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**Fire Protection/Life Safety
Chapter 34 Building Investigation & Evaluation Report**

Project:

The Worcshop
11 Hankey Street
Leicester, MA

Prepared for:

The Office of Penn Ruderman Architects
110 Gleasondale Rd.
Stow, MA 01775

Prepared by:

A handwritten signature in black ink, appearing to read 'Kevin N. Lynch'.

Kevin N. Lynch

Reviewed by:

A handwritten signature in black ink, appearing to read 'Jeff D. Perras'.

Jeff D. Perras, P.E.

February 2, 2021

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**CODE CONSULTING - FIRE PROTECTION ENGINEERING
CONSTRUCTION ADMINISTRATION - PERFORMANCE-BASED DESIGN**

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1. Introduction

The Office of Penn Ruderman Architects has retained Code Red Consultants to provide fire protection, life safety, and accessibility code consulting services for the Workshop Renovation project located at 11 Hankey Street, in Leicester, MA. The scope of the project includes alterations to the existing facility in order to facilitate its new use as a maker space.

The existing facility was originally constructed in 1927 and expanded over the years to its current footprint of approximately 52,000 GSF. The building was previously owned by Worcester Tool and Stamping Co. Inc. and used as industrial building for manufacturing and fabrication operations. The entire structure is 1-story in height, with 2 intermediate mezzanine/2nd floor levels located at different portions of the facility. A variety of construction types are present throughout, consisting of a mix of unprotected structural steel, brick masonry exterior walls, metal exterior walls, and combustible framing. Two automatic, wet-type sprinkler systems serve the facility, with deficiencies observed as outlined in Section 4.7.1 of this report. A fire alarm system consisting of a single audio-visual notification appliance is also provided in the building.



FIGURE 1: BUILDING EXTERIOR



FIGURE 2: BUILDING INTERIOR

The facility is proposed to consist of the following building portions as outlined in Figure 3. These areas are currently referred to as “Buildings” by ownership (i.e. Building 1, Building 2, etc.). For the purposes of this report, these numbered areas illustrated in Figure 3 are herein referred to as “Spaces” in order to prevent misinterpretation that these areas are separate buildings from a code perspective (i.e. Space 1, Space 2, etc.)

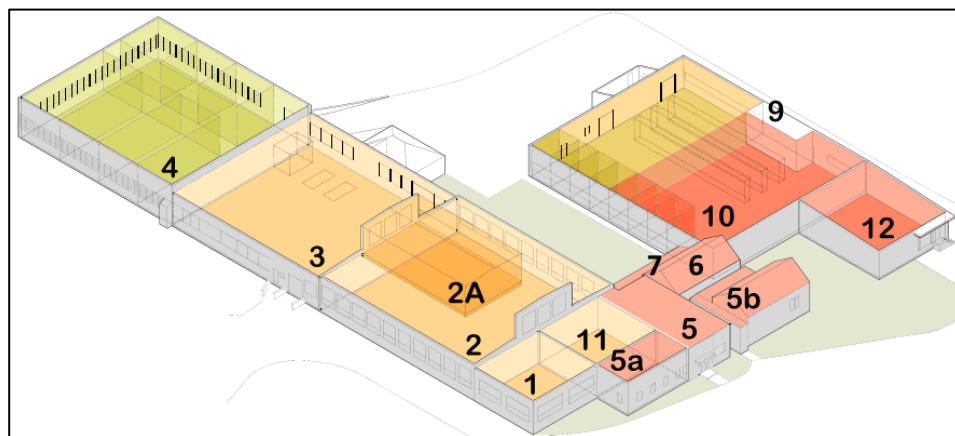


FIGURE 3: PROPOSED DIAGRAM

2. Applicable Codes

| | |
|----------------------|---|
| Building | 780 CMR – Massachusetts State Building Code 9 th Edition, which is an amended version of the 2015 International Building Code (IBC) 780 CMR 34.00, which is an amended version of the 2015 International Existing Building Code (IEBC), herein referred to as the MEBC. |
| Fire | 527 CMR 1.00 - Massachusetts Comprehensive Fire Safety Code, which is an amended version of the 2015 Edition of NFPA 1, Uniform Fire Code |
| Accessibility | 521 CMR – Massachusetts Architectural Access Board (MAAB) Rules and Regulations and the 2010 ADA Standards for Accessible Design |
| Electrical | 527 CMR 12.00 - Massachusetts Electrical Code, which is an amended version of the 2020 Edition of NFPA 70, National Electrical Code |
| Mechanical | 2015 International Mechanical Code (IMC) as amended by 780 CMR 28.00. |
| Plumbing | 248 CMR 10.00 – Uniform State Plumbing Code |
| Energy | 780 CMR 13.00, which is an amended version of the 2018 International Energy Conservation Code (IECC) or the 2016 ASHRAE 90.1 |
| Elevator | 524 CMR – Massachusetts Board of Elevator Regulations, which is an amended version of the 2013 ASME A17.1, Safety Code for Elevators and Escalators |
| Other | National Fire Protection Association (NFPA) Standards, as referenced by the above codes, including the following: <ul style="list-style-type: none">- 2013 NFPA 10: <i>Standard for Portable Fire Extinguishers</i>- 2013 NFPA 13: <i>Standard for the Installation of Sprinkler Systems</i>- 2014 NFPA 51B: <i>Standard for Fire Prevention During Welding, Cutting, and Other Hot Work</i>- 2013 NFPA 72: <i>National Fire Alarm and Signaling Code</i>- 2015 NFPA 484: <i>Standard for Combustible Metals</i>- 2013 NFPA 654: <i>Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids</i>- 2012 NFPA 664: <i>Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities</i> |

