



SECOND DRAFT **LIFE SAFETY REPORT**

for

United Temple United Methodist Church (UTUMC) ACC/ Student Housing Project

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Seattle, WA 98105

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I. INTRODUCTION

This Life Safety Report (LSR) has been developed to describe in conceptual and performance-based terms, the general fire protection aspects of the active and passive fire-protection features for the proposed University Temple United Methodist Church (UTUMC) project. This document will be used as a basis for construction documentation preparation that will detail the way in which the facility will comply with this document and the applicable Codes. Where conflicts may occur between the LSR and any other design submittal, this report will take precedence.

II. GENERAL PROJECT DESCRIPTION

The UTUMC project is a proposed fully-sprinklered high-rise building to be located at 1415 NE 43rd St in Seattle, WA. The building consists of a below-grade enclosed parking garage and an above-grade mixed-use building. The above-grade building is divided into three non-separated structures: the Podium, Tower 1 and Tower 2. The Podium consists of the Below-Grade Parking Garage and Levels 1 through Level 2 of the above-grade building. The above-grade building diverges at Level 3 into separate two towers: Tower 1 and Tower 2. Tower 1 extends from Level 4 through Level 15 and Tower 2 extends from Level 4 through Level 24. The maximum building height is approximately 265 feet measured from grade plane to the average roof height of Tower 2. The building has an occupied floor more than 75 feet above the lowest level of fire department access and, therefore, is considered a high-rise building in accordance with 2015 Seattle Building Code.

The UTUMC building will contain the following occupancies classified in accordance with SBC Section 302.1.

Primary Occupancies:	Group R-2 (Permanent Residential) Group A-3 (Place of worship and Assembly with 50 or more)
Secondary Occupancies:	Group A-2 (Lobbies, Parish Hall, Outdoor Decks, Dining Hall, Academic Success, Kitchen) Group B (Office, Fitness Amenity, Assembly Less than 50) Group M (Retail) Group S-2 (Parking, Storage, MEP, Loading Dock)

III. APPLICABLE CODES AND STANDARDS

The City of Seattle Department of Construction and Inspections (SDCI) and City of Seattle Fire Department (SFD) are the primary Authorities Having Jurisdiction (AHJ) for this project. The applicable codes and standards (including; amendments, director's rules, and administrative rules) used in preparing this report include the following:

- 2015 Seattle Building Code (SBC)
- 2015 Seattle Fire Code (SFC)
- 2015 Seattle Mechanical Code (SMC)
- 2015 Seattle Plumbing Code Amendments (SPC)
- 2014 National Electrical Code with City of Seattle Amendments (NEC)
- 2009 ICC A117.1 Accessible and Usable Buildings and Facilities (A117.1)
- 2010 Americans with Disabilities Act (ADA)
- 2013 ASME A17.1/CSA B44 Safety Code for Elevators and Escalators (ASME A17.1)
- 2010 NFPA-10, Standard for Portable Fire Extinguishers (NFPA-10)
- 2013 NFPA 13: Standard for the Installation of Sprinkler Systems (NFPA 13)



- 2013 NFPA 14: Standard for the Installation of Standpipe and Hose Systems (NFPA 14)
- 2013 NFPA 20: Standard for the Installation of Stationary Fire Pumps (NFPA 20)
- 2008 NFPA-22, Standard for Water Tanks for Private Fire Protection (NFPA-22)
- 2010 NFPA-24, Standard for the Installation of Private Fire Service Mains and their Appurtenances (NFPA-24)
- 2013 NFPA 72: National Fire Alarm and Signaling Code (NFPA 72)
- 2013 NFPA 80: Standard for Fire Doors and Other Opening Protectives (NFPA 80)
- 2010 NFPA-96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations (NFPA-96)
- Seattle Department of Planning & Development Director Rules (SDPD)
- Seattle Fire Department Administrative Rules (SFD)
- Seattle Fire Department Client Assistance Memos (CAM)

IV. SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY

The UTUMC building will consider the following special requirements based on specific use and occupancy in accordance with SBC Chapter 4

A. HIGHRISE BUILDING PROVISIONS

- Occupied Roof Decks (SBC Interpretation 403.1b)
- Pre-submittal Conference (SBC Section 403.1.1)
- Automatic Sprinkler System Installed Throughout All Areas (SBC Sections 403.3 and 903.3.1.1.3)
- Secondary Water Supply (SBC Section 403.3.3)
- Fire Pump Room (SBC Section 403.3.4)
- Smoke Detection (SBC Section 403.4.1)
- Fire Alarm System (SBC Section 403.4.2)
- Standpipe System (SBC Section 403.4.3)
- Emergency Voice/Alarm Communication System (SBC Section 403.4.4)
- Emergency Responder Radio Coverage (SBC Section 403.4.5)
- Fire Command Center (SBC Section 403.4.6)
- Emergency Power (SBC Section 403.4.8)
- Interior Exit Stairways (SBC Section 403.5)
- Smoke Control in Exit Stairways (SBC Section 403.5.4)
- Luminous Egress Markings (SBC Section 403.5.5)
- Access to Roofs (SBC Section 403.5.7)
- Fire Service Access Elevator (FASE) (SBC Section 403.6.1)
- Emergency Operational Plan (SBC 403.7)
- Signs (SBC Section 403.8)
- Fire Safety and Evacuation Plan (SFC Section 404)
- Fire Department Connection Signs (SFC Section 913.5.1)
- Carbon Monoxide Detection (SFC Section 915)
- Alerting System (SFC Section 916)
- Minimum Standards for High-Rise Buildings (SFC Chapter 93)

B. GROUP R-2 PROVISIONS

- Separation Walls (SBC Section 420.2)
- Horizontal Separation (SBC Section 420.3)
- Security from Criminal Activity in Group R (SBC Section 420.10)



C. UTILITY TRANSFORMER VAULTS

- Required for Transformers Rated Over 600 Volts (SBC Section 428.3.1)
- Access to Transformer Vaults (SBC Section 428.4)
- Location of Transformer Vaults (SBC Section 428.5)
- Construction (SBC Section 428.6.2)
- Openings into Transformer Vaults (SBC Section 428.7)
- Ventilation Systems for Transformer Vaults (SBC Section 428.8)
- Drainage for Vaults (428.9)
- Pipes and Ducts in Transformer Vaults (428.10)
- Storage not Permitted in Transformer Vaults (428.11)
- Sprinklers not Permitted in Transformer Vaults (428.12)

V. GENERAL BUILDING CONSTRUCTION

The UTUMC building will be provided with approved address identification in accordance with SBC Section 501.2. The building contains multiple non-separated occupancies and, therefore, the allowable building height and area will be determined based on the most restrictive occupancy classification for the construction type in accordance with SBC Section 508.3.2.

A. BUILDING AREA:

	Tower 1	Tower 2
Floor	Area (ft²)	Area (ft²)
Level 24		4,830
Level 23		4,553
Level 22		8,776
Level 21		8,776
Level 20		8,776
Level 19		8,776
Level 18		8,776
Level 17		8,776
Level 16		8,776
Level 15		2,130
Level 14	4,287	8,776
Level 13	8,162	8,776
Level 12	8,162	8,776
Level 11	8,162	8,776
Level 10	8,162	8,776
Level 9	8,162	8,776
Level 8	8,162	8,776
Level 7	8,162	8,776
Level 6	8,162	8,776
Level 5	8,162	8,776
Level 4	8,162	8,776
Level 3	17,339	
Level 2	22,972	
Level 1	27,039 ¹	
Level P1	27,919	
Level P2	31,005	
Level P3	31,005	
Total Area	421,443	

¹ Level 1 contains a mezzanine with an area of 2,292 ft² that will not contribute to building area nor number of stories but will be included in determining the fire area in accordance with SBC Section 505.2.



B. ALLOWABLE BUILDING HEIGHT AND AREA:

Allowable Stories and Building Area							
Occupancy Classification	Construction	Building Area (ft ²)		Number of Floors Above Grade Plane		Building Height (ft.)	
		Actual	Allowable	Actual	Allowable	Actual	Allowable
Group R-2	Type I-A ¹ (Reduced)	300,766	Unlimited	24	Unlimited	265	420 ²
Group A-2		12,000	Unlimited	24	Unlimited	265	420 ²
Group A-3		34,160	Unlimited	3	Unlimited	45	420 ²
Group B		4,613	Unlimited	1	Unlimited	15	420 ²
Group M		3,246	Unlimited	1	Unlimited	15	420 ²
Group S-2		69,423	Unlimited	24	Unlimited	265	420 ²
¹ The building construction, except for the structural frame and bearing walls, may be reduced from Type I-A to Type I-B in accordance with SBC Section 403.2.1.1 Exception 1.							
² Building height limited to 420 feet to utilize reduced building construction in accordance with SBC Section 403.2.1.1							

C. FIRE RESISTANCE RATING REQUIREMENTS OF BUILDING ELEMENTS:

Building Element	Fire-Resistance Rating
Structural Frame	3 hour
Bearing Walls (Exterior)	3 hour ¹
Bearing Walls (Interior)	3 hour
Non-Bearing Walls (Exterior)	0 hour ¹
Non-Bearing Walls (Interior)	0 hour ¹
Floors and Secondary Members	2 hour
Roofs and Secondary Members	1 hour
¹ All exterior walls assume a fire separation distance of 20 feet or more with no additional fire-resistance rating required. Walls, or portions thereof, may require additional fire-resistance based on separation distance from other buildings in accordance with SBC Table 602.	

D. EXTERIOR OPENING AND WALL PROTECTION:

Non-bearing exterior wall assemblies will be of fire-rated construction based on the fire separation distance from adjacent building construction and/or adjacent lot lines in accordance with SBC Table 602. Exterior walls will be permitted to have an allowable area of unprotected openings in accordance with SBC Table 705.8.



Building Level	Direction	Fire Separation Distance	Allowable Area of Unprotected Openings	Wall Fire Resistance Rating
Level 4 to Level 24 (Sprinklered)	North	+20'-0"	No Limit	0 hour
	East	+20'-0"	No Limit	0 hour
	South	+20'-0"	No Limit	0 hour
	West	+17'-0"	75%	1 hour
Level 1 to Level 3 (Sprinklered)	North	+20'-0"	No Limit	0 hour
	East	+20'-0"	No Limit	0 hour
	South	0'-0"	Not Permitted	2 hour ²
	West	+20'-0"	No Limit	0 hour
Level P3 to Level P1 (Sprinklered)	North	0'-0"	N/A ¹	N/A ¹
	East	0'-0"	N/A ¹	N/A ¹
	South	0'-0"	Not Permitted	1 hour
	West	0'-0"	N/A ¹	N/A ¹

¹ Exterior walls that are not part of a Group M occupancy may be reduced to 1 hour fire-rated construction.

² Exterior walls for the below-grade parking garage are partially subterranean and adjacent to public way. The ground slopes downward from North to South and exposed exterior wall portions of the parking garage will need to be specifically considered for fire-rated construction and opening protection based on fire separation distance.

- E. Where steel construction is required to have a fire resistance rating, Underwriters Laboratories (UL)-listed spray applied fireproofing installed in accordance with a UL-listed design will be provided in accordance with SBC Section 403.2.4 and tested in accordance with ASTM E-119. Applied fire-resistive materials will further have a Flame Spread Rating of 25 or less and a Smoke Developed Rating of 0 as tested in accordance with ASTM E-84. Fire proofing materials will be either sprayed cementitious or intumescent mastic. Fire-resistive materials will be compatible with their substrates and intended locations and have minimum bond strength of 430-PSF in accordance with SBC Table 403.2.4.
- F. Roofs will have a minimum Class B exterior fire exposure as tested per ASTM E-108 or UL-790 in accordance with SBC Table 1505.1. Class A fire exposure is required at planted roofs with 6' of access area in accordance with SFC Sections 317.2 & 317.3.
- G. Voids created at the intersection of the exterior curtain wall assemblies and fire resistance-rated floor or floor/ceiling assemblies will be protected with securely installed, UL-listed fire stopping material approved by the City of Seattle, or 2-hour fire resistive assemblies tested in accordance with ASTM E 2307 complying with SBC Section 715.4. Fire-resistive-rated curtain wall spandrels are not required in sprinklered buildings. Provide products with Flame Spread Ratings of less than 25 and Smoke Developed Ratings of less than 450 as tested per ASTM E-84.
- H. Where the vision glass extends to the finished floor level, voids created at the intersection of the exterior curtain wall assemblies and floor assemblies may be sealed with an approved material to prevent the interior spread of fire by material securely installed and capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E 119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (0.254 mm) of water column (2.5 Pa) for the time period at least equal to the fire-resistance rating of the floor assembly in accordance with the Exception to SBC 715.4.



VI. INTERIOR FIRE RESISTIVE SEPARATIONS AND OPENINGS

A. Occupancy Separations

1. Non-separated use provisions of SBC Section 508.3 are utilized. Being such, there will be no occupancy separations or incidental use separations unless otherwise identified. All membrane and through-penetrations and building joints that occur at fire-rated partitions and barriers will be protected with sealant or stopping material rated to maintain the fire-resistance per the manufacturer's specification in accordance with SBC Sections 714 and 715.
2. Chiller rooms will be provided with a 1-hour fire-resistive-rated separation.

B. 2 hour Fire Barrier

- Shaft Enclosure (SBC 713)
- Fire Command Center (SBC Section 911.1.2)
- Fire Pump Room (SBC Section 913.2.1)
- Exit Enclosure (SBC Section 1023.2)
- Exit Passageway (SBC Section 1024.3)
- Legally Required Standby and Emergency Power Equipment Room (SBC Section 2702.1.8)
- Elevator Machine Room (SBC Sections 3020.4)

C. 1 hour Horizontal separation

- Floors Separating Sleeping/Dwelling Units (SBC Section 420.3)

D. 1 hour Fire Barrier

- Electrical Equipment Rooms (NEC)

E. 1 Hour Fire Partition

- Corridor Walls (SBC Section 1020.1)
- Walls Separating Sleeping/Dwelling Units (SBC Section 420.2)

F. Non-Rated Smoke Partition

- Elevator Lobby (SBC Section 713.14.3 Item 2)

G. Refuse chute enclosures:

1. Shaft enclosures containing refuse will not be used for any other purpose and will be enclosed in accordance with SBC Section 713.4. Doors and openings installed in refuse chutes and access and termination rooms will be provided in accordance with SBC Section 713.13 and not located in corridors or exits.
2. Refuse chutes on all levels will be enclosed in minimum 2-hour fire-resistance rated shaft enclosures having minimum 90-min fire rated opening protectives.
3. Access rooms will have a minimum 1-hour fire-resistance rating with minimum 45-minute fire-protection rated, self-closing openings and doors per SBC Section 713.13.3. Doors will be self- or automatic-closing upon the detection of smoke in accordance with SBC Section 716.5.9.3. The room or compartment will be sized to allow the access door to the room or compartment to close and latch with the access panel to the refuse chute in any position.



