

The background of the page features a complex architectural wireframe drawing. It consists of numerous thin, grey lines that form a series of overlapping, angular planes, creating a sense of depth and perspective. The lines are arranged in a way that suggests a multi-level structure or a series of interconnected surfaces.

FIRE PROTECTION AND LIFE SAFETY CODE REPORT

Project:

108 Centre St
Boston, MA 02119

Prepared For:

ICON Architecture
101 Summer St
Boston, MA 02110

Issue:

Schematic Design
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1 INTRODUCTION

ICON Architecture has retained SLS Consulting, Inc. to prepare this new building narrative code report for the proposed 108 Centre St project in Boston, MA. This project consists of a 7-story residential building with amenity space on the ground floor.

The building will be fully sprinkler protected and will be considered a high-rise building.



Figure 1: 108 Centre St Location

2 APPLICABLE CODES

The major applicable codes for the project include, but are not limited to, the following:

Building	780 CMR: Massachusetts State Building Code, 9th Edition, Base Volume (2015 International Building Code with amendments) – also referred to as “the code for new construction”
Fire	527 CMR 1.00: Board of Fire Prevention Regulations (2015 NFPA 1 with amendments) Massachusetts General Law Chapter 148 §26
Accessibility	521 CMR: Architectural Access Board Regulations, 2006 Edition 2010 Americans with Disabilities Act (ADA) Design Guidelines Fair Housing Act Design Guidelines (FHA)
Electrical	527 CMR 12.00: Massachusetts Electrical Code (2020 NFPA 70 with amendments)
Mechanical	2015 International Mechanical Code (IMC) as amended by 780 CMR 28.00
Plumbing	248 CMR 10.00: Board of State Examiners of Plumbers and Gas Fitters Regulations
Energy	Massachusetts Stretch Energy Code (2018 International Energy Conservation Code with amendments)
Elevator	524 CMR: Massachusetts Board of Elevator Regulations (2013 Edition of ANSI A 17.1 – Safety Code for Elevators and Escalators, with amendments)
Other	National Fire Protection Association (NFPA) Standards, as referenced by the above codes

The purpose of this report is to: (1) demonstrate compliance with 780 CMR by evaluating the code-requirements of the proposed project, (2) serve as a record document for the project to be kept by the building owner, and (3) coordinate designs across several disciplines relating to the items in this report.

3 USE AND OCCUPANCY CLASSIFICATIONS

The mixed-use building will contain the following use groups.

3.1 Primary Occupancies

The project includes the following occupancies:

Table 1: Primary Occupancies

Use	Occupancy Classification (780 CMR 301)
Café	A-2
Multipurpose Room	A-3
Offices	Group B
Residential Units, Residential Lobby ^a , Group Exercise ^a ,	Group R-2
Storage, MEP	Group S-2

Note a: Amenity spaces with an occupant load less than 50 persons can be classified as part of the main occupancy per 780 CMR §303.1.2.

3.2 Mixed-Use and Multiple Occupancy Approach

The design of buildings containing multiple occupancy types is regulated by 780 CMR §508. Such buildings may utilize a specific approach as it relates to accessory, nonseparated, or separated mixed use; combinations of these approaches are also common.

3.2.1 Nonseparated

The nonseparated mixed use approach requires each occupancy to be individually classified in accordance with 780 CMR §302.1. Code requirements are applied to each portion of the building based on the individual occupancy classification, except that the most restrictive provisions of Chapter 9 are applied throughout the contiguous non-separated occupancies (780 CMR §508.3.1). The allowable construction type, height, and area of the building (or portion thereof) are based upon the most restrictive allowances for the occupancies present (780 CMR §508.3.2).

3.2.2 Separated

The separated mixed-use approach requires each occupancy to be individually classified in accordance with 780 CMR §302.1; code requirements are applied to each portion of the building based on occupancy classification (780 CMR §508.4.1). The allowable area per story shall be determined based on a sum of ratios of the present occupancies on a floor in accordance with 780 CMR §508.4.2. The allowable height for each occupancy shall be limited by the occupancy and type

of construction in accordance with 780 CMR Table 503 (780 CMR §508.4.3). Occupancies shall be separated as required by 780 CMR Table 508.4.

3.2.3 Design Approach

The building is designed using the non-separated mixed-use approach in accordance with 780 CMR §508.3.

4 HEIGHT, AREA AND CONSTRUCTION TYPE

The building is considered a high-rise as the average roof levels are located more than 70 feet above grade plane per 780 CMR §202.

4.1 Podium Provisions

The building will utilize the provisions for podium construction of 780 CMR §510.2. In podium construction, the stories above and below a horizontal separation are considered separate and distinct buildings for the purpose of determining the limitation of number of stories if all of the following conditions are met per 780 CMR §510.2:

1. The building is separated with a horizontal assembly having a minimum 3-hour fire-resistance rating.
2. The building below the horizontal assembly is of Type IA construction.
3. Shaft and stairway enclosures through the horizontal assembly have a minimum 2-hour fire-resistance rating. An exception permits enclosure walls extending above the horizontal assembly to be 1-hour fire-resistance rated construction where a 3-hour fire-resistance rating is provided for the enclosure below the horizontal assembly, the enclosure connects a maximum of three (3) stories, and the opening protectives above the horizontal assembly have a minimum 1-hour fire-resistance rating.
4. The building above the horizontal assembly is permitted to have multiple Group A occupancy uses, each with an occupant load of less than 300, or unlimited Group B, M, R, or S occupancies.
5. The building below the horizontal assembly is protected throughout by an automatic sprinkler system and does not consist of Use Group H occupancies.
6. The maximum building height in feet does not exceed the 780 CMR Table 504.3 limit of 85' for the most restrictive construction type (i.e. Type IIIA) and Use Group.

The proposed plans show compliance with the above requirements for podium construction.

The 3-hour horizontal separation is provided above Level 2 (i.e. at the Level 3 floor slab), separating the Type IA construction from the Type IIIA construction. The building is to be constructed of two (2) stories below the horizontal separation and five (5) stories above (see Figure 2).



