The Butterfly Room was particularly challenging because the lush plant life and butterflies needed to be isolated from the concrete floor drying strategy.

We Dried Out a ZOO!

Story and photos by Ken Larsen, CR WLS

[Editor's Note: This project illustrates the value of RIA membership and was a joint effort between several member contractors. Rocky Cross Construction (North) Ltd. of Calgary, Alberta, was the general contractor, Drytech International was the drying sub-contrator that provided the specialized equipment, and Ken Larsen, CR, WLS, of the International Dry Standard Organization (and an RIA CR/WLS instructor) was retained by Drytech to manage the specialty drying portion of the project.]

During a "500-year flood," the city of Calgary, Alberta, and outlying areas suffered catastrophic flooding that carried silt and drainage contaminants into the built environment. One of the cherished landmarks damaged was the Calgary Zoo. Ranked among North America's top 10 zoos and boasting 1,000 animals from about 275 species, it features dozens of beautifully designed buildings and acres of sculptured landscape.

More than three dozen buildings, ranging in size from 400 square feet to more than 20,000 square feet, with some ceiling heights in excess of 80 feet, were severely damaged by the flooding. The life and health of all who would occupy them were potentially endangered.

Once this risk was acknowledged, the restoration protocol became apparent: Access and remove all absorbent materials and expose the breached structural cavities, follow with a thorough washing and decontamination protocol prior to drying efforts. The very definition of "mitigation" is to manage risk.

Hundreds of temporary workers were employed to remove the absorbent materials and shovel the debris out of the buildings. Safety protocols were defined and strictly enforced upon all who worked on the property by qualified, third-party health and safety officers—a hallmark of a competently managed project.

Since the structures would not have any electrical power for many weeks, temporary power was brought in for each building to operate responsible atmospheric control devices.

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PROJECT OBJECTIVES

The humidity control and restoration strategy was segregated into three phases:

- Pre-restorative drying stabilization
- Restorative drying
- Post-restorative drying stabilization

It was important to acknowledge the different objectives for each phase. For this project, the first and third phases had the distinct objective of maintaining an atmospheric condition of less than 50 percent relative humidity to diminish the possibility of secondary damages that would inflate the cost of the loss. Following the emergency controlled deconstruction and initial sanitizing of the structures, the objective of the second phase was to produce an adequate and responsible delta vapor pressure necessary to responsibly dry the remaining materials.

This delta vapor pressure was determined prior to the execution of Phase Two and became the plan against which the drying strategy was measured. By segregating these phases, the paying parties and third-party auditors would understand that the equipment use was not strictly a "drying effort," but was dictated by an adherence to a predetermined plan. Equipment type and quantity was modified as each phase was executed.

While carpets were quickly scheduled for removal, the hardwood, VC tile, slate and ceramic tile floors required careful consideration for salvage potential. It was determined early in the process that the contamina- tion had become trapped below these flooring surfaces; therefore, they, too, were scheduled for removal. Powerful flooring removal devices were brought in to not only take out the mortar beds into which the tiles were set, but also the adhesives used to install the carpet. If the concrete slabs were not exposed, the drying efforts would have been severely impeded, thus delaying the replacement of the flooring. This process took the better part of about 10-14 days and a lot of sweat from some dedicated, hard workers.

Federally regulated materials, such as asbestos and lead, were found in several buildings. This required bringing in qualified individuals to assist in the process.

UNUSUAL CIRCUMSTANCES

Many of the buildings presented unique challenges for the restorative drying expert. Interior gardens of rare plants, structural embellishments of rare woods, classrooms with real animal biology training devices, and even live, exotic animals were potentially exposed to the drying chambers! Drying experts work with these complexities on a case-by-case basis and relish them.

One such case was the Butterfly Room, a favorite exhibit at the Calgary Zoo, a lush garden and center pond that comes to life with dozens of rare, intensely colorful butterflies to inspire visitors with a sense of awe and serenity.

The slate tile floor was removed; the concrete slab required drying prior to tile replacement. The butterflies and plants could not be relocated and the room has a normal relative humidity of between 60 percent to 80 percent, so the concrete slab needed to be isolated from the ambient conditions with a tenting process.

Hardwoods imported from South America had to be removed to dry and clean the Amazon exhibit.

While it was easy enough to inflate a tent in the room, it was necessary to evacuate the air from under the tent so that it wouldn't seep into the butterflies' atmosphere. This was accomplished by extending the tent to an open window on the opposite end through which the air could ventilate.

As it turned out, the butterflies only have a lifespan of a few weeks. However, the efforts taken by the technicians to preserve the zoo's living assets were appreciated and praised.

