CODEWORD©

THE OFFICIAL NEWSLETTER OF THE BOARD OF BUILDING REGULATIONS & STANDARDS

~January 2002~

BOCA AWARDED CONTRACT TO PUBLISH 7TH EDITION OF THE MASSACHUSETTS STATE BUILDING CODE

Building Officials and Code Administrators International (BOCA) has been awarded the contract to assist the BBRS in the development of the 7th edition of the Massachusetts State Building Code. In addition to development of the printed version of the code, BOCA will produce an electronic searchable version on CD. Costs for the code are still under discussion.

BOCA will "cull-in" and specifically identify all Massachusetts changes to the IBC/IRC in order to avoid the cumbersome "front end" amendment process used by some States. The BBRS has determined that the Massachusetts Building Code will be published in 2 volumes. One volume will contain the One and Two Family dwelling code provisions and the second will be for all other buildings. Each is intended to be a "Stand Alone document" and will contain administrative provisions, definitions and appropriate reference standards. The CD version will contain both codes.

BBRS MOVES FORWARD WITH THE FORMULATION OF THE SEVENTH EDITION OF THE MASSACHUSETTS STATE BUILDING CODE

The BBRS, its staff and advisory committees have begun the laborious task of reviewing the 2000 International Building Code and 2000 International Residential Code for adoption in Massachusetts. It is anticipated that the 7th edition will be promulgated on or slightly before January 1, 2003.

The BBRS has established two new committees in addition to its seven standing advisory committees for the development of the 7th edition of the Massachusetts State Building Code. These committees are the *Existing Buildings Committee* and the *One and Two Family Dwelling Code Committee*.

The BBRS is often asked the question ……*"Why does Massachusetts amend the "Model Code"?*

There are numerous reasons, first and foremost is the input received from the Board's technical advisory committees. These committees are composed of individuals with vast amounts of experience, education and first hand practical knowledge in their respective fields. Some recommendations capture current regional or local conditions or practices which may be unique to this particular part of the country.

An example of this includes the *Bulk Merchandizing Retail Warehouse* provisions, which were adopted into the State Building Code (6th edition) following a fire in a Home Depot in Quincy. Model codes would actually not permit these kinds of stores to be constructed as Mercantile occupancies but would, due to the amounts of hazardous materials typically on display or stored, require compliance

with the *High Hazard* use group requirements. The BBRS and the Office of the State Fire Marshal convened a committee of technical experts and representatives of the large retailing occupancies involved. The National Fire Protection Association generously provided staff and facilities in order to develop a reasonable series of regulations. Similar provisions are currently absent from the IBC 2000.

Additionally, there are many Massachusetts General Laws with which the regulations promulgated by the Board must be consistent. Some of these laws deal directly with construction, others with legal and administrative provisions

In Massachusetts the BBRS does not have the authority to promulgate the so called "specialized" codes e.g. plumbing, electrical, fire prevention, architectural access, sanitary to name a few. Since these codes are promulgated by other state agencies under specific legislative authorization, the BBRS and other specialized code promulgating agencies must endeavor to assure overlapping areas of regulation, if occurring, are either eliminated from one code or do not inadvertently create a conflict.

SOME THOUGHTS ON SEPTEMBER 11, 2001

by
Pedro J. Sifre, PE, Senior Project Manager
Joseph J. Zona, PE*, Principal, and
Paul L. Kelley, PE*, Principal
Simpson Gumpertz & Heger Inc
Arlington, MA.

It will take a long time for the construction industry to assimilate the scale of the devastation and horrific consequences wrought by the attacks on the World Trade Center (WTC) and Pentagon buildings. As in every disaster involving buildings, we will profit from lessons learned. Teams of investigators are hard at work trying to extract as much knowledge from these tragedies as can be reasonably expected under the circumstances. It will probably take years for the teams to produce definitive conclusions.

Until those conclusions are reached, we do well to reflect and even speculate on what has happened and on the lessons to be learned.

The towers survived the initial impact of the jetliners largely because of the following factors:

- The strength and redundancy of the buildings' lateral load resisting system.
- The energy absorption of the deformed and sheared steel as well as the crushing of the concrete floor slabs in the impact zone.
- The energy absorption from the crushing and shearing of the airplane's structure.

the framed tube construction of the exterior of the buildings was able carry the gravity loads above the impact zone and span over the holes created by the airplanes. We do not yet know much about the damage to the core columns, but the core columns sustained the immediate impact without precipitating a collapse.

