CODEWORD©

THE OFFICIAL NEWSLETTER OF THE BOARD OF BUILDING REGULATIONS & STANDARDS

~April 2002~

Thomas Gatzunis, P.E. Chairman | James Jajuga Secretary | Jane Swift Governor | Thomas L. Rogers Administrator

BBRS ELECTS NEW CHAIRMAN AND VICE CHAIRMAN

BBRS Chairman Tom Gatzunis, PE

At its January 2002 meeting the BBRS elected member Tom Gatzunis as Chairman and former Chairman Professor Kentaro Tsutsumi was elected Chairman. Tom represents the Building Officials of the Commonwealth and Vice Chairman Tsutsumi represents the Registered Structural Engineering community.

BBRS TRAINING NEWS

THE BOARD OF BUILDING REGULATIONS AND STANDARDS (BBRS) PROVIDES POST EARTHQUAKE DAMAGE ASSESSMENT TRAINING TO 317 MASSACHUSETTS BUILDING OFFICIALS.

In Afghanistan in March 2002 reportedly 2000 people lost their lives in the aftermath of a devastating earthquake. This event underscores the importance of disaster preparedness. On March 19, 20 and 21, 2002 the BBRS, in conjunction with the Federal Emergency Management Agency (FEMA), the Massachusetts Emergency Management Agency (FEMA) and the Applied Technology Council (ATC) trained 317 of the Commonwealths certified building officials on techniques for the evaluation and posting of buildings damaged by earthquakes. All building officials were registered at the seminar with MEMA as "first responders in the event of a disaster requiring damage assessment of damaged buildings. MEMA will issue photo identity cards to all attendees.

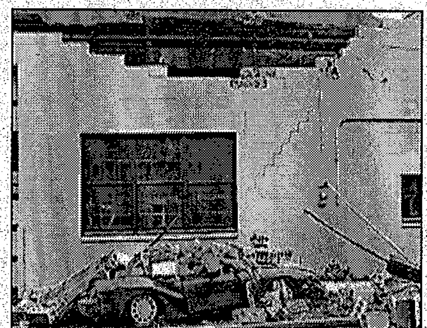


Photo Credit - Andrea J. Wright The Seattle Times

Seminar presenter was structural engineer Robert Bruce, a practicing registered professional structural engineer from California with first hand experience in post earthquake damage assessment. Mr. Bruce instructed building officials on various techniques on how to recognize damage to masonry, concrete, steel and wood buildings; explained guidelines on whether or not to permit entry or limited entry into buildings and also when to order professional assistance.

The techniques can be applied to any natural (or man made) disaster. This training was also given in 1995 following which a number of State and Local building officials were mobilized by MEMA to provide technical assistance in damage evaluation following the Great Barrington/Egremont tornado

Certified building officials in attendance were awarded 6 hours of category 1 continuing education credits by the BBRS.

BBRS STAFF MEETS WITH THE ASSOCIATED GENERAL CONTRACTORS

Technical Director Brian Gore, PE and Code Development Manager Tom Riley, BSME, recently spoke at a lunchtime meeting of the Associated General Contractors (AGC) at the 57 restaurant in Boston. Tom and Brian provided an update to the AGC Codes Committee on the progress in the development of the 7th Edition of the Massachusetts State Building Code.

BBRS STAFF MEETS WITH BOSTON SOCIETY OF ARCHITECTS CODES COMMITTEE

BBRS Staff members Brian Gore, PE, Technical Director and David Weitz, Energy Code Co-coordinator and Wagdy Anis, AIA Energy Advisory Committee recently met with the Codes Committee of the Boston Society of Architects at the BSA offices in Broad Street, Boston for a round table discussion on the direction of the development of the existing buildings code and energy conservation provisions.

BBRS STAFF ASSISTS STATE OF ISRAEL FOLLOWING COLLAPSE OF VERSAILLES WEDDING HALL IN TEL AVIV

BBRS Technical Director Brian Gore, PE has been selected by the Chairman of the State of Israel Commission of Inquiry to assist by providing information on the design and regulatory process in Massachusetts as the State of Israel seeks to modify its building construction regulatory system.