4. Refuse chutes will discharge into enclosed termination rooms separated from the remainder of the building by 2-hour fire resistance rated fire barriers to maintain the integrity of the shaft enclosures in accordance with SBC Section 713.13.4. Openings into the termination room will be protected by opening protectives having a fire protection rating equal to the protection required for the shaft enclosure (minimum 90-minutes fire resistance). Doors will be self- or automatic-closing upon detection of smoke, per SBC Section 716.5.9.3.
- H. The fire pump room will be provided with a 2-hour fire-resistance rated separation from adjacent areas per SBC Section 913.2.1.
- I. The Fire Command Center (FCC) will be located within a 2-hour fire resistive enclosure per SFC 508.1.2. The FCC will be in a location approved by the Seattle Fire Department.
- J. Emergency feeder equipment will be located in a minimum two-hour rated room with approved automatic fire suppression systems. The emergency electrical room will be dedicated to the emergency systems in accordance with the SEC.
- K. Emergency system feeder circuits will be installed in spaces fully protected by approved automatic fire suppression systems, be protected by a listed thermal barrier system for electrical system components with a minimum 2-hour fire rating, be a listed electrical circuit protective system with a minimum 2-hour fire-protection rating or be encased in not less than 2-inches of concrete per SEC Section 700.10(D) (1). Note: In buildings having Seattle Building Code Type I or II construction, wiring located above sprinkler heads, including wiring separated from sprinkler heads by a drop-ceiling system, is considered fully protected as required by this section.
- L. In non-Seattle City Light electrical rooms, containing dry-type transformers 112.5 kVA and greater per NEC paragraph 450.21 (B), will be enclosed by 1-hour fire barrier construction unless the transformer is designed with a Class 155 insulation system (80 degree C listing) or higher. The main electrical rooms with the service disconnects will be separated from the adjacent building areas by 1-hour fire barrier construction.
- M. The Seattle City Light utility transformer vault located on Level P1 will be enclosed by 3 hour fire-rated construction in accordance with SBC Section 428.6.2 and Seattle City Light requirements.
- N. Standard elevator machine rooms will be separated by minimum 2-hour fire-resistance rated construction per SBC Section 3020.4. Openings will have a fire-protection rating of not less than 1½-hour and doors. As the building is in excess of 160-feet in height, separate elevator rooms will be provided.
- O. Where applicable, horizontal exits will be 2-hour fire-resistance rated construction per SBC Section 1025.2.
- P. All penetrations through fire resistive construction including, but not limited to, electrical conduit, mechanical piping, sanitary piping, floor sinks, membrane penetrations, joints through fire resistant rated walls, head of wall, floors and ceilings will be protected with UL-listed materials in the annular space or assemblies complying with SBC Sections 714 and 715. Contractor shop drawings and/ or permit drawings will identify the UL-listing design number and applicable information of the penetration assembly. For fire-resistive joint and penetration firestopping, provide products with Flame Spread Ratings of less than 25 and Smoke Developed Ratings of less than 450 as tested per ASTM E-84.



Q. Fire Doors

1. Fire doors will meet the requirements for rate of temperature rise and positive pressure, as may apply and be installed in accordance with NFPA-80.
2. Doors and corresponding frames to have smoke seals where required and listed/ labeled by a nationally recognized testing laboratory acceptable to SBD and SFD. Seals will be provided on stairway doors if found necessary by the rational analysis for smoke control.
3. Doors protecting openings into corridors will be provided with an "S" rating.
4. Electrical rooms with equipment rated 1,200-amperes or more and over 6-feet wide that contain overcurrent devices, switching devices or control devices with exit or exit access doors will be equipped with panic hardware or fire exit hardware in accordance with SBC Section 1008.1.10. The doors will swing in the direction of egress travel.
5. Fire door fire-resistance ratings will be as follows: (SBC Table 716.5)
 - a) 3-hour fire walls and fire barriers: 3-hour
 - b) 2-hour fire walls and fire barriers: 1½-hour
 - c) 2-hour Exit Enclosure and Horizontal Exit: 1½-hour
 - d) 1-hour fire barriers: means of egress: 1-hour, other doors 45 minute
 - e) Exit enclosures/ passageways: 1½-hour (smoke- and draft-control assembly)
 - f) Shaft Enclosure: 1½-hour
 - g) 1-hour Separation between Dwelling Units: ¾-hour
 - h) 1-hour Separation between Dwelling Units and Corridor: 1/3-hour
 - i) Oversized doors where required to be fire-resistive rated will be provided with "oversized door" certificates from UL to show compliance with required ratings in accordance with SBC Section 716.4.
 - j) Fire doors will be automatic-closing. Fire doors in other than fire walls will be either self- or automatic-closing

R. Fire Dampers

1. Fire rated dampers will be provided as required in SBC Section 717 based on the type of wall indicated unless a combination fire/ smoke damper is provided.
2. Fire Damper Rating: (SBC Table 717.3.2.1)
 - a) Fire rated dampers penetrating assemblies having a fire resistance rating of less than 3-hour fire resistance will have a min. fire resistance rating of 1.5-hours.
 - b) Fire rated dampers penetrating assemblies having a fire resistance rating of 3-hours or greater fire resistance will have a min. fire resistance rating of 3-hours.



3. All fire dampers will be UL-listed and labeled, dynamic rated damper assemblies tested per UL-555.
4. Located at duct penetrations of fire barriers, shafts (except exhaust-only shafts with 22-inch sub-ducts), and fire partitions.
5. Activated by fixed temperature (SBC Section 717.3.3.1):
 - a) The fire damper operating temperature will be approximately 50°F above the normal temperature within the duct system, but not less than 160°F.
 - b) The operating temperature will be not more than 350°F (177°C) where located in a smoke control system complying with SBC/SFC Section 909 or associated with exhaust fans used for hoistway and stair pressurization.
6. Fire dampers are not required when the penetration is tested in accordance with ASTM E-119 as part of the fire-resistance rated assembly.
7. In accordance with the Exceptions to SBC 717.5.3, fire dampers are not required in shaft penetrations where:
 - a) Steel exhaust sub-ducts are extended at least 22-inches vertically in exhaust shafts, provided there is a continuous airflow upward to the outside; or
 - b) Penetrations are tested in accordance with ASTM E-119 or UL-263 as part of the fire-resistance-rated assembly; or
 - c) Ducts are used as part of an approved smoke control system designed and installed in accordance with SBC/SFC Section 909 and where the fire damper will interfere with the operation of the smoke control system; or
 - d) The penetrations are in parking garage exhaust or supply shafts that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.
 - e) In kitchen and clothes dryer exhaust systems when installed in accordance with the International Mechanical Code.

S. Smoke Dampers

1. Smoke dampers will be located at the penetrations of shaft enclosures.
2. Where an assembly is required to have both fire and smoke dampers, combination fire/smoke dampers may be used.
3. Smoke dampers will be UL-listed and labeled damper assemblies tested per UL-555S having a leakage rating of Class II or better. Elevated temperature ratings will be not less than 250°F in accordance with SBC Section 717.3.2.2.
4. Smoke dampers will close upon actuation of a listed smoke detector or detectors installed in accordance with SBC/SFC Section 907.3 and one of the following methods, as applicable: (SBC Section 717.3.3.2)
 - a) Where a smoke damper is installed within a duct, a smoke detector will be installed in the duct within 5-feet of the damper with no air outlets or inlets



between the detector and the damper. The detector will be listed for the air velocity, temperature and humidity anticipated at the point where it is installed. Other than in mechanical smoke control systems, dampers will be closed upon fan shutdown where local smoke detectors require a minimum velocity to operate.

- b) Where a smoke damper is installed above smoke barrier doors in a smoke barrier, a spot-type detector listed for releasing service will be installed on either side of the smoke barrier door opening.
 - c) Where a smoke damper is installed within an air transfer opening in a wall, a spot-type detector listed for releasing service will be installed within 5-feet horizontally of the damper.
 - d) Where a smoke damper is installed in a corridor wall or ceiling, the damper will be permitted to be controlled by a smoke detection system installed in the corridor.
 - e) Where a total-coverage smoke detector system is provided within areas served by a heating, ventilation and air-conditioning (HVAC) system, smoke dampers will be permitted to be controlled by the smoke detection system.
5. In accordance with the Exceptions to SBC 717.5.3, smoke dampers are not required in shaft penetrations or Group B and R occupancies equipped with automatic sprinkler protection where:
- a) At penetrations of exhaust or supply shafts in parking garages that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.
 - b) At penetrations of shafts where ducts are used as part of an approved mechanical smoke control system designed in accordance with SBC/SFC Section 909 and where the smoke damper will interfere with the operation of the smoke control system.
 - c) Fire dampers and combination fire/smoke dampers are not required in kitchen and clothes dryer exhaust systems when installed in accordance with the International Mechanical Code.
 - d) Kitchen, clothes dryer, bathroom, and toilet exhausts are required to be ducted horizontally to the exterior façade, not through sub-ducted vertical shafts.

T. Combination fire/smoke dampers: (SBC Section 717)

- 1. Provided as required in SBC Section 717 based on the type and fire-resistance of wall or floor indicated and located where ducts or air transfer openings penetrate fire-rated corridors, shafts, floors when not shafted, and smoke barriers.
- 2. Dynamic rated and UL-listed and labeled per both UL-555 and UL-555S.
- 3. Located where ducts or air transfer openings penetrate fire-rated corridors, all fire barrier walls, shafts (except for general and toilet exhaust ducts serving continuously operating fans on emergency power complying with all portions of the exception to SBC Section 717.5.3, floors when not shafted, and smoke barriers.



4. Minimum leakage rating of Class II and a minimum elevated temperature rating of 250°F per SBC Section 717.3.2.
5. Activated by fixed temperature – approximately 50°F above the normal temperature within the duct system, but not less than 160°F per SBC 717.3.3.1 or not more than 350°F (177°C) where located in a smoke control system complying with SBC Section 909.
6. Will fail in the closed position, unless otherwise required as a part of a programmed smoke control sequence.
7. FSD's and smoke dampers will close upon actuation of a listed smoke detector or detectors installed in accordance with SBC Section 717 and one of the following methods, as applicable.
 - a) Where a damper is installed within a duct, a smoke detector will be installed in the duct within 5-feet of the damper with no air outlets or inlets between the detector and the damper. (Exception: Dampers that are part of the active smoke control system). The detector will be UL-listed for the air velocity, temperature and humidity anticipated at the point where it is installed.
 - b) Where a damper is installed above smoke barrier doors in a smoke barrier, a spot-type detector listed for releasing service will be installed on either side of the smoke barrier door opening.
 - c) Where a damper is installed within an un-ducted opening in a wall, a spot-type detector listed for releasing service will be installed within 5-feet horizontally of the damper.
 - d) Where a damper is installed in a corridor wall or ceiling, the damper will be permitted to be controlled by a smoke detection system installed in the corridor.
 - e) Where a total-coverage smoke detector system is provided within areas served by a heating, ventilation and air-conditioning (HVAC) system, dampers will be permitted to be controlled by the smoke detection system.
 - f) When part of the smoke control system, FSD's will have UL-listed end switches to monitor the open and closed status of the dampers and be monitored by the fire alarm system for their appropriate position, as described in the Smoke Control System section of this report.
 - g) When approved by the Code Official, smoke dampers may be replaced with fire dampers in locations where it can be demonstrated that the smoke damper is not essential to limit the passage of smoke under passive conditions and the proper function of a smoke control system complying with SBC/ SFC Chapter 9 does not depend on the operation of the damper.

VII. INTERIOR WALL, CEILING, AND FLOOR FINISHES

- A. The flame spread index and smoke develop index of interior wall and ceiling finishes will be in accordance with SBC Section 803.1.2 and SBC Table 803.14.



Occupancy	Assembly Type	Classification	Flame Spread Index	Smoke Development Index
Group R-2 (Sprinklered)	Interior Exit Stairways and Passageways	Class C	76 - 200	0 - 450
	Corridors and Exit Access Enclosures	Class C	76 - 200	0 - 450
	Rooms and Enclosed Spaces	Class C	76 - 200	0 - 450
Group S-2 (Sprinklered)	Interior Exit Stairways and Passageways	Class C	76 - 200	0 - 450
	Corridors and Exit Access Enclosures	Class C	76 - 200	0 - 450
	Rooms and Enclosed Spaces	Class C	76 - 200	0 - 450
Group A-2 (Sprinklered)	Interior Exit Stairways and Passageways	Class B	26 - 75	0 - 450
	Corridors and Exit Access Enclosures	Class B	26 - 75	0 - 450
	Rooms and Enclosed Spaces	Class C	76 - 200	0 - 450
Group A-3 (Sprinklered)	Interior Exit Stairways and Passageways	Class B	26 - 75	0 - 450
	Corridors and Exit Access Enclosures	Class B	26 - 75	0 - 450
	Rooms and Enclosed Spaces	Class C	76 - 200	0 - 450
Group B (Sprinklered)	Interior Exit Stairways and Passageways	Class B	26 - 75	0 - 450
	Corridors and Exit Access Enclosures	Class C	76 - 200	0 - 450
	Rooms and Enclosed Spaces	Class C	76 - 200	0 - 450
Group M (Sprinklered)	Interior Exit Stairways and Passageways	Class B	26 - 75	0 - 450
	Corridors and Exit Access Enclosures	Class C	76 - 200	0 - 450
	Rooms and Enclosed Spaces	Class C	76 - 200	0 - 450

- B. Insulation, sound attenuating, batts and blankets, acoustical tile, and similar materials including their associated jacket materials, adhesives, mastics, tapes, etc. will have a maximum Flame Spread Rating of 25 or less and a maximum Smoke Developed Rating of 50 or less as tested in accordance with ASTM E-84.
- C. Insulating materials, where concealed, installed in buildings of any type of construction will have a Flame Spread Rating of not more than 25 (Class A) in accordance with SBC Section 807.1 and 720.2.
- D. Drop ceiling assemblies and materials with spaces used as an air plenum will have a Flame Spread Rating of 25 or less and a Smoke Developed Rating of 50 or less per SBC Section 803.1.1 or 803.1.2.
- E. Foam plastics will not be used as interior finish or trim, except as provided in SBC Section 2604.
- F. If plastics are proposed for use as interior finish material, they will be separately identified and submitted for review.
- G. Textiles on walls or ceilings will not exceed a Flame Spread of 25 (Class A) and will be fully protected by automatic fire sprinklers.
- H. All other interior finish will have a Flame Spread not to exceed 200.

VIII. OCCUPANT LOADS AND EGRESS

All occupiable portions of the building will be provided with means of egress in accordance with SBC Chapter 10.