Figure 2: Podium Location

4.2 Height and Area

The building was analyzed with respect to the height and area requirements of 780 CMR Table 504.3, 504.4, 506.2 and 508.3. An automatic sprinkler system complying with NFPA 13 will be installed throughout the building.

4.2.1 Below Podium

The Type IA building below the podium is 2 stories in height with a maximum floor area of 8,080 square feet. Type IA construction permits unlimited floor area and number of stories (780 CMR Tables 504.4 and 506.2).

4.2.2 Above Podium

The structure above the 3-hour podium will be of Type IIIA construction. Type IIIA construction permits a maximum of 5 stories and a maximum footprint area of 72,000 square feet for Use Group R-2. The maximum area does not assume an increase for full frontage per 780 CMR 506.2 and 506.3.

Table 2 below provides an analysis of the height and area requirements for the structure above the podium. Note that number of stories is measured from the podium level.

Table 2: Height/Area Analysis

Height/Area Analysis			
Element	Proposed	Allowed	Status
Floor Area (SF)	8,070	72,000	Compliant
Aggregate Area (SF)	36,960	216,000	Compliant
Height (ft)	79	85	Compliant
Stories	5	5	Compliant

5 PASSIVE FIRE PROTECTION ELEMENTS

The following sections outline the required fire-resistance ratings for various building elements.

5.1 Construction Type

The table below provides the required fire-resistance rating of elements if Type IA and IIIA construction (780 CMR §601). Unless required to have a higher fire resistance rating by other sections of this report, the following minimum fire-resistance ratings are required.

Table 3: Fire-Resistance Ratings

Building Element	Type IA Construction	Type IIIA Construction
Primary structural frame (see 780 CMR §202 for definition)	3 Hours	1 Hour
Exterior bearing walls	3 Hours	2 Hours
Interior bearing walls	3 Hours	1 Hour
Interior nonbearing walls and partitions	0 Hours	0 Hours
Exterior nonbearing walls and partitions	See Section 5.2	
Floor construction and secondary members (see 780 CMR §202 for definition)	2 Hours	1 Hour
Roof construction and secondary members (see 780 CMR §202 for definition)	1½ Hours	1 Hour

5.2 Exterior Walls

The fire-resistance rating and allowable openings in exterior wall are based on the fire separation distance (FSD) of each wall. The FSD is measured at a right angle from the face of each exterior wall to the closest interior lot line, the centerline of a street, alley, or public way, or an imaginary lot line between two buildings on the same lot.

As summarized below, 780 CMR Table 602 shows the required fire-resistance rating for nonbearing exterior walls based on the FSD measured on the site plan. The FSD is only applicable to nonbearing exterior walls per 780 CMR Tables 601 and 602; load-bearing exterior walls must be fire-resistance rated as indicated by Table 3, regardless of the FSD.

Where the FSD of the exterior walls is greater than 10', exterior walls required to be rated must be rated for exposure from the inside. Where the FSD is 10' or less, rated exterior walls must be rated for exposure from both sides per 780 CMR §705.5.

Table 4: Fire Resistance Rating for Nonbearing Exterior Walls Based on Fire Separation Distance

Fire Separation Distance = X [feet]	Wall Ratings Type IA	Wall Ratings Type IIIA	Allowable Area of Openings Unprotected, Sprinklered [%]
	Use Group B/R-2/S-2 [hours]	Use Group R-2 [hours]	
X < 3	1	1	Not Permitted
3 ≤ X < 5	1	1	15%
5 ≤ X < 10	1	1	25%
10 ≤ X < 15	1	1	45%
15 ≤ X < 20	1	1	75%
20 ≤ X	0 ^a	0 ^a	No Limit

Note a: Based on the allowance for unlimited unprotected openings.

The FSD on the north side of the building measures greater than 20 feet. Accordingly, unlimited unprotected openings are permitted along this wall.

The FSD on the east side of the building varies. The FSD at the exterior wall at the café measures less than 3 feet; the FSD along the exterior wall at the group exercise and multipurpose room varies between 9 feet and 12 feet.

The FSD on the south side of the building measures 0 feet at the café and roughly 7 feet at the book share and vestibule.

The FSD on the west side of the building measures between 0 and 5 feet along different portions of the exterior wall.

5.2.1 Exterior Wall Projections

Projections which extend past exterior walls of Type IIIA construction may be combustible per 780 CMR §705.2.1. Combustible projections not constructed of FRT

wood must be FRR as required for the floor construction, unless sprinkler protection is provided to the projection (780 CMR §1406.3).

Projections must not extend any closer to the line used to determine the fire separation distance than shown in the table below.

Table 5: Minimum Distance of Projection (780 CMR Table 705.2)

Fire Separation Distance = X (feet)	Minimum Distance From Line Used to Determine FSD
$X \leq 2$	Projections not Permitted
$2 < X \leq 3$	24 inches
$3 < X \leq 30$	24 inches plus 8 inches for every foot of FSD beyond 3 feet or fraction thereof
$30 < X$	20 feet

5.3 Party Walls

Any wall on a lot line between adjacent buildings, which is used or adapted for joint service between the two building, is required to be constructed as a fire wall in accordance with 780 CMR §706. Such walls are not permitted any openings (780 CMR §706.1.1).

The building connects to the adjacent property in the basement level. The wall between these properties must be constructed as a party wall.

5.4 Interior Walls and Partitions

5.4.1 Fire and Smoke Resistive Assemblies

The tables below identify the interior walls and partitions that are required to be composed of fire/smoke resistive assemblies. Note that supporting construction for a fire barrier is required to be protected such that the required fire-resistance rating of the fire barrier being supported is afforded per 780 CMR §707.5.1.

