780 CMR 120.Q

RECOMMENDED FASTENING SCHEDULE

(Note: *780 CMR 120.Q is unique to Massachusetts*)

Note: The applicable fastening schedules presented/referenced in 780 CMR 53.00 through 61.00 shall apply except that where fastening schedule information is not presented, the fastening schedule below shall then apply, unless fasteners are sized by a registered design professional.

780 CMR Table 120.Q1
RECOMMENDED FASTENING SCHEDULE

BUILDING ELEMENT	NAIL SIZE AND TYPE	NUMBER AND LOCATION
Stud to sole plate	8d common 16d common	4 toe-nail or 2 direct-nail
Stud to cap plate	16d common	2 toe-nail or 2 direct-nail
Double studs	10d common	12" o.c. direct
Corner studs	16d common	24" o.c. direct
Sole plate to joist or blocking	16d common	16" o.c.
Double cap plate	10d common	16" o.c. direct
Cap plate laps	10d common	2 direct-nail
Ribbon strip, 6" or less	10d common	2 each direct bearing
Ribbon strip, 6" or more	10d common	3 each direct bearing
Roof rafter to plate	8d common	3 toe-nail
Roof rafter to ridge	16d common	2 toe-nail or direct nail
Jack rafter to hip	10d common 16d common	3 toe-nail or 2 direct-nail
Floor joists to studs (No ceiling joists)	10d common 10d common	5 direct or 3 direct
Floor joists to studs (With ceiling joists)	10d common	2 direct
Floor joists to sill or girder	3d common	3 toe-nail
Ledger strip	16d common	3 each direct
Ceiling joists to plate	16d common	3 toe-nail
Ceiling joists (laps over partition)	10d common	3 direct-nail
Ceiling joists (parallel to rafter)	10d common	3 direct
Collar beam	10d common	3 direct
Bridging to joists	8d common	2 each direct end
Diagonal brace (to stud & plate)	8d common	2 each direct bearing
Tail beams to headers (When nailing permitted)	20d common	1 each end 4 sq. ft. floor area
Header beams to trimmers	20d common	1 each end 8 sq. ft. floor area
1" roof decking (over 6" in width)	8d common 8d common	2 ea. direct rafter 3 each direct rafter
1 " subflooring (6" or less)	8d common	2 each direct joist
1" subflooring (8" or more)	8d common	3 each direct joist
2" subflooring	16d common	2 each direct joist
1" wall sheathing (8" or less in width)	8d common	2 each direct stud
1" wall sheathing (over 8" in width)	8d common	3 each direct stud
Plywood roof & wall sheathing (½" or less) (⅝" or greater) (5/16", ⅜",or ½") (⅝")	 6d common 8d common 16 gauge galvanized wire staples, ⅜" minimum crown; length of 1" plus plywood thickness Same as immediately above	 6" o.c. direct edges & 12" o.c intermediate 6" o.c. direct edges & 12" o.c. intermediate 4" o.c. edges & 8" o.c. intermediate 2½" o.c. edges & 5" o.c. intermediate
Plywood subflooring: (½") (⅜", ¾") (1", 1⅛") (½") (⅜")	 6d common or 6d annular or spiral thread 8d common or 8d annular or spiral thread 10d common or 8d ring shank or 8d annular or spiral thread 16d galvanized wire staples ⅜" minimum crown, 1⅜" length	 6" o.c. direct edges & 10" o.c. intermediate 6" o.c. direct edges & 10" o.c. intermediate 6" o.c. direct edges & 6" o.c. intermediate 4" o.c. edges & 7" o.c. intermediate 2½" o.c. edge 4" o.c. intermediate

BUILDING ELEMENT	NAIL SIZE AND TYPE	NUMBER AND LOCATION
Built-up girders and beams	20d common	32" o.c. direct
Continuous header to stud	8d common	4 toe nail
Continuous header, two pieces	16d common	16" o.c. direct
½" fiber board sheathing	1½" galvanized roofing nail or 16 gauge staple, 1½" long with min. crown of 7/16"	3" o.c. exterior edge 6" o.c. intermediate
25/32" fiber board sheathing	1¾" galvanized roofing nail or 8d common nail or 16 gauge staple, 1½" long with min. crown of 7/16"	3" o.c. exterior edge 6" o.c. intermediate
Gypsum sheathing	12 gauge 1¾" large head corrosion-resistant	4" o.c. on edge 8" o.c. intermediate
Particle board underlayment (¼"-¾")	6d annular threaded	6" o.c. direct edges 10" o.c. intermediate
Particle board roof and wall sheathing ½" or less	6d common	6" o.c. direct edges 12" o.c. intermediate
⅝" or greater	8d common	6" o.c. direct edges 12" o.c. intermediate
Particle board subflooring (⅝" or greater)	8d common	6" o.c. direct edges 12" o.c. intermediate
Shingles, wood[a]	No. 14 B&S Gage corrosion resistive	2 each bearing
Weather boarding	8d corrosion	2 each bearing

For SI: 1 inch - 25.4 mm, 1 square foot = 0.0929m^2

Note a: Shingle nails shall penetrate not less than ¾" into nailing strips, sheathing or supporting construction except as otherwise provided in 780 CMR 1225.4.4.

780 CMR TABLE 120.Q2
MAXIMUM SPACING OF GYPSUM WALLBOARD FASTENERS
(For nonfire-resistance rated construction assemblies)

Thickness of gypsum wallboard (inch)	Plane of framing surface	Long dimension of gypsum wall-board sheets in relation to direction of framing members	Maximum spacing of framing members (center-to-center in inches)	Maximum spacing of fasteners (center-to- center in inches) Nails	Screws	Nails to wood
½	Horizontal Horizontal Vertical	Either direction Perpendicular Either direction	16 24 24	7 7 8	12 12 12	No. 13 gage, 1⅜" long, 19/54" head No. 098 gage, 1¼" long, Annular ringed 5d cooler nail
⅝	Horizontal Horizontal Vertical	Either direction Perpendicular Either direction	16 24 24	7 7 8	12 12 12	No. 13 gage, 1⅝" long, 19/64" head No .098 gage, 1⅜" long, Annular ringed 6d cooler nail
Fastening required with adhesive application						
½ or ⅝	Horizontal Vertical	Either direction Perpendicular Either direction	16 24 24	16 12	16 16	As required for ½" and ⅝" gypsum wallboard, see above
2 layers each ⅜" (¾" total)	Horizontal Vertical	Perpendicular Either direction	24 24	16 24	16 24	Base ply nailed as required for ½" gypsum wallboard and face ply placed with adhesive

Note a. Where the metal framing has a clinching design formed to receive the nails by two edges of metal, the nails shall be not less than ⅝ inch longer than the wallboard thickness, and shall have ringed shanks. Where the metal framing has a nailing groove formed to receive the nails, the nails shall have barbed shanks or be 5d cooler nail (No. 13 ½ gage, 1⅝ inches long, 15/64 inch head) for ½ inch gypsum wallboard; 6d cooler (No. 13 gage, 1⅞ inches long, 15/64 head) for ⅝-inch gypsum wallboard.

Note b. Two nails at 2 inches to 2½ inches apart may be used if the pairs are spaced 12 inches center-to-center except around perimeters.

Note c. Screws shall be No. 6 with tapered head and long enough to penetrate into wood framing not less than ⅝ inch and metal framing not less than ¼ inch

Note d. All nails shall meet ASTM C514 or Federal Specification FF-N-105C.

Note e. For fireresistance rated construction, see the pertinent fire test information.

Note f. 1 inch = 25.4 mm.

780 CMR TABLE 120.Q3
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES IN POUNDS PER FOOT FOR VERTICAL DIAPHRAGMS OF LATH AND PLASTER OR GYPSUM BOARD FRAME WALL ASSEMBLIES

Type of material	Thickness of Material	Wall Construction	Nail spacing maximum (in inches)	Shear value	Minimum nail size
Gypsum lath, plain or perforated	⅜" Lath and ½" Plaster	Unblocked	5	100	No. 13 gage, 1⅛" long, 19/64" head, plasterboard blued nail.
Gypsum sheathing board	½" x 2'x 8' ½"x4' ½"x4'	Unblocked Blocked Unblocked	4 7	75	No. 11 gage, 1¼" long, 7/64" head, diamond point, galvanized.
Gypsum Wallboard or Veneer base	½"		7	2e+20	5d Cooler nails
		Unblocked	4		
		Blocked	7		
			4		
			4		
	⅝"	Blocked			6d cooler nails
		Two ply	Base ply 9		Base ply-6d cooler nails
			Face ply 7		Face ply-8d cooler nails

Note a. These vertical diaphragms shall not be used to resist loads imposed by masonry or concrete construction. Values are for short time loading due to wind or earthquake and must be reduced 25% for normal loading

Note b. Applies to nailing at all studs, top and bottom plates and blocking.

Note c. Values shown are for gypsum board applied to one side only. The shear values may be doubled when identical materials are applied to both sides of wall

Note d. 1 inch = 25.4 mm.

NON-TEXT PAGE

780 CMR 120.R

GUIDANCE FOR SELECTION OF FOUNDATION MATERIAL CLASSES

120.R1.1 Purpose. The purpose of 780 CMR 120.R is to provide guidance for the selection of the material class and consistency in place when using Table 1804.3, Allowable Bearing Pressures for Foundation Materials.

120.R1.2 Application. 780 CMR 120.R is provided only as a general guide to engineering judgment. All available data should be evaluated and professional engineering judgment exercised in selection of the appropriate material classification for use with Table 1804.3. The references on soil and rock classification and typical ranges of index properties provided in this appendix should not be considered to be code requirements.

120.R1.3 Classification of Soil. Guidelines for generally accepted engineering practice in the description and classification of soils are provided in ASTM D2488-84 Description and identification of Soils (Visual-Manual Procedure) and ASTM D2487-85 Classification of Soils for Engineering Purposes.

120.R1.4 Classification of Rock. Guidelines for generally accepted engineering practice in the description and classification of rocks are provided in Chapter 1 of Design Manual 7.1 - Soil Mechanics, Naval Facilities Engineering Command, May 1982 (NAVFAC DM-7.1)

120.R1.5 Typical Index Properties. Typical ranges of index properties for the Material Classes listed in Table 120.R1 are provided in Table 120.R2.

TABLE 120.R1 ALLOWABLE BEARING PRESSURES FOR FOUNDATION MATERIALS

Material Class	Description	Notes	Consistency in Place[1]	Allowable Net Bearing Pressure (tons/ft^2)
1a	Massive bedrock: Granite, diorite gabbro, basalt, gneiss	3	Hard, sound rock, minor jointing	100
1b	Quartzite, well cemented conglomerate	3	Hard, sound rock moderate jointing	60
2	Foliated bedrock: slate, schist	3	Medium hard rock, minor jointing	40
3	Sedimentary bedrock: cementation shale, siltstone, sandstone, limestone, dolomite, conglomerate	3, 4	Soft rock, moderate jointing	20
4	Weakly cemented sedimentary bedrock: compaction shale or other similar rock in sound condition	3	Very soft rock	10
5	Weathered bedrock: any of the above except shale.	3, 5	Very soft rock, weathered and/or major jointing and fracturing	8
6	Slightly cemented sand and/or gravel, glacial till (basal or lodgement), hardpan	7,8	Very dense	10
7	Gravel, widely graded sand and gravel; and granular ablation till	6, 7, 8	Very dense Dense Medium dense Loose Very loose	8 6 4 2 Note 11
8	Sands and non-plastic silty sands with little or no gravel (except for Class 9 materials)	6, 7, 8, 9	Dense Medium dense Loose Very loose	4 3 2 Note 11
9	Fine sand, silty fine sand, and non-plastic inorganic silt	6, 7, 9	Dense Medium dense Loose Very loose	3 2 1 Note 11
10	Inorganic sandy or silty clay, clayey sand, clayey silt, clay, or varved clay; low to high plasticity	5, 6, 10	Hard Stiff Medium Soft	4 2 1 Note 11
11	Organic soils: peat, organic silt, organic clay	11		Note 11

Notes for TABLE 120.R1:

1. Refer to 780 CMR 120.R2 regarding typical index test values that may be helpful as guides for evaluation of consistency in place.

2. Refer to 780 CMR 18.00 of the 6TH Edition Massachusetts Building Code for determination of design loads and for special cases.

3. The allowable bearing pressures may be increased by an amount equal to 10% for each foot of depth below the surface of sound rock; however, the increase shall not exceed two times the value given in the table.

4. For limestone and dolomite, the bearing pressures given are acceptable only if an exploration program performed under the direction of a registered design professional demonstrates that there are no cavities within the zone of influence of the foundations. If cavities exist, a special study of the foundation conditions is required.

5. Weathered shale and/or weathered compaction shale shall be included in Material Class 10. Other highly weathered rocks and/or residual soils shall be treated as soil under the appropriate description in Material Classes 6 to 10. Where the transition between residual soil and bedrock is gradual, a registered design professional shall make a judgment as to the appropriate bearing pressure.

6. Settlement analyses in accordance with 780 CMR 18.00 of the 6th Edition Massachusetts Building Code should be performed if the ability of a given structure to tolerate settlements is in question, particularly for, but not limited to, soft or very soft clays and silts and loose granular materials.

7. Allowable bearing pressures may be increased by an amount equal to 5% for each foot of depth of the bearing area below the minimum required in 780 CMR 18.00 of the 6th Edition Massachusetts Building Code; however, the bearing pressure shall not exceed two times the value given in the table. For foundation bearing areas having a least lateral dimension smaller than three feet, the allowable bearing pressure shall be ⅓ of the tabulated value times the least dimension in feet.

8. Refer to 780 CMR 18.00 of the 6th Edition Massachusetts Building Code when these materials are used as compacted fills.

9. These materials are subject to the provisions in 780 CMR 18.00 of the 6th Edition Massachusetts Building Code for Liquefaction).

10 Alternatively, the allowable bearing pressure may be taken as 1.5 times the peak unconfined compressive strength of undisturbed samples for square and round footings or 1.25 times that strength for footings with length to width ratio of 4 or greater. For intermediate cases, interpolation may be used.

11. A registered design professional shall be engaged to provide recommendations for these special cases. Direct bearing on organic soils is not permitted. Organic soils are allowed under foundations for those cases defined in 780 CMR 18.00 of the 6th Edition Massachusetts Building Code, Preloaded materials.

