

Flood Best Practices

Elevation Saves Business and Provides Refuge

ESTES PARK, CO – Thirteen years ago, Ravit Michener purchased an elevated building in Estes Park to house her new spa and retreat business.

Due to the elevation, her business was not only saved from the recent September flooding, but the structure provided refuge for the family as well.

The destructive Colorado storms and flooding affected approximately 2,000 square miles of the state. Nine individuals died and there was nearly \$2 billion in property damage.

The Rocky Mountain resort town of Estes Park was hit hard by the flooding. Starting September 9, the town received more rain in five days than it usually does annually. The town has a population of nearly 6,000 and is located about 75 miles northwest of Denver.

“We have lived in the city for 20 years and have never seen the rivers breach the banks until the September flood,” said Michener.

Besides owning the spa and retreat business, Michener, her husband Monty, and daughter Mia have a home near Fish Creek, not far from the business. On the day of the storm, they realized there was a strong possibility that their home might flood. The family members packed up their belongings and moved into the upstairs vacation rental above the business. Michener felt safer there because she knew the building was elevated. This proved to be a good decision since their home received a foot of water from the flooding.

The Micheners lived in the building for three weeks while wet carpet was being ripped out in their home and mud-soaked dry wall was being removed.

“During the flood, it was like a huge river surrounding our building,” said Michener. “We were totally an island. The entire cul-de-sac was an ocean and surrounding buildings were flooding except for the business next door, which also was elevated.”

“Not only were the banks of the Big Thompson River overflowing behind the business, but water was coming through the streets from another direction,” she said.

“It always bugged me that there was this big swell between me and my neighbor at the end of the property, but now I get it,” said Michener. “It was like a four-foot river between me and my neighbor.”

Her 2,600 square foot, two-story business structure is located approximately 30 feet from the Big Thompson River. The building has a flood protection level of two foot of freeboard above the base flood elevation. Michener’s elevation certificate also helped reduce her flood insurance rate.

There is not a freeboard requirement for Estes Park. But, as an extra precautionary measure, Will Birchfield, city building official, always advises individuals to raise structures above the base flood elevation. “Of, course it’s up to the individuals to decide,” said Birchfield.

Michener was grateful to get back in business without the clean-up other businesses were experiencing. The family was also grateful that they were able to use the upstairs retreat and not worry about finding a place to live while their home was being repaired.

“The loss would have been huge in so many ways if this building had flooded, even though we had flood insurance,” said Michener. “I don’t want to even think about the problems we would have encountered; not only financially, but emotionally as well.”

For information on elevation and permits, homeowners should first contact their local building officials.

Elevating a Slab-On-Grade Home

Baldwin County, AL – The Scarcliff family enjoyed living on the river. What they disliked was the fact that each time Fish River overtopped its banks, floodwaters would show its presence in their home.

Floodwaters made repeat visits to their slab-on-grade home until the Scarcliffs sought mitigation measures to hold it at bay.

“Our home has flooded five times. We’re only 300 feet away from the river” said Glenn Scarcliff, retired salesman. “In 1997, during Hurricane Danny, we got seven feet of water. Recovery costs were estimated at \$168,000. We had three incidents where floodwaters got up to six to eight inches in our home. Then in 2005, we got five feet of water.”

To add to the family’s woes was the fact that Mr. Scarcliff bought the house in 1976 and had maintained flood insurance as long as the home was mortgaged. He paid the mortgage off in 11 years and canceled the policy shortly afterward.

“I thought I was wasting money,” said Scarcliff.

The Scarcliffs nearly exhausted their life savings to defray the cost of repairs following the 1997 flood event.

“I quickly went back to the insurance company, upon completion of repairs, to ask if I could be re-instated,” he said. “I was told I could.”

The Alabama Emergency Management Agency (AEMA) along with the Federal Emergency Management Agency (FEMA) offered a solution to the Scarcliffs’ flood issue – elevating their flood-prone home.

The elevation project was funded by FEMA’s Hazard Mitigation Grant Program (HMGP).

HMGP provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The state administers the grant. The project was approved March 2, 2006 and was completed December 6, 2006.

The total cost of the project was \$90,492. The Federal share was 75 percent. Local share provided by the Scarcliffs was 25 percent. As policy holders in the National Flood Insurance Program, Increase Cost of Compliance (ICC) funds covered the Scarcliffs’ share.

