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THE OFFICIAL NEWSLETTER OF THE BOARD OF BUILDING REGULATIONS & STANDARDS

~April 2003~

FAREWELL KEN

It is with profound sadness that the BBRS announces the death of its longtime member and former chairman Kentaro Tsutsumi. "Ken" was the consummate gentleman and a true leader in his chosen field of structural engineering. Even at the time of his death, Ken remained a stalwart member of the BBRS, never missing a meeting and he was also a member of the Engineering Faculty of Tufts University.

Ken was one of the most pleasant, caring and humble individuals you could ever wish to meet. He carried an engaging and ever present smile for all to see and always had a warm, sincere greeting for everyone he met. Ken had an insatiable curiosity about everything and never left the BBRS office without taking the time to ask about each and every family member of the staff and querying the staff on everything from fire protection issues to computer software.

One of Ken's favorite memories was his flight on the supersonic jet "Concorde" This was as a result of a personal invitation from the King of Saudi Arabia who had retained Ken to perform some consulting work for the kingdom. Not many people knew, and it is very ironic that, as much as Ken was in awe of Concorde, he was instrumental in the design of the spatial guidance system used by Concorde and by modern aircraft today.

Ken suffered a stroke from which he did not recover. He passed away on Saturday March 29th, 2003, his daughters Jean and Patricia by his side.

We will miss you Ken. You are indeed one of a kind.

BBRS and Staff.

SPECIAL WORD OF THANKS TO SIMPSON GUMPERTZ AND HEGER

The BBRS would like to thank Simpson Gumpertz and Heger, Consulting Engineers of Waltham, MA for providing a seminar on March 11, 2003 to over 40 building officials. The topics were "Hot and Cold Weather Concreting". The seminar was given by Matt Shepherd, PE and was followed by a visit to SGH's on site concrete testing laboratory.

Building Officials in attendance received 2 hours of continuing education.

Once again the BBRS expresses its sincere thanks to SGH for their hospitality and generosity in providing their time, staff and, expertise and a special thanks to Joseph Zona, PE and Paul Kelley, PE.

BBRS and DEPARTMENT OF FIRE SERVICES PROVIDES JOINT TRAINING TO BUILDING AND FIRE OFFICIALS

On March 13th, 20th and 28th, the BBRS and DFS Staff provided 4 hours of training on the use of pyrotechnics and what to look for when inspecting assembly buildings following the recent West Warwick fire. Over 400 building and fire officials attended the trainings.

Seminar presenters were John McGrath of 4 star pyrotechnics, Scott McDermott, Jacob Nunemacher and John Fleck of Department of Fire Services and Brian Gore, PE, Technical Director of the Board of Building Regulations and Standards. Tom McGowan of the State Fire Marshal's Office provided administrative assistance at the seminar facilities.

COMMERCIAL STORE-FRONT WINDOW REPLACEMENT
(Energy Conservation Requirements of the State Building Code)

by
Tom Riley
Code Development Manager

Many commercial buildings or portions thereof have large display windows fronting on main walkways, streets and/or parking areas. It is not uncommon, that over time, these large store-front window need repair or replacing.

This short article addresses how staff to the BBRS views requirements of the State Building Code relative to store front window repair and/or replacement.

In determining Building Code requirements for such repair/replacement, it's important to note that for any building structure legally occupied and/or used for a period of at least five (5) years, one must begin Code assessment in Chapter 34 the "existing building" chapter.

The Sections of Chapter 34 of immediate interest include Sections: 3404.3 "New Building Systems"; 3404.4 "Alterations and Repairs"; and 3407 "Energy Provisions for Existing Buildings".

Reviewing these Sections, staff concludes that in a multiple store-front window arrangement where perhaps only one window is being replaced due to breakage, the building owner would be entitled to replace that single large window with a window of like kind.

If, however, all the store-front windows are being replaced and in recognition that Chapter 34 is written to encourage incremental improvement in building performance, staff concludes that the opportunity to improve energy conservation efficiency exists and such store-front windows must be upgraded with windows which satisfy the Code for new Commercial construction per the requirements of Section 3407 generally or Table 3407 if utilized - discussions with suppliers of commercial glazing products indicate that such an approach is readily achievable, noting that the framing to support such upgraded windows would also need to be replaced to accommodate multi-layered glazing product and gasketing.

THE WEST WARWICK, RI, NIGHTCLUB FIRE

by
Brian Gore, PE
Technical Director

The fire at the Station Nightclub in West Warwick is yet another defining event in the history of the country and again underscores the importance of building codes and the adherence to these codes. Although the fire investigation is not yet concluded, certain undeniable telltale signs were evident from the videotaped record of the events which occurred that evening. The following article is not intended, in any way, and should not be viewed as an analysis or commentary of the actual fire at the Station Nightclub.

