

BUILDING CODE ANALYSIS

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Project Description:

Central School Renovations
20 Academy St. Arlington, MA

October 30, 2018, Rev. 4.8.19

Overview:

The existing building is an original 19th C. structure, a major 1984 renovation and subsequent minor modifications. The basement and first floors are to be altered for reuse as a senior center and the second floor for various town offices and existing rental space that is to remain. The third and fourth floors are rented by the Arlington Center for the Arts (ACA) and MYRNA.

Alteration Level 3,

Work includes complete alteration to Ground Floor (Basement) and 1st Floor plus partial changes to 2nd Floor in this permit application. The crawl space under the ground floor is not within the defined work area for this project. Even though some access is required to make plumbing, mechanical and fire protection connections, no new construction will take place there.

When combined with tenant improvements also being proposed as a separate project, on Floors 3 & 4, alterations will exceed 50% of the building area, thus triggering the Level 3 Alterations.

Applicable Building Codes

- 780 CMR, Massachusetts Building Code, 9th Edition (referenced to 2015 IBC with MA Amendments)
- 521 CMR, Massachusetts Architectural Access Board, Rev. 1.27.06
- 248 CMR, Massachusetts Fuel Gas and Plumbing Code
- 2015 International Energy Conservation Code
- 2015 International Existing Building Code
- 2015 International Mechanical Code

Occupancy Type:

There will be no change in the existing building Use Classification: mixed use, B (Business) & A-3 (Assembly).

- B Business Activities in Basement, and 2nd floor
- A-3 Public Assembly – First Floor Main Hall served by proposed commercial kitchen.

Occupant Load & Assumptions:

Refer to egress calculations and spreadsheets on the 3rd and 4th pages.

Construction Type:

- Type “IIIB” Unreinforced Masonry building with wood subfloors; a wood framed and slate roof; & brick siding with wood trim.
- Fire Protection: Sprinkler System
- Automatic Fire Protective Signaling System: Existing system is code compliant.
- Required Component Ratings of IIIB per Table 601:
 - Loadbearing Exterior Walls 2 hrs
 - Non-loadbearing Exterior Walls (>30’) 0 hrs*

- Non-loadbearing Interior Walls 0 hrs
- Floor Construction 0 hrs
- Roof Construction 0 hrs

*Except as noted otherwise, no added fire resistance rating of the exterior wall is required due to Table 602 requirements based on fire separation distance from property lines.

Structural Code Compliance:

Section 807.6 & 907 of the IEBC regulations are met as follows.

- There will be new headers where bearing walls are modified to make wider openings. The new headers shall be anchored to the existing structure in such a way as to provide lateral stability as well as gravity load support in compliance with the IBC 2015.

Height & Area Limitations: with no change in use, existing non-conforming height is allowed to remain.

- Classified as B & A3 Occupancy
- IBC limits A-3 use to 3 stories in a Type IIIB construction, sprinklered building. In Type IIIB, the Business use can be 4 stories. The ground floor is actually a basement by definition. Therefore, the building is a 4 story building.

Fire Rated Separation

- Mechanical Rooms, including boiler and furnace rooms, and storage rooms in B Use buildings are not required to have a fire resistance rated separation.
- Stairs, Per 1009.6.3, areas under stairs must be provided with 1 hr separation within enclosed usable space.
- Exterior Walls: No wall of the subject building is closer than 30 feet to the property line. Therefore no exterior wall ratings are required.
- Exterior Openings - All of the exterior walls in the building have a fire separation distance greater than 20 feet, Therefore, the exterior walls are allowed to have unlimited window and door openings. Therefore, existing exterior wall openings are allowed to remain.

Fire Protection – Per 804.4 & 904 of the IEBC & NFPA 72. Because of no change in occupancy, existing system to be unchanged unless required by Arlington Fire Department.

*Note: 804.4.1, Exception, Existing previously approved fire alarm system may remain.

**Superseding note: MGL Chapter 148 Section 26G:

“Every building or structure, including any additions or major alterations thereto, which totals, in the aggregate, more than 7,500 gross square feet in floor area shall be protected throughout with an adequate system of automatic sprinklers in accordance with the provisions of the state building code.”

The Central School is clearly in excess of 7,500 SF and the amount of work done on the building within 5 years will have exceeded 33% of the assessed value of the building (thus “major alterations”). The two floors of currently proposed alterations will be protected throughout with automatic sprinklers in accordance with the state building code. However, the unprotected 30” crawl space under the ground floor is virtually inaccessible with only 14 – 16” clear under the bottom of the floor joists. Sprinklering this windowless space below the first floor is not triggered by the provisions of IEBC for Level 3 Alterations because it is outside the defined work area. However, it can be interpreted as being triggered by MGL Chapter 148 Section 26G. This crawl space is not an occupied

space in any way, and contains no motors, or other mechanical equipment. Adding sprinklers to the crawl space would require complete removal of the entire ground floor construction to gain access to the space at great expense. Completely filling this 17,870 cubic foot crawl space with non-combustible insulation would provide little improved safety. We propose adding heat detectors instead as a compliance alternative, allowed by Section 104.10, Modifications. Regarding existing floors outside the work area, it appears that the upper three floors are already protected by an NFPA 13 compliant system of automatic sprinklers.