TABLE 120.R2 TYPICAL RANGE OF INDEX PROPERTIES

Material Class	Description	Consistency in Place	Rock Quality Designation (RQD%)	Unconfined Compressive Strength (PSF)	Standard Penetration Resistance (Blows/Foot)
1a	Massive bedrock - granite, diorite, gabbro, basalt, gneiss,	Hard rock, minor jointing	>75	>8000	-
1b	quartzite, well-cemented conglomerate	Hard sound rock, moderate jointing	50 to 75		
2	Folliated bedrock	Medium hard rock minor jointing	>50	>8000	-
3	Sedimentary bedrock-cementation shale, silt-stone, sandstone, limestone, dolomite, conglomerate	Soft rock, moderate jointing	>50		-
4	Weakly cemented sedimentary bedrock - compaction shale or other similar rock in sound condition	Very soft rock	<50		
5	Weathered bedrock - any of the above except shale	Very soft rock. weathered and/or major jointing and fracturing	<50		-
6	Slightly cemented sand and/or gravel, glacial till (basal or lodgement), haropan	Very dense	-		>50
7	Gravel, widely graded sand and gravel, and granular abiation till	Very dense	-		>50
		Dense			41-50
		Medium dense			16-40
		Loose			8-15
		Very loose			<8
8	Sands and non-plastic silty sands with little or no gravel (except for Class 9 materials	Dense	-		>30
		Medium dense			11-30
		Loose			6-10
		Very loose			<6
9	Fine sand, silty sand and non-plastic inorganic silt	Dense	-		>30
		Medium dense			11-30
		loose			6-10
		Very loose			<6
10	Inorganic sandy or silty clay, clayey sand, clayey slit, clay or varved clay low to high plasticity	Hard	-		>20
		Stiff			9-20
		Medium			4-8
		Soft			<4
11	Organic soils - peat organic silt, organic clay	-	-		-

Notes to TABLEe 120.R2

Note 1: For discussion of RQD values see Deere, D.U., Rock Mechanics in Engineering Practice (Chapter 1), Stagg and Zinkiewicz, Eds., 1968, John Wiley and Sons, Inc.

Note 2: For determination of Unconfined Compressive Strength see ASTM D2938.

Note 3: For determination of Standard Penetration Resistance N-value see ASTM D1586. The presence of large particles (coarse gravel, cobbies, boulders) may cause N-values to be unrealistically high. Such values should not be used. Also standard penetration resistance should not be used over depths less than five feet.

NON-TEXT PAGE

780 CMR 120.S

REFERENCE DATA FOR REPAIR, ALTERATION AND CHANGE OF USE OF EXISTING BUILDINGS

(Note: *780 CMR 120.S is unique to Massachusetts*)

120.S101.0 - PART ONE-GUIDELINES FOR APPLICATION

120.S101.1 Intent Relative to 780 CMR 34.00 and 93.00. The purpose of 780 CMR 120.S is to provide guidance to users of 780 CMR (the Massachusetts State Building Code) as to techniques of acceptable practice which can be used to assess the acceptability of various methods of meeting the intent of code provisions of 780 CMR 34.00 or 93.00 on a case-by-case basis. The purpose of the provisions in 780 CMR 34.00 and 93.00 and 780 CMR 120.S is to allow the repair, alteration addition, and change of use of existing buildings without requiring the entire building to be brought up to new construction requirements, while still providing for the public health, safety and general welfare. The provisions of 780 CMR 34.00 and 93.00 and 780 CMR 120.S recognize that the provisions of 780 CMR for new construction reflect the latest improvements in materials, construction techniques, standards of living and safety and, therefore, may preclude the repair, alteration, addition, or change of use of existing buildings that have demonstrated their usefulness and safety.

120.S102.0 SCOPE

120.S102.1 Techniques. 780 CMR 120.S is intended to demonstrate techniques of analysis and compliance with 780 CMR 34.00 in the repair, alteration, addition, and change of use of existing buildings.

120.S103.0 GENERAL CONDITIONS

120.S103.1 General Conditions. Conceptually, it is the intent of 780 CMR 34.00 and 93.00 and 780 CMR 120.S to allow repair, alteration, addition, or change of use of existing buildings without meeting all new construction requirements under the following general conditions:

1. all hazardous conditions must be corrected;
2. the existing building becomes the minimum performance standard; and
3. the degree of compliance of the building after changes must not be below that existing before the changes, except that nothing in 780 CMR 34 or 93 will require compliance with requirements more stringent than that required for new construction.

120.S104.0 IMPLEMENTATION

120.S104.1 Framework. Implementation of the above concept requires that a framework be established for evaluating the condition of the building; determining the potential for modification; and establishing the acceptability of proposed changes.

120.S104.2 Evaluation of Existing Building. Evaluation of existing conditions in a structure is required to determine the existence of any hazardous conditions, which must be corrected; and to provide a basis for evaluating the impact of the proposed changes on the performance of the building.

The following list of evaluation tools described in 780 CMR 120.S4.1.1 through 120.S4.2.7 can be used for determining the condition of the structure. However, this list is not necessarily complete and the use of other methods should not be precluded.

120.S104.2.1 Available Documentation of Existing Building. Prime sources of design information for existing buildings are the architectural and engineering drawings and specifications used in the construction of the building. Although the passing of time often obscures depositaries of such documents, the following are likely prospects in attempting to locate such information:

1. If the building is currently in use, an individual or office responsible for its management may have retained drawings and specifications to facilitate maintenance. A building manager, resident engineer, superintendent, custodian, stationary engineer or plant engineer may be the most direct contact at the building site.
2. Other potential sources (especially if the building is not in use) include the original designer-architect or engineer.
3. The building department which issued the permit for construction may have documentation.
4. Documentation may have been retained by the general contractor or numerous sub-contractors; *i.e.*: the mason, carpenter, plumber, electrician, HVAC installer, steel erector, etc., as well as manufacturers of component parts, as potential sources of documentation.
5. In the case of large corporations or government agencies, a separate contracting officer may have developed a technical file on the erection of a building.

6. In some cases, individual consultants are contracted to serve as "clerk-of-the-works" and pursue the inspection of a building project from start to finish with the keeping of a file likely.

7. Insurance companies sometimes maintain drawings or records of their insured buildings.

8. Historical or archaeological societies may have considered a building to be important enough to develop a file of documentation.

120.S104.2.2 Field Surveys. Having drawn upon available documentation to help evaluate a building's condition, such documentation may be augmented by on-site data acquired through field survey. The most obvious approach is to make use of detailed visual examination to confirm and/or alter any previously available information pertaining to the building.

120.S104.2.3 Testing. Testing is a tool that may be used in evaluating the condition of a building or structure or parts thereof when other methods of evaluation will not suffice. Testing may be initiated voluntarily on the part of the permit applicant or may be required by the building official in the absence of approved rules as indicated in 780 CMR 109.0, 116.0, and 780 CMR 34.00 and 93.00 when applicable. The costs of all such tests are to be borne by the permit applicant and should, therefore, be required by the building official only when other methods of evaluation prove inadequate or insufficient. Such testing should be conducted by an approved testing agency under the supervision of a registered architect or engineer. The report of the tests shall be submitted to the building official and shall include the details of test procedures, references to any accepted test standards used, the results of the tests and any conclusions drawn from the test results.

120.S104.2.4 Nondestructive Testing. This includes techniques where the structural integrity of the building is not affected, such as the following:

1. analyzing various portions of the building to determine dimensions, types and condition of materials, etc.;

2. portable apparatus for impact testing;

3. load application short of failure to determine capacity of materials and components;

4. magnetic methods for detecting flaws in ferrous metal;

5. proximity magnetometers (locating rebars in concrete, concealed ferrous fasteners, etc.);

6. electronic means for measuring the sonic modulus of elasticity of concrete and masonry in assessing its soundness;

7. ultrasonic transmission or reflective methods in detecting flaws in various materials; and

8. x-ray or infrared-ray photographic techniques used to evaluate portions of elements whose integrity is questionable.

120.S104.2.6 Destructive Testing. In destructive testing a sample of the building could be removed and tested (*e.g.*, concrete core), or components of the building could be reconstructed and tested in the laboratory.

120.S104.2.7 Laboratory Analysis. In some cases, tests can be performed in the laboratory. Such tests might include the following:

1. chemical or metallurgical test;

2. optical or electronic microscopic examination which can help identify and evaluate the soundness of materials where decay or other molecular degradation is involved;

3. conventional laboratory tests for determining physical properties (strength, ductility, absorption, solubility, permeability, stiffness, *etc.*; and/or

4. testing of a scale model of the building (computer model, wind tunnel model, etc.).

120.S104.3 Evaluation of Change in Performance Level. It is necessary to determine if the level of performance of the building after alteration is below that which existed before the change. The hazard level could be increased for certain attributes (such as fire safety) while decreased for other attributes (such as floor loads) for a given alteration. The evaluation of the change in hazard levels of each attribute can be accomplished using various tools singly or in combination as described below in 780 CMR 120.S4.3.1 through 120.S4.3.5.

120.S104.3.1 Data on Archaic Systems. Performance data on architectural and structural systems encountered are tabulated in 780 CMR 120.S, Part Four. This data can be compared to the proposed altered systems to determine if the performance is adversely affected.

120.S104.3.2 Compliance Alternatives. Alternate solutions tabulated in 780 CMR 120.S, Part Two were developed from appeal data and from accepted practice. The list is not all-inclusive and should not preclude consideration of other alternatives.

120.S104.3.3 Analysis Methods. Analytical methods based on good engineering practice may be used to determine changes in performance levels.

120.S104.3.4 Test Methods. Test procedures as discussed in 780 CMR 120.S4.2.3 through 120.S4.2.6 can be used to evaluate the performance of existing construction.

120.S104.3.5 Professional Judgement. Professional judgement based on previous experience with similar buildings should be used to the fullest extent possible.

120.S201.0 - PART TWO - SUGGESTED COMPLIANCE ALTERNATIVES

120.S201.1 Purpose. The purpose of 780 CMR 120.S201.0 is to assist the building official and those regulated by 780 CMR in judging the acceptability of compliance alternatives to specific provisions required by 780 CMR.

120.S201.1.1 Application. 780 CMR 120.S202.0 contains generally acceptable compliance alternatives and examples. The examples are solely for the purpose of illustrating principles which can be applied to the solution of code compliance problems and are not necessarily acceptable under all circumstances. It is recognized that all building systems interact with each other. Therefore, any consideration of compliance alternatives must take into account all existing and proposed conditions to determine their acceptability. The principles applied can be used for the solution of similar compliance problems in other buildings and occupancy groups. Commentaries are provided where the philosophy in establishing the alternatives is not obvious. The examples were developed from appeal data and accepted practice. They are not all-inclusive and should not preclude consideration of other alternatives.

Note. It is anticipated that additional compliance alternatives will be added to 780 CMR 120.S202.0 through the mechanism of appeal decisions and from results of research being conducted by various organizations in the field of relative permanence of life safety systems.

120.S202.0 – COMPLIANCE ALTERNATIVES FOR EGRESS REQUIREMENTS

(*Note that Compliance Alternatives May be Accepted by the Building Official or not Accepted*)

120.S202.1 Number of Exits.

120.S202.1.1 General Compliance Alternatives:

1. Provide connecting fire balconies.
2. Provide alternate egress facilities.
3. Provide a fire escape.
4. Provide fire-rated areas of refuge.
5. Provide early fire detection.
6. Provide a fire suppression system.

120.S202.1.2 Examples:

Example 1 involves a five-story Building of Use Group B without a fire suppression system and with only one *means of egress*.

Solution A. Add one or more fire escapes as may be necessary to provide all tenants with reasonable access to two *means of egress* in separate directions. Access to a street, public way or area of refuge shall be provided at the termination of the fire escape.

Solution B. Add connecting fire balconies across fire walls if the above solution is impractical due to construction difficulties.

Solution C. Introduce a fire sprinkler system.

Example 2 involves a building of Use Group R-2 occupancy with apartments in the basement. There is only one *means of egress* from the basement.

Solution A. Incorporate emergency escape and rescue systems into each basement apartment that comply with 780 CMR 10.00 of the 6th Edition State Building Code or of 780 CMR 53.00.

Solution B. Introduce a fire sprinkler system.

120.S202.2 Travel Distance.

120.S202.2.1 General Compliance Alternatives:

1. Add detection system.
2. Add a partial fire suppression system.
3. Add smoke doors.
4. Increase fireresistance rating of corridor walls and doors.

120.S202.2.1 Example. This example involves a four story building of Use Group R-2 without a fire suppression system. The length of exitway access travel is 250 feet.

Solution A. Incorporate a fire suppression system for the building.

Solution B. Subdivide corridor into segments, if less than 100 feet, with smoke doors.

Solution C. If the building is pre-existing, non-conforming, install smoke and fire detectors with audible alarms in the corridor.

Solution D. Increase the fireresistance rating of the exit access corridor from one hour to two hours and provide "B" label self-closing or automatic closing fire doors in all openings into the corridor.

120.S202.3 Enclosure of Exitways.

120.S202.3.1 General Compliance Alternatives:

1. Improve enclosure of exitway.
2. Incorporate a fire suppression system.
3. Add early notice fire detection system.

120.S202.3.2 Example. This example involves a four story row building of Use Group R-2 with connecting fire balconies and an interior stair. The stair is enclosed with lath and plaster, wood stud partitions and paneled doors.

Solution A. Cover partitions on the apartment side with ⅝ inch Type X gypsum wallboard or its equivalent. Replace or build up panel doors until minimum solid portion is 1⅜ inch and install self-closers.

Solution B. Provide a heat and smoke detection system in the stairwell with an alarm audible to all tenants. Provide self-closers on all stairwell doors.

Solution C. Provide a fire suppression system for the building. Provide self-closers on all stairwell doors.

120.S202.3.3 Commentary. The above example, while pertaining to a four story, Use Group R-2 building, can also be applied to other buildings of occupancies and floor levels. The principle that the degree of code compliance may not be reduced should be remembered. If the existing enclosure is of fireresistive construction, it must be maintained. The primary principle to remember, in the required enclosure of exitway, is that an enclosure must be provided, whether fireresistive or not, so as to provide a smoke barrier. The purpose of providing a smoke barrier is to prevent the passage of smoke from a fire on one floor to the exitways and exit access corridors of other floors and thus render them unusable for egress. This principle is illustrated by solutions A, B, and C in the above example.

