CODEWORD ©

THE OFFICIAL NEWSLETTER OF THE BOARD OF BUILDING REGULATIONS & STANDARDS

~April 2000~

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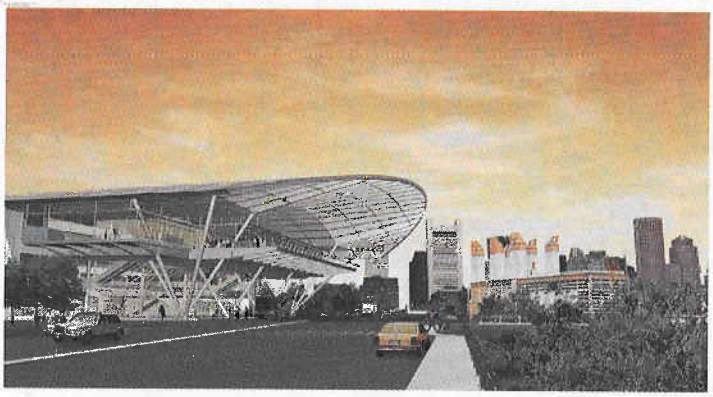
NEW BOSTON CONVENTION & EXHIBITION CENTER GRANTED BUILDING CODE VARIANCES

At a building code appeals hearing held on February 29, 2000 the designers of the Massachusetts Convention Center received important variances from State Building Code requirements. The variance request was filed as a result of the co-operative efforts of the design team, the owner/operator, the Department of Public Safety and the Boston Fire Department.



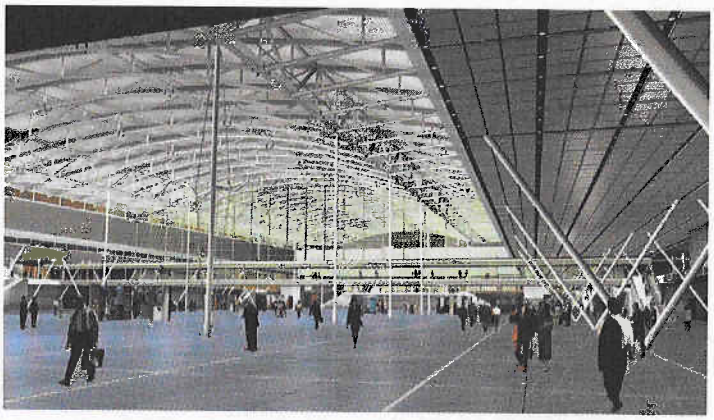
Exterior Rendering of Proposed Convention Center
Courtesy Massachusetts Convention Center Authority and
Rafael Vinoly - Architect

The variances granted relate to maximum length of travel to reach an exit and permitted occupant loads. The convention center is an extremely large building and without the variances would need to be significantly reconfigured.

The building code sets prescriptive requirements for the distance that the occupant furthest from an exit must travel to reach an exit. This distance is known as the "length of exit access travel". The length of travel depends upon the use of the space or building and whether or not the building is equipped with an automatic fire suppression system.

The variances are by no means perfunctory. The fire protection engineers were required to demonstrate, using a specialized analysis, that the building and its exit systems would be safe and permit safe egress in case of a fire emergency in the building.

The specialized analysis used is a form of performance based design and includes a "timed egress analysis" and requires the engineer to examine all possible scenarios of events within the building, to estimate a maximum fire size and to calculate the amount of smoke produced and the time at which the smoke reaches specific heights from the floor. These times are then compared with the times estimated for persons occupying the space to exit from the space.



Interior Rendering of Proposed Convention Center
Courtesy Massachusetts Convention Center Authority and
Rafael Vinoly - Architect

The Department of Public Safety of the Commonwealth and the City of Boston Fire Department also provided testimony as the project reviewers, neither of whom objected to the variance requests.

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The building will be equipped with a complete automatic fire suppression system, a smoke exhaust system and fire alarm system. The design also utilizes a mix of effective crowd management in conjunction with alarm notification. The Appeals Board conditioned the variances and required compliance with the intelligibility requirements for occupant emergency notification of NFPA 72 (1999 edition).

Factors of safety of 2 and 3 were used in the analysis which proved that, even without fire department or sprinkler or smoke exhaust that the design was sufficient to warrant the variances in travel distance to the exits and occupant load increases. The final details of the crowd management and emergency pre-planning and alarm notification systems must be approved by the Department of Public Safety and the Boston Fire Department prior to the issuance of the certificate of use and occupancy.

