

### 1. APPLICABLE CODES & STANDARDS

The State of Maine requires municipalities with more than 4,000 residents to adopt and enforce the Maine Uniform Building and Energy Code (MUBEC). The next edition of the MUBEC became effective on January 23, 2018. The following codes and standards are applicable to the project:

- International Building Code (IBC), 2015 Edition with ME Amendments
- International Existing Building Code (IEBC), 2015 Edition with ME Amendments
- International Energy Conservation Code (IECC), 2009 Edition with ME Amendments
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 62.1, Standard for Ventilation and Indoor Air Quality, 2013 edition

In addition to the codes identified above, the State Fire Marshal's Office promulgates the Rules of the State Fire Marshal, which adopt numerous NFPA codes and standards, including the following:

- NFPA 1, Uniform Fire Code, 2006 Edition with ME Amendments
- NFPA 13, Standard for Installation of Sprinkler Systems, 2016 Edition

The Plumbers' Examining Board promulgates the Maine Plumbing Code, which includes the following:

- International Association of Plumbing and Mechanical Officials (IAPMO), 2015 Uniform Plumbing Code (UPC), with ME amendments

The Electricians' Examining Board adopts and amends the following electrical code:

- NFPA 70, National Electrical Code, 2017 Edition

The following federal regulation also applies to the project (as referenced by the Maine Human Rights Commission - 5 M.R.S. §4594-G):

- Americans with Disabilities Act (ADA), 2010 Standards for Accessible Design

The Joint Commission also requires compliance with the following:

- NFPA 101, Life Safety Code, 2012 Edition
- NFPA 99, Health Care Facilities Code, 2012 Edition

The following design standards will also be used for the project:

- Facilities Guidelines Institute (FGI), Guidelines for Design and Construction of Hospitals and Outpatient Facilities, 2014 Edition
- ASHRAE Standard 170, Ventilation of Healthcare Facilities, 2013 edition

### 2. PROPOSED SCOPE OF WORK & LOCATION

The proposed project will add two stories (Level 6 and 7) to the existing East Tower clinical building on the Maine Medical Center campus in Portland, ME. A penthouse and helipad structure will also be constructed on the new roof of the building. The use groups proposed in the addition are as follows:

- Use Group B/business: Office areas, staff lockers, conference/meeting space less than 750 SF and 50 people

- Use Group I-2 (Condition 2)/healthcare: Inpatient hospital care
- Use Group S-1 (ordinary hazard storage): Linen storage (accessory)
- Use Group S-2 (low hazard storage): Storage/utility spaces (accessory)

As indicated in the list above, the Group S-1 and S-2 spaces qualify as accessory to the main Group B and I-2 occupancies because the spaces are less than 10% of the floor area (approximately 7% of the floor area).

### 3. ADDITION

Since the project includes an addition to the existing building, the project is subject to compliance with Chapter 11 of the IEBC, and Section 43.8 of NFPA 101, which are summarized as follows. Note that East Tower is considered part of the same building as the existing Bean Building and Richards Building on the Maine Medical Center campus.

#### 3.1 General Requirements

The addition must comply with the code for new construction while the existing building is permitted to remain without change, except as required by the provisions of IEBC Chapter 11 and NFPA 101 Section 43.8.1.1 for additions. An addition to an existing building cannot create or extend any nonconformity in the existing building with regard to accessibility, structural strength, fire safety, means of egress, or the occupancy of MEP systems (IEBC 1101.2.2 and NFPA 101 Section 43.8.1.2). Any repair or alteration work taking place within the existing building must meet the applicable IEBC and NFPA 101 requirements for such alterations (IEBC 1101.3 and NFPA 101 Section 43.8.1.3).

#### 3.2 Separation

NFPA 101 Section 43.8.1.1 requires the existing portions of the building to comply with the requirements contained in NFPA 101 applicable to existing buildings. However, where the existing structure does not conform to the requirements of NFPA 101 Chapter 19 (i.e. existing healthcare occupancies), a 2-hour fire-resistance rated separation is required between the existing building and the addition (NFPA 101 Section 19.1.1.4.1).