Fire Alarm – 904.2.1 –Existing alarms that do not need to be upgraded or replaced due to construction may remain. New fire alarms shall be the same as required for new construction. Note that an emergency voice evacuation fire signaling system is not required for the assembly use spaces in this building.

Means of Egress

Exit Access includes:

- An unenclosed egress access stairway from the Basement to the 1st Floor.
- A main entrance/egress directly outside to Maple Street.
- A second direct egress from the Basement to the back parking lot via stairs.
- An existing enclosed egress stair serving the Basement, 1st Floor, 2nd Floor, 3rd Floor and 4th Floor, exiting into a sprinklered lobby at the 1st Floor.
- An existing enclosed stairway from the 1st floor to the 2nd Floor, 3rd Floor & 4th Floor, exiting into a sprinklered lobby at the 1st Floor.
- There are exit doors from the First Floor directly outside to the Academy St. entrance, the East driveway entrance, & Kitchen Service entrance.

Egress Summary: Two means of egress are required in Business Use and A-3 Use buildings. There are actually three remote means of egress doors from the first floor of the building that total 132” in combined width where only 40.5” is required.

Although there are various Assembly Uses throughout the building, the 1st floor use as Assembly (199 people) imposes the largest egress width requirement. Yet the three existing doors exceed the egress width requirement that would be required under the IBC for Assembly use. See the Table below.

The 2nd floor office with a total occupancy load of only 100 people has two existing remotely located exits. Two remote means of egress exist from every other level as well.

Egress Calculations: In Compliance per IBC Table 1004.1

<u>Level</u>	<u>Area</u>	<u>Use</u>	<u>Occup/tot</u>	<u>(Number) and Req'd width Egress (Stair/Door)</u>	<u>(Number) and Prov'd width Egress (Stair/Door)</u>	<u>Dist.</u>
Basement	6,639 sf	B	66	(2) 54.8" / 41.1"	(3) 135" / 108"	(2) 60 ft
@15	3,126 sf	A3	208			
	9,765 sf	Combined	274			
		Actual	118			
1 st fl	6,212 sf	B	62	(2) 54" / 40.5"	(3) 169.5" / 132"	(3) 48 ft
	2,979 sf	A3	199			
	9,191 sf	Combined	261			
		Actual	270			

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<u>Level</u>	<u>Area</u>	<u>Use</u>	<u>Occup/tot</u>	<u>Req'd width Egress</u>	<u>Prov'd width Egress</u>	<u>Dist.</u>
				<u>(Stair/Door)</u>	<u>(Stair/Door)</u>	
2 nd fl.	6,173 sf	B	62	(2) 30.2" / 22.7"	(2) 72+" / 72"	(2) 50 ft
	1,331 sf	A3	89			
Tenant	1,806 sf	B	18			
	9,310 sf	Combined	169			
		Actual	94			
3rd fl	7,118 sf	E*(post HS)	142	(2) 48.3" / 33.4"	(2) 72+" / 72"	(2) 60 ft
Tenant	1,856 sf	B	19			
	8,974 sf	Combined	161			
		Actual	144			
4th fl	4,766 sf	E*(post HS)	95	(2) 30.3" / 20.2"	(2) 72+" / 72"	(2) 75 ft
Tenant	607 sf	B	6			
	5,373 sf	Combined	101			
		Actual	96			

Note: Assembly activities are permitted in a Mixed Use Classified building that is primarily a Business Use, provided that the local Building Inspector is satisfied that each mixed use floor has adequate egress capacity for each proposed use on the floor. The existing doors on the first floor provide an egress capacity for over 400 people. In addition, two egress stairs with a combined width of 9'-1" add an egress capacity of 363 people. The total egress capacity of the first floor is 763 people where proposed maximum occupancy will be 270 people.

*Note that E – educational use of art studios, is classified as a B, business occupancy, and the number of occupants is deemed equivalent to shop/vocational use: 50 sf/p

Interior Environment Requirements Met

- Minimum Ceiling Height, per section 1208.2, habitable and occupiable spaces must be 7'-6" in height. However, furred ceiling spaces must have 7'6" in at least two thirds of the area. Rest rooms must be 7'-0" minimum. Note: existing non-conforming soffit ceiling height in rest rooms of 2nd and 3rd floors.
- Provide with natural artificial ventilation,
- Provide natural light or artificial light with an average illumination of 10 foot-candles (107 lux) over the area of the room at a height of 30 inches above the floor.