The videotape of the event, however, prompts some questions, which perhaps will be answered following the completion of the investigation:

- Why did the material ignite so readily?
- Why did the fire spread so quickly?
- Why couldn't the building's occupants exit safely and why were they jammed at the front door?
- What should be done to ensure that a situation like this doesn't happen again?
- Why didn't the inspectors see the sound insulation material on the walls during previous inspections?

Building Code life safety requirements derive, in general, from a building's Use and Occupancy. Nightclubs are classified in the "Assembly" use group, specifically A-2, which is typically characterized by:

- High densities of people
- Loud music
- Low levels of lighting and/or distracting illumination
- Consumption of alcohol.

These occupancy characteristics have resulted in multiple life loss in past fires, not only in the United States, but also many other developed countries and therefore are recognized as occupancies requiring particular attention by the building code.

Almost invariably, similar incidents in which multiple deaths occurred reveal similar patterns - fast growing fires: problems with the exit systems and often an absence of automatic sprinklers.

In order to minimize the possibility of a fast growing fire, the State Building Code restricts the types of materials which may be applied to the walls, ceilings and floors, the so called interior finishes of the building or space.

Interior Finish Requirements:

The building code regulates the kinds of materials which are permitted to be placed on walls, ceilings and floors in Chapter 8.

The building code requires that interior finishes possess a degree of resistance to flame spread across the surface the material and places restrictions on the extent that flame will propagate across the surface as measured by standard test procedures. The results yield the, so called, Flame Spread Rating of the material tested. A second standardized test measures the degree of obscuration by smoke when a sample of a particular material is burned. The results of this test yield what is termed the Smoke Developed Rating of the material.

These tests are performed in qualified independent laboratories under the test procedures of ASTM E 84

Results from these tests allow a comparison of flame resistance to be made between different materials which are then categorized into three different classes.

All results are compared to RED OAK which is assigned a value of 100. A material with a flame spread of less than 100 is more flame resistant than red oak and materials over 100 are less flame resistant.

Material	Flame Spread Rating
Treated Northern Pine	20
Untreated Southern Pine	130-190
Plywood Paneling	130-190
RED OAK	100
Brick	0
Carpeting	10 - 600
Gypsum Board	10 - 25

Flame Spread Rating - typical construction Materials

Classification	Flame Spread Rating
I	0-25
II	26-75
III	76-200

Flame Spread Classification Based on Flame Spread Rating

For Assembly spaces the Massachusetts State Building Code requires that the interior finish materials meet the following requirements:

- Exits, exit passageways, vertical exits and exit access corridors - CLASS I
- All other rooms and spaces - CLASS II

A relaxation from class I to Class II and Class II to Class III is permitted when the building has an automatic fire sprinkler system.

Use of Foam Plastics:

There has been much speculation, to date, about the materials allegedly used at the Station Nightclub with respect to the insulation used on the walls adjacent to the stage and where the fire initiated. Tests have yet to confirm exactly the type of material used but reports have mentioned the possible use of foam plastics.

The use of foam plastics is highly restricted by the Massachusetts State Building Code because of the flammable nature of the material and the toxic products of combustion associated with the material.

Foam plastics are limited to trim materials and also must comply with the following requirements:

- Minimum Density of 20 pcf
- Maximum Thickness ½ inch
- Maximum Width 4 inches
- Not more than 10% aggregate wall or ceiling area in any one space
- Flame spread index not more than 75

Means of Egress:

It is imperative that means of egress must:

- Provide alternative paths of travel top a place of safety
- Provide shelter from fire and products of combustion
- Accommodate all occupants safely
- Provide a clear, unobstructed, well marked and illuminated path to safety
- Ensure that all occupants of the system are under the control of the occupant
- Be arranged so that sufficient time is provided to travel through the system without undue risk of injury or accident.

Faulty means of egress is very often the major cause of death and injury in a fire or emergency situation. Locked, blocked or otherwise compromised exits are often reported as a contributing factor to loss of life, especially in Assembly buildings due to the large and concentrated occupant loads associated with this use. This is sometimes seen as locked doors, or simply restrictions or obstructions placed in the means of egress resulting in "bottlenecking" of occupants leading to panic and crushing.