CODE DEVELOPMENT PROGRESS

At its March, 2002 meeting, members of the Board of Building Regulations and Standards discussed progress of the Seventh Edition of the State Building Code. As most of you may be aware, the Board has voted to use the 2000 version (with 2001 amendments) of the International Building Code (IBC) and the International Residential Code (IRC) as the basis for the next edition of the Massachusetts code. Like the international codes, the Seventh Edition of the Massachusetts code will consist of two volumes. Volume Two will contain provisions for one and two family dwellings only, and Volume One will contain provisions for all other building types.

Since the 2002 amendments to the IBC and IRC have recently been issued by the International Code Council, Board members agreed to review and appropriately incorporate 2002 amendments into the next edition, as well. With this decision, the Seventh Edition of the Building Code will be one of the most up to date codes in the nation (only the 2003 international codes will be more current).

Although steady progress is being made, it is projected that the date of availability for new code may slip somewhat. Originally, the Seventh Edition was scheduled to be reviewed at the Board's November, 2002 public hearing, with an anticipated effective date of January 1, 2003. Due to the effort involved in incorporating the 2002 amendments (as well as other factors), it is unlikely that this schedule will be met, at least for Volume One. However, there is every reason to believe that Volume Two will be made available as originally scheduled.

Board members and staff wish to thank all the dedicated professionals who are assisting with the development of the new edition of the code. Each individual brings a different and valuable perspective to the process, which helps to produce a solid set of building regulations.

EARTHQUAKE BRACING FOR SPRINKLER SYSTEMS

Many existing buildings are retrofitted with fire sprinkler systems and questions have been raised as to whether these systems should be seismically braced, especially in existing buildings which may not have been originally designed for seismic loads.

It has been argued; "Why seismically restrain the piping if the building is not designed to resist earthquakes?

Even though a building may not have been originally designed to withstand earthquake loads, all buildings possess some measure of lateral load resistance and will not necessarily collapse during an earthquake, especially if the earthquake is moderate. Non-seismically braced sprinkler piping, however may be susceptible to collapse if not laterally braced. Many fires occur following earthquakes due to rupturing of gas lines, overturning or rupturing of flammable materials containers and electrical shorts. It becomes imperative that the sprinkler system be braced and remain effective should a post earthquake fire occur. And also so that the heavy piping does not injure building occupants. Bracing requirements are located in chapter 16 of the Massachusetts State Building Code.

This opinion was rendered by a unanimous vote of the seismic advisory committee at its March 14, 2002 meeting.

SWEDISH HOMES CONSTRUCTED WITHOUT HEATING SYSTEMS

Energy Design Update, February 2002.

The holy grail of cold-climate energy-efficient design is the house without a heating system. In March 2001, in Lindås, Sweden, a non-profit company completed construction of a 20-unit multi-family housing project that is said to have attained that goal (see Figure 1). The Lindås houses, which were built by the local municipal housing authority, Egnahemsbolget, are so well insulated that the heat from occupants, appliances and lighting is adequate to keep the houses warm, even through several weeks of cloudy winter weather. Moreover, the construction cost was not significantly more expensive than the cost of standard Swedish residential construction.

Winter Sunlight is Scarce

The climate in Lindås, Sweden (about 12 miles south of Göteborg) is not particularly cold. The winter design temperature is 5°F, about the same as for Boston. But since the latitude of Lindås is 57.4° north -- the same latitude as Sitka, Alaska -- winter sunlight is rare. In December, Lindås has an average of only 0.26 kWh/m2/day of insolation, a scant 20% of Boston's December average of 1.32 kWh/m2/day.