The primary intent of this document is to (1) coordinate the fire protection and life safety approach between all design disciplines, (2) demonstrate building, fire and life safety code compliance to the Authorities Having Jurisdiction per Section 104.2.2.1 of the Massachusetts Existing Building Code, and (3) serve as a record document for the building owner. Details of compliance are left to the construction documents and the contractors. This report is intended to address code requirements as enforced by Authorities Having Jurisdiction only. It is the responsibility of the design team to ensure that any owner or insurance carrier requirements, which may exceed the provisions of the applicable codes and standards, are met.

3. Existing Building Code Scoping Requirements

3.1 General Requirements

Portions of an existing building undergoing repair, alteration, addition, or a change of occupancy are subject to the requirements of the MEBC. In general, existing materials and conditions can remain provided they were installed in accordance with the code at the time of original installation and are not deemed a hazardous condition by an authority having jurisdiction (AHJ). All new work in existing buildings is required to comply with the materials and methods in accordance with 780 CMR, or the applicable code for new construction unless otherwise specified by the MEBC (MEBC 702.6). Alterations to an existing building or portion thereof are not permitted to reduce the level of safety currently provided within the building unless portion altered complies with the requirements of 780 CMR for new construction (MEBC 701.2).

Where compliance with the requirements of the code for new construction is impractical due to construction difficulties or regulatory conflicts, compliance alternatives may be approved by the building official. Any compliance alternatives being sought are required to be identified on the submittal documents (MEBC 104.11). **Refer to Section 3.2 for the compliance alternative being requested as part of the project in order to mitigate the lack of headroom provided at the mezzanine level.**

3.2 Means of Egress, Lighting and Ventilation

Regardless of the scope of work performed, the building official may cite any of the following conditions as not compliant, and require them to be mitigated or made safe (780 CMR 102.6.4):

- Inadequate number of means of egress: The number of exits serving every space and/or story must comply with 780 CMR 10.00.
 - **The building is being provided with a sufficient number of exits as part of the project.**
- Egress components with insufficient width or so arranged to be inadequate, including signage and lighting: Means of egress components must be of sufficient width to provide adequate exit capacity.
 - **The building is provided with sufficient egress capacity based on the calculated occupant load as outlined on the Life Safety Plans for the project.**
- Inadequate lighting and ventilation. Lighting levels and ventilation are to be provided for egress systems such that they are maintained as usable.
 - **Coverage of lighting and ventilations systems was not verified as part of the survey. It should be confirmed that the means of egress throughout the building is illuminated at all times and illumination levels are maintained to be greater than 1 foot-candle at walking surface as outlined in Section 4.8.10 of this Report. The emergency power system within the building is required to be provided for these features (780 CMR 2702.2).**

- Means of egress components that have not be maintained in a safe, operable, and sanitary condition. Means of egress are to be configured such they are safe and adequate in accordance with 780 CMR 10.00.
 - **The following noncompliant deficiencies associated with existing means of egress components were observed during the survey and are being corrected as part of the project:**
 1. Non-illuminated exit signage (780 CMR 1013.6 & 1013.5);
 2. Noncompliant guards (780 CMR 1015);
 3. Noncompliant handrails (780 CMR 1014);
 4. Surface bolts on egress doors (780 CMR 1010.1.9);
 5. Steps at exit discharge doors (780 CMR 1010.1.5 & 1010.1.7);
 6. Noncompliant changes in elevation (780 CMR 1003.5 & 1012);
 7. Doors with insufficient clear width (780 CMR 1010.1.1);
 8. Obstructed paths of egress (780 CMR 1003.6); and
 9. Open stair risers (780 CMR 1011.5.5.3).

3.3 Compliance Method & Classification of Work

The MEBC has 3 different compliance methods that can be used to evaluate a renovation project:

- Prescriptive Method (MEBC Chapter 4)
- Work Area Method (MEBC Chapters 5-13)
- Performance Method (MEBC Chapter 14)

The **Work Area Compliance Method** has been selected for use on this project (MEBC 301.1.2). The project includes the alterations to the existing building to facilitate the proposed program for the conversion to a maker space. The planned work primarily consists of the construction of new partial-height interior partitions, means of egress upgrades, building and life safety system upgrades, and the reconfiguration of existing rack storage shelves. Less than 50% of the floor area of the facility is being reconfigured as a result of the scope of work. The following changes of occupancy are also taking place respective to the areas shown in Figure 3:

- Space 3: Metal fabrication (Group F-1) to workspace (Group F-1 or Group B) and storage space (Group S-1)
- Space 4: Metal fabrication (Group F-1) to workspace (Group F-1 or Group B) and storage space (Group S-1).
- Space 10: Metal fabrication (Group F-1) to workspace (Group F-1 or Group B).
- Space 12: Shipping and receiving (Group S-1) to fabrication space (Group F-1).