After approximately 2 hours of testimony the BBRS Appeals Board granted the necessary variances to allow the design of the building to proceed.

Maurice Pilette, P.E., Chairman, Chief Keith Hoyle, Amherst Fire Department and Alexander McLeod, R.A. served as appeal board members for this case

BBRS MEMBER PROFILE THOMAS L. ROGERS CHIEF OF INSPECTIONS

This issue of Codeword profiles Thomas L. Rogers, Chief of Inspections of the Department of Public Safety and Administrator of the Board of Building Regulations and Standards. Tom has been Chief of Inspections since 1992 and during his tenure has overseen the implementation of the 6th edition of the State Building Code, the certification of building officials and the Home Improvement Contractor Registration Law.

An avid supporter of continuing education, Tom brought on line the DPS/BBRS training facility at the Paul Dever campus in Taunton.

Tom formerly held the position of Assistant Building Commissioner of the City of Boston.

EXISTING BUILDINGS AND BUILDING SURVEYS

Chapter 34, section 3402.1.1 requires that an existing building undergoing renovations, change in use additions undergo a building survey (investigation and evaluation) when the building is greater than 35,000 cf of enclosed space.

The trigger point of 35,000 cf reflects the size of a building above which Massachusetts General Law and the Massachusetts State Building Code require that registered architects or registered professional engineers are required to prepare the design. This process is referred to as "construction control" and is governed by section 116 of the State Building Code.

Changing the use of a building can affect the fixed life safety systems performance and careful study of the change in use or the addition must be made in order to ensure that all relevant code provisions are met.

For example;

- Occupant loads may increase necessitating a review of the egress systems effected
- Floor live loads may be increased
- Sprinkler systems (if present) may need to improved if the fuel load changes
- If there are no sprinkler systems a sprinkler system may be required depending upon the work
- Seismic loads may need to be considered
- Other issues best determined by a registered design professional are required to be evaluated in order that the building complies with the State Building Code when the alterations are completed

The evaluation, in addition to establishing the baseline level of safety of the building, is required to be submitted at the time of building permit application.

CONSTRUCTION SUPERVISOR LICENSE EXAMINATION SCHEDULES

All test administrations now incorporate a series of questions, which will require the candidate to interpret a typical set of plans.

Construction Supervisor License Examination Schedule

Registration Deadline	Examination Date
February 11, 2000	March 11, 2000
May 12, 2000	June 10, 2000
August 11, 2000	September 9, 2000

CONCRETE TESTING LABORATORIES

The Board of Building Regulations and Standards licenses laboratories engaged in the testing concrete. The following laboratories are currently approved.

Advanced Testing Company 22 Sarah Wells Trail Campbell Hall, NY 10916 CTL# 055	Allied Testing Laboratories, Inc. 115 St. George Road Springfield, MA 01104 CTL# 018
American Engr. & Testing, Inc. 14 Rock Sam Park Road Braintree, MA 02184 CTL# 017	ATC Associates, Inc. 40 Robbie Road - Unit 40 Avon, MA 02322 CTL# 05
Boston Sand & Gravel Testing 500 Front Street Charlestown, MA 02129 CTL# 044	Boston Testing, Inc. 1831 Broadway Saugus, MA 01960 CTL# 030
PK Associates, Inc. d/b/a Briggs Engineer & Testing 100 Weymouth Street-Unit B1 Rockland, MA 02370 CTL# 012	PK Associates, Inc. d/b/a Briggs Engineer & Testing 190 Tafts Avenue Winthrop, MA 02152 CTL# 012
Central Artery/Tunnel Testing Laboratory 400 D Street South Boston, MA 02210 CTL# 042	CME Associates, Inc. Building 3 - Suite A Vatrano Road Albany, NY 12205 CTL# 057
Geotechnical Consultants, Inc. 201 Boston Post Road West Marlborough, MA 01752 CTL# 052	Geotechnical Consultants, Inc. 18 Cote Avenue – Unit 11 Goffstown, NH 03045 CTL# 056
Meisser Engineering Corp. 227 Wampanoag Trail Riverside, RI 02915 CTL# 045	The Haller Test. Labs of MA, Inc PO Box 1191 11A Walkup Drive Westborough, MA 01581 CTL# 003
Independent Mtls. Testing Labs PO Box 745 57 N. Washington Street Plainville, CT 06062 CTL# 049	Jaworski Geotech, Inc. 150 Zachary Road Manchester, NH 03109 CTL# 046
MDC Materials Field Lab 148 Newton Street Waltham, MA 02454 CTL# 006	Miller Engineering & Testing PO Box 4776 100 Sheffield Road Manchester, NH 03108 CTL# 008
Miller Engineering & Testing PO Box 11 130 East Main Street Northborough, MA 01532 CTL# 023	Special Testing Laboratories, Inc 21 Henry Street Bethel, CT 06081 CTL# 043
The Thompson & Lichtner Co. 111 First Street Cambridge, MA 02141 CTL# 001	Tibbetts Engineering Corp. 716 County Street Taunton, MA 02780 CTL# 014
UTS of Mass., Inc. 5 Richardson Lane Stoneham, MA 02180 CTL# 009	Yankee Engineering & Testing 10 Mason Street Worcester, MA 01609 CTL# 032