Fire damage is evidently the ultimate cause of the collapse of the towers. Much has been made of the large amounts of fuel that was carried into the buildings by the airplanes and the high temperatures produced by its combustion. Further investigation may reveal that the role of the fuel was more as an accelerant than as a sustained source of heat. This is because 1) most air planes – even those on transcontinental flights – do not fly with a full fuel load, 2) a lot of the fuel is consumed during take-off and climb, 3) the cruise from

Boston likely did not follow an economical cruise configuration, and 4) a lot of fuel was consumed in the impact fireballs. Any fuel that made it into the buildings produced a rapid ignition of essentially the entire floors near the impact zones. The consequent rapid rise in temperature and the extent of the fire is not contemplated by conventional fire testing protocols. Conceivably, the rapid rise in temperature might have reduced any ASTM E 119 fire rating of the structures in the fuel splash zone by as much as one hour or more.

The current conventional wisdom is that once a series of columns buckled because of the combination of fire and impact, the dynamic amplification of the loads above the buckled columns collapsing on the lower floors caused the structures immediately below to collapse, setting off a series of progressive collapses that has been described as a pile-hammer effect. The dynamic amplification of this impact has been calculated to be as high as 30 times the static gravity load. Elementary structural analysis shows that most building structures cannot resist such an overload.

Some have speculated that an aggravating factor in the progressive collapse scenario was the weakening of columns from the sudden loss of several levels of bracing as the floor framing collapsed in the zone of impact. However, in the 1993 terrorist attack, the bomb blast did just that to core columns in the subgrade levels. Then, the affected columns were still able to carry the loads with multistory unbraced lengths. This time, the fire and other circumstances near the impact zone may not have allowed for such a benign outcome.

There are elements of the collapse that pose a challenge to the conventional wisdom. Professor Eduardo Kausel of MIT has postulated that once the collapse was initiated, the buildings were essentially in free fall, that is, the structures did not do much to arrest or slow the collapse of the buildings. The pictures we have all seen in the press show little deformation of the buildings' columns but a lot of deformation, if not total destruction, of the floor system - suggesting that the columns were not able to absorb energy via ductile deformations. In addition, there are case histories of buildings that have had one or more intermediate stories collapse during earthquakes without precipitating a collapse of the entire building. This begs the question as to whether a different type of floor framing structure and different detailing of the structural connections could have done anything to slow or even arrest the collapse of the buildings.

Another focus of the investigation will be the fire resistance of the structural elements. Look for scrutiny of the fire resistance of open web steel joists and the effectiveness of current fireproofing applications on joists. We hope that the investigation will highlight the need for a better understanding of the fire ratings of structural connections.

Although there is no precedent for the damage sustained by the WTC Twin Towers, there are instances of high-rise buildings that have burned for days without collapsing. An especially interesting case study will be 7 World Trade Center. This 47-story tower burned for 8 or 9 hours before collapsing. Unlike the WTC Twin Towers, the construction of 7 World Trade Center was typical of high-rise steel-framed buildings in non- seismic zones in the United States.

Other lessons that will issue from this disaster will pertain to fire-fighting protocols and the planning for and management of egress from high-rise buildings. The scale of these buildings magnified many of the issues involved. Look for the

investigations to address the negative potential of having structural assemblies with nominal fire ratings that are less than the evacuation time of a building. Another issue is that fire fighters must climb up against the egress flow in fire stairs. And another area that is ripe for discussion is how to mitigate the risks of exposure to multiple hazards - e.g., combination of fire, structural damage, and loss of sprinklers as in the WTC. There are other multi-hazard scenarios that warrant further study. In the larger sense, future evaluation of this disaster is sure to focus on whether any building should be this large - too many lives and too much wealth has disappeared.

It is unlikely that the building codes will be modified to allow buildings to sustain jetliner impacts. But the lessons learned will help improve our understanding of the overall safety of building systems. Our energies must be devoted to learning lessons from this disaster and having these lessons drive the evolution of our model codes.