Date	Location	# Casualties
11-28-42	Cocoanut Grove Boston, MA	490
6-5-46	LaSalle St. Hotel	61
12-7-46	Winecoff Hotel, Atlanta GA	119
12-17-83	Madrid, Spain	83
11-24-94	Fuxin, China	233
3-19-96	Manilla, Philippines	135
2-20-03	Station Nightclub West Warwick, RI	99

Nightclub Fire Deaths attributed to interior finishes/decorations and locked or blocked exits

SNOW - AN ENGINEERS PERSPECTIVE

by Robert Daigle, P.E.
Daigle Engineers
Methuen, MA

A few years ago, New England was hit by a series of snow storms one after another. In fact, it was a record breaking season for snow accumulation. The region ended up with a number of heavily loaded roofs, along with a proportional number of concerned building owners. A weather advisory was broadcast on TV alerting people to beware of heavy snow on roofs; that a number of collapses had occurred. As the snow kept falling, the number of calls to our office increased. The common question we were asked was: "Is my roof Okay?" Obviously, this was an impossible question to answer over the phone, especially if the call was from a new client for whom we had no information or knowledge about their building. At least if we knew the building in question, we would have a feel for its strength and condition. However, even knowing the condition of the building, we still did not know how much snow was on the roof.

In order to provide the services that the callers were requesting, our office developed a method to determine the actual weight of snow on a roof. We wanted a method that was easy to deal with in the cold, even when it was dark and windy. The equipment had to be light and easy to carry because we usually have to climb a ladder to get on the roof. We came up with a solution that works very well, and it's nothing high tech either. To start we took a couple of two foot sections of standard 4" diameter aluminum vent pipe. These two sections of pipe were interconnected by means of inserting one swaged end into the other. We found it best to hold the two sections together with duct tape so they would not fall apart when climbing a ladder. We procured a scale having a 10 pound capacity along with a plastic clip board, to hold the sample from dropping out of the sampling pipe. The above equipment was found to suffice for weighing snow samples from the majority of snow packs on open roofs.

Here's the procedure:

Shovel a small area near where you would like to know the snow weight. This will give you a flat area to work in. Take the sample pipe and push it down into the snow pack directly adjacent to where you are standing. Try to reach away from any area which has been trampled or where snow was thrown. Once the pipe hits resistance, gently twist it to cut into the ice or packed snow base, but be careful not to damage the roofing. Once this step is complete, without moving the pipe, take a shovel or the clip board and pull the snow from around the pipe at the front and sides. Then, taking the clip board in one hand, push the board under the sample pipe to keep the snow from falling out when you pick it up. Before hand you want to "zero-out" the scale with the sample pipe and clip board on it. That way the weight you read on the scale will be that of the snow sample only. Next, pick up the sample pipe with the clip board underneath and place it on the scale. The weight you read is what you will use on the following chart to determine the roof load (per square foot) resulting from the snow.

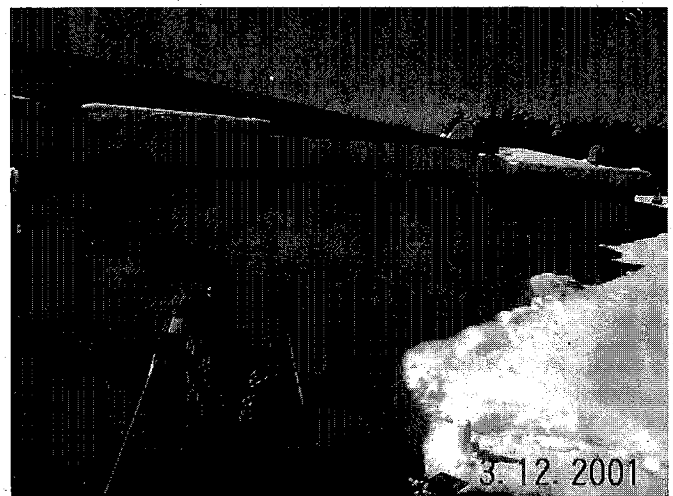
Conversion chart for 4" diameter sample:

Weight of Sample (lbs.)	Roof Snow Load in (lb/ft^2)
0.25	3
0.5	6
0.75	9
1	12
1.25	15
1.5	17
1.75	20
2	23
2.25	25
2.5	28
2.75	31
3	34
3.25	37
3.5	40
3.75	43
4	46
4.25	49
4.5	52
4.75	55
5	57

Cut this chart out and tape it to the sample pipe for easy reference in the field. It would be best if this were laminated first to keep it dry.

This chart merely converts the weight of the specimen from the 12.6 square inches which is the cross sectional area of the 4" sample pipe, to the 144 square inches in a square foot. Therefore, a 3.0 pound sample specimen in the pipe is the same as 34 psf (pounds per square foot) of snow weight on the roof.