As indicated in Section 6 below, 2-hour rated floor assemblies are required for the building. Therefore, the floor assembly will serve as this separation. Further, a 2-hour rating will be provided to separate the addition from the Richards wing. As such, an evaluation of compliance with Chapter 19 has not been completed for the existing floors. This report addresses the applicable requirements for the construction of Level 6 and above.

#### 3.3 Height and Area

An addition cannot increase the height or area of an existing building beyond that permitted by the applicable provisions of IEBC Chapter 5 (IEBC 1102.1, 1102.2 and NFPA 101 Section 43.8.2). Refer to the height and area analysis in Section 5 of this report which describes compliance with height and area requirements.

#### 3.4 Structural

While additions are required to comply with the code requirements for new construction, the Structural Engineer of Record must perform an investigation and evaluation of the impact of the proposed addition on the existing building with respect to the following elements identified in the IEBC (1103):

- Additional gravity loads,
- Lateral-force-resisting system,
- Snow drift loads, and
- Flood hazard areas.

#### 3.5 Accessibility

Additions to existing buildings are subject to the applicable new construction requirements of the Americans with Disabilities Act Standards (ADA) and Chapter 11 of the IEBC. Where the addition affects the accessibility to, or contains a primary function area, additional alterations may be required along the path of travel to the primary function area (IEBC 1105.1 and ADA 202.2).

Refer to Section 11 of this report for further details regarding accessibility requirements.

#### 3.6 Energy Conservation

Additions to existing buildings must comply with new construction provisions of the International Energy Conservation Code (IECC), without requiring the unaltered portions to comply (IECC 1106.1).

#### 4. HIGH-RISE BUILDING FEATURES

The proposed addition increases the height of the building such that it is considered a high-rise building (i.e. there is an occupied floor located more than 75 feet above the lowest level of fire-resistance vehicle access)(IBC 202 and NFPA 101 Section 3.3.3.2.7).

High-rise buildings must comply with IBC 403 and NFPA 101 Section 11.8. The applicable provisions for high-rise buildings are summarized below.

##### 4.1 Structural

Since the building is considered Risk Category IV per IBC Table 1604.5, the structural integrity requirements of IBC 403.2.3 apply. Section 403.2.3 requires interior exit stairways and elevator hoistway wall assemblies to comply with impact classifications of ASTM C 1629/ C 1629M. Spray fire-resistant materials (SFRM) must have a minimum bond strength of 430 psi (IBC Table 403.2.4).

##### 4.2 Fire Protection Systems

The following fire protection systems are required within the building as noted. Refer to Section 9 of this report for further details regarding fire protection systems.

##### Automatic Sprinkler System

An automatic sprinkler system is required throughout the building per IBC Sections 403.8 & 903.2.6 and NFPA 101 Sections 11.8.3.1 & 18.3.5.1. A secondary water supply is required since the building is located in seismic design category C (IBC 403.3).

##### Standpipe System

Class 1 standpipes must be provided (IBC 905.3 & 403.4.3 and NFPA 101 Section 11.8.4.1).

##### Fire Alarm System

A manual fire alarm system with an emergency voice/alarm communication system must be provided in accordance with IBC 907.2.13 (IBC 403.4.2 & 403.4.4 and NFPA 101 Section 11.8.4.1).

##### Smoke Detection System

An automatic smoke detection system must be provided in accordance with IBC 907.2.13.1 (IBC 403.4.1). See Section 9.2 of this report for additional requirements for smoke detection systems.

##### Emergency Responder Radio Coverage

Emergency responder radio coverage or a two-way telephone communication system must be provided (IBC 403.4.5, NFPA 1 Section 13.2.2.7.2.2, and NFPA 101 Section 11.8.4.2).

##### Fire Command Center

A fire command center (FCC) complying with IBC 911 must be provided in a location approved by the fire department (IBC 403.4.6 & NFPA 101 Section 11.8.6). The FCC must comply with the following requirements and contain the following features. The proposed FCC must be constructed with the local fire official. The fire command center will be located on the Ground Floor of the building adjacent to the visitor elevators. The proposed fire command center complies with the dimensional requirements listed below.