SMOKE DETECTOR REQUIREMENTS IN 1 & 2 FAMILY DETACHED DWELLINGS

Smoke detectors are required in the following locations for new construction;

1. In ALL bedrooms
2. In the immediate vicinity of all sleeping areas
3. For every 1200 sf of floor area or part thereof on every floor excluding crawl spaces and uninhabitable attics.

Example: A 2 story dwelling with 2,000 sf per floor and a 2000 sf cellar with 3 bedrooms on the second floor requires the following number of detectors.

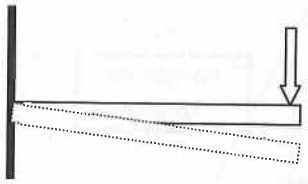
Location	Number of detectors
Cellar	2
1 st floor	2
2nd floor	4
Total	**8**

Additionally, any detector located within 20 feet of a kitchen or within 20 feet of a bathroom (with shower or tub) is required to be a photoelectric device, which must be compatible with all other devices.

When one or more bedrooms are added to an existing 1 and 2 family dwelling, the entire dwelling is required to be equipped with detectors as indicated above.

CANTILEVER BEAMS

A cantilever beam is a beam supported at end only, the opposite end being free to deflect.



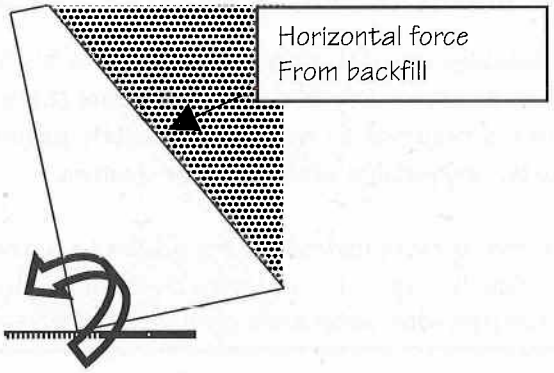
There are no prescriptive provisions in the State Building Code for the design of cantilever beams. Rules of thumb are sometimes used by construction trades for the design of cantilevers - however loading conditions and spans can vary significantly.

Remember that rules of thumb are not a substitute for properly substantiated engineering analysis.

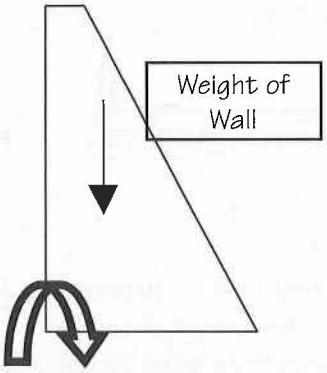
RETAINING WALLS

Retaining walls are constructed to retain earth at different elevations. Forces from earth pressure and surcharges have the effect of causing the wall to slide or to overturn. In addition to the structural design of the wall, the wall itself must be designed so that it will not overturn. Factors of safety of 2 against overturning are typically used by engineers in the design of these walls for resistance to overturning. Walls of these types (excluding sheet pile walls) are either gravity walls or cantilever walls.