120.S203.0 COMPLIANCE ALTERNATIVES FOR FIRE HAZARDS

120.S203.1 Fire Separations and Partitions.

120.S203.1.1 General Compliance Alternatives:

1. Improve fire separation.
2. Add a fire suppression system.
3. Add a detection system.

120.S203.1.2 Examples. Example 1 involves a three story building of Type 3A construction, containing a Mercantile (M) Use Group, on the first floor and occupancy Business (B) Use on the second and third floors. The required separation is three hours.

Solution A. Add a fire suppression system to the first and second floors.

Solution B. Add 5/8 inch Type X gypsum wallboard or its equivalent to the underside of the second floor and install a system of smoke and heat detectors with audible alarms on the first and second floors.

Example 2 involves the separation between two tenants of wood lath and plaster on a wood studs partition. The required separation is one hour.

Solution A. Add ⅝ inch Type X gypsum wallboard or its equivalent to either side of the existing partition.

Example 3 involves a building of Use Group B with unrated exit access corridors.

Solution A. Install a partial fire suppression system in the exit access corridors.

Solution B. Add ⅝ inch Type X gypsum wallboard or its equivalent to either side of the corridor partition and install self-closers on all corridor doors.

Solution C. Install a smoke and heat detection system in the corridor with and alarm audible to all tenants on the floor and install self-closers on all corridor doors.

120.S203.2 Openings and Exterior Wall Protection:

120.S203.2.1 General Compliance Alternatives:

1. Add fire suppression system.
2. Improve fireresistance.
3. Remove or improve openings.

120.S203.2.2 Examples. Example 1 involves a two story of Type 5B construction building, with Use Group M, on the first floor the basement and upper floors. The distance between the building and the side lot line is five feet and ten feet between it and the adjacent building. The adjacent building is of Type 5B construction and Use Group R-2. The former occupant was a grocery store; the new occupant is a hardware store.

Solution A. Install a deluge sprinkler system along the interior side of the wall affected.

Solution B. Add ⅝ inch Type X gypsum wallboard to interior side of the wall affected.

Example 2 is the same as example 1 but with double-hung wood windows in affected wall.

Solution A. Remove windows and close opening with one hour fireresistive construction.

Solution B. Remove windows and install fire windows.

Solution C. Install a deluge sprinkler system as in solution A to example 1.

120.S301.0 - PART THREE - DETAILED CLASSIFICATION OF OCCUPANCY BY HAZARD INDEX NUMBER AND USE GROUP

120.S303.1 General. 780 CMR 120.S, PART THREE provides a more detailed guide for users of 780 CMR to determine hazard index numbers and use groups for various types of occupancies. 780 CMR 120.S supplements 780 CMR 3.00 and Table 780 CMR 3403.0 contained in 780 CMR 34.00.

Note 1. The Use Classifications and Hazard Indicies shown below now reflect the Use Classifications and Hazard Indicies of the Seventh (7th) Edition State Building Code which, in some instances, utilize a somewhat different Use Classification and Hazard Index classification than that of earlier Editions of the Massachusetts State Building Code.

Note 2. The Use Classifications and Hazard Indicies presented are representative only and property-specific conditions may result in different USE Classifications and resulting Hazard Indicies.

TABLE 120.S1 HAZARD INDEX AND USE GROUP CLASSIFICATION

Use of Structure	Hazard Index No.	Use Group
Advertising Displays Manufacture including billboards	3	F-1
Airport or other aircraft landing or service facility (see also:	3	F-1
Helicopter rooftop landing facility		
Amusement park, indoor	4	A-3
Animal		
Crematorium	2	B
Hospital, kennel, pound	2	B
Apartment (see Residences)		
Appliances		
Manufacture	3	M
Sales	3	M
Arenas	4	A-3
Asphalt		
Processing and products manufacture	8	H
Athletic equipment		
Manufacture	3	F-1
Sales	3	M
Auditoriums		
with stage	6	A-1
without stage	4	A-3
Automobile and other motor vehicles		
Gasoline service station	2	M
Rental agency within a building	2	B
Repair	3	S-1
Repair incidental to auto sales with limitation	2	B
Sales within a building	3	M
Wrecking	3	F-1B
Washing	2	
Awning manufacturer	3	F-1
Baked goods shop	3	M
Bakeries	3	F-1
Banks	2	B
Banquet halls	5	A-2
Barber shops	2	B
Beauty shops	2	B
Beverages		
Bottling	3	F-1
Manufacture		
Alcoholic (Up to and including 12% alcohol)	3	F-2
Alcoholic (above 12% alcohol)	8	H
Bicycle		
Manufacture	3	F-1
Rental or repair conducted within a building	3	S-1
Sales	3	M or S-1
Billiard Parlor	4	A-3

TABLE 120.S1 HAZARD INDEX AND USE GROUP CLASSIFICATION - continued

Use of Structure	Hazard Index No.	Use Group
Blacksmith shops	3	F-1
Blueprinting, etc. establishments	2 or 3	B or S-1
Boarding house	4	R-1 or R-2
Boats or ships		
Building or repair of boats	3	F-1
Bowling alleys	4	A-3
Broom or brush manufacture	3	F-1
Building materials		
Wholesale business in roofed structures	3	M or S-1 or SPECIAL USE
Bus terminals or stations	4	A-3
Business schools or colleges	2 or other	B or dependent upon use
Camera and other photo equipment		
Manufacture except film sales	3	F-1
Sales	3	M
Canvas or canvas products		
Manufacture or repair	3	F-1
Carpet and rug		
Cleaning establishments	3	F-1
Manufacture or repair	3	F-1
Catering for outside consumption	3	F-1
Cemeteries		
Crematory in cemetery	3	F-1
Mausoleum, crypt, columbarium	1	S-2
Mortuary chapel in cemetery	4	A-3
Ceramics products manufacture, including pottery, small glazed tile and similar items	3	F-2
Charcoal, fuel, briquettes, or lampblack manufacture	8	H
Chemicals		
Packaging	8 or 3	H or F-1 or S-1 depending on nature of material
Manufacture	8 or 3	H or F-1 depending on nature of material
Churches or other places of worship	4	A-3
Circuses, temporary	4	A-3
Cleaning (see Drycleaning & dying; Laundries; Automobiles, washing)	3	F-1
Clothing		
Manufacture	3	F-1
Rental establishment		
Retail sales	2	B
Tailoring, custom manufacture or repair (see also Feathers; Felt; Fur; Leather)	3	F-1
Clubs		
Private	4 or 5	A-2 or A-3
Nightclubs (see Eating & drinking establishments)	5	A-2
Coal, coke or tar products		
Manufacture	8	H
Colleges and Universities		
Classroom buildings	2 or 4	A-3 or B
Dormitories	4	R-2
Fraternities or sororities	2 or 4	R-2 or R-3

TABLE 120.S1 HAZARD INDEX AND USE GROUP CLASSIFICATION - continued

Use of Structure	Hazard Index No.	Use Group
Community centers	4	A-3
Convalescent homes	4	I-1
Convents	2	R-2
Cosmetics or toiletries manufacture	3 or 8	F-1 or H
Cotton ginning	8	H
Cotton wadding or linters manufacture	8	H
Courthouses	2 or 4	B or A-3
Crematoriums		
Animal	2	B
Human	2 or 3	B or F-1
Dance halls	7	A-3
Day care centers	4	E or I-4
Dental offices (see Medical & dental)		
Department stores	3	M
Dormitories	4	R-1 or R-2
Dressmaking shops, custom	3	F-1 or M
Drinking places (see Eating & drinking establishments)		
Drug stores	3	M
Dry cleaning and dying establishments	2 or 4 or 8	B or F-1 or H depending on solvent used
Dwellings (see Residences)		
Eating or drinking establishments	5	A-2
Lunchrooms, restaurants, cafeterias, etc., primarily enclosed	4	A-2
Drive-in	5	A-2
With entertainment or dancing	5	A-2
Electric		
Power or steam generating plants	3 or 8	F-1 or H
Substation	3 or 8	F-1 or H
Electrical appliances, bulbs, wiring, supplies, etc.		
Manufacture	3	F-1
Sales	3	M
Electronic components & supplies		
Manufacture or repair	3	F-1
Feathers		
Curing, dyeing, washing or bulk processing	3 or 8	F-1 or H
Manufacturing exclusive of above	3 or 8	F-1 or H
Felt		
Curing, dyeing, washing or bulk processing	3 or 8	F-1 or H
Products manufacture, exclusive of above	3 or 8	F-1 or H
Fertilizer manufacture	8	H
Film, photographic, manufacture	3 or 8	F-1 or H
Storage and studios	2 or 3 or 8	B or F-1or H
Fire stations	2	B
Fish processing	3	F-1
Food		
Product processing except meat & fish	3	F-1
Retail sales	3	M
Fraternities or sororities	2 or 4	R-1 or R-2 or R-3
Funeral establishments	4	A-3
Fur		
Curing, dyeing, finishing, tanning	3 or 8	H or S-1
Products manufacture exclusive of above	3 or 8	H or S-1
Garage (see Parking garage)		
Garbage incineration or reduction	3 or 8	F-1 or H

TABLE 120.S1 HAZARD INDEX AND USE GROUP CLASSIFICATION - continued

Use of Structure	Hazard Index No.	Use Group
Gas		
Manufacture	3 or 8	F-1 or H
Public utility stations for metering or regulating	3 or 8	F-1 or H
Storage		
2500 cu. ft. or less	3	S-1
more than 2500 cu. ft.	8	H
Gasoline service station (see Automobiles)		
Gelatin manufacture	3	F-1
Generating plants, electric or steam	3 or 8	F-1 or H
Gift shops	3	M
Glass products from previously manufactured	3	S-2
Glue manufacture	3 or 8	F-1 or H
Golf		
Indoor courses or driving ranges	4	A-3
Gymnasiums (without spectator seating)	4	A-3
Grain storage	3 or 8	H or S-1
Hair		
Curing, dyeing, washing, bulk processing	3	F-1
Product manufacture exclusive of above	3	F-1
Hardware	3	F-1
Manufacture	3	M
Retail sales		
Helicopter landing facility, rooftop	3	S-1
Home occupations	2	B
Homes for the aged	4	I-2
Hosiery manufacture	3 or 8	F-1 or H
Hospitals		
Including convalescent, nursing, or rest homes and sanitariums, provided custodial care is not provided for drug addicts, alcoholics, mentally ill or mentally deficient	4	I-2
For care of drug addicts, mentally ill, or mentally deficient	4	I-2
Research or teaching laboratories (see also Animal hospitals)	2 or other	B or other
Hotels	4	R-1
Ice manufacturing (dry or natural)	3	F-1
Ice skating rinks	4	A-3 or A-4
Incineration or reduction of garbage, offal, or dead animals	3	F-1
Industry uses (see specific items)		
Without resulting noise, vibration, special danger, hazard, dust, smoke, fumes, etc.	3 or 8	F-1 or H
Other than above	Based on use.	Based on use.
Ink or inked ribbon manufacture	3	F-1 or H
Jewelry	3	F-1 or M
Kennels (see Animal)		
Laboratories		
Research laboratory not accessory to school or hospital	2 or 8	B or H
Scientific research or teaching laboratory, non-profit, accessory to school, or hospital, subject to limitations	2 or 8	B or H
Laundries		
Hand laundry	2	B
Self service; pick-up and delivery station of laundry or dry cleaner	2	B
Steam laundries without limitations	3	F-1

TABLE 120.S1 HAZARD INDEX AND USE GROUP CLASSIFICATION - continued

Use of Structure	Hazard Index No.	Use Group
Leather		
Curing, dyeing, finishing or tanning	3 or 8	F-1 or H
Product manufacture exclusive of above	3 or 8	F-1 or H
Libraries	4	A-3
Linoleum or oilcloth manufacture	3 or 8	F-1 or H
Liquor sales, package	3	M
Luggage manufacture	3	F-1
Lumber (see Wood)		
Manufacturing	3 or 8	F-1 or H
Matches manufacture	8	H
Mattress manufacture and renovation	3	F-1
Meat Markets	3	M
Slaughtering or packaging	3	F-1
Medical & dental offices	2	B
(see also Laboratories; Orthopedic & medical appliances; Hospitals)		
Meeting hall	4	A-3
Metals, manufacture	3	F-1
Reduction, refining or smelting	8	H
Monasteries	4	R2
Motels	4	R-1
Motor freight stations (see trucking terminals)		
Museums	4	A-3
Musical instruments manufacture	3	F-1
Newspaper publishing	3	F-1
Newsstands	3	M
Novelty products manufacture	3	F-1
Nursing Homes	4	I-2
Offices	2	B
Oilcloth manufacture	3	F-1
Optical equipment or similar precision instruments manufacture	3	F-1
Orphanages	3 or 4	I-1 or I-2
Orthopedic or medical appliance manufacture	3	F-1
Paint, turpentine or varnish		
Manufacture	8	H
Spraying booths	8	H
Paper products manufacture	3	F-1
Parish houses	4	A-3 or R-2
Parking garages	1	S-2
Petroleum or petroleum products		
Refining	8	H
Storage	3	S-1
Pharmaceutical products manufacture	3 or 8	F-1 or H
Photography studio	2	B
Plastics		
Product manufacture	8	H
Raw, manufacture	8	H
Police stations	2	B
Pool rooms	4	A-3
Post offices	2	B
Printing		
Plant	3	F-1
Printing or newspaper publishing	3	F-1
Prisons & other correctional or detention institutions	5	I-3
Pumping station or substation, water or sewage	3 or 8	F-1 or H

