

# Regular Structural Inspections Are Key To Controlling Facility Snow Load Failures

*The Ontario Recreation Facilities Association Inc. (ORFA) regularly researches and writes about issues that could affect our members. These documents provide an opinion on key risk management issues but are not meant to provide any form of legal opinion or official interpretation. No one should act on such information without appropriate professional advice after a thorough examination of the particular situation. All rights reserved. ©2010 Ontario Recreation Facilities Association Inc.*

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On February 28<sup>th</sup>, 1959 the collapse of the Listowel Arena, Ontario, Canada resulted in the death of seven lives and changed the recreation facility industry forever. More than 50-years later, the industry continues to experience regular structural failures, the question asked is why?

Over the last fifty years it has been generally observed that most of these types of building failures occur in regions that experience significant snow fall. The winter of 2009-2010 saw a shift in weather patterns that resulted in significant snow levels in areas that did not traditionally see such events. Many of these same building owners/managers were busy concentrating on snow removal on the ground rather than focusing on snow load stress on their buildings roof system above.

*So, whose responsibility is it to ensure the facility is safe for use?* In Ontario, Canada - the Occupational Health and Safety Act (OHSA) RSO 1990 c.).<sup>1</sup> includes arenas in the definition of "industrial establishments" therefore regulates the structural condition of any arena under the jurisdiction of the Ministry of Labour (MOL). The MOL previously released reminders to owners of such obligations, but stopped this formal process through a Bulletin dated April 4<sup>th</sup> 1997.

*Here is what the OHSA says, "it is the responsibility of the employer to ensure that a roof "is capable of supporting all loads to which it may be subjected without causing the materials therein to be stressed beyond the allowable unit stresses established under the Building Code Act" [s. 25(1)(e)]. The OHSA, section 9 (23) further requires that "all physical conditions of each building be inspected for safety at least once a month".*

So, under this definition who is the "owner"? In a municipal setting it can be the Mayor and Council, followed by administrative staff. Ultimately any breach under the OHSA would include an investigation of how the events may have been avoided. The MOL has an expectation that health and safety will always begin and then percolate down from the top. Investigations typically include determination of where the chain of responsibility was broken; and where true accountability lays.

Consider this recent event:

*The water supply for the Town of Walkerton was operated by the Walkerton Public Utilities Commission, with Stan Koebel as manager and Frank Koebel as water foreman. Neither had any formal training in their positions - retaining their jobs through three decades of on-the-job experience". "For years, the Walkerton Public Utilities Commission operators engaged in a host of improper operating practices, including failing to use adequate doses of chlorine, failing to monitor chlorine residuals daily, making false entries about residuals in daily operating records, and misstating the locations at which microbiological samples were taken. The operators knew that these practices were unacceptable and contrary to Ministry guidelines and directives.*

Although the MOL has the authority to order an inspection of an arena at anytime, and at the owner's expense, it is currently left to the owner to determine when such an inspection is required to meet the previously noted OHSA obligation. An obligation that is often lost in the daily operational requirements of a typical arena.

In answer to the “*whose responsibility is it to ensure the facility is safe for use*” question – it is suggested that it is the facility managers responsibility on behalf of the owners obligation to ensure the structural inspection requirement is met.

Should a building failure occur with a significant loss of human life; and should the investigation to such an incident discover that the owner failed to conduct regular detailed/adequate structural inspections contributed to the failure; it would not be unreasonable to predict that Bill C-45 would be applied with these breaches under the OHSA being brought into criminal court. Further, facility management could be personally held responsible if accountability could not be shifted to a higher level of internal decision-makers within the operation.

The inspection requirement is fairly broad and allows owners to take internal control of this obligation as long as the persons conducting the inspections are “competent” to do so. **Is there a role for frontline staff to play in building safety? Yes! But it is a limited one.** Frontline staff must play a role in ongoing building inspection of the facility as required under the OHSA – their review of cracks, shifting and structural changes are important to ensure that the building remains safe and serviceable.

These regular inspections should be logged for future reference, ensuring that any discovered issues are immediately attended to, with repairs being logged.