Table 6: Required Fire-Resistance Ratings

Building Element	Required Rating	Code Reference
Dwelling unit separations	1-hr fire partition	780 CMR §420.2, 708.3, & Table 716.5
Corridor walls (Group R-2)	½-hour fire partition	780 CMR Table 1020.1 & Table 716.5
Corridor walls (All other occupancies)	No rating required	780 CMR Table 1020.1
Stair, elevator, mechanical shafts connecting up to 3 stories	1-hr fire barrier	780 CMR §713.4 & Table 716.5

Building Element	Required Rating	Code Reference
Stair, elevator, mechanical shafts connecting 4 or more stories	2-hr fire barrier	780 CMR §713.4 & Table 716.5

Table 7: Required Fire-Resistance Ratings – Incidental Accessory Uses

Building Element	Required Rating	Code Reference
Trash/linen chute access rooms	1-hr fire barrier	780 CMR §713.13.3
Trash/linen chute discharge rooms	2-hr fire barrier	780 CMR §713.13.4
Elevator Lobby	1-hour <i>smoke partition</i>	780 CMR §3006.3
Furnace rooms with any equipment over 400,000 Btu/hr	Smoke resistant construction with sprinkler protection	780 CMR Table 509 & §509.4.2
Boiler rooms with largest piece of equipment over 15 psi and 10 hp	Smoke resistant construction with sprinkler protection	780 CMR Table 509 & §509.4.2
Fire Pump Room	2-hour <i>fire barrier</i>	780 CMR §913.2, NFPA 20 §4.12.1
Emergency electrical rooms	2-hr fire barrier	527 CMR §700.10 & NEC 700.10(D)(2)
Emergency feeder circuit wiring	2-hr fire protection	NEC 700.10(D)(1)
Elevator Machine Room/Controls Room	2-hr fire barrier	780 CMR §3005.4
Transformer vault (<112.5 kV)	Noncombustible	527 CMR 12.00 (NFPA 70)
Transformer vault (>112.5 kV)	1-hr fire barrier	527 CMR 12.00 (NFPA 70)
Transformer vault (>35,000 volts)	3-hr masonry	527 CMR 12.00 (NFPA 70)
Eversource utility transformer vaults	3-hr masonry	527 CMR 12.00 (NFPA 70)
Emergency/standby generator	2-hr fire barrier	780 CMR §403.4.8.1

5.4.2 Doors and Fire Shutters

Doors and fire shutters as well as their components are required to have fire-resistance ratings and meet the required test standards as specified in the table below. All fire doors and fire shutters are required to be designed, installed and labeled in accordance with NFPA 80 (780 §CMR 716.4).

Table 8: Fire Door and Fire Shutter Requirements

Wall Type	Required Wall Rating	Required Minimum Door Rating	Required Performance Criteria	Code Reference
Fire Barriers	2 Hours	1.5 Hours	NFPA 252 or UL 10C / NFPA 252 or UL 10B	780 CMR §716.5
Fire Barriers for Shafts & Exit Enclosures serving less than 3 stories	1 Hour	1 Hour	NFPA 252 or UL 10C / NFPA 252 or UL 10B	780 CMR §716.5
Other Fire Barriers	1 Hour	¾ Hour	NFPA 252 or UL 10C / NFPA 252 or UL 10B	780 CMR §716.5
Fire Partitions	1 Hour	¾ Hour	NFPA 252 or UL 10C / NFPA 252 or UL 10B	780 CMR §716.5
Residential Corridors	½ Hour	1/3 Hour ^a	NFPA 252 or UL 10C / NFPA 252 or UL 10B	780 CMR §716.5.3
Wall Capable of Resisting the Passage of Smoke	No Rating	No Rating	No air transfer openings ¹ , max. ¾" undercut	780 CMR §509.4.2

Note a: Doors must also meet the requirements for smoke and draft control doors in accordance with UL 1784

All doors are required to be self- or automatic closing and provided with an active latch bolt that will secure the door when it is closed (780 CMR §716.5.9).

5.4.3 Trash Chutes

Trash chutes must be designed in accordance with the requirements of 780 CMR §713.13 and NFPA 82-2014 Chapter 5 (527 CMR §11.6.2). The following sections provide a summary of requirements from 780 CMR §713.13 and NFPA 82 Chapter 6.

5.4.3.1 Chute Enclosure

Trash chutes must be constructed within a shaft enclosure, as outlined above, and may not be used for any other purpose; said enclosure must have a 2-hr fire resistance rating, where connecting 4-stories or more (780 CMR §713.4 and NFPA 82 §6.2.3.1.2). Openings into the shaft must be protected and may not be located in corridors.

¹ Unless protected by smoke dampers

Chute discharge doors must meet the following criteria:

- Doors must be 1.5-hr rated (chutes serving 4+ stories) and self-closing or automatic-closing (780 CMR §713.13.1 and NFPA 82 §6.2.3.2.1).

Chute intake doors must meet the following criteria:

- Doors must be 1.5-hr rated (chutes serving 4+ stories), self-closing, positive latching, and gasketed (780 CMR §713.13.1 and NFPA 82 §6.2.3.3.1.1).
- The door frame must be fastened into the chute and shaft wall (NFPA 82 §6.2.3.3.1.2).
- No part of the frame or door may project into the chute (NFPA 82 §6.2.3.3.1.3).
- The area of each intake door must not exceed 1/3 the cross-sectional area of a square chute and 44% of the area of a round chute (NFPA 82 §6.2.3.3.1.4).

5.4.3.2 Chute Access Rooms

In fully sprinklered buildings, trash chute access openings must be located in rooms enclosed by fire barriers and/or horizontal assemblies with a minimum 1-hr fire resistance rating (780 CMR §713.13.2 and NFPA 82 §6.2.5.1.3). Chute access room doors must have a minimum 45-minute fire resistance rating (for 1-hr rated access rooms) and be self-closing (780 CMR §713.13.3 and NFPA 82 §5.2.5.1.2).

5.4.3.3 Chute Termination Room

Trash chutes may not terminate in an incinerator room. Trash chutes must terminate in rooms enclosed by fire barriers and/or horizontal assemblies with fire resistance ratings equal to that of the chute enclosure (780 CMR §713.13.4 and NFPA 82 §6.2.4.1.1). Doors into the termination room must be 1.5-hr fire resistance rated and self-closing (780 CMR §713.13.4 and NFPA 82 §6.2.4.1.2). An automatic sprinkler system must be installed at the top of trash chutes and in their terminal rooms. Chutes extending through three or more floors must have additional sprinklers installed within the chute at alternate floors (780 CMR §903.2.11.2). Chute sprinklers must be accessible for servicing.