Therefore, the planned work is classified as a mix of **Level 1 Alterations and Level 2 Alterations**, and a **Change of Occupancy** subject to compliance with MEBC Chapters 7, 8, and 10 (MEBC 503.1, 504.1, 506.1 & 202 – Work Area definition). An addition is not planned as part of the project.

The following are the definitions for each level of work:

Level 1 Alteration – Includes the removal and replacement of the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose (MEBC 503.1).

Level 2 Alteration – Includes the reconfiguration of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment in less than 50% of the aggregate building area (MEBC 504.1).

Change of Occupancy - A change in the use of the building or a portion of a building. A change of occupancy shall include any change of occupancy classification, any change from one group to another group within an occupancy classification or any change in use within a group for a specific occupancy classification (MEBC 202).

4. Fire Protection/ Life Safety Analysis

The following section has been prepared to illustrate compliance with the requirements of the MEBC based on the compliance method and classifications of work identified above. In general, new work is required to comply with the new construction requirements of 780 CMR unless otherwise stated herein (MEBC 702.4 & 801.3).

The observations outlined herein are based on visual observations made by Jeff Perras and Kevin Lynch of Code Red Consultants on November 5, 2020, progress design drawings dated January 11, 2021, and discussions with the design team. No destructive inspection or functional testing of building systems were performed as part of the evaluation.

4.1 Use and Occupancy Classifications

4.1.1 Primary Occupancies

The building was previously owned and operated by the Worcester Tool and Stamping Co. as a manufacturing facility with areas designated for fabrication (**Group F-1**) and office space (**Group B**).

The facility is proposed to serve as a maker space with the following occupancies listed in Table 1 below.

TABLE 1: PRIMARY OCCUPANCIES

| Description | 780 CMR Classification |
|--|--|
| Office Space | Group B (Business) |
| Wood Shop/ Machine Shop/ Metal Fabrication | Group F-1 (Moderate-Hazard Factory Industrial) |
| Storage | Group S-1 (Moderate-Hazard Storage) |

Small assembly spaces within office areas are permitted to be classified as part of the **Group B** occupancy in which they are located, provided these assembly spaces are less than 750 sf in area or have an occupant load that is less than 50 (780 CMR 303.1.2).

4.1.3 High-Hazard Group H

Based on the observed features provided in the areas housing hazardous materials, it is assumed by this Report that none of the spaces within the building constitute a Group H occupancy. A detailed analysis is planned as part of the project which will outline the quantity and classification of all chemicals included within the building in order to verify compliance with the Maximum Allowable Quantities per Control Area of 780 CMR Table 307.1(1) / Table 307.1(2), as applicable. The actual chemical classifications will be determined based on review of Safety Data Sheets (SDS's) for each chemical. These classifications may ultimately impact the hazard classification and required design of the fire protection systems protecting these areas. This Section of this Report will be updated once this analysis is complete.

4.1.4 Special Uses and Occupancies

4.1.4.1 Wood Shop

Wood shops are required to comply with 527 CMR 1.00 Chapter 40 and NFPA 664 (780 CMR 426.1 & 527 CMR 1.00, 40.1).

4.1.4.2 Metal Fabrication

The facility is anticipated to contain a variety of metal fabrication and processing equipment including welders, cutting and grinding machinery, lathes and other metal processing tools.

Equipment, processes, and operations that involve the manufacture, processing, blending, repackaging, and handling of combustible particulate solids or combustible dusts, regardless of concentration is required to be installed and maintained in accordance with the requirements of 527 CMR 1.00 Chapter 40 and NFPA 484 (780 CMR 426.1 & 527 CMR 1.00, 40.1).

All welding, cutting, and hot work operations are required to be in accordance with 527 CMR 1.00 Chapter 41, NFPA 484, and NFPA 51B.

4.2 Construction Type

4.2.1 Existing Construction Classification

A variety of construction types are present throughout, consisting of a mix of unprotected structural steel, brick masonry exterior walls, metal exterior walls, and combustible framing without any true building separations. The majority of the facility primarily consists of unprotected steel structure that is most consistent with Type IIB construction. The office wing consists of combustible construction and most closely represents Type VB construction.



FIGURE 4: OFFICE WING COMBUSTIBLE FRAMING (TYPE VB CONSTRUCTION)



FIGURE 5: UNPROTECTED STEEL JOISTS (TYPE IIB CONSTRUCTION)

Limited quantities of combustible construction were observed throughout Type IIB portions of the facility including framing and interior partitions. It should be confirmed that all combustible construction in the Type IIB portion of the building is in accordance with 780 CMR 603.1, previously permitted, or otherwise approved by the building official.

4.2.2 Height and Area Limitations

Compliance with new construction height and area limitations is required for projects including a change of occupancy to a higher hazard classification per MEBC Table 1012.5 or an addition (MEBC 1012.5 & 1102).

The change of occupancy throughout Spaces 3, 4, 10, and 12 do not require compliance with new construction height and area limitations since the relative hazard of the proposed occupancies (Group B, F-1 and S-1) per MEBC Table 1012.5 are considered lesser or equal hazards to the existing occupancy (Group F-1) (MEBC Table 1012.5.2).