In harmony with these internal inspections is the necessity to retain a professional structural engineer to conduct a detailed inspection of arena structures. The Ontario Recreation Facilities Association (ORFA) is often contacted to provide an overview of what should occur during such an inspection. Regrettably, the diversity in design, age and materials used in building arenas in Ontario’s will not permit the Association to provide such detailed information. This responsibility rests firmly with

facility management to research, design and implement such an inspection to meet their specific facilities needs.

As diverse as the different arena designs, it is also matched by the types and detail of available structural inspections in today’s marketplace. Engineers retained to conduct structural inspections look for the provision of some basic facility construction documentation. Having access to construction/as-built drawings, previous reports and records of previous structural repairs, allows the Engineer to prepare more relevant and accurate descriptions and recommendations. Unfortunately, most times an Engineer begins the process with almost no documentation to complete the structural review.

Be clear, that when an engineer signs off on a facility inspection it will often be designed to place the overall ongoing structural safety back in the hands of the owners. Most inspections will be conducted from “ground level” with the engineer noting that the inspection is limited to conditions visible from the ground – most do not include any electrical, mechanical or other building code analysis.

Considering that many buildings are experiencing high humidity levels that will have a concentrated impact on structural beams and supports often hidden by low-e ceilings and/or insulation, the facility owner must give consideration to when a more comprehensive inspection is warranted. These inspections might be best served from a lifting device that includes visual inspection for rot and decay, moisture level readings in high areas, as well as air flow testing to ensure that air circulation is adequate.

The ORFA is not an expert in these areas but offers the following industry best practices for structural inspection to help facility management in their efforts in maintaining a safe work and play environment.

## Industry Structural Inspection Guidelines

- Monitoring and maintaining your roof throughout its lifecycle is critical especially given the number of aging buildings in Ontario, and the potential for heavy snow loads;
- Most Ontario arenas have been built using concrete and steel as the primary materials (pre-engineered steel frame buildings) – most of these same facilities are 25+years of age and may no longer meet current Building Codes, a structural engineers report should include what designs no longer meet current building, mechanical and electrical codes;
- The above noted building designs are considered durable, but not without due care and control. Buildings of these designs will most likely be well protected by a ground level structural inspection every 5-years. However, buildings that are experiencing visible shifting, rot or decay may benefit from a more comprehensive detailed inspection;
- Buildings that exceed 25+years of age should also be given consideration to the benefits of a more comprehensive detailed inspection;
- Buildings that are built from materials other than concrete or steel or are not of a “pre-engineered steel frame design” may require more regular comprehensive detailed inspection;
- Many of Ontario’s arenas were built to Codes that are now more than 25-years old. As such, Managers may be challenged to advise of what the original design limitations of their facility were – now combine these facts with the reality that throughout the winter season snow loads can become excessive and the roofs of many of Ontario’s aging facilities may be carrying a greater weight of snow than

is allowed for in their structural designs – the structural assessment must include this information, what it was originally designed for compared to current Building Codes.

Facility management who detect a snow load issue must act. Information contained in the following ORFA Snow Loading and Roof Failure Alert of February 2002 remains relevant and applicable in today’s arena operational environments.

*Note: facility management that detect snow load or structural issues and fail to act may have limited insurance coverage.*

### **SNOW LOADING & ROOF FAILURES ALERT (Revised February 2010)**

The Ministry of Labour (MOL) makes the following recommendations and a local MOL Office should be consulted if additional information and or clarification are required:

- Owners of workplaces and/or employers at workplaces where there is snow on the roof of buildings should have the roofs assessed by a professional engineer to determine whether:
  - the snow load is significant, or if there are any visible signs of structural distress, for example, twisting, bending or cracking.
- If snow is excessive or a roof shows signs of distress, the owner or employer should implement a safe snow removal procedure.
- A snow removal operation should avoid producing any uneven or concentrated loading on the roof.
- Areas onto which snow will be dumped from a roof should be secured to prevent access.
- Also, workers on a roof must use fall-arrest or travel-restraint equipment in accordance with the fall protection requirements of the Regulations for Industrial Establishments (RRO 851, s. 85).
- A civil or structural engineer should be consulted: (1) to determine whether snow loads are excessive; (2) to determine whether there are signs of structural distress; (3) to obtain a

removal procedure that will not cause more structural problems; or (4) to reinforce a structure that is overstressed.

