



With an oceanic climate, Cordova experiences year-round precipitation, with no real dry season to perform construction. PHOTOS COURTESY AHTNA ENGINEERING SERVICES

Time Critical Repairs in Alaska

In Cordova, Alaska, five-year-old U.S. Coast Guard family housing units experienced significant water leakages, causing mold and rot, and requiring immediate restoration work.

By Karina Quintans, M.S.A.M.E.

While the design and construction of facilities are routinely executed to a high standard, sometimes issues emerge after occupancy that must be corrected or improved upon, so that a building will perform as the design intended.

In Cordova, Alaska, five-year-old U.S. Coast Guard family housing units experienced significant water leakages, which eventually ruined floors and walls due to deficiencies in the construction of the weather-resistant barriers. By making small penetrations into interior walls, the Coast Guard confirmed high levels of humidity, indicating a risk to human health from mold as well as the possibility of structural failure from rot.

Repairs and alterations were needed to restore and improve all 13 family housing duplex units in two phases. The housing facility is supervised by Coast Guard Base Kodiak, but not located on the installation. The Coast Guard members assigned to the site are charged with maintaining buoys that are part of the navigational system.

INITIATING PHASE ONE

Phase one of the work would be a pilot project to determine the extent of water damage to building structural conditions. The Coast Guard identified one duplex for investigation and evaluation, and anticipated a worst-case scenario based on its location directly in the path of the prevailing weather pattern. With an oceanic climate, Cordova experiences constant precipitation throughout the year, with no real dry season to perform construction. East-northeast winds off of the Copper River flats have delivered wind speeds as high as 100-mph. The area presents challenging conditions.

After demolishing the five layers within the wall structure, over 25 percent of the building's superstructure was discovered rotted through to the sheetrock, with

significant impact to structural components including shear walls and floor joists. Working with the Coast Guard, improvements were made to the design of the fit-for-purpose siding system to ensure protection from future water intrusion in a location that experiences an average of 206 days per year of precipitation.

The design and quality standards established on this pilot phase would soon be adopted as the standard for the remaining 12 housing units.

OVERCOMING CHALLENGES

Due to extensive rot and mold encountered during the pilot project, work on the remaining 12 duplex units was time critical. The Coast Guard made a direct award to fast track this work. Already mobilized in Cordova, and armed with the knowledge and experience from successful completion of phase one, a direct award to Ahtna was the best value scenario, saving both time and money in the procurement process. It also was prudent, in light of the potential for structural failure with 12 occupied units left to repair.

With logistics complex—involving only barges, ferries and planes to mobilize equipment, materials, and supplies to Cordova—detailed upfront planning was necessary to procure everything that would be needed on the site within a single mobilization, especially long lead items. Design plans were imported into AutoCAD to quantify the amount of construction materials and supplies needed. A 15 percent contingency was then added, ensuring all long lead and specialty items were onsite in the proper quantities. By project completion, there was minimal waste and overstock.

Work was executed on the remaining 12 duplex units from October through May, essentially winter in Alaska.

Both Occupational Safety & Health Administration regulations and U.S. Army Corps of Engineers Engineering Manual 385-1-1 were strictly enforced throughout project execution to maximize safety. In fact, safety was reinforced through daily standup meetings that included directives on the appropriate personal protective equipment to wear based on construction hazards and weather conditions. On snow and icy days, the field team wore crampons designed for



In assessing the damage to the housing units, the Coast Guard confirmed high levels of humidity, indicating a risk to human health from mold and the possibility of structural failure from rot.

construction work (to avoid slippage while also being able to climb ladders safely). Insulated, waterproof boots and rain gear kept workers dry. Since all of the sealing work was done from the exterior, the site manager monitored the field team closely for hypothermia. Frequent breaks were included in the daily schedule and the field crew was encouraged to take extra breaks as needed to warm up and avoid hypothermia and frostbite. With low-light conditions at this time of year (four hours of sunlight per day at its lowest), vertical tower light plants with large halogen lights were put into place and used almost continuously.

The field team worked throughout the rain, snow and icy conditions without a safety incident and with no major work stoppages due to extreme weather.

WORKING IN OCCUPIED UNITS

Because the units at Cordova were occupied while the work was performed, with walls open and exposed to the outside wintry conditions, reinforced polysheeting was mounted and draped from ceiling to floor to prevent wind and rain from entering the duplex. The sheeting was secured with nails spaced minimally apart to avoid ripping from the windy conditions. Work areas also were isolated from the occupants by establishing a barrier wall. Caution tape

was applied on walls and the interior door. Designated work areas around each building were delineated using tape and fencing.

Working on occupied units required active stakeholder management and customer service, since residents were quick to call the Coast Guard's onsite facility managers with any issues. Though work was coordinated officially through these managers, the Ahtna site manager also made an effort to speak directly with the residents to ensure minimal impact to their daily lives, as well as quality completion of the repair and finish work (performed by professional craftsmen) in each of their homes. Each unit was thoroughly cleaned of dust and debris at construction completion.

As work progressed during phase two, each of the 12 buildings presented a unique challenge because the extent of the rot was unknown until the siding was removed. Although the pilot project housing unit that was evaluated and repaired was anticipated to be the worst-case scenario due to its location in the path of prevailing winds, the reality was that several units worked on during phase two had worse rot conditions.

ENSURING QUALITY CONTROL

As part of the quality assurance and quality control process, the Coast Guard assigned a Quality Assurance



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Representative (QAR) who inspected work daily against the drawings and specifications, with a particular focus on the construction of the weather resistant barrier between the exterior siding system and the building substrate. The barriers had complicated design specifications due to the detail required for properly sealing window openings, utility connections/penetrations, and air handling system and vents, to more effectively protect the structure from the harsh weather and constant precipitation.

There were four layers applied to properly seal the penetrations. To ensure design standards and specifications were achieved when constructing the four-layer barrier, field teams were first trained on demonstrations on each of the components of the new siding system using scaled models. In addition, per contract requirements, each of these four layers were photographed as completed, then compiled in a photo log

(one log submitted per building), to ensure weather-proofing was properly constructed.

With a total of approximately 1,400 photos for all 12 buildings, this effort proved much more involved than anticipated and required a workaround. The field staff performed the photography themselves instead of the site/quality control manager. At the end of each day, the cameras were turned in to the site manager who filed the photos on the computer.

The onsite project engineer then organized the photos into a log for printing and binding. The Coast Guard QAR also photographed various aspects of the work, all of which were filed in a daily report.

As part of the quality effort, several betterments were proposed and implemented based on the findings of the pilot project. These betterments were focused on maximizing airflow around windows and at the top of exterior walls to maintain dryness

and avoid repeat rotting of structural elements. In both cases, the betterments eliminated unnecessary materials and extra work, made construction installation much easier to complete, and improved overall aesthetics. More than \$10,000 in materials and labor were saved as a result.

FINISHING AHEAD OF SCHEDULE

The decision to make a direct award for phase two would prove all its worth. Ahtna transitioned quickly from the pilot project to phase two, saving the government approximately 55 days compared to a competitive process.

The work was completed two months ahead of schedule, in May 2016, allowing peace of mind to return to members of the Coast Guard and their families.

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