A. Egress design parameters & limitations

Occupancy	Room Description	O.L.F.	Travel Distance	Common Path	Dead Ends
Group R-2	Permanent Residential	1:200 ft ² gross	250 ft.	125 ft.	50 ft.
Group A-3	Main Lobby, Parish Hall, Outdoor Decks, Academic Success, Assembly with 50+	1:15 ft ² net	250 ft.	75 ft.	25 ft.
Group A-2	Queuing Areas	1:7 ft ² net	250 ft.	75 ft.	25 ft.
Group A-2	Dining Hall	1:15 ft ² net	250 ft.	75 ft.	25 ft.
Group A-2	Kitchens	1:200 ft ²	250 ft.	75 ft.	25 ft.
Group A-3	Place of Worship	Fixed Seating	250 ft.	75 ft.	25 ft.
Group B	Office, Assembly Less than 50	1:130 ft ² gross	300 ft.	100 ft.	50 ft.
Group M	Retail	1:60 ft ² gross	250 ft.	75 ft.	50 ft.
Group S-2	Parking	1:200 ft ² gross	400 ft.	100 ft.	50 ft.
Group S-2	MEP, Storage, Loading Dock	1:300 ft ² gross	400 ft.	100 ft.	50 ft.

B. Exits:

1. Minimum required exit width will be based upon 0.2-inches/occupant for stairs and 0.15-inches/occupant for other egress components per SBC Section 1005.3 when the building is equipped with an approved automatic sprinkler system and automatic voice/alarm communication system, both of which are required for a high rise building.
2. When serving 50 or more occupants, exits will have a minimum width of 44-inches, and a minimum width of 36-inches when serving less than 50. (SBC Section 1009.4, Exception 1 for stairways and SBC Section 1018.2 for corridors).
3. Doorways will be provided with 32-inch minimum clear width (SBC Section 1008.1.1).
4. The maximum width of a swinging door leaf will be 48-inches (SBC Section 1008.1.2).
5. Doors will swing in the direction of egress travel where serving a space with an occupant load of 50 or more persons (SBC Section 1008.1.2).
6. Panic hardware will be provided on all doors provided with latch or lock that are part of the means of egress from the assembly areas having an occupant load of 50 or more (SBC Section 1008.1.10).

C. Exit Separation

1. Exit and exit access doorways will be separated by no less than 1/3 the overall diagonal dimension of the area served provided the building is equipped throughout with an automatic sprinkler system in accordance with SBC Section 1015.2.1, Exception # 2.
2. Interior exit stairways enclosures will be separated by a distance not less than 30 feet or less than one-fourth of the length of the maximum diagonal dimension of the building or area to be served, whichever is less. The distance will be measured from a straight line between the nearest points of the interior exit stairways. (SBC Section 403.5.1). In buildings containing primarily Group R occupancies, required *interior exit stairways* are permitted to be separated by a distance not less than 15 feet (SBC Section 403.5.1, Exception).



3. Two (2) means of egress will be provided for spaces as required by SBC Table 1015.1. In particular, two (2) means of egress will be provided from Groups A, B, and M spaces with an occupant load greater than 49, Group R spaces greater than 10, and Group S spaces greater than 29. Additionally, a minimum of two exits will be provided from any space, where the common path of egress travel exceeds one of the limitations of Section 1014.3, or where required by Sections 1015.3, 1015.4, 1015.5, or 1015.6 (SBC 1015.1).
4. Where access to three or more exits is required, at least two exit doors or exit access doorways will be arranged in accordance with the provisions of SBC Section 1015.2.1. Additional exits or exit access doorways will be distributed so that if one becomes blocked, the others will be available per SBC/SFC Section 1015.2.2.
5. Refrigeration machinery rooms (chiller rooms) and refrigerated rooms larger than 1,000-square feet will have two (2) means of egress per SBC Section 1015.4 and 1015.5.
6. Boiler rooms which exceed 500-square feet of floor area and house equipment having an input of more than 400,000 Btu/hour will be of 1-hour fire resistive construction and will have two (2) means of egress per SBC Section 1015.3.
7. Egress from a space will not pass through intervening rooms except where intervening rooms are accessory, not a Group H occupancy, and provide a discernable path of travel to an exit per SBC Section 1014.2.
8. Electrical rooms containing equipment that is rated a minimum of 1000 V and has minimum width of 6 feet will be provided with two (2) means of egress, one (1) on each side of the equipment, in accordance with NEC Article 110.33. Each means of egress door will be equipped with panic hardware.
9. Egress will not pass through kitchens, storage rooms, closets or spaces used for purposes.

D. Minimum Number of Exits:

1. Each story, room or space requires a minimum two (2) exits for occupant loads up to 500 people, three (3) exits for occupant loads up to 1000 people, and four (4) exits for occupant loads in excess of 1,000 people, per SBC Section 1006.3.1.
2. Per SBC Section Table 1006.2.1, occupied spaces require only one (1) exit when neither the occupant load nor the common path travel distance exceed the following values:

Occupancy	Description	Occupant Load	Common Path
Group R-2	Permanent Residential	10	125 ft.
Group A-2	Lobbies, Parish Hall, Outdoor Decks, Dining Hall, Academic Success, Kitchen	49	75 ft.
Group A-3	Place of worship, Assembly with 50+	49	75 ft.
Group B	Office, Fitness Amenity, Assembly with less than 50 Occupants	49	100 ft.
Group M	Retail	49	75 ft.
Group S-2	Parking Garage, Storage, MEP	29	100 ft.

- E. Dead end corridors will be less than the maximum of either 25-feet or 2.5 times the width of the corridor per SBC Section 1018.4, or 50-feet in Group B, M, R-2, or S occupancies



- per Exception #2 to SBC Section 1018.4 when provided with automatic sprinkler protection. Dead ends are further permitted to be 75-feet in length in areas containing Group B offices in buildings of Type IA and IB construction, where the cumulative occupant load does not exceed 50 for all areas for which the dead end serves as the only means of egress (Exception #4 to SBC Section 1018.4).
- F. Exit discharge: Exits will discharge either to public ways or to uncovered spaces on the property that offer pathways to a public way(s) without passing beneath another facility element. One half of the required exit stairways may pass through a lobby if a direct line of sight is provided from the stairway discharge to the exit door to the outside.
- G. Corridors: (SBC Section 1018)
1. Residential floors require a corridor with a one-hour fire-resistive rating. Doors into the corridor are 20 minute rated and S listed for restricting the passage of smoke.
- H. Doors:
1. Egress doors, including roof level stair entrances, will be operable from the egress side without the use of a key or special knowledge or effort in accordance with SBC Section 1008.1.9.
 2. Means of egress doors will be of the pivoted or side hinged type unless specifically exempt in accordance with SBC Section 1010.1.2. Doors will swing in the direction of egress when serving occupants loads of 50 or more.
 3. Panic hardware or fire exit hardware will be provided on all latching and/or locking doors that are part of the means of egress from assembly areas serving 50 or more occupants in accordance with SBC Section 1010.1.10.
 4. Egress stairway doors will not be locked on any floor and therefore a consolidated stairway communication system is not required. Wiring will however be provided to facilitate future installations.
 5. Fire-resistive rated doors will meet the applicable requirements for rate of temperature rise and positive pressure.
 6. The primary entrance door to the individual dwelling units will contain a means to allow the occupant to visually identify a visitor without opening the unit entry door per SBC Section 420.9.1.5.
- I. Stairs:
1. Stairs serving levels that are more than 75-feet above the lowest level of fire department vehicle access will be pressurized as required by SBC Section 1022.10. Enclosures will be constructed according to SBC Section 909.20.
 2. Enclosed stairs will discharge directly to the building exterior at grade or continue through 2-hour rated exit passageways from the stair enclosure leading to the exterior at grade, except where specifically noted in accordance with SBC Sections 1022 and 1023. Where exit passageways from the stair are provided as part of pressurized stairs enclosures, such exit passageways will also be pressurized as required for the stairs.



3. Open stairways shall permitted in accordance with SBC Section 712.1.9 where it complies with all of the following conditions:
 - a) Does not connect more than two (2) stories
 - b) Does not penetrate a horizontal assembly that separates fire areas or smoke barriers that separate smoke compartments.
 - c) Is not concealed within the construction of a wall or a floor/ceiling assembly.
 - d) Is not open to a corridor within a Group R occupancy
 - e) Is not open to a corridor on a non-sprinklered floor
 - f) Is separated from openings and/or air transfer openings serving other floors by construction forming to required shaft enclosures.
4. The minimum headroom clearance within the stairway will be 6'-8" (80-inches), including any landings per SBC Section 1009.5.
5. Exit enclosures, including passageways and stairwells, will not contain equipment, ducting, piping, systems or devices that do not serve the exit enclosure. Piping and conduit may penetrate the stair but only to serve systems which are within the stair. Such penetrations will be protected by a listed through penetration fire stop system of the appropriate rating.
6. Floor openings between stories created by exit stairways will be enclosed per SBC 1009.3.
7. Equipment is prohibited in interior exit stairways except for equipment necessary for independent pressurization, lighting of the interior exit stairway, sprinkler piping, standpipes, electrical equipment for fire department communication and sprinkler monitoring, and unit heaters required to protect fire protection equipment from freezing (SBC 1022.11).
8. Due to the small footprint and clear access at each tower roof area, each will have only one (1) stair terminate at the roof in a penthouse with a door. The second required stair access will be provided as roof hatch accessed by a ships ladder as an 'Approved Penthouse Alternate', with the following features:
 - a) Roof hatch dimensions will be a minimum of 3'-0" wide x 12'-0" long.
 - b) Roof hatch will be installed with a snow sensors/heating cables system.
 - c) Roof hatch will be motorized with a remote pushbutton station located at the base of the top stair landing leading to the hatch.
 - d) Roof hatch electrical system will be on building emergency power. Provide switch in the Fire Command Center that unlocks the electro-magnetic locks on the hatch doors.
 - e) Interlock electromagnetic locks on hatch doors with fire alarm system to unlock automatically on any fire alarm signal.
 - f) Roof hatch will be operable from the roof.



J. Horizontal Exits (where applicable):

1. Horizontal exits will be constructed of 2-hour fire-resistance rated fire barriers extending from exterior wall to exterior wall per SBC Section 1025.2.
2. The horizontal exit separation will extend vertically through all floor levels of the building unless floor assemblies have a minimum 2-hour fire-resistance rating with no unprotected openings.
3. 2½-inch Class I standpipe hose valves will be provided on each side of the wall adjacent to the exit opening of all horizontal exits per SBC/SFC Section 905.4 unless floor areas adjacent to a horizontal exit are reachable from exit stairway hose connections by a 30-foot hose stream from a nozzle attached to 100-feet of hose.
4. Not more than ½ of the total number of exits or total exit width may be through horizontal exits per SBC Section 1025.1.

K. Accessible Means of Egress

1. At least one (1) elevator will be provided as one of the required accessible means of egress in each tower, a total of two (2) elevators, in accordance SBC Sections 1009.2.1 and 1009.4. In order to be considered part of an accessible means of egress, each elevator will comply with the emergency operation and signaling device requirements of ASME A17.1 Section 2.27. Legally required standby power will be provided in accordance with SBC Chapter 27 and Section 3003. Each accessible means of egress elevator is not required to be accessed from an area of refuge in buildings and facilities equipped throughout with an automatic sprinkler system.
2. Signage indicating special accessibility provisions and instructions will be in accordance with SBC Section 1009.9. Signage will comply with the A117.1 requirements for visual characters and include the International Symbol of Accessibility. Where exit sign illumination is required by SBC Section 1013.3, the signs will be illuminated. Additionally, raised character and Braille signage complying with A117.1 will be located at each door to an area of refuge and exterior area for assisted rescue in accordance with SBC Section 1013.4.

IX. EXIT SIGNS AND MEANS OF EGRESS ILLUMINATION

- A. Illuminated exit signs will be provided at exit doors and where otherwise necessary to clearly indicate the direction of exit travel when two (2) or more exits are required per SBC Section 1011.1.
- B. Exit signs will be placed so that no point in an exit access corridor is more than 100-feet from the nearest visible exit sign or the listed viewing distance of the sign whichever is less per SBC Section 1011.1.
- C. A sign stating EXIT in raised characters and Braille and complying with ICC A117.1 will be provided adjacent to each door to an area of refuge, area of rescue assistance, an exterior area for assisted rescue, an exit stairway, an exit ramp, an exit passageway and the exit discharge in accordance with SBC Section 1011.4.
- D. Normal power for exit signage and exit illumination will be supplied from the building wiring. Emergency power will be provided by the emergency generator per SBC Sections 1006.3 and 1011.6.3.



- E. Emergency illumination of at least one (1) foot-candle will be provided at the walking surface level of all means of egress paths per SBC Section 1006.2.
- F. In the event of power supply failure, the emergency electrical system will automatically illuminate all of the following areas: (SFC Section 1006.3)
 - 1. Aisles and unenclosed egress stairways in rooms and spaces that require two or more means of egress.
 - 2. Corridors, exit enclosures and exit passageways in buildings required to have two or more exits.
 - 3. Exterior egress components at other than their levels of exit discharge until exit discharge is accomplished for buildings required to have two or more exits.
 - 4. Interior exit discharge elements, as permitted in Section 1027.1, in buildings required to have two or more exits.
 - 5. Exterior landings as required by Section 1008.1.6 for exit discharge doorways in buildings required to have two or more exits.
 - 6. Electrical equipment rooms, FCC's, fire pump rooms, and generator rooms.
 - 7. Public restrooms that are greater than 64-square feet and accessed by means of egress components that are required to have emergency illumination.

The emergency power system will provide power for a duration of not less than 90 minutes and will consist of storage batteries, unit equipment or an on-site generator. The installation of the emergency power system will be in accordance with SFC 604.

- G. Emergency illumination will include all required means of egress lighting, illuminated exit signs, and all other lights specified as necessary to provide required illumination. SEC Article 700.16.
- H. Luminous egress path markings will be provided within all interior egress at all levels above grade to exit discharge that serve the Group A and B occupancies in accordance with SBC Section 403.5.5 and Section 1025. Markings will not be provided at parking garage levels (i.e. below the level of exit discharge).

X. EMERGENCY SIGNAGE

- A. Stairway identification signs will be provided and
 - 1. Comply with SBC Section 1022.9.
 - 2. Designate the floor level, the terminus of the top and bottom of the stair, and the identification of the stair.
 - 3. Identify the story of and direction to the exit discharge.
 - 4. Identify the availability of roof access from the stairway.
 - 5. Located 5-feet above the floor landing in a position that is readily visible when the doors are in the open and closed position.