5.4.3.4 Trash Collection Rooms

The collection of large amounts of trash inside a building must comply with the container requirements of 527 CMR, Massachusetts Fire Prevention Regulations. Rubbish containers exceeding 5.33 ft³ (40 gal.) must be provided with lids. Containers must also be made of noncombustible materials or nonmetallic materials complying with §19.2.1.2 (527 CMR §19.2.1.1.2). Dumpsters and containers of 1.5 yd³ or more of individual capacity are not permitted to be stored inside buildings, or within 10 feet of combustible walls, openings, or combustible roof eave lines (527 CMR §19.2.1.4). Areas containing dumpsters (of

less than 1.5 yd³ and of noncombustible or nonmetallic materials) shall be protected by an approved automatic sprinkler system, and be enclosed by 1-hour fire-resistance rated construction (527 CMR §19.2.1.4.1).

It should be noted that the restrictions on dumpster size per 527 CMR §19.2.1.4 is not applicable to approved rubbish containers which are part of a waste compactor.

5.5 Fire Blocking and Draftstopping

Fire blocking is required to cut off concealed draft openings (both vertical and horizontal) in residential buildings and form an effective barrier between floors as well as between a top story and a roof or attic space. Fire blocking is required to be installed per 780 CMR §718.2.2 through 718.2.7.

Draftstopping is not required in floors or concealed roof spaces protected throughout by an automatic sprinkler system (780 CMR §718.3.2, Ex. 1 and 780 CMR §718.4.2, Ex. 2).

5.6 Interior Finishes

5.6.1 Wall and Ceiling Finishes

The table below provides the interior wall and ceiling requirements based on occupancy classifications. The finish requirements are maximum flame spread and smoke-developed indexes. Interior wall and ceiling finish ratings are classified in accordance with ASTM E 84 or UL 723 (780 CMR §803.1.1).

Table 9: Interior Wall and Ceiling Finish Requirements

Occupancy Classification	Exit Enclosures	Corridors, Exit Access Stairways, Ramps	Rooms and Enclosed Spaces
A-2, A-3	B	B	C
B	B	C	C
R-2 & S-2	C	C	C

5.6.2 Interior Floor Finishes

Interior floor covering materials comply with the requirements of the DOC FF-1 "pill test" (CPSC 16 CFR Part 1630) (780 CMR §804.4.1). Traditional finishes such as wood, vinyl, linoleum or terrazzo, and resilient floor covering materials are permitted in all areas per 780 CMR §804.1 Exception.

6 FIRE PROTECTION/EMERGENCY SYSTEMS

6.1 Automatic Sprinkler System

The building is required to have an automatic sprinkler system installed per Massachusetts General Law Chapter 148 §26G and 780 CMR Table 903.2. The automatic sprinkler systems must be installed in accordance with NFPA 13 per 780 CMR §903.3.

It should be noted that due to combustible construction above the ceiling, sprinklers may be required within the cavity between the ceiling and the bottom of the floor above, unless filled with material complying with ASTM E136.

An automatic sprinkler system complying with NFPA 13 will be installed throughout the building.

6.2 Standpipe System

The building will contain a standpipe system as required by 780 CMR §403.4.3. Class I standpipes are permitted since the building will be fully sprinklered. Class I standpipe hose connections must be located in accordance with 780 CMR §905.4.

A Class I standpipe system is provided in the building. Hose connections are provided in each exit stair.

6.3 Fire Department Connection

A fire department connection must be provided for the building's automatic sprinkler and standpipe systems in a location approved by the fire department. The fire department connection must be located a minimum of 18 inches above and a maximum of 42 above the ground level to the centerline of the inlet (780 CMR §912 and NFPA 14 §6.4.6). A clear working space of 36 inches in width, by 36 inches in depth, by 78 inches in height is required in front of the fire department connection (780 CMR §912.4.2).

6.4 Fire Alarm System

A fully addressable fire alarm system with smoke detection and emergency voice/alarm communication is required for the building per 780 CMR Sections 403.4.1, 403.4.2, 403.4.4. The system must include the following per 780 CMR Sections 907.2.9, 907.2.11, 907.2.13, 907.5.2.2, and 907.5.2.3:

- Automatic smoke/fire detection
- Sprinkler waterflow and tamper switches
- Visual and audible alarm notification appliances
- Single- and multiple-station smoke alarms required in accordance with 780 CMR §907.2.11.2

- Low frequency audible notification devices in all sleeping areas

A manual fire alarm system is not required for the building per 780 CMR §907.2.9.1 since the building will be fully protected with an automatic sprinkler system in which the occupant notification system will be activated in accordance with 780 CMR §907.5 by the sprinkler waterflow switches.

Per 780 CMR §907.2, a minimum of a single manual fire alarm box must be provided in an approved location to initiate a fire alarm signal for fire alarm systems employing automatic fire detectors or waterflow detection devices. Where other sections of the code allow elimination of fire alarm boxes due to sprinklers, 780 CMR §907.2 requires that a single fire alarm box be installed unless the omission is approved by the fire code official. If the omission of the manual fire alarm box is not approved, where provided, the manual fire alarm box cannot be located in an area that is accessible to the public.

Further, per 780 CMR §907.2 Exception 2, the manual fire alarm box is not required for Group R-2 occupancies unless required by the fire code official to provide a means for fire watch personnel to initiate an alarm during a sprinkler system impairment event.

With this considered, it is our opinion that a fire alarm box is not required in the building unless specifically mandated by the fire code official.

6.4.1 Emergency Voice/Alarm Communication System

An emergency voice/alarm communication system must be provided in accordance with 780 CMR §403.4.4.

An emergency voice/alarm communication system will be provided in the building.