Although the Lindås houses have their long axis aligned east-west, and most of their glazing faces south, they do not depend on passive solar principles for winter heating. The project architect, Hans Eek of Göteborg Energy in Göteborg, Sweden, has a simple design philosophy. "There are three types of heat loss from a building: first, the transmission of heat through the windows, walls, and roof; second, the ventilation losses; and third, the losses from the sewage water," says Eek. "In this project, I didn't address the sewage water losses. But if you minimize the other losses -- if the window quality is very good, if you have enough insulation, and if you make the building airtight -- the building will work. And that isn't hard to do."

The wood-framed row houses have R-71 roofs, R-63 floors, R-57 walls. The triple-glazed, krypton-filled windows have a remarkably low U-factor of 0.15. Thermal mass does not pay a large role in the design of the homes; the most massive element of the homes is the concrete slab foundation. "We have found, as a result of research, that when you insulate the house more, the influence of heavy construction [thermal mass] is less than if you don't insulate it well," explains Eek.

While the Swedish building code requires homes to reduce air leakage to 2 air changes per hour @ 50 Pascals, the Lindås houses are much tighter. Blower door tests confirmed that their leakage is only 0.4 ac/h @ 50 Pa. To make the homes this tight, the walls and ceilings include a polyethylene air barrier, installed at about one-third the distance from the interior to the exterior. All electrical wiring was kept inside the poly barrier. The poly was attached with sealant to the window frames. The electrical service cable enters the homes through a conduit, and the penetration sealed with aerosol urethane foam. Sealant was also used at all pipe penetrations through the poly air barrier.

In such airtight houses, heat recovery ventilation is essential, and the HRV manufacturer, Temovex, worked closely with the project designers. "It was a standard heat exchanger, but it was modified by the manufacturer," says Eek. "They doubled the length of the unit by putting two units together in series. Now they offer this modified design as one of their standard units." These HRVs recover 85% of the heat from the exhaust air.

The lighting and appliances (refrigerator, freezer, dishwasher, and washing machine) were chosen with special attention to energy efficiency. Although such energy-efficient appliances are obviously desirable, they make the space heating calculations more burdensome, since they throw off less waste heat than typical appliances.

Eek is particularly proud of the project's reasonable cost. "The building costs are no higher than standard building in Sweden," he says. "The sum of the costs for the extra insulation, the better windows, and the heat exchanger is only about $5,000 extra. And there is no cost for a heating system."

Getting Through a Cold Snap

According to Eek, the houses' only start-up problems involved the HRVs, which were somewhat noisier than the specifications called for. The problem was resolved when the HRV manufacturer muffled the units with added insulation.

This winter is providing the first real test of the thermal performance of the houses. "I was a little worried over Christmas time, because the outdoor temperature was about 20 degrees Celsius below zero [-4°F]," Eek said with a light-hearted tone. "The Swedish Testing Institute has been monitoring the apartments, so I questioned them, and they told me, 'It's a catastrophe! In some of the houses the temperature is between 25 and 30 degrees [77° - 86°F], because they have too many people, and there are so many candles burning. They are spoiling the measurements.'"

The architect provided ***EDU*** with performance data for three of the houses for the months of November and December 2001 (see Figure 2). One house (B12) had indoor temperatures that ranged as low as 63°F, possibly because the homeowners prefer cooler temperatures. In the other two homes, the interior temperatures fell in a very comfortable range of 68°F to 75°F. According to Eek, there have been no temperature complaints from homeowners.

Although the Lindås houses are apparently the first Swedish houses built without heating systems, they will probably not be the last. The Lindås design team is now working to develop a group of single-family, no-furnace homes to be built in the north of Sweden.

For more information, contact: Hans Eek, Göteborg Energi, Box 53, 401 20 Göteborg, Sweden. Web sites: http://www.ebd.lth.se/ (click on Research), www.goteborg2050.nu.

The municipal housing authority in Lindås, Sweden, recently built 20 housing units that are so well insulated that heat from the residents, lighting and appliances provides all of the space heating requirements.