6. Identify on each floor landing within a stairway indicating where reentry is provided into the building or indicating the location of telephones or other means of two-way communication (SBC 403.8.3).
- B. Elevators:
1. A sign indicating the floor level will be posted facing each set of elevator doors approximately 5-feet above the floor. Numerals will be at least 5-inches high with a $\frac{3}{4}$ -inch stroke.
 2. Designations of floor levels on signs at elevators and in exit stairs will be coordinated with designations used in the fire alarm system.
 3. An approved pictorial sign will be posted adjacent to each elevator call station on all floors instructing the occupants, "IN CASE OF FIRE, ELEVATORS ARE OUT OF SERVICE. USE EXIT STAIRS" will be posted adjacent to each elevator call station. This sign will also provide a pictorial representation to indicate that the elevator will not operate during a fire and that exit stairs should be used.
 4. The international symbol for emergency medical services (star of life) of not less than 3 inches in height will be located inside both sides of the hoistway door frame to identify the elevator car (cars) that accommodate transport of a 24-inch by 84-inch ambulance stretcher in accordance with SBC Section 3016.12
 5. An approved sign indicating elevators are suitable for occupant self-evacuation will be posted on all floors adjacent to each elevator call station serving occupant evacuation elevators (SBC Section 403.6.2.5.5).
 6. A sign will be posted in every elevator lobby above each hall call fixture noting that the elevators will be recalled to the building lobby on fire alarm (SBC Section 403.8.1).
 7. If approved by the building official, signs need not be posted in lobbies at the main egress level if the means of egress are obviously identifiable. (SBC Section 403.8.1, Exception).
 8. A sign indicating the number of each elevator will be posted and maintained in the elevator lobby at each designated recall floor and at alternate floors of recall, if provided (SBC Section 403.8.2).
 9. In accordance with SBC 403.6.1.6.5, a pictorial symbol of a standardized design designating which elevators are fire service access elevators will be installed on each side of the hoistway door frame on the portion of the frame at right angles to the fire service access elevator lobby.
- C. Fire Department Connections. Signs at FDC's will indicate the minimum required pressure and flow that must be delivered at the FDC inlets to assist in proper system performance.
- D. The maximum occupant load of all assembly spaces will be posted in a conspicuous space near the main exit or exit access doorway from the space in accordance with SBC Section 1004.3.
- E. Permanent signage will be provided on access doors to the following rooms:
1. Fire pump rooms



2. Fire Command Centers
 3. Emergency generator rooms
 4. Main electrical rooms
 5. Other rooms as designated by SFD.
- F. Access points to fire and smoke dampers will be permanently identified on the exterior by a label.
- G. Fire walls, fire barriers, fire partitions, smoke barriers, and smoke partitions or any other wall required to have protected openings or penetrations will be effectively and permanently identified with signs or stenciling where there is an accessible concealed floor, floor-ceiling or attic space in accordance with SBC Section 703.7.
- H. Signage indicating special accessibility provisions and instructions will be in accordance with SBC Section 1007.9.
- I. Shaftways and access to shaftways will be identified per SBC Section 914.
- J. In accordance with SBC Section 1007.9, signage indicating special accessibility provisions will be provided for:
1. Each door providing access to an area of refuge from an adjacent floor area will be identified by a sign stating: AREA OF REFUGE.
 2. Each door providing access to an exterior area for assisted rescue will be identified by a sign stating: EXTERIOR AREA FOR ASSISTED RESCUE.
- Signage will comply with the ICC A117.1 requirements for visual characters and include the International Symbol of Accessibility. Where exit sign illumination is required by SBC Section 1011.3, the signs will be illuminated. Additionally, raised character and Braille signage complying with ICC A117.1 will be located at each door to an area of refuge and exterior area for assisted rescue in accordance with SBC Section 1011.4.
- K. Per SBC Section 1007.10, directional signage indicating the location of the other means of egress and which are accessible means of egress will be provided at the following:
1. At exits serving a required accessible space but not providing an approved accessible means of egress.
 2. At elevator landings.
 3. Within areas of refuge.
- L. In areas of refuge and exterior areas for assisted rescue, instructions on the use of the area under emergency conditions will be posted in accordance with SBC Section 1007.11. The instructions will include all of the following:
1. Persons able to use the exit stairway do so as soon as possible, unless they are assisting others.
 2. Information on planned availability of assistance in the use of stairs or supervised operation of elevators and how to summon such assistance.
 3. Directions for use of the two-way communications system where provided.



- M. Required accessible elements, directional signage, and other signs will be in accordance with applicable SBC Chapter 11 requirements.

XI. FIRE SUPPRESSION SYSTEMS

A. Automatic Sprinkler Protection: (SBC Section 403.3 & SBC/SFC Section 903)

1. Hydraulically calculated, automatic sprinkler systems will be provided throughout all areas of the project including the high-rise towers, the podium, and the below ground parking and support areas except as may be modified in required code provisions and where approved by SFD. Sprinklers protecting areas that cannot be maintained above 40°F will be of the dry type or be part of a dry system. The area of operation in the hydraulic calculations for dry pipe systems will be increased by 30-percent. Unless otherwise approved by SFD, anti-freeze systems will not be permitted.
 - Sprinklers shall not be installed in Transformer Vaults in accordance with SBC Section 428.12.
2. Combination standpipe/sprinkler risers using a 6-inch minimum pipe diameter will be used with the sprinkler system connected between standpipe risers. Shut-off valves, water flow devices and check valves (or pressure reducing valves) will be provided on each floor at the sprinkler system connection to each standpipe.
3. Sprinkler design and installations will be in accordance with NFPA-13 and the SFC both with Seattle amendments. Sprinkler contractor will be responsible for producing detailed shop drawings, hydraulic calculations, equipment submittals, and other required design documentation which will be submitted to the SFD for review and approval.
4. Applicable sprinkler system components, materials, and devices essential to successful system operation will be UL- Listed for their intended use.
5. Riser rooms will be sized in accordance with SBC Section 901.8.
6. Within the high-rise towers, automatic sprinklers will be supplied by a combined standpipe system interconnected at the base per SBC Section 905.4.2. Combination risers will be located within the exit enclosures. The floor fire sprinkler control valves will be located within the stair enclosures at each floor level. Approved supervised indicating control valves will be provided at the point of connection to the riser on each floor in accordance with the SBC Section 903.4.3.
7. In accordance with SFD Administrative Rule 9.03.14, a minimum safety margin of 10-psi will be incorporated in all sprinkler system hydraulic calculations between the available water supply pressure and the system design demand pressure. This safety margin is however not required for the hose allowance that is added to the demand flow at the sprinkler system point of connection to the water supply. Losses through water service piping, valves, backflow preventer(s), and similar will also be included in these calculations. The fire protection sprinkler contractor will coordinate and verify the type, location, and use of these devices and account for their applicable characteristics and losses.
8. Quick-response type, UL-listed, ordinary temperature rated sprinklers will be used throughout all light hazard occupancies in accordance with NFPA-13 Section 8.3.3.1. Ordinary hazard occupancies may use either ordinary temperature rated sprinklers



quick response or standard response sprinklers except in high temperature areas as defined by NFPA-13.

9. Sprinklers and piping located on exterior piping systems or located in corrosive atmospheres will be corrosion resistant.
10. Automatic sprinklers will be zoned as follows:
 - a) The maximum area per sprinkler zone served on any floor level will not exceed 52,000-ft² or to the limits established by NFPA-13. Dry pipe systems will be designed to comply with NFPA-13 for areas of coverage and system volume and will meet a 60 second water to inspector's test outlet trip test time (SFD Administrative Rule 9.03.14).
 - b) Designed to correspond with horizontal exits (if provided) and fire alarm zoning. At a minimum, each floor level will be treated as a separate sprinkler system zone.
 - c) Mechanical and electrical rooms will be fully protected by automatic sprinklers and served by the sprinkler zone in which they reside.
 - d) Sprinklers installed to protect openings in fire-resistive construction will be a separate sprinkler system, and will be controlled, monitored and supplied independently from the overhead system serving the space.
11. Where UL-listed quick response sprinklers are provided, except where significant amounts of combustible materials are present, the design areas identified in the section below may be reduced by as much as 40% in accordance with NFPA-13 when approved by SFD.
12. Sprinkler system design densities will be as follows:

<u>Area</u>	<u>Minimum Density/ Area</u>
Residence, suites, offices, and similar areas	Light Hazard – 0.10 gpm/ft ² over the most hydraulically remote 1,500 ft ² area
Restaurant, kitchen, fitness and spa area, maintenance shops, MEP areas, housekeeping/linen rooms, linen/trash termination room	Ordinary Hazard, Group 1 - 0.15 gpm/ft ² over the most hydraulically remote 1,500 ft ² area
Retail, VIP lounge Combustible storage < 12-ft	Ordinary Hazard, Group 2 - 0.20 gpm/ft ² over the most hydraulically remote 1,500 ft ² area
Parking garage, loading dock	Ordinary Hazard, Group 2 - 0.20 gpm/ft ² over the most hydraulically remote 1,950 ft ² area (dry pipe)

13. Each refuse chute will constitute a separate vertical sprinkler zone. Sprinklers serving chutes will be on separate dedicated supply risers and installed at the top and bottom of each chute, at alternating floors levels and in the termination room in accordance



with SBC/SFC Section 903.2.11.2 and NFPA-13 requirements. Chute sprinklers will be recessed, protected from impact, and be accessible for servicing.

14. Each vertical sprinkler zone (refuse chute) will be provided with a separate control valve with electrical supervision, water flow device, and will be designed to provide a minimum of 15-gpm per sprinkler for the hydraulically most remote 3 sprinklers in accordance with NFPA-13 Section 11.2.3.4.1.
15. Dry-pipe sprinkler systems serving parking garages may use a single supply and one separate two-way fire department connection. The dry-pipe sprinkler system will be supplied by the on-site water tank.
16. All stairways serving sprinklered buildings require a sprinkler at each floor landing (SFD Administrative Rule 9.03.14).
17. Within the high-rise towers, automatic sprinklers will be supplied by a combined standpipe system interconnected at the base per SBC/SFC Section 905.4.2. Combination risers will be located within the exit enclosures. The floor fire sprinkler control valves will be located within the stair enclosures at each floor level. Approved supervised indicating control valves will be provided at the point of connection to the riser on each floor in accordance with the SBC/SFC Section 903.4.3.
18. Building recesses that are inset 4 feet or more into a building will be sprinklered. Sprinkler protection will be provided for exterior decks and ground floor patios where there is a roof or deck above having a combined projection and/or building inset of 4 feet or more. Exterior egress balconies/exit corridors will be sprinklered regardless of width or type of construction. Noncombustible canopies over roof decks are not required to be sprinklered unless there are charcoal burners or other open flame devices present.
19. Sprinklers in elevator hoistways and machine rooms will be in accordance with City of Seattle standards as specified in Director's Rule 7-2014, *Sprinkler Systems and Fire Alarms for Elevator Machinery Rooms, Control Rooms, Hoistways and Pits*.
20. Elevator shafts with elevators using combustible suspension means (belts) that do not provide at least an FT-1 rating, and machine rooms and elevator pits for elevators having combustible hydraulic fluids will be protected in accordance with Seattle Fire Department Administrative Rule 9.06.14 (Department of Construction and Inspections (SDCI) Director's Rule 7-2014).
21. Sprinklers will be installed in elevator hoistways and machine rooms in accordance with the Director's Rule 7-2014. The following requirements apply to all sprinklered buildings.
 - a) Smoke detectors will be installed at each elevator lobby or floor level served by the elevator, and in each elevator machine room and control room in accordance with NFPA 72. Upon activation, these detectors will initiate Phase I recall and activate a fire alarm.
 - b) If the elevator driving machine is located at the top of the hoistway or located in the elevator pit area, 135 degrees fixed temperature heat detector(s) will be located within 18 inches of the motor and sprinkler head(s). The heat detector(s) will initiate Phase I recall and activate a fire alarm.



- c) The detectors will report to the fire alarm panel as an initiating device identifier for each machine room, control room and secondary sheave area provided with a detector.
22. Sprinklers will be installed in elevator hoistways and machine rooms in accordance with NFPA-13 Section 8.15.5 as follows:
- a) Sidewall spray sprinklers will be installed at the bottom of each elevator hoistway not more than 2-ft above the floor of the pit unless representing an enclosed, noncombustible elevator shaft that does not contain hydraulic fluids.
 - b) Automatic sprinklers will not be required in elevator machine rooms, elevator machinery spaces, control spaces, or hoistways of traction elevators installed in accordance with the applicable provisions of the IBC, where all of the following conditions are met:
 - 1) The elevator machine room, machinery space, control room, control space, or hoistway of traction elevator is dedicated to elevator equipment only.
 - 2) The elevator machine room, machinery space, control room, or control space, are protected by smoke detectors, or other automatic fire detection, installed in accordance with NFPA-72.
 - 3) The elevator machinery space, control room, control space, or hoistway of traction elevators is separated from the remainder of the building by walls and floor/ceiling or roof/ceiling assemblies having a fire resistance rating of not less than that specified by the applicable building code.
 - 4) No materials unrelated to elevator equipment are permitted to be stored in elevator machine rooms, machinery spaces, control rooms, control spaces, or hoistways of traction elevators.
 - 5) The elevator machinery is not of the hydraulic type.
 - c) Automatic sprinklers in elevator machine rooms or at the tops of hoistways will be of ordinary- or intermediate temperature rating.
 - d) Upright, pendent, or sidewall spray sprinklers will be installed at the top of elevator hoistways unless the hoistway for passenger elevators is noncombustible or limited-combustible and the car enclosure materials meet the requirements of ASME A17.1, Safety Code for Elevators and Escalators.
23. Pressure ratings of all piping and fittings will meet or exceed maximum working pressures available within the system.
24. Where system pressures exceed 175-psi, listed and approved pressure reducing valves to limit pressures on the system may be provided. Pressure reducing valves (PRVs) will be pilot operated and capable of reducing pressure under all flow and non-flow conditions. PRVs will be provided with appropriate means for testing and inspections as required by NFPA-13 and NFPA-14. Provide gauges on both sides of each PRV, along with associated isolation valves.
25. Fire-suppression and standpipe systems will be capable of withstanding the effects of earthquake motions as required in NFPA-13.



26. No storage areas of ordinary combustibles are intended to have storage in excess of 12-feet in height. If storage in excess of 12-feet is later added, or storage of hazardous materials is introduced, it will be protected in accordance with NFPA-13 and SFD requirements with appropriate permits obtained.

27. Fire Department Connections:

- a. Connections will be provided with all trim and fittings as necessary and have 2-1/2 inch swivel female couplings with caps and chain. Hose threads will national standard threads matching those used by SFD in accordance with SBC/SFC Section 912.
- b. A fire department connection with a minimum of four 2-1/2 inch inlet ports will be provided for 6 inch and larger standpipes.
- c. All fire department connections will be located at least 10 feet away from building exits.
- d. Two fire department connections serving the combination system will be provided on separate streets well separated from each other will be as required per SFC Section 912 as modified by SFD Administrative Rule 9.03.20. Two (2) FDCs will be provided, one (1) on 15th Ave NE and one (1) on NE 43rd St. The FDCs will be either wall mounted or located in landscaped areas located a minimum 10 feet from all building exits. Final FDC locations to be confirmed with Fire Marshal prior to deferred submittal. Fire department connection sizes will be based on the system demand and will include one 2 1/2 inch inlet per every 250 gpm in accordance with NFPA-14, Section 7.12.3.
- e. Fire department connections are not required to be installed on the building but must be located such that the fire apparatus and/or hose connected to supply the system will not obstruct fire department access for additional fire apparatus in accordance with SFC Section 912.2. Fire department connections will be located on the street side of buildings, fully visible and recognizable from the nearest point of fire department access.
- f. Where fire department connections are subject to impact by a motor vehicle, vehicle impact protection will be provided in accordance with SFC Section 312.
- g. At least one of the fire department connections will be connected to the riser above a riser isolation valve.
- h. Caps on 2 1/2-inch outlet valves will incorporate a 1/8-inch hole for pressure relief.
- i. Signage with letters at least 1 inch in size will be provided at the fire department connections of high-rise buildings that indicate the building fire pump static (churn) discharge pressure. Where the pump is more than two stories above or below the fire department connections, the pump static/churn discharge pressure on the signage will be adjusted to correct for the elevation difference. For example, for a building having a pump drafting from a tank and providing a static pressure boost of 260 psi, the sign would read FDC INLET PRESSURE 260 PSI.