6.4.2 Single- and Multiple-Station Smoke Alarms

Single- or multiple-station smoke alarms must be installed in the following locations:

1. On the ceiling or wall outside of each separate sleeping area in the immediate vicinity of bedrooms.
2. In each room used for sleeping purposes.
3. In each story within a dwelling unit.
4. Not less than 3' horizontally from the door opening adjacent to bathrooms containing a bathtub or shower.
5. Where not in conflict with Items (1) and (2), ionization smoke alarms must not be installed within 20 feet from a permanently-installed cooking appliance unless provided with an alarm-silencing switch and photoelectric smoke alarms must not be installed within 6' from a permanently-installed cooking appliance.

Where more than one smoke alarm is required to be installed within an individual dwelling unit, the smoke alarms must be interconnected in such a manner that the activation of one alarm will activate all of the alarms in the individual unit per 780 CMR §907.2.11.5. Smoke detectors listed in accordance with UL 268 – Smoke

Detectors for Fire Alarm Systems can be provided as an alternative to the single- and multiple-station smoke alarms if they comply with the requirements of 780 CMR §907.2.11.7.

6.4.3 Carbon Monoxide Devices

Carbon monoxide detection will be provided as is required in accordance with 780 CMR §915.1 through 915.5, and 527 CMR §13.7.2.11.4 and 13.7.6.

6.5 Emergency Responder Radio Coverage

The building shall be provided with emergency responder radio coverage as required by 780 CMR §403.4.5, §907.5.2.2, and The International Fire Code. The requirements of the Emergency Responder Radio System are listed in NFPA 72 §24.5. The Fire Department will also have specific requirements for their radio system in addition to the basic items below.

- *Radio Signal Strength:* Signal strength measurements in 95% of all areas of each floor of the building should the following minimum signal strengths:
 - -95 dBm minimum signal strength within the building;
 - -95 dBm minimum signal strength should be received by the agency's radio system when transmitted from within the building.
- *Secondary Power:* The emergency responder radio coverage system shall be provided with an approved secondary source of power capable of providing an 8-hour supply.

6.6 Portable Fire Extinguishers

Portable fire extinguishers are required and will be provided in all occupancies per 780 CMR §906.1 and will be selected and installed in accordance with NFPA 10. Extinguishers are required in Use Groups A, B, R-2, and S-2. For the Use Group R-2 areas, per 780 CMR §906.1, an option exists to provide extinguishers in each dwelling unit rather than within travel distance requirements of 780 CMR §906.3; however, extinguishers must still be provided in locations listed in 780 CMR §906.1 Exception Items 2-6.

6.7 Standby/Emergency Power Systems

Standby and emergency power systems are required to be installed in accordance with 780 CMR §2702. Standby and emergency power can be provided for systems which require standby or emergency power by various sources including those complying with NFPA 110 – *Standard for Emergency and Standby Power Systems* and NFPA 111 – *Standard on Stored Electrical*

Energy Emergency and Standby Power Systems per 780 CMR §2702.1. Emergency and standby power systems must provide the required power for a minimum duration of two (2) hours without being refueled per 780 CMR §2702.1.4.

Per 780 CMR §2702.1.3, emergency and standby power systems must transfer within 10 and 60 seconds after primary power loss, respectively. The emergency and standby power systems must support the power load for a duration of two (2) hours per 780 CMR §2702.1.4. The following applies:

Emergency power loads per 780 CMR §2702.2 and §403.4.8:

- Exit signs and means of egress illumination
- Elevator car lighting
- Automatic fire detection system
- Fire alarm system
- Electrically powered fire pumps

Standby power loads per 780 CMR §2702.2 and §403.4.8:

- Fire Command Center lighting and power
- Ventilation and automatic fire detection for smokeproof enclosures
- Elevators
- Accessible means of egress elevators

6.8 Fire Command Center

The building will have a fire command center as required for high-rise buildings (780 CMR §403.4.6). The fire command center must be at least 200 sq. ft. in size with a minimum dimension of 10 ft. (780 CMR §911.1.3). The fire command center must be constructed of at least 1-hour fire barrier enclosure (780 CMR §911.1.2). The location and accessibility of the fire command center shall be approved by the fire chief (780 CMR §911.1.1).

It is noted that the lighting and HVAC system in the fire command center must be tied into emergency power. The following items must be provided in the fire command center:

- The emergency/voice alarm communications system.
- The fire department communication systems; two-way telephone communication service panels and controls.
- 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 control panel is required by §909.16 for any smoke control systems installed in the building.
- Controls for unlocking stairway doors simultaneously.
- 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.
- Schematic building plans indicating the typical floor plan and detailing the building core, fire protection systems, fire-fighting equipment, and fire department access and the location of *firewalls*, *fire barriers*, *fire partitions*, *smoke barriers*, and smoke partitions.
- Worktable.
- Generator supervision devices, manual start, and transfer features.
- Public address system, where specifically required by other sections of this code.
- Elevator fire recall switch in accordance with ASME A17.1.
- Elevator emergency or standby power selector switch(es), where emergency or standby power is provided.

6.9 Fire Pump

If the building requires a fire pump to supply the sprinkler and standpipe systems, the following requirements will apply. The installation of the fire pump shall be designed and installed in accordance with NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*.

The fire pump room must be accessed directly from the exterior. The fire pump rooms that are not directly accessible from the outside shall be accessible through an enclosed passageway from an enclosed stairway or exterior exit. The enclosed passageway shall have a fire-resistance rating not less than the fire-resistance rating of the fire pump room (2-hours) (NFPA 20 §4.12.2.1).

6.10 Smoke Control Systems

Stairways serving floors more than 75 feet above the lowest level of fire department access are required to be smokeproof enclosures designed in accordance with 780 CMR §909.20 and 1032.11 (780 CMR §403.5.4).

The elevation of the highest floor (Level 7) is located roughly 66 feet above the lowest level of fire department vehicle access.

Stair 1 only connects Levels 1-7 and therefore does not need to be constructed as a smokeproof enclosure and is not required to be provided with a pressurization system.

Stair 2 extends to the roof of the building, which is located greater than 75 feet above the lowest level of fire department vehicle access. If the roof is non-occupiable and does not contain any equipment that would otherwise require the stair to extend to the roof, it is our opinion that this stair would not be required to be constructed as a

smokeproof enclosure and would not required to be provided with a pressurization system.