TABLE 120.S1 HAZARD INDEX AND USE GROUP CLASSIFICATION - continued

Use of Structure	Hazard Index No.	Use Group
Radio		
Sales	3	M
Studios with audience	4	A-3 or A-4
Studios without audience	4	A-3
Railroad		
Freight terminal	3	S-1
Passenger station	4	A-3
Recreation		
Center, indoor	4	A-3
Community center building	4	A-3
Rectories	4	R-2
Residences		
One-family	2	R-3
Two-family	2	R-3
Apartment	2 or 4	R-2 or R-3
Temporary dwelling structure	4	R-1
Boarding or lodging house	4	R-1 or R-2
Dormitory	4	R-1 or R-2
Fraternity or sorority	2or 4	R-2 or R-3
Hotel, motel apartment with accessory services	4	R-1
Convents, monasteries, rectories	2or 4	R-2 or R-3
Research laboratories (see Laboratories)		
Restaurant, lunch room, cafeteria or other establishments primarily for eating	5	A-2
Retail business	3	M
Stores with combustible or flammable goods constructing a high hazard	8	H
Rubber		
Manufacture (natural or synthetic), including tires, tubes, or similar products	8	H
Products (exclusive or processing) including washers, gloves, footwear bathing caps and the like	3	S-1
Sanatariums		
Not providing custodial care for drug addicts, alcoholics, mentally ill, or mentally deficient	4 or 5	I-1 or R-2
Providing care for the above	4 or 5	I-1 or R-3
Schools (K-12)	4	E
Seminaries	2 or 4	R-2 or R-3
Sewage		
Disposal plant	3 or 8	F-1 or H
Pumping station	3 or 8	F-1 or H
Shoes		
Manufacture	3	F-1
Repair shop	3	F-1
Silverware manufacture, plate or sterling	3	F-1
Skating rinks	4	A-3 or A-4
Soap and detergents		
Manufacturing, including fat rendering	8	H
Packaging	3	F-1
Solvent extracting	8	H
Sporting or athletic goods		
Manufacture	3	F-1
Stores	3	M
Stables	3	S-1

TABLE 120.S1 HAZARD INDEX AND USE GROUP CLASSIFICATION - continued

Use of Structure	Hazard Index No.	Use Group
Stadiums	4	A-5
Wholesale business, including accessory storage other than flammable liquids, gases and explosives, in roofed structures	1 or 3	S-1 or S-2 or M depending on nature of materials
Stores (see Retail stores; or specific items)		
Tailor shops, custom	2	B
Tanning (see leather; Fur)		
Taxidermist shops	3	M
Telephone exchanges		
Automatic	2	B
Non-automatic	2	B
Television		
Sales	3	M
Studios	3 or 6	A-1 or A-3
Textiles		
Manufacture, including knit & yard goods, thread or cordage, spinning, weaving, dyeing & printing, shoddy manufacture	3	F-1
Theaters	6	A-1
Tires, manufacture	8	H
Tobacco products manufacture including curing	3	F-1
Tools & hardware		
Manufacture	3	F-1
Sales	3	M
Toys		
Manufacture	3	F-1
Trailer park (see Mobile homes)		
Truck		
Repairs	3	S-1
Sales	3	M
Trucking terminals	3	S-1
Turpentine manufacture	8	H
Warehouses	1 or 3 or 8	H or S-1 or S-2 depending on nature of materials
Waterpumping stations	3 or 8	F-1 or H
Wax products manufacture	8	H

120.S401.0 – PART FOUR - ARCHAIC CONSTRUCTION SYSTEMS

120.S401.1 Purpose. The purpose of 780 CMR 120.S401through 120.S402, is to assist the building official and those regulated by780 CMR in evaluating the properties of archaic construction systems.

120.S401.2 Scope. 780 cmr 120.S4 contains data on construction systems no longer in general use but which may be encountered in older existing buildings. It is meant to be used for assessing existing conditions when evaluating how proposed changes will impact upon the performance of the building.

120.S401.3 Application. In any given problem, all available data should be collected and professional judgement exercised in arriving at decisions. Evaluative judgment should be used when test data does not exist or when applying the data contained in this standard.

120.S402.0 ARCHAIC FIRERESISTIVE SYSTEMS

120.S402.1 General. 780 CMR 120.S, Part Four contains a list of fireresistive materials and construction which are not necessarily currently in common use. Some of the hourly ratings contained in the listing predate ASTM E-119 that is in current use. The hourly ratings may be higher or lower if tested according to ASTM E 119. In addition to the data contained herein, see Report BMS92, Building Materials and Structures, dated October 7, 1942, National Bureau of Standards. The data listed below is extracted from the Boston Building Code, *circa* 1943.

120.S402.2 Fireresistive materials and construction.

120.S402.2.1 Minimum Qualities. Materials, to be given the fireresistive ratings specified in this part, shall have the following minimum qualities set forth in 780 CMR 120.S402.2.2 through 120.S402.2.19.

120.S402.2.2 Class 1 Concrete. Concrete of Class 1 shall be so proportioned as to have a strength of at least 1500 pounds per square inch (psi) and the coarse aggregate shall consist of limestone, trap rock, blast furnace slag, cinders containing not more that 20% of combustive material, burned clay or shale.

120.S402.2.3 Class 2 Concrete. Concrete of Class 2 shall be so proportioned as to have a strength of at least 1500 pounds psi, the coarse aggregate consisting of sandstone, granite, quartzite, siliceous gravel or other similar material not over one inch in size.

120.S402.2.4 Masonry. Masonry shall be laid in lime-cement or cement mortar, or approved masonry cement mortar, except that masonry of gypsum tile shall, and masonry of structural clay tile may, be laid in gypsum mortar. Masonry shall be thoroughly bonded by breaking joints in successive courses or by the use of metal ties.

120.S402.2.5 Brick. Brick shall be burned clay or shale, concrete or sand-lime brick of Grade C or better.

120.S402.2.6 Stone. Stone shall be limestone, marble, slate or equally fireresistive natural stone. Sandstone, granite or other stone which, because of its crystalline structure or for other reason, is less fireresistive, shall not be considered fire protection for structural metal, but may be used in a masonry wall not less that 12 inches thick required to have fireresistance. Stone masonry shall have the same fireresistive rating as brick masonry.

120.S402.2.7 Cast Stone. Cast stone masonry shall have the same fireresistive rating as brick masonry.

120.S402.2.8 Concrete Blocks. Concrete blocks, whether solid or hollow, shall have as coarse aggregate limestone, trap rock, blast furnace slag, cinders containing not more than 20% of combustible material, burned clay or shale.

120.S402.2.9 Structural Clay Tile. Structural clay tile shall conform to the specifications for load-bearing tile, floor tile or partition tile. Where partition tile is specified load-bearing tile may be used.

120.S402.2.10 Gypsum. Gypsum tile or pre-cast gypsum concrete, whether solid or hollow, shall conform to Standard Specifications for Gypsum Partition Tile or Block of the American Society for Testing Materials and shall not contain more than 3% by weight of wood or other combustible binder or filler.

120.S402.2.11 Gypsum Concrete. Gypsum concrete shall not contain more than 12½ by weight of wood or other combustive binder or filler and shall have a compressive strength of at least 500 psi. It shall not be used where exposed to the elements.

120.S402.2.12 Lath. Expanded metal or wire lath as a base or reinforcement for plastering shall weigh not less that 2.2 pounds per square yard and shall have not less than 2½ meshes per inch.

120.S402.2.13 Metal Mesh for Masonry. Metal mesh reinforcement specified for masonry fire protection of structural metal shall consist of wire lath strips the full thickness of the masonry, laid in the beds thereof, or its approved equivalent.

120.S402.2.14 Metal Mesh for Concrete. Metal mesh reinforcement specified for concrete fire protection of structural metal shall consist of wire mesh weighing not less than 1½ pounds per square yard with wire spaced not over four inches, or not less than No. 11 gauge steel wire spaced not over four inches apart, or its approved equivalent.

120.S402.2.15 Cement Plaster. Cement plaster shall be proportioned of one part Portland cement, and not more than two parts of sand measured by volume dry and loose to which may be added lime putty or hydrated lime not exceeding 15% of the cement.

120.S402.2.16 Gypsum Plaster. Gypsum plaster, except where otherwise specified, may contain sand, not in excess of three times the weight of the gypsum.

120.S402.2.17 Lime plaster. Lime plaster shall consist of a mixture of one part lime, not over three parts sand, and water.

120.S402.2.18 Pneumatically Projected Mortar. Pneumatically projected mortar made of Portland cement, sand and water shall be rated for fire protection the same as Class 1 concrete.

120.S402.2.19 Concrete Fill. Concrete fill, where specified in 780 CMR 120.S in connection with hollow masonry units shall consist of Class 1 or Class 2 concrete poured in the hollow spaces of the units as they are laid.

120.S402.2.20 Reinforced Concrete. Portland cement concrete or gypsum concrete poured in place as fire protection for beams, trusses and other horizontal or inclined members of structural steel and pneumatically projected mortar applied to structural steel as fire protection shall be reinforced with metal mesh reinforcement. Concrete protection for vertical columns of structural metal shall have reinforcing consisting

of No. 5 wire spaced not over eight inches apart or its equivalent. Reinforcement shall be wrapped around the structural member and so arranged as to be completely embedded in the fire protection material and to ensure its integrity.

120.S402.2.21 Reinforced Plaster. Plaster used as fire protection or to resist the spread of fire shall be reinforced with metal lath, except plaster less than one inch thick or masonry or concrete.

120.S402.2.22 Replacement Material. In the protection of structural metal including reinforcement, ½ inch of cement or gypsum plaster may replace an equal thickness of poured concrete or pneumatically projected mortar as protective material; and one inch of cement or gypsum plaster reinforced with metal lath may replace an equal thickness of poured concrete, pneumatically projected mortar or masonry protection.

120.S402.2.23 Plaster. Where plaster is required without other specification, it shall consist of ½ inch of cement or gypsum plaster, except that only gypsum plaster shall be used on gypsum masonry.

120.S402.2.24 Thickness. In 780 CMR 120.S, except where otherwise specifically stated, the thickness given in a list of materials applies to the next following item only, and not to the total thickness where additional materials are specified.

120.S402.2.25 Embedding Limitations. Pipes, wires, conduits and ducts shall not be embedded in or placed behind the fire-protective materials required for the protection of structural steel or iron except as otherwise provided in this paragraph. Above fire-protective hung ceilings and within the enclosed space in buildings of Type 1 construction within which, other than the enclosure, fire protection of steel is not required, pipes, wires, conduits and ducts may be placed, provided they are so arranged and so secured that they will not, either by expanding in the event of fire, or otherwise impair, the effectiveness of the enclosing protective materials. Electric conduits and wires and gas pipes may be embedded in concrete or masonry fire protection of structural steel where the protective material is reinforced with wire mesh, provided they shall have protective covering except over the tops of beams and girders, at least as thick as required for the steel.

120.S5.2.7402.2.26 Damage Protection. In factories, garages, warehouses and other buildings in which the fire-protective covering required for steel or iron columns may be damaged by the movement of vehicles, materials or equipment, such covering shall be protected by metal or other material in a manner satisfactory to the building official.

120.S402.2.27 Firestopping. Firestopping shall mean the stopping off or enclosure at the ends and wherever else specified of the spaced between studs of partitions, joists of floors and roofs and other similar spaces to prevent drafts of air and the communication of fire from one such space to another. Fire-stopping shall consist of wood not less than 1½ inches thick, of sheet metal not less than No. 24 gauge or of masonry, or a combination of such materials. Firestopping shall be tightly fitted in the space to be filled, about pipes, wires and ducts and, if cut or disturbed in the placement of pipes, wires and ducts, shall be repaired.

120.S402.3 Fire Protection of Steel Columns.

120.S402.3.1 Protective Thickness. Structural steel columns required to have fire protection of a given rating shall be covered on all sides with protective material having not less than the thickness necessary for the required rating. Except where "no fill" is specified, re-entrant and other accessible spaces behind the specified outer protection shall be filled with concrete or brick masonry or the material of the outer protection.

120.S402.3.2 Fireresistance Rating. Materials shall be assumed to afford to steel columns fire protection of the rating indicated in the following 780 CMR 120.S402.3.3 through 120.S402.3.6:

120.S402.3.3 Four Hour Rating:

1. Two inches Class 1 concrete.
2. Three inches Class 2 concrete, metal mesh reinforcement.
3. 3½ inches brick masonry.
4. Two layers two inch structural clay partition tile masonry, metal mesh in beds.
5. Two inches structural clay partition tile masonry, concrete fill, metal mesh in beds, ¾ inch gypsum plaster.
6. Four inches structural clay partition tile masonry, concrete fill, metal mesh in beds, _ inch lime plaster.
7. Four inches structural clay partition tile or concrete block masonry, concrete fill, plaster.
8. Three inches hollow gypsum tile masonry and plaster.
9. Two inches gypsum concrete, metal mesh reinforcement.
10. Two inches solid gypsum tile masonry and plaster.
11. Three inches solid cinder concrete block masonry and plaster.
12. Four inches hollow cinder concrete block masonry and plaster

120.S402.3.4 Three Hour Rating:

1. 1¾ inches Class 1 concrete.
2. Two inches Class 2 concrete, metal mesh reinforcement.

3. Two inches gypsum concrete.

4. Two inches solid cinder concrete block masonry and plaster.

5. Two inches structural clay partition tile masonry, concrete fill.

6. Four inches structural clay partition tile masonry, concrete fill, metal mesh in beds, _ inch lime plaster.

120.S402.3.5 Two Hour Rating:

1. 1½ inches Class 1 concrete.

2. Two inches Class 2 concrete, metal mesh reinforcement.

3. One inch Class 1 or Class 2 concrete encased in standard weight steel or wrought iron pipe.

4. Two inches structural clay partition tile masonry and plaster.

5. Two layers plaster, each on metal lath, with ¾ inch air space between, two inches total thickness.

6. Two inches gypsum concrete.

7. Two inches solid or three inches hollow gypsum tile masonry.

120.S402.3.6 One Hour Rating:

1. One inch Class 1 concrete.

2. 1½ inches Class 2 concrete with metal mesh reinforcement.

3. 2¼ inches brick masonry.

4. Two inches structural clay partition tile or concrete block masonry.

5. One inch cement or gypsum plaster on metal lath.

120.S402.3.7 Thickness. The thickness of protection on the outer edges of lugs or brackets need not exceed one inch.

120.S402.4 Fire Protection of Cast Iron Columns.

120.S402.4.1 Protective Thickness. Cast iron columns required to have fire protection of a given rating shall be covered on all sides with protective materials having not less than the thickness necessary for the required rating. Re-entrant spaces, if any on the exterior of cast iron columns, and other accessible spaces behind the specified protection, shall be filled with Class 1 concrete or brick masonry or the material of the outer protection.

120.S402.4.2 Fireresistance Rating. Materials shall be assumed to afford to cast iron columns fire protection of the rating indicating in 780 CMR 120.S402.4.3 through 120.S402.4.5:

120.S402.4.3 Four Hour Rating. Cast iron columns shall not be used where the protection of a four hour rating is required.

120.S402.4.4 Three Hour Rating:

1. Two inches Class 2 concrete.

2. Three inches Class 2 Concrete, metal mesh reinforcement.

3. Two inches structural clay partition tile or concrete block masonry concrete fill.

4. 1½ inches cement or gypsum plaster on metal lath and metal furring to form ½ inch air space.