28. In accordance with SFC Section 507.5.1.1, buildings equipped with a standpipe system are required to have a fire hydrant within 100 feet of the fire department



connections. The distance may exceed 100 feet where approved by the fire code official in accordance with the Exception to SFC Section 507.5.1.1.

29. Alarm and Trouble Signal

- a) Waterflow devices will be provided at the control valve to each sprinkler riser on each floor for each zone. Waterflow devices will be UL-listed.
- b) Electrical monitoring supervision will be provided at:
 - 1) All sprinkler and standpipe control valves,
 - 2) Supervisory air pressure switches,
 - 3) The fire pump, and
 - 4) The dedicated secondary water storage tank.
- c) Monitoring will be provided for all alarm, supervisory, and trouble signals at the FCC and the secondary fire department response location. 24-hour monitoring will be provided for all alarm, supervisory, and trouble signals at a UL-listed Central Station, accomplished by use of a transmitter connected to a UL-listed Central Station.

B. Standpipe Systems

1. Class I automatic wet standpipes, outlets, and their control valves will be provided in the high-rise towers, high-rise towers roof, low rise, and parking garage in accordance with NFPA-14 and SBC/SFC Section 905. Standpipes that are part of a combined system will be at least 6-inch in diameter in accordance with NFPA-14 Section 7.6.2.
2. Class I automatic wet standpipes will be interconnected at the base and incorporate riser isolation valves with electrical monitoring supervision/ tamper switches. Sprinklers will be supplied from the combination standpipe system. Pressure regulating valves, high-pressure fittings, and piping will be used as necessary to accommodate design pressures.
3. The sprinkler risers and standpipes will be supplied by the new fire pump and water supply system.
4. Class 1 connections and outlets will be provided in the following locations per SBC/SFC Section 905.4 and NFPA-14, Section 7.3.2:
 - a) Two, 2.5-inch diameter hose valve connections will be provided on every floor level landing above and below grade in every required stairway as approved by SFD. If pressure reducing valves (PRV) are required, each hose connection will be provided with its own PRV in accordance with SFC Section 914.3.1.1(8).
 - b) On either side of a horizontal exit except where floor areas adjacent to a horizontal exit are reachable from exit stairway hose connections by a 30-foot hose stream from a nozzle attached to 100-feet of hose.
 - c) In every exit passageway except where floor areas adjacent to an exit passageway are reachable from exit stairway hose connections by a 30-foot hose stream from a nozzle attached to 100-feet of hose.
 - d) Each standpipe will be provided with a hose connection located either on the roof or at the highest landing of a stairway with stair access to the roof. An additional



hose connection will be provided at the top of the most hydraulically remote standpipe for testing purposes.

- e) On the roof where the roof has a slope less than four units vertical in 12 units horizontal (33.3-percent slope), located to serve the roof or at the highest landing of a stairway with stair access to the roof provided in accordance with SBC Section 1009.16. Hose connections on a roof will be at least 10 feet (3048 mm) from the roof edge or other opening, unless protected by an approved 42-inch-high (1067 mm) guardrail or equivalent.
 - f) At the top of the most hydraulically remote standpipe (for testing purposes).
 - g) Parking garage will be provided with Class I standpipes in accordance with SBC/ SFC Section 905.3.1. Standpipes will be protected against mechanical damage, freezing, and will be located on every parking level so that all portions of each floor level is provided with hose valve coverage utilizing 100-feet of hose and 30-foot stream from any hose connection.
 - h) As otherwise required so that all areas throughout the entire building and roof areas and all portions of each floor level are provided with hose valve coverage utilizing 100-feet of hose and 30-foot stream from any hose connection located on that floor or intermediate landing. The length of hose will be along normal walking routes, and the stream will not be expected to penetrate walls or windows. The floor fire sprinkler control valves will be located within the stair enclosures at each floor level.
- 5. Pressure regulating valves with required test drains may be installed where necessary to keep sprinkler piping pressures below 175-psi. 3-inch drain risers with connections will be provided to test these valves in accordance with NFPA-13.
 - 6. In accordance with SFC Section 914.3.1.1(9), the standpipe system will be designed to provide a minimum flow of 300 gpm at a minimum pressure of 150 psi and maximum pressure of 205 psi at each standpipe connection in addition to the flow and pressure requirements contained in NFPA 14. Pipe sizing will be hydraulically calculated per NFPA-14.
 - 7. Fire department hose connections will be provided at accessible locations adjacent to usable stairs.
 - 8. Standpipe risers will be protected by 2-hour construction unless they are within a 2-hour fire resistive stair enclosure.
 - 9. A placard will be placed indicating the maximum pressure to be applied at the fire department connection.

C. Fire Pumps: (SBC/ SFC Section 913)

- 1. Fire protection sprinkler and standpipe systems within all buildings and parking garage will be served by a new fire pump system consisting of two (2) UL Listed electric motor driven fire pump assemblies designed in a primary & secondary configuration serving the entire facility. Each fire pump assembly will be capable of taking suction from both the water utility and an on-site secondary water supply tank. Fire pump assemblies will be sized to provide the required waterflow and pressure based on the largest design flow/ pressure for the largest sprinkler system design or



the standpipe system whichever is greater. Both fire pumps will be rated for 150% of the fire protection demand.

2. The fire pumps will be sized to achieve the maximum required hydraulic flow and pressure requirements based on the largest design flow/ pressure while under the worst case scenario (taking suction from the secondary fire protection water supply tanks). The project's design/ build sprinkler contractor will provide final determination of the size, capacity, and operational requirements of the fire pump assembly and secondary tank based on the actual hydraulic demands of the automatic sprinkler and standpipe systems.
 3. The two (2) fire pumps will be installed in parallel. The fire pump controllers will be configured such that one of the fire pumps will be designated as the primary fire pump with the other designated as the secondary fire pump. The primary fire pump will automatically start first upon pressure loss in the fire protection piping system in accordance with NFPA 20. An adjustable 10 second timing device will be present in the designated secondary fire pump controller as recommended in NFPA-20 to delay the secondary fire pump from starting to allow the primary pump to start first and make sure that only one (1) pump starts at a time. If the primary fire pump fails to start, the secondary fire pump will then be commanded to start by its controller after the adjustable time delay has been satisfied.
 4. Fire pump room construction and separation from other areas of the building will be in accordance with NFPA 20 and SBC Section 913.2.1. Fire pump rooms not directly accessible from the outside are not required to be accessible through an enclosed passageway from an enclosed stairway or exterior exit (SFD Administrative Rule 9.03.14).
 5. Fire pump room will be sized in accordance with SBC Section 901.8.
 6. The temperature within fire pump rooms will be maintained in accordance with the manufacturer's requirements and at least above 40°F per SFC 913.3.
 7. Signs will be posted on the door indicating the fire pump room.
 8. Each fire pump assembly will include the fire pump, driver, and controller. Electric motor driven UL-listed Jockey pump and controller will be provided for the fire pump to start upon a loss of pressure in the system piping.
 9. The electric fire pumps and jockey pumps will be served by both normal (commercial) and emergency electrical power.
 10. Fire pump, jockey pump, and secondary water supply tank status will be monitored at the FCC. Pump status panels manufactured as part of the fire pump controller equipment will be provided within the FCC.
- D. Primary and Dedicated Secondary Water Supply: (SBC/ SFC Section 903)
1. The fire suppression and standpipe systems will be connected to both the public water supply and for those systems served by the fire pump, a dedicated Secondary Water Supply tank located on site.
 2. Design and installation of the secondary water supply tank and water supply will comply with NFPA-22 and NFPA-24.



3. As required by SFC Section 903.3.5.2, an automatic dedicated secondary on-site water supply will be provided having a usable capacity of the lesser of a net volume of 33,000 gallons or having a volume that is not less than the hydraulically calculated sprinkler demand, including the hose stream requirement in NFPA 13. An additional fire pump will not be required for the secondary water supply unless needed to provide the minimum design intake pressure at the suction side of the fire pump supplying the automatic sprinkler system. The secondary water supply will have a duration of not less than 30 minutes as determined by the occupancy hazard classification in accordance with NFPA 13.
 4. Secondary water tank will be configured to be automatically refilled from the city water supply by permanent pipes connected to an approved water supply.
 5. The means to fill the tank will be sized to automatically fill the tank in a maximum time of 8 hours.
- E. Kitchen Hood System: (SFC Section 904)
1. Where required, Type I grease hoods and ducts will be provided with automatic suppression in accordance with SFC Section 904.2.1 and NFPA-96.
 2. Where grease exhaust ducts exceed 75-feet in length, the entire duct will be provided with wet pipe, automatic, high temperature sprinklers in accordance with SFC Section 903.2.11.5 and NFPA-96. These sprinklers will be supplied from independent risers not connected to other overhead sprinkler systems to avoid multiple water flow alarms.
 3. Activation of a kitchen hood suppression system will cause automatic fuel shut-off for the area served in addition to shutdown of electrical service under the affected hood.
 4. The fire alarm system will monitor the activation of all hood and grease exhaust duct systems.
 5. The interaction of kitchen hood exhaust systems and smoke control systems, if applicable, will be included in the rational analysis report.
 6. Design and operation of the kitchen will be in accordance with the current SFD Commercial Kitchen Requirements Information Sheet.
 7. Functionality of the installed fire protection systems and associated ventilation for the kitchen will be in accordance with the current SFD Commercial Kitchen Fire Protection/ Ventilation Functionality Information Sheet.
- F. Fire Extinguishers
1. Fire extinguishers will be provided and located in compliance with SBC/SFC Section 906, and NFPA-10, and SFD direction.
- G. Site Elements
1. Primary Fire Department vehicular access will be provided along city streets on all four sides of the building.
 2. New UL-listed fire hydrants will be designed and installed at the property in accordance with SFC Section 507, SFC Appendix C, NFPA-24, and SFD



requirements.

3. Where fire hydrants are subject to impact by a motor vehicle, guard posts or other approved means will be provided to comply with SFC Section 312.
4. A fire hydrant will be located within 100-feet of a fire department connection in accordance with SFC 507.5.1.1. The distance is permitted to exceed 100 feet where approved by the fire code official.

XII. FIRE ALARM AND DETECTION SYSTEMS

A new fully addressable fire alarm system will be designed and installed serving this project to comply with NFPA-72 with City of Seattle amendments, and SBC/SFC Section 907. Fire alarm initiating device circuits will be zoned to correspond with automatic sprinkler and mechanical smoke control zones. System will have UL-864, *Control Units for Fire Protective Signaling Systems* and UUKL, *Smoke Control System Equipment* listings. Fire alarm system equipment and components will be protected against mechanical damage, inadvertent tampering, and be located where the equipment including system stand-by batteries are within their allowable temperature, humidity, and operating conditions.

The project will be equipped with a voice communication fire alarm system in accordance with SBC and SFC requirements. The new fire alarm system will incorporate area smoke detection on all levels and a voice communication evacuation system. The fire alarm system will also control the required smoke control through a Fire Fighter's Smoke Control Panel.

A UL Listed addressable networked fire alarm system will be provided for this project. The main fire alarm control panel and the fire fighter's smoke control panel for the facility will be located in the Fire Command Center (FCC) located in the first floor. The sanctuary will be provided with its own fire alarm control panel with a secondary fire alarm system annunciator panel located at the church entrance. These panels will be integrated into the networked fire alarm system. Alarm conditions received from any floor will be annunciated on the control panel identifying the specific device in alarm and its location in the building. Audible appliances will activate automatically throughout the facility. In addition, the system will activate the smoke control system for the smoke zone from which the alarm is located. The control panel will monitor all fire alarm initiating devices such as smoke detectors, heat detectors, water-flow devices and manual pull stations. The system will also monitor supervisory devices such as duct smoke detectors, sprinkler valve position switches, the fire pump and the smoke control monitor points. The system will also control the operation of fan shutdown, damper closure and door release as required by the Code.

Fire alarm contractor will be responsible for producing shop drawings showing initiating devices, notification appliances, alarm panels, system configuration, calculations including sound-level, battery, voltage drop, and similar, and other information that fully describes the new fire alarm system. Drawings and calculations will be submitted to the SFD for review and approval.

- A. All fire alarm circuits will be fully supervised to annunciate alarm, supervisory and trouble conditions as required by NFPA-72 and will be monitored at the constantly attended room as required.
- B. If a networked fire alarm system is installed, and if the fire alarm network nodes are interconnected utilizing physical conductors (e.g., metallic, optical fiber), the network nodes will be interfaced with each other utilizing Class A wiring methods. The outgoing and return conductors will not be run in the same cable assembly, enclosure, or raceway in accordance with SBC/SFC Section 907.2.13.4.