The existing height and area of the entire facility is as follows:

- Footprint Area: 52,841 ft.²
- Aggregate Area: 56,678 ft.²
- Height: 2 Stories/ ~40 ft.

4.2.3 Fire Resistance Rating of Building Elements

As part of the renovation project the existing construction types are required to be maintained. Unless otherwise required to have a higher fire resistance rating by other sections of this Report, the following table indicates the minimum fire-resistance ratings based on construction type (780 CMR 601).

TABLE 2: FIRE RESISTANCE RATINGS

| Building Element | Type IIB/ VB |
|--|----------------------|
| Primary Structural Frame | 0 Hour |
| Interior Bearing Walls | 0 Hour |
| Exterior Bearing Walls | 0 Hour |
| Exterior Nonbearing Walls | Refer to Section 4.3 |
| Floor Construction and Secondary Members | 0 Hour |
| Roof Construction and Secondary Members | 0 Hour |

1. Not less than the rating of supported elements, such as stairs and shafts (780 CMR 704.1).

4.2.4 Mezzanines

Upgrades to the existing mezzanine located at Space 2 are not required to take place unless otherwise noted in another Section of this report (MEBC 701.2). The aggregate area of the mezzanine does not exceed one-third the floor area of space in which it is located (780 CMR 505.2.1).

4.3 Exterior Walls

Existing exterior walls are not required to be altered or upgraded as part of a renovation and are permitted to be replaced in kind (MEBC 701.2 & 1012.5). Alterations are required to comply with the code for new construction.

The opening limitations for new or altered exterior walls are based on the fire separation distance for each wall, measured from the building face to the closest interior lot line, the centerline of a street, alley, or public way, or to an imaginary lot line between two buildings (780 CMR 202). The table below indicates the opening limitations required for the exterior walls based on fire separation distance of a fully sprinklered building (780 CMR 602 & 705.8).

TABLE 3: EXTERIOR WALL FIRE RATING AND OPENING LIMITATIONS

| Fire Separation Distance (ft) | Rating | Allowable Area |
|-------------------------------|--------|----------------|
| $0 \leq X < 3$ | 1 Hour | Not Permitted |
| $3 \leq X < 5$ | 1 Hour | 15% |
| $5 \leq X < 10$ | 1 Hour | 25% |
| $X \geq 10$ | 0 Hour | No Limit |

All exterior elevations of the building have a fire separation distance of at least 10 feet, permitting nonrated construction with unlimited unprotected openings.

4.4 Interior Walls

4.4.1 Fire/Smoke Resistive Assemblies

Alterations to existing rated walls are required to maintain the existing level of safety provided within the building, including new penetrations of these assemblies. New assemblies are required to comply with the code for new construction (MEBC 801.3).

New rated assemblies are not required or planned as part of the project.

The existing boiler room was observed to be provided with 90-minute rated opening protectives, which is required for 2-hour rated construction. Unprotected openings and unsealed penetrations were observed at this enclosure. These openings and penetrations are required to be repaired or sealed in order to meet the required fire resistance rating of the room as originally constructed (780 CMR 102.8).



FIGURE 6: 90-MINUTE RATED FIRE DOOR



FIGURE 7: ENCLOSURE OPENING

4.4.2 Penetrations

New penetrations of existing fire-resistance-rated walls that are not protected with dampers are required to comply with this section. Ducts and air transfer

openings that are protected by dampers are required to comply with Section 4.4.4 of this report. Existing penetrations in the work area that are not protected with fire stopping are also required to comply with this section.

New through and membrane penetrations of fire-resistance-rated walls are required to be protected by an approved penetration firestop system installed as tested in accordance with ASTM E 814 or UL 1479, with a minimum positive pressure differential of 0.01 inch of water (780 CMR 714.3 & 714.4). Penetrations of fire-resistance-rated walls must have an F rating of not less than the required fire-resistance rating of the wall penetrated (780 CMR 714.3.1).

4.4.3 Doors and Fire Shutters

New doors, fire shutters, and their corresponding components are required to have fire-resistance ratings and meet the required testing standards as specified in Table 4. All doors and fire shutters required to be fire-resistance-rated must be designed, installed, and labeled in accordance with NFPA 80 (780 CMR 716.5).

TABLE 4: FIRE & SMOKE DOOR RATING SUMMARY TABLE

| Wall Type | Required Wall Rating | Minimum Fire Door Rating | Performance Criteria for Doors/Shutters ¹ |
|---------------|----------------------|--------------------------|--|
| Fire barriers | 2-hours | 1½-hours | NFPA 252 or UL 10C / NFPA 252 or UL 10B |
| | 1-hour | ¾-hour | |

2. 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 716.5.9.1).

No new fire doors or fire shutters are to be located within rated assemblies as part of the scope of work.

4.4.4 Ducts and Air Transfer Openings

Where new dampers are installed, they must be listed and bear the label of an approved testing agency (780 CMR 717.3.1). Fire dampers must be tested in accordance with UL 555 and smoke dampers must be tested in accordance with UL 555S. Combination fire/smoke dampers must comply with both test standards.

