A NEW GARAGE FOR THE PRINCESS ELISABETH ANTARCTICA



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Already several weeks into the new season, the old garage on the north side of the station is in the process of being torn down while the anchor points for its replacement are being installed.

The old garage has served the station team well during the first 10 years of the life of the station, housing equipment and serving as a workshop to perform maintenance on vehicles. This temporary technical facility was built during the construction of the Princess Elisabeth Antarctica Research Station. Since then, the station has hosted more scientific activities and scientists than initially planned during the pre-study phase of the project. It was not foreseen that there would be such a high demand to use the station from the Belgian scientific community.

The additional infrastructure that became the old garage was set up on the ice (a small glacier moving slowly down towards the west). The IPF wanted to study the movement of the ice in order to determine how to design and build a more permanent structure that would take into account this movement while having a sustainable structure supported by sliding posts with a hydraulic system to lift it up the station once a year.

This work was started in 2012-13 and will be completed this season by the reconstruction of a new technical garage space.

Mathieu Chables, the building foreman who is responsible for overseeing the garage demolition and replacement project, explains why this change was necessary. He also gives some details about the new garage and the construction process.

Why was it necessary to replace the old garage after ten years?

Slowly flowing ice beneath the old garage was the main reason to tear down the old garage and construct a new one. The old one had been constructed on top of the glacier in front of the station and anchored directly into the ice.

But as any glaciologist can tell you, ice pretty much anywhere on an ice sheet like the one covering Antarctica moves very slowly but surely over time through a process known as plastic flow. All the ice in Antarctica, Greenland, and the world's mountain glaciers slowly flow towards the coast like a very slow-moving river due to gravity. This means any structures built on top of ice will slowly be distorted over time as the ice moves. The flow is imperceptible, but over time, in some locations in the world, ice can flow as fast as several meters per year!

At Princess Elisabeth, each year, the ice moved both horizontally and vertically by about 10-15 centimetres. As the ice flowed, so did the anchor points of the old garage in the ice, making the entire structure increasingly crooked with each passing year. After 10 years, this movement adds up. By the start of the current season, one side of the garage had dropped almost a metre, and the walls of the structure had been distorted.

How will the new version of the garage solve the problem of having to build over slowly flowing ice?

The new garage will be anchored on its eastern side to the granite ridge that the main body of the Princess Elisabeth station is built upon. This new anchor point - which is essentially a hinge - will make it possible for the garage to be moved back into place as the ice below it slowly flows and recedes. The western side of the new garage will have pistons, allowing it to be raised each year as the ice on the glacier beneath it drops, making sure it stays level with the rest of the station over time.

It's quite an ambitious project to undertake over the course of the 2019-2020 season. How far along in the process?

We started the demolition of the old garage in November not long after the first members of the BELARE team arrived in November. It took us about three weeks to tear down the old garage.

Will materials from the old garage be recycled?

In accordance with the philosophy behind the Princess Elisabeth Antarctica to leave as small an environmental footprint as possible, we're going to re-use as much of the wood from the original garage as possible. We're also going to re-use the glass wool insulation from the old garage in the new garage.

Wood that can't be re-used in the new garage will be used for other construction projects around the station. We always need wood for something we're building, so it will be put to good use one way or another. Any leftover waste that simply can't be used again - which we hope will be very little - will be sent back to South Africa to be disposed of.

What's the timeline for the construction of the new garage?

As the old garage was being torn down, we already started to install the main anchor point where the hinge for the new garage will be attached. Once this is installed, all we need to do is wait for materials that will arrive on the supply ship later in December to start the construction of the new garage. Once these materials arrive in Antarctica, they are transported from the coast to the station on the annual mid-season traverses that the BELARE team does.

Once we have all the materials we need, I expect that we'll need about six weeks to build the garage. It should go very quickly once we have everything we need because the specific design and architecture of the building will allow it to be assembled very quickly. We also work very well as a team and can get things done very quickly when we put the effort in.

How big will the new garage be?

It will be 430 square metres in area and about around 4.5 metres high.

How many people are working on the garage renovation project?

It varies from week to week, depending on who might be needed elsewhere to take care of another job. But on average, at any given time, we have about ten people working on the garage renovation project.

What are the challenges in the construction of the new garage

Cutting into the granite ridge to make anchor points for the hinge of the new garage has been challenging. The hinge of the new garage will be placed on this anchor point. We drilled deep holes in the rock, into which the hinge will be placed and then secured with resin, similar to how we secured the supports of the Princess Elisabeth Antarctica on the same ridge. We also have to be sure the hinge is perfectly level to ensure smooth movement of the garage as we need to adjust it over time.

Aside from the new hinge system, will there be any other significant differences with the new garage?

One major improvement that the mechanics and technicians of the station will appreciate is that the new garage will be heated. The old one wasn't, so it was often -15°C or -20°C in the old garage. At these temperatures, it was often difficult to perform maintenance on vehicles and equipment.

The new garage will no longer serve to park vehicles and will only be used as a workshop. Now that the hangar at the Winter Park (which is 2 km from the station) has been built, most of the machines can find a sheltered space during the winter and when not used. This means more room to work and store equipment in the new building. The garage will also be equipped with a pit so that mechanics can comfortably work on the underside of vehicles.