5. 1½ inches Class 1 concrete.

6. Two inches Class 2 concrete with metal mesh reinforcement.

120.S402.4.5 One Hour Rating:

1. One inch Class 1 concrete.

2. 1½ inches Class 2 concrete with metal mesh reinforcement.

3. One inch cement or gypsum plaster on metal lath.

120.S402.5 Fire Protection of Steel in Reinforced Concrete Columns.

120.S402.5.1 Protection Thickness. The main steel reinforcement, including spiral reinforcement and ties larger than ½ inch, in reinforced concrete columns required to have fire protection of a given rating shall be covered with concrete having not less than the thickness listed in 780 CMR 120.S402.5 for the rating indicating in the following 780 CMR 120.S402.5.2 through 120.S402.5.6.

120.S402.5.2 Four Hour Rating:

1. 1½ inches Class 1 concrete.
2. Two inches Class 2 concrete.

120.S402.5.3 Three Hour Rating. 1½ inches Class 1 or Class 2 concrete.

120.S402.5.4 Two Hour Rating:

1. One inch Class 1 concrete.
2. 1½ inches Class 2 concrete.

120.S402.5.5 One Hour Rating. One inch Class 1 or Class 2 concrete.

120.S402.5.6 Ties less than ½ Inch. The thickness of protection on column ties not larger than ½ inch may be ½ inch may be ½ inch thinner than that listed above.

120.S402.6 Fire protection of Steel Beams, Girders, and Trusses.

120.S402.6.1 Protective Thickness. Steel beams, girders and trusses or the members of trusses, required to have fire protection of a given rating, shall be covered on all sides with material having not less than the thickness necessary for the required rating.

120.S402.6.2 Four Hour Rating:

1. Two inches Class 1 concrete.
2. Three inches Class 2 concrete.
3. Three inches structural clay partition tile or concrete block masonry and plaster.
4. Three inches hollow gypsum tile masonry and plaster.
5. Two inches gypsum concrete.
6. Two inches solid gypsum tile masonry and plaster.

120.S402.6.3 Three Hour Rating:

1 1¾ inches Class 1 concrete.
2. 2½ inches Class 2 concrete.
3. Two inches gypsum concrete.
4. Two inches structural clay partition tile, or concrete block masonry and plaster.
5. Two inches solid, or three inches hollow gypsum tile masonry.

120.S402.6.4 Two Hour Rating:

1. 1½ inches of Class 2 concrete.
2. Two inches gypsum concrete.

120.S402.6.5 One Hour Rating:

1. One inch Class 1 concrete.
2. 1½ inches Class 2 concrete.
3. _ inch or cement or gypsum plaster on metal lath.

120.S402.7 Fire Protection of Steel in Reinforced Concrete Beams.

120.S402.7.1 Protective Thickness. The main steel reinforcement, including stirrups larger than ½ inch, in reinforced concrete beams, girders and trusses, including the ribs of reinforced concrete ribbed floors or roofs where one or both sides of the ribs, in addition to the soffit, are exposed to fire, required to have fire protection of a given rating, shall be covered on all sides with concrete having not less than the thickness listed in 780 CMR 120.S402.7 for the required rating. Where a reinforced concrete floor or roof has a flush ceiling formed with approved permanent masonry filler between ribs, the reinforcement shall have the protection required for reinforcing steel of floors and roofs in 780 CMR 120.S402.8.

120.S402.7.2 Four Hour Rating:

1. 1½ inches Class 1 concrete.
2. Two inches Class 2 concrete.

120.S402.7.3 Three Hour Rating. 1½ inches Class 1 or Class 2 concrete.

120.S402.7.4 Two hour rating:

1. One inch Class 1 concrete.
2. 1½ inches Class 2 concrete.

120.S402.7.5 One Hour Rating. One inch Class 1 or Class 2 concrete.

120.S402.7.6 Stirrups less than ½ Inch. The thickness of protection on stirrups not larger than ½ inch may be less than that listed by not more than ½ inch.

120.S402.8 Fire Protection of Steel Reinforcing in Floors and Roofs.

120.S402.8.1 Protection Thickness. The steel reinforcement in reinforced concrete floors and roofs with flush or plane ceiling, such that the exposure to fire is on the soffit only, required to have fire protection of a given rating, shall be covered with concrete having not less than the thickness listed in 780 CMR 120.S402.8 for the required rating. In floors or roofs having reinforced concrete ribs where the concrete surrounding the steel reinforcement is exposed to fire on one or both sides in addition to the soffit, such reinforcement shall have the protection specified in 780 CMR 120.S402.7 for steel in reinforced concrete beams.

120.S402.8.2 Four Hour Rating:

1. One inch Class 1 concrete.
2. 1¼ inches Class 2 concrete.

120.S402.8.3 Three Hour Rating. One inch Class 1 or Class 2 concrete.

120.S402.8.4 Two Hour Rating:

1. ¾ inch Class 1 concrete.
2. One inch Class 2 concrete.

120.S402.8.5 One Hour Rating. ¾ inch Class 1 or Class 2 concrete.

120.S402.9 Fireresistive Floor and Roof Construction.

120.S402.9.1 Protective Thickness. Floors and roofs required to have resistance of a given rating to the spread of fire shall have such thickness of the materials of which it is constructed, as shall be necessary for the required rating, and structural metal forming a part of such floors or roofs shall have protection against fire of such required rating. Floors and roofs required to have two hour or longer resistance to fire be constructed of noncombustible materials. Granolithic, burned clay tile, ceramic tile or other similar incombustible floor finish of a given thickness may be substituted for an equal thickness, and sand, cinder or other incombustible filling material, with or without embedded wooden screeds, may be substituted for two thirds its thickness, of the floor or roof construction material specified in 780 CMR 120.S402.9, provided that such floors and roofs shall have adequate thickness for structural purposes.

120.S402.9.2 Fireresistance Rating. Floor or roof construction shall be assumed to afford resistance to the spread of fire of the rating indicated in the following 780 CMR 120.S402.9.3 through 120.S4029.6:

120.S402.9.3 Four Hour Rating:

1. Four inches solid slab of reinforced Portland cement concrete or reinforced precast gypsum concrete.
2. Four inches solid masonry arched or slabs.
3. Four inches structural clay floor tile masonry arches or slabs with top covering of not less than two inches of solid masonry or reinforced concrete.
4. Five inches combination reinforced Portland cement concrete slab consisting of permanent fillers of concrete block, gypsum or structural clay tile and 1½ inches of concrete topping; but if structural clay partition tiles are used for fillers, they shall be plastered on the soffit.

120.S402.9.4 Three Hour Rating:

1. Three inches solid slab of reinforced Portland cement concrete or reinforced precast gypsum concrete.
2. Three inches solid masonry arches or slabs.
3. Four inches structural clay floor tile masonry, arches or slabs with top covering of not less than 1½ inches of solid masonry or reinforced concrete.
4. Four inches combination reinforced Portland cement concrete slab consisting of permanent fillers of concrete block, gypsum or structural clay tile and one inch concrete topping; but if structural clay partition tiles are used for fillers, they shall be plastered on the soffit.

120.S402.9.5 Two Hour Rating:

1. 2½ inches solid slab of reinforced Portland cement concrete or reinforced precast gypsum concrete.
2. 2½ inches solid masonry arches or slabs.
3. Three inches structural clay floor tile masonry, arches or slabs with top covering of not less than one inch of solid masonry or reinforced concrete.

120.S402.9.6 One Hour Rating:

1. Three inches structural clay floor tile masonry, arches or slabs with all joints thoroughly filled with cement or gypsum mortar.
2. Wood floor or roof construction with joists not less than one and five eigths inches in least dimension, firestopped, double board floor, approved asbestos felt between lay of boards, and with a ceiling of at least ¾ inch cement or gypsum plaster on metal lath.
3. Steel beams or steel joists not more than 36 inches apart on centers with noncombustible floor and a ceiling of at least ¾ inch cement or gypsum plaster on metal lath furring.

120.S402.10 Fireresistive Ceiling Construction:

120.S402.10.1 Protective Thickness. Ceilings required to afford fire protection of a given rating to the floor or roof framing under which it is supported shall be of fireresistive materials of at least the thickness necessary for the given rating. A fireresistive ceiling and all hangers and fastenings necessary for its support to the protected framing shall be of noncombustible materials. It shall be capable of sustaining its own weight without exceeding allowable stresses. Metal reinforcement in such a ceiling shall be protected from fire as specified in 780 CMR 120.S402.8 for reinforcing in a floor.

120.S402.10.2 Fireresistance Tating. Ceiling construction shall be assumed to afford to floor or roof framing fire protection of the rating indicated in the following 780 CMR 120.S402.10.3 through 120.S402.10.6.

120.S402.10.3 Four Hour Rating:

1. 2½ inches solid slab of reinforced Portland cement concrete or reinforced precast gypsum concrete.
2. Two inches precast reinforced gypsum concrete, plastered.

120.S402.10.4 Three Hour Rating:

1. Two inches solid slab of reinforced Portland cement concrete or reinforced precast gypsum concrete.
2. Two inches precast reinforced gypsum concrete, lapped or rabbeted joints.

120.S402.10.5 Two Hour Rating. 1½ inches solid slab of reinforced Portland cement concrete or reinforced precast gypsum concrete.

120.S402.10.6 One Hour Rating. ¾ inch cement or gypsum plaster on metal lath.

120.S402.11 Fireresistive Bearing Walls and Partitions.

120.S402.11.1 Protective Thickness. Bearing walls and partitions required to have resistance to fire or the spread of fire of a given rating shall be constructed of fireresistive materials and shall have at least the thickness necessary for the required rating. Walls required to have two hour or longer rating shall be of noncombustible materials. Steel reinforcement in reinforced concrete walls shall have the same protection for the given rating as is required in 780 CMR 120.S402.9 for floors.

120.S402.11.2 Fireresistance Rating. Bearing walls and partitions shall be assumed to have resistance to fire and the spread of fire of the rating indicated in the following 780 CMR 120.S402.11.3 through 120.S40211.6:

120.S402.11.3 Four Hour Rating:

1. Eight inches solid brick masonry.
2. 12 inches hollow wall of brick masonry, minimum eight inch masonry thickness.
3. 12 inches structural clay load-bearing tile masonry with two units and not less than three cells in the thickness of the wall.
4. Eight inches structural clay load-bearing tile masonry with one unit and not less than two cells in the thickness of the wall, plastered both sides.
5. 12 inches concrete block masonry with one unit and not less than two cells in the thickness of the wall.
6. Eight inches one piece concrete block masonry with shells and webs at least 1½ inches thick, plastered both sides.
7. 12 inches total thickness of brick masonry facing bonded to structural clay load-bearing tile masonry backing.
8. Eight inches solid concrete.
9. Six inches solid reinforced concrete.
10. A steel or reinforced concrete frame bearing wall in which the steel has fire protection of four hour rating, with panel filling as specified in 780 CMR 120.S402.12 for a nonbearing wall of four hour rating.

120.S402.11.4 Three Hour Rating:

1. Eight inches structural clay load-bearing tile masonry with two units and not less than four cells in the thickness of the wall.
2. 12 inches structural clay load-bearing tile masonry with one unit and not less than three cells in the thickness if the wall.
3. Eight inches one piece concrete block masonry with shells and webs not less than 1½ inches thick, plastered both sides.
4. Eight inches one piece concrete block masonry with shells and webs not less than two inches thick.
5. Five inches solid reinforced concrete.
6. A steel or reinforced concrete frame bearing wall in which the steel has fire protection of three hour rating, with panel filling as specified in 780 CMR 120.S402.12 for a nonbearing wall of three hour rating.

120.S402.11.5 Two Hour Rating:

1. Eight inches structural clay load-bearing tile masonry with not less than three cells in the thickness of the wall.
2. Eight inches concrete block masonry with shells and webs not less than 1½ inches thick.
3. A steel or reinforced concrete frame bearing wall in which the steel has fire protection of two hour rating, with panel filling as specified in 780 CMR 120.S402.12 for a nonbearing wall of two hour rating.

120.S402.11.6 One Hour Rating:

1. A steel or wooden stud bearing wall covered on both sides with one inch cement or gypsum plaster on metal lath, firestopped if of wood.
2. A steel or reinforced concrete frame bearing wall in which the steel has fire protection of one hour rating, with panel filling as specified in 780 CMR 120.S402.12 for a nonbearing wall of one hour rating.

120.S402.12 Fireresistive Nonbearing Walls and Partitions.

120.S402.12.1 Protective Thickness. Nonbearing walls and partitions required to have resistance to fire and the spread of fire of a given rating shall be constructed of fireresistive materials and shall have at least the thickness necessary for the required rating. Walls required to have two hour or longer rating shall be of incombustible materials. Steel reinforcement in reinforced concrete walls shall have the same protection for the given rating as is required in 780 CMR 120.S402.8.

120.S402.12.2 Fireresistance Rating. Nonbearing walls and partitions shall be assumed to have resistance to fire and the spread of fire of the rating indicated in the following 780 CMR 120.S402.12.3 through 120.S402.12.6.

120.S402.12.3 Four Hour Rating:

1. Eight inches solid brick masonry.
2. 3½ inches solid brick masonry, plastered goth sides.
3. Six inches structural clay load-bearing tile, plastered both sides.
4. Six inches solid concrete.
5. Four inches solid reinforced concrete.
6. Any wall which, as a bearing wall, has a three hour or four hour rating in 780 CMR 120.S402.11, except the steel or reinforced concrete frame bearing wall.

120.S402.12.4 Three Hour Rating:

1. 3½ inches solid brick masonry.
2. Four inches structural clay load-bearing tile, plastered both sides.
3. Four inches solid concrete.
4. Three inches reinforced concrete.

5. Any wall which, as a bearing wall, has a two hour rating in 780 CMR 120.S402.11 except the steel or reinforced concrete frame bearing wall.

120.S402.12.5 Two Hour Rating:

1. Three inches gypsum tile masonry plastered both sides except in exterior walls.

2. Eight inches structural clay partition tile masonry, plastered both sides.

3. Eight inches structural clay load-bearing tile, with three cells in the thickness of the wall.

4. 2½ inches solid cement or sanded gypsum plaster on metal lath and noncombustible studding.

5. Three inches total thickness of hollow wall, ¾ inch cement or gypsum plaster on metal lath and noncombustible studding.