The authors were part of a group of fifteen Massachusetts engineers at Simpson Gumpertz & Heger Inc. that volunteered their services to the Structural Engineers Association of New York to provide on-site structural engineering consulting to contractors and the New York City Department of Design and Construction during the search and rescue efforts in the immediate aftermath of the collapses at the World Trade Center.

**Mr. Zona is a member of the BBRS Seismic Advisory Committee*
** Mr. Kelley is a member of the BBRS Loads Advisory Committee

BBRS ISSUES OFFICIAL INTERPRETATION NUMBER 53-2001

At a regular meeting of the Board of Building Regulations and Standards held on October 9, 2001 the Board of Building Regulations and Standards issued the following official interpretations of the 6th edition of the Massachusetts State Building Code (780 CMR).

Question 1: 780 CMR Chapter 36 is titled the ***One and Two Family Dwelling Code.*** Is Chapter 36 intended to be a stand-alone code, providing all provisions for the design and construction of single and two family homes?

Answer 1: Yes. Although Chapter 36 is part of the overall code (sold as one document at the State House Bookstore), it is intended to be a wholly separate and unique code presenting requirements for the design and construction of single and two family homes that are identified as R-4 structures.

Question 2: Are there differences between Chapter 36 and base code requirements (the base code refers to the remaining code chapters 1 through 35 which pertain to all other building types)?

Answer 2: Yes. A code reader can expect to find differences between Chapter 36 and base code requirements. 780 CMR Chapter 36 (Sixth Edition) is based on the provisions of the 1995 version of the Council of American Building Officials (CABO), One and Two Family Dwelling Code. The remaining portions of 780 CMR (Chapters 1 through 35) are based on the 1993 version of the Building Officials and Code Administrators (BOCA), International Code. CABO and BOCA are different and distinct code development agencies. One does not coordinate code text with the other. Consequently, a code reader may find that certain building features (although identical) are treated differently in Chapter 36 than in the base code.

An example of a difference between Chapter 36 and the base code is found in requirements for emergency escape windows. 780 CMR 3603.10.4.1 states

that emergency escape windows from sleeping rooms shall have a net clear opening of 3.3 square feet. Whereas, 780 CMR 1010.4 requires a 5.7 square foot clear opening size for the same building feature (emergency escape windows). This example happens to illustrate a change that was approved by the Board based on input from the Homebuilders Association of Massachusetts (it is not a difference resulting from the adoption of CABO as a base document). However, the point is that it is a cognitive difference between the two code sections.

Question 3: What if Chapter 36 appears to be silent on a particular issue, should the code reader turn to the base code for guidance on the issue?

Answer 3: This question cannot be answered with a simple yes or no. If Chapter 36 is truly devoid of information relative to a particular issue, a building official should determine that the matter is not provided for in (that portion of) the code. 780 CMR Section 102.2 specifies that requirements that are essential for the structural, fire or sanitary safety, or interior climate comfort of an existing or proposed building or structure, or for the safety of the occupants thereof, which are not specifically provided for by the code, shall be determined by the building official. The section continues to state that the State Board of Building Regulations and Standards and the Department of Public Safety shall be notified by the building official in writing within seven working days of any action taken pursuant to this section.

In order to make a reasonable determination on a matter, a building official needs guidance. Logically, he\she would first turn to the provisions of the base code if Chapter 36 does not provide guidance. However, if the base code is silent, a building official should reference manufacturer specifications and\or engineering data.

An example of where Chapter 36 is silent relates to the fastening of sill plates to concrete foundation walls. It is clear from the footnotes to Figure 3604.3.1a that anchor bolts are required to affix a sill plate to a concrete foundation. Specifically, footnote 5 states that the sill plate or floor system shall be anchored to the foundation with ½-inch diameter bolts placed six feet on center and not more than 12 inches from corner points.

However, what if a homebuilder (or other code user) wishes to use metal straps to anchor the sill plate to the foundation. Chapter 36 simply does not address the issue of strap ties, but that does not prevent their use. Both Chapter 36 and the base code provides prescriptive requirements for building construction (such as those described above for anchor bolts). However, the code also allows for performance-based compliance.