Fire dampers are required to be rated for 1.5 hours, unless they are installed in a 3-hour or greater assembly, in which case they are required to be 3-hour rated (780 CMR 717.3.2.1). Smoke damper leakage ratings must be Class I or II. Elevated temperature ratings must not be less than 250°F (780 CMR 717.3.2.2). Combination fire/smoke dampers must comply with both rating requirements (780 CMR 717.3.2.3). Refer to 780 CMR 717.3.3 for required damper actuation methods.

Fire, smoke, and fire/smoke dampers are required to be provided with an approved means of access that permits inspection and maintenance of the damper and its operating parts (780 CMR 717.4). Access points are required to

have permanent labels with letters that are not less than ½ inch in height that reads “FIRE/SMOKE DAMPER, SMOKE DAMPER, or FIRE DAMPER”.

4.5 Vertical Openings

The building is provided with an existing two-story open stair connecting the First and Second Floors within the existing office wing. **This stair is permitted to remain unenclosed since the building is being provided with sprinkler coverage throughout as part of the project and only connects two stories (MEBC 803.2.1 & 780 CMR 1019.3(1)).**

Portions of the facility undergoing a change of occupancy as part of the project are 1-story in height and do not contain vertical openings. Therefore, no further compliance is necessary.

4.6 Interior Finishes & Furniture

4.6.1 Wall and Ceiling Finishes

The interior finish of walls and ceiling in the work area and any exits or corridors within the work area are required to comply with the code for new construction (MEBC 803.4). In areas of the building undergoing a change of occupancy classification, the interior finish of walls and ceilings are required to comply with the new construction requirements for the new occupancy classification in accordance with 780 CMR (MEBC 1012.3).

Table 5 outlines the minimum interior wall and ceiling finish requirements for new construction (780 CMR 803.11). It should be noted that Chapter 8 of 780 CMR contains other requirements for interior finishes, which vary based the type of finish selected (i.e. textile wall coverings). As finishes are selected, it should be verified that they comply with these requirements.

TABLE 5: INTERIOR WALL & CEILING FINISH REQUIREMENTS ¹

| Occupancy Classification | Exit Enclosures | Corridors, Exit Access Stairways/Ramps | Rooms and Enclosed Spaces |
|--------------------------|-----------------|--|---------------------------|
| B | Class A or B | Class A, B or C | Class A, B or C |
| F-1/S-1 | Class A, B or C | Class A, B or C | Class A, B or C |

1. Interior finishes are grouped in the following classes: Class A – flame spread index 0-25, Class B – flame spread index 26-75, Class C – flame spread index 76-200. All classes must have a smoke-developed index that does not exceed 450 (780 CMR 803.1.1).

4.6.2 Interior Floor Finish

Existing floor finishes are permitted to remain as is. New floor finishes and coverings of a traditional type, such as wood, vinyl, linoleum or terrazzo, and resilient floor covering materials that are not comprised of fibers are permitted throughout (MEBC 702.2 & 780 CMR 804.1 Exception). Other interior floor covering materials are required to comply with the requirements of the DOC FF-1 “pill test” (CPSC 16 CFR Part 1630) (780 CMR 804.4.1 Exception).

4.7 Fire Protection Systems

4.7.1 Automatic Sprinkler Systems

The existing building is provided with two automatic, wet-type sprinkler systems that are each fed by separate risers. The following sprinkler system deficiencies were observed throughout the complex:

- Spare sprinklers were observed to be dated 1944 and loaded with foreign material (i.e. dust, debris, etc.). Sprinkler heads in service for at least 75 years are required to be tested or replaced in accordance with NFPA 25, 5.3.1.1.1.5.
- Storage at the ceiling joists was observed to be within 18" of sprinklers located at the ceiling, thus obstructing sprinkler coverage (NFPA 13, 8.6.5.2).
- Sprinklers located within 4" of walls. The minimum distance the sprinkler is permitted to be from the wall is 4" (NFPA 13, 8.6.3.3).

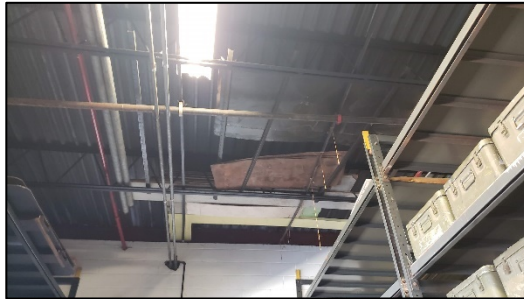


FIGURE 8: STORAGE AT CEILING



FIGURE 9: 1944 SPRINKLER HEAD



FIGURE 10: SPRINKLER ASSEMBLY (SPACE 10)



FIGURE 11: SPRINKLER ASSEMBLY (SPACE 3)

A survey has been conducted by a licensed Fire Sprinkler Contractor in order to identify deficiencies associated with the existing systems, required corrective actions, and additional alterations to provide full coverage per the scope of work (MEBC 1012.2.1).

Coverage of the existing sprinkler system is required to be maintained and extended as necessary in accordance with the 2013 NFPA 13 as part of the renovation (MEBC 703.1). Areas undergoing a change of occupancy are

required to be provided with sprinkler system coverage based on the new occupancy (MEBC 1012.2.1).