6. Three inches total thickness of hollow wall, ¾ inch cement or gypsum plaster on metal lath and wooden studding, firestopped.

120.S402.13 Fireresistive Doors.

120.S402.13.1 General. Doors which are required to be fire doors, fireresistive doors, or of fireresistive construction shall conform to the requirements of 780 CMR 120.S402.13 and 120.S402.14

120.S402.13.2 Classification. Fire doors shall be classified for the proposes of 780 CMR as Class A, Class B, and Class C.

120.S402.13.3 Class A Ffire Doors. Class A fire doors shall be doors of the following construction and as specified in 780 CMR 120.S402.14:

1. Tin-clad, three ply wood core, sliding.

2. Tin-clad, three ply wood core, swinging single leaf, doorway not over six feet wide.

3. Tin-clad, three ply wood core, swinging in pairs, doorway not over feet wide.

4. Hollow metal, swinging single leaf, doorway not over four feet wide.

5. Hollow metal, swinging in pairs, doorway not over eight feet wide.

6. Sheet metal, sliding, single, doorway not over ten feet wide.

7. Sheet metal, sliding in pairs, doorway not over 12 feet wide.

8. Sheet metal, swinging single leaf, doorway not over feet wide.

9. Sheet metal, swinging in pairs, doorway not over ten feet wide.

10. Steel rolling doorway not over 12 feet wide.

11. Steel plate, doorway not over four feet wide.

12. Any other construction equal or superior to a tin-clad three ply wood core door in a standard fire test, for resistance to fire, the spread of fire and smoke, and transmission of heat.

120.S402.13.4 Class B Fire Doors. Class B fire doors shall be doors of the following construction and as specified in 780 CMR 120.S402.14:

1. Tin-clad, three ply wood core.

2. Tin-clad, two ply wood core, sliding, doorway not over ten feet wide.

3. Tin-clad, two ply wood core, swinging single leaf, doorway not over six feet wide.

4. Tin-clad, two ply wood core, swinging in pairs, doorway not over ten feet wide.

5. Hollow metal, sliding, doorway not over eight feet wide.

6. Metal-clad, paneled, swinging single leaf, doorway not over three feet wide.

7. Metal-clad, paneled, swinging in pairs, doorway not over six feet wide.

8. Any other construction equal or superior to a tin-clad two ply wood core door in a standard fire test, for resistance to fire, the spread of fire and smoke, and transmission of heat.

120.S402.13.5 Class C Fire Doors. Class C Fire doors shall be doors of the following construction and as specified in 780 CMR 120.S402.14:

1. Metal-clad, paneled, swinging single leaf, doorway not over four feet wide.

2. Metal-clad, paneled, swinging in pairs, doorway not over eight feet wide.

120.S402.13.6 Substitution. A Class A door may be used where Class b or Class C is specified; a Class B door may be used where Class C is specified. Two Class B or Class C doors on opposite sides of the wall may be used where a single Class A or Class B door is specified.

120.S402.13.7 Overlap. Fireresistive doors, when closed, shall completely cover the doorways in the walls and partitions or the openings in the floors or roofs to which they ar fitted. A swinging fire door shall either overlap both jambs and the head of the opening not less than four inches or be fitted to a fireresistive frame with a rabbet the full thickness of the door and with not less than ½ inch overlap on the door. A sliding fire door, except in enclosures about passenger elevators, shall overlap both jambs and the head of the opening not less than four inches. A sliding fire door in an enclosure about a passenger elevator shall overlap jambs, head and adjoining panels not less than ½ inch. Fire doors shall fit closely at the floor with clearance of not over ¼ inch.

120.S402.13.8 Thresholds. In buildings with combustible floors, doorways required to have fire doors shall have noncombustible thresholds the

full thickness of the wall, extending at least four inches from the face of the wall where a door is hung and extending laterally at least six inches behind each jamb of the doorway. Thresholds may be flush with the floor.

120.S402.13.9 Rabbeted Frame. The rabbeted frame of a swinging fire door shall be constructed of structural steel built into the concrete, masonry or other fireresistive material of the wall about the opening and secured thereto, except that the rabbeted frame of a Class B or C door may be of wood, covered with sheet metal not less than No. 26 gauge in thickness, secured to the wall in the opening.

120.S402.13.10 Fit. Fire doors when closed shall fit tightly against the wall or frame so as to provide an effective stop for fire and smoke. Except for the metal-covered wooden frame specified in 780 CMR 120.S402.10, combustible material shall not intervene between the door and the fireresistive material of the wall, floor or roof to which it is fitted.

120.S402.13.11 Hardware. Hinge hardware for fire doors shall be of malleable iron or rolled structural steel not less than ¼ inch thick except that tubular steel track for sliding doors may be not less than _ inch thick. Equivalent thickness of solid bronze or brass may be used. Fire doors shall not depend upon cords, cables or chains to support them in closed position except in elevator shafts.

120.S402.13.12 Tracks. Tracks for sliding fire doors shall be so supported that a track hanger comes at each door hanger when the door is closed. Track hangers shall be secured to wood stud walls by through bolts and to concrete walls by through bolts or approved built-in inserts. Expansion shields shall not be used to support fire doors.

120.S402.13.13 Hinges. Hinges for swinging fire doors, except in wooden stud walls, shall be riveted or through-bolted to the structural steel frame of the opening, through-bolted to the wall if of masonry or concrete or secured by approved inserts in the concrete or built into masonry in an approved manner

120.S402.13.14 Strap Hinges. Strap hinges and sliding door hangers shall be secured to fire doors by through-bolting, riveting or welding. Swinging fire doors in rabbeted frames, except tin-clad, wood core doors, may be hung on butts. Other swinging fire doors shall have strap hinges.

120.S402.13.15 Straps, Locks and Latches. Sliding fire doors shall have adequate stops for the closed position. Swinging Class A fire doors shall have surface lathes or unit locks. Class B and C doors shall have surface latches, unit or mortise locks. The latch bolts of unit or mortise locks on fire doors shall have a throw of ¾ inch. When mounted in pairs, fire doors shall be rabbeted by means of an astragal or otherwise where they come together. One of a pair of swinging fire doors shall have push bolts at top and bottom with a throw of ¾ inch and the other shall be held by latch to the first.

120.S402.13.16 Opening Hardware. Except in detention buildings, fire doors hung in required exits shall be so fitted with hardware that they can be opened from inside without use of a key when the building is occupied.

120.S402.14 Fire Door Construction

120.S402.14.1 Fastening. In the construction of fire doors, solder shall not be used except for filling joints. Sheet metal shall be fastened to wood by nailing and to metal frame by bolting, riveting or welding.

120.S402.14.2 Glass. Class A doors shall not have glass panels. Class B doors may have glass panels not larger than 100 square inches in exposed area nor more than 12 inches in width or height. Class C doors may have glass panels not larger than 2,016 square inches in total exposed area, and any single light shall not have an exposed area exceeding 1,296 square inches. Glass in fire doors shall be wire glass not less than on quarter inch thick and shall be set ⅝ inch in grooves three quarters of an inch deep.

120.S402.14.3. Deleted

120.S402.14.4 Tin-clay, Two Ply. In-clad, two ply wood core doors shall be shall be constructed in accordance with the specifications of the National Board of Fire Underwriters for such doors in Class B openings and shall bear the label of the Underwriters' Laboratories to this effect.

120.S402.14.5 Hollow Metals. Hollow metal doors shall have substantial stiles and rails of heavy pressed steel, reinforced for hinges and other hardware. Panels shall be of sheet filled with asbestos board or other approved insulating materials. The door shall be assembled by welding or riveting.

120.S402.14.6 Sheet Metals. Sheet metal doors shall be constructed with a rolled steel rigid frame covered both sides with $^{1}/_{16}$ inch asbestos board and No. 26 gauge corrugated steel metal, with corrugations vertical on one side and horizontal on the other, bound on the edges with rolled steel or pressed steel shapes.

120.S402.14.7 Steel Rolling. A steel rolling fire door shall be constructed of sheet steel interlocking slats, sliding in grooves, counterweighted by springs, with the roller and mechanism enclosed in heavy sheet metal.

120.S402.14.8 Steel Plate. A steel plate fire door shall be constructed of not less than No. 12 gauge steel plate mounted on a rolled steel frame, assembled by welding or riveting.

120.S402.14.9 Metal Clad. A metal clad, paneled fire door shall have a wood core with stiles and rails not less than 1¾ inches thick covered with No. 26 gauge sheet steel; panels ¾ inch thick covered with No. 26 gauge sheet steel, set ¾ inch in grooves; joints of metal lapped and well nailed.

120.S402.14.10 Class A Label. A door properly bearing the Underwriters' label certifying that it is suitable for the protection of a Class A opening shall be acceptable as a Class A door.

120.S402.14.11 Class B Label. A door properly bearing the Underwriters' label certifying that it is suitable for the protection of a Class B opening shall be acceptable as a Class B door, except that metal clad doors wider than three feet shall not be accepted as Class B doors.

120.S402.14.12 Class C Label. A door properly bearing the Underwriters' label certifying that it is suitable for the protection of a Class C opening shall be acceptable as a Class C door.

120.S402.15 Fireresistive Shutters. Shutters required to be fire shutters or fireresistive shutters shall be constructed and hung as specified for Class B fireresistive doors in 780 CMR 120.S402.13 and 120.S402.14.

120.S402.16 Fireresistive Windows.

120.S402.16.1 General. Windows which are required to be fire windows, fireresistive windows, or of fireresistive construction shall conform to the requirements of 780 CMR 120.S402.16.

120.S402.16.2 Moveable. Firereisistive windows may be fixed or arranged to open and close. Fixed fireresistive windows shall be so secured in the walls in which they are placed that they may expand in case of fire without buckling. Moveable firereisitive windows shall be opened or closed in one of the following manners:

1. One or more sashes may slide horizontally in a fireresistive frame.
2. One or more sashes may slide vertically with counterweights or with tow sashes counterbalanced and hung on chains. If a sash is closed in raised position, it shall have a fastening.
3. A sash may be hinged at top, bottom, or either side.
4. A sash may be pivoted at top and bottom or at the sides.
5. A sash may be arranged to open and close in any other approved manner, with approved hardware.

120.S402.16.3 Sash. Moveable sashes in fireresistive windows shall be furred to fireresistive frames of the same or similar construction. Both sashes and frames, and metal mullions between window units, shall be so fitted in the walls in which they are placed as to be continuous with the fireresistive material of the wall and so secured that they may expand in case of fire without buckling.

120.S402.16.4 Glass. Glass in firereisistive windows shall be wired glass not less than one quarter inch thick and the area of a single light shall not exceed 720 square inches. Glass shall be set in three eigths inch grooves at least one half inch deep. Glass shall be secured by glazing angles or molding screwed to the sash and forming continuous grooves for the glass.

120.S402.16.5 Construction. Fireresistive windows shall be of the following construction:

1. Hollow sheet metal sashes and frames fabricated by pressing, welding, riveting or crimping without the use of solder or other fusible alloy, except for filling joints, and bearing the label of Underwriters' Laboratories.
2. Rolled steel or pressed steel sashes fabricated by pressing, welding, riveting or crimping, of a make and style approved by the commissioner.
3. Any other approved constructions as fireresistive as that specified in 780 CMR 120.S402.16.5 item.

120.S402.16.6 Hollow Sheet Metal. Fired fireresistive windows of hollow sheet metal construction shall not exceed seven feet in width not ten feet in height. Fireresistive windows of hollow sheet metal construction with moveable sashes shall not exceed six feet in width nor ten feet in height.

120.S402.16.7 Rolled Steel. Fireresistive windows of rolled steel construction shall not exceed 84 square feet in area not 12 feet in either height or width.

120.S402.16.8 Wind Pressure. Fireresistive windows and their fastenings shall be capable of resisting the wind pressure on the wall of the building applied either on the inside or the outside of the window exceeding allowable stresses.

120.S402.16.9 Substitution. Where fireresistive windows are required, wooden windows and plain glass may be substituted provided the openings are protection by fireresistive doors or shutters, or, in buildings of approved occupancy and construction, by an approved system of open sprinklers.

120.S402.17 Fireresistive Roof Covering.

120.S402.17.1 Classification. Roof covering allowed under this code shall be classified as fire-retardant or ordinary, according to resistance to fire outside, as provided in 780 CMR 120.S402.17. Fire-retardant roof covering is the more firereisistive and may be used where fire-retardant roofing is specified. Roof covering less fireresistive than ordinary roof covering shall not be used on any building.

120.S402.17.2 Fire-retardant Roofing. Fire-retardant roofing shall be any roof covering than meets the requirements of Class A or Class B roofing under the specifications of the Underwriters' Laboratories, Inc. The following roof covering shall be assumed to meet the requirements for fire-retardant roofing:

1. Built-up roofing consisting of successive layers of roofing felt impregnated with asphalt; a final layer of asphalt in which, while molten, is embedded a continuous layer of roofing gravel or slag.
2. Built-up roofing consisting of successive layers of roofing felt impregnated with coal tar; a final layer of tar in which, while molten, is embedded a continuous layer of roofing gravel or slag.
3. Built-up roofing consisting of successive layers of roofing felt impregnated with asphalt; a final layer of asbestos roofing felt impregnated with asphalt weighing not less than 14 pounds per 100 square feet, or a final layer of asphalt-saturated prepared roofing coated with granulated slate or other similar material.
4. Built-up roofing consisting of successive layers of roofing felt impregnated with tar or asphalt and a finish of burned clay floor tile, stone flagging, cement concrete or other similar material.
5. Sheet metal with locked and soldered joints not less than No. 26 gauge in thickness.
6. Shingles of natural slate.
7. Shingles of burned clay tile.
8. Shingles of sheet metal not less than No. 26 gauge in thickness.
9. Shingles of asbestos board not less than ⅛ inch thick.
10. Shingles of asphalt saturated felt surfaced with granulated slate or other similar material and carrying the Underwriters Class "C" label.
11. Corrugated sheet metal with lapped joints not less than No. 26 gauge in thickness.
12. Corrugated asbestos board not less than 3/16 inch thick.