780 CMR Section 109.3.1 illustrates how a building official may accept performance-based methods of compliance. The section states that code provisions are not intended to limit the appropriate use or installation of materials, appliances, equipment or methods of design or construction nor specifically prescribed by the code, provided that any such alternative has been approved by the building official. In order to approve an alternative method, a building official must be presented with proof that demonstrates that the method achieves the purpose intended by the code. In the case of strap ties, the building official may accept manufacturers specifications relating to the use of the product which demonstrate that the ties, when properly installed, satisfy code requirements for anchoring the structure.

Question 4: 780 CMR Section 3603.14.2.2 presents guardrail construction requirements that are not

as restrictive as those presented in the base code under Section 1021.3. Should a building official enforce the more restrictive provisions of the base code relative to one and two family homes designed as an R-4 structure?

Answer 4: No. As indicated in question number 1 above, Chapter 36 is intended to be a stand-alone document. Also, as illustrated above, this statement may not be true in all instances. Sometimes, as illustrated in question 2, there are cognitive differences between Chapter 36 and the base code. Other times Chapter 36 is simply silent on an issue, as illustrated in question 3.
However, in this instance, Chapter 36 is not silent. Section 3603.14.2.2 provides clear guidance for guardrail construction, stating that guardrails shall be constructed with intermediate rails, balusters or ornamental closures which prevent the passage of an object five inches or more in diameter. The section does not specify whether the rails or balusters are to be arranged vertically or horizontally. Therefore, as long as the guards are constructed in accordance with the limiting dimensions, the rails, balusters or ornamental closures may be arranged either vertically or horizontally.

Question 5: What about the issue of climability? Section 1021.3 states that guards shall not have an ornamental pattern that would provide a ladder effect. Does this language apply to single and two family homes designed and constructed in accordance with Chapter 36?

Answer 5: No. It is important to recognize that single and two family homes designed and constructed in accordance with Chapter 36 requirements are classified as Use Group R-4 structures. Although Section 1021.3 includes Use Group R in its beginning language relative to limitations for guardrail construction, the reference is restricted to residential buildings other than R-4 structures.
A single or two family home may be classified as an R-3 structure at the option of the code user. Sometimes, such as with multiple single family attached units, the code requires a single family home to be classified as an R-3. In these instances, the code user is obliged to comply with all code provisions relating to an R-3 structure, including limitations specified by Section 1021.3 relative to climability. Ultimately, a single or two family home designed and constructed as an R-3 may look a little different than one designed and constructed as an R-4. Inasmuch as all provisions of Chapter 36 are met, the R-4 structure shall be deemed to be in compliance with applicable code provisions (taking into consideration variations noted above).

OBITUARY - ALFRED (AL) DOWNEY

Alfred Downey was a State Building Inspector for 30 years, starting with the Department of Public Safety on March 14, 1971. Prior to that Al worked for the City of Boston in the Building Division going back to 1964. Al spent his career serving the public to ensure each building he inspected was safe. Al also honorably served the United States in the Korean Conflict, US Army. Al's illness and passing was saddening to his co-workers. Al will be greatly missed.

Al, was a devoted husband of 45 years to Barbara J. (Foley) Downey, and father of five (5) children; Patrick J. of Duxbury, Michael S. of South Boston, Lisa J. of Newburyport, RI, John E. and Christopher J. Downey both of Quincy, and grandfather of 8. He was brother of Arthur of Quincy, Esther of South Boston and the late Anna Clougherty, Katherine, Chester, John, Paul, William, Walter and Fredrick Downey.

The BBRS and its staff extend their condolences to Al's family - he will be sorely missed.

NEW MEMBERS APPOINTED TO SEISMIC LOADS AND GEOTECHNICAL ADVISORY COMMITTEES

At its meeting of November 13, 2001 Chairman Kentaro Tsutsumi appointed the following new advisory committee members;

LOADS ADVISORY COMMITTEE

Mysore Ravindra, PE	V.	LeMessurier Consultants
Dr. Lee C. Lim, PhD, PE		Lim Consultants, Inc
Stephen Crockett, PE	K.	DM Berg Consultants
James Balmer PE		Boston Building Consultants

SEISMIC ADVISORY COMMITTEE

Dominic Kelly, SE	J.	Simpson Gumpertz & Heger

GEOTECHNICAL ADVISORY COMMITTEE

Nick PE	Campagna,	GZA Associates

The BBRS and staff welcome the new committee members and thanks them for their enthusiasm and willingness to serve The BBRS also extends its gratitude to all of the firms who support the code development process by donating hundreds of hours of their senior staff members valuable time.

