



Structural Failure: Could Your Theater Be Next?

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Roofs and other building structures do not collapse often, but when they do the consequences can be devastating. Theatres are particularly vulnerable because they are often older or historical structures and are used as areas for public assembly.

Catastrophic failures occur when a structure is overloaded. Overloads can be caused by a combination of factors that result in excessive loads, including flaws in the integrity of the structure, external factors such as weather, or even from workers on the roof installing riggings for a production.

Structural failure is a real risk for theaters. Owners need to pay proper attention to all these factors that can contribute to structural failure and try to protect themselves against them.

Maintain Structural Integrity

Even properly designed structures must be maintained. Obvious signs of roof damage such as leaks, sagging, cracks, and corrosion should not be taken lightly. Water should never “pond” on a well-designed and well-maintained roof. Property owners and operators should conduct regular inspections looking for signs of potential failure. These inspections should include annual evaluations by professional engineers with experience and expertise inspecting roofing structures.

If a new roof is needed for your theater, it should be designed by a qualified engineer, accounting for expected wind loads for the region, and be installed by qualified contractors.

Weather-Related Failure

Wind, snow, rain and sleet can put a tremendous load on any structure. Property owners/operators can ensure that weather will not result in an excessive load being placed on the structure by inspecting regularly to determine if:

- Roof drains and downspouts are clear and properly arranged.
- Roof components such as flashing and coverings are in good condition.
- Roofs are clear of debris that could impede effective roof drainage.

Additional inspections should be conducted following severe weather and when forecasts predict severe weather.

However, managing snow and ice requires more effort than just inspecting roofs. As snow and ice accumulate, it must be removed before it reaches unsafe levels.

Theater owners and operators should have emergency management plans in place to monitor for unacceptable levels of snow and ice and to safely remove it well before there is any danger of collapse. Keys to success include:

- Knowing maximum amounts of snow/ice the structure can safely handle. Insight from engineering experts will be required.
- Monitoring weather forecasts for severe weather.
- Monitoring actual snow/ice accumulation during a storm including snow drifts.
- Preplanning for safe removal of snow/ice before, during and after a storm. Preplanning should ensure that qualified people, proper equipment and safe procedures are established well before they are required. Removal procedures should ensure both the safety of the people and be designed to not damage roof components.

Manmade-Related Failure

Human activities, such as installation of new roof equipment, roofing repairs/modifications or installation of production-related rigging can also introduce risks.

Installation of new roofing and/or production rigging equipment should trigger a formal risk assessment that documents the hazards and adequacy of controls and/or engineering designs before any work is done. Theater owners and operators should ensure that the risk assessment and related activities are planned and



implemented by qualified and experienced professionals. Buildings are especially vulnerable during construction.

Contracts should identify risk management responsibilities and transfer financial risks associated with an activity to the party responsible for completing the work.

Entertainment Rigging

Fatigue, time pressures and technical challenges can contribute to human errors on a production. Similarly, unsafe rigging can collapse and threaten people and the integrity of a building. Safe rigging practices should include:

- Verification that engineered designs are installed in accordance with engineering documents and/or non-engineered designs are within venue load capacity.
- Rigging that relies on point redundancies to achieve failsafe design.
- Daily safety meetings with cast and crew.
- Written code of safe practices which include rigging specific expectations.
- Disciplinary procedures for noncompliance with safety practices.
- Inspection of individual components by qualified individuals.
- Multi-tiered rigging equipment inspection program that requires two inspections - once on ground and once after it has been rigged but before weight is lifted.

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