6.11 Post-Fire Smoke Removal System

To facilitate smoke removal in post-fire salvage and overhaul operations, the building is required to be equipped with natural or mechanical ventilation for removal of products of combustion in accordance with one of the following per 780 CMR §403.4.7:

- Easily identifiable, manually operable windows or panels distributed around the perimeter of each floor at not more than 50' intervals. The area of operable windows or panels must not be less than 40 ft² per 50 linear feet of perimeter (780 CMR §403.4.7-1).
- Mechanical air-handling equipment providing one (1) exhaust air change every 15 minutes for the area involved. Return and exhaust air must be moved directly to the outside without recirculation to other portions of the Building (780 CMR §403.4.7-2).
- Any other approved design that will produce equivalent results (780 CMR §403.4.7-3).

A mechanical system is not classified as a smoke control system and is not subject to the requirements of 780 CMR §909. Accordingly, such a system would not be required to be on standby power.

7 MEANS OF EGRESS

Applicable means of egress requirements are outlined below.

7.1 Occupant Loads

The occupant load of a space is determined by the function of the space and the floor area. The floor area is either measured as a gross (includes all areas within the exterior walls) or a net (actual occupied area of the space) area. Applicable occupant load factors per 780 CMR Table 1004.1.2 are provided in

Table 10 below.

Table 10: Occupant Load Factors

Function of Space	OLF [SF / occupant]
Assembly (unconcentrated, tables and chairs)	15 net
Business	100 gross
Residential	200 gross
Fitness	50 gross
Storage / Mechanical	300 gross

7.2 Egress Capacities

The capacity of egress components is calculated based on the width of the egress component. The egress capacity factors are as follows in Table 11:

Table 11: Egress Capacity Factors

Exit Component	Egress Capacity Factor [in / occupant]
Stairs	0.2
Other egress components	0.15

7.3 Travel Distance, Common Path, and Dead Ends

Travel distance and common path of egress travel requirements are outlined in the table below.

Table 12: Egress Requirements

Requirement	Value [feet]	780 CMR
Maximum exit access travel distance	400 (Use Group S-2) 300 (Use Group B) 250 (Use Groups R-2)	Table 1017.2
Maximum common path of egress travel	125 (Use Group R-2) 100 (Use Group B, S)	§1006.2.1
Dead end corridors	50 (all other uses)	§1020.4

A single means of egress is permitted within and from dwelling units where the maximum unit occupant load is 20 people, and the common path of travel is a maximum of 125' per 780 CMR §1006.2.1 Exception 1.

A single means of egress is permitted from a Group S occupancy where the occupant load does not exceed 29 and the common path of travel does not exceed 100 feet per 780 CMR Table 1006.3.2(2).

A single means of egress is provided from the basement. The occupant load and travel distance meet the limitations identified above.

Where more than one means of egress is required, the exits are separated by $\frac{1}{3}$ of the overall diagonal distance of the space served per 780 CMR §1015.2.1. Egress is permitted through an enclosed elevator lobby; however, access to one of the required exits must be provided without requiring travel through the elevator lobby in accordance with 780 CMR §1016.2(1).

7.4 High Rise Requirements

In the building, exit stairway enclosures must be separated by at least 30 feet or $\frac{1}{4}$ the maximum overall diagonal of the building, whichever is less (780 CMR §403.5.1). The separation distance must be measured between the two nearest points of the exit enclosures. This requirement must be met in addition to the $\frac{1}{3}$ maximum diagonal provisions of 780 CMR §1007.1.1, Exception 2.

Other than the discharge door(s), stairway doors may be locked from the stairway side. These doors must be capable of being unlocked simultaneously, without unlatching, upon a signal from the fire command center (780 CMR §403.5.3). Where stairway doors are normally locked from the stairway side, a telephone or other two-way communication system connected to an approved constantly attended station must be provided within the stairway at every fifth floor.

7.5 Egress Components

7.5.1 Doors

The minimum door clear width requirements per 780 CMR §1010.1.1 are as follows:

- No minimum width for doors to storage closets less than 10 ft² in area per 780 CMR §1010.1.1, Exception 3, and
- 32" for all other doors.

Door openings in dwelling units must not be less than 78" in height. Exterior doors opening in dwelling units must not be less than 76" in height. Other door openings must not be less than 80" in height per 780 CMR §1010.1.1.

Doors are not permitted to encroach on the required corridor width when in the fully open position by more than 7" and doors in any position are not permitted to reduce the required corridor width by more than $\frac{1}{2}$ per 780 CMR §1005.7. These requirements do not apply to doors within the individual Group R-2 units per 780 CMR §1005.7.1, Exception 2.

All doors serving an occupant load of 50 or more people must swing in the direction of egress travel per 780 CMR §1010.1.2.1.

7.5.2 Ramps

Any part of an accessible route with a slope greater than one unit horizontal in 20 units vertical is considered a ramp.

Ramps must have a slope not steeper than one unit vertical in 12 units horizontal (8.3% slope) (521 CMR §24.2.1). The maximum rise for any ramp run is 30 inches.

The minimum clear width for a ramp is 48 inches, measured between the railings (521 CMR §24.3).

Ramp landings are required to be 60 inches minimum in length. The width of the ramp's landing is required to be not less than the width of the widest ramp run adjoining the landing (521 CMR §24.4).

Handrails are required at all ramps. Handrails are required to be provided in pairs, one at a height between 34 and 38 inches, and a lower handrail at a height between 18 and 20 inches (521 CMR §24.5).

7.5.3 Corridors

The minimum corridor width requirements per 780 CMR §1020.2 are as follows:

- 36" permitted when serving less than 50 occupants or within a dwelling unit per 780 CMR Table 1020.2,
- 24" permitted for access to and utilization of MEP equipment per 780 CMR Table 1020.2, and
- 44" in general for all other corridors per 780 CMR Table 1020.2.

7.5.4 Stairs

Requirements for stairs are summarized in the below table.