CONGRATULATIONS DANNY

The BBRS and Staff extend congratulations to BBRS staff member Danny Plaza and his wife Maria on the birth of their son Daniel, who was born on October 9, 2001. Mom and baby are both doing well - Danny is looking really tired but very happy.

LICENSED CONSTRUCTION SUPERVISOR DISCIPLINARY ACTIONS

Licensee	CSL #	Disciplinary Action Taken
Raymond Hebert	9213	**License Suspended** effective September 5, 2001, must take and pass construction supervisor license examination.
Philip DiMarzio	69778	**Letter of Reprimand** issued effective September 5, 2001.
Walter Baenziger	44162	**Letter of Reprimand** Issued effective September 5, 2001. Reprimand applies to complaint numbers 2001-080 and 2001-081. Reprimand to remain on file for one year.

HOME IMPROVEMENT CONTRACTOR DISCIPLINARY ACTIONS

On September 19, 2001, hearings were held before the designee for the Director of the Home Improvement Contractor Registration Program pursuant to M. G. L. c. 142A and 780 CMR. The designee for the Director issued the following decisions and administrative penalties. Questions regarding the decisions can be directed to Ms. Marian Doyle at (617) 727-7532 x25259.

HIC Registration Number	Applicant Name	Company:	Disciplinary Action	Comments:
128016	PENNY, WILLIAM C	ANDOVER RENOVATION SOLUTIONS, INC 110 WINN ST WOBURN, MA 01801	09/19/2001 Six-month suspension - $2000 admin. penalty	See also reg. #101865
111739	BROOKES, DAVID J	BROTHERS BUILDING CO INC PO BOX 269 RT 100 MAD RIVER GREEN WAITSFIELD, VT 05673	09/19/2001 Revoked	May apply for new registration under current business.
120453	SHEEHAN, TIMOTHY	CITY BUILDERS 33 KOVEY Rd Hyde Park, MA 02136	09/19/2001 2100 admin. penalty - Revoked	must reimburse Guaranty Fund - default
128225	HESTER, DAVID J	D.J. HESTER & SONS CONSTRUCTION CO 955 MASS AVE. PMB 196 CAMBRIDGE, MA 02139	09/19/2001 Suspended and Suspended $600 admin. penalty	Must reimburse Guaranty

			- until he either complies with or appeals outstanding arbitration case	fund.
101865	PENNY, WILLIAM, C	DESIGN BUILD SOLUTIONS INC 110 WINN ST Woburn, MA 01801	09/19/2001 Revoked $2000 admin. penalty	See also reg. #128016
113519	BARREIRO, ROBERT	HOME BUILDING & REMODELING, INC. 15R COTTAGE ST NORWOOD, MA 02062	09/19/2001 Revoked $6300 admin. penalty	Must reimburse Guaranty Fund
108256	Richard, Mark H	MARK RICHARD GEN CONTRACTOR, INC. 46 Hope St Acushnet, MA 02743	Suspended minimum of six months 9/19/01 through 3/19/02 - $700 admin. penalty	Must submit new contract for approval.
117114	IMBERGAMO, ALEXANDER R	NORTH EAST HOME IMPR INC 15 R Cottage Street Norwood, MA 02062	09/19/2001 Revoked $2100 admin. penalty	Must reimburse Guaranty. Fund - default
106353	Prunier, Richard T	NORTHEAST HOME & ENERGY, INC. 21 N. Main Street N. Grafton, MA 01536	One year suspension 9/19/01 through 9/19/02 $8800 admin. penalty	
124966	Buck, Jeffrey J	Profile Design 49 Charter St # 3 Boston, MA 02113	09/19/2001 Suspended $550 admin. penalty	Must submit new contract for approval
128924	Dixon, Thomas M	Thomas Dixon 49 Frederick St. New Bedford, MA 02744	09/19/2001 Revoked	Defaulted - $8400 administrative penalty
107340	DeLorey, Peter J	WHITNEY ASSOCIATES INC. 1104 Main St. Norwell, MA 02061	09/19/2001 Revoked $1300 admin. penalty	Must reimburse Guaranty Fund

CURRENT REQUIREMENTS AND THINKING REGARDING SMOKE AND HEAT DETECTORS FOR USE IN ONE- AND TWO-FAMILY DETACHED HOUSING

Chapter 36, Section 3603.16.4 titled HEAT DETECTORS is currently "reserved" and the State Building Code does not, at this time, require the installation of heat detectors in one- and two-family detached housing.

