- HFPT-11

ADBX-11

- FP-11
- FPT-11

Mounting Diagrams



Details for Ordering

| Model Number | Part Number | Description |
|--------------|-------------|---|
| ADB-11 | 500-096117 | Audible-Base (Series 11) Detector |
| ADBX-11 | 500-096181 | Audible-Base (FP Series) Detector |
| ADBH-11 | 500-033210 | Smoke-Detector Accessory |
| AD2-P | 500-649706 | Air-Duct Housing |
| AD2-PR | 500-649707 | Air-Duct Housing with Relay |
| AD2-4W | 500-649709 | Self-Contained Air-Duct Housing with Power Supply and Relay |
| DB-ADPT | 500-094187 | Adapter for Model PE-11 to Model DB-3 Base |
| DB-11 | 500-094151 | Low-Profile Surface-Mount Base |
| DB-11E | 500-094151E | Smaller-Diameter Detector Base |
| DMK-11 | 500-695338 | Detector Maintenance Kit |
| LK-11 | 500-695350 | Model PE-11 Detector-Locking Kit |
| PE-11 | 500-094150 | Conventional Photoelectric Smoke Detector |
| PE-11T | 500-095150 | Photoelectric Smoke Detector with 135°F Thermal Sensor |
| RLC-11 | 500-694625 | Remote LED Ceiling Mount Detector, Red |
| RLW-11 | 500-694626 | Remote LED Wall Mount Detector, Red |
| RR-11 | 500-694922 | Relay Module |
| RSAC-11 | 500-694935 | Remote, Multi-Color LED: Ceiling Mount |
| RS AW-11 | 500-695101 | Remote, Multi-Color LED: Wall Mount |

LED Indicator Operation

| Flash Color | Condition | Flash Interval (in seconds) |
|-------------|---|-----------------------------|
| Green: | Normal supervisory operation. | 10 |
| Yellow: | Detector is in trouble and needs replacement. | 5 |
| Red: | Alarm condition. | 2.5 |
| No Flash: | Detector is not powered, or detector requires repair. | — |

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Notice: This marketing catalog sheet is not intended to be used for system design or installation purposes.
For the most up-to-date information, refer to each product's installation instructions.

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July 2010
Supersedes sheet dated 3/07
(Rev. 1)



Strobe, Horn Strobe, and Horn Notification Appliances



Description:

The Wheelock® Exceder™ Series of notification appliances feature a sleek modern design that will please building owners with reduced total cost of ownership. Installers will benefit from its comprehensive feature list, including the most candela options in one appliance, low current draw, no tools needed for setting changes, voltage test points, 12/24 VDC operation, universal mounting base and multiple mounting options for both new and retrofit construction.

The Wheelock® Exceder™ Series incorporates high reliability and high efficiency optics to minimize current draw allowing for a greater number of appliances on the notification appliance circuit. All strobe models feature an industry first of 8 candela settings on a single appliance. Models with an audible feature 3 sound settings (90, 95, 99 dB). All switches to change settings, can be set without the use of a tool and are located behind the appliance to prevent tampering. Wall models feature voltage test points to take readings with a voltage meter for troubleshooting and AHJ inspection.

The Wheelock® Exceder™ Series of wall and ceiling notification appliances feature a Universal Mounting Base (UMB) designed to simplify the installation and testing of horns, strobes, and combination horn strobes. The separate universal mounting base can be pre-wired to allow full testing of circuit wiring before the appliance is installed and the surface is finished. It comes complete with a Contact Cover for protection against dirt, dust, paint and damage to the contacts. The Contact Cover also acts as a shunting device to allow pre-wire testing for common wiring issues. The Contact Cover is polarized to prevent it from being installed incorrectly and prevents the appliance from being installed while it is on the UMB. When the Contact Cover is removed the circuit will show an open until the appliance is installed. The UMB allows for consistent installation and easy replacement of appliances if required. Wall models provide an optional locking screw for extra secure installation, while the ceiling models provide a captivated screw to prevent the screw from falling during installation.

Compliance

- UL 1971, UL 464, ULC, CSFM, FM
- ADA/NFPA/ANSI/OSHA
- RoHS

- Save up to **48%** in current draw*
- Up to **9** models now in **1** appliance
- Save up to **14%** cost of installation**



Sleek Modern Aesthetics



Finger Slide Switches



Voltage Test Points



Multiple Voltages



3 Audible Settings
90, 95, 99 dB



8 Candela Settings ***
Wall - 15/1575/30/75/95/110/135/185
Ceiling - 15/30/60/75/95/115/150/177



Universal Mounting Base ***
Ceiling and Wall
Mounts to 5 Backbox Types



Environmentally Friendly
Low Current Draw


Compatibility and Requirements

- Synchronize using the Wheelock® Sync Modules or panels with built-in Wheelock® Patented Sync Protocol
- Compatible with UL "Regulated Voltage" using filtered VDC or unfiltered VRMS input voltage
- Strobes produce 1 flash per second over the "Regulated Voltage" range

* Compared to competitive models

*** Patented

** Compared to previous models

NOTE: All CAUTIONS and WARNINGS are identified by the symbol . All warnings are printed in bold capital letters.

⚠ WARNING: PLEASE READ THESE SPECIFICATIONS AND ASSOCIATED INSTALLATION INSTRUCTIONS CAREFULLY BEFORE USING, SPECIFYING OR APPLYING THIS PRODUCT. VISIT WWW.COOPERNOTIFICATION.COM OR CONTACT COOPER NOTIFICATION FOR THE CURRENT INSTALLATION INSTRUCTIONS. FAILURE TO COMPLY WITH ANY OF THESE INSTRUCTIONS, CAUTIONS OR WARNINGS COULD RESULT IN IMPROPER APPLICATION, INSTALLATION AND/OR OPERATION OF THESE PRODUCTS IN AN EMERGENCY SITUATION, WHICH COULD RESULT IN PROPERTY DAMAGE, AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS.

General Notes:

General Notes:

- Strobes are designed to flash at 1 flash per second minimum over their "Regulated Voltage Range".
- All candela ratings represent minimum effective strobe intensity based on UL Standard 1971.
- Series Exceder Strobe products are Listed under UL Standards 1971 and 464 for indoor use with a temperature range of 32°F to 120°F (0°C to 49°C) and maximum humidity of 93% (± 2%) UL 464 (85% UL 1971).
- Series Exceder horns are under UL Standard 464 for audible signal appliances (Indoor use only).

Low Current Draw = Fewer Power Supplies

Strobe Ratings per UL Standard 1971

| | | UL Max Current* | | | | | | | | | | | | | |
|-------|-----------------------------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|
| | | 24 VDC / 24 FWR | | | | | | | | | | | | 12 VDC | |
| Model | Regulated Voltage Range VDC | 15 | 15/75 | 30 | 60 | 75 | 95 | 110 | 115 | 135 | 150 | 177 | 185 | 15 | 15/75 |
| ST | 8.0-33.0 | 0.057 | 0.070 | 0.085 | | 0.135 | 0.163 | 0.182 | | 0.205 | | | 0.253 | 0.110 | 0.140 |
| STC | 8.0-33.0 | 0.061 | | 0.085 | 0.103 | 0.135 | 0.163 | | 0.182 | | 0.205 | 0.253 | | 0.110 | |

Horn Strobe Ratings per UL 1971 & Anechoic at 24 VDC

| | | UL Max Current* at Anechoic 99 dBA | | | | | | | | | | | | | |
|-------|-----------------------------|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|
| | | 24 VDC | | | | | | | | | | | | 12 VDC | |
| Model | Regulated Voltage Range VDC | 15 | 15/75 | 30 | 60 | 75 | 95 | 110 | 115 | 135 | 150 | 177 | 185 | 15 | 15/75 |
| HS | 8.0-33.0 | 0.082 | 0.095 | 0.102 | | 0.148 | 0.176 | 0.197 | | 0.242 | | | 0.282 | 0.125 | 0.159 |
| HSC | 8.0-33.0 | 0.082 | | 0.102 | 0.141 | 0.148 | 0.176 | | 0.197 | | 0.242 | 0.282 | | 0.125 | |

| | | UL Max Current* at Anechoic 95 dBA | | | | | | | | | | | | | |
|-------|-----------------------------|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|
| | | 24 VDC | | | | | | | | | | | | 12 VDC | |
| Model | Regulated Voltage Range VDC | 15 | 15/75 | 30 | 60 | 75 | 95 | 110 | 115 | 135 | 150 | 177 | 185 | 15 | 15/75 |
| HS | 8.0-33.0 | 0.073 | 0.083 | 0.087 | | 0.139 | 0.163 | 0.186 | | 0.230 | | | 0.272 | 0.122 | 0.153 |
| HSC | 8.0-33.0 | 0.073 | | 0.087 | 0.128 | 0.139 | 0.163 | | 0.186 | | 0.230 | 0.272 | | 0.122 | |

| | | UL Max Current* at Anechoic 90 dBA | | | | | | | | | | | | | |
|-------|-----------------------------|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|
| | | 24 VDC | | | | | | | | | | | | 12 VDC | |
| Model | Regulated Voltage Range VDC | 15 | 15/75 | 30 | 60 | 75 | 95 | 110 | 115 | 135 | 150 | 177 | 185 | 15 | 15/75 |
| HS | 8.0-33.0 | 0.065 | 0.075 | 0.084 | | 0.136 | 0.157 | 0.184 | | 0.226 | | | 0.267 | 0.120 | 0.148 |
| HSC | 8.0-33.0 | 0.065 | | 0.084 | 0.120 | 0.136 | 0.157 | | 0.184 | | 0.226 | 0.267 | | 0.120 | |

Horn Ratings per UL Anechoic

| Model | Regulated Voltage Range VDC | 99 dBA | 95 dBA | 90 dBA |
|-------|-----------------------------|--------|--------|--------|
| HN | 16-33.0 | 0.064 | 0.044 | 0.022 |
| HNC | 16-33.0 | 0.084 | 0.044 | 0.022 |
| HN | 8.0-17.5 | 0.047 | 0.026 | 0.017 |
| HNC | 8.0-17.5 | 0.047 | 0.026 | 0.017 |



* UL max current rating is the maximum RMS current within the listed voltage range (16-33 VDC for 24 VDC units). For strobes the UL max current is usually at the minimum listed voltage (16 VDC for 24 VDC units). For audibles the max current is usually at the maximum listed voltage (33 VDC for 24 VDC units). For unfiltered ratings, see installation instructions.

Specification & Ordering Information

| Easy to remember model codes | Model | Strobe Candela | Sync w/ DSM or Wheelock Power Supplies | 12/24 VDC* | 1 gang, 2 gang, 4" sq, 3.5" octal & 4" octal boxes | Mounting Options |
|------------------------------|--------------|------------------------------|--|------------|--|------------------|
| | Horn Strobes | | | | | |
| | HSR | 15/1575/30/75/95/110/135/185 | X | X | | UMB** |
| | HSW | 15/1575/30/75/95/110/135/185 | X | X | | UMB** |
| | HSRC | 15/30/60/75/95/115/150/177 | X | X | | UMB** |
| | HSWC | 15/30/60/75/95/115/150/177 | X | X | | UMB** |
| | Strobes | | | | | |
| | STR | 15/1575/30/75/95/110/135/185 | X | X | | UMB** |
| | STW | 15/1575/30/75/95/110/135/185 | X | X | | UMB** |
| | STRC | 15/30/60/75/95/115/150/177 | X | X | | UMB** |
| | STWC | 15/30/60/75/95/115/150/177 | X | X | | UMB** |
| | Horn | | | | | |
| | HNR | | X | X | | UMB** |
| | HNW | | X | X | | UMB** |
| | HNRC | | X | X | | UMB** |
| | HNWC | | X | X | | UMB** |

*12 VDC models feature 15 & 15/75 settings

**UMB = Universal Mounting Base

Model Legend

HN = Horn
 ST = Strobe
 HS = Horn Strobe
 C = Ceiling Mount
 W = White
 R = Red
 A = Agent Lettering (Strobes only)
 AL = Alert Lettering (Strobes only)
 N = No Lettering (Strobes only)

Example 1: STRC = Strobe, Red, Ceiling Mount

Example 2: HSR = Horn Strobe, Red, Wall Mount

Example 3: HSW = Horn Strobe, White, Wall Mount

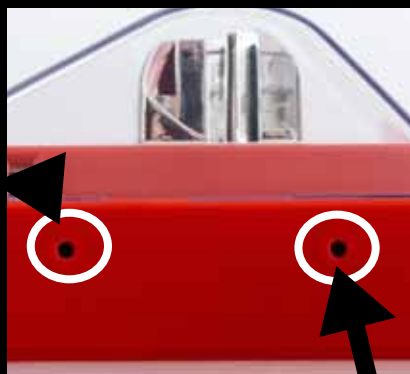
Example 4: STW-AL = Strobe, White, Wall Mount, Alert Lettering



Example: HSR



Example: HSWC



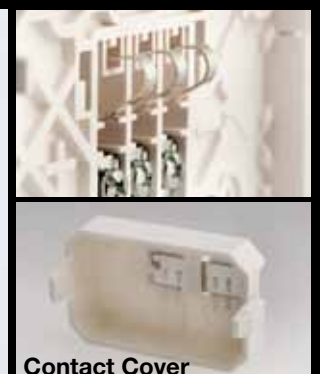
Voltage test points for quick troubleshooting and easy spot checking (wall models only)



8 candela settings



*UMB



Contact Cover

Common base for wall and ceiling with 5 mounting options

NOTE: Due to continuous development of our products, specifications and offerings are subject to change without notice in accordance with Cooper Wheelock Inc., dba Cooper Notification standard terms and conditions.

Architects and Engineers Specifications

The notification appliances shall be Wheelock® Exceder™ Series HS Audible Strobe appliances, Series ST Visual Strobe appliances and Series HN Audible appliances or approved equals. The Series HS and ST Strobes shall be listed for UL Standard 1971 (Emergency Devices for the Hearing-Impaired) for Indoor Fire Protection Service. The Series HS and HN Audibles shall be UL Listed under Standard 464 (Fire Protective Signaling). All Series shall meet the requirements of FCC Part 15 Class B. All inputs shall be compatible with standard reverse polarity supervision of circuit wiring by a Fire Alarm Control Panel (FACP) with the ability to operate from 8 to 33 VDC. Indoor wall models shall incorporate voltage test points for easy voltage inspection.

The Series HS Audible Strobe and ST Strobe appliances shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens. The Series shall be of low current design. Where Multi-Candela appliances are specified, the strobe intensity shall have 8 field selectable settings at 15, 15/75, 30, 75, 95, 110, 135, 185 candela for wall mount and 15, 30, 60, 75, 95, 115, 150, 177 candela for ceiling mount. The selector switch for selecting the candela shall be tamper resistant. The 15/75 candela strobe shall be specified when 15 candela UL Standard 1971 Listing with 75 candela on-axis is required (e.g. ADA compliance). Appliances with candela settings shall show the candela selection in a visible location at all times when installed.