If you have NFIP insurance, and your home has been declared substantially damaged, ICC coverage is provided to cover up to \$30,000 of the cost to elevate, flood proof, demolish, or relocate your home. ICC coverage is in addition to the coverage you receive to repair flood damages.

Bay Head Elevated Home Undamaged by Sandy Surge

Ocean County, New Jersey

Patricia Wojcik's decision to elevate her Jersey Shore home above her town's flood ordinance requirement saved it from Post-tropical Cyclone Sandy's catastrophic storm surge, which ravaged her neighborhood and the majority of her barrier island town.

When she built her home in 1997, Wojcik had the home's living space elevated two feet higher than what Bay Head's floodplain ordinance required because she knew historic storms had flooded the town in the past. Sandy's storm surge brought high waves that flooded her neighbors' homes and left longstanding floodwaters, but the interior of Wojcik's home was left dry and undamaged.

"I wanted to be prepared," Wojcik said, explaining why she paid the extra costs to elevate her home higher than required when she built it years ago. "I knew more big storms would come and there would be flooding." Sandy slammed ashore in New Jersey on Oct. 29, 2012, causing widespread catastrophic flooding, billions of dollars in damages, and 38 deaths in the state.

Bay Head, noted for its large Victorian-era beachfront homes and other historic structures, is bound by the Atlantic Ocean on one side and Barnegat Bay on the other. When Sandy came ashore, the storm surge and huge ocean waves rose to meet the rising back bay and inundated the town with severe flooding, causing an estimated \$200 million in damages in this town of less than 1,000 residents.

Wojcik's home, which sits less than 80 feet from a saltwater lake that connects to the bay and a short distance from the ocean, received almost four feet of water in her home's crawlspace and garage from the storm surge. She had elevated the furnace and hot water heater on a platform in the garage when she built her home, and those appliances were undamaged by the flooding.

Her home's ductwork and electrical system were also elevated when the two-story home was built and were undamaged in the flood. Wojcik's flood insurance paid for repairs caused by flooding to her crawlspace and garage, which were minimum flood repairs compared to her neighbors.

Her decision to plan ahead, pay the added costs to elevate her home, and take other steps to protect it from flooding paid off. It saved her home from a major flood disaster, but did not save her from the distress of seeing her neighbors and town suffer major flood losses.

Wojcik, who has lived in the town for 46 years, said she and her family have long enjoyed the beautiful beaches and special charm of Bay Head. "It's wonderful living here," she said. And her elevated home reduces her flood risk and flood concerns and lets her focus on the pleasures of coastal living.

For information about home elevation and other mitigation measures to reduce flood risk, visit www.FEMA.gov. For information about flood maps and to look up a property's advisory base flood elevation, visit www.region2coastal.com.



Elevated Bay Head Home



Home elevated with private funds

Flood Vents, Elevation, and Compliance: Homeowners Protect Their Investment

State-wide, New Jersey

Jeanne originally bought her home in 1998 as a summer cottage. The home was built in 1933 and is located in a small, densely populated section of Port Monmouth, a short distance away from the Sandy Hook Bay.

Her home is located in a four-block-wide land strip and is bounded on the west and east by large tracts of marshland. To the north about 200 feet is Port Monmouth Road, a coastal evacuation route. As such, the road was built higher than the surrounding area to prevent minor flooding. This provided the added benefit for Jeanne of naturally elevating her property. However, it was not uncommon for the residential areas south of her home to experience minor flooding from the marshlands during rain events.

In 2006, Jeanne's brother, Greg, moved in with her and they decided to add a second floor. When they submitted the plans to the local officials to obtain the necessary permits, they were informed about new ordinances requiring them to elevate the home a minimum of 60 inches above the street.

They were not happy with the added \$22,000 cost, but they complied as they love the neighborhood and proximity with the water.

As construction began, Greg realized that it would be better to add more block to the foundation and raise the home above the minimum requirement. It cost about \$850 to add the extra courses of block.

The first floor is now measured at 77 inches above the street and about 14 feet above sea level and the foundation consists of cement filled block with flood vents. All of the utilities, except for the outside air conditioning unit, were elevated, leaving nothing in the five foot high enclosure. Taking another additional step to protect their home, Greg had hurricane straps attached from the roof to the foundation.