This "reserved" section exists because at the time of issuance of the Sixth Edition of the Building Code it was discovered that the listing temperature range for available 120V heat detectors was potentially narrower than the ambient temperatures a heat detector might experience in the colder portions of the state - regulations must never order the citizenry to install devices in violation of such device listings.

A Building Code-proposed amendment has been filed that would require that heat detectors be installed in the attached garages of new construction one- and two-family homes - this proposal, in part, is made based on the fact that over 2% of the reported fires in such housing are found to have begun in the garage areas and additionally it now appears that some manufacturers of 120V heat detectors may be able to list their detectors for a broader temperature range.

At its December 11, 2001 monthly meeting, the BBRS had the opportunity to hear from manufacturers of 120V single and multiple station smoke detectors and heat detectors and heat alarms (heat alarms are heat detectors possessing "in-device" audible alarm).

The following is a summary of the testimony provided regarding 120V heat detector, heat alarm and interconnected heat and smoke detector technology at this time, as well as the action of the BBRS regarding the subject Code Change proposal.

- Manufacturers commented that 120V heat alarms/detectors are tested and listed to UL-539 and that such test protocol observes heat alarm/detector performance from minus 22° F to plus 125° F but that some of the current listed ambient temperature ranges for heat alarms define a much narrower temperature range which is why the "reserved" language still exists in Chapter 36, Section 3603.16.4.

- Manufacturers indicated that as early as the first or second quarter of 2002 it would be possible to redefine the listed temperature range for heat alarms/detectors but not all manufacturers are ready today to sell product with the expanded listed temperature range.

- Manufacturers indicated that it probably would require more than one heat alarm/detector to be installed in an attached garage (or garage under) if the garage ceiling has structural elements that act as a smoke curtain (two or more such devices would be needed depending on the specific construction of the garage ceiling area).

- Heat alarms/detectors are available (from some manufacturers) both with and without battery back up.

- Typically the temperature at which the heat alarm/detector would operate/alarm is 135°F and one manufacturer is also producing a "rate-of-rise" device.

- Manufactures stated that for their specific brand (no cross-over between brands due to lack of testing and listing) their heat alarms/detectors can be interconnected with current Building Code-required smoke detectors (both ionization and photo-electric types).

- Manufacturers also noted that smoke detectors manufactured in the past 5 to 15 years (depending on the manufacturer) would also be compatible with current heat alarm/detectors.

- Manufacturers indicated that they would not recommend that a heat alarm/detector be installed in a laundry room on the basis that a heat alarm/detector is not a life safety device (a smoke detector is a life safety device). Note: Smoke detectors are currently not required in rooms specifically dedicated as laundry rooms.

- Manufacturers also indicated that current and near-future 120V heat alarm/detectors cannot be placed in an unconditioned attic as the attic's high temperature in summer months can cause failure of the electronics of such devices; likewise smoke detectors should not be utilized in attics due to dust issues (false alarming) and the need to perform battery replacement of battery-backed devices located in remote places of the dwelling.

- Manufacturers also stated that smoke detectors should not be utilized in a garage since the products of automobile internal combustion will cause smoke detectors to false alarm.

The BBRS, on recommendation of the Designee of the State Fire Marshal, agreed to send the subject heat detector proposed amendment to the newly-formed Chapter 36 (One- and Two-Family) Advisory Committee for possible adoption into the Seventh Edition of the State Building Code, now under development - thus, at this time, the State Building Code still does not require heat detectors in one- and two-family housing constructed per the requirements of Chapter 36.

In This Issue of *Codeword:*

Editor in Chief: Thomas L. Rogers
Supervising Editor: Brian Gore, P.E.
Graphic Design & Layout: Brian Gore, P.E.
Subscriptions Accountant: Anne Marie Rose

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

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