- C. Annunciation of all fire alarm system devices will be provided at the FCC for the project. Signals will also be transmitted to a constantly attended central supervising station.
- D. The fire alarm system will receive alarm signals from fire alarm initiating devices including the following devices:
 - 1. Automatic sprinkler system waterflow indicators
 - 2. Area smoke detectors
 - 3. Beam type smoke detectors
 - 4. Air Aspirated smoke detection systems
 - 5. Dry Pipe and Pre-action sprinkler systems
 - 6. Heat detectors
 - 7. Fire Pump Running status
 - 8. Kitchen hood and/or special suppression systems
 - 9. Other life safety and emergency alarm systems (i.e.: a refrigerant detection system in a mechanical room)
- E. Alarm Sequence of Operations - Upon the alarm activation of any area fire alarm initiating device, the following functions will automatically occur.
 - 1. The internal audible and visual alarm device will sound at the fire alarm control panel (FACP).
 - 2. The LCD display on both the FACP will indicate applicable information associated with the fire alarm condition including; zone, device type and address, floor level, device location, and time/date.
 - 3. All system activity/events will be stored in the system history log.
 - 4. Activate audible and visual notification appliances. The FACP audible and visual alarm device will stop operating when the "Alarm Silence" is activated.
 - 5. All required fire/ smoke doors on listed hold-open devices will close.
 - 6. Electromagnetic locks on stairway roof hatch doors will automatically unlock
 - 7. Activate their associated smoke control sequence of operation, stairwell, and elevator hoistway pressurization systems.
 - 8. Alarm signal will be transmitted to central station.
- F. The fire alarm system will receive supervisory signals from supervisory devices including the following:
 - 1. Automatic sprinkler and standpipe system control valves, including primary and zone control valves.
 - 2. Pre-action sprinkler systems
 - 3. Duct or in-duct smoke detectors
 - 4. Air compressors for dry-pipe or pre-action systems
 - 5. High and low air supervisory switches for dry-pipe or pre-action systems
 - 6. Fire pump status (loss of phase, phase reversal, alternate power source)
 - 7. Dedicated secondary water tank high and low-level water status
 - 8. Emergency generator status
 - 9. Kitchen hood and special suppression system supervisory alarms



10. Emergency Responder Radio System
 11. Other life safety and emergency alarm systems
 12. Temperature monitoring of all FSAE lobbies and machine rooms
- G. Upon the activation of a supervisory device, the following functions will automatically occur.
1. The internal audible and visual supervisory device will sound at the FACP.
 2. The LCD display on both the FACP will indicate applicable information associated with the fire alarm condition including; zone, device type and address, floor level, device location, and time/date.
 3. All system activity/events will be stored in the system history log.
 4. Deactivate associated air handling unit (duct smoke detector only).
 5. Signal will be transmitted to central station.
- H. The fire alarm system will also monitor all circuits and panels for trouble signals in accordance with NFPA-72.
- I. Upon activation of a trouble condition, the following functions will automatically occur:
1. The internal audible and visual trouble device will sound at the FACP.
 2. The LCD display on both the FACP will indicate applicable information associated with the fire alarm condition including; zone, device type and address, floor level, device location, and time/date.
 3. All system activity/events will be stored in the system history log.
- J. The fire alarm system will monitor the emergency responder radio system. Monitoring will be provided to annunciate the status of the system. A supervisory signal will be sent to the fire alarm control unit upon any off-normal condition. At a minimum, the following conditions will be monitored:
1. Active component trouble.
 2. Loss of normal ac power.
 3. Battery system trouble.
- K. Addressable area smoke detection will be provided at the following locations. Where approved by the Fire Department, alarm verification will be provided for these detectors.
1. Mechanical, electrical, transformer, telephone, transformer, elevator, information technology (IT), battery room(s), UPS, and similar equipment and machine rooms.
 2. In interior corridors serving dwelling units in accordance with SBC/SFC Section 907.2.8.2.
 3. Each elevator lobby or floor level served by the elevator.
 4. Elevator machine rooms.



5. Where fire-rated doors are held open by magnetic devices.
 6. Within all rooms containing fire alarm control equipment including each fire alarm control unit, notification appliance circuit power extenders and supervising station transmitting equipment. Where ambient conditions prohibit installation of smoke detector, a heat detector is permitted in accordance with SBC/SFC Section 907.4.1.
 7. Other locations in accordance with SBC/SFC Section 907.2.
- L. Duct or in-duct type smoke detectors will be provided at the following locations:
1. Main re-circulating air duct ahead of any fresh air inlet serving any system providing more than 2,000-cfm.
 2. All smoke control supply and pressurization fans.
 3. At combination fire and smoke dampers that are not part of the smoke control system when required by SBC.
 4. At combination fire and smoke dampers serving the areas without complete area detection.
 5. Main return plenums at each air conditioning system downstream of the last inlet. Fan coil units and fan powered boxes will not be provided with smoke detectors on the inlet side, since these units receive return air from the main air-handling units already provided with smoke detection.
 6. Air handling unit supply and return air duct serving any system delivering more than 2,000-cfm except for systems serving as recirculation devices for a single room and individual fan coil units as interpreted by SFD.
 7. Main supply and return plenums at each air conditioning system downstream of the last inlet.
 8. Where necessary to close fire/smoke dampers.
 9. At each connection to a vertical duct or riser serving two or more stories of a return air duct or plenum of an air conditioning system. In Group R-2, a smoke detector is allowed to be used in each return air riser carrying not more than 5,000 cfm and serving not more than 10 air-inlet openings.
- M. Within the R-2 occupancies, UL-Listed smoke alarms will be installed and maintained on the ceiling or wall outside of each separate sleeping area in the immediate vicinity of bedrooms, in each room used for sleeping purposes, and within each story within a dwelling unit in accordance with SFC Section 907.2.11 and NFPA-72 requirements.
1. UL-Listed single and multiple station smoke alarms complying with UL 217 will be installed in accordance with SFC Section 907.2.11.1 through 907.2.11.4 and NFPA-72.
 2. Where more than one smoke alarm is required to be installed within an individual dwelling unit, the smoke alarms will be interconnected in such a manner that the activation of one alarm will activate all the alarms in the individual unit. The alarm will be clearly audible in all bedrooms over background noise levels with all intervening doors closed per SFC Section 907.2.11.3.



3. Activation of the smoke detector(s) will cause the audible and/ or the combined audible/ visual notification appliances within the individual dwelling unit, suite of rooms, or similar area to activate but will not actuate any audio/visual alarms outside of the dwelling unit nor actuate the building fire alarm system.
 4. Required smoke alarms will receive their primary power from the building wiring where such wiring is served from a commercial source and will be equipped with a battery backup. Smoke alarms with integral strobes that are not equipped with battery backup will be connected to the emergency electrical system. Smoke alarms will emit a signal when the batteries are low. Wiring will be permanent and without a disconnecting switch other than as required for overcurrent protection. In accordance with the Exception to SFC Section 907.2.11.4, smoke alarms are not required to be equipped with battery backup where they are connected to an emergency electrical system.
 5. In accordance with NFPA-72 Section 18.4.5.3, unless otherwise directed by SFD, audible notification in all sleeping areas for the purpose of awakening occupants and will produce a low frequency alarm signal:
 - a) The alarm signal will be a square wave or provide equivalent awakening ability.
 - b) The signal is to have a fundamental frequency of 520 Hz \pm 10 percent.
 - c) Audible notification appliances will be UL-listed and comply with NFPA-72 requirements providing the low frequency signal at a sound pressure level of at least 75 decibels (dBa) at the pillow, 15 decibels (dBa) above average ambient sound level, or 5 dBA above maximum sound level having duration of at least 60 seconds, whichever is greater in the sleeping spaces of the project area.
 6. Combination smoke alarms and audible/ visible notification appliances within accessible/ hearing impaired rooms will be installed in accordance with SBC, SFC, A117.1, and ADA requirements.
 7. Accessible/ hearing impaired rooms will be provided with smoke detectors with audible and visual notification appliances (177 cd strobes) interconnected to these smoke detectors. Separate speakers and strobes connected to the fire alarm system will be utilized in the accessible/ hearing impaired rooms for notification of a building fire alarm. Minimum number of accessible/ hearing impaired rooms to be provided with strobes will be in accordance with SBC, SFC, A117.1, and ADA requirements.
 8. With the approval of SFD, UL-listed addressable smoke detectors connected to the building fire alarm system may be used in lieu of the smoke alarms in the residential dwelling units. If used, addressable smoke detectors will send a supervisory alarm signal to the building fire alarm control panel. Activation of the smoke detector(s) will cause the audible and combined audible/ visual notification appliances within the individual dwelling unit, suite of rooms, or similar area to activate but will not actuate the building fire alarm system, unless otherwise required by the SFD.
- N. Manual fire alarm stations are not required per SBC/SFC Sections 907.2.1, 907.2.2, and 907.2.8 and will not be provided, except for a single station at the FCC that will activate all alarm notification appliances simultaneously.

XIII. EMERGENCY ALARM AND COMMUNICATION SYSTEMS



The FCC will contain controls for manually activating the voice alarm system throughout the building. The operation of fire alarm initiating devices will automatically sound an alert tone followed by voice instructions giving approved information and directions for a general or staged evacuation. The system will operate on a minimum of the alarming floor, the floor above and the floor below. Visual and audible notification appliances will activate automatically throughout all public and common areas when the fire alarm condition originates from these areas. The system will be able to simultaneously annunciate at a minimum of the alarming floor, the floor above and the floor below, per SBC/SFC Section 907.5.2.2.

- A. Speakers will be provided throughout the building by paging zones. Dedicated fire alarm system speakers and strobes will be installed throughout the building for occupant notification. Speakers will sound an automatic alarm sound followed by a voice message to the affected areas. Staff in the control room will be able to issue specific evacuation directions to the affected occupants through these speakers. Speakers will be distributed and tapped to provide an easily understandable message. At a minimum, paging zones will be provided as follows:
1. Elevator groups
 2. Exit stairways
 3. Each floor including roof
 4. Each Smoke Control Zone
 5. A manual override for emergency voice communication will be provided on a selective and all-call basis for all paging zones.
 6. The emergency voice/alarm communication system will also have the capability to broadcast live voice messages by paging zones on a selective and all-call basis.
 7. The emergency voice/alarm communication system will be allowed to be used for other announcements, provided the manual fire alarm use takes precedence over any other use.
 8. The voice alarm system will be verified to operate as a multi-channel system, allowing evacuation tones and voice messages to be transmitted simultaneously to different zones.
 9. The FCC will contain controls for manual operation of the public address system and FACP will be provided with both individual circuit and all-call capabilities.
 10. The voice alarm system will be zoned to be coordinated with fire alarm, sprinkler, and egress zones. Notification Appliances will not be required in exit stair enclosures, exit passageways, and elevator car in accordance with NFPA-72 Section 23.8.6.2.
 11. Audible notification appliances will be UL-listed and comply with NFPA-72 requirements providing a sound pressure level of 15 decibels (dBA) above the average sound level or 5 dBA above maximum sound level having duration of at least 60 seconds, whichever is greater in every occupiable space within the project area in accordance with SBC/SFC Section 907.5.2.1.1. The minimum sound pressure levels will be: 90 dBA in mechanical equipment rooms; and 80 dBA in other occupancies per SBC/SFC Section 907.5.2.1.1, with a maximum sound pressure at 110 dBA at the minimum hearing distance from the audible appliance in accordance with SBC/SFC Section 907.5.2.1.2. Where the average ambient noise is greater than



95 dBA, visible alarm notification appliances will be provided in accordance with NFPA-72.

12. For occupancies having sound and lighting controls, such as show rooms, theaters, etc., controls will be provided to shut off the sound/ music and light effects, and increase lighting to minimum lighting levels required for egress (as applicable) upon activation of a fire alarm signal.
13. In accordance with NFPA-72 Section 18.4.5.3, unless otherwise directed by SFD, audible notification appliances connected to the building fire alarm system will be provided in all sleeping areas for the purpose of awakening occupants and will produce a low frequency alarm signal:
 - a) The alarm signal will be a square wave or provide equivalent awakening ability.
 - b) The signal is to have a fundamental frequency of 520 Hz \pm 10 percent.
 - c) Audible notification appliances will be UL-listed and comply with NFPA-72 requirements providing the low frequency signal at a sound pressure level of at least 75 decibels (dbA) at the pillow, 15 decibels (dBA) above average ambient sound level, or 5 dBA above maximum sound level having duration of at least 60 seconds, whichever is greater in the sleeping spaces of the project area.
14. In accordance with Chapter 10 of ICC-A117.1 and SFC Section 907.5.2.3.4, in addition to audible fire alarm notification appliances, all Group R-2 apartment units will be provided with the capability to support visual alarm notification appliances. Such capability is to include the future interconnection of the building fire alarm system with the unit smoke alarms, replacement of audible appliances with combination audible/ visual appliances, or future extension of the existing wiring from the unit smoke alarm locations to required locations for visual appliances.
15. Minimum number of accessible/ hearing impaired rooms to be provided with both audible and visual fire alarm notification appliances will be in accordance with SBC, SFC, A117.1, and ADA requirements.
16. Notification zoning of the system will be in accordance with SFC Section 907.6.4

B. Visual Signaling Devices

1. New visible alarm notification appliances will be provided throughout all public and common use areas such as restrooms, public use areas, common employee areas, back-of-house areas, residential unit corridors, inside all ADA areas, and public egress corridors in accordance with amended ICC/ANSI- A117.1, ADA, and SFD requirements. Strobe lights will be UL-listed to UL Standard 1971 and meet the requirements of NFPA-72, ANSI-A117.1, and ADA.
2. In R-2 occupancies, every dwelling unit and sleeping unit will be provided with the capability to support visible alarm notification appliances in accordance with Chapter 10 of ICC A117.1, SFD Administrative Rule 9.09.07, and SFC Section 907.5.2.3.4. Such capability will allow for replacement and updates of audible/visual appliances, the potential for future interconnection of the building fire alarm system with the unit smoke alarms, replacement of audible appliances with combination audible/visible appliances, or future extension of the existing wiring from the unit smoke alarm locations to required locations for visible appliances. Minimum number of accessible/



hearing impaired rooms to be provided with strobes will be in accordance with SBC, SFC, A117.1, and ADA requirements.

3. Per SFD Administrative Rule 9.09.07, a separate visible alarm circuit is required for each dwelling unit and is allowed to be terminated at the location of the emergency voice alarm speaker.
4. For new installations, in accordance with the Exceptions to SBC/SFC Section 907.5.2.3, visible alarm notification appliances are not required in exits as defined in SBC Chapter 2 or within elevator cars.
5. Visual signaling appliances in the building will operate in conjunction with the voice alarm system.

C. Emergency Responder Radio System:

1. An approved public safety/first responder emergency responder radio coverage system will be provided throughout the building in accordance with SFC Section 510, NFPA-72, and CAM 5123. The system will be coordinated with the City of Seattle Information Technology Department, Seattle Department of Construction and Inspections, and the Seattle Fire Department.
2. In accordance with SFC Section 510.4.1, the radio system will provide a minimum of 90 percent coverage to all floor areas and 99 percent coverage for critical areas that include the following areas:
 - a. Emergency and standby power room.
 - b. Fire pump room(s).
 - c. Fire Command Center (FCC) and other emergency command centers.
 - d. Interior exit stairs and exit passageways.
 - e. Elevator lobbies.
 - f. Standpipe cabinets.
 - g. Sprinkler sectional control valve locations.
 - h. Mechanical penthouses.
 - i. Elevator machine rooms.
 - j. Other locations deemed critical by the fire code official.
3. The radio system will utilize the King County Regional 800 MHz Radio System. Radio coverage will be designed to provide a minimum signal strength level of -95 dBm for two-way coverage. (SFC Section 510.4.1).
4. Emergency responder radio coverage systems will be provided with at least two independent and reliable power supply sources conforming to NFPA 72 and the SEC, one primary and one secondary. (SFC Section 510.4.2.3)

XIV. FIRE COMMAND CENTER

A. Fire Command Center: (SFC Section 508)

1. The Fire Command Center (FCC) will be located:
 - a) Fire Command Center will be located on Level 1 within visual line of sight to Residential Lobby Entry (from NE 43rd Street) and one required egress stair (Stair 4).