Table 13: Stair Requirements

Feature	Requirement	780 CMR
Headroom	Clearance of 80"	780 CMR §1011.3
Treads and Risers	Common areas: Maximum riser height: 7", minimum tread depth: 11". Within dwelling units: Maximum riser height: 7¾", minimum tread depth: 10".	780 CMR §1011.5.2 and §1011.5.2 Exception 3

Feature	Requirement	780 CMR
Landings	<p>Width: equal to the width of the stair (e.g. 44" for common stairs and 36" within dwelling units).</p> <p>Encroachment: Doors opening onto landings cannot reduce the landing to less than ½ the required width. When fully open, doors cannot project more than 7" into the landing.</p>	780 CMR §1011.6
Handrails	<p>Location: Both sides for common stairs and one side within dwelling units.</p> <p>Height: 34" minimum and 38" maximum for common stairs (can be exceeded for fittings within dwelling units), 30" minimum and 34" maximum for alternating tread devices.</p> <p>Extension: 12" beyond the top riser and continue to slope for the depth of one riser beyond the bottom riser. No extensions required within dwelling units.</p> <p>Clearance: Minimum 1½".</p>	780 CMR §1011.11, §1014.2, §1014.6, §1014.7, and 521 CMR §27
Roof Access (Residential Building)	Permitted to be an alternating tread device where there is no elevator machine room on the roof.	780 CMR §1011.12 and Exception to same

7.6 Exit Discharge

The exit discharge is the portion of the means of egress from the termination of the exit to a public way. A sidewalk will be provided to a public way or safe dispersal area in accordance with 780 CMR §1028.5.

Exits must discharge directly to the exterior of the building with a maximum of 50% of required exits permitted to discharge in the interior of the building if certain conditions are met per 780 CMR §1028.1 Exception 1. Discharge of interior exit stairways are required to be provided with a free and unobstructed path of travel to an exterior exit door and such exit is readily visible and identifiable from the point of termination of the enclosure.

Per 780 CMR §1008.1, the means of egress, including the exit discharge, must be illuminated at all times such that occupants can find the public way if an emergency occurs at night. Therefore, egress lighting must be provided at the exterior exit stairs and any pathway connecting to the public way.

As currently designed, Stair 1 discharges to the interior of the building and Stair 2 discharges directly to the exterior of the building.

7.7 Accessible Means of Egress

Since the building contains levels six (6) stories above the level of exit discharge, an elevator provided with standby power is required, unless a horizontal exit is provided on each floor level (780 CMR §1009.2.1).

The building is not provided with a horizontal exit on Levels 2-7. Accordingly, the elevator is required to serve as an accessible means of egress and be provided with standby power.

Areas of refuge within the stairwells are not required since the building will be provided with an automatic sprinkler system per 780 CMR §1009.3.

Where a single means of egress is permitted from a space, at least a single accessible means of egress must be provided per 780 CMR §1009.1. Where two or more means of egress are required from a story or space, at least two accessible means of egress must be provided. A stairway is permitted to serve as the second accessible means of egress per 780 CMR §1009.2. Since the building will be fully sprinklered, the stairs are not required to have a clear width of 48" between handrails.

A two-way communication system must be provided at elevator landings on each accessible floor above the level of exit discharge. This system is required regardless of whether an accessible egress elevator is provided 780 CMR §1009.8.

7.8 Roof Access

Buildings four or more stories above grade plane requires one stairway to extend to the roof surface, unless the roof has a slope steeper than 33% (780 CMR §1011.12). In buildings without an occupied roof, access to the roof from the top story shall be permitted to be by an alternating tread device, if elevator equipment is not provided on the roof. Where a stairway is provided to a roof, access to the roof shall be provided through a penthouse complying with MSBC §1509.2. However, buildings without an occupied roof, are permitted to have a roof hatch not less than 16 square feet in area and having a minimum dimension of 2 feet.

Stair 2 extends to the roof to provide access to mechanical equipment on the roof. The requirement for roof access has been met.

7.9 Exterior Doors and Locks

The main common entryway to the building must be equipped such that it closes and locks automatically. It must include a lock with an electrically-operated striker mechanism, a self-closing door and associated equipment. Such equipment must include an intercom system tied independently to each apartment and where the electrically operated striker mechanism can be released from each apartment.

Additionally, a closed-circuit security camera system must be incorporated such that the occupants of each apartment unit can utilize their personal television sets to observe who is seeking entrance to the building. The intercom and closed-circuit security camera systems must be designed and listed for the weather and temperature conditions to which they will be exposed per 780 CMR §1010.1.9.12.

The required intercom and TV connections can be supplanted with other audio and visual technology that serves the same purpose, provided such information is readily available for all dwelling units per 780 CMR §1010.1.9.12 Exception 2.

7.10 Electrical Rooms

Electrical rooms with equipment rated 1,200A or more and over 6' wide that contain overcurrent devices, switching devices, or control devices with exit or exit access doors must be equipped with panic hardware and the doors must swing in the direction of egress per 780 CMR §1010.1.10.

For electrical rooms containing equipment on circuits of 600V nominal or less, personnel doors intended for entrance to and egress from work spaces in rooms containing equipment rated 800A or more, that contain overcurrent devices, switching devices, or control devices, must open in the direction of egress and be equipped with listed panic hardware if the door is located less than 25' from the nearest edge of the work space per NFPA 70 §110.26(C)(3).

For electrical rooms containing equipment on circuits greater than 600V nominal, personnel doors providing entrance to and egress from work spaces serving all electrical equipment (regardless of amperage) that are located less than 25' from the nearest edge of the working space must open in the direction of egress and be equipped with listed panic hardware per NFPA 70 §110.32(A)(3).

7.11 Luminous Egress Path Markings

Luminous egress path markings shall be provided in high-rise buildings in accordance with 780 CMR §1025 per 780 CMR §403.5.5. This requirement applies to Use Group A and M occupancies per 780 CMR §1025.1.

Since the Group A and M occupancies are limited to levels below the high-rise building threshold (less than 70 feet above grade plane), it is our opinion that luminous egress path markings are not required.