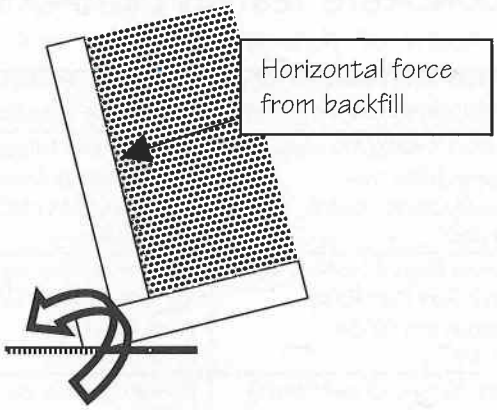
The gravity wall primarily utilizes the weight of the wall itself to counteract the overturning forces, while the cantilever wall uses its own weight plus the weight of the earth on the heel of the wall to counteract the overturning forces.



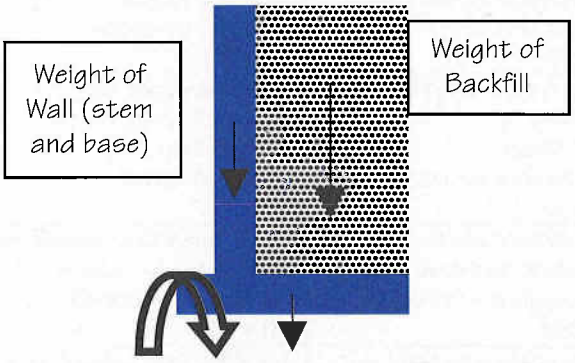
Gravity wall
Overturning forces



Gravity Wall
Restoring Force

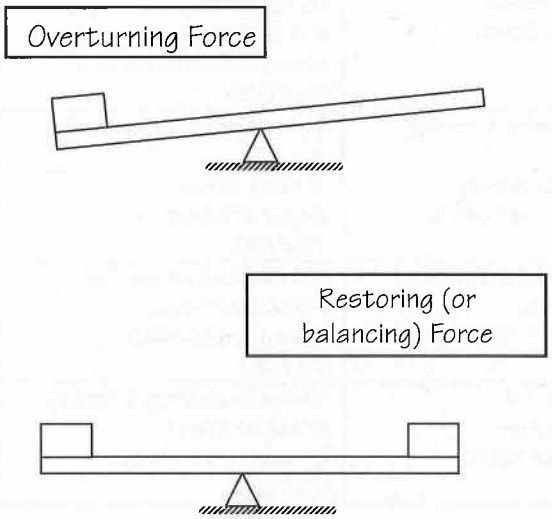


Cantilever wall
Overturning forces



Cantilever wall
Restoring forces

To further illustrate the overtuning and restoring forces consider the force required to balance the see saw below;



CONSTRUCTION SUPERVISOR LICENSE DISCIPLINARY ACTIONS

ted below are decisions issued by the BBRS License Review Committee following hearings held on February 10, 2000;

NAME & ADDRESS	CSL NUMBER	ACTION TAKEN
Mr. Edward Melanson 11 Jill Circle North Reading MA 01864	55978	License SUSPENDED for a minimum of six months. Must take the Construction Supervisor Licensing Examination. License can be re-issued after six months if he successfully passes the examination.
Mr. Mark Jackson 72 Canal Drive Belchertown, MA 01007	36094	Letter of WARNING issued.
Mr. Dean Todd P. O. Box 2020 Lanesboro MA	45717	License REVOKED effective February 23, 2000.

STATUS OF THE NEXT BUILDING CODE ADOPTED AMENDMENTS PACKAGE

ate agencies that are empowered to create regulations are now required to submit adopted amendments to a legal review prior to promulgation of such regulations.

This review process is created by Executive Order No. 384 and is intended to reduce the possibility that unnecessary or duplicative regulations are imposed on the regulated community.

Approximately fifty (50) voted Code Changes are being prepared for EO #384 review and it is expected this review process will now commence around mid-March with actual promulgation targeted for the April/May timeframe.

This package of adopted Code changes, when promulgated, will impact Chapters 1, 3, 4 (if promulgated), 5, 7, 9, 13, 14, 16, 18, 28, 34, 36, Appendicies A, B, H and J, and Regulations R3 and R6.

Notice of the actual promulgation date and copies of promulgated amendments will be provided to each Building Department.

IS YOUR BUILDING CODE CURRENT

From time to time the BBRS amends the Building Code by filing changes with the Secretary of State Regulations Division.

Shown below are all of the changes made to the 6th edition. See the preceding article relative to changes which will be filed shortly.

Date	Action
2-28-97	Initial Issue 6th edition
8-28-97	Amendment
12-12-97	Amendment
3-1-98	Amendment
11-27-98	Amendment

Question: How can you tell if the copy of the building code in your possession is current?