120.S402.17.3 Ordinary Roofing. Ordinary roofing shall be of any roof covering which meets the requirements of Class C roofing under the specifications of the Underwriters' Laboratories, Inc. The following roof covering shall be assumed to meet the requirements for ordinary roofing:

1. Built-up roofing consisting of successive layers of roofing felt impregnated with asphalt, coal tar or other approved material, not equal in fireresistance to a fire-retardant roofing.
2. Prepared roofing consisting of felt or fabric impregnated or coated, or both, with asphalt, tar or other approved material or shingles of such prepared roofing, not equal in fireresistance to fire-retardant roofing.
3. Canvas stretched tightly and coated with paint.

120.S402.17.4 Means of Securing. Built up roofing shall be secured to the roof deck in the following manner:

1. Over masonry slab, the first layer shall be laid in molted asphalt or tar mopped on the roof deck, after the deck is properly primed, or by nailing a layer of building paper to nailing inserts other than wood placed in the deck.
2. Over wood decks, the built-up roofing shall be secured by nailing a layer of building paper to the roof deck over which the prepared roofing is to be laid with the first layer laid in molten asphalt or tar.
3. Roofings other than built-up roofings, such as shingles, slates, and tile roll roofing shall be well secured to the deck by nailing, bolting, wiring, or other approved methods.

NON-TEXT PAGE

780 CMR 120.T (RESERVED)

(PAGES 1091 THROUGH 1094 ARE RESERVED FOR FUTURE USE.)

780 CMR 120.U

INDEPENDENT STRUCTURAL ENGINEER REVIEW

(See 780 CMR 110.11 of the *Sixth Edition of the Massachusetts State Building Code*)

120.U101 Primary Structure: For the purposes of the independent structural engineering review, the primary structure shall be defined as the structural frame, the load supporting parts of floors, roofs, and walls, and the foundations. Cladding, cladding framing, stairs, equipment supports, ceiling supports, non-load bearing partitions, and railings are excluded from this definition of primary structure.

120.U102 Reviewing Engineer: The reviewing engineer shall be engaged by the owner.

120.U102.1 Qualifications: The reviewing engineer shall be a registered professional engineer, registered in Massachusetts, qualified by experience and training and who shall have had structural design experience with buildings or structures similar to that covered by the application for the building permit. The reviewing engineer shall be impartial, and shall be independent of the architect of record, structural engineer of record, and contractors and suppliers who will be involved in the construction of the structure.

120.U103 Criteria for Review: The reviewing engineer shall review the plans and specifications submitted with the application for the building permit for compliance with the structural and foundation design provisions of the Code. The reviewing engineer shall perform the following tasks:

1. Check to assure that the design loads conform with 780 CMR;
2. Check that other design criteria, and design assumptions, conform to 780 CMR and are in accordance with accepted engineering practice;
3. Review geotechnical and other engineering investigations that are related to the structural design to determine if the design properly incorporates the results and recommendations of the investigations;
4. Check that the organization of the structure is conceptually correct ; and
5. Make independent calculations for a represent-ative fraction of systems, members, and details to check their adequacy. The number of representative systems, members, and details shall be sufficient to form a basis for the reviewer's conclusions.

120.U103.1 Structural Calculations: The structural calculations prepared by the structural engineer of record shall be submitted to the reviewing engineer, upon the reviewing engineer's request, for his or her reference only. The reviewing engineer shall not be obligated to review or check these calculations. If the design criteria and design assumptions are not shown on the drawings or in the computations, the structural engineer of record shall provide a statement of these criteria and assumptions for the review.

120.U104 Structural Engineer of Record: The structural engineer of record shall retain sole responsibility for the structural design, and the activities and reports of the reviewing engineer shall not relieve the structural engineer of record of this responsibility.

120.U105 Report and follow-up:

1. The reviewing engineer shall prepare a report to the building official stating whether or not the structural design shown on the drawings and the specifications conform with the structural and foundation requirements of 780 CMR. Said report shall be based on the review as prescribed in 780 CMR 120.U and shall include a summary of all deficiencies, if any, which cannot be resolved with the structural engineer of record.
2. The structural engineer of record shall review the report of the reviewing engineer, and notify the building official in writing, whether or not he agrees with or disputes the conclusions and recommendations of the reviewing engineer.
3. Unresolved disputes between the structural engineer of record and the reviewing engineer shall be submitted by the building official, the owner, the structural engineer of record or the reviewing engineer to the Structural Peer Review Advisory Board for resolution.
4. Any changes to the structural design subsequent to the original submission of the plans and specifications shall be shown on revised drawings and specifications, submitted with an amendment to the application for permit. The reviewing engineer shall review the changes on the revised drawings and specifications, and, if the original report does not account for the changes in said drawings and specifications, a supplementary report relating to the changes and prepared by the reviewing engineer shall be made to the building official.

120.U106 Foundation Permits: When the plans and specifications are partially complete and an application is made for a foundation permit, the reviewing engineer may review the foundation plans and specifications on a conditional basis, provided that the reviewing engineer is given sufficient documentation so that he can perform 780 CMR 120.U103, Tasks 1, 2, 3, and 4 for the whole

structure, and so that he can perform 780 CMR 120.U103, Task 5 for that part of the foundation covered by the application for foundation permit. The reviewing engineer shall prepare a report on that part of the foundation covered by the application for foundation permit, as prescribed in 780 CMR 120.U105, stating all conditions upon which the report is based. When the reviewing engineer reviews the completed plans and specifications as prescribed in 780 CMR 120.U103, the reviewing engineer shall reperform Tasks 1, 2, 3, and 4, as necessary, to include all the revisions to the design subsequent to the application for the foundation permit.

780 CMR 120.V

ENERGY PROVISIONS

- For new construction one- and two-family dwellings and other low-rise residential buildings*, except hotels and motels, *see* 780 CMR 61.00.
- For existing one- and two-family dwellings and other low rise residential buildings, except hotels and motels, *see* 780 CMR 93.00.
- For new construction buildings other than low rise residential building, *see* 780 CMR 13.00
- For existing buildings, other than low-rise residential buildings, *see* 780 CMR 34.00.

* Low rise residential buildings are any residential use up to three stories in height, except hotels and motels.

NON-TEXT PAGE

780 CMR 120.W

FLOOR PROTECTOR THERMAL CONDUCTIVITY CALCULATIONS

(Reference 780 CMR 60.00, as applicable, for solid fuel-burning appliances)

OVERVIEW

Floor protection requirements for heat producing appliances are typically included as part of the tested/listed installation criteria for such appliances.

Such floor protection, listed as a thermal conductivity factor is often developed utilizing NFPA SUBJECT 1618, *Outline of Investigation for Wall Protectors, Floor Protectors, and Hearth Extensions*. (Note that an NFPA SUBJECT is not treated nor maintained in the same manner as an NFPA standard).

When floor protection is developed utilizing NFPA SUBJECT 1618, or developed via "good Engineer-ing Practice", such methodology will typically estab-lish floor protection based on ⅜ inch millboard.

As the thermal conductivity of such millboard can vary from manufacturer to manufacturer, it will be necessary to obtain the thermal conductivity value from a specific manufacturer for a specific millboard product.

Typical thermal conductivity values can range from:

$k = 0.21$ (Btu) (inch) / (foot^2) (hour) (°F)

to

$k = 0.84$ (Btu) (inch) / (foot^2) (hour) (°F)

Thus the necessity for product specific thermal conductivity.

Note that the lower the algebraic value of "k", the lower the thermal conductivity and the less heat per given time that is transferred across the *floor protector*.

Note that in the following discussions it is necessary to maintain consistent dimensions - i.e.; in dealing with the thickness of materials, do not mix feet with inches, but rather keep all dimensions in inches.

COMPLIANCE

If the manufacturer of the appliance specifies an acceptable material and thickness for floor protection it is necessary, utilizing that specific material with specific thermal conductivity, k, to meet or exceed the thickness specified in order to assure compliance with the listed floor protection requirements of the appliance.

ESTABLISHING EQUIVALENCY

If it is determined that another material of different thermal conductivity is desired to be utilized for floor protection (i.e., perhaps for aesthetic reasons or in order to minimize the thickness of the floor protector) and noting that the thermal conductivity, k, is linear as a function of thickness (for a given single material) then:

$$k_1/t_1 = k_2/t_2,$$

where:

k = thermal conductivity in

(Btu) (inch) / (foot^2) (hour) (°F) and

t = thickness in inches

and therefore knowing any three of the variables of k and t allows one to solve for the remaining variable; i.e., :

Knowing k_1, t_1 and t_2, one can solve for k_2:

$k_2 = (k_1)\ (t_2)/(t_1)$

Knowing k_1, t_1 and k_2, one can solve for t_2:

$t_2 = (k_2)\ (t_1)/(k_1)$

COMPOSITE FLOOR PROTECTOR ASSEMBLIES

When an assembly consists of more than one material, the assembly is defined as a composite "material".

When a floor protector is constructed of more than one material; i.e., some form of backer board with decorative tile over, it is helpful to first establish the thermal resistance, r, of each material as thermal resistances may be directly added together and then convert the resulting total R to an equivalent thermal conductivity.

r = (foot^2) (hour) (°F)/(Btu) (inch) and;

$R = (r)\ (t)$

where r is for a particular material in the composite and t is the thickness of that particular material.

Thus for the two-material example of backer board plus decorative tile,

$$R_{\text{total}} = R_{\text{backer Board}} + R_{\text{decorative tile}}$$

and;

$$R_{\text{backer board}} = (r_{\text{backer board}})\ (t_{\text{backer board}})$$

and;

$$R_{\text{tile}} = (r_{\text{tile}})\ (t_{\text{tile}})$$

RELATIONSHIP BETWEEN *k* AND *R*

By definition:

$R = (1/k)\ (t)$ for each distinct material.

NON-TEXT PAGE

780 CMR 120.X

SCHEDULE OF FEES

120.X101 Fee Schedule: In accordance with the authority conferred by M.G.L. c 143, § 94, the State Board of Building Regulations and Standards hereby establishes the following fees as specified in 780 CMR Table 120.X101.

Exceptions:

1. Fees for projects which are under the jurisdiction of a city or town shall be as duly established by said city or town in accordance with 780 CMR 5114.

2. Fees for construction related licenses issued by a city or town shall be in accordance with fee schedules established by said city or town.

3. Fees for administrative appeals hearings in cities of towns having duly established building code appeals boards in accordance with 780 CMR 5122 shall be as established by said city or town.

780 CMR TABLE 120.X101

Fee Item	Period of Certification or Licensure	Fee (Dollars)	780 or M.G.L. Authority or Reference
Concrete Testing Laboratory			**780 CMR 110.R1[a]**
Initial license	One year	150.00	780 CMR 110.R1.1.8
Renewal	One year	150.00	780 CMR 110.R1.1.10
Concrete Test Technician - Class A			780 CMR 110.R2[a]
Initial license	Five years	Note 5	780 CMR 110.R2.1.9
Renewal	Five years	Note 5	780 CMR 110.R2.1.11
Examination	Five years	Note 5	780 CMR 110.R2.1.7
Manufactured Buildings			780 CMR 110.R3[a]
Manufacturer - initial certification (per system)	One year	1200.00	780 CMR 110.R3.18.1
Manufacturer -renewal of certification	One year	650.00	780 CMR 110.R3.18.3
Certificates\Labels per unit	Per label	50.00	780 CMR 110.R3.18.4
Replacement certificate\label	Per label	2.00	780 CMR 110.R3.18.4
Certificates\Labels per component	Per label	2.00	780 CMR 110.R3.18.4
Inspection Agency - initial certification	One year	500.00	780 CMR 110.R3.18.2
Inspection Agency - certification renewal	One year	500.00	780 CMR 110.R3.18.3
Registration of Producers of Native Lumber			780 CMR 110.R4[a]
Initial registration fee	Two years	50.00	780 CMR 110.R4.1.4
Registration renewal	Two years	50.00	780 CMR 110.R4.1.5
Construction Supervisor License (CSL)			780 CMR 110.R5[a]
Unrestricted license (any building enclosing up to 35,000 cubic feet of space)			
Initial license	Three years	150.00	780 CMR 110.R5.2.5
Renewal	Two years	100.00	780 CMR 110.R5.2.5
Examination fee	Per exam	Note 1	780 CMR 110.R5.2.5
Restricted License (one and two family dwellings)			
Initial license	Three years	150.00	780 CMR 110.R5.2.5
Renewal	Two years	100.00	780 CMR 110.R5.2.5
Examination fee	Per exam	Note 1	780 CMR 110.R5.2.5
Restricted License - Masonry only			
Initial license	Three years	150.00	780 CMR 110.R5.2.5
Renewal	Two years	100.00	780 CMR 110.R5.2.5
Examination fee	Per exam	25.00	780 CMR 110.R5.2.5

780 CMR TABLE 120.X101 - continued

Fee Item	Period of Certification or Licensure	Fee (Dollars)	780 or M.G.L. Authority or Reference
Home Improvement Contractor Registration			M.G.L. c 142A & 780 CMR 110.R6[a]
Initial Certification (applicants holding CSL License)	Two years	No fee	
Initial Application (all other applicants)	Two years	100.00	
Renewal (applicants holding CSL License)	Two years	No fee	
Renewal (all other applicants)	Two years	100.00	
Guaranty Fund Payment (upon initial registration - all applicants)			
0-3 employees	Note 2	100.00	
4-10 employees	Note 2	200.00	
11-30 employees	Note 2	300.00	
over 30 employees	Note 2	500.00	
Certification of Building Commissioners, Inspectors of Buildings and Local Inspectors.			M.G.L. c 143, § 3 & 780 CMR 110.R7[a]
Certification fee		no fee	
Examination registration		Note 1	
Continuing education programs provided directly by the Board of Building Regulations and Standards		Reserved	
State Building Code Appeal Board			M.G.L. c 143, § 100
Administrative Hearing	Per hearing	150	780 CMR 122.3.1
Structural Peer Review Advisory Board			
Mediation Hearing		No fee	Not applicable to one- and two family dwellings
Building Permits and Construction Inspection for State Projects (except Massachusetts Bay Transportation Authority Projects) subject to 780 CMR and under the jurisdiction of the Department of Public Safety, Division of Inspections.			M.G.L. c 143, §§ 93 & 94 M.G.L. c 143 § 3A
Plans examination, construction inspection, issuance of building permit and certificate of and occupancy Note: This fee structure shall be deemed to include, but not be limited to, electrical, plumbing mechanical and fire protection work. Fees shall not be permitted to be levied by local jurisdictions.	Per building or structure.	0.005 times the contract amount - minimum fee for a single project shall be $25.00 (Note 3)	M.G.L. c 143, §§ 93 & 94
Massachusetts Bay Transportation Authority Projects			M.G.L. c 161A, § 18
Massachusetts Bay Transportation Authority Projects subject to 780 CMR.		No fee	M.G.L. c 161A, § 18
Periodic Inspections of Existing Buildings under the jurisdiction of the Division of Inspections, Department of Public Safety			780 CMR 106.5 & M.G.L. c 111
Hospitals and Clinics (certificate of inspection)			
First 100 beds	Two years	50.00	M.G.L. c 111, § 51
Each additional 25 beds	Two years	10.00	
Infirmaries; Convalescent Homes; Nursing Homes; Charitable Homes for the Aged; Rest Homes; Intermediate Care Facilities for the Mentally Retarded. (certificate of inspection)	Two years	50.00	M.G.L. c 111, § 71

780 CMR TABLE 120.X101 - continued

Fee Item	Period of Certification or Licensure	Fee (Dollars)	780 or M.G.L. Authority or Reference
Periodic Inspections of all other existing buildings.			M.G.L. c 143, § 94
Periodic inspections of specified use groups as specified by the *Sixth Edition of the Massachusetts State Building Code.*	As specified by 780 CMR	As specified by 780 CMR	
Certification of Building Commissioners, Inspectors of Buildings, and Local Inspectors			M.G.L. c.143, §§ 94 & 99 & 780 CMR 110.R7[a]
Certification Preparation Course of Instruction		zero – 500.00 See Note 4	M.G.L. c.143, §§ 94 & 99 & 780 CMR 110.R7 & the General Appropriation Act
Building Code Training			
One to Two Hour Session	. . . . .	zero - 25.00 See Note 4	"
½ Day Training Session	. . . . .	zero - 50.00 See Note 4	"
1 day Training Session	. . . . .	zero - 100.00 See Note 4	"
Multi Session Training	. . . . .	zero - 1000.00 See Note 4	"

a. Per the *Sixth Edition of the Massachusetts State Building Code*

Notes:

1. Examination fees established by examining institution.

2. M.G.L. c 142 A. § 11 provides that additional payments into the guaranty fund may be required if the fund administrator determines that the amount of the fund is insufficient to maintain it at a level commensurate with claims made against said fund.