The audible shall have a minimum of three (3) field selectable settings for dBA levels and shall have a choice of continuous or temporal (Code 3) audible outputs.

The Series HS Audible Strobe, ST Strobe and Series HN Audible shall incorporate a patented Universal Mounting Base that shall allow mounting to a single-gang, double-gang, 4-inch square, 3.5-inch octal, 4-inch octal or 100mm European type back boxes. Two wire appliance wiring shall be capable of directly connecting to the mounting base. Continuity checking of the entire NAC circuit prior to attaching any notification appliances shall be allowed. Product shall come with Contact Cover to protect contact springs. Removal of an appliance shall result in a supervision fault condition by the Fire Alarm Control Panel (FACP). The mounting base shall be the same base among all horn, strobe, horn strobe, wall and ceiling models. All notification appliances shall be backwards compatible.

The Series HS and ST wall models shall have a low profile measuring 5.24" H x 4.58" W x 2.19" D. Series HN wall shall measure 5.24" H x 4.58" W x 1.6" D. The Series HSC and STC shall be round and have a low profile with a diameter of 6.68" x 2.63" D. Series HNC ceiling shall have a diameter of 6.68" x 1.50" D.

When synchronization is required, the appliance shall be compatible with Wheelock®'s DSM Sync Modules, Wheelock® Power Supplies or other manufacturer's panels with built-in Wheelock® Patented Sync Protocol. The strobes shall not drift out of synchronization at any time during operation. If the sync protocol fails to operate, the strobe shall revert to a non-synchronized flash-rate and still maintain (1) flash per second over its Regulated Voltage Range. The appliance shall also be designed so that the audible signal may be silenced while maintaining strobe activation when used with Wheelock® synchronization protocol.

Wall Appliances – UL Standard 1971, UL Standard 464, California State Fire Marshal (CSFM), ULC, FM, RoHS

Ceiling Appliances – UL Standard 1971, UL Standard 464, California State Fire Marshal (CSFM), ULC, FM, RoHS



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3 YEAR WARRANTY

Exceder - Spec Sheet 5/13

NJ Location

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Long Branch, NJ 07740
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www.coopernotification.com

Cooper Notification is

Wheelock®



SAFEPATH®

WAVES



COOPERNotification

Series E60 Speakers and Speaker Strobes



Description

The NEW Wheelock Series E60 Ceiling Speakers and Speaker Strobes are designed for high efficiency sound output, with dual voltage (25/70 VRMS) capability and field selectable taps from 1/8 to 2 watts. These E60 Multi-Candela ceiling appliances are part of the new family of ceiling mount strobe appliances that will also be available on strobes, horns and horn/strobes. Optional Extender (E60 Ext) is for mounting to 4" backboxes with no extension ring.

The Series E60 Speaker Strobe models incorporate the Low Current draw Series RSS Strobes. These ceiling mount round models are available in Wheelock patented MCC multi-candela ceiling strobe with field selectable intensities of 15/30/75/95cd or the high intensity MCCH strobe with field selectable 115/177cd.

Series E60 Speakers and Speaker Strobes provide high audio output with clear audibility and are designed to meet the critical needs of the life safety industry for effective emergency voice communications, tone signaling and visible signaling to alert the hearing impaired.

The low profile design incorporates a speaker mounting plate for faster and easier installation. Each model has a built-in level adjustment feature and snap-on cover with no visible mounting screws.

The strobe portion of all Series E60 Speaker Strobes may be synchronized when used in conjunction with the Wheelock DSM Sync Modules or the Wheelock Power Supplies with Patented Sync Protocol. Wheelock synchronized strobes offer an easy way to comply with ADA recommendations concerning photosensitive epilepsy.

Series E60 Speaker Strobes are UL Listed for indoor use under Standard 1971 (Signaling Devices for the Hearing-Impaired) and Standard 1480 (Speaker Appliances), and use a Xenon flashtube with solid state circuitry enclosed in a rugged Lexan® lens to provide maximum reliability for effective visual signaling. All inputs are supervised and employ IN/OUT wiring terminals for fast installation using #12 to #18 AWG wiring.

Color options for the Series E60 Speakers and Speaker Strobes are red and white.

Features

- Approvals include: UL Standard 1971, UL Standard 1480, New York City (MEA), California State Fire Marshal (CSFM), and Factory Mutual (FM). See approvals by model in Specifications and Ordering Information
- ADA/NFPA/ANSI compliant
- Complies with OSHA 29 Part 1910.165
- **Ceiling mount strobe models are available with field selectable candela settings of 15/30/75/95cd or 115/177cd (Multi-candela models)**
- Strobes produce 1 flash per second over the regulated voltage range
- 24 VDC with wide UL "Regulated Voltage" using filtered DC or unfiltered VRMS input voltage
- Synchronize with Wheelock DSM or Wheelock Power Supplies with built-in sync protocol
- Field selectable taps for 25 or 70 VRMS operation from 1/8 watt up to 2 watts
- High efficiency design for maximum output at minimum wattage across a frequency range of 400 to 4000 HZ
- Fast installation with IN/OUT screw terminals using #12 to #18 AWG wires
- Optional Extender (E60 Ext) is for mounting to 4" backboxes with no extension ring.



NOTE: All CAUTIONS and WARNINGS are identified by the symbol . All warnings are printed in bold capital letters.

⚠ WARNING: PLEASE READ THESE SPECIFICATIONS AND ASSOCIATED INSTALLATION INSTRUCTIONS CAREFULLY BEFORE USING, SPECIFYING OR APPLYING THIS PRODUCT. VISIT WWW.COOPERNOTIFICATION.COM OR CONTACT COOPER WHEELLOCK FOR THE CURRENT INSTALLATION INSTRUCTIONS. FAILURE TO COMPLY WITH ANY OF THESE INSTRUCTIONS, CAUTIONS OR WARNINGS COULD RESULT IN IMPROPER APPLICATION, INSTALLATION AND/OR OPERATION OF THESE PRODUCTS IN AN EMERGENCY SITUATION, WHICH COULD RESULT IN PROPERTY DAMAGE, AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS.

General Notes:

- Strobes are designed to flash at 1 flash per second minimum over their “Regulated Voltage Range”. Note that NFPA-72 specifies a flash rate of 1 to 2 flashes per second and ADA Guidelines specify a flash rate of 1 to 3 flashes per second.
- All candela ratings represent minimum effective Strobe intensity based on UL Standard 1971.
- **“Regulated Voltage Range” is the newest terminology used by UL to identify the voltage range. Prior to this change UL used the terminology “Listed Voltage Range”.**

| Table 1: Average RMS Current | | | | | | |
|------------------------------|------------------------------------|-------|-------|-------|--------|-------|
| E60 Speaker Strobes | E60 Strobe Current - Ceiling Mount | | | | | |
| | 24MCC | | | | 24MCCH | |
| | 15cd | 30cd | 75cd | 95cd | 115cd | 177cd |
| 24 vdc | 0.045 | 0.070 | 0.119 | 0.159 | 0.195 | 0.270 |
| UL max* | 0.065 | 0.105 | 0.189 | 0.249 | 0.300 | 0.420 |

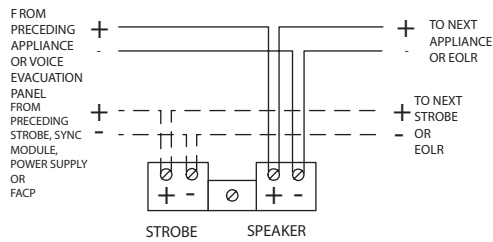
| Table 2: E60 UL Reverberant dBA @ 10 Feet** | | | | | |
|---|-----|------|------|----|----|
| watts | 1/8 | 1/4 | 1/2 | 1 | 2 |
| E Speaker | 77 | 79.5 | 82.5 | 85 | 88 |
| E Speaker Strobe | 77 | 79.5 | 82.5 | 85 | 88 |

**dBA ratings are based on testing under UL Standard 1480.

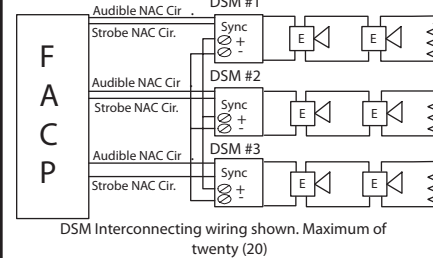
* RMS current ratings are per UL average RMS method. UL max current rating is the maximum RMS current within the listed voltage range (16-33v for 24v units). For strobes the UL max current is usually at the minimum listed voltage (16v for 24v units). For audibles the max current is usually at the maximum listed voltage (33v for 24v units). For unfiltered FWR ratings, see installation instructions.

Wiring Diagrams#

SERIES E60 SPEAKER & STROBE OPERATE INDEPENDENTLY (NON-SYNC OR SYNC)

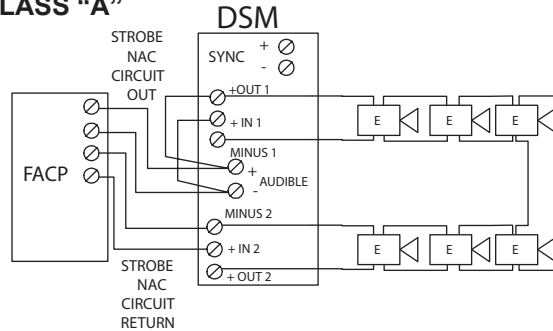


SERIES E60 SPEAKER STROBES SYNCHRONIZED WITH MULTIPLE DSM MODULES

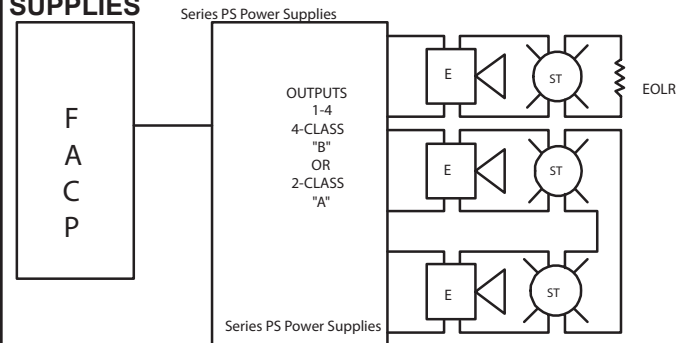


Note: Figure shows interconnection to strobe through sync module. Speaker portion requires 2 separate conductors to FACP.

SERIES E60 SPEAKER STROBE APPLIANCES SYNCHRONIZED WITH DSM MODULE SINGLE CLASS "A"



SERIES E60 SPEAKER STROBE APPLIANCES & RSS STROBES SYNCHRONIZED WHEELLOCK POWER SUPPLIES



For wiring information on the Wheellock power supplies, please refer to Data Sheet # S9100.

For detail using DSM Sync Module refer to Data Sheet S3000 or Installation Instructions P83177 for DSM. For wiring information on the power supplies refer to Installation Instructions P84905.

Specifications and Ordering Information

| Model | Order Code | Wall Mount | Ceiling Mount | Non-Sync | Strobe Sync w/ DSM or Wheellock Power Supplies | Strobe Candela | Model Color RED | Model Color White | Mounting Options | Agency Approvals | | | |
|---------------|------------|------------|---------------|----------|--|----------------|-----------------|-------------------|------------------|------------------|-----|----|------|
| | | | | | | | | | | UL | MEA | FM | CSFM |
| E60-R | 3746 | | X | - | - | - | X | - | Q,U | X | X | X | X |
| E60-W | 3745 | | X | - | - | - | - | X | Q,U | X | X | X | X |
| E60-24MCC-FR | 3748 | - | X | X | X | 15/30/75/95 | X | - | Q,U,V | X | - | X | X |
| E60-24MCC-FW | 3747 | - | X | X | X | 15/30/75/95 | - | X | Q,U,V | X | - | X | X |
| E60-24MCCH-FW | 3749 | - | X | X | X | 115/177 | - | X | Q,U,V | X | - | X | X |
| E60-24MCCH-FR | 3750 | - | X | X | X | 115/177 | X | - | Q,U,V | X | - | X | X |
| E60EXT-R** | 3578 | | | | | | X | | | X | - | - | - |
| E60EXT-W** | 3757 | | | | | | | X | | X | - | - | - |

**E60 EXT is an attractive extender ring that mounts behind the speaker to permit mounting to a 4" square x 2 1/8" deep electrical box without need for an extension ring on the box.

Also comes in NW (no writing). Models available with no writing, may be subject to minimum quantity order.

NOTE: Due to continuous development of our products, specifications and offerings are subject to change without notice in accordance with Wheelock Inc. standard terms and conditions.

Architects and Engineers Specifications

The speaker appliances shall be Wheelock Series E60 Speakers and the Speaker Strobe appliances shall be Wheelock Series E60 Speaker Strobes or approved equals. The speakers shall be UL Listed under Standard 1480 for Fire Protective Service and speakers equipped with strobes shall be listed under UL Standard 1971 for Emergency Devices for the Hearing-Impaired. In addition, the strobes shall be certified to meet the requirements of FCC Part 15, Class B.

All speakers shall be designed for a field selectable input of either 25 or 70 VRMS, with selectable power taps from 1/8 watt to 2 watts. All models shall have listed sound output of up to 87 dB at 10 feet and a listed frequency response of 400 to 4000 Hz. The speaker shall also incorporate a sealed back construction. All inputs shall employ terminals that accept #12 to #18 AWG wire sizes. The strobe portion of the appliance shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens. The strobe shall be of low current design. Where Multi-Candela Speaker Strobes are specified, the strobe intensity shall have field selectable settings and shall be rated per UL Standard 1971 15/30/75/95cd or 115/177cd for ceiling mount. The selector switch for selecting the candela shall be tamper resistant.

When synchronization is required, the strobe portion of the appliance shall be compatible with Wheelock DSM sync modules or the Wheelock Power Supplies with built-in Patented Sync Protocol. The strobes shall not drift out of synchronization at any time during operation. If the sync module or Power Supply fails to operate, (i.e., contacts remain closed), the strobe shall revert to a non-synchronized flash rate.

The speaker and speaker strobe appliances shall be designed for indoor flush mounting. The speaker and speaker strobe shall incorporate a speaker mounting plate with a snap-on grille cover with no visible screws for a level, aesthetic finish and shall mount to standard electrical hardware.

The finish of the Series E60 Speakers and Speaker Strobes shall be white or red. All speaker and speaker strobe appliances shall be backward compatible.