8 ELEVATORS

8.1 Fire Service Access Elevators

Buildings with an occupied floor more than 120' above the lowest level of fire department vehicle access are required to be provided with a fire service access elevator (FSAE) designed in accordance with 780 CMR 3007 per 780 CMR §403.6.1.

Since the highest occupied floor is roughly 66 feet above the lowest level of fire department vehicle access, FSAEs are not required.

8.2 Elevator Lobbies

Elevators in the building with hoistways that are more than 75' in height, measured from the lowest floor served to the highest floor served, are required to be provided with hoistway opening protection in accordance with 780 CMR §3006.3. Elevators are required to be equipped with lobbies on each floor. Lobbies are required to be constructed as smoke partitions in accordance with 780 CMR §710 (780 CMR §3006.2 Item 5). Alternately, elevator lobbies can be omitted if the elevator shafts are pressurized or if additional UL 1784 doors are provided (780 CMR 3006.3, Items 3 & 4). Elevator lobbies on the level of discharge are not required to be rated (780 CMR §3006.2 Ex. 2).

Elevator 1 serves Levels 1-7 of the building; the height of the hoistway, as measured from Level 1 to Level 7 is 66 feet. Accordingly, hoistway protection is not required for Elevator 1.

Elevator 2 serves Levels Basement-7 of the building; the height of the hoistway, as measured from the Basement to Level 7 is 78 feet. Accordingly, hoistway protection is required for Elevator 2.

8.3 Medical Emergency Elevator

New elevators are required to comply with 524 CMR 35.00. At least one elevator must be able to accommodate the loading and transportation of an ambulance gurney or stretcher (24" wide by 84" long with 5" radius corner) in its horizontal position per 524 CMR §2.27.12.

9 ADDITIONAL CONSIDERATIONS

9.1 Interior Environment

Minimum ceiling height requirements per 780 CMR §1208.2 are as follows:

- 7½' for occupiable spaces, habitable spaces, and corridors
- 7' permitted for bathrooms, toilet rooms, kitchens, and storage rooms

Every dwelling unit must have at least one room with a minimum net floor area of 120 ft². Other habitable rooms must have a net floor area of at least 70 ft² per 780 CMR §1208.3.

The building must be provided with natural or mechanical ventilation per 780 CMR §1203.1. Every space intended for human occupancy must be provided with natural or artificial lighting in accordance with 780 CMR §1205.1.

9.1.1 Sound Transmission

Per 780 CMR §1207.2, walls and horizontal assemblies between dwelling units or between dwelling units and public or service areas must have a sound transmission class (STC) of not less than 50, or not less than 45 if field-tested, for airborne noise when tested in accordance with ASTM E90 – *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*.

Per 780 CMR §1207.3, horizontal assemblies between dwelling units or between dwelling units and public or service areas must have an impact insulation class rating of not less than 50, or not less than 45 if field-tested, when tested in accordance with ASTM E492 – *Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine*.

9.1.2 Ventilation

Per 780 CMR §1203.1, unless the dwelling units in the building have air infiltration rates of 5 air changes per hour or greater when tested with a blower door at a pressure of 0.2" water column in accordance with 2018 IECC §R402.4.1.2, ventilation by mechanical means in accordance with 2015 International Mechanical Code (IMC) §403 must be provided.

Since the building is considered Use Group R-2 and is greater than three (3) stories, an outdoor air ventilation system must be installed in each occupiable space per IMC §403.3.1.1. In this case, an occupiable space is defined as any space intended for human activities, excluding those spaces intended primarily for other purposes, such as storage rooms and equipment rooms, that are only intended to be occupied occasionally and for short periods of time.

9.1.3 Natural Light

Habitable rooms, other than kitchens, must be provided with natural light from windows that occupy an area not less than 8% of the floor area of the room per 105 CMR §410.250.

9.2 Fire Department Access

Access roads must be capable of supporting all imposed loads of the fire department apparatus and must be provided with an all-weather driving surface per 527 CMR §18.2.2.1.1 and 18.2.2.1.1.1. Fire department apparatus access road plans are required to be submitted to the fire department along with the permit set. The plans must be signed and stamped by the responsible registered design professional and include an analysis and evaluation of fire department apparatus maneuvers throughout the access roads created by a swept path analysis and turn simulation software per 527 CMR §18.1.3.

Fire department access roads must not have a width less than 20' and a height not less than 13½' per 527 CMR §18.2.3.4.1.1 and 18.2.3.4.1.2. Dead end fire department access roads must be provided with an approved turn around area if in excess of 150' per 527 CMR §18.2.3.4.4.

9.3 Roof Construction

Class B roof assemblies tested in accordance with ASTM E108 or UL 790 are required for Construction Type IA & IIIA per 780 CMR Table 1505.1.

9.4 Accessibility

The following accessibility requirements apply to the project. The project must meet the requirements of 521 CMR, the Fair Housing Act Design Manual (FHA) and the Americans with Disabilities Act (ADA) (public spaces only).

9.4.1 Dwelling Units

At least 5% of the dwelling units must be designed as Group 2A dwelling units per 521 CMR §9.4. These units must be proportionally distributed throughout the space in relation to size, quality, and location per 521 CMR §9.4.2. In addition to the required Group 2 units, at least 2% must provide sleeping accommodations for persons who are deaf or hard of hearing in accordance with 521 CMR 9.7. All other units must be designed as Group 1 units per 521 CMR §9.3. Public and common use areas must comply with 521 CMR 10.00.

There are 54 total dwelling units in the building, therefore 3 dwelling units are required to be Group 2A units. A total of 2 units are required to be provided for occupants who are deaf or hard of hearing.

9.5 Energy

For the purposes of the 2018 International Energy Conservation Code (IECC) §C202, a residential building is a Use Group R-2 building that is three stories or less in height above grade plane. Since the building exceeds three stories above grade plane, it is classified as a commercial building per the 2018 IECC.

The new commercial building will comply with 780 CMR Chapter 13 and Appendix AA (i.e. 2018 IECC with MA amendments and Stretch Energy Code).

If you have any questions regarding the information included in the report above, please do not hesitate to contact us.

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