Now that the actual snow weight on the roof is known, a rational decision on how to proceed can be made. If



you know the snow load capacity of the roof, this will be easier. For example: if you know that your roof has a snow load capacity of 25 psf, and you take sample readings which on the conversion chart show an equivalent snow load of 17 psf, you might decide to postpone snow removal pending further snow accumulation. If you do not know the roof's capacity, contact your structural engineer. As you may suspect, the snow load requirements vary dramatically from the north to south. Snow loads can range from 0 psf (although by code, roofs must be designed to support minimum live load) to a maximum of over 60 psf on an unobstructed roof area.

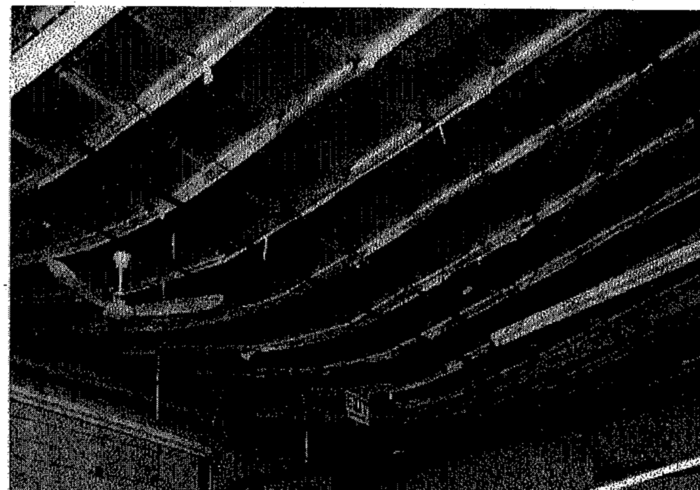
Snow drifting is another issue which requires much attention. Building Codes require that engineers design for this drifting effect where roofs abut a higher building or piece of equipment such as a large roof top unit. This drifting condition also develops along parapets. Believe me when I say that snow loads can drift to over eighteen feet tall on a roof. I've seen it once in Buffalo, New York and once in Watertown, Connecticut. In both situations, it was on a low roof of an office which abutted a high bay storage warehouse. The snow load was calculated to weigh upwards of 180 psf. Fortunately, the Buffalo building had a non-bearing masonry wall running below the joists perpendicular to the span near midspan of the members. This saved the roof from collapse. The roof structure did not have provisions for drifting because it was designed prior to the code requirement increasing the design snow load in such areas. At the Watertown job, the roof did not collapse because, fortunately, it was designed for the Code required snow drift load for that specific area, which was 120 psf. Although the 180 psf snow pack exceeded this load, the factor of safety proved to be the saving grace. The roof deflected 4" under the load but did not exceed the elastic limit of the long span joists; therefore, once the load was removed, the roof rebounded to its original shape. A word of caution though - provisions for snow drifting are not always properly addressed, or may be missed entirely. Do not assume that your building is properly designed.

Another issue that makes this "weigh the snow routine" a good thing to do is that if you find the snow doesn't have to be removed, you can:

1. Save a tremendous amount of money on a large roof;
2. Eliminate the potential damage to the roofing membrane; and,
3. Eliminate the risk of someone falling off the roof when they are shoveling snow, especially at night.

One word of caution when measuring a snow pack deeper than the 48" length of pipe; always make sure that the specimen you take is the full depth of the snow pack. If it is 54" deep I would recommend getting another section of pipe to add on to the other two. Otherwise you would have to take much care in measuring the weight in multiple lifts, being careful not to disturb the different levels.

On roofs that we have inspected, a number of weight measurements were taken around the roof. At each measurement, we also measured the depth of snow for our reference. This would give us a feel for weight versus depth. However, this relationship could vary significantly from day to day. For example: a 22" depth of powdery snow might weigh 15 psf.; however, a rain storm could increase the snow density by a factor of 3. The snow also restricts the flow of snow melt and rain runoff toward the roof drains.



Horror Stories:

1. Helicopter Blow Off Method - One municipality hired a helicopter to blow the snow off their roof. This might work well with the light, powdery type of snow that would blow off easily. What happens though if the roof is loaded to its limit with snow and then a helicopter hovers overhead. Could the down blast cause a collapse? It's possible.

2. "Bob Cat" Method - One municipality decided to lift a small "Bob Cat" type tractor onto the roof to remove the snow. They were fortunate that the machine did not punch through the deck as this is a highly concentrated load for a roof system. I am sure the abrasion from the unit turning and running back and forth didn't help the roof warranty either.