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3 YEAR WARRANTY

S1611 E60 06/11

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COOPER Notification

Weatherproof Appliances - Series AH Audibles, AS Audible Strobes, MT Multitone Strobes, RSS Strobes and ET70 Speaker Strobes and Weatherproof Mounting Accessories



Description:

Designed for life safety, performance and reliability, Cooper Notification's Wheelock cost effective weatherproof notification appliances include:

| | |
|-------------------------|------------------|
| Weatherproof Appliances | Series |
| Strobes | RSSWP |
| Horn Strobes | ASWP |
| Horns | AH-24WP, AH-12WP |
| Multitone Horn Strobes | MTWP |
| Multitone Horns | MT |
| Speaker Strobes | ET70WP |
| Speakers | ET-1010 |

All strobe models are UL dual listed - meeting both UL1638 and UL1971 requirements. As dual listed appliances, these weatherproof strobes, horn strobes and speaker strobes are listed for outdoor applications under UL 1638 as well as under UL 1971, the Standard for Safety Signaling Devices for Hearing Impaired. With an extended temperature range of -31°F to 150°F (-35°C to 66°C), Wheelock weatherproof appliances meet or exceed UL outdoor test requirements for rain, humidity and corrosion resistance while providing multiple strobe intensity options, including the highest strobe ratings available for area coverage per NFPA 72 strobe spacing tables (up to 185 candela for wall mounting and 177 candela for ceiling mounting).

To enable weatherproof mounting, Cooper Notification provides the industry's widest choice of mounting options for surface or unique semi-flush installation. Models are available for surface mounting to Wheelock weatherproof backboxes on walls or ceilings. The optional WP-KIT allows the weatherproof backboxes (IOB, WPBB or WPSBB) to be mounted to a recessed electrical box for concealed conduit installation. For semi-flush installation, the WPA* and WFPA* kits allow a customer to mount the weatherproof appliances to a recessed electrical box without the need for an external weatherproof backbox. See the Backboxes, Plates and Gaskets Table on page three of this document for a summarization of these mounting options and the required accessories.

All models may be synchronized using the Wheelock DSM Sync Modules, Wheelock Power Supplies or other manufacturers panels incorporating the Wheelock Patented Sync Protocol. The horn output of horn strobes can be independently controlled on 2-wire circuits using the Wheelock patented sync protocol. MTWP horn strobe models are 4-wire appliances; the strobes can be synchronized while the audible can be connected to a coded fire alarm system or can be set to produce any of eight selectable tones.

Features:

- Approvals include: UL Standards 1971, 1638, 464 and 1480 California State Fire Marshal (CSFM), New York City (MEA), Factory Mutual (FM), Chicago (BFP) and ULC. See agency approvals by model number on page two of this document
- Compliance with the following requirements: NFPA, UFC, ANSI 117.1, OSHA Part 29, 1910.165, ADA
- Weatherproof with extended temperature range of -40°F to 150°F (-40°C to 66°C)*
- Dual Listed strobe models (UL 1638 and UL 1971)
- Industry's highest strobe candela options
- Synchronize using the Wheelock Sync Modules or panels with built-in Wheelock Patented Sync Protocol
- Models with field selectable tone, dBA and candela settings
- Wall or ceiling mounting options
- Surface or semi-flush mounting
- IN/OUT wiring termination accepting two #12-18 AWG wires at each terminal

The series RSSWP, ASWP, AH-24WP, MTWP-2475W, and MT-12/24 have UL / ULC approval down to -40°F. The ET-1010 and ET70WP have UL approval down to -40°F. The AH-12WP has UL approval down to -31°F.



E5946
S5391
S2652



151-92-E



7125-0785:131 (ASWP)
7125-0785:146 (ET70WP)
7125-0785:156 (MTWP)
7300-0785:154 (RSSWP)



APPROVED

NOTE: All CAUTIONS and WARNINGS are identified by the symbol ▲. All warnings are printed in bold capital letters.

▲ WARNING: PLEASE READ THESE SPECIFICATIONS AND ASSOCIATED INSTALLATION INSTRUCTIONS CAREFULLY BEFORE USING, SPECIFYING OR APPLYING THIS PRODUCT. VISIT WWW.COOPERNOTIFICATION.COM OR CONTACT COOPER WHEELLOCK FOR THE CURRENT INSTALLATION INSTRUCTIONS. FAILURE TO COMPLY WITH ANY OF THESE INSTRUCTIONS, CAUTIONS OR WARNINGS COULD RESULT IN IMPROPER APPLICATION, INSTALLATION AND/OR OPERATION OF THESE PRODUCTS IN AN EMERGENCY SITUATION, WHICH COULD RESULT IN PROPERTY DAMAGE, AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS.

General Notes:

- Strobes are designed to flash at 1 flash per second minimum over their UL Listed Regulated Voltage Range.
- All candela ratings represent minimum effective Strobe intensity based on UL Standards 1971 and 1638 as indicated in candela ratings table.

Wall Mount



| Strobe | | Order Code |
|-----------------|-------|------------|
| RSSWP-2475W-FR | Red | 9013 |
| RSSWP-2475W-FW | White | 3034 |
| RSSWP-24MCWH-FR | Red | 5161 |
| RSSWP-24MCWH-FW | White | 5165 |

| Audible Strobe | | |
|----------------|-------|------|
| ASWP-2475W-FR | Red | 9012 |
| ASWP-24MCWH-FR | Red | 5137 |
| ASWP-24MCWH-FW | White | 5140 |

| Multi-tone Strobe | | |
|-------------------|-------|------|
| MTWP-2475W-FR | Red | 8420 |
| MTWP-2475W-FW | White | 3112 |
| MTWP-24MCWH-FR | Red | 5132 |
| MTWP-24MCWH-FW | White | 5134 |

| Speaker Strobe | | |
|------------------|-------|------|
| ET70WP-2475W-FR | Red | 9077 |
| ET70WP-2475W-FW | White | 3179 |
| ET70WP-24185W-FR | Red | 4885 |
| ET70WP-24185W-FW | White | 4891 |
| ET70WP-24135W-FR | Red | 4872 |
| ET70WP-24135W-FW | White | 4875 |

Ceiling Mount



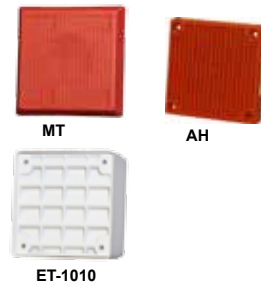
| Strobe | | Order Code |
|-----------------|-------|------------|
| RSSWP-2475C-FR | Red | 4338 |
| RSSWP-2475C-FW | White | 4446 |
| RSSWP-24MCCH-FR | Red | 5167 |
| RSSWP-24MCCH-FW | White | 5187 |

| Audible Strobe | | |
|----------------|-------|------|
| ASWP-2475C-FR | Red | 4251 |
| ASWP-2475C-FW | White | 4502 |
| ASWP-24MCCH-FR | Red | 5149 |
| ASWP-24MCCH-FW | White | 5157 |

| Multi-tone Strobe | | |
|-------------------|-------|------|
| MTWP-2475C-FR | Red | 4457 |
| MTWP-2475C-FW | White | 4478 |
| MTWP-24MCCH-FR | Red | 5102 |
| MTWP-24MCCH-FW | White | 5122 |

| Speaker Strobe | | |
|------------------|-------|------|
| ET70WP-2475C-FR | Red | 4452 |
| ET70WP-2475C-FW | White | 4454 |
| ET70WP-24177C-FR | Red | 4845 |
| ET70WP-24177C-FW | White | 4859 |
| ET70WP-24115C-FR | Red | 4550 |
| ET70WP-24115C-FW | White | 4732 |

Wall or Ceiling Mount



| Audible | | Order Code |
|-----------|-----|------------|
| AH-24WP-R | Red | 7416 |
| AH-12WP-R | Red | 7415 |

| Horn | | |
|------------|-----|------|
| MT-12/24-R | Red | 5023 |

| Speaker | | |
|-----------|-------|------|
| ET-1010-R | Red | 3135 |
| ET-1010-W | White | 3137 |

| UL Max. Current | AH | |
|-----------------|--------|--------|
| | 24 VDC | 12 VDC |
| High (99) dBA | 0.080 | 0.192 |
| Med (95) dBA | 0.043 | 0.108 |
| Low (90) dBA | 0.021 | 0.058 |

| UL Reverberant dBA @ 10 Feet | | | | | | | |
|------------------------------|-----|-----|-----|----|----|----|----|
| Watts | 1/8 | 1/4 | 1/2 | 1 | 2 | 4 | 8 |
| ET-1010 | 77 | 80 | 83 | 86 | 87 | 92 | 94 |
| ET70WP | 78 | 81 | 84 | 87 | 90 | 93 | 95 |

| Candela Ratings | | | | | | | |
|-----------------|---------|-------------------|--------------------|---|--------------------------|-------|-------|
| Series | UL 1971 | UL 1638 @ 77°F | UL 1638 @ -40°F | RSS, ET70WP and MTWP UL Max Current (Strobe Only) | ASWP | | |
| | | | | | High | Med | Low |
| 2475W | 30** | 180 | 115 | 0.138 | 0.168 | 0.155 | 0.150 |
| 2475C | 15 | 180 | 115 | 0.138 | 0.168 | 0.155 | 0.150 |
| MCWH | 135 | 135 | 56 | 0.300 | 0.355 | 0.340 | 0.335 |
| | 185 | 185 | 77 | 0.420 | 0.480 | 0.465 | 0.460 |
| MCCH | 115 | 115 | 47 | 0.300 | 0.355 | 0.340 | 0.335 |
| | 177 | 177 | 73 | 0.420 | 0.480 | 0.465 | 0.460 |
| 24185 | 185 | 185 | 77 | 0.420 | **Wall mount rating only | | |
| 24177 | 177 | 177 | 73 | 0.420 | | | |

| UL Max. Current (Audible) | MTWP/MT 24 VDC | | MT 12 VDC | |
|------------------------------|-------------------|-------|--------------|-------|
| dBA | HI | STD | HI | STD |
| Horn | 0.108 | 0.044 | 0.177 | 0.034 |
| Bell | 0.053 | 0.024 | 0.095 | 0.020 |
| March Time | 0.104 | 0.038 | 0.142 | 0.034 |
| Code 3 Horn | 0.091 | 0.035 | 0.142 | 0.034 |
| Code 3 Tone | 0.075 | 0.035 | 0.105 | 0.021 |
| Slow Whoop | 0.098 | 0.037 | 0.142 | 0.035 |
| Siren | 0.104 | 0.036 | 0.152 | 0.030 |
| Hi/Lo | 0.057 | 0.025 | 0.114 | 0.026 |

| Model Number | Agency Approvals | | | | |
|------------------|------------------|-----|------|----|-----|
| Strobe | UL | MEA | CSFM | FM | BFP |
| RSSWP-2475 | X | X | X | X | - |
| RSSWP-24MCWH | X | - | X | - | - |
| RSSWP-24MCCH | X | - | X | - | - |
| Audible Strobe | | | | | |
| ASWP-2475 | X | X | X | X | X |
| ASWP-MCWH | X | - | X | - | - |
| ASWP-MCCH | X | - | X | - | - |
| Multitone Strobe | | | | | |
| MTWP-2475 | X | X | X | X | - |
| MTWP-MCWH | X | - | X | - | - |
| MTWP-MCCH | X | - | X | - | - |
| Horns/Audibles | | | | | |
| AH-24WP | X | X | X | X | X |
| AH-12WP | X | X | X | X | X |
| MT-12/24 | X | X | X | X | X |
| Speaker Strobe | | | | | |
| ET70WP-2475 | X | - | X | X | - |
| ET70WP-185 | X | - | X | X | - |
| ET70WP-177 | X | - | X | X | - |
| ET70WP-115 | X | - | X | X | - |
| ET70WP-135 | X | - | X | X | - |

Mounting Accessories



Gasket Kit

WP-KIT Order Code 4486

Flush Plates

| | | |
|-------|-------|------|
| WFA-R | Red | 4698 |
| WFA-W | White | 4701 |
| WFP-R | Red | 4696 |
| WFP-W | White | 4697 |

Backboxes

| | | |
|----------|-------|------|
| IOB-R* | Red | 5046 |
| IOB-W* | White | 5047 |
| WPSBB-R* | Red | 9751 |
| WPSBB-W* | White | 3033 |
| WPBB-R* | Red | 9014 |
| WPBB-W* | White | 4692 |
| WBB-R | Red | 2959 |
| WBB-W | White | 2960 |

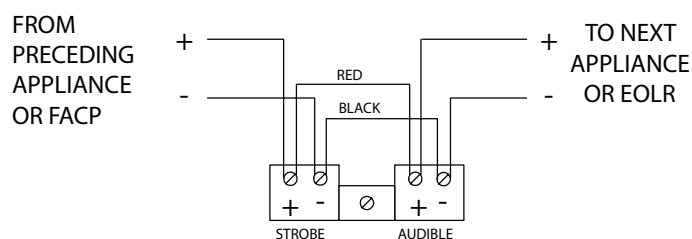
Mounting Options:

| | Backboxes, Plates, Gasket Kits | | |
|-----------------------------|--------------------------------|-------------------|-------------|
| | Surface Mount | | Flush Mount |
| | Exposed Conduit | Concealed Conduit | |
| RSSWP Strobes | WPSBB | WPSBB + WP-KIT | WFP |
| ET70WP Speaker Strobes | IOB | IOB + WP-KIT | WFP |
| ASWP Horn Strobes | WPBB | WPBB + WP-KIT | WFA |
| AHWP Horns | WBB | - | WFP |
| ET-1010 Speakers | WBB | - | WFP |
| MTWP Multitone Horn Strobes | IOB | IOB + WP-KIT | WFP |
| Multitone Horn | IOB | IOB + WP-KIT | WFP |

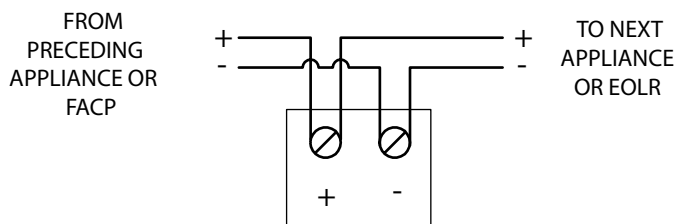
*IOB, WPSBB and WPBB models include weep holes and plug in the event that moisture may have entered the appliance

Wiring Diagrams

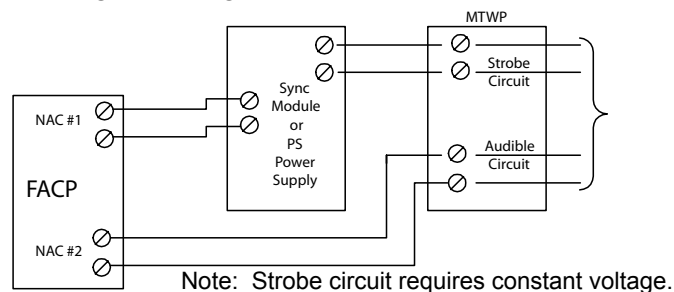
SERIES MTWP AUDIBLE APPLIANCE AND STROBE OPERATE IN UNISON. RED AND BLACK SHUNT-WIRES ARE SUPPLIED.