4.7.2 Fire Extinguishers

Portable fire extinguishers were observed to be provided throughout the building and last inspected October, 2020. **As part of this renovation, fire extinguisher coverage should be maintained/reconfigured as necessary to comply with NFPA 10, 780 CMR and 527 CMR.**

4.7.3 Fire Alarm and Detection Systems

A single audio-visual notification appliance is located within Space 3, and was the only fire alarm system appliance observed throughout the existing facility during the survey. Operation of the existing fire alarm system was not confirmed during the survey. An evaluation of the existing fire alarm system was recently conducted by a licensed Fire Alarm Contractor to determine its existing capabilities and planned upgrades as part of the project.

Fire alarm system coverage is required to be provided to monitor the sprinkler system and an provide coverage the work areas and spaces undergoing a change of occupancy as part of the project in accordance with NFPA 72 and 780 CMR Section 907 (780 CMR 102.8 & 903.4; MEBC 804.4).

4.8 Means of Egress

Existing means of egress, that have been maintained as originally designed and constructed, are permitted to remain unless deemed hazardous by the building official (780 CMR 102.6.4). Newly constructed or reconfigured means of egress and alterations to the means of egress are required to comply with the code for new construction (MEBC 803.2). The means of egress serving spaces undergoing a change of occupancy are required to comply with MEBC Section 805 and 905 (MEBC 1012.4.2).

4.8.1 Occupant Load

The number of occupants is computed at the rate of one occupant per unit of area (780 CMR 1004.1.2). Factors anticipated to be used on this project are listed in the table below. The occupant load is permitted to be increased from the occupant load established for the given use where all other requirements of 780 CMR are met (780 CMR 1004.2).

TABLE 6: OCCUPANT LOAD FACTORS

| Function of Space | Occupant Load Factor |
|--|----------------------|
| Assembly, Standing Space | 5 net |
| Assembly, Concentrated (Chairs Only) | 7 net |
| Assembly, Unconcentrated (Tables & Chairs) | 15 net |
| Office/ Shops | 100 gross |
| Storage/MEP | 300 gross |

Refer to the Life Safety Plans which outline detailed occupant load calculations.

4.8.2 Egress Width Factors

The required egress capacity for any means of egress component is based on the following capacity factors (780 CMR 1005.3.1 & 1005.3.2):

TABLE 7: EGRESS WIDTH FACTORS

| Stairways (inches of width per person) | All Other Components (inches of width per person) |
|---|--|
| 0.3 | 0.2 |

Refer to the Life Safety Plans which summarize the egress capacity of the building.

4.8.3 Number of Exits

The number of exits required from every story is not permitted be less than that specified in Table 8 (780 CMR 1006.2.1).

TABLE 8: MINIMUM NUMBER OF EXITS REQUIRED

| Occupant Load | Number of Exits Required |
|----------------------|---------------------------------|
| 1 – 500 | 2 |
| 501 – 1,000 | 3 |
| > 1,000 | 4 |

Two exits or exit access doorways are also required to be provided from any new space where the occupant load or common path of travel distances in the following table are exceeded (780 CMR 1006.2.1):

TABLE 9: SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY

| Occupancy | Maximum Occupant Load | Maximum Common Path of Travel Distance |
|------------------|------------------------------|---|
| B/F-1 | 49 | 100 feet |
| S-1 | 29 | 100 feet |

Where two exits or exit access doorways are required from any new portion of the exit access as outlined above, the exit doors or exit access doorways are required to be placed a distance apart equal to not less than 1/3 of the length of the maximum overall diagonal dimension of the building or area served (780 CMR 1007.1.1).

4.8.4 Exit Access Travel Distances

Exit access travel distances is not permitted to exceed the maximum values specified in the table below for newly reconfigured areas (780 CMR 1017.1).

TABLE 10: EXIT ACCESS TRAVEL DISTANCES

| Occupancy | Maximum Exit Access Travel Distance |
|-----------|-------------------------------------|
| F-1/S-1 | 250 feet |
| B | 300 feet |

4.8.5 Corridors

The width of new corridors is not permitted to be less than that specified in the table below or as determined using the egress factors in based on the occupant load served (780 CMR 1020.2).

TABLE 11: MINIMUM CORRIDOR WIDTH

| Occupancy | Minimum Width |
|--|---------------|
| Access to and utilization of MEP equipment | 24 inches |
| With a required occupancy capacity < 50 people | 36 inches |
| Any areas not listed above | 44 inches |

Where more than one exit or exit access doorway is required, the exit access is required to be arranged such that any dead ends in the corridor do not exceed that specified in the following table (780 CMR 1020.4).

TABLE 12: MAXIMUM DEAD END CORRIDOR LENGTH

| Occupancy | Maximum Dead End Length ¹ |
|-----------|--------------------------------------|
| B/F-1/S-1 | 50 feet |

1. A dead end corridor is not limited in length where the length of the dead end corridor is less than 2.5 times the least width of the dead end corridor (780 CMR 1020.4(3)).

4.8.6 Doors

All doors in the work area and in portions of the building undergoing a change of occupancy are required to swing in the direction of exit travel (MEBC 805.4.2 & 1012.4.1). New doors are required to comply with 780 CMR Section 1010.