3. Contract amount, for the basis calculation of permit fees, shall include the entire scope of work of the project and shall include all incidental constructions. Contract amount, for the basis of calculation of permit fees, shall not be deemed to include design fees or any other professional fees associated with construction observation or supervision or construction management. (Note that the minimum fee shall be $25.00 if calculated fees are less than $25.00.)

4. Fees for continuing education of building officials and building code training will be established by the agency and may vary due to costs associated with each individual training session. Cost of materials, space rental, and contracted instructors, may influence fees.

5. Fees established by the American Concrete Institute (ACI) and their local sponsoring group.

NON-TEXT PAGE

780 CMR 120.Y

HISTORIC STRUCTURES

Historic structures eligible for individual listing in the National Register of Historic Places, qualifying as totally preserved buildings (see 780 CMR 9309.0).

Acton	Faulkner Homestead, High Street
Agawam	Capt. Charles Leonard House, Main Street
Amherst	Emily Dickinson Museum, 280 Main Street
Amesbury	Rocky Hill Meetinghouse, Portsmouth Road
Arlington	Fowle-Reed-Wyman House, 64 Old Mystic Street Jason Russell, 7 Jason Street Old Schwamb Mill, 17 Mill Lane
Barre	Barre Historical Society, Common Street
Barnstable	Barnstable Custom House, Route 6A
Bedford	Job Lane House, 295 North Road
Beverly	John Balch House, 448 Cabot Street Capt. John Cabot House, 117 Cabot Street Rev. John Hale House, 39 Hale Street
Boston	Gleason House, Beacon Street James Blake House, E. Cottage Street (Dor.) Clapp Houses, 105 Boston Street (Dor.) Loring-Greenough House, 12 South Street (JP) Old State House, 15 State Street Pierce House, 24 Oakten Avenue (Dor.) South End Historical Soc., 532 Mass. Avenue Isabella Stewart Gardner Museum, 280 The Fenway Nichols House, 55 Mt. Vernon Street
Boxford	Holyoke-French House, Elm Street Sylvanius-Thayer Birthplace, 786 Washington St
Brookline	Edward Devotion House, 347 Harvard Street
Burlington	Francis Wyman House, Francis Wyman Road
Cambridge	Cooper-Frost-Austin House, 21 Linnaean St.
Charlton	Ryder Tavern, Stafford Street
Chelmsford	Old Chelmsford Garrison House, 105 Garrison Road
Chelsea	Gov. Bellingham-Cary House, 34 Parker Street
Cohasset	Caleb Lothrop House, 14 Summer Street
Cummington	William Cullen Bryant Homestead, Bryant Road
Danvers	Fowler House, 166 High Street Rebecca Nurse House Glen Magna House
Dennis	Josiah Dennis Manse, Nobscuset Road West Schoolhouse
Duxbury	Gershom Bradford House, 931 Tremont Street King Caesar House, King Caesar Road Nathaniel Winsor House, 479 Washington Street
Gloucester	Beauport, Eastern Pt. Blvd. Hammond Castle, 80 Hesperus Avenue
Hadley	Hadley Farm Museum, Russell Street Porter Phelps Huntinghouse, 130 River Drive
Haverhill	The Whittier House, 305 Whittier Road
Holyoke	Wisteriahurst, 238 Cabot Street
Ipswich	Castle Hill, Argilla Road
Lee	Merrell Tavern, Route 102
Lenox	Ventfort Hall, 104 Walker Street
Lexington	Buckman Tavern, 1 Bedford Street Sanderson House, 314 Massachusetts Ave. Monroe Tavern, 1332 Massachusetts Ave. Hancock-Clarke House, 26 Hancock Street.
Lincoln	The Grange, Codman Road
Lowell	Whistler House, Worthen Street
Lynn	Mary Baker Eddy House, 12 Broad Street
Lynnfield	Meetinghouse
Medford	Peak House, 347 Main Street
Milton	Dr. Amos Holbrook House, 203 Adams Street Daniel Vose House, 1370 Canton Avenue
Nantucket	Whaling Museum, Broad Street Fire Hose Cart House, 8 Gardner Street Greater Light, 8 Howard Court Old Gaol, 15 Vestal Street 1800 House, 4 Mill Street Old Mill, 50 Prospect Street Hawden House, 96 Main Street Nathaniel Macy House, 12 Liberty Street Thomas Macy Warehouse, 10 Straight Wharf Fair Street Museum, 7 Fair Street Quaker Meeting House, 7 Fair Street
New Bedford	Benjamin Rodman House, 50 North Second Street
New Salem	Whitaker-Clary House, Elm Street
Newbury	Tristram Coffin House, 16 High Road Spencer-Pierce-Little House, Little Lane
Newton	Jackson Homestead, 527 Washington Street
No. Andover	Parson Barnard House, Osgood Street
No. Easton	Old Colony Railroad Station, Oliver Street
Norwood	Fred Holland Day, 93 Bay Street

Orleans	French Cable Station, Cove Road
Oxford	Clara Barton Homestead, Clara Barton Road
Peabody	Gen. Gideon Foster House, 35 Washington Street
Pittsfield	Herman Melville House, 78 Holmes Road
Plymouth	Plymouth Antiquarian Society, 126 Water Street Harlow Old Ft. House, 19 Sandwich Street Pilgrim Hall, 75 Court Street Richard Sparrow House, 42 Summer Street
Quincy	Adams Academy, 8 Adams Quincy Homestead, 34 Butler Street Josiah Quincy House, 20 Muirhead Street
Randolph	Johnathan Belcher House, 360 N. Main
Reading	Parker Tavern, 103 Washington Street
Rockport	Old Castle, Castle Lane
Salem	House of 7 Gables, 46-54 Turner Street Essex Institute, Essex Street The Norbone House Witch Museum Crowningshield Bently, Essex Street Gardner-Pingree House, 128 Essex Street Gedney House, 21 High Street Cox House, 19 High Street
Sandwich	Hoxie House, 18 Water Street Eldred House, 4 Water Street Wing Fort House, Spring Hill Road
Sheffield	Col. John Ashley House, Cooper Hill Road
Shrewsbury	Gen. Artemas Ward Homestead, Main Street
Springfield	Alexander House, State Street George Walter Vincent Smith Art Museum
Swansea	The Luther Store, 160 Old Warren Road The Martin House, 22 Stoney Hill Road
Taunton	Old Colony Historical Society, 66 Church Green Parson Capen House
Waltham	Robert Treat Paine House, 577 Beaver Street
Watertown	Edmund Fowle House, 26 Marshall Street
Wenham	Claflin-Richard House, 132 Main
West Springfield	Josiah Day House, 70 Park Street
Weston	Gold Ball Tavern, Old Post Road
Woburn	Loammi Baldwin Mansion, 2 Alfred Street
Wilmington	Harden Tavern, 436 Salem Street
Worcester	Timothy Paine House, 140 Lincoln Street

National Historic Landmarks

Amesbury	John Greenleaf Whittier Home, 86 Friend Street
Boston	African Meeting House, 8 Smith Court Nichols House, 55 Mt. Vernon Street Brook Farm, 678 Baker Street (Rox.) Christ Church, 191 Salem Street Faneuil Hall, Dock Square 1st Harrison Gray Otis House, 141 Beacon Street Paul Revere House, 19 North Street
Concord	Ralph Waldo Emerson House, 28 Cambridge Tpk. The Old Manse Orchard House, 299 Lexington Road
Dedham	Fairbanks House
Deerfield	Old Deerfield Village Historic District
Hancock	Hancock Shaker Village
Harvard	Fruitlands, Prospect Street
Hingham	Old Ship Meetinghouse, Main Street
Ipswich	John Whipple House, 53 S. Main Street
Lexington	Hancock Clarke House, 35 Hancock Street
Marblehead	Jeremiah Lee House, Washington Street King Hooper Mansion, Hooper Street
Marshfield	Daniel Webster Law Office, Webster Street
Medford	Peter Tufts House, 350 Riverside Drive Isaac Royal House, 15 George Street
Milton	Capt. R. B. Forbes House, 215 Adams
Nantucket	Nantucket Historic District Jethro Coffin House, Sunset Hill
New Bedford	New Bedford Historic District
Newburyport	Caleb Cushing House, 98 High Street
Quincy	John Adams Birthplace, 133 Franklin Street John Quincy Adams Birthplace, 141 Franklin Street
Salem	Peabody Museum The Custom House, 178 Derby Street
Saugus	Scotch Boardman House, 117 Howard Street
Stockbridge	Chesterwood, Williamsville Road The Mission House, Main Street
Waltham	The Vale, Lyman Street Gore Place, 52 Gore Street
Woburn	Count Rumford Birthplace, 90 Elm Street
Worcester	American Antiquarian Society, 185 Salisbury Street

Historic structures determined eligible for listing in the National Register of Historic Places not qualifying as totally preserved buildings (see Partially preserved buildings, 780 CMR 3409.0). Refer to:

1. National Register of Historic Places, U.S. Federal Register, February 1, 1978, Part II.
2. National Register of Historic Place (additions). Contact the Massachusetts Historical Commission at the Massachusetts Archives Building, 220 Morrissey Boulevard, Boston, MA 02125.

Historic districts listed in the National Register of Historic Places. Refer to:

1. National Register of Historic Places, U.S. Federal Register, February 1, 1979, Part II.
2. National Register of Historic Place (additions). Contact the Massachusetts Historical Commission at the Massachusetts Archives Building, 220 Morrissey Boulevard, Boston, MA 02125.

Structures proposed for certification as partially preserved not listed in the national register of historic places. Refer to Massachusetts Historical Commission Inventory Forms.

Contact the Massachusetts Historical Commission at the Massachusetts Archives Building, 220 Morrissey Boulevard, Boston, MA 02125.

NON-TEXT PAGE

APPENDIX 120.Z

DESIGN AND CONSTRUCTION OF *TOWNHOUSES*

(Note: 780 CMR 120.Z is unique to Massachusetts)

780 CMR 120.Z101 GENERAL

120.Z101.1 Scope. The provisions of 780 CMR 120.Z shall govern the design, construction, repair, renovation, alteration, addition, demolition and change of use to *townhouses*.

780 CMR 120.Z102 DEFINITIONS

120.Z102.1 General. The following words and items shall, for the purposes of 780 CMR 120.Z and as used elsewhere in 780 CMR, have the meaning shown in 780 CMR 120Z102.

TOWNHOUSE. ***A single family dwelling unit constructed in a group of three or more attached units in which each unit extends from foundation to roof and with open space on at least two sides (Use classification is typically R-2 by nature of numbers of and nature of occupancy of dwelling units per 780 CMR 3.00). Note; Townhouses ("row housing") in Massachusetts, unlike one- and two-family dwellings, are subject to seismic design requirements but townhouses of no more than three stories in height are allowed, in certain other respects, to resemble one- and two-family homes.***

LOW-RISE RESIDENTIAL BUILDINGS. ***Any Residential use of up to three stories in height above grade, except hotels and motels***.

780 CMR 120.Z103 BUILDING PLANNING FOR TOWNHOUSES

120.Z103.1 Design and Construction. For design and construction purposes, *townhouses* shall be designed and constructed in accordance with the applicable requirements of 780 CMR 1.00 through 50.00: *The Massachusetts State Building Code*, 7th Edition, as applicable). The height and area restrictions of 780 CMR 5.00 generally and of 780 CMR T503, specifically, shall likewise apply.

Exception 1. Energy conservation requirements for any new construction *low-rise residential building* including townhouses of no more than three stories in height (except hotels and motels) shall comply with the requirements of 780 CMR 61.00: *Energy Efficiency* of the Massachusetts Building Code for One- and Two-Family Dwellings, 7th Edition.

Exception 2. For townhouses of no more than three stories in height, fire separation requirements between dwelling units shall comply with the requirements of 780 CMR 5302 of the Massachusetts Building Code for One- and Two-Family Dwellings or the fire separation requirements dictated by the building Construction Type, whichever is greater.

Exception 3. For townhouses of no more than three stories in height, all required means of egress elements, including, but not limited to stair design and allowed widths, stair rise and run, hand rails and guardrails and required landings may comply with requirements of 780 CMR 51.00 through 100.00, as applicable. For townhouses of more than three stories in height the applicable egress element requirements of 780 CMR 1.00 through 50.00, are required.

NON-TEXT PAGE