They did not receive any funding from the Federal Emergency Management Agency (FEMA) or from the National Flood Insurance Program (NFIP) policy Jeanne has maintained on her home.

The first test of these improvements came in the summer of 2011 when Hurricane Irene came ashore. While they did have two feet of water in their enclosure, they were able to clean it up easily, and the home itself survived unscathed.

As Hurricane Sandy approached, they heeded the evacuation orders. They were not disillusioned by the little impact felt from Hurricane Irene and expected the worst from Hurricane Sandy.

Greg returned the day after Sandy made landfall to check on the house; his fear being the house may be looted by persons who remained behind. His fears were not unfounded as six persons were arrested by local police for looting in the neighborhood.

As for the house, they found that the flood waters had reached the bottom of the floor joist in the enclosure soaking the insulation, but did not enter the house. The flood vents worked perfectly, allowing the flood water to drain out. The decision to raise the home an additional 17 inches made all the difference in the amount of damage and in the speed of their recovery.

The main damage was to the fencing in the back yard, which Greg was able to repair, and the air conditioner which was destroyed.

The only other damage was from debris which had flowed onto the back deck. Greg had just re-sealed the deck in the summer of 2012 and it only required a power wash to clean up.

Hurricane Sandy changed their opinions about FEMA because they had only minor loss despite the complete flooding in the enclosure. Their entire neighborhood was flooded, mostly through the first floors. "If it weren't for FEMA, we wouldn't be here", Greg said. They are now grateful for having listened to their local floodplain management official about the risk to their home and the floodplain management regulations that are required for NFIP participating communities to enforce. The guidance FEMA provided on taking steps to prevent flood and wind damage were the reason their home survived. They "didn't even lose a shingle or a piece of siding."

They did learn one lesson and that is they will elevate their new air conditioning unit.

They also realized that their flood insurance premiums were significantly less than their neighbors who did not elevate. That was an added plus that they hadn't figured on when they decided to elevate.

Together they feel blessed at having been spared the losses that their neighbors are experiencing. They are saddened for the devastation Sandy has caused, yet relieved. They also gratefully acknowledge "everyone pulling together" and helping each other.

Their message is that "elevation works." They hope that others will follow their lead: rebuild higher, install flood vents, and elevate utilities. They do not know whether they will have to elevate more as a result of the Advisory Base Flood Elevation (ABFE) maps the community may use to direct re-building, but they will comply.



Front view of elevated home



Rear view of elevated home



Flood vents

Combating Streambank Erosion in Fountain Creek

Pueblo County, CO – Embankment erosion of Fountain Creek was threatening the roadway in Chinook, an area in the city of Pueblo. “When this creek floods, basically this whole area is inundated with water,” said Earl Wilkinson, director of Public Works.

“Approximately 928 square miles of the drainage district drains down to Pueblo,” according to Daryl Wood, stormwater coordinator for Pueblo County.

The erosion of stream banks is a natural process that occurs in lakes, streams, and rivers, and although it can be rapid, more often it involves the gradual removal of sediments from the shoreline. Erosion is caused by a number of factors, including storms, wave action, rain, ice, winds, runoff, and the lack of trees and other vegetation.

In the spring of 1999, rain fell most of the day over Colorado Springs, Manitou Springs, Pueblo, and the surrounding areas. The rain intensified that evening and continued to come down heavily until the afternoon of April 30. Many areas received as many as eight inches in 40 hours, with some receiving more than 13 inches in 48 hours. The heavy rain in the Arkansas River basin led to widespread river flooding along Fountain Creek in El Paso and Pueblo Counties.

“We saw significant erosion in Fountain Creek after the 1999 flood, especially in the area of Creek Side at Velmount,” said Wood. “We had to act fast and also consider cost. We determined that using hardpoints was the way to go.”

Hardpoints are an erosion-control technique consisting of stone fills spaced along an eroding bank line. The fills protrude only short distances into the river channel and are supplemented with a root section extending landward into the bank to preclude flanking if excessive erosion persists. The majority of the structure cannot be seen. The lower part consists of rock placed underwater, and the upper part is covered with topsoil and seeded with native vegetation. The structures are especially adaptable in long, straight reaches not subject to direct attack.