Major requirements include:

- Width. Doors are required to be a minimum of 32 inches in clear width and are not permitted to have a swinging door leaf greater than 48 inches in nominal width (780 CMR 1010.1.1).
- Landings. Level landing are required to be provided on each side of the door (780 CMR 1010.1.5 & 1010.1.6).
- Door Swing. Egress doors are required to be of the pivoted or side-swinging type and are required to swing in the direction of egress travel where serving an occupant load of 50 or more persons (780 CMR 1010.1.2).

- Locking. Except as specifically permitted by 780 CMR Section 1010.1.9, doors are required to be readily operable in the direction of egress travel.
- Doors in Series. Space between two doors in series is required to be a minimum of 48 inches plus the width of the door swinging into the space. Doors in series are required to swing either in the same direction or away from the space between the doors (780 CMR 1010.1.8).
- Electrical Rooms. Electrical rooms with equipment rated over 1,200 amperes or more and over 6 feet in width that contain overcurrent devices, switching devices, or control devices with exit or exit access doors are required to be equipped with panic hardware or fire exit hardware and swing in the direction of egress travel (780 CMR 1010.1.10).

4.8.7 Stairs

Existing stairways are permitted to remain (MEBC 704.1 1012.4). In the event stairs are altered as part of the project, they are required to be constructed in accordance with 780 CMR 1011. Major requirements include:

- Width. Minimum clear width of 44" (780 CMR 1011.2)
- Headroom. Minimum headroom of 80" (780 CMR 1011.3)
- Riser Height. Maximum 7" riser height (780 CMR 1011.5.2)
- Riser Depth. Minimum 11" riser depth (780 CMR 1011.5.2)
- Landings. Compliant landings at the top and bottom of runs (780 CMR 1011.6). Maximum 12-foot vertical rise between landings (780 CMR 1011.8)
- Handrails. Handrails within 30" of required egress width (780 CMR 1011.11 & 1014.6)

4.8.8 Guards

Existing guards are permitted to remain provided they are not in danger of collapsing (MEBC 805.11.1). Where new guards are installed, they are required to be provided in accordance with 780 CMR Section 1015.

4.8.9 Exit Signage

Exit and exit access doors are required to be marked by an approved exit sign readily visible from any direction of egress travel (780 CMR 1013.1). The path of egress travel to exits and within exits is required to be marked by readily visible exit signs to clearly indicate the direction of egress travel where the exit or path of travel is not immediately visible. Exit signs within corridors are required to be placed such that no point is more than 100 feet or the listed viewing distance for the sign, whichever is less, from the nearest visible exit sign. Exit signs are not required in rooms or areas that require only one exit or means of exit access.

Exit signage coverage is required to be maintained/reconfigured in accordance with 780 CMR 1011 as part of this project.

4.8.10 Egress Illumination

The means of egress, including the exit discharge, is required to be illuminated at all times the building served by the means of egress is occupied (780 CMR 1008.1). The illumination level is not permitted to be less than 1 foot-candle at the walking surface (780 CMR 1008.2.1)

In the event of power supply failure, an emergency electrical system is required to automatically illuminate all of the following areas (780 CMR 1008.3):

- Spaces that require two or more means of egress.
- Corridors and interior exit access stairways.
- Exterior landings for exit discharge doorways.

The emergency power system must provide power for a duration of not less than 90 minutes and must consist of storage batteries, unit equipment, or an on-site generator (780 CMR 1008.3.4). The initial illumination must be an average of 1 foot-candle and a minimum at any point of 0.1 foot-candle measured along the path of egress at the floor level. Illumination levels are permitted to decline to 0.6 foot-candle average and a minimum of 0.06 foot-candle at the end of the emergency lighting time duration (780 CMR 1008.3.5).

Emergency lighting was observed to be lacking throughout the facility and is recommended to be upgraded to comply with the code for new construction as part of this project.

4.9 Standby/Emergency Power Systems

Regardless of the scope of work, alterations to the existing standby/ emergency power supply are not permitted to reduce the level of safety currently provided within the building unless portion altered complies with the requirements of 780 CMR for new construction (MEBC 701.2).

4.10 Accessibility

The building is required to meet the requirements of 521 CMR, Massachusetts Architectural Access Board (MAAB) and the Americans with Disabilities Act (ADA).

4.10.1 Massachusetts Architectural Access Board Regulations (521 CMR)

The requirements of 521 CMR are limited to buildings or portions thereof that are open to the public. Employee-only spaces are exempt from these requirements. 521 CMR Section 3.3 contains the following scoping requirements for projects in existing buildings. The costs referred to in the scoping requirements below are cumulative for all projects to the building within a rolling 36-month period:

1. If the work is less than \$100,000, then only the work being performed is required to comply with 521 CMR.

2. If the work costs more than \$100,000 but is less than 30% of the full and fair cash value of the building then in addition to the working being performed, the following accessible features are also required to be provided in the building:
 - a. Accessible entrance
 - b. Accessible toilet room
 - c. Accessible drinking fountain (if provided)
 - d. Accessible public telephone (if provided)
3. If the work, and all permitted work within a 36 month rolling window, costs more than 30% of the full and fair cash value of the building (prorated based on public spaces), then all public portions of the building are subject to the requirements of 521 CMR.

It is our understanding that the cumulative cost of this project and all work conducted within the past 36-month period will not exceed the \$100,000. Based on this, only the work performed is required to comply with 521 CMR as outlined above.