Answer: Look at the sheet in the front of the code titled "Regulation and Filing Publication". The bottom of this sheet has a date which reads "Compiled as in full force and effect <DATE>".

This date will read 11-27-98 if your code is current. If it reads any other date you should have purchased separately all amendment packages dated AFTER the date shown in your copy of the code

For instance if your code shows a date of 12-12-97 you should have purchased the 3-1-98 and 11-27-98 amendments separately, or you can purchase a new code which will include all the amendments.

To purchase a code call the State Book Store at: (617) 727-2834

BUILDING CODE APPEALS BOARD NOTICE OF CHANGE IN ADMINISTRATIVE OFFICE LOCATION

Effective immediately all appeals filed with the State Building Code Appeals Board should be addressed to:

State Building Code Appeals Board
CERC Building
Paul A. Dever State School
1380 Bay Street
Taunton, MA 02780
Telephone: (617) 727-5190 x 561

Please ignore any other address shown on the appeals application filing sheets.

ENERGY CORNER

There are several different ways that a builder, architect or homeowner can demonstrate compliance with the design requirements of Appendix J. They are:

- MAScheck software
- Manual Trade-Off
- Prescriptive Packages
- Total Energy Analysis

Remember that it is the choice of the permit applicant which of these methods they will use. Following is a brief description of the alternatives.

MAScheck

Over the two years since Appendix J took effect, MAScheck appears to be the most popular compliance tool. The software allows trade-offs between insulation R-values, window U-factors, and heating system efficiency so that weaker performance in one component can be overcome with better performance in another. It is easy to use, and shows the affect of changes immediately to help users choose the best design for their projects. MAScheck also generates a printed Compliance Report and Inspection Checklist to help building officials verify compliance with the code. MAScheck is available to download from the BBRS website at www.state.ma.us/bbrs/energy.htm.

Manual Trade-Off

This method allows the same flexibility of MAScheck, but the user performs calculations by hand using the calculation worksheets J6.0. The process is described in 8 steps at the beginning of the section.

Prescriptive Tables

This relatively simple method requires a few less calculations than the others, but it does not allow to user to make any trade-offs whatsoever. Using the tables in J5.0, one of 37 packages is selected by the builder, based on climate zone and percentage of glazing. The various packages provide different combinations of wall, ceiling, and floor insulation, window U-factor, and heating system efficiency. The values in the selected package must be used with no changes allowed.

Total Energy Analysis

This method is the most sophisticated, and the most rarely used. It must be performed a Massachusetts-registered architect or engineer, who calculates the total annual energy consumption for the house, included features like solar gain, air tightness, energy-saving controls, etc.

Home Energy Ratings on the Horizon

One additional alternative was adopted by the Board last year, and will take effect once it has cleared administrative review. This method allows a Home Energy Rating to be performed on the house by an accredited Home Energy Rater. The process is very similar to the Total Energy Analysis method, but it provides a score for the house on a scale of 0-100. Any score of 83 or better means that the design complies. In addition, the rater will visit the house to document that certain energy measures, such as low air leakage, have actually been achieved.

THE IMPORTANCE OF FIRE PROTECTION NARRATIVE REPORTS

Section 903.1 of the State Building Code mandates that a Fire Protection Narrative Report be submitted as part of the fire protection construction documents AT THE BUILDING PERMIT APPLICATION STAGE.

This is an extremely important tool and greatly assists the building and fire departments in both the PLAN REVIEW and ACCEPTANCE TESTING of fire protection systems and the interaction of these systems with other systems within a building.

Many potential problems can be identified at this stage of a project before problems arise during the latter stages of a project.

In essence the narrative is intended to be a simple description of the fire protection systems and the philosophy used in the design of the fire protection systems, including water supply information, design standards, etc. Additionally, the acceptance testing standards and protocol are required to be identified - an extremely valuable reference when witnessing acceptance tests.

See the BBRS web page for complete guidelines on the preparation of narrative reports, www.state.ma.us/bbrs

MAY PUBLIC HEARING REMINDER

The BBRS Statutory Public Hearing is scheduled for Tuesday May 9, 2000 at One Ashburton Place, Boston, MA - 21st Floor Conference Room.

Code change proposals will be available for viewing at the office of the BBRS at One Ashburton, Room 1301 Place 30 days prior to the hearing.

