

Building Research Institute
of Montana

Lincoln Education
Center

Special Report: Water Problems at Tower





Lincoln Education Center

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History

The tower at Lincoln Education Center has water problems. Water is entering the building and causing damage to the interior finishes and materials.

The tower is part of an addition to Lincoln Center built 62-years ago in 1935. It was and can still be considered the main entry to Lincoln Center for the downtown pedestrian. Administration offices are located on the second floor. The third floor is home to preschool testing. Most of the water damage has been done in this third floor area.

The tower faces south and addresses downtown Billings with a quiet and solid dignity. It provides an important focal point for pedestrians and motorists alike. It also holds an engraving of powerful words and a bas-relief of Abraham Lincoln. This large area of limestone is approximately 16 x 12 feet.

Limestone is also used for stone bands as a design system to break up the elevation and add variety to the building facade. The bands provide horizontal elements to give the tower a strong presence, rooted to the ground.

The 1935 addition was designed by one of Billings' most prolific architects of the era, Chandler C. CoHagen along with his partner at the time, McIver. At the same time, they designed the auditorium addition of Lincoln Center. The old Jefferson Schoolhouse was situated between these two additions.

Problems

Building Research Institute of Montana looked at some of the symptoms the water problems have created at the tower of Lincoln Center to try and ascertain the underlying cause.

- Interior of Preschool Test Center

- Wood floor is buckling in 3 areas.

- Acoustical ceiling is stained and coming apart.

- Interior of Tower

- Efflorescence on brick and structural clay tile walls.

- Deteriorated grout.

- Displaced masonry units.

- Water stains on roof framing members.

- Exterior of Tower

Efflorescence on brick wall.

Stains on brick wall.

Copper flashing displaced.

Stucco falling off brick wall.

Deteriorated grout.

Displaced masonry.

Deteriorated (spalling) brick.

There may be unseen problems within the structure. The masonry walls of the tower are built on steel beams. Some steel beams are encased in concrete and some are not. The most serious noticeable water damage is directly below three steel beams located in the ceiling structure of the third floor.

These steel beams should be inspected. The wood ceiling framing should also be inspected. This will require some “destructive” testing such as removing the ceiling tiles. If these structural members show signs that deterioration has occurred, then a closer examination of other hidden structural members around the perimeter of the tower would be prudent.

Two types of brick, limestone, and structural clay tile make up the structure of the tower at the top level. Face brick and limestone is used for exposed areas where appearance is an important design criterion. Common brick and structural clay tile is used where appearance is not as important.

The walls are made up of two wythes of masonry. The exterior wythe is face brick and limestone. The interior wythe is common brick or structural clay tile. Water is getting between the wythes, freezing and thawing, and causing efflorescence. Water can also get on the face of the brick, permeate the brick and cause the same types of problems. Once water gets inside the walls it can run down further into the building causing more damage.

Over the entire tower, generally, the face brick have shown little weathering. Just below the roof of the tower is a different situation. The mortar has deteriorated and some of the face brick has spalled.

The exterior west wall of the tower has been covered with stucco. This was most likely applied as a stopgap measure to solve a problem with deteriorating brick and mortar. Now this stucco layer is coming off and exposing some of the problems of the past.

The exterior north wall of the tower has been painted. Normally paint and stucco applied to the exterior of masonry causes more problems than it solves. Moisture is prevented from evaporating at the wall face. Any moisture from the inside can be trapped behind the paint or stucco and left there to possibly freeze and cause the masonry to spall.

Solutions

The water needs to be stopped from entering the building. To do this effectively a number of tasks will have to be performed.

- New flashing is needed on top of two levels of exterior wall just below the roof of the tower. This will prevent the water from draining between the wythes of brick.
- Repointing the brick and limestone is necessary to prevent water from entering from the face of the wall. It is best to repoint an entire area of masonry wall because visual inspection may not identify all of the damaged joints. Some work should be done inside the upper level of the tower on the structural clay tile.
- Roofing should be repaired or replaced. Possibly an integral gutter system could be incorporated in a replacement roof to help keep the water off the face of the brick and limestone. Please see the special report from Building Research Institute of Montana: Re-Roofing Lincoln Center.
- The brick and the limestone should be cleaned. This not only improves the appearance, but also allows for a better inspection process. Sealant (caulk) should be applied around doors and openings.
- The stucco on the west wall should be removed and replaced. The painted north wall should be prepared and repainted.

Strategic Planning

It is important to match the appropriate solution to the project. For example, one could apply exterior insulation (dryvit) to the tower but that would not be the correct application for the elegant building we have. This is an important civic structure and a symbol for the entire school district. In many ways, the future of the building depends on how the details are handled now.

Once a decision is made on the appropriate solution, another decision should be made on how thorough a job to do. For instance, if we decide to repoint the mortar joints, do we repoint the visible deterioration only or do we spend more time and energy providing a longer-term solution?

These decisions have important ramifications for the initial costs of the project and long-term maintenance costs. Generally, the more appropriate the solution and the more thoroughly we apply the solution, the less future costs and problems there will be. This has to be tempered with the reality of budgets and the priority of the project.

Decision Support System

The costs can vary greatly depending on the solution and thoroughness applied to the project. The following table shows the costs of an appropriate and long-term solution.

DESCRIPTION	COSTS
Exterior	
Remove and replace stucco on west wall	\$2,500
Clean, repoint and replace some masonry	9,000
Repaint masonry on north wall	900
New 16 oz. Copper flashing	3,650
Interior	
Ceiling	\$650
Wood floor	1,000
Sub-total	\$17,700
Roofing*	
Remove existing cement-asbestos shingles	3,120
New metal roof	8,190
Sub-total	\$11,310
Combine sub-totals	\$29,010
Contingency	2,500
A/E Fees	4,500
Total	\$36,410

* The roofing costs were also included in the Special Report: Re-Roofing Lincoln Center.

Blueprint for Action

Solving the water problems at the tower are important steps in safeguarding the building from further deterioration. Following a blueprint for action will optimize resources while providing a long-term solution to the restoration process.

1. Clean, repoint and replace some exterior masonry.
2. Apply new stucco and paint to selected areas of brick.
3. Apply new copper flashing on top of masonry walls.
4. Replace tower roof.
5. Check for unseen damage within the structure.
6. Restore damaged interior finishes.
7. Implement effective exterior maintenance program.
8. Make all trades aware of building envelope waterproofing requirements.
9. Schedule inspection programs to stay on top of maintenance.

Conclusion

The tower is in need of restoration. To save this quality old structure from more extensive damage will require a commitment of time and resources. There are no good inexpensive solutions to the water problems associated with the tower. No quick repair jobs will protect the considerable investment in the building.

The water problem involves not only cosmetic concerns but also impacts the structure of the building. The problems have been developing for a long time. Once deterioration begins, it will continue, often at an accelerated rate. Simple routine maintenance and inspections can prevent these more expensive restoration projects.

There are other areas of masonry walls at Lincoln Center that require some attention. If these areas are not addressed now, there could be more expensive restoration work in the future.

Start with a thorough inspection of the entire building envelope. Then prioritize the list of recommendations. Act on as many as practical. Even if all the items cannot be acted on there will be a record of need. This record helps track the deterioration. Action can then be taken before the problem can get out of hand.

Lincoln Center is an important symbol of our past and a link to the future. The resources that it holds reflect the quality of our school system. Working together, we can protect these precious resources in the most cost-effective way.

Please see the appendix on the next page for selected photographs.

Appendix