1. Location, layout, and features must be approved by the fire chief
2. Must be separated by 1-hr rated construction
3. Must be 200 of minimum dimension of 10 ft
4. Unrelated storage is prohibited in the FCC
5. Emergency voice/alarm communication system control unit
6. Fire department communications system
7. Fire detection and alarm system location
8. Annunciator unit visually indicating the location of the elevators and whether they are operational
9. System indicators and controls for air distribution systems
10. Fire fighter's control panel for smoke control systems
11. Controls for unlocking interior exit stairway doors simultaneously
12. Sprinkler valve and waterflow detector display panels
13. Emergency and standby power status indicators
14. Telephone for fire department use with controlled access to the public telephone system
15. Fire pump status indicators
16. Schematic building plans
17. Building Information Card

##### Smoke Removal

A means of smoke removal in post-fire salvage operations must be provided in accordance with IBC 403.4.7. The means of smoke removal must be provided by natural or mechanical ventilation. Post-fire smoke purge can be achieved through natural or mechanical ventilation. Natural ventilation must consist of operable windows (panels distributed at maximum 50-foot intervals and with a total area of at least 40 SF per 50 linear feet of perimeter. Mechanical ventilation must provide one air change every 15 minutes with return and exhaust air moved directly to the outside.

##### 4.3 Standby and Emergency Power

Standby power must be provided for the following (IBC 403.4.8.3 and NFPA 101 Section 11.8.2.4.2):

1. Power and lighting for the FCC
2. Ventilation and automatic fire detection equipment for smokeproof enclosures
3. Elevators, including elevators provided for accessible means of egress and fire service access, where applicable
4. Mechanical equipment for smoke control systems
5. Electric fire pump
6. Jockey pump
7. Air compressor serving dry-pipe and pre-action systems

Emergency power must be provided for the following (IBC 403.4.8.4):

1. Exit signs and means of egress illumination
2. Elevator car lighting
3. Automatic fire detection systems
4. Fire alarm systems
5. Electrically powered fire pumps

##### 4.4 Means of Egress

Means of egress in high-rise buildings must comply with the additional provisions of IBC 403.5. These provisions include the following:

##### Remedies

Required interior exit stairways in the high-rise portions of the building must be separated by a distance of at least 20 feet or at least one quarter of the length of the maximum overall diagonal of the building or area served (whichever is least). This separation distance is measured in a straight line between the closest points of the stairway enclosures. The existing exit stairs comply with the remedies criteria.

##### Stairway Communication System

Stairway doors other than the discharge doors are permitted to be locked from the stairway side if they can be unlocked simultaneously from the FCC (IBC 403.5.3). If stairway doors are locked, a stairway communication system must be provided on at least every fifth floor. The communication system must connect to an approved constantly attended station (IBC 403.5.3.1).

##### Stairway Recessed

Since the stairs serve more than four stories, re-entry into other floors from inside the stairwells must be provided in accordance with NFPA 101 Sections 7.2.1.5.8 & 7.2.1.5.8.1 and the ME amendment to IBC 716.5.9.1.2 (NFPA 101 Section 18.2.2.9). All stair doors must release upon activation of the fire alarm system, unless selected re-entry is provided in accordance with NFPA 101 Section 7.2.1.5.8.1.

##### Smokeproof Enclosures

Every required exit stairway serving high-rise portions of the building must comply with the smokeproof enclosure requirements of IBC 909.20 and 1002.1 (IBC 403.5.4). The most common method for providing smokeproof enclosures in sprinklerized buildings is through stair pressurization complying with NFPA 101 Sections 7.2.1.5.8 & 7.2.1.5.8.1 and the ME amendment to IBC 716.5.9.1.2 (NFPA 101 Section 18.2.2.9). All stair doors must release upon activation of the fire alarm system, unless selected re-entry is provided in accordance with NFPA 101 Section 7.2.1.5.8.1.

##### Luminous Egress Path Markings

Luminous egress path markings must be provided throughout the exit stairs in the building in accordance with IBC 1025.

##### 4.5 Elevators

The following sections provide information regarding the elevator requirements.