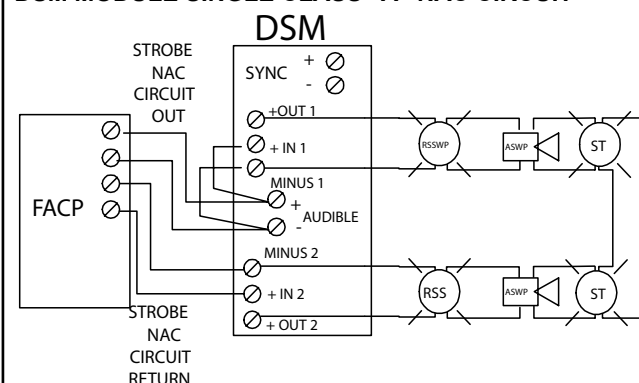
SERIES RSSWP, ASWP, AHWP, MTWP AND MT-12/24 APPLIANCES



SERIES MTWP APPLIANCES SYNCHRONIZED STROBE OPERATION WITH CODED FACP



SERIES RSSWP/ASWP APPLIANCES SYNCHRONIZED W/ DSM MODULE SINGLE CLASS "A" NAC CIRCUIT



Note: Models are available in Red or White. Contact Customer Service for Order Code and Delivery.

#Refer to Data Sheet S7000 for Mounting Options

NOTE: Due to continuous development of our products, specifications and offerings are subject to change without notice in accordance with Cooper Wheelock Inc. dba Cooper Notification standard terms and conditions.

ARCHITECTS AND ENGINEERS SPECIFICATIONS

General

Weatherproof notification appliances shall be UL listed for outdoor use. Weatherproof Strobe appliances shall be listed under UL Standard 1638 (Standard for Visual Signaling Appliances) for Indoor/Outdoor use and UL Standard 1971 (Standard for Safety Signaling Devices for Hearing Impaired). The appliances shall be available for optional wall mounting or ceiling mounting to weatherproof backboxes using either exposed conduit or concealed conduit, or semi-flush mounting to a recessed electrical box in walls or ceilings using Wheelock mounting accessories.

Weatherproof Strobes

Weatherproof Strobe appliances shall produce a minimum flash rate of 60 flashes per minute over the UL Regulated Voltage Range of 16 to 33 VDC and shall incorporate a Xenon flashtube. The weatherproof strobes shall be available with UL 1971 candela ratings up to 185 cd for wall mounting and 177 cd for ceiling mounting. UL 1638 candela ratings up to 180 cd at 77°F shall be available. The strobes shall operate over an extended temperature range of -40°F to 150°F (-40°C to 66°C) and be listed for maximum humidity of 95% RH. Strobe inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring by a Fire Alarm Control Panel (FACP).

Weatherproof Audibles and Audible/Strobe Combinations Weatherproof horns and multitone audibles shall be listed for Indoor/Outdoor use under UL Standard 464. The horns shall be able to produce a continuous output or a temporal code-3 output that can be synchronized. The horns shall have at least 3 sound level settings. Horn/Strobe combinations shall be able to be synchronized on a single NAC.

Multitone audibles shall be able to produce 8 distinct tones selectable by dip switch and shall have at least 2 sound level settings. Multitone Audible/Strobe combinations shall have independent inputs for the audible and strobe. The strobes shall be able to be synchronized. The audibles shall be able to be coded when operated on a separate NAC.

Weatherproof Speakers and Speaker/Strobes

Weatherproof speakers and speaker/strobes shall be listed for Indoor/Outdoor use under UL Standard 1480. All speakers shall provide field selectable taps for 1/8W to 8W operation for either 25 VRMS or 70 VRMS audio systems and shall incorporate a sealed back construction for extra protection and improved audibility. Speakers without strobes shall be Wheelock Series ET-1010. They shall be listed to produce up to 94 dBA and shall incorporate a vandal resistant grille design. Speaker with strobes shall be Wheelock Series ET70WP. They shall be available for surface or semi-flush mounting to walls or ceilings and shall be listed to produce up to 93 dBA.

Synchronization Modules

When synchronization of strobes or temporal code-3 audibles is required, the appliances shall be compatible with the Wheelock Series DSM Sync Modules, Wheelock Power Supplies or other manufacturers panels with built-in Wheelock Patented Sync Protocol. The strobes and audibles shall not drift out of synchronization at any time during operation.

Series ASWP audibles and strobes shall be able to be synchronized on a 2-wire circuit with the ability to silence the audible if required. The strobes on Series MT multitone audible/strobe appliances shall be able to be synchronized and shall be able to be operated on a separate circuit from the audibles while the audible circuit is connected to a coded or continuous NAC.

Weatherproof Mounting Accessories

Weatherproof mounting options shall include surface mounting or semi-flush mounting to walls or ceilings. Surface mounted appliances shall mount to Wheelock IOB, WBB, WPBB or WPSBB weatherproof backboxes using either exposed conduit or concealed conduit. For concealed conduit the weatherproof backbox shall be mounted to a recessed electrical box with Wheelock's WP-KIT to provide a weatherproof seal for the electrical box. Semi-flush mounted appliances shall mount to a recessed electrical box using Wheelock WFP or WFP-A flush plates to provide a weatherproof seal between the electrical box and the appliance.



WE ENCOURAGE AND SUPPORT NICET CERTIFICATION
3 YEAR WARRANTY

S9004 WP 11/12

NJ Location

273 Branchport Ave.
Long Branch, NJ 07740
P: 800-631-2148
F: 732-222-8707
www.coopernotification.com

Cooper Notification is Wheelock®



COOPER Notification



DTK-120SR

54kA Series Connected Surge Protector General Product Specifications



DITEK's DTK-120SR protects 120V power on electrical circuits and control panels. The hybrid series design provides maximum critical load protection, with EMI/RFI filtering. The 120SR is ideal for use in UL Listed control panels where a UL Recognized Component is required for control panel certification.

Use DITEK's DTK-TSS4 when a UL Listed series surge protector is required.

DTK-120SR

Product Features

- Series design for fast response and best protection
- Compact design fits in a variety of control panels
- Suitable for use on circuit breakers rated at 10kA AIC
- Multi-stage hybrid circuit design
- EMI/RFI filtering
- LED indicates protection status
- UL1449 3rd Edition Recognized component
- Ten Year Limited Warranty

Specifications

Agency Approvals: UL1449 3rd Edition, cUL, UL1283
Protector Type: Type 4 SPD, for Type 2 Application
Nominal Discharge Current Rating (In): 3kA
SCCR: 10kA
Operating Voltage: 120VAC
MCOV: 150VAC
Peak Surge Current: 54,000 Amps
Maximum Continuous Current: 20A
EMI/RFI Attenuation: Up to 35dB, 100kHz-100MHz
Protection Modes: All modes (L-N, L-G, N-G)
Voltage Protection Rating: 600V
Temperature Range: 32°F – 104°F (0°C - 40°C)
Dimensions: 6.87" x 3.50" x 2.50"
(174.50 mm x 88.90 mm x 63.50 mm)
Weight: 12.16 oz.
Housing: ABS



89841 Multi-Conductor - Low Capacitance Computer and Computer P.O.S. Cable



For more Information
please call

1-800-Belden1

**General Description:**

Low cap 24 AWG stranded (7x32) TC conductors, plenum, foam FEP insulation, twisted pairs, overall Beldfoil (100% coverage) + TC braid shield (90% coverage), 24 AWG stranded TC drain wire, FEP jacket.

Physical Characteristics (Overall)**Conductor****AWG:**

| # Pairs | AWG | Stranding | Conductor Material |
|---------|-----|-----------|--------------------|
| 1 | 24 | 7x32 | TC - Tinned Copper |

Total Number of Conductors: 2

Insulation**Insulation Material:**

| Insulation Trade Name | Insulation Material | Wall Thickness (in.) |
|-----------------------|--|----------------------|
| Teflon® | FFEP - Foam Fluorinated Ethylene Propylene | 0.025 |

Outer Shield**Outer Shield Material:**

| Layer # | Outer Shield Trade Name | Type | Outer Shield Material | Coverage (%) |
|---------|-------------------------|-------|------------------------------|--------------|
| 1 | Beldfoil® | Tape | Aluminum Foil-Polyester Tape | 100 |
| 2 | | Braid | TC - Tinned Copper | 90 |

Outer Shield Drain Wire AWG:

| AWG | Stranding | Drain Wire Conductor Material |
|-----|-----------|-------------------------------|
| 24 | 7x32 | TC - Tinned Copper |

Outer Jacket**Outer Jacket Material:**

| Outer Jacket Trade Name | Outer Jacket Material |
|-------------------------|--------------------------------------|
| Teflon® | FEP - Fluorinated Ethylene Propylene |

Overall Cable

Overall Nominal Diameter: 0.202 in.

Pair**Pair Color Code Chart:**

| Number | Color |
|--------|-------------------------|
| 1 | White/Blue & Blue/White |

Mechanical Characteristics (Overall)

| | |
|-----------------------------------|-----------------|
| Operating Temperature Range: | -70°C To +200°C |
| UL Temperature Rating: | 150°C |
| Non-UL Temperature Rating: | 150°C |
| Bulk Cable Weight: | 27 lbs/1000 ft. |
| Max. Recommended Pulling Tension: | 45.700 lbs. |
| Min. Bend Radius/Minor Axis: | 2.250 in. |

89841 Multi-Conductor - Low Capacitance Computer and Computer P.O.S. Cable

Applicable Specifications and Agency Compliance (Overall)

Applicable Standards & Environmental Programs

| | |
|---------------------------------------|------------|
| NEC/(UL) Specification: | CMP |
| CEC/C(UL) Specification: | CMP |
| EU Directive 2011/65/EU (ROHS II): | Yes |
| EU CE Mark: | Yes |
| EU Directive 2000/53/EC (ELV): | Yes |
| EU Directive 2002/95/EC (RoHS): | Yes |
| EU RoHS Compliance Date (mm/dd/yyyy): | 04/01/2005 |
| EU Directive 2002/96/EC (WEEE): | Yes |
| EU Directive 2003/11/EC (BFR): | Yes |
| CA Prop 65 (CJ for Wire & Cable): | Yes |
| MII Order #39 (China RoHS): | Yes |

Flame Test

| | |
|-----------------|----------|
| UL Flame Test: | NFPA 262 |
| CSA Flame Test: | FT6 |

Plenum/Non-Plenum

| | |
|--------------------|------|
| Plenum (Y/N): | Yes |
| Non-Plenum Number: | 9841 |

Electrical Characteristics (Overall)

Nom. Characteristic Impedance:

Impedance (Ohm)

120

Nom. Capacitance Conductor to Conductor:

Capacitance (pF/ft)

12

Nom. Capacitance Cond. to Other Conductor & Shield:

Capacitance (pF/ft)

22

Nominal Velocity of Propagation:

VP (%)

76

Nom. Conductor DC Resistance:

DCR @ 20°C (Ohm/1000 ft)

24

Nominal Outer Shield DC Resistance:

DCR @ 20°C (Ohm/1000 ft)

3.1

Max. Operating Voltage - UL:

Voltage

300 V RMS

Max. Recommended Current:

Current

4 Amps per conductor @ 25°C

Notes (Overall)

Notes: Teflon® is a registered trademark of E. I. duPont de Nemours and Co. used under license by Belden, Inc.

89841 Multi-Conductor - Low Capacitance Computer and Computer P.O.S. Cable**Put Ups and Colors:**

| Item # | Putup | Ship Weight | Color | Notes | Item Desc |
|---------------|----------|-------------|-------|-------|-----------------------|
| 89841 0021000 | 1,000 FT | 29.000 LB | RED | C | 1 PR #24 FFEPR SH FEP |
| 89841 002500 | 500 FT | 15.500 LB | RED | | 1 PR #24 FFEPR SH FEP |
| 89841 0025000 | 5,000 FT | 145.000 LB | RED | | 1 PR #24 FFEPR SH FEP |

Notes:

C = CRATE REEL PUT-UP.

Revision Number: 2 Revision Date: 08-15-2012

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All sales of Belden products are subject to Belden's standard terms and conditions of sale.

Belden believes this product to be in compliance with EU RoHS (Directive 2002/95/EC, 27-Jan-2003). Material manufactured prior to the compliance date may be in stock at Belden facilities and in our Distributor's inventory. The information provided in this Product Disclosure, and the identification of materials listed as reportable or restricted within the Product Disclosure, is correct to the best of Belden's knowledge, information, and belief at the date of its publication. The information provided in this Product Disclosure is designed only as a general guide for the safe handling, storage, and any other operation of the product itself or the one that it becomes a part of. This Product Disclosure is not to be considered a warranty or quality specification. Regulatory information is for guidance purposes only. Product users are responsible for determining the applicability of legislation and regulations based on their individual usage of the product.

Belden declares this product to be in compliance with EU LVD (Low Voltage Directive 73/23/EEC), as amended by directive 93/68/EEC.

CONNECT ^{AIR} Wire and Cable

Product Data Sheet
P/N W221P-1003B

MADE IN USA

1Pair 22AWG Stranded Shielded Level 4 Non-Plenum Echelon/Lonworks
UL TYPE CM

CONSTRUCTION:

| | |
|---------------|--|
| CONDUCTOR: | 22 AWG STRANDED BC |
| INSULATION: | FOAMED POLYETHYLENE |
| CABLE: | 2 COLOR CODED SINGLES TWISTED TOGETHER TO FORM A PAIR |
| COLOR CODE: | 1.WHITE\BLUE 2. BLUE |
| SHIELD: | ALUMINUM MYLAR 100% COVERAGE 22 AWG STRANDED TINNED COPPER DRAIN WIRE. |
| JACKET: | PVC GREY OVERALL O.D.:.200"nom. |
| JACKET PRINT: | CONNECT-AIR W221P-1003 800-247-1978 LEVEL 4 (UL FILE #) 22AWG 1PR SHIELDED (UL) CM C(UL)US OR (UL) CL3 75c SUN RES "ROHS 11" REACH MADE IN USA (ASCENDING/DESCENDING FOOTAGE MARKERS) |

AGENCY APPROVALS:

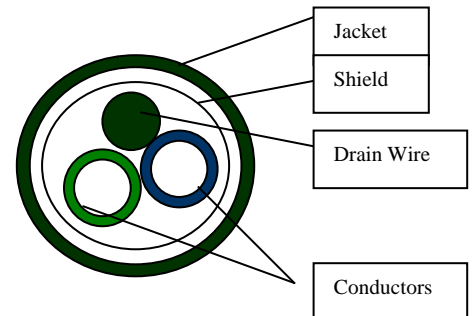
NEC (UL) TYPE CL3 OR CM

PHYSICAL PROPERTIES:

| | |
|---------------------------|------------|
| TEMPERATURE RATING, MAX.: | 75C |
| WEIGHT, NOM., NET: | 20 LBS/MFT |

ELECTRICAL CHARACTERISTICS:

| | |
|----------------------|--------------------|
| CAPACITANCE, MUTUAL: | 12.9 pF/ft. nom |
| IMPEDANCE: | 101 OHMS +/- 10% |
| DC RESISTANCE: | 14.8 OHMS/MFT @20C |
| VOLTAGE RATING, MAX. | 300V |



This cable has been approved and recommended by Echelon/Lonworks for use in their systems.