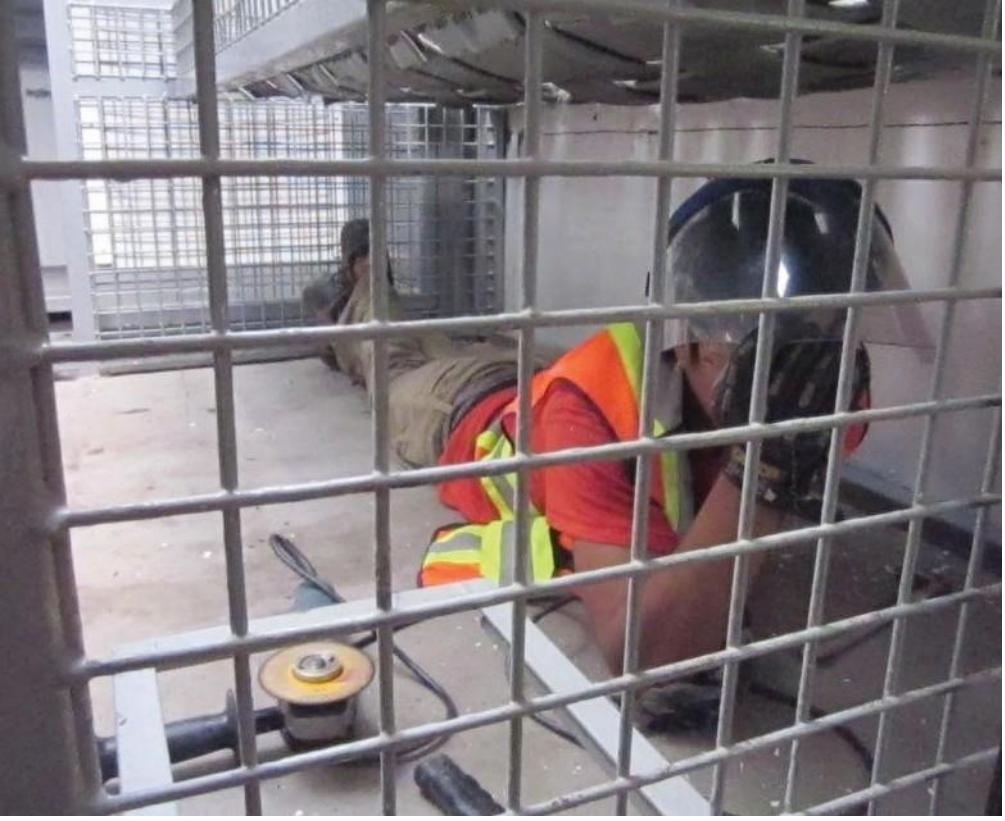
Another structure, the Safari Building, featured timber imported from Africa. While this wood was not found in large quantities within the building, its function and beauty were an important element of the superstructure.

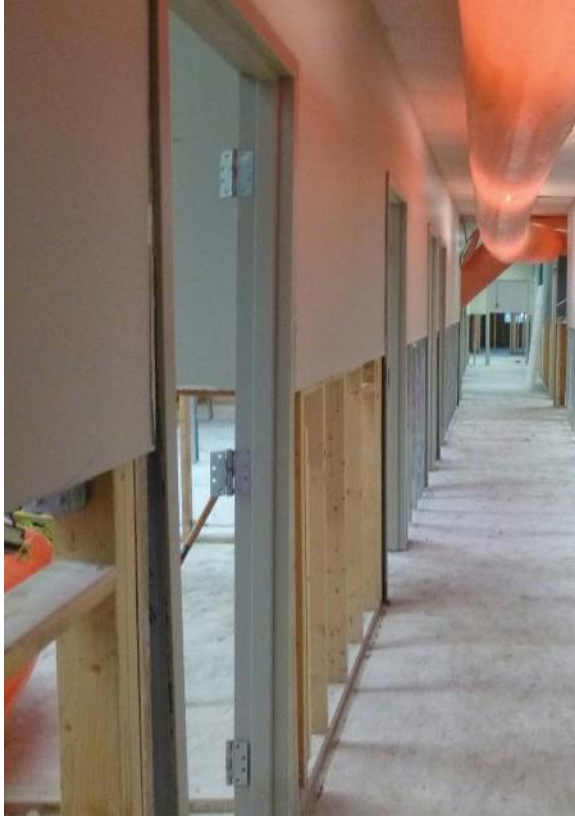
Exposed roof trusses were made of large African wood beams, assembled with strong gusset plates. The rich tone of the wood effectively reminds the visitor of the African landscape. These beams are embellished with a Plexiglas-type mirror that reflects and emphasizes their presence.

Phase Two (drying phase) is the intentionally engineered creation of a low atmospheric vapor pressure in conjunction with the wet materials being responsibly warmed.