##### Fire Service Access Elevators

A minimum of two fire service access elevators are required in buildings with an occupied floor greater than 120 feet above the lowest level of fire-resistance vehicle access where at least two elevators are provided (IBC 403.6.1). Based on the plans provided to AEF on January 17, 2018 the highest occupied floor (i.e. Level 7) is 112 feet 4 inches above the lowest level of fire-resistance vehicle access. Therefore, fire service access elevators are not required.

##### Other Elevator Lobbies

Enclosed elevator lobbies are required for all other elevators that serve high-rise levels within the building (IBC 2008.205). These lobbies are required to consist of smoke partitions complying with IBC 710. Doors penetrating the enclosed elevator lobby must comply with IBC 710.5.2, 710.5.2.3, and 716.5.9.2. Ducts and air transfer openings must comply with IBC 717.5.4.1. Elevator lobbies are being provided on both the new floors as well as the existing lower floors of the building with the exception of the level of exit discharge, as permitted by IBC 3006.2 Exception 2.

A two-way communication system must be provided at the landing elevator landing for each elevator or bank of elevators on each accessible floor above the level of exit discharge. The system must communicate between the elevator landing and the fire command center and the system must have both audible and visible signals. Directions for use of the system must be provided adjacent to the system (IBC 1009.8).

##### 5. HEIGHT & AREA

The lowest level of the building (i.e. the Basement) is considered a story above grade because the Ground Floor is more than 12 feet above ground level (IBC 202). Therefore, the building is 8 stories above grade.

High-rise buildings are permitted a reduction in the required fire-resistance ratings for building elements where sprinkler control valves are provided with supervisory initiating devices and water-flow initiating devices on each floor. Since the building is less than 420 feet in height, the fire-resistance ratings required for Type II construction may be used while granting unlimited height and area allowances per Type IA construction (IBC 403.2.1). NFPA 101 Table 18.1.6.1 permits 8-story healthcare buildings of Type II (222) construction.

##### 6. TYPE OF CONSTRUCTION

The following table summarizes the required ratings for modified Type IA construction (i.e. Type II) in accordance with IBC Table 601 and NFPA 1 Table A.12.2.1. These ratings also meet the requirements of Type II (222) per NFPA 101.

##### IBC Table 601 & NFPA 101 Table A.12.2.1 Fire-Resistance Rating Requirements for Building Elements (Hours)

Element	Required Rating (hours)
Primary structural frame (see Section 202)	2 <sup>+</sup>
Others	3 <sup>+</sup>
Bearing walls	2 <sup>+</sup>
Elevator	2 <sup>+</sup>
Nonbearing walls and partitions	See Table 602 discussion below.
Interior	0
Floor construction and secondary members (see Section 202)	2 <sup>+</sup>
Roof construction and secondary members	1

<sup>+</sup> Not less than the rating of the assemblies supported, i.e. shaft enclosures, etc.

The non-bearing exterior wall requirements for East Tower are based on the fire separation distance (FSD) of each wall. The FSD is measured perpendicular 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. Where the

FSD is greater than or equal to 30 feet, the non-bearing exterior walls do not require a fire-resistance rating.

Where Table 601 or 602 requires an exterior wall to be fire-resistance rated and the FSD is less than or equal to 10 feet, the wall must be rated to be exposed to a fire from both sides (IBC 705.5). The exterior walls are required to maintain their structural stability for the duration of the time indicated by the fire-resistance rating.

##### IBC Table 602 Fire-Resistance Rating Requirements for Exterior Walls Based on Fire Separation Distance

Fire Separation Distance = X (feet)	Group B, I-2, A-S
X < 5	1
5 ≤ X < 10	1
10 ≤ X < 20	1
X ≥ 20	0

Note: Unrated non-bearing exterior walls are permitted where the building is permitted to have unlimited unprotected openings (IBC Table 602, footnote (a)). See Section 7.1 for details.

Based on satellite images of the building and the site plan provided in the Visitor Garage Rent model (sent on August 7, 2017) East Tower is provided with a FSD of at least 20 feet around the entire exterior perimeter of the building. Therefore, non-bearing exterior walls are not required to be rated. It is our understanding that the East Tower, Richards, and Bean buildings are constructed as one building. Therefore, exterior wall protection is not required where the exterior walls of East Tower face either the Bean or Richards building. However, all exterior bearing walls must be 2-hr rated in accordance with the requirements for modified Type IA (i.e. Type II) construction.