- b) In a room having not less than a 2-hour fire-resistive rated construction, including floor/ ceiling assemblies per SBC/SFC Section 911.1.2.
 - c) Have a minimum area of 200-square feet with a minimum dimension of 10 feet per SFC Section 508.1.3.
2. A sign will be posted on the door identifying the FCC.
3. Will contain sufficient wall space and floor area to accommodate its operations. Locations of panels and equipment in the FCC will be coordinated by function with the following minimum items located within. Required features (SFC Section 508.1.5). The FCC will comply with NFPA-72 and will include the following features:
- The emergency voice/alarm communication system control unit.
 - The fire department communications system.
 - Fire detection and alarm system annunciator.
 - Annunciator unit visually indicating the location of the elevators and whether they are operational.
 - Status indicators and controls for air distribution systems
 - The fire-fighter's smoke control panel required by SBC/SFC Section 909.16 for smoke control systems installed in the building
 - Sprinkler valve and water-flow detector display panels.
 - Emergency and standby power status indicators.
 - A telephone for fire department use with controlled access to the public telephone system.
 - Fire pump status indicators (loss of line side power, phase loss, phase reversal, pump running).
 - Schematic building plans indicating the floor plan and detailing the building core, means of egress, fire protection systems, fire-fighting equipment and fire department access, and the location of fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions.
 - An approved Building Information Card that contains, but is not limited to, the information required in SFC Section 508.1.5 (13).
 - A work table.
 - Generator supervision devices, manual start and stop features.
 - Public address and voice alarm status and controls.
 - Elevator fire recall switch in accordance with ASME-A17.1.
 - Elevator emergency or legally required standby power selector switch (es), where emergency or legally required standby power is required.
 - On-site fire protection water tank fill valve control switch, tank level indicators, tank low level alarm and tank fill signal.
 - Switches that unlocks the electro-magnetic locks on the stairway hatch doors at the roof.

Details of the annunciation and control panels to be installed in the FCC and their location will be submitted to the SFD for review and approval prior to fabrication.

XV. SMOKE CONTROL SYSTEMS

- A. The design of UTUMC is providing the following design aspects concerning smoke control and smoke removal:
- 1. High-Rise Towers:



- a) Active smoke control systems on each floor level is not required per either the base code or local amendments to SBC Sections 403 and SBC/SFC 909. Active smoke control systems are limited to the stair pressurization fans for the stairways and the pressurization of elevator hoistways and equipment rooms. Given these systems, a rational analysis document for this project as identified in SBC Section 909.4 will be required.
- b) Passive Barriers – Residential rooms, corridors, etc. will be provided.
- 2. Garage: No smoke control or smoke removal systems are required.
- B. Smoke Control System Equipment: High-Rise Towers: This section describes the general requirements for the smoke control and smoke removal system equipment where required by the provisions of the SBC. Mechanical and passive smoke control systems will meet the requirements of SBC/SFC 909. The fire alarm and detection system will monitor and control the smoke control system components, will be UL-864 listed, and be listed as smoke control equipment (UUKL). All other equipment and systems controlling and monitoring the smoke control system will also be UL-listed under UL Category UUKL.
- C. Equipment:
 - 1. Variable Frequency Drives (VFDs) and other computer based equipment will be protected from high heat, moisture, etc. and provided with an uninterruptable Power System (UPS) or similar for protection against potential power surges and transfer to secondary power to maintain the operability of this equipment. Where volatile memories are utilized, a UPS system (battery power) will be utilized. UPS systems will provide sufficient duration to span 15-minute primary power interruption in accordance with SBC Section 909.11.1. Fans, dampers, controls and other elements of the mechanical smoke control systems will be connected to both the primary and the standby power supply which will provide power to the most demanding combination of zones acting simultaneously for a single fire scenario. Elements of the smoke control system susceptible to power surges will be suitably protected by conditioners, suppressors or other approved means.
 - 2. Smoke Control Fans:
 - a) Smoke control fans that incorporate belt drives will have 1.5 times the standard number of belts with a minimum number of 2. (SBC Section 909.10.5)
 - b) Smoke control system fans will have a minimum service factor of 1.15. (SBC Section 909.10.5)
 - c) Smoke exhaust fan components will be rated and certified by the manufacturer for the probable temperature rise to which the components will be exposed.
 - 3. Monitoring of Smoke Fans, Dampers, and Doors
 - a) Fans used for smoke control will be monitored via UL-listed adjustable current sensors/ transducers, differential pressure transmitters, or similar devices to verify actual airflow.
 - b) All fans used for smoke control will be monitored for presence of power in the alarm and non-alarm conditions.



- c) Combination fire/smoke dampers that are a part of the smoke control system will be monitored to verify proper position (open, closed, or both) in the smoke control mode.
 - d) Fans will be supported and restrained by noncombustible devices in accordance with the requirements of SBC Chapter 16.
- 4. Smoke Control System Ducts (SBC Section 909.10.2)
 - a) Duct materials and joints will be capable of withstanding the probable temperatures and pressures to which they are exposed.
 - b) Ducts passing through separate smoke zones will be leak tested to 1.5 times the maximum design pressure. Measure leakage will not exceed 5% of design flow.
 - c) Ducts will be supported directly from fire-resistance rated structural elements of the building by substantial, noncombustible supports.
- 5. Duct Smoke Detection: Duct detectors in supply systems used for smoke control will automatically shut down the related fan and annunciate a supervisory signal on the fire alarm system. Automatic capabilities will be provided to override these detectors if smoke control functions require the fans to be operational. Manual overrides of the smoke control system will be provided via the Fire Fighter Smoke Control panel located in the FCC.
- 6. System Response Time: (SBC Section 909.17)
 - a) Activation of the smoke control system will be initiated immediately after the receipt of an appropriate automatic or manual activation command. The individual system components will activate in a sequence necessary to avoid physical damage to fans, dampers, ducts and other equipment.
 - b) For purposes of smoke control, the fire-fighter's smoke control panel response time will be the same for automatic or manual smoke control action initiated from any other building control point. The total response time, including that necessary for detection, shut-down of operating equipment and smoke control system startup, will allow for full operational mode to be achieved before the conditions in the space exceed the design smoke condition.
 - c) Upon receipt of an alarm condition at the fire alarm control panel, fans, dampers and automatic doors will have achieved their proper operating state and final status will be indicated at the smoke control panel within 90 seconds. Verification will be reported in the required final test report.
 - d) Preprogrammed test: Pre-programmed weekly test sequences for verification of smoke control system component verification will be performed per SBC Section 909.12. In accordance with the Exception to SBC Section 909.12 however, weekly testing is not required for stairway and hoistway pressurization systems.
- D. As the building will be equipped throughout with automatic sprinkler systems, in lieu of stair vestibules, the exit stairways will use the pressurization method as permitted in SBC Section 909.20.5.
 - 1. Each of the stair enclosures serving the high-rise towers will be provided with a dedicated pressurization system as required by the high-rise provisions of the code.



2. Upon actuation, the stair enclosures will be pressurized to a minimum of 0.10 inches of water (25 Pa) and a maximum of 0.35 inches of water (87 Pa) in the shaft relative to the building measured with all stairway doors closed under maximum anticipated conditions of stack effect and wind effect. The pressure differential will be measured between the interior exit stairway and the adjacent area. In residential buildings, the pressure differential is permitted to be measured between the interior exit stairway and the dwelling units.
 3. In accordance with SBC Section 909.20.5.3, the upper portion of the stairway enclosure will be provided with a barometric relief damper and a motorized damper that complies with the International Energy Conservation Code. The motorized damper will be of the normally open type (open with the power off). Activation of the damper will be initiated by the building fire alarm system and by actuation of the automatic sprinkler system.
 4. The pressurization system will be capable of maintaining the differential pressure required by SBC Section 909.20.5 while discharging 2,500 cubic feet per minute (1180 L/s) of air through the relief opening. The relief outlet will be located at least 20 feet from elevator hoistway and stairway pressurization system supply air intake locations.
 5. Enclosed stairs continuing through a 2-hour rated horizontal extension of the stair enclosure leading to the exterior will require the horizontal extension to be mechanically pressurized equal to that of the stairs served.
 6. Stair door opening force will not exceed 30-pounds maximum force to begin opening the door in accordance with SNBC 1008.1.3.
 7. Manual control switches and operation indicators will be provided in the FCC.
 8. Pressurization system will be supplied by both the public utility and on-site generator.
 9. Supply air will be taken directly from an outside, uncontaminated source at least 20 feet (6096 mm) from any air outlet. The supply air intake will be located at the exterior of the building. The intake will be continuous to the exterior of the building.
 10. The pressurization fan systems will be equipped with two smoke detectors located in the duct in accordance with NFPA 72 arranged to automatically shut down the fan system only when both smoke detectors activate. The detectors will be located downstream of the fan and will be connected to the fire alarm as a supervisory signal.
 11. The stairway pressurization systems will be activated by a fire alarm signal originating anywhere in the building in accordance with SBC Section 909.20.5.4.
- E. In lieu of elevator lobbies, pressurized elevator hoistways will be used in accordance with SBC Section 713.14.1, Exception 6 & Section 909.21).
1. Each of the elevator hoistways serving the high-rise towers will be provided with a dedicated pressurization system as required by the high-rise provisions of the code. In accordance with SBC Section 909.21.4.3, a separate fan system will be used for each elevator hoistway. Elevators having less than 75' of travel are not required to have hoistway protection per SBC Section 713.14.2, Item 5.



2. When located within the building, the fan system(s) that provides the pressurization will be protected with the same fire-resistance rating required for the elevator ((shaft)) hoistway enclosure per SBC Section 909.21.4.1.
 3. Upon actuation, the elevator hoistways will be pressurized to maintain a minimum positive pressure of 0.10 inches of water (25 Pa) and a maximum positive pressure of 0.25 inches of water (67 Pa) with respect to adjacent occupied space on all floors. This pressure will be measured at the midpoint of each hoistway door, with all elevator cars at the floor of recall and all hoistway doors on the floor of recall open and all other hoistway doors closed. The opening and closing of hoistway doors at each level must be demonstrated during this test. The pressure differential will be measured between the hoistway and the adjacent area. In residential buildings, the pressure differential is permitted to be measured between the hoistway and the dwelling units.
 4. Pressurization system will be supplied by both the public utility and the on-site generator.
 5. Manual control switches and operation indicators will be provided in the FCC.
 6. Supply air will be taken directly from an outside, uncontaminated source at least 20 feet (6096 mm) from any air outlet. The supply air intake will be located at the exterior of the building. The intake will be continuous to the exterior of the building.
 7. The pressurization fan systems will be equipped with two smoke detectors located in the duct in accordance with NFPA 72 arranged to automatically shut down the fan(s) only when both smoke detectors activate. The detectors will be located downstream of the fan and will be connected to the fire alarm as a supervisory signal.
 8. Per SBC Section 909.21.4.4, the fan system will be provided with the capacity to pressurize the elevator hoistway as determined by a registered design professional. The fan system will be provided with a means to balance or modulate the airflow to the elevator hoistway to meet the differential pressure requirements on all floors for each condition identified by the rational analysis.
 9. The elevator pressurization system will be activated upon activation of the building fire alarm system or upon activation of the elevator lobby smoke detectors. Where both a building fire alarm system and elevator lobby smoke detectors are present, each will be independently capable of activating the pressurization system. Activation of the fan serving the hoistway is permitted to be delayed by up to 30 seconds so that elevator recall can be initiated prior to pressurizing the hoistway in accordance with SBC Sections 909.21.6.
 10. Control systems will be in accordance with SBC Sections 909.12 and 909.13.
- F. Testing of Stairway and Hoistway Pressurization Systems in High Rise Buildings (SDCI Director's Rule 7-2012)
1. Minimum code requirements are listed in SBC Section 708.14.2.1. If they satisfy the requirements then system may be deemed to comply with prescriptive requirements of SBC Section 708.14.2.
 2. SBC Section 1704 requires special inspection for smoke control systems. This requires that special inspection agencies have expertise in fire protection engineering, mechanical engineering and certification as air balancers. SDCI will allow the registered design professional who designed the pressurization system to



act in the capacity of the special inspector. The test technicians will be certified by the Seattle Fire Department.

3. To start the test procedure, the testing agency is encouraged to create an initial pressure profile of the building prior to activating the pressurization system. The profile should include measurements of the difference in pressure between both the stairway and hoistway, and adjacent occupied space on each floor. In residential occupancies, the profile should show the difference between the stairway and hoistway, and the dwelling units. Adjustments to the pressurization system during testing will be easier if a pressure profile has been created.
4. The pressurization system will be tested in blocks of no more than five floors. One of the floors in each block will be selected to be tested as if it is the fire floor. The pressure will be measured on the two floors immediately below and one floor immediately above that floor, and on the floors in the building with the highest and lowest expected pressure differences. Every block of five floors will be tested in this manner. Floors representing all conditions that affect pressures, including atypical conditions, will be tested. It is recognized that some floors may not be included in the test.
5. Conditions for stairways are as follows:
 - a) All stairway doors will be closed. Doors from the stairway to the exterior and doors from the stairway to the main lobby where the stairway exits through the main lobby.
 - b) All doors that part of the boundaries between the pressurized space and adjacent spaces will be closed
 - c) Partitions or seals that will not be in place at the issuance of the Certificate of Occupancy are not permitted at the time of testing.
 - d) All opening and penetration protection, electrical wall plates, door hardware smoke seals, thresholds, and door sweeps in the boundary between the pressurized space and adjacent spaces will be in place when the test is performed.
 - e) Hoistway pressurization will be operating during stairway pressurization tests.
 - f) Carpets need not be installed.
 - g) Exit passageway doors, if provided, will be closed.
 - h) The relief dampers at the top of the stairway will be operable.
6. Conditions for elevators are as follows:
 - a) All elevator cars will be at the primary recall level with their doors open.
 - b) All doors that are part of the boundaries between the pressurized space and adjacent spaces will be closed.
 - c) Partitions or seals are prohibited unless they will be in place at the issuance of the Certificate of Occupancy.