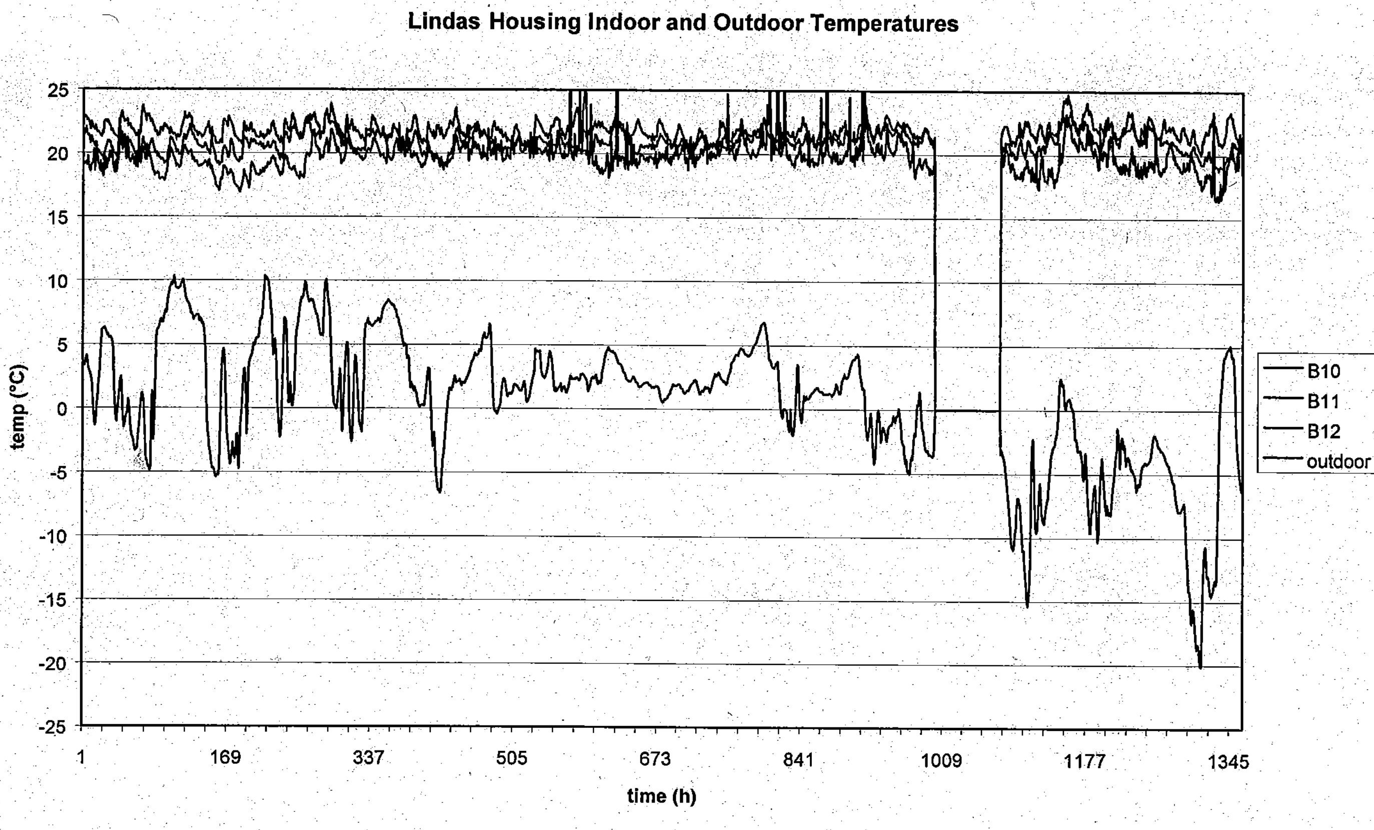


Figure 2. During November and December 2001, when outdoor temperatures ranged from -4°F to 50°F, the indoor temperatures in three of the unheated Lindås houses ranged from 63°F to 75°F