### **Facility Structural Inspection Best Practices**

Conducting structural inspections from ground level is considered appropriate for buildings less than 10-years of age which have not experienced any shifting, cracking or other such structural events; and who maintain internal humidity levels of less than 50% at all times.

*Note: Ground level inspections often generate a false sense of structural adequacy, with the end report placing the structural responsibility back on the owner and/or designates if the structure fails.*

The ORFA strongly recommends the following structural inspection activities:

1. That all recreation facilities receive a comprehensive structural inspection which includes a detailed aerial review by a recognized professional who is experienced in arena structural review, no less than every 5-years or as deemed necessary by facility management.
  - a. That such inspection include a detailed roof beam, roof paneling, roof joints, expansion areas and connections, using the most appropriate lifting device.
2. The final structural inspection report should include a recommendation of when the next structural inspection is to take place.
  - a. Depending on the age of the building and the findings of the structural inspection, this may be annually, every two years or every five years.

The facility insurance carrier may offer a variety of support risk inspection services that can be accessed to support your recommendations for a more detailed facility structural inspection.

The Joint Health and Safety Committee also plays a role in building safety and as such, should be consulted as required.

### **ORFA Members**

Are reminded to be remain diligent in recognizing their role in the structural assessment process. Ensuring that a role to provide regular, adequate information as part of operational updates or budget deliberations is not dropped as a result of feeling that their recommendations will merely “fall on deaf ears”.

ORFA members will appreciate that many owners are under significant operational pressures and often try to balance all areas of operational responsibility.

The ORFA reminds its members that one of their key responsibilities is that of “information broker”. Our responsibility to the owner and the people we serve is to continually remind all involved of what is expected of our operation by way of legislative or industry best practice. We must further table reasonable plans on how these obligations can be achieved. These responsibilities and recommendations should not become lost – they must be tabled on a regular basis as a constant reminder to that obligation.

Consider these events and follow-up investigation:

Captain Edward John Smith, (27 January 1850 – 15 April 1912) who was the British naval reserve captain in command of the RMS *Titanic*; he died on board when it sank in 1912.

The perception persists that the Titanic was, if obviously not “unsinkable” (though the White Star line actually never used that word in advertising), then very safe, as safe as the art could build her. That, despite various errors, the accident was mostly enormous bad luck. Nothing could be further from the truth. It was amazing good luck that there had been no

similar accidents years earlier. For over 50 years, safety standards had been steadily deteriorating in various ways – almost always because of pressures to be "competitive". What gets far less comment is that most of the problems all came from a larger, systemic problem: the owners and operators of steamships had for five decades taken larger and larger risks to save money – risks to which they had methodically blinded themselves. The Titanic disaster suddenly ripped away the blindfolds and changed dozens of attitudes, practices, and standards almost literally overnight.

Those of us who design and operate public services, and bear the title of "civil servant", may be much sobered by this transcript from the inquiry. Captain Maurice Henry Clarke, the inspector who cleared the Titanic for sailing, was being examined on the reasons for Titanic's only "lifeboat drill" having been conducted at the dock, consisting of only two boats, manned by hand-picked crew. Having conceded that he had since tightened requirements, he was asked:

"Did you think your system was satisfactory before the Titanic disaster?"

"No, sir."

"Then why did you do it?"

"Because it was the custom."

"Do you follow a custom because it is bad?"

"Well, I am a civil servant sir, and custom guides us a good bit."

All risks need rational consideration, and some must be accepted. Even today however, it is still often the case that money management wins out over risk management.

(Source: Brander, Copr. R. (1995). *The Titanic disaster: An enduring example of money management vs. risk management*. Available at:

[http://www.cuug.ab.ca/~branderr/risk\\_essay/titanic.html](http://www.cuug.ab.ca/~branderr/risk_essay/titanic.html)

## Resources:

- ORFA – Determining Your Facilities Replacement
- ORFA – Snow Load Alert
- ORFA – Snow Load Analysis

### Disclaimer

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