

Foam Domes

Spray Foam Solves Decades-Old Leakage Issues at Alaska Radar Site



Less than 40 miles south of the Arctic Circle, in the Brooks Mountain Range of Alaska, lies the Indian Mountain Long Range Radar Station (LRRS). It was originally built in the 1950s for the Indian Mountain Air Force Base to serve as part of an early defense system against possible Soviet invasion. The USAF Base was inactivated in 1983, and the site is now designated as a radar station solely for homeland security purposes.

The Indian Mountain LRRS is currently under the command of the Pacific Air Force's 611th Air and Space Operations Center and is staffed year-round by four ARCTEC civilian contractors. Two domed buildings house the contractors' living quarters and a mechanical/power station. For safety reasons, the actual radar dish itself is located in the mountains far above the base.

When the two domes were built, back in the mid '80s, they were designed as two perfect 100' diameter half-spheres of aluminum I-beams and aluminum-skinned structural insulating panels (SIP). It was an ingenious structure, but with one major problem: the temperatures are so extreme at its remote location that the metal would expand and contract, causing the jointing seams to break and allowing water in. Both structures leaked like a sieve whenever it rained or the snow melted. Over the decades, various solutions with patching material had been tried, creating layers almost an inch thick at the joints. However, nothing ever solved the problem completely. The LRRS needed a permanent roofing solution that could withstand the extreme temperature changes at the LRRS. ARCTEC, in conjunction with the USAF, contacted Polyseal Insulation to develop a spray foam roofing system for the total roofing area of 44,000 sq. ft.

The biggest challenge of this project was logistics. There are no roads going to the LRRS, and the station is only accessible by plane. A gravel runway left over from the LRRS's days as an Air Force Base is the only place to land. It took several months of planning to account for everything Polyseal might need at the job site. They also brought in enough spare parts to build a whole new reactor machine, just to prepare for any contingency. This was

needed because it is next to impossible to get spare parts out in this remote location— if something happened, they couldn't just run to their local dealer and pick up a part. The mail only comes once a month, and to fly anything in costs \$6000 - \$8000. Time and cost would have been prohibitive otherwise.

The existing roof had many variations of coatings on it, so adhesion of the foam on the lower part of each building's dome was a concern. In order to prevent the foam from becoming delaminated at the bottom part of the domes, Polyseal mechanically fastened a woven monofilament, erosion-control mesh around the base of the



The numerous patch jobs previously used to seal the roof had created a questionable surface for the foam to adhere to. A monofilament mesh was used to give the foam a better surface to stick to, as well as eliminate the possibility of wind uplift.

domes. This mesh gave a better surface for the foam to adhere to the substrate, and it prevented the foam from cracking. This is extremely important because the numerous patch jobs and previous fixes created a questionable surface for the foam to adhere to. The cost to remove the existing patchwork coatings would have increased the cost of the job exponentially. However, with the mesh in place, the foam could be applied right over the old patching material.

The foam, when applied, saturated the mesh and formed an extremely strong bond. This contributed to the roofing system's durability as well, making it virtually indestructible. As Polyseal noted,



Due to the remote location of the jobsite, it took months of careful planning to make sure they got everything needed for the job, including 20% extra foam and enough spare parts to build a whole new spray reactor.

“Basically we wanted the building to be able to collapse underneath the foam and have the foam still stay there.”

Six crew members applied four inches of Quik-Shield 125 2.5 lb. roofing foam in three lifts—first, a two-inch layer, then two one-inch layers. After the second lift, the contractor allowed the foam to cure for 10-15 minutes before applying the third 1-1.5” lift.

The applicators monitored and adjusted spray patterns to ensure that the foam was uniformly applied as a smooth surface. Creating a smooth surface is extremely important with roofing because it will allow for even distribution of the coating that would later go on top of it. That’s why, after the third lift, a very light pass of half an inch was done in order to have a nice surface for the Quik-Shield 952 polyurea hybrid roof coating to stick to.

The biggest benefit of the new spray foam roofing system is that the roof no longer leaks. Spray foam has exceptionally high dimensional stability and insulating properties, which is important in an area where the temperature can plunge down to -90°F. Due to the dimensional stability properties of the spray foam system, the issues with drastic expanding and contracting due to extreme temperature changes have been mitigated significantly. This resolved the issues of flexing, cracking, and leaking, and there is no longer a need for constant patch jobs or repairs.

Having the spray foam roofing system also allows the building to be heated more

efficiently. The facility is heated by waste heat from the generators that power the radar, but thanks to the spray foam, LRRS didn’t have to generate extra heat beyond what the generators produce. This saves fuel, which is vital in such a remote area, since everything the ARCTEC crew needs must be flown in.

It took 11 days and 670 man hours to finish the job. Since it was light out for 24 hours a day during the foam application, the crew was not limited to normal daylight hours, and they were able to work continuously until they felt they got to a comfortable stopping point. One time, one of the applicators expressed surprise when he looked at his watch and discovered it was actually 10 pm—he had been spraying for 14 hours! It’s incredibly easy to lose track of time when the sun doesn’t set. In total, 76,000 lbs. of foam were sprayed. As a precaution when working in remote locations, the contractor always brings 20% extra foam, and on this project almost all of it ended up being needed. Foresight on the part of the Polyseal was key to completing the job on time.



The polyurea coating was applied in two coats, with the base coat a different color than the top coat to ensure no spots were missed.



At Polyseal Insulation, LLC, we work with architects, builders, developers, municipalities, and individuals who recognize the value and importance of maintaining a healthy indoor environment for the residents and appreciate the opportunity to save environmental resources. We work with each client to ascertain their particular needs while listening to all our clients in an effort to locate and assess products that may benefit future projects and/or address a current need.



The Quik-Shield brand is owned and operated by SWD Urethane (www.swdurethane.com) and represents over 40 years of spray foam experience in the construction industry.