Spec Sheet: Lindås Housing
(All specifications are per housing unit)
Location: Lindås, Sweden
Price: $200,000
Size: 120 square meters (1,292 square feet)
Wall insulation: R-57 rigid polystyrene and mineral wool, total thickness 43 cm. (17 inches).
Roof insulation: R-71 rigid polystyrene and mineral wool, total thickness 48 cm. (19 inches).
Floor insulation: R-63 rigid polystyrene, 25 cm. (10 inches) thick, under concrete slab.
Windows: U-0.15 wood-framed windows with triple-pane krypton-filled low-e glazing, manufactured by Överums Fönsterfabrik (Överum, S-590 96 Överum, Sweden; Tel.: 011-46-0493-30420).
Domestic hot water: Solar with electric backup; storage tank size, 500 liters (132 gallons).
Solar thermal collector: 5 square meters (54 square feet).
Heat recovery ventilator: Temovex unit with 85% heat recovery.
Heating system: None

Estimated annual electrical use:
Domestic hot water: 1,500 kWh (50% of 3,000 kWh, with balance provided by solar thermal collectors).
Fans, pumps, etc.: 1,000 kWh.
Remaining household electricity: 2,900 kWh.
Total electrical budget: 5,400 kWh.

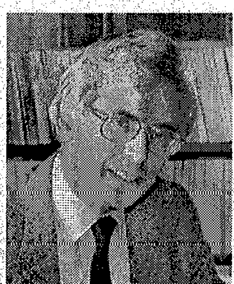
Heat input design criteria:
Estimated heat from occupants: 1,200 kWh per year
Estimated heat from appliances: 2,900 kWh per year

Cost of energy-efficiency features (in U.S. $):
Extra insulation
$1,500 - $2,000

Heat-recovery ventilator
$1,000
High performance windows
(U 0.149, R 6.68cost over typical)
$1,500 - $2,000
High efficiency appliances
$1,000
(cost over typical)
Solar thermal system (DHW)
$2,000
Total $7,000 - $8,000

Savings from omitting heating system
$4,000 - $5,000
Net extra cost $2,000 - $4,000

PROFILE - LOADS ADVISORY COMMITTEE CHAIRMAN - RUBIN M. ZALLEN, P.E.



Rubin M. Zallen is a structural and forensic engineer and principal of Zallen Engineering in Framingham, MA. He has a Bachelor of Civil Engineering degree from Syracuse University and a Master of Science degree from MIT where he studied structural and geotechnical engineering. He is a registered professional engineer in eight states.

Mr. Zallen started his career on the construction side of the construction industry, working for Bethlehem Steel Company and supervising construction for a general contractor. He then switched over to the design side, where he has been involved in the design and investigation of buildings, bridges, and special structures. He opened his own practice, Rubin M. Zallen Associates in 1966, specializing in the design of buildings and special structures. Mr. Zallen opened a successor firm, Zallen Engineering, in 1982, which specializes in the investigation of structural failures and problem structures, and earthquake engineering.

Mr. Zallen has been on the Loads Advisory Committee of BBRS for more than 25 years and is now its chairman. He is a past president and trustee of the Massachusetts Construction Industry Board and in 1986 was the chairman of the Massachusetts Select Committee on the Building Regulatory System. He is a past director, secretary, and Structural Group chairman of the Boston Society of Civil Engineers; a member of the American Consulting Engineers Council, and a member of the Boston Association of Structural Engineers.

The BBRS expresses its gratitude and thanks to the many municipalities, firms and individual who provide the technical expertise to the Board in the continued development of the Massachusetts State Building Code.

SPEAKING OF LOADS

Snow load can sometimes be unpredictable and in certain instances can result in severe overstressing and even collapse of roof systems and entire buildings. In an effort to gather information on such events, the BBRS and Loads Advisory Committee seeks your assistance in reporting any winter roof collapses due to snow loading. If any reader has been involved with the inspection, assessment or repair of a collapsed roof structure, please contact Technical Director Brian Gore, PE at 617 727 3200 extension 25204 or by e mail at brian.gore@state.ma.us.

WOOD RETAINING WALLS

Question: Is frost protection required for a 6″ by 6″ pressure treated wood retaining wall that has five feet of exposed height above grade and is approximately 45 feet in length.