4.10.2 2010 ADA Standards

The American with Disabilities Act (ADA) is federal civil rights law enacted in 1990 and enforced by the U.S. Department of Justice (DOJ). Title III of the ADA requires that the design, construction and alteration of state owned buildings and facilities be carried out in a manner that is accessible and usable by people with disabilities. Where discrepancies exist between the ADA and 521 CMR, the regulation that provides the greater level of accessibility must be followed. Though 521 CMR does not regulate employee only areas, Title III makes it clear that employee-only areas are required to comply with the 2010 ADA Standards.

The 2010 ADA Standards require altered portions of an existing building to be readily accessible to and usable by individuals with disabilities to the maximum extent feasible (ADA 35.151(b)). Further, alterations to primary function areas should be made such that the level of accessibility, including the path of travel to the space, is made accessible to the maximum extent feasible. When determining if the upgrade is feasible, the ADA requirements state that the upgrade to the path of travel is disproportionate to the project when the cost to perform the work exceeds 20% of the cost of the alteration to the primary function area

4.11 Plumbing Fixtures

248 CMR 10.00, *Uniform State Plumbing Code*, regulates the minimum number of plumbing fixtures. The requirements set forth in 248 CMR 10.10(18) Table 1: Minimum Facilities for Building Occupancy apply to plumbing system installation, alteration, or extension projects in which the plumbing work begins on or after June 3, 1994. The minimum number of plumbing fixtures are based upon the use and occupancy classification of the building or space and the population as established by the authority having jurisdiction. The following table outlines the plumbing fixture requirements for the building.

TABLE 13: PLUMBING FIXTURE FACTORS

| Use Group | Toilets | | Urinals | Lavatories Per Sex | Drinking Fountains | Service Sink | Bath/ Shower |
|--------------------------|----------|----------|---------------------|-----------------------|-----------------------|-----------------|-----------------|
| | F | M | | | | | |
| Office | 1 per 20 | 1 per 25 | 33% substitution | 1 per 50 | 1 per floor | 1 per floor | N/A |
| Industrial (Employee) | 1 per 15 | 1 per 20 | 1 per 40 | 1 per 30 | 1 per 15 | 1 per floor | 1 per 15 |

Single-user gender-neutral toilet fixtures are permitted to be substituted for gender-designated toilet fixtures provided that all fixtures are designated as gender neutral or gender-neutral toilets are provided in increments of two (248 CMR 10.10(18)(r)). A gender-neutral toilet fixture is only permitted to be counted once toward the minimum fixture requirements. All gender-neutral toilet rooms are required to be fully accessible in accordance with 521 CMR Chapter 30.

Where the occupant load of a story is increased by more than 20 percent, plumbing fixtures for the story are required to be provided based on the increased occupant load (MEBC 810.1). Where the occupancy of an existing building is changed such that the new occupancy is subject to increased or different plumbing fixture requirements, the new occupancy is required to comply with the intent of the provisions outlined in 248 CMR.

Based on the factors provided in Table 13, an evaluation of the expected number of occupants and the existing number of plumbing fixtures is summarized below.

TABLE 14: PLUMBING FIXTURE CALCULATIONS

| Occupant Load | Classification | Water Closets | | Male Urinals | Lavatories Per Sex | Drinking Fountains | Service Sink | Showers Per Sex |
|--------------------------------|---------------------------|---------------|----------|-------------------|--------------------|----------------------|--------------|-----------------|
| | | Female | Male | | | | | |
| 80 | Office (Workshop Members) | 1 per 20 | 1 per 25 | 0.33 ^A | 1 per 50 | 1 per floor | 1 per floor | - |
| | Required fixtures | 2.00 | 1.60 | 0.53 | 0.80 | 1 | - | - |
| Total Required Fixtures | | 2 | 2 | 1 | 1 | 1^B | 1 | - |
| Total Provided Fixtures | | 2 | 2 | 1 | 1 | 0 | 1 | - |
| 15 | Industrial (Employee) | 1 per 15 | 1 per 20 | 1 per 40 | 1 per 20 | N/A | 1 per floor | 1 per 15 |
| | Required fixtures | 0.33 | 0.25 | 0.13 | 0.25 | 0 | 1 | 0.67 |
| Total Required Fixtures | | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| Total Provided Fixtures | | 1 | 1 | 1 | 1 | 0 | 1 | 0 |

^A Permitted to be substituted for male water closets.

^B Permitted to be substituted for a water station without a drain.

As shown above the building is provided with a sufficient number of plumbing fixtures based on the expected population with exception to the bath/shower required for Industrial Employees, and a drinking fountain. As a result of the project, it is anticipated that the expected population within the building will not

increase the existing occupant load of the building by more than 20% (MEBC 810.1). Therefore, no further compliance is required.

4.12 Energy Code

Except as specified in the 2015 IECC, the energy code does not require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system law-fully in existence at the time of adoption of this code (2015 IECC C501.2). Alterations to any building or structure shall comply with the requirements of the code for new construction. Alterations shall be such that the existing building or structure is no less conforming to the provisions of this code than the existing building or structure was prior to the alteration. Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code. Alterations shall not create an unsafe or hazardous condition or overload existing building systems (2015 IECC 503.1). Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with the code for new construction (2015 IECC 505.1).