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4240 B Street NW
Auburn, WA 98001
(800) 247-1978
www.connect-air.com

Updated 1/3/14 kz

CONNECT *AIR* Wire and Cable

Product Data Sheet
P/N W161P-1601

MADE IN USA

2Cond 16AWG Solid BC Unshielded Fire Alarm Cable
Type FPLR

CONSTRUCTION

| | |
|---------------|--|
| CONDUCTOR: | #16 AWG SOLID BC |
| INSULATION: | SEMI-RIGID PVC |
| CABLE: | 2 CONDUCTORS @ 4.00" OSCILLATED LAY |
| COLOR CODE: | 1. BLACK 2. RED |
| JACKET: | POLYVINYL CHLORIDE- RED OVERALL O.D.: 0.172" nom. |
| PRINT LEGEND: | 16 AWG -E1512S -- 75C (UL FILE NO.) (UL) TYPE FPLR MADE IN USA (DATE CODE & SEQUENTIAL FOOTAGE) |

INDUSTRY APPROVALS

| | |
|-------------------------|-------------|
| NATIONAL ELECTRIC CODE: | ARTICLE 760 |
| UL STANDARD 1424: | TYPE FPLR |

ELECTRICAL PROPERTIES

| | |
|--------------------------------|-------------------------|
| TEMPERATURE / WORKING VOLTAGE: | -20C TO 75C / 300 VRMS |
| CONDUCTOR D.C. RESISTANCE: | 4.2 OHMS/1000FT NOM. |
| MUTUAL CAPACITANCE: | 32.99 Pf/ft @ 1 kHz nom |
| CHARACTERISTIC IMPEDANCE: | 58.3 OHMS @ 1MHz NOM |

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4240 B Street NW
Auburn, WA 98001
(800) 247-1978
www.connect-air.com

4/4/12 – Updated kz

P

Product Data Sheet
P/N W141C-1461BLK

1Cond 14 AWG Stranded --- Black
Type THHN/MTW/THWN

CONSTRUCTION

- 14 AWG Soft drawn bare copper conductor
- PVC insulation
- NYLON jacket
- Gasoline & oil resistant - Type MTW 90°C Machine Tool Wire (stranded only) 105°C AWM, 80°C where exposed to oil.
- Outside diameter - .120 in (nominal)

INDUSTRY RATINGS:

- THHN-THWN: 75°C Oil, 75°C Wet, 90°C Dry, 600V
- THWN-2: 75°C Oil, 90°C Wet, 90°C Dry, 600V
- MTW: 60°C Oil, 60°C Wet, 90°C Dry, 600V
- AWM 1316 to 1321: 80°C Oil, - Wet, 105°C Dry, 600V
- AWM 1408 to 1414: 60°C Oil, 60°C Wet, 90°C Dry, 600V
- AWM 1452 to 1453: 80°C Oil, - Wet, 90°C Dry, 600V
- T90 NYLON: 60°C Oil, - Wet, 90°C Dry, 1000V
- TWN 75: - Oil, 75°C Wet, - Dry, 600V

INDUSTRY APPROVALS:

- UL listed Stds. 83 & 1063 as: Type THHN Wire 90°C in dry locations, Type THWN Wire 75°C in wet locations.
- A-A-59544, NEMA WC-5, UL-758
- CSA approval upon request

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4240 B STREET NW
AUBURN, WA 98001



Specification Sheet

Lake Cable Part #: THHN142(7)-02/00

Description: 14 AWG 2 conductors stranded bare copper with polyvinylchloride and nylon insulation, unshielded cable, approved for use in THHN applications.

1. Conductor

- 1.1. AWG Size & Stranding: 14 AWG 7 Strands
- 1.2. Material: Annealed Bare Copper
- 1.3. Conductor Count: 2 Conductors

2. Insulation

- 2.1. Material: Polyvinylchloride & Nylon
- 2.2. Wall Thickness: 0.015" PVC & 0.005" Nylon
- 2.3. Color Code: Black, Red

3. Assembly

- 3.1. Lay Length: 3.50" LHL
- 3.2. Fillers: N/A
- 3.3. Binder: N/A
- 3.4. Shield: N/A
- 3.5. Drain Wire: N/A

4. Jacket

- 4.1. Material: N/A
- 4.2. Wall Thickness: N/A
- 4.3. Diameter: 0.226"
- 4.4. Color: N/A
- 4.5. Ripcord: N/A
- 4.6. Weight: 35 lbs./Mft.

5. Markings

- 5.1. Type: Conductors shall be permanently identified via surface inkjet print
- 5.2. Legend: LAKE CABLE E206524 14AWG (UL) THHN 600V 90°C DRY 75°C WET VW-1 "ROHS II" REACH MADE IN USA
- 5.3. Footage Markers: No

6. Standards

- 6.1. Meets all requirements of UL Standard 83 for Type THHN/THWN/VW-1
- 6.2. All materials used in the manufacture of this cable are RoHS compliant
- 6.3. Made in the USA

Your signature constitutes that you have read and agreed to this specification sheet and upon confirmation of your order; this item may be non-cancelable and non-returnable.

Signature

Company

ALL SPECIFIED PARAMETERS ARE NOMINAL AND SUBJECT TO VERIFICATION

TIMES MICROWAVE SYSTEMS

A Smiths Group plc company

LMR®-400

Flexible Low Loss Communications Coax

Ideal for...

- Drop-in replacement for RG-8/9913 Air-Dielectric type Cable
- Jumper Assemblies in Wireless Communications Systems
- Short Antenna Feeder runs
- Any application (e.g. WLL, GPS, LMR) requiring an easily routed, low loss RF cable



- **LMR®** standard is a UV Resistant Polyethylene jacketed cable designed for 20-year service outdoor use. The bending and handling characteristics are significantly better than air-dielectric and corrugated hard-line cables.
- **LMR®-DB** is identical to standard LMR plus has the advantage of being watertight. The addition of waterproofing compound in and around the foil/braid insures continuous reliable service should the jacket be inadvertently damaged during installation or in the future.
- **LMR®-FR** is a non-halogen (non-toxic), low smoke, fire retardant cable designed for in-building runs that can be routed anywhere except air handling plenums. LMR-FR has a UL/NEC & CSA rating of 'CMR/MPR' and 'FT4' respectively.
- **LMR®-FR-PVC** is a general-purpose indoor cable and has a UL/NEC & CSA rating of 'CMR/MPR' and 'FT4' respectively. It is less expensive than LMR-FR, however it emits toxic fumes (HCL) and greater smoke density when burned.
- **LMR®-PVC** is designed for low loss general-purpose indoor/outdoor applications and is somewhat more flexible than the standard polyethylene jacketed LMR.
- **LMR®-PVC-W** is a white-jacketed version of LMR-PVC for marine and other indoor/outdoor applications where color compatibility is desired.

- **Flexibility** and bendability are hallmarks of the LMR-400 cable design. The flexible outer conductor enables the tightest bend radius available for any cable of similar size and performance.
- **Low Loss** is another hallmark feature of LMR-400. Size for size LMR has the lowest loss of any flexible cable and comparable loss to semirigid hard-line cables.

- **RF Shielding** is 50 dB greater than typical single shielded coax (40 dB). The multi-ply bonded foil outer conductor is rated conservatively at > 90 dB (i.e. >180 dB between two adjacent cables).
- **Weatherability:** LMR-400 cables designed for outdoor exposure incorporate the best materials for UV resistance and have life expectancy in excess of 20 years.
- **Connectors:** A wide variety of connectors are available for LMR-400 cable, including all common interface types, reverse polarity, and a choice of solder or non-solder center pins. Most LMR connectors employ crimp outer attachment using standard hex crimp sizes.
- **Cable Assemblies:** All LMR-400 cable types are available as pre-terminated cable assemblies. Refer to the section on FlexTech for further details.

| Part Description | | | | |
|------------------|--------------------|--------|-------|------------|
| Part No. | Application | Jacket | Color | Stock Code |
| LMR-400 | Outdoor | PE | Black | 54001 |
| LMR-400-DB | Outdoor/Watertight | PE | Black | 54091 |
| LMR-400-FR | Indoor -Riser CMR | FRPE | Black | 54030 |
| LMR-400-FR-PVC | Indoor -Riser CMR | FRPVC | Black | 54073 |
| LMR-400-PVC | Indoor/Outdoor | PVC | Black | 54218 |
| LMR-400-PVC-W | Indoor/Outdoor | PVC | White | 54204 |

| Construction Specifications | | | |
|-----------------------------|-------------------|-------|---------|
| Description | Material | In. | (mm) |
| Inner Conductor | Solid BCCAI | 0.108 | (2.74) |
| Dielectric | Foam PE | 0.285 | (7.24) |
| Outer Conductor | Aluminum Tape | 0.291 | (7.39) |
| Overall Braid | Tinned Copper | 0.320 | (8.13) |
| Jacket | (see table above) | 0.405 | (10.29) |

Mechanical Specifications

| Performance Property | Units | US | (metric) |
|---------------------------|----------------|-------|----------|
| Bend Radius: installation | in. (mm) | 1.00 | (25.4) |
| Bend Radius: repeated | in. (mm) | 4.0 | (101.6) |
| Bending Moment | ft-lb (N-m) | 0.5 | (0.68) |
| Weight | lb/ft (kg/m) | 0.068 | (0.10) |
| Tensile Strength | lb (kg) | 160 | (72.6) |
| Flat Plate Crush | lb/in. (kg/mm) | 40 | (0.71) |

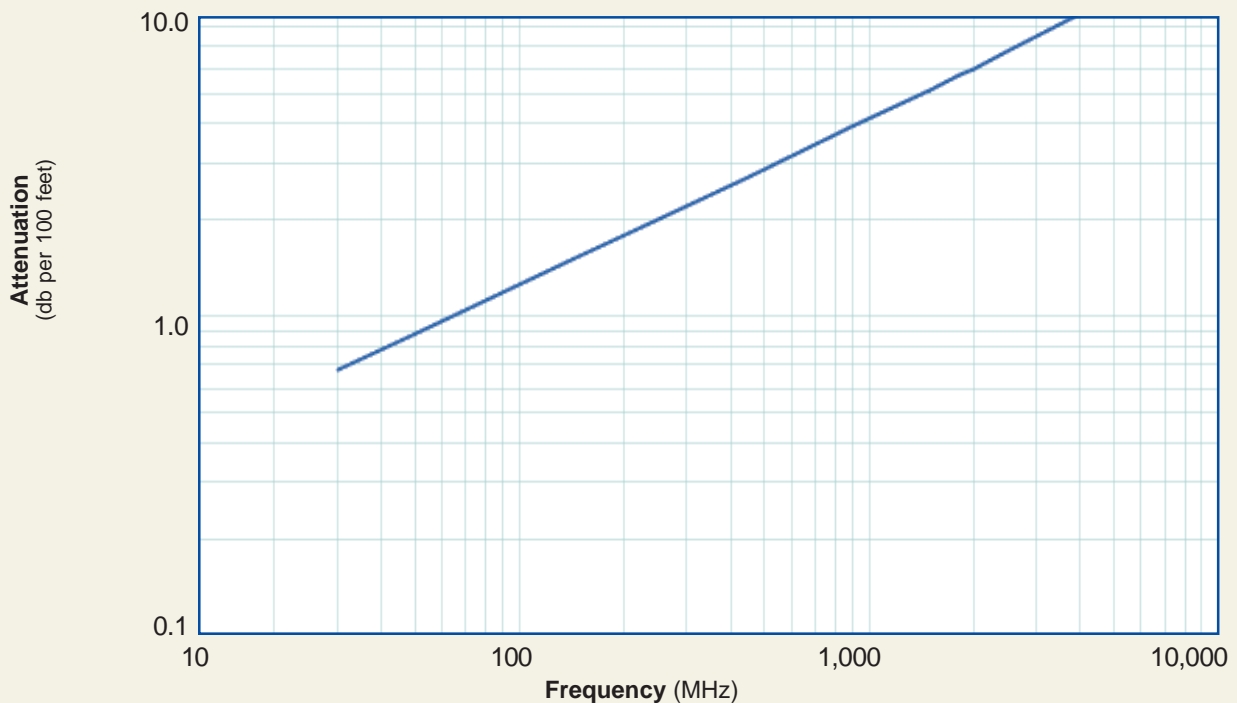
Environmental Specifications

| Performance Property | °F | °C |
|--------------------------------|----------|---------|
| Installation Temperature Range | -40/+185 | -40/+85 |
| Storage Temperature Range | -94/+185 | -70/+85 |
| Operating Temperature Range | -40/+185 | -40/+85 |

Electrical Specifications

| Performance Property | Units | US | (metric) |
|-------------------------|-------------------|-------|----------|
| Cutoff Frequency | GHz | 16.2 | |
| Velocity of Propagation | % | 85 | |
| Dielectric Constant | NA | 1.38 | |
| Time Delay | nS/ft (nS/m) | 1.20 | (3.92) |
| Impedance | ohms | 50 | |
| Capacitance | pF/ft (pF/m) | 23.9 | (78.4) |
| Inductance | uH/ft (uH/m) | 0.060 | (0.20) |
| Shielding Effectiveness | dB | >90 | |
| DC Resistance | | | |
| Inner Conductor | ohms/1000ft (/km) | 1.39 | (4.6) |
| Outer Conductor | ohms/1000ft (/km) | 1.65 | (5.4) |
| Voltage Withstand | Volts DC | 2500 | |
| Jacket Spark | Volts RMS | 8000 | |
| Peak Power | kW | 16 | |