An obvious focus involved the efforts to dry the concrete slab beneath the building and the wood/tile flooring materials on top. There was concern about the impact of the drying process on the trusses; since they were from Africa and came from those conditions, the dry atmosphere wasn't an issue.

On the seventh day of Phase Two, it was reported that the mirrors were falling from the roof trusses. The area was quarantined until the cause could be determined. There was speculation that the temperatures in the building caused a failure in the mirror adhesives or even melted





the Plexiglas-type mirrors. However, the thermal conditions in the building never rose to temperatures that could support such assertions; at no time did the temperatures exceed 91°F with the desiccant dehumidifiers being used. But the environmental conditions indeed possessed a low vapor pressure and a low relative humidity.

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The cause of the mirror breakage was found by checking the U.S. Department of Forestry's wood equilibrium moisture content (EMC) table. The anticipated normal wood EMC in the building was approximately 7-8 percent. The drying strategy we employed produced an atmospheric condition that would produce a wood EMC of 2 or 3 percent. Since timber will change dimensionally when its moisture content diminishes below approximately 30 percent, the drying was shrinking the wood trusses and causing the mirrors to no longer "fit" into the truss framework.

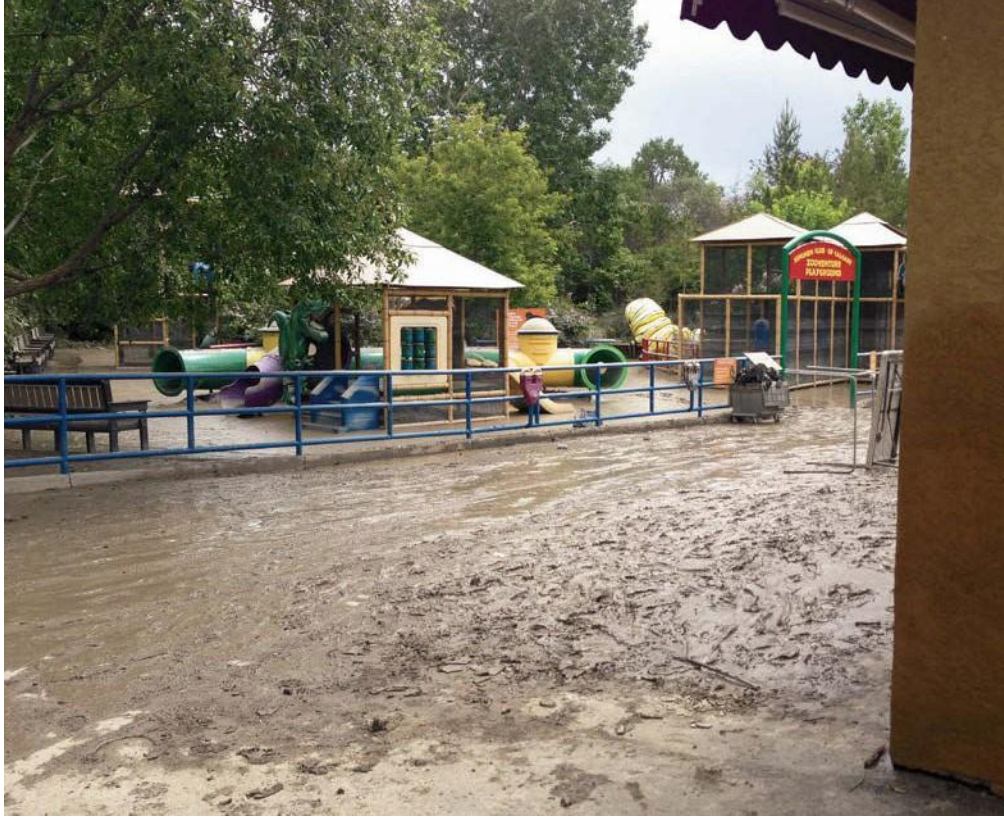
The Plexiglas-type mirrors were not a big-ticket item and we verified that they were adequately fastened to the trusses. The risk was documented and abated and the last few days of drying were completed. However, we were firmly reminded that our drying strategies can produce surprising consequences for which we shall be held accountable. We tend to look down when evaluating our drying processes, and every once in a while, we might get a surprising reminder that we are modifying all materials within the drying chamber.