Plumbing Fixture Requirements

The Plumbing Code provides that the actual building occupancy count is used to determine total number of fixtures, not the code stipulated occupancy, which remains valid for egress calculations. The building population is calculated based on their "Use" categories as follows:

*Basement Assumptions:

100 Occupants under Business and A3 Uses

Code Gender Split: 50 men / 50 women (per code and typical for Business Use)

Proposed Gender Split: 28% men / 72% women (estimated actual proportion in A3 Use)

<u>Use</u>	<u>Occup</u>	<u>Split</u>		<u>WC</u>	<u>U</u>	<u>Lav</u>	<u>EWC</u>
B (Code)	30	M-15	1/25	0.60		1	
		W-15	1/20	0.75		1	
A3 (Actual)	70	M-20	1/100	0.20		1	
		W-50	1/50	1.00		1	
Combined	100	M-35		0.80		1	2
		W-65		1.75		1	

1st Floor:

Using Table 1 248CMR, the total number of fixtures required on the 1st Floor:

<u>Use</u>	<u>Occup</u>	<u>Split</u>		<u>WC</u>	<u>U</u>	<u>Lav</u>	<u>EWC</u>
B	73	M-36	1/25	1.44			
		W-37	1/20	1.85			
A3 (Actual)	199	M-49	1/100	0.49			
		W-150	1/50	3.00			
Combined	272	M-86		1.93		1	2
		W-187		4.85		3	

2nd Floor:

Proposed Occupants under Business and Assembly Use:

<u>Use</u>	<u>Occup</u>	<u>Split</u>		<u>WC</u>	<u>U</u>	<u>Lav</u>	<u>EWC</u>
B	77	M-38	1/25	1.52			
		W-39	1/20	1.95			
A3	46	M-23	1/100	0.23			
		W-23	1/50	0.46			
Combined	123	M-61		1.75	1	1	2
		W-62		2.41		2	

3rd & 4th Floor:

<u>Use</u>	<u>Occup</u>	<u>Split</u>		<u>WC</u>	<u>U</u>	<u>Lav</u>	<u>EWC</u>
E	139 (235)	M-117	1/180	0.65		1	3
B	96	W-118	1/90	1.31		1	

Conclusion: The proposed rest room count meets the total plumbing fixture requirements for the Basement and 1st floor. The use of gender-neutral rest rooms allows for more flexibility in serving actual proportions of users. However, the existing rest rooms on the second floor are slightly below the required fixture count for the proposed population. One additional WC is required for women and will be added. The men's room may have been compliant in 1984 with 50% of the WC count for urinals however, under the current code urinals can only substitute for 33% of the men's room WC requirement.

Existing fixture count for 3rd and 4th is fully met with the restrooms on the 3rd floor, as approved by prior permit from the building department for ACA construction.

Energy Code Compliance:

IEBC, Section 908.1 Minimum requirements provides that Level 3 alterations to existing buildings or structures are permitted without requiring the entire building to comply with the energy requirements of the International Energy Conservation Code.

The HVAC design for this project is compliant with the International Energy Conservation Code (IECC 2015).

Cooling:

Scope of work includes new air-to-water air conditioning units to serve the renovated areas. The centralized cooling plant will include new evaporative cooling tower with a variable speed fan. Additionally, the condenser pumps will be replaced with new pumps that will include variable frequency drives.

Heating:

Scope of work includes new gas fired, condensing mode boilers and new pumps with variable frequency drives. The existing perimeter baseboard forced hot water heating system is to be modified for the new partition layout on the ground and first floors.

Controls:

HVAC scope includes replacement of existing pneumatic zone controls with a new direct digital control (DDC) system. The new boilers include packaged controls with outdoor setback controls that automatically lower the supply water temperature in response to increasing outdoor air temperature.

Accessibility Code Compliance:

Mass AAB & 521 CMR regulations are met as follows.

- There will be no change in Use Classification as regulated by IEBC Section 901.2. The building will remain a mixed use, B (Business) & A-3 (Assembly) use building.
- Per 521 CMR the proposed construction cost will exceed 30% of the Assessed building value. It shall include construction of Barrier Free rest rooms and related wheelchair access to the main floor. It will also include the cost of replacing the existing ramp entry path with a chair lift. All new work must comply with vertical access and accessible routes throughout.
- The Building valuation is calculated as follows. Current assessment is approximately \$2,500,000. 30% of the adjusted value for equalized "fair cash value" would come to \$750,000. Expenditure will be well above that number and trigger full compliance with the Mass AAB.
- The proposed scope includes a new graded pathway from the rear parking lot and the rear BF parking spaces, a new accessible chair lift to the main floor from the East entry.
- Striping the required BF parking space will occur after the asphalt is repaired and installed.
- Proposed re-grading and new vestibule at the Maple St. entry will be fully accessible.
- The existing West entry from Academy St. may become a staff (employee only) entrance.
- The existing North entry for kitchen service will also remain a staff only entrance.
- Accessible toilet facilities are required on each floor that has toilet facilities.