- d) All opening and penetration protection, electrical wall plates, door hardware, smoke seals, thresholds and door sweeps in the boundary between the pressurized space and adjacent spaces will be in place when the test is performed
 - e) Stairway pressurization will be operating during hoistway pressurization tests.
 - f) Carpets need not be installed.
 - g) The testing plan will specify whether exterior doors will be closed, and will be consistent with the design of the pressurization.
7. Operation of each damper must be tested as postured for every fire scenario. For buildings in which pressurization is provided by separate fans on each floor, the operation of the fans and dampers on each floor will be tested as if that floor were the fire floor, and operation of the fans and dampers on the other floors in the four test floors will be observed. Fans and dampers that operate improperly will be corrected. Pressure differences will be measured as required.
8. Within the four test floors, stairway and hoistway pressure will be measured with respect to adjacent occupied space on those floors. In residential buildings, the pressure differential may be measured between the hoistway and the dwelling units. On floors outside the four test floors, stairway and hoistway pressure may be measured relative to atmospheric pressure.
9. Stairway doors will be set in motion when subjected to a 30-pound force while the pressurization system is running.
10. Stairway relief vents will be tested and balanced to ensure the minimum required airflow of the code.
11. If the pressurization system is adjusted for operation of elevator doors on Phase II operation, then Phase I operation must be retested. If pressurization is adjusted, the entire pressurization system must be retested, and must satisfy all the requirements of the code.
12. The system will reach a consistent pressure within the required range no more than 5 minutes after the system is activated. For test purposes, there is no minimum duration for the system to operate at the required pressure.
13. The pressurization test may be performed using the normal building power, except that operation of dampers, fans, and controls will be tested using the emergency power source without normal power.
14. The special inspection agency will witness the test. The City is not required to witness the test. SDCI elevator inspectors will test elevator operation with the pressurization system operating after the pressurization system has been tested.
15. The special inspector or special inspection agency will submit a report of the test to the building official. The report will include at least the following statements and information:
- a) The system, including supply and exhaust fans, started up within the required time.



- b) The system configured itself, including postures of dampers, as designed. The system configuration will be observed for each five-floor block tested.
 - c) The measured pressure differentials were within code limits. All measured pressures will be included in the report.
 - d) The stairway doors operated correctly at the required pressures.
 - e) The stairwell relief vent airflow is at or above the code minimum.
 - f) The elevator doors operated correctly at the required pressures.
 - g) The system operates properly under emergency or standby power.
 - h) All changes made to the system during the test will be documented.
 - i) A summary of the test results will include a statement that, as tested and modified, the system complies with the code.
16. The following information will be included in the copy of the report maintained on the file at the building as required by SBC Section 909.18.9
- a) All devices identified by manufacturer, nameplate data and identification tag or mark.
 - b) Charts, drawings or other documents identifying and locating each pressurization system component, and describing its function & maintenance requirements.
 - c) Design values.
 - d) Measured values.
 - e) The final configuration and adjustments made to the system during testing.
17. A registered design professional will stamp the final report stating that they have reviewed the test report, and that the results are consistent with the Code, this rule and the design of the pressurization system.
18. The system will not be accepted unless the pressurization system and the stairway and the elevator doors operate satisfactorily.
19. Annual testing is a smaller-scale test in which fewer locations are tested. The other protocols of this Rule will be followed. Annual tests will be conducted in compliance with Seattle Fire Department Administrative Rules.

XVI. EMERGENCY POWER

As part of this project, a diesel engine emergency generator will serve the facility. The generator will be supplied by a 600 gallon, UL 142 listed diesel fuel belly tank to be located under the generator. Emergency Generator will be located within the parking garage on Level P-1. Exhaust termination on building façade a minimum of 10 feet above grade. Fuel storage capacity to be less than 660 gallons to avoid designation as Group H occupancy in accordance with SFC Section 603.3.2.1. Fuel fill location to be provided outside along the exterior wall of Generator Room, adjacent to the alley.



- A. The emergency generator will supply electrical power in accordance with the requirements of SBC Section 403, Chapter 10, and Section 2702, SFC 604, NFPA-20, NFPA-72, and SEC to the following systems:
1. Exit Signage.
 2. Means of Egress illumination (one foot-candle illumination for exit paths) including exit corridors, stairways, exit discharge per SBC 1008.
 3. Lighting: Elevator cabs (all elevators) and hoistways of Fire Service Access elevators.
 4. Lighting circuits for public restrooms, Fire Command Center, generator room, mechanical and electrical rooms, switchgear rooms, PBX/ control rooms, secondary response point, and fire pump room.
 5. Fire alarm systems.
 6. Automatic fire detection.
 7. Sprinkler alarm and supervisory systems.
 8. Emergency Voice/ Alarm Communication System
 9. All required communication and emergency responder radio communication system.
 10. Electric fire pumps, jockey pumps, controllers, and status monitoring.
 11. Smoke control/removal equipment, including fans, dampers, panels, and controls.
 12. Egress Stair and elevator hoistway smoke control pressurization systems.
 13. Fire Service Access Elevator sump pumps.
 14. Aircraft warning lights.
 15. Air compressors for dry-pipe sprinkler systems.
 16. Continuously running exhaust fans where fire/ smoke dampers have been omitted
 17. Elevators (at least one car at a time in each bank) including accessible means of egress and will be automatically as well as manually transferable to any other elevator in the bank.
 18. Elevator machine room, machine spaces, and control room air-conditioning, ventilation, and pressurization systems.
 19. Operation of all elevator cars. Elevator controller cooling equipment, and elevator machine room ventilation and cooling equipment for fire service and occupant evacuation elevators.
 20. Elevator hoistway lighting for fire service access elevators only.
 21. The means of monitoring of the FSAE elevator lobbies and the machine room temperature per SBC 403.6.1.6 if not supplied by the fire alarm system.



- 22. Roof hatch electrical systems including snow sensors/heating cables and unlocking system.
- 23. Other loads connected to the generator will comply with SEC 700.5 (a) & (b).
- B. Per SBC 403.4.9.2 and SFC 604.2.14.1, emergency power systems will be located in a separate room enclosed with two-hour fire-resistance rated fire barriers and horizontal assemblies. System supervision with manual start and transfer features will be provided at the fire command center. A separate room for the generator set is not required for systems having fuel quantities meeting the limits of SFC Section 603.3 when located in a sprinklered parking garage of Type I or II construction.
- C. Transfer time: Within 10 seconds for those systems required to be connected to emergency power and 60 seconds for systems requiring connections to stand-by power.
- D. Emergency illumination of one (1) foot candle (min) will be provided at walking surfaces of all means of egress paths for a minimum of 90-minutes per SBC Section 1006.2.
- E. Fuel for the generator will be diesel to provide at least a 2-hour fuel supply to emergency lighting, exit signs, and equipment at full demand operations in accordance with SFC 604.2.14.1.1. Fuel supply will also provide at least an eight-hour fuel supply for operation of the fire pump(s) at 100% of rated capacity in addition to the other required demands per NFPA-20, Section 9.6.2.3. City of Settle permits will be obtained as required.

XVII. ELEVATORS

- A. Elevator Shaft Protection
 - 1. Elevator hoistways will be 2-hour fire resistive construction per SBC Section 713.14.
 - 2. Elevator doors will provide 2-hour opening protection per SBC Table 716.5.
- B. Elevator Lobbies
 - 1. Elevator hoistways will be pressurized in lieu of providing fire-resistive-rated vestibules.
- C. Hoistway Venting
 - 1. Elevator shafts vents are not required when hoistways are pressurized per SBC Section 3016.5.
- D. Manual Overrides
 - 1. A three-position (on/off/bypass) key-operated switch will be provided at the first level primary recall level for each bank of elevators for emergency override.
 - 2. A three-position (on/off/hold) key-operated switch will be provided inside each elevator cab.
 - 3. Elevator keys will be provided for Fire Department use in case of emergency in a lockable cabinet or key box in the FCC.



- E. Each elevator machine room and Gen-2 elevator controller room will be provided with smoke detector(s) installed in accordance with their UL-listing(s).
- F. Elevator machine room pressurization where provided will be in accordance with SBC section 909.21.12 unless separated from the elevator hoistway by construction in accordance with SBC Section 713.
- G. With elevators under normal or standby power, activation of an elevator lobby, floor level, hoistway, or elevator machine room smoke detector or a sprinkler system waterflow will cause automatic recall of all elevators in that bank to return nonstop to the designated primary level. Manual control for elevator recall will also be provided. If a smoke detector on the designated primary level activates, elevator recall will be to the designated secondary level.
- H. Elevators 1, 2, and 3 of the south tower will have primary recall to Level P1, and alternate recall to Level 2. Elevators 5, 6, 7, and 8 of the north tower will have primary recall to Level 1 and alternate recall to Level P1.
- I. Standby power will be provided for one (1) elevator in each bank and will automatically, as well as manually, be transferable to all other elevators in the bank from the elevator status panel in the FCC.
- J. In accordance with SBC Section 403.6, as the building has elevator landings located more than 160 feet above the lowest level of fire department access, access to each floor of each tower will be provided by not less than two elevators served by separate machine rooms.
- K. In accordance with SBC Sections 403.6.1 & 3016.12, as the building has occupied floors more than 120 feet above the lowest level of fire department vehicle access, no fewer than two (2) elevators will be provided for Fire Service Access Elevators (FSAE) to all floors of the building, above and below the level of exit discharge. As Tower 1 and Tower 2 each have occupied floor levels 120 feet above the lowest level of department access, a total of four fire service access elevators (FSAEs) will be provided in accordance with SBC Section 403.6.1. Two FSAEs will be required to serve all levels, including the roof, of Tower 1 as well as all levels of the Podium that have floors above the lowest street-level building entrance. Two FSAEs will be required to serve all levels, including the roof, of Tower 2 as well as all levels of the Podium that have floors above the lowest street-level building entrance.

FSAE hoistway enclosures will be constructed of materials that meet or exceed the structural integrity requirements in accordance with SBC Section 403.2.3. Each FSAE will be served by a different dedicated machine or control room in accordance with SBC Section 403.6.1.1 and comply as follows:

- 1. FSA elevator cars will be of such a size and arrangement to accommodate an ambulance stretch 24 inches by 84 inches with not less than 5-inch radius corners, in the horizontal, open position.
- 2. FSA elevator cars will be identified by the international symbol for emergency medical services (star of life) of not less than 3 inches in height and located inside both sides of the hoistway doorframe.
- 3. FSA elevators will open into a lobby providing sufficient area to accommodate transport of a 24-inch by 84-inch ambulance stretcher.
- 4. FSA elevators will have a capacity of not less than 4,000 pounds.



5. Actuation of any building fire alarm-initiating device will initiate Phase I emergency recall operation on all fire service access elevators in accordance with the requirements in ASME A17.1/CSA B44. All other elevators will remain in normal service unless Phase I emergency recall operation is manually initiated by a separate, required three-position, key-operated "Fire Recall" switch or automatically initiated by the associated elevator lobby, hoistway or elevator machine room *smoke detectors*. In addition, if the building also contains occupant evacuation elevators in accordance with SBC Section 403.6.2, an independent, three-position, key operated "Fire Recall" switch conforming to the applicable requirements in ASME A17.1/CSA B44 will be provided at the designated level for each fire service access elevator.
 6. Per SBC Section 403.6.1.3, an approved method to prevent water from infiltrating into the hoistway enclosure from the operation of the automatic sprinkler system outside the fire service access elevator lobby will be provided.
 7. Per SBC Section 403.6.1.5, when fire-fighters' emergency operation is active, the entire height of the hoistway will be illuminated at not less than 1 foot-candle (11 lux) as measured from the top of the car of each fire service access elevator.
 8. Per SBC Section 403.6.1.7, FSA elevators will be continuously monitored by the fire command center by a standard emergency service interface system meeting NFPA 72 requirements.
 9. Per SBC Section 403.6.1.8, wires or cables that are located outside of the elevator hoistway and machine room and that provide normal or emergency power, control signals, communication with the car, lighting, heating, air conditioning, ventilation and fire-detecting systems to fire service access elevators will be protected by construction having a fire-resistance rating of not less than 2 hours, or will be circuit integrity cable having a fire-resistance rating of not less than 2 hours.
- L. Per SBC Section 403.8, elevator signage will be provided as follows:
1. At each elevator landing above the hall call fixture, noting that all elevators will be recalled to the building lobby on fire alarm (except on recall floors).
 2. On recall floors, a sign indicating each elevator number will be posted in the elevator landing area.
- M. A two-way communication system will be provided at the elevator landing on each accessible floor that is one or more stories above or below the story of exit discharge identified as an Area of Rescue Assistance in accordance with SBC Section 1009.8.
1. Two-way communication system will be provided between each required location and the Fire Command Center or a central control point location approved by the fire department in accordance with SBC Section 1009.8.1. Where the central control point is not constantly attended, a two-way communication system will have a timed automatic telephone dial-out capability to a monitoring location. The two-way communication system will include both audible and visible signals. The two-way communication system will have a battery backup or an approved alternate source of power that is capable of 90 minutes use upon failure of the normal power source.
 2. Directions for the use of the two-way communication system instructions for summoning assistance via the two-way communication system and written identification of the location will be provided and posted adjacent to the two-way communication system in accordance with SBC Section 1009.8.2.
 3. Signage indicating special accessibility provisions and instructions will be in accordance with SBC Section 1007.9. Signage will comply with the ICC A117.1



requirements for visual characters and include the International Symbol of Accessibility. Where exit sign illumination is required by SBC Section 1011.3, the signs will be illuminated. Additionally, raised character and Braille signage complying with ICC A117.1 will be located at each door to an area of refuge and exterior area for assisted rescue in accordance with SBC Section 1011.4.

XVIII. ACCEPTANCE TESTING

Per SBC Section 403.7, prior to the issuance of a Certificate of Occupancy, the owner-occupant of the building will assign a responsible person as the building's Fire Safety Director to work with the fire code official in establishing an operational plan for the building. The operational plan will contain the guidelines and procedures to be followed and responsibilities of the fire department, building employees, and tenants under emergency conditions, including special provisions for persons with disabilities. The plan will also include procedures for operation, maintenance and testing of the life safety systems and the allowable use and occupancy of each portion of the building. One copy of the operational plan will be filed with the fire code official, and one will be posted in the central control station prior to issuance of the Certificate of Occupancy.

All mechanical and electrical equipment installed according to *approved* plans and specifications pursuant to SBC Section 403 will be tested and proven to be in proper working condition to the satisfaction of the fire code official before issuance of the Certificate of Occupancy. Such systems will be maintained in accordance with the Fire Code (SBC Section 403.1.2).

Three copies of a document describing testing procedures of all active fire protection systems will be submitted to the City of Seattle Department of Construction and Inspections for review and comment at least 60 days prior to final testing.

XIX. PERIODIC OPERATION AND MAINTENANCE

- A. Qualified individuals acceptable to the State of Washington Fire Marshal and the SFD will regularly test all active fire protection systems and devices in accordance with applicable codes and standards.
- B. All passive fire protection building features will be regularly inspected and maintained to verify they are still installed as designed to perform their intended function,
- C. Smoke control systems will be tested annually by a third-party inspector approved by the City of Seattle Department of Construction and Inspections and Fire Departments.
- D. Records of all maintenance and testing will be retained onsite and presented to the City of Seattle representatives upon request.

XX. CONCLUSION

The approaches, devices, and systems outlined in this report are intended to provide a level of life safety and property protection that are in compliance with the applicable codes. This level of protection is based on the interaction of both active and passive fire protection features. Passive features include compartmentalization with fire-resistive separations and exit systems. Active systems include fire suppression and detection systems, as well as secondary power, communications, and mechanical smoke control. Working drawings and specifications are to be coordinated to comply with the fire protection features outlined in this document.



END OF REPORT

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