REVISITING SUBSTANTIAL RENOVATION (SECTION 3404.12 (3.)

In the writing of the Sixth Edition of the Building Code, BBRS staff was aware of confusion in the field as to when an existing building, undergoing building permittable work should be required to incorporate fire protection systems.

Although Sections 3400.3 (6., 7. and 8.) and 3405 provide historic guidance in this matter, requirements of earlier Editions of the Building Code were not sufficiently clear when an existing building, was altered but retained the same hazard index (see Section 3403) or acquired a lesser hazard index.

Utilizing (for guidance only) reasoning incorporated into Appellate Court Decision (Congregation Beth Sholom & Community Center, Inc. v. Building Commissioner of Framingham, 1989, 537 N.E.2d 605, 27 Mass.App.Ct. 276), the following "three-part litmus test" has been established for determining when fire protection systems are required in buildings falling under the criteria of section 3404 generally (retaining the same hazard index or acquiring a lesser hazard index):

Substantial Renovation/Substantial Alteration [Section 3404.12(3.)] a "three-part litmus test"

(1) Does the Code for new construction, require the fire protection system?–YES__, or NO__;
(2) Is there an opportunity to incorporate the fire protection system(s) into the building without causing unanticipated significant destructive tear down of portions of the building in order to install the fire protection system(s)?–YES__ or NO__ ;
(3) Is/are the cost(s) of the fire protection system(s) substantial (or not!) relative to the building permittable work initially proposed?–YES__ or NO__

"Litmus test" (1) is self-explanatory and one can, by reviewing Chapter 9 or 4 or 36 or other chapters as applicable, determine when the Building Code, for new construction, requires fire protection systems and further, what particular systems are required.

"Litmus test" (2) is somewhat subtler but is intended to cause thought regarding how easily a fire protection system can be installed in an existing building. When finished walls, ceilings and/or floors must be measurably destroyed in order to incorporate the fire protection system(s), then the opportunity to install such systems may not really exist. On the other hand, if a building is undergoing a "gut" rebuild and wall and floor/ceiling systems are "open", then arguably the opportunity to install the fire protection system(s) does exist.

"Litmus test" (3) continues to be the most difficult concept to grasp but the intent is really straightforward.

Relative to "litmus test" (3) and using extremely simplistic examples: if the projected cost (exclusive of fire protection systems design and construction costs) of intended building permittable work is $100,000.00 and the answers to "litmus tests" (1) and (2) are YES, then one must establish the costs of designing and installing the Building Code-required fire protection systems to determine if the Building Code will require such systems [per "litmus test" (3)].

If the total design and installation cost for the fire protection system(s) is $100.00, then it can be readily argued that the cost of designing and installing the fire protection system is not substantial relative to the costs otherwise intended— i.e., $100,000.00 v. $100.00 — and the fire protection system(s) must be installed.

If the total design and installation cost for the fire protection system(s) is $100,000.00, but the cost of intended work (excluding the fire protection system costs) is projected to be $100.00, then the cost of designing and incorporating the fire protection system in the building is substantial when compared to the work otherwise intended to be performed and the fire protection system would not be required by the Building Code per "litmus test" (3).

The obviousness of the two previous simplistic examples is, of course, not what typically happens. In reality, the costs of the fire protection systems may range from less than 5% of the cost of work otherwise intended to perhaps greater than 100% of the cost of the work

otherwise intended and the question is always... "what percentage number should be used to trigger requirements for the fire protection system(s)?

The answer to that question is left to be a uniform policy decision of each Building Department in the state and the reason for this is that installation costs of, say a sprinkler system, can be adversely affected by the cost of opening the street to run dedicated water lines and this cost varies from town to town, but is allowed to be considered as part of the total costs of the fire protection system.

The Appellate Court Decision referenced earlier in this article considered a $60,000.00 cost of a sprinkler system not to be substantial relative to costs otherwise incurred that totaled $550,000.00 and under such circumstances required sprinklers to be incorporated into the subject building — Note, however, that the Appellate case was not related to the Building Code but related to one of the local option fire laws (MGL c.148 §26G) that cities and towns may adopt.

The BBRS and its staff encourage readers to comment on this article with the hope that such discussions will further improve regulations.

In This Issue of *Codeword:*

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Board of Building Regulations and Standards
One Ashburton Place, Room 1301
Boston, MA. 02108

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