Attenuation vs. Frequency (typical)



| Frequency (MHz) | 30 | 50 | 150 | 220 | 450 | 900 | 1500 | 1800 | 2000 | 2500 | 5800 |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|
| Attenuation dB/100 ft | 0.7 | 0.9 | 1.5 | 1.9 | 2.7 | 3.9 | 5.1 | 5.7 | 6.0 | 6.8 | 10.8 |
| Attenuation dB/100 m | 2.2 | 2.9 | 5.0 | 6.1 | 8.9 | 12.8 | 16.8 | 18.6 | 19.6 | 22.2 | 35.5 |
| Avg. Power kW | 3.33 | 2.57 | 1.47 | 1.20 | 0.83 | 0.58 | 0.44 | 0.40 | 0.37 | 0.33 | 0.21 |

Calculate Attenuation =

$(0.122290) \cdot \sqrt{\text{FMHz}} + (0.000260) \cdot \text{FMHz}$ (interactive calculator available at <http://www.timesmicrowave/telecom>)

Attenuation:

VSWR=1.0 ; Ambient = +25°C (77°F)

Power:

VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F); Sea Level; dry air; atmospheric pressure; no solar loading

TIMES MICROWAVE SYSTEMS

A Smiths Group plc company

LMR®-400

Flexible Low Loss Communications Coax



Connectors

| Interface | Description | Part Number | Stock Code | VSWR** Freq. (GHz) | Coupling Nut | Inner Contact Attach | Outer Contact Attach | Finish* Body /Pin | Length in (mm) | Width in (mm) | Weight lb (g) |
|-----------------|------------------|-------------------|------------|--------------------|--------------|----------------------|----------------------|-------------------|----------------|---------------|---------------|
| 7-16 DIN Female | Straight Jack | TC-400-716-FC | 3190-376 | <1.25:1 (2.5) | NA | Solder | Clamp | S/S | 1.6 (41) | 1.13 (28.7) | 0.281 (127.5) |
| 7-16 DIN Male | Straight Plug | TC-400-716-MC | 3190-279 | <1.25:1 (2.5) | Hex | Solder | Clamp | S/S | 1.4 (36) | 1.40 (35.6) | 0.268 (121.6) |
| 7-16 DIN Male | Right Angle | TC-400-716MC-RA | 3190-1671 | <1.25:1 (<3) | Hex | Solder | Clamp | A/S | 2.4 (61.5) | 1.88 (47.8) | 0.35 (159) |
| BNC Male | Straight Plug | TC-400-BM | 3190-318 | <1.25:1 (2.5) | Knurl | Solder | Crimp | N/S | 1.7 (43) | 0.56 (14.2) | 0.063 (28.6) |
| HN Male | Straight Plug | TC-400-HNM | 3190-923 | <1.25: (<1) | Knurl | Solder | Clamp | S/G | 2.3 (59.2) | 0.88 (22.4) | 0.25 (113.4) |
| QDS Male | Straight Plug | TC-400-QDSM | 3190-620 | <1.25: (<3) | Knurl | Solder | Clamp | A/G | 1.8 (46.6) | 1.00 (25.4) | 0.25 (113.4) |
| Mini-UHF | Straight Plug | TC-400-MUHF | 3190-520 | <1.25:1 (2.5) | Knurl | Solder | Crimp | N/G | 1.1 (28) | 0.50 (12.7) | 0.020 (9.1) |
| N Female | Straight Jack | TC-400-NFC | 3190-299 | <1.25:1 (2.5) | NA | Solder | Clamp | N/S | 1.6 (41) | 0.75 (19.1) | 0.119 (54.0) |
| | Straight Jack | EZ-400-NF | 3190-956 | <1.25:1 (2.5) | NA | Spring Finger | Crimp | N/G | 1.8 (45) | 0.66 (16.8) | 0.105 (47.6) |
| | Bulkhead Jack | EZ-400-NF-BH | 3190-518 | <1.25:1 (2.5) | NA | Spring Finger | Crimp | N/G | 1.8 (46) | 0.88 (22.4) | 0.102 (46.3) |
| | Bulkhead Jack | TC-400-NFC-BH (A) | 3190-872 | <1.25:1 (2.5) | NA | Solder | Clamp | A/G | 1.8 (46) | 0.88 (22.4) | 0.145 (65.8) |
| N Male | Straight Plug | SC-400-NM | 3190-1454 | <1.25:1 (2.5) | Knurl | Solder | Crimp | N/G | 1.5 (38) | 0.75 (19.1) | 0.090 (40.8) |
| | Straight Plug | TC-400-NM | 3190-188 | <1.25:1 (2.5) | Knurl | Solder | Crimp | N/G | 1.5 (38) | 0.75 (19.1) | 0.090 (40.8) |
| | Straight Plug | TC-400-NMC | 3190-277 | <1.25:1 (2.5) | Knurl | Solder | Clamp | S/G | 1.5 (38) | 0.70 (17.8) | 0.121 (54.9) |
| | Straight Plug | EZ-400-NFC-2 | 3190-1907 | <1.25:1 (2.5) | NA | Spring Finger | Clamp | N/G | 1.5 (38) | 0.89 (22.6) | 0.121 (54.9) |
| | Straight Plug | EZ-400-NMC-2 | 3190-1906 | <1.25:1 (2.5) | Hex/Knurl | Spring Finger | Clamp | N/G | 1.5 (38) | 0.75 (19.1) | 0.121 (54.9) |
| | Straight Plug | EZ-400-NMH | 3190-400 | <1.25:1 (10) | Hex | Spring Finger | Crimp | S/G | 1.5 (38) | 0.89 (22.6) | 0.103 (46.8) |
| | Straight Plug | TC-400-NMH | 3190-552 | <1.25:1 (10) | Hex | Solder | Crimp | S/G | 1.5 (38) | 0.89 (22.6) | 0.113 (51.3) |
| | Straight Plug | EZ-400-NMK | 3190-661 | <1.25:1 (10) | Knurl | Spring Finger | Crimp | S/G | 1.5 (38) | 0.89 (22.6) | 0.113 (51.3) |
| | Right Angle | TC-400-NMH-RA | 3190-422 | <1.35:1 (6) | Hex | Solder | Crimp | S/G | 1.8 (46) | 1.25 (31.8) | 0.130 (59.0) |
| | Right Angle | TC-400-NMC-RA (A) | 3190-870 | <1.35:1 (2.5) | Hex | Solder | Clamp | A/G | 1.8 (46) | 1.25 (31.8) | 0.150 (68.0) |
| | Right Angle | EZ-400-NMH-RA | 3190-761 | <1.35:1 (2.5) | Hex | Spring Finger | Crimp | S/G | 1.8 (46) | 1.25 (31.8) | 0.130 (59.0) |
| | Reverse Polarity | TC-400-NM-RP | 3190-960 | <1.25:1 (2.5) | Knurl | Solder | Crimp | N/G | 1.5 (38) | 0.75 (19.1) | 0.090 (40.8) |
| SMA Male | Straight Plug | TC-400-SM | 3190-439 | <1.25:1 (8) | Hex | Solder | Crimp | N/G | 1.2 (29) | 0.50 (12.7) | 0.032 (14.5) |
| TNC Female | Reverse Polarity | TC-400-TF-RP | 3190-1063 | <1.25:1 (2.5) | NA | Solder | Crimp | N/G | 1.8 (46) | 0.55 (14.0) | 0.074 (33.6) |
| | Reverse Polarity | EZ-400-TF-RP | 3190-795 | <1.25:1 (2.5) | NA | Spring Finger | Crimp | A/G | 1.8 (46) | 0.55 (14.0) | 0.074 (33.6) |
| TNC Male | Straight Plug | TC-400-TM | 3190-260 | <1.25:1 (2.5) | Knurl | Solder | Crimp | N/S | 1.7 (43) | 0.59 (15.0) | 0.074 (33.6) |
| | Straight Plug | EZ-400-TM | 3190-650 | <1.25:1 (2.5) | Knurl | Spring Finger | Crimp | N/S | 1.7 (43) | 0.59 (15.0) | 0.074 (33.6) |
| | Right Angle | TC-400-TM-RA | 3190-442 | <1.35:1 (2.5) | Knurl | Solder | Crimp | N/G | 1.7 (43) | 0.59 (15.0) | 0.085 (38.6) |
| | Reverse Polarity | TC-400-TM-RP | 3190-1062 | <1.25:1 (2.5) | Knurl | Solder | Crimp | N/G | 1.7 (43) | 0.59 (15.0) | 0.074 (33.6) |
| | Reverse Polarity | EZ-400-TM-RP | 3190-794 | <1.25:1 (2.5) | Knurl | Spring Finger | Crimp | A/G | 1.7 (43) | 0.59 (15.0) | 0.074 (33.6) |
| UHF Male | Straight Plug | EZ-400-UM | 3190-997 | <1.25:1 (2.5) | Knurl | Spring Finger | Crimp | N/G | 1.9 (48) | 0.80 (20.3) | 0.090 (40.8) |

* Finish metals: N=Nickel, S=Silver, G=Gold, SS=Stainless Steel, A=Alloy **VSWR spec based on 3 foot cable with a connector pair



Hardware Accessories

| Type | Part Number | Stock Code | Description |
|---------------|-------------|------------|-------------------------------|
| Ground Kit | GK-S400T | GK-S400T | Standard Grounding Kit (each) |
| Hoisting Grip | HG-400T | HG-400T | Laced Type (each) |



Install Tools

| Type | Part Number | Stock Code | Description |
|--------------------|-------------|------------|---|
| Crimp Tool | HX-4 | 3190-200 | Crimp Handle |
| Crimp Dies | Y1719 | 3190-202 | .429" Hex Dies |
| Crimp Tool | CT-400/300 | 3190-666 | Crimp tool for LMR 400 connectors |
| Crimp Rings | CR-400 | 3190-830 | Crimp rings for TC/EZ-400 connectors (package of 10) |
| Strip Tool | ST-400C | 3190-228 | Prep tool for all LMR clamp style connectors except EZ-400-NMC-2 |
| Strip Tool | ST-400C-2 | 3190-1972 | Prep tool for EZ-400-NMC-2 two piece clamp style connector |
| Strip Tool | ST-400EZ | 3190-401 | For Crimp Connectors |
| Replacement Blades | RB-456 | 3190-421 | Replacement blades for Strip Tool |
| Deburr Tool | DBT-01 | 3190-406 | Removes center conductor rough edges |
| Cutting Tool | CCT-01 | 3190-1544 | Cable end flush cut tool |
| Replacement Blade | RB-01 | 3190-1609 | Replacement blade for cutting tool |
| Tool Kit | TK-400EZ | 3190-1602 | Tool kit for LMR-400 Crimp Connectors (includes CCT-01, ST-400EZ, CT-400/300, DBT-01, Tool Pouch) |

Appendix J – Emergency Instructions for Residents

Emergency Instructions for Residents of Apartment Buildings

Battalion Headquarters Complex (UEPH)

Location Unknown



1. BUILDING INFORMATION

| | |
|--------------------------------------|--|
| Building Location & Name: | Battalion Headquarters Complex (UEPH) / Location Unknown |
| Building Owner: | United States Army |
| Building Occupier: | Military Personnel |
| Building Manager: | Battalion Commander |
| Occupancy Type: | R-2 |
| Building Construction: | V-B |
| Number of Stories: | 3 |
| Floor Area: 1st | 38,574 square feet |
| Floor Area: 2nd | 37,029 square feet |
| Floor Area: 3rd | 37,778 square feet |

2. ALLOWABLE NUMBER OF OCCUPANTS

| Typical Bedroom | Room Size | Area in ft ² | Max No of occupants (200ft ² /person) | 200ft travel path (Yes or No) |
|---|---------------|-------------------------|--|-------------------------------|
| 1 st Floor | Standard Room | 621 | 4 | Yes |
| 2 nd Floor | Standard Room | 621 | 4 | Yes |
| 3 rd Floor | Standard Room | 621 | 4 | Yes |
| | | | | |
| | | | | |
| | | | | |
| TOTAL: 836 PERSONS MAX OCCUPANT LOAD | | | | |

There are 148 total apartment units between all three floors.

3. LIST OF PRESCRIBED FIRE SAFETY INSTALLATIONS

| | |
|-------------------------------------|---|
| Fire Alarm System: | FireFinder XLSV(SIEMENS) |
| Location of Main Panel: | Mechanical room first floor. |
| Smoke Alarms: | Photoelectric Smoke Detectors-Addressable, hard wired with battery backup |
| Portable Fire Extinguishers: | All ABC located at end of each corridor on each floor. |
| Sprinkler System: | Located throughout entire building. |
| Standpipe System: | No. 1 stairwell on North side of building. |
| Emergency Lighting: | Battery backup emergency lighting units in all corridors & exit stair shafts. |
| Exit Signs: | Battery backup installed over all exit doors and along hall ways. |

4. PROPOSED MAINTENANCE SCHEDULE PRESCRIBED FIRE SAFETY INSTALLATIONS

Fire Detection and Alarm ITM Tasks:

| Frequency | Component | Tasks |
|-----------|--|--|
| Monthly | 1. Control Panels and Annunciator Equipment (unmonitored only) | 1. Inspect panel condition (connections, fuses, light-emitting diodes [LED]). |
| Annual | 1. Control Panel and Annunciator Equipment (monitored) | 1. Test to verify proper receipt of alarm, supervisory, and trouble signals (inputs) and operation of notification appliances and auxiliary functions (outputs). 2. Verify that all lamps and LEDs are illuminated. 3. Load test backup batteries (when provided). |
| | 2. Initiating Devices: a. Manual Fire Alarm Stations | 1. Verify station is accessible (visual). |
| | b. Radiant Energy Detectors (Optical Detectors) | 1. Test to verify alarm initiation and receipt. 2. Verify no facility change that affects performance. |
| | c. Gas Detectors | 1. Test to verify alarm initiation and receipt. 2. Verify no facility change that affects performance. |
| | 3. Notification Appliances and Voice Communication (telephone, speakers, horns, and strobe lights) | 1. Test to verify operability. |
| | 4. Digital Alarm Transmitters and Receivers | 1. Test to verify operability. |

Fire Detection and Alarm ITM Tasks Continued:

| Frequency | Component | Tasks |
|--------------------------------|---|--|
| 2 Years | 1. Initiating Devices: | |
| | a. Manual Fire Alarm Stations | 1. Operate to verify alarm receipt. |
| | b. Heat Detectors (restorable) (Remove devices not required by UFC 3-600-01.) | 1. Test with a heat source to verify alarm initiating and receipt. 2. Verify no facility change that affects performance. |
| | c. Smoke Detectors (single-station detectors, system detectors, and air sampling detectors) (Remove devices not required by UFC 3-600-01 or other directives.) | 1. Test with manufacturer-approved smoke simulant to verify smoke entry and alarm initiation and receipt. 2. Verify no facility change that affects performance. |
| | d. Supervisory Devices (low air pressure, temperature, water level) | 1. Test to verify initiation and receipt of supervisory alarm. |
| 5 Years | 1. Smoke Detectors (Remove devices not required by UFC 3-600-01.) | 1. Test detector sensitivity to ensure that the detector has remained within its listed and marked sensitivity range (or 4 percent obscuration light gray smoke, if not marked). |
| As Part of Building Inspection | Entire System | 1. Visually check: a. Detectors unblocked and uncovered. b. Panels secured and indicator lamps functional. c. Notification appliances in place. d. Manual stations in place and unobstructed. 2. Exercise evacuation notification appliances for audibility, clarity, and visibility. |