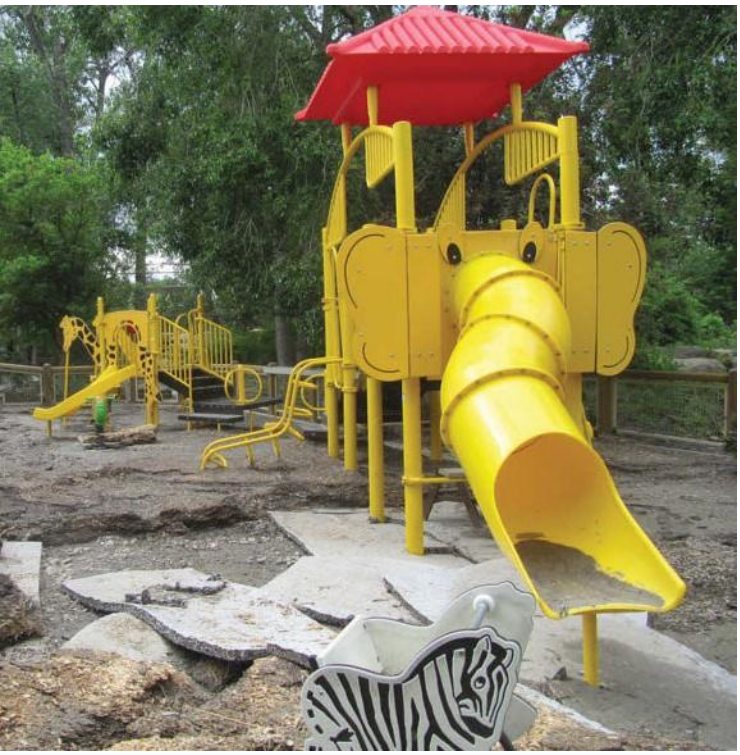
DRYING DOCUMENTATION

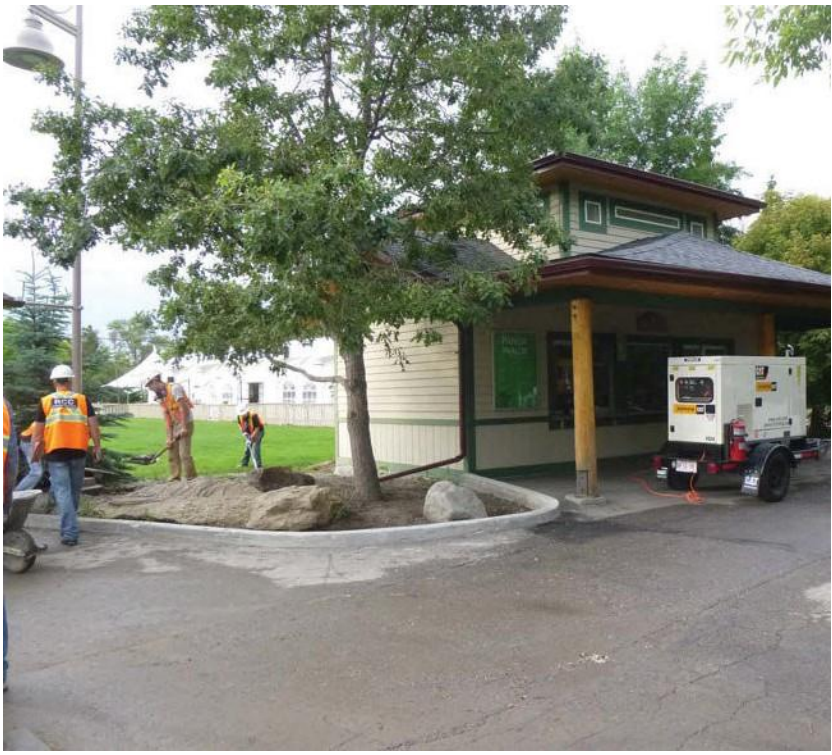
Drying records were another serious challenge, but were necessary to document control of the restoration process. Thousands of daily moisture meter readings were taken throughout the process. DryStandard report software made short order of this task by:

- Collecting the daily readings
- Embedding photographic support of the readings into a report
- Extrapolating the delta vapor pressures produced on the project
- Clarifying the results in a simple executive summary that everyone could understand
- Communicating the results via daily emails

The production of comprehensive and clearly explained drying documentation was praised and appreciated by both the insurer and customer representatives.







This was the kind of job that most restorative drying professionals relish. The unique challenges at the Calgary Zoo made every day both engaging and rewarding. RIA

Ken Larsen, CR, WLS, of IDSO Consulting Services provided technical assistance and documented the drying of this project in conjunction with equipment provided by DryTech International Inc. and claim/project management by Rocky Cross Construction (North) of Calgary, Alberta. Larsen can be reached at ken@drystandard.org.

(Clockwise from top left) Animal cages were particularly challenging to isolate with effective containment. Decontamination protocols included containment and controlled deconstruction. Silt and muck from rising river water grossly contaminated areas that were sensitive to visitors. Temporary power was required for several isolated buildings ranging in size from this small concession stand to very large exhibit buildings. The children's playground suffered powerful erosion damage and Category 3 contamination.