“Five areas in Fountain Creek were targeted by the City of Pueblo to be mitigated using hardpoints,” said Wood. “We funded the project ourselves. It was inexpensive.”

Vegetation is the most natural method for protecting stream banks. It is relatively easy to establish and maintain, in addition to being visually attractive. However, vegetation alone should not be considered as a countermeasure against severe bank erosion where a highway facility, such as a roadway, is at risk. At such locations, vegetation can best serve to supplement other countermeasures such as hardpoints.

According to the U.S. Department of Transportation, hardpoints are most effective along straight or relatively flat convex banks where the streamlines are parallel to the bank lines and velocities are not greater than 10 feet per second within 50 feet of the bank. Thus, hardpoints may be appropriate for use in long, straight reaches where bank erosion occurs mainly from a wandering line defining the lowest points along the length of the watercourse.

As rain continued to pummel flood-ravaged Colorado in September, 2013, Fountain Creek continued to take a beating.

“After this year’s flooding, we noted other areas within the creek that needed to be stabilized. Paramount on the list is the area near 40th Street,” said Wood. “We plan to place hardpoints there because they work. They really do.”

For additional information, visit:

http://www.fhwa.dot.gov/engineering/hydraulics/library_arc.cfm?pub_number=23&id=142 and www.pueblo.org

Flood Mitigation Project Leads to Saving the Town of Wellington

WELLINGTON, CO – The completion of the Coal Creek flood mitigation project with the support of a Federal Emergency Management Agency (FEMA) pre-disaster mitigation grant has taken much of the town of Wellington out of the Larimer County 100-year floodplain.

Coal Creek and Indian Creek are tributaries to the Boxelder Creek watershed that runs through Wellington. One-hundred-year flows of 1,700 cubic feet per second had been calculated through Wellington – and that was just from the Coal Creek tributary of the Boxelder Basin.

This watershed was on the Top 10 list of flood-prone watersheds in Colorado. The state made it a high priority to mitigate the extensive threat from these waterways. Because of the threat to residents, the state made an active commitment to mitigating this risk.

“A flooding of Coal Creek would be damaging and disruptive to public and private properties,” said Martina Wilkinson, project manager with the Larimer County Engineering Department. A flood would also be a threat to public safety, particularly in view of the limited emergency response capability in Wellington.

Police services for the town are supplied by the Larimer County sheriff's office, headquartered ten miles south in Fort Collins. Ambulance services also are provided from Fort Collins. In the event of a flood, transportation is affected between the west and east sides of Wellington. Roads north and south of town have often been overtopped with stormwater, worsening access problems and further isolating Wellington from emergency services.

The Boxelder Creek Basin stretches from north Fort Collins into southern Wyoming and covers about 260 square miles. The basin has a lengthy history of flooding and in 2008, the county applied for a pre-disaster mitigation grant from FEMA to defray the cost of a flood mitigation project. Total cost of the project was \$5.1 million, of which the FEMA grant provided \$2.9 million. The non-federal share (funds from stormwater fees collected by participating jurisdictions) was \$2.2 million.

This flood hazard mitigation included diverting Coal Creek floodwater into Clark Reservoir, an existing irrigation storage basin. Improvements were made that now cause floodwater to flow into the reservoir along the North Poudre Canal, which supplies irrigation water to Clark Reservoir.

A design was prepared for excavation and dredging in and around Clark Reservoir. This excavation removed 170 thousand cubic yards of sedimentation and provided sufficient capacity for floodwaters from Coal Creek. Improvements were also designed for the emergency spillway in order to maximize the potential for storage of water in the reservoir.

The County Road 7 Bridge over the Clark Reservoir inlet ditch was enlarged and reconstructed to allow the 100-year Coal Creek flood flow to be diverted into Clark Reservoir via the inlet ditch. The design took into account hydraulic conditions where County Road 7 crosses the North Poudre Canal. This improvement mitigated the flooding potential from Coal Creek in the Wellington area by rerouting the flood waters before they ever reach Wellington. As a result, the flood waters are now slowly released from Clark Reservoir after a flood peak has passed. This

mitigation by the state minimized damage in the town of Wellington during the September storms.

The revised floodplain mapping became effective February 4, 2013.