Discussion: Frost protection requirements are established in section 1806.1 which reads, in part, as follows;

> "All permanent supports of buildings and structures larger than 100 square feet in area or ten feet in height shall extend to a minimum of four feet below finished grade........."

Answer: Given the parameters of the wall in question, as the height of the wall is less than ten feet, the footing need not extend a minimum of four feet below finished grade.

REPORT OF THE THEFT OF A HIGH EFFICIENCY BOILER

Recently a Contractor called the BBRS Boston Office and asked if we would assist in reporting the theft of a high efficiency boiler that was allegedly stolen from a construction site.

The following information is made available to Building Inspectors and others in the enforcement community and should anyone identify this boiler as part of permitting or inspection, would they please contact Mr. Stephen Hinkley at 978-852-6364.

BOILER INFORMATION: *Manufacturer* - Energy Kinetics; *Model No.:* EK-1 Premier; *Boiler Serial No.:* SN101125744; *Manager Serial No.:* SN175380801; allegedly stolen from a construction site in Methuen, Massachusetts

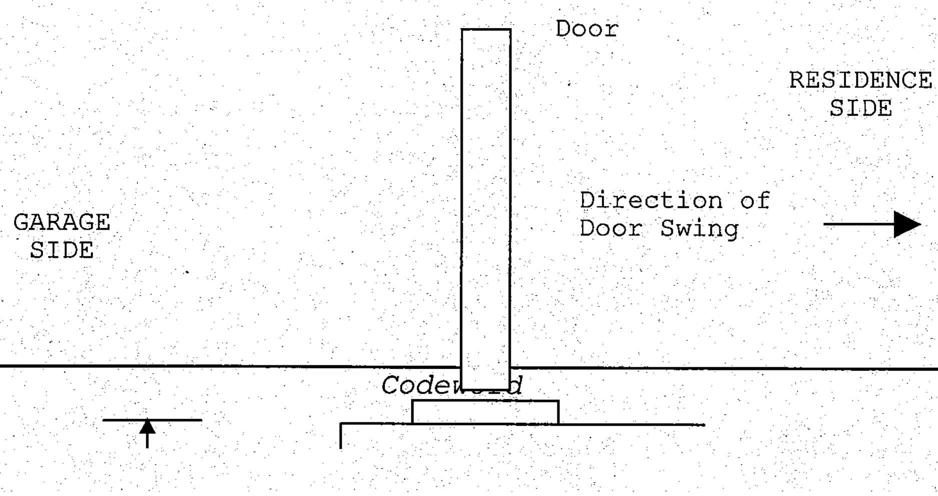
LANDING SAFELY

The question sometimes arises as to whether or not a landing is required at the intersection of a single or two-family home and an attached garage (when designed and constructed as an R-4 Use under the provisions of 780 CMR Chapter 36).

Section 3603.12.1 states that a 3 foot by 3 foot landing or open floor area is required " . . . *at the interior side of all exit doors . . .*" and that a " . . .*48 inch wide by 42 inch deep landing shall be provided on the exterior side of all exit doors. The floor area or landing shall not be more than 1½ inches lower than the top of the threshold on the interior side nor more than 8¼ inches lower than the threshold on the exterior side*".

Exception number 1 under this section states that a landing is not required "*at the top of a flight of interior stairs, on the stairway side, provided the door does not swing over the stairs*". Typically, a garage door will not swing over a stair leading to the dwelling unit (generally it swings into the dwelling unit). Consequently, a landing is not required in this application. (See figure below)

What if the door swings over the stair leading from the garage to the dwelling unit?. In this instance a landing would be required in accordance with Section 3603.12.1.



BASEMENT/CELLAR BULKHEAD STAIR SYSTEMS

Very often, bulkheads are used to access basement or cellar spaces in single family dwellings. These "bulkheads are typically used in a utilitarian fashion and serve to allow the occupants to move objects in and out of the basement. As such they are typically not used, nor intended to be used as a means of egress. Sometimes questions arise as to how to treat the stairway system within the bulkhead.