3. Wave Method - One common method is to use snow blowers on the roof. One word of caution though, the snow blower can become a Gatling gun if the roof has stone ballast on it. Get ready to take cover! The technique used by the unknowing is to start in the center and keep moving the snow toward the

edge of the roof. The only problem with this is that the snow depth and density keeps building up on every pass. This could be catastrophic.

Snow Removal Methods:

One innovative way to clear a large roof is to have a crane and dumpster available. The crane holds the dumpster above the roof for workers to fill with snow. That way, areas of

roof can be cleared without having to carry the snow across a large distance. This also reduces the wear and tear on the roof membrane. As you probably suspect, we recommend against lowering the dumpster onto the roof. The added weight could cause a problem.One suggestion we make, when we find that a roof is over loaded, is how much weight should be removed. Many times we have seen an owner remove all of the snow when in actuality all they needed to do was reduce the loading, not remove it entirely. If it is determined that 30% of the snow must be removed, we might recommend that 3'-0" wide lanes be cleared every 9'-0" on center. These lanes would preferably be oriented parallel with the roof slope to help facilitate water migration to the drains. If the roof has isolated interior drains, these lanes should radiate outward from each drain. Our recommendations could vary depending on actual conditions.

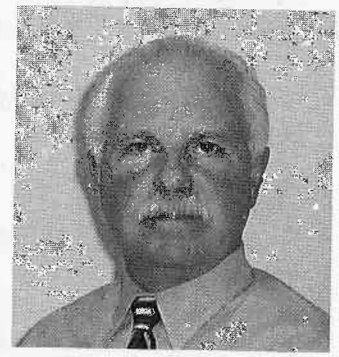
The other method mentioned earlier about clearing snow from aisles radiating from drains is a desirable method. In all cases plastic tipped shovels are recommended as well as minimizing worker loading until an adequate area is cleared to compensate for their added weight.

One word of caution: when digging out a roof which abuts a higher sloped roof make sure to shovel the upper roof first, if the low roof snow is up to the eave of the upper roof. The drift on the low roof might be holding back the snow from sliding off of the sloped roof. This was learned first hand when a low roof was cleared of a drift only to have the snow on the sloped roof come crashing down. Fortunately, there was no damage or injury from this oversight.

There's an old saying, "If it ain't broke, don't fix it". In this case, if you don't have to shovel your roof, don't do it. Stay inside where it's warm.

About the author:

Robert K. Daigle, P.E.



Mr. Daigle is a structural engineer and president of Daigle Engineers Inc., a consulting firm with 8 employees. Daigle Engineers was founded by Mr. Daigle in 1979 and has provided structural engineering services to facilities throughout the northeast. A 1971 graduate of Lowell Technological Institute, Mr. Daigle is a past president of the Massachusetts Society of Professional Engineers and has given numerous talks to many groups of Building Inspectors and Officials in New England. Mr. Daigle is also an active member of the Boston Association of Structural Engineers. Along with serving on many other boards, he recently completed a two years position on the Designer Selection Board for MassPort/ Logan Airport.

EXISTING BUILDINGS AND FIRE PROTECTION REQUIREMENTS (CONTINUED)

This article is a continuation of the article from the January 2003 issue in which the proposed philosophy of fire protection requirements in existing buildings was discussed. The proposed building facilitation index for new work was 0.92 and the question was asked what systems if any should be installed?

To answer that question, the Final step is a cost analysis which will determine whether work k which has facilitated an upgrade to fire protection systems is actually required to be done. This analysis is consistent with the BBRS mandate to also consider the possible cost impacts of its regulations.

The committee's view at this point is to require systems when the facilitation index is 0.5 or greater and when the system or systems installation costs are 10% or less of the project costs. In the example suppose the costs were as follows:

A. Sprinklers 8% of construction cost
B. Fire Alarm 4% of construction cost and
C. Standpipes 5% of construction cost

A + B + C = 17% > 10%

But individually A, B or C are < 10%, therefore which system(s) should be installed?

The code will prioritize the required systems as follows:

A. Sprinklers
B. Fire Alarm/Detection
C. Standpipes

In this example since A + B = 12% then only sprinklers would be required. However if A + B were equal to 10% then both would be required to be installed. Although B + C would be 9% it is felt that sprinklers would provide the better public safety option.

In This Issue of Codeword:

- Farewell Ken
- Special Thanks to Simpson, Gumpertz and Heger
- BBRS and DFS Provide Seminars to Building and Fire Officials in the Wake of the West Warwick Nightclub Fire
- Commercial Store Front Window Replacement
- The West Warwick Nightclub Fire
- Snow - An Engineer's Perspective
- Existing Buildings and Fire Protection Requirements Follow Up From January 2003 Codeword Article

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