##### 7. FIRE AND SMOKE PROTECTED FEATURES

##### 7.1 Exterior Walls & Opening Protectives

Openings in the exterior walls must comply with IBC 406.5.6 based on the FSD of each wall. The opening limitations are summarized below for modified Type IA (i.e. Type II) construction.

##### IBC Table 705.6 Maximum Area of Exterior Wall Openings Based on Fire Separation Distance and Degree of Opening Protection

Fire Separation Distance (feet)	Unprotected, Sprinklered	Allowable Area
X < 5	Unprotected, Sprinklered	Not Permitted
5 ≤ X < 10	Unprotected, Sprinklered	10%
10 ≤ X < 15	Unprotected, Sprinklered	45%
15 ≤ X < 20	Unprotected, Sprinklered	75%
X ≥ 20	Unprotected, Sprinklered	No Limit

Based on satellite images of the building and the site plan provided in the Visitor Garage Rent model (sent on August 7, 2017) East Tower is provided with a FSD of at least 20 feet around the entire exterior perimeter of the building. Therefore, unprotected openings are permitted in the building's exterior walls. Since East Tower, Richards, and Bean are constructed as one building, there are no opening protection requirements at adjacent walls.

##### 7.2 Shaft Enclosures

Vertical openings must be enclosed with shaft construction unless an alternative provision is in IBC 712 and NFPA 101 Section 8.6 is met. Shafts connecting four stories or more must be enclosed with at least 2-hour fire-resistance rated construction. Shafts connecting three stories or less must be enclosed with 1-hour rated construction (IBC 713.4 and NFPA 101 Section 8.6.5). It is our understanding that the 2-hour rated construction for the stair enclosure will be extended above the roof to provide additional protection between the stairs and the helipad structures.

##### 7.3 Corridors

In Group I-2 occupancies, corridors must be continuous to exits and separated from other areas with walls that comply with the requirements for smoke partitions (IBC 407.2 & 407.3 and NFPA 101 Section 18.3.6.1). Doors within corridor walls are not required to be fire-resistance rated; however they must be self-closing, be provided with positive latching hardware, and must provide an effective barrier to limit smoke spread (IBC 407.3.1 and NFPA 101 Sections 18.3.6.2.2, 18.3.6.3.1, & 18.3.6.3.5). Note that there are some spaces that are permitted to be open to corridors as outlined below.

##### Waiting Areas

Waiting areas that are open to corridors must comply with the following requirements (IBC 407.2.1 and NFPA 101 Section 18.3.6.1(2)):

1. Must be constructed as required for corridors;
2. Cannot contain sleeping rooms, treatment rooms, incidental uses, or hazardous uses;
3. The space must be protected by an automatic fire detection system complying with IBC 907.

The corridor into which the space opens must be protected by an automatic fire detection system that complies with IBC 907 or the smoke compartment is protected by quick-response sprinklers.

4. The corridor into which the space opens must be protected by an automatic fire detection system that complies with IBC 907 or the smoke compartment is protected by quick-response sprinklers.
5. The space cannot obstruct access to required exits;
6. The aggregate water area open to the corridor in each smoke compartment cannot exceed 600 SF.

##### Care Providers' Stations

Corridors may be open to spaces for care provider, supervisory staff, doctors' and nurses' changing, communications, and related clerical areas so long as such spaces are enclosed as required for corridors (IBC 407.2.2).

##### 7.4 Smoke Compartments

Level 6 and 7 must be divided into at least two smoke compartments, each with a maximum area of 22,500 SF (NFPA 101 Section 18.3.7.1). The smoke compartments must be separated by 1-hour rated smoke barriers with 20-minute opening protections complying with IBC 709 and NFPA 101 Sections 8.6.5 (IBC 407.5 and NFPA 101 Section 18.3.7.2).

Smoke dampers must be provided at each duct penetration of the smoke barrier unless one of the following conditions apply (780 CMR 717.5.5.8 NFPA 101 Section 18.3.7.2(2)):

1. The openings in the ducts are limited to a single smoke compartment and the ducts are constructed of steel.
2. The HVAC system is fully ducted in accordance with the IMC Section 603; and the building is fully sprinklered and the sprinkler system is equipped with quick-response sprinklers in accordance with Section 903.3.2.