For example should such a stair system be required to incorporate a landing at the stair to basement/cellar floor intersection; what should the headroom be between such stair system and building proper, and are handrails and guardrails required for such a stair system.

780 CMR 3603.12.1 provided guidance regarding when landings are required and by prescription, what must be the size of such landings.

Staff observes that Section 3603.12.1 <u>specifically</u> controls landing requirements for all *exit* doors and the question arises as to whether or not a bulkhead stair/door system serves as a component of a *required means of egress* for which an *exit* is one component (*exit access*, *exit* and *exit discharge* making up the 3 components of a *required means of egress*)

Staff concludes that unless the basement/cellar bulkhead stair system is truly part of *a required means of egress* Section 3603.12.1 is silent on how to address landing requirements for such a bulkhead stair system (further below staff offers some additional opinions regarding the use of a bulkhead stair system as part of a true *required means of egress*).

In the absence of explicit Building Code requirements it is still prudent (under "matters not provided for" in Chapter 1, Section 102.2) to ask when a landing for such a bulkhead stair system should be incorporated and a general rule would be to perhaps call for a landing if and when the distance from the basement/cellar door threshold is greater than 8 1/4 inches above the basement/cellar floor - a similar call might be made for the exterior "upper end" of the bulkhead stair system relative to exterior grade - the BBRS is considering such EXCEPTION guidance in the developing 7th Edition of the State Building Code.

Relative to bulkhead stair headroom staff believes that 780 CMR 3603.13.3 currently controls headroom requirements for all stair systems (not just *exit* stairs). In reality, however, "half basements" and many basement/cellars may be constructed (water table issues, etc.) such that the headroom requirements of Section 3603.13.3 cannot be met for a basement/cellar bulkhead stair system; (bulkheads are typically used in a utilitarian fashion and serve to allow the occupants to move objects in and out of the basement) - the BBRS is currently considering adding a "headroom" EXCEPTION for basement/cellar bulkhead stair systems in the developing 7th Edition of the State Building Code.

Relative to handrail and guardrail requirements for a basement/cellar bulkhead stair system, although 780 CMR 3603.14.1 and 3603.14.2, inclusive address such requirements, it is clear that a bulkhead structure cannot accommodate a handrail system of constant required height (due to the triangular shape of the bulkhead structure walls relative to the stair system) so such a handrail system can never be incorporated and be in compliance with Code. Staff believes that the handrail/guardrail requirements of Sections 3603.14.1 and .2 inadvertently overlook the need for an EXCEPTION to such requirements for bulkhead stair systems. Staff further notes that for a portion of such stair system, the bulkhead structure walls provide at least guard capability - the BBRS is considering an EXCEPTION to handrail/guardrail requirements for bulkhead stair systems in the developing 7th Edition of the State Building Code.

Relative to the use of a basement/cellar bulkhead stair system as part of *a required means of egress*, staff believes that since such bulkhead structure cannot accommodate a handrail system of required constant height, such a bulkhead stair system cannot be utilized as part of a *required means of egress* unless the bulkhead structure is "doghoused" so that a handrail/guardrail system of required constant height can be incorporated; likewise all other requirements imposed on a *required means of egress* would have to be incorporated into such a stair system and the applicable portions of the Building Code that impact the "doghouse" structure design and construction, likewise would apply.

NORTHEAST ENERGY EFFICIENCY PARTNERSHIPS, INC. AWARDS BBRS "STATE AGENCY PROGRAM OF THE YEAR"

Thanks to the sterling efforts of BBRS Energy Code co-coordinator David Weitz, BBRS Code Development Manager Tom Riley and the Energy Advisory Committee (EAC), the BBRS was recently honored by Northeast Energy Efficiency Partnerships (NEEP) Inc., and received their State Agency Program of the year Award

Massachusetts Energy Code development and implementation has further influenced the development and implementation of advanced building energy codes throughout the Northeast.

NEEP is a regional non-profit that increases and coordinates energy efficiency and market transformation efforts in the Northeast United State

In This Issue of *Codeword:*

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