Wet Pipe Sprinkler Systems ITM Tasks:

| Frequency | Component | Tasks |
|-----------|---|--|
| Monthly | 1. Control Valves (without seal, lock, or electric supervision) | 1. Verify valve position. |
| Annual | 1. Control Valves (sealed, locked, or electrically supervised) | 1. Verify valve position. |
| | 2. Waterflow Alarm Devices | 1. Operate to verify initiation and receipt of alarm. 2. Verify alarm test valve alignment and tamper switch (if sealed or electrically supervised). |
| | 3. Alarm Valve and Trim | 1. Visually check the exterior of valves, gauges, trim alignment. 2. Verify valve pressure and legibility of the hydraulic nameplate. |
| | 4. Main Drain | 1. Conduct a main drain test to verify supply (valve position). 2. Document static and residual pressure readings on a 3- by 5-inch (3x5) tag and secure it to the system pressure gauge. 3. Compare results with results from previous main drain tests and original acceptance test. 4. Verify that the results are within acceptable limits or identify corrective measures. |

Wet Pipe Sprinkler Systems ITM Tasks Continued:

| Frequency | Component | Tasks |
|---|--|--|
| Annual (Continued) | 5. Fire Department Connection | 1. Verify accessibility and condition. 2. If caps are removed or missing, check for obstructions. |
| 2 Years | 1. Control Valves | 1. Operate valve through entire travel to verify function. 2. Lubricate valves and stems to ensure operability. |
| 5 Years | 1. Alarm Valve | 1. Clean and inspect internally to verify condition. |
| | 2. Anti-freeze Loops | 1. Confirm correct solution mixture. |
| 10 Years | 1. Gauges | 1. Recalibrate or replace gauges. |
| 20 Years | 1. Fast Response Sprinklers and Extra High Temperature Sprinklers | 1. Test sample sprinklers to verify response characteristics. |
| 50 Years | 1. Standard Sprinklers | 1. Replace or test a sample of sprinklers to verify response characteristics. |
| Following System Modification or Repair | 1. Main Drain (following maintenance or repair action requiring the water supply to be shut off) | 1. Conduct main drain test to verify supply (valve position). |
| As Part of Building Inspection | Entire System | Visually check: 1. Pipe hangers. 2. Sprinklers for obstruction. 3. Piping for leaks. 4. Riser condition. |

Emergency Lighting System ITM Tasks:

| Frequency | Component | Tasks |
|---------------|---|--|
| Annual | 1. Individual Battery-Powered Lighting Units | 1. Activate for not less than 90 minutes to verify battery voltage and capacity. |
| | 2. Central Battery-Powered Lighting Systems | 1. Activate for not less than 90 minutes to verify battery voltage and capacity. |
| | 3. Emergency Generator-Powered Lighting Systems | 1. During regularly scheduled generator and transfer switch maintenance, visually check operation of each emergency generator-powered fixture. |
| 5 to 10 years | Individual Fixtures' Replaceable Batteries or Unitized Fixtures | 1. Replace battery or complete unitized fixture in accordance with manufacturer's estimated service life. |

Egress Marking Systems ITM Tasks:

| Frequency | Component | Tasks |
|------------------|---|---|
| Annual | 1. Externally Illuminated and Un-illuminated Marking | 1. Inspect fixture condition and mounting. 2. Ensure that emergency light source, if required, is functional. |
| | 2. Photoluminescent Marking | 1. Inspect sign condition and mounting. 2. Inspect charging light source and mounting. 3. Ensure that charging light source is functional (un-switched 5 foot-candles fluorescent or greater). Note: Charging light must be on at all times the building is occupied. |
| | 3. Internally Illuminated Marking | 1. Inspect fixture condition and mounting. 2. Ensure that the bulb or light source is functional. 3. For electroluminescent marking, ensure that the power source is operational. |
| | 4. Internally Illuminated Marking with Standby Battery Backup | 1. Inspect fixture condition and mounting. 2. Ensure that the bulb or light source is functional. 3. Activate on battery power for not less than 90 minutes to verify battery voltage and capacity. |
| | 5. Internally Illuminated Marking with Emergency Generator Backup | 1. Inspect fixture condition and mounting 2. Ensure that the bulb or light source is functional. 3. During regularly scheduled generator and transfer switch maintenance, visually check the operation of each emergency generator-powered fixture. |
| 5 to 10 years | 1. Internally Illuminated Marking with Standby Battery Backup | 1. Replace battery or fixture if battery is not replaceable (unitized fixture) in accordance with manufacturer's estimated service life. |

Fire and Smoke Barrier Opening Protection ITM Tasks:

| Frequency | Component | Tasks |
|--|-------------------------------------|--|
| Annual (Electric hold-open devices are tested as part of the alarm systems in Table 2-1.) | 1. Hinged Fire Doors | 1. Test magnetic hold-open devices for release on activation of fire alarm. 2. Inspect closers for proper operation. |
| | 2. Sliding Doors | 1. Test magnetic hold-open devices for release on activation of fire alarm. 2. Ensure that weights have a free and unobstructed path of travel. |
| | 3. Rolling or Sliding Fire Shutters | 1. Test magnetic hold-open and other mechanical latches for release on activation of fire alarm. 2. Operate the shutter through its entire travel. |
| 1 Year after Construction and Every 6 Years Thereafter | 1. Fire and Smoke Dampers | 1. Test electric (magnetic) hold-open and other mechanical latches for release on activation of fire alarm. 2. Inspect travel path for anything that may obstruct or interfere with free operation. |
| As Part of Building Inspection | 1. Hinged Fire Doors | 1. Inspect door condition, gaskets, and mounting hardware. Ensure proper lubrication. 2. Inspect fusible links, if present, for paint or other accumulations that slow thermal response. |
| | 2. Sliding Doors | 1. Inspect door condition and mounting hardware. Ensure proper lubrication. 2. Inspect fusible links, if present, for paint or other accumulations that slow thermal response. 3. Inspect travel path for anything that may obstruct or interfere with free operation. |

Fire and Smoke Barrier Opening Protection ITM Tasks Continued:

| Frequency | Component | Tasks |
|--|---|--|
| As Part of Building Inspection (Continued) | 3. Rolling or Sliding Fire Shutters | <ol style="list-style-type: none">1. Inspect door condition and mounting hardware. Ensure proper lubrication.2. Inspect fusible links, if present, for paint or other accumulations that slow thermal response.3. Inspect travel path for anything that may obstruct or interfere with free operation. |
| | 4. Fire and Smoke Dampers | <ol style="list-style-type: none">1. Inspect fixture condition and mounting.2. Inspect fusible links, if present, for paint or other accumulations that slow thermal response. |
| | 5. Installed Fire Stopping, Listed Sleeves, Penetrations, Seal Bags, and Other Fire Stopping Material | <ol style="list-style-type: none">1. Inspect fire-resistive barriers for new or other unprotected penetrations of rated walls, floors, or ceilings. |

5. FIRE AND EVACUATION PLAN

EMERGENCY PROCEDURE CHECKLIST FOR RESIDENTS

In an emergency, phone **000**. Manager – *Contact details*

Smoke Alarms Sounding or Evidence of Fire Occurring

Evacuate to assembly area, closing doors and windows, if possible

Contact the Fire Service on 000 (Phone Located near Assembly Area)

FIRE

Assist people to evacuate to assembly area without endangering yourself

Fight fire if safe & you are trained

Remain in assembly area until everyone is accounted for and the manager has arrived

Await arrival of fire service

Do not re-enter building until advised by the fire service

NO FIRE

If the fire service has already been called, notify them of the situation

Help to reassure residents of situation

Allow fire service to enter building on their arrival to investigate the situation

Manager will attend to deal with the situation and rectify any problems or system faults

In the event of fire, or upon the smoke alarms activating, residents should leave the building with due haste and gather at a predetermined assembly area. The Manager is usually always in attendance in the Manager's residence. On the odd occasion that the Manager is absent, an agent of the Manager will be present.

In the event of the smoke alarms activating, the Manager (or agent), will:

- Investigate the fire situation
- If there is a fire, ensure the Fire Service has been called. If there is any doubt regarding whether there is a fire situation, the Fire Service should still be called.
- Ensure the safe evacuation of all residents from the building
- Ensure the Fire Service has been notified and provided with information regarding the incident
- Account for all occupants at the assembly area
- If required and safe to do, conduct a search for any missing residents

Meet the Fire Service and advise them of any information relevant to the emergency

IF YOU DISCOVER FIRE

- Leave the fire area, take key
- Close all doors behind you
- Activate the fire alarm, use pull station
- Telephone the Fire Department, dial 911 (never assume this has been done)
- Know and give the correct address and location of fire in the building
- Use exit stairwells to leave the building immediately
- Do NOT use elevators
- Do not return until it is declared safe to do so by Fire Official

IF YOU ARE IN A SUITE AND A FIRE ALARM IS HEARD

- Before opening door, feel door knob for heat
- If not hot, brace yourself against door and open slightly
- If you feel air pressure or hot draft, close door quickly
- If you find no fire or smoke in corridor, take room key, close door behind you and leave by nearest exit stairwell
- If you encounter smoke in corridor or stairwell, consider taking corridor to other side of building where another stairwell may be clear or return to your suite

IF YOU CANNOT LEAVE YOUR SUITE OR HAVE RETURNED TO IT BECAUSE OF FIRE OR HEAVY SMOKE, REMAIN IN YOUR SUITE, AND

- Close the door
- Unlock door for possible entry or firefighter
- Dial 911 - tell Fire Dept. where you are, then signal to firefighters by waving a sheet
- Seal all cracks where smoke can get in by using wet towels or sheets to seal mail slots, transoms and central air conditioning outlets if necessary (roll of wide strong masking tape is useful)
- Crouch low to the floor if smoke enters the room & move to the balcony or most protected room & partially open the window for air (close window if smoke comes in)
- Wait to be rescued – remain calm – do not panic or jump
- Listen for instructions or information which may be given by authorized personnel or over loudspeakers

In the event of a fire being located, the manager, or their agent, will:

- Ensure the evacuation of the building – alert all occupants without further compromising life
- Attempt to extinguish the fire if safe to do so –
If the fire is small enough, use a nearby fire extinguisher to control and extinguish the fire. Do not fight the fire if the following conditions exist:
 - *You have not been trained or instructed in using a fire extinguisher*
 - *You don't know what's burning*
 - *The fire is spreading rapidly*
 - *You don't have the proper equipment*
 - *You cant do so with your back to an exit*
 - *The fire might block your means of escape*
 - *You might inhale toxic smoke*
 - *Your instincts tell you not to do so*

If the first attempts to put out the fire do not succeed, evacuate the building immediately

Meet the Fire Service on arrival & inform them of the situation. If the fire has been extinguished the Fire Service will still attend

If no fire is found, the Manager should:

- Inform residents of the situation
- If the Fire Service has been called, ring the Fire Service to advise them of the situation
- Meet the Fire Service on arrival and inform them of the situation

The Manager is responsible for;

- all personnel and procedures until the arrival of the Fire Service
- the maintaining of an up-to-date list of the residents in the building
- nomination of a person to assume the emergency duties of the Manager in his absence (Maintenance Officer)
- arrangement and coordination of practice evacuation exercises
- the accurate logging of the performance, any problems encountered, the conduct of a debriefing with everyone involved, and the continual improvement of the effectiveness of the evacuation plan

5. FIRE AND EVACUATION PLAN (cont.)

EMERGENCY EVACUATION PLAN

In case of

FIRE

Leave through the nearest

EXIT

- If you see **SMOKE, FLAMES** or hear the **FIRE ALARM**, alert other residents immediately
- If safe, close any windows and doors to confine the fire.
- Follow the **EXIT** signs to locate and leave through the nearest emergency exit and proceed to the assembly point.
- **TELEPHONE 000** and notify the fire service. (NOTE: some mobile phones may not access the 000 number – check with your mobile service provider for the emergency number well before you need it.)
- If unable to safely evacuate, stay in your room, close the door, and signal your presence at a window.
- Calmly follow instructions given by staff or the attending Fire Officers. The manager/fire warden will account for all occupants and report persons missing to Fire Officers. **Do not re-enter the building until you are told it is safe to do so by the manager or Fire Officers.**

6. PROPOSED TRAINING PROGRAM

Initial Instruction

The Manager or the manager's agent will instruct residents when they take up residence (and at least every 12 months while in residence), and workers (if there any workers within the accommodation building) at the time they commence employment concerning the action to be taken by them in the event of fire threatening the building in order to ensure their own & other persons safety, and in particular;

- The procedure to follow in an emergency
- The location of emergency exits
- The paths of travel to exits
- The location of fire fighting equipment
- The method of raising the alarm if the smoke alarms do not activate
- The location of the assembly area

Permanent Employees

1. Permanent Employees (workers) must receive instruction within 1 month of commencing work, and repeated at intervals of no more than 12 months.
2. The instructions given are the procedure to be followed in the event of fire, means of escape from the building in the event of fire and the location and method of operation of fire fighting equipment and fire alarms or equipment for warning of fire. In addition workers who have persons in their care or custody are to be instructed on conducting those persons to a safe place outside the building in the event of fire, where they are marshaled, each person is accounted for, and the manager and fire service officers are informed of any missing persons.
3. A record of worker instruction will be retained with the original Fire Safety Management Plan.