##### Travel Distance

The travel distance from the most remote point in each smoke compartment to the smoke barrier door must be a maximum of 200 feet (IBC 407.5 and NFPA 101 Section 18.3.7.1(4)).

##### Refuge Area

Each smoke compartment must contain a refuge area sized to accommodate the required care occupants from adjacent smoke compartments. The refuge areas must be sized using a factor of 30 SF per person. Refuge areas may consist of corridors, sleeping areas, treatment rooms, lounges, dining areas, and other low-hazard areas (IBC 407.5.1 and NFPA 101 Section 18.3.7.1.5.1). Refer to the associated Life Safety Plans for illustrations of the refuge areas for each compartment.

##### Independent Egress

Means of egress from each smoke compartment must be arranged such that once occupants egress from a smoke compartment they are not required to return through the smoke compartment to evacuate the building (IBC 407.5.2 and NFPA 101 Section 18.2.4.4).

##### Horizontal Assemblies

Where horizontal assemblies support smoke barriers that are part of smoke compartments, such horizontal assemblies must be designed to resist the passage of smoke (IBC 407.5.3).

##### 7.5 Incidental Uses

IBC Table 509 and NFPA 101 Table 8.5 prescribe requirements for the protection of several incidental uses in Group I-2/healthcare occupancies. The requirements of these tables are provided below.

##### Incidental Uses

Room or Area	Separation and/or Protection	Code Section
Boiler and fuel-fired heater rooms	1 hour	NFPA 101 Table 18.3.2.1
Laboratories not classified as Group H	1-hour and provide automatic sprinkler system	IBC Table 509 & IBC Table 509.4
Laundry rooms over 100 SF	1 hour	IBC Table 509 & NFPA 101 Table 18.3.2.1
Physical plant maintenance shops	1 hour	NFPA 101 Table 18.3.2.1
Waste and linen collection rooms with containers that have an aggregate volume of 64 gallons or more	1 hour	NFPA 101 Table 18.3.2.1
Storage rooms less than 100 SF	1 hour	IBC Table 509
Storage rooms less than 100 SF but greater than 50 SF and storing combustible material	Smoke partition	NFPA 101 Table 18.3.2.1 & Section 8.7.1.2

##### 8. INTERIOR FINISH

The interior finishes of the walls, ceilings, and floors of the building are governed by IBC Chapter 8 and NFPA 101 Chapter 10. These chapters outline the testing requirements for the different surfaces. The required tests and finish classifications are summarized in the tables below.

##### Finish Characteristics

Element	Test Method	Criteria
Wall & Ceiling Finishes	ASTM E84 or UL 723	Class A = FSI 0-25, SDI 0-450 Class B = FSI 26-75, SDI 0-450 Class C = FSI 76-200, SDI 0-450
Floor Finish	NFPA 253	Class I = 0.45 W/cm <sup>2</sup> or greater Class II = 0.22 W/cm <sup>2</sup> up to 0.45 W/cm <sup>2</sup>

Note: FSI = Flame spread index, SDI = smoke-developed index.

##### Interior Wall and Ceiling Finishes by Occupancy (Sprinklered Building)

Use Group	Walls & Ceilings		Floors		Other spaces
	Exit enclosures and exit passageways	Corridors	Rooms and enclosed spaces	Exits and corridors	
B	B	C	C	DOC FF.1	DOC FF.1
I-2	B	B	B <sup>1</sup>	Class II	Class II
S-1, S-2, S-3	C	C	C	DOC FF.1	DOC FF.1

<sup>1</sup>Class C interior finish materials are permitted in rooms with a capacity of four persons or less.

The tables above show the required interior finish classifications throughout the building based on most restrictive requirements of IBC Table 803.1.1 and NFPA 101 Table A.10.2.2. All floors throughout the building must pass the DOC FF.1 "jill test".

##### 9. FIRE PROTECTION SYSTEMS

In addition to the systems discussed in Section 4 of this report, the following fire protection requirements also apply:

##### 9.1 Automatic Sprinkler System