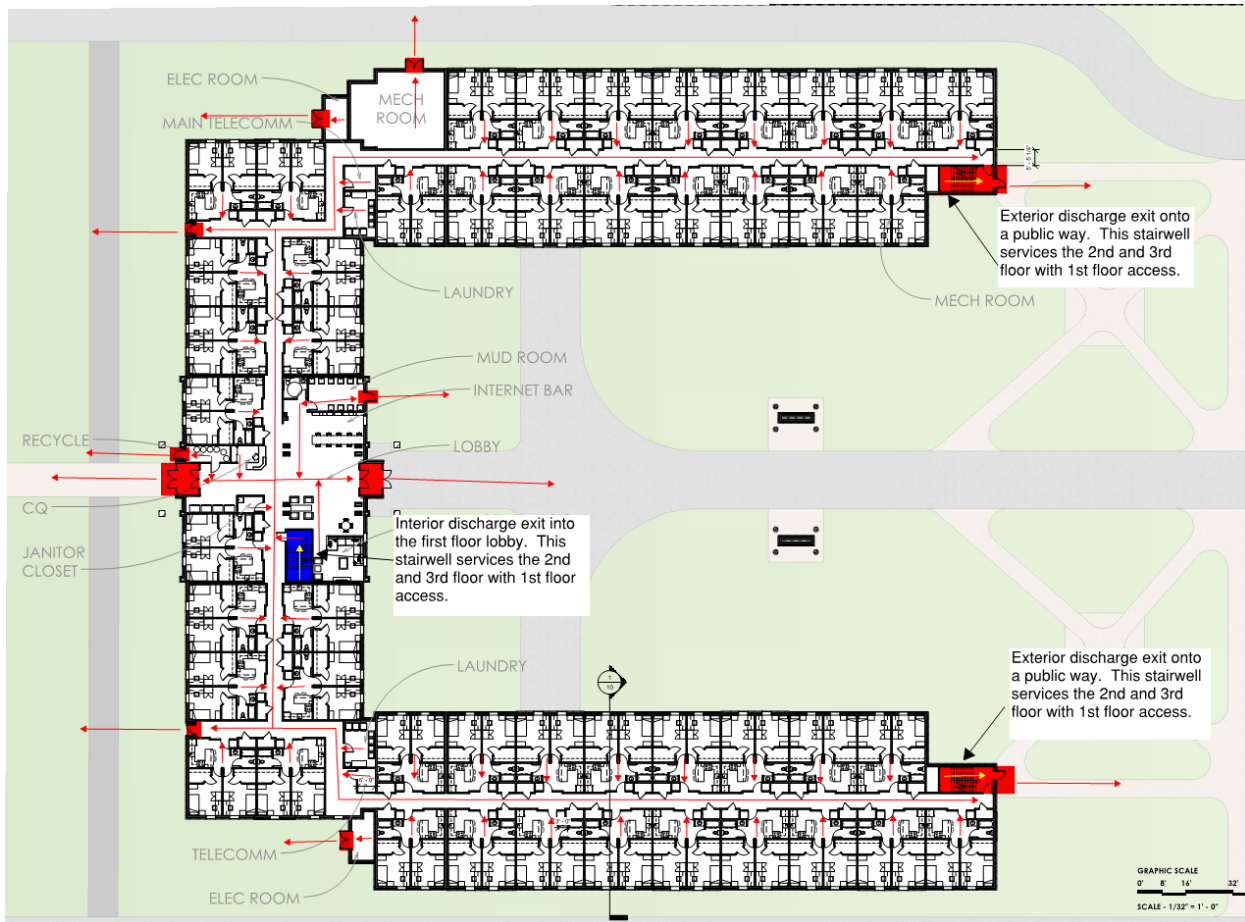
Yearly Evacuation Training

An evacuation practice will be carried out at intervals of not more than 12 months in order to practice the fire and evacuation plan for the building. A record of each evacuation will be retained with the Fire Safety Management Plan.

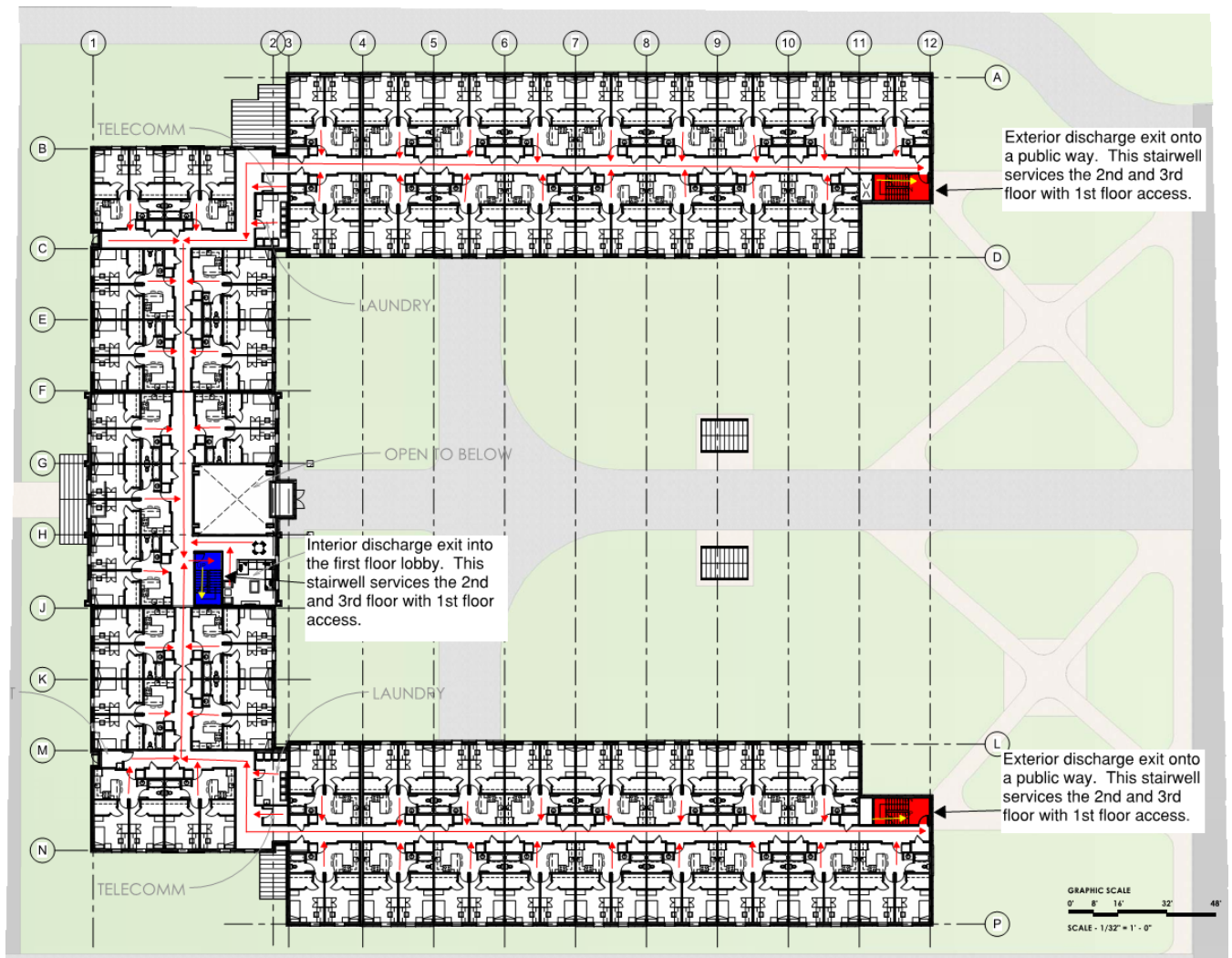
Fire and Evacuation Plan – Signage

Copies of the Emergency Evacuation Procedure shall be conspicuously displayed in common areas of the building to allow residents to become familiar with the fire and evacuation procedures.

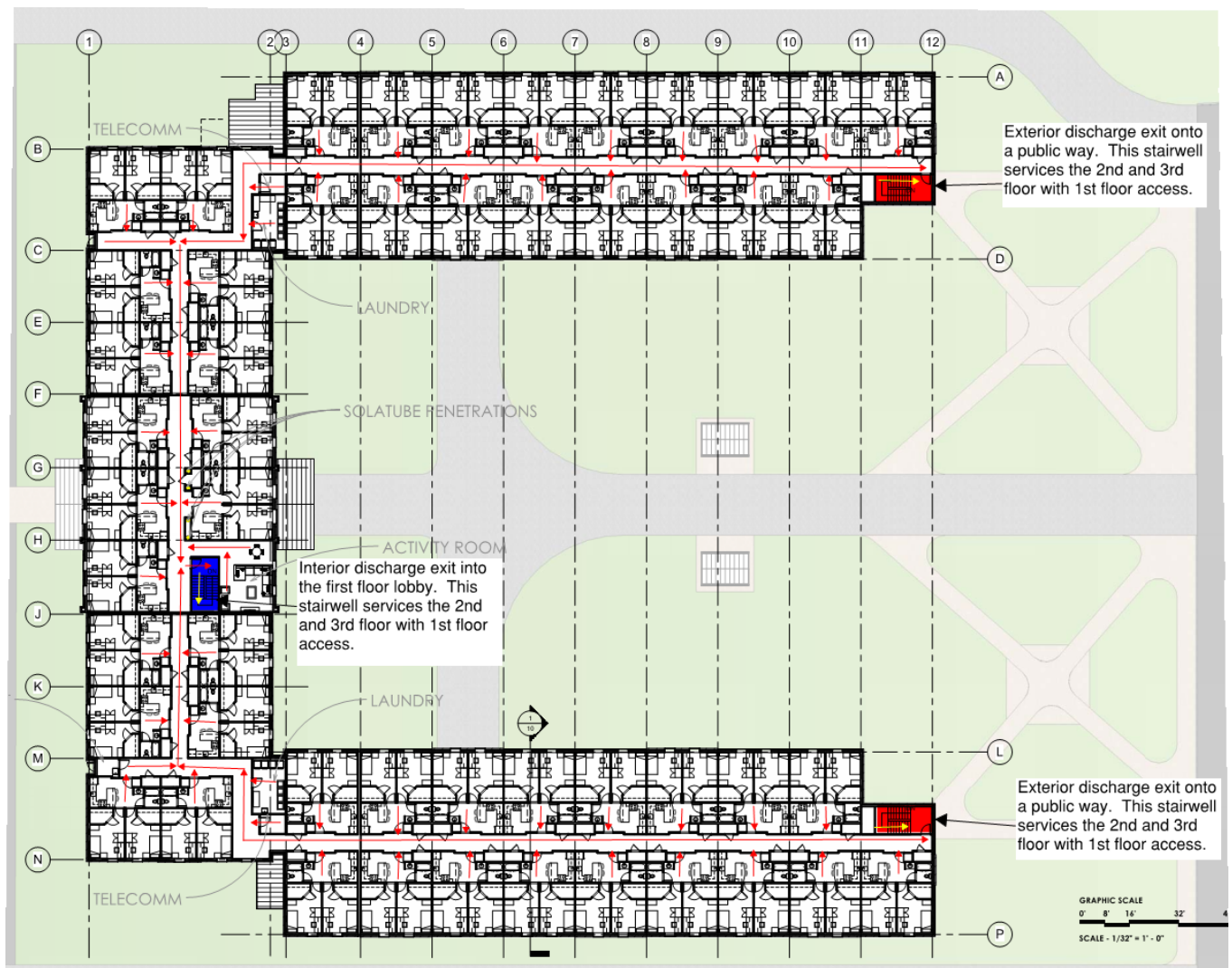
7. BUILDING PLANS



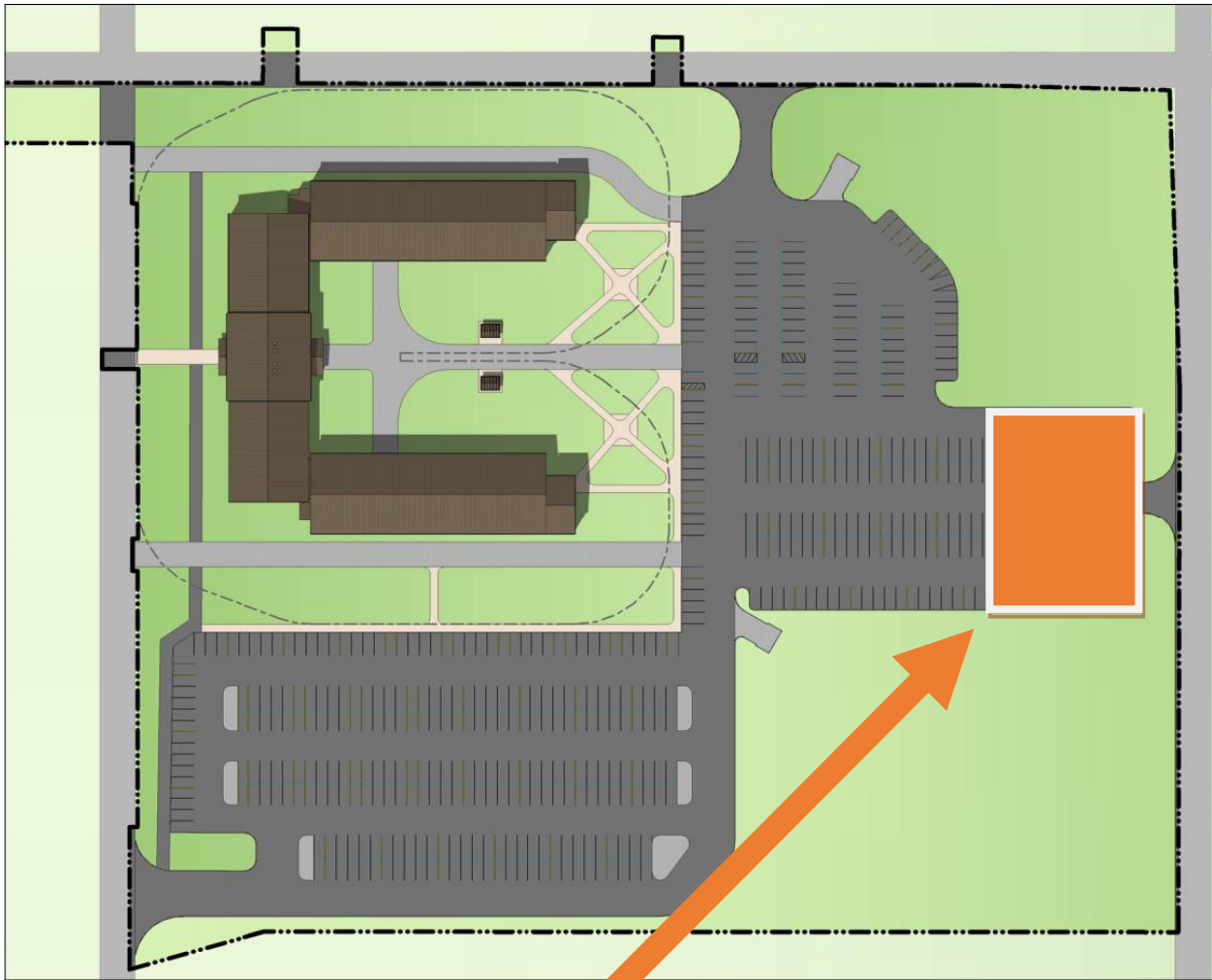
First Floor Exit Plan



Second Floor Exit Plan



Third Floor Exit Plan



Site Plan

Evacuation Zone

Appendix K – Fire Dynamic Simulator Code

Dorm_Room2.fds

Generated by PyroSim - Version 2014.4.1105

Apr 12, 2015 8:22:47 PM

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