

EISRIESENWELT - ICE CAVE

Garry K. Smith

Location

Eisriesenwelt (pronounced – ice-ree-sen-velt) which in English means “World of the Ice Giants” is reputed to be the largest ice cave in the world. It is designated an ice cave because it contains ice formations which remain all the year round. However, in reality this cave is a limestone cave which contains ice decorations.

The cave system is the most significant in the Alps and is located in the Tennen Gebirge mountains near Werfen in the Province of Salzburg - Austria, approximately 40km south of the capital Salzburg. The main entrance is approximately 1000 metres above the Salzach Valley at an elevation of 1641m ASL.

The carbonate strata in this part of the Alps extends from the Triassic to the Jurassic and the caves were formed during the late Tertiary period.

To date there is approximately 42km of surveyed cave. The first kilometre of cave passage contains the majority of ice sculptures and covers approximately 30,000 square metres. The ice is more than 20 metres thick in places.

A timber walkway, throughout the tourist part of the cave, leads visitors through a series of large chambers and connecting passages, past magnificent ice decorations and climbs steeply in places over large ice flows to an elevation of 1775m.

Getting To The Cave

Tourists can travel to the area by private vehicles or by using several modes of public transport (train, bus & taxi). Alternatively, several companies run half day coach tours from Salzburg to the Cave. The coach route passes through the township of Werfen (548m ASL) nestled in the valley between two huge limestone



*Looking out the entrance of Eisriesenwelt Cave.
Photo: Garry K. Smith*

mountain ranges which tower some 1900m or so above the valley floor. The narrow road winds steeply up to a small parking area next to the new Welcome Centre (ticket office and souvenir shop). From here there is a 15 minute walk up a well graded track which winds around the side of the steep mountain. A tunnel through one ridge can be used to reduce the walking distance to Wimmer Hütte, where the cable car lower station is located. A 15 person gondola takes visitors up a further 500m in 3 minutes to an elevation of 1586m where a restaurant (Dr. Oedl-Haus) is perched on the side of the mountain. Here visitors can purchase a drink, snack, meal, or rent a simple room for the night. From this point there are excellent views of the Salzach Valley and town of Werfen far below.



*Looking along the shortcut tunnel on track to Eisriesenwelt. Right. Final section of the path leading to Eisriesenwelt.
Photos: Garry K. Smith*



Above. The guide burns magnesium ribbon to illuminate ice decorations in Eisriesenwelt. Below. Ice decorations.
 Photos: Garry K. Smith

The 900-year-old Burg Hohenwerfen Fortress, once used as a film set for the James Bond movie “Where Eagles Dare”, when viewed from Werten village looked so grand perched high on a rugged peak, yet from the high vantage point of Dr. Oedl-Haus restaurant, it looks so small and insignificant.

From the restaurant there is a further 15 minute walk up a steeply graded track, much of which is under a concrete awning to protect against avalanche or rock fall. The first glimpse of the Ice Cave entrance can be seen



just before the covered walkway begins. The valley side of the covered walkway is completely open which allows an unobstructed view of the fabulous scenery.

The cave tour lasts about 75 minutes. Visitors not travelling with an organised tour group should allow three to five hours for the complete trip from Werfen.

The Cave Tour – a personal account

The first glimpse of the cave entrance is a very impressive sight with a large opening (20m wide x 16m high) in the face of a huge wall of limestone. It was a warm pleasant day and only required the wearing of light clothing so far. We are greeted by our guide at the entrance (1641m ASL).

A carbide lamp with an exposed naked flame is given to every fifth person as the guide tells us some of the cave’s history. (See history details at the end of this article.) We are told that this form of lighting (carbide lamps) was used a hundred years ago to explore the caves, so is used today so tourists can experience what it was like in the early days. Thankfully the guide suggested that people with the lamps be careful not to burn themselves or the person next to them as the naked flame is very hot.

We were then warned to remove any loose clothing such as hats, scarves etc due to the strong breeze which will whip them away when the cave door is opened. The



*Left. Layers of ice contain a valuable record covering 1000 years of the Earth's history. Right. Ice column.
Photos: Garry K. Smith*

heavy metal door was opened and sure enough an icy gale force breeze rushed out as we entered. Several of our party's carbide lamps were extinguished, then relit by our guide.

Thankfully I had rugged up at the entrance. Twenty metres inside the entrance the breeze subsided and eventually was not noticeable in the large chambers.

The guide burned magnesium ribbon to light up the huge ice decorations. Several times he lit long strips tied on pieces of wire behind the ice sculptures. It is all extremely beautiful with ice stalagmites, stalactites and columns illuminated to reveal various shades of translucent aqua, blue, through to white and glass clear. There are numerous large chambers and halls connected by narrow passages. Ice decorations range from small delicate crystals up to numerous figures of gigantic dimensions.

There are approximately 700 steps along the wooden walkways which allowed us to climb a total of 134 metres over a number of large and very steep ice flows to the upper chambers at an elevation of 1775m ASL. All through the tour the guide continued to break off strips of magnesium ribbon from a roll and ignite them with the flame of his carbide lamp. The burning magnesium was waved in the air like some magic wand to illuminate the passages. Lumps of burning ribbon continuously dropped onto the ice decoration and timber walkway while trails of white smoke issued from the burning ribbon. All through the cave there are clumps of magnesium oxide on the floor and the timberwork is pitted with small burn marks.

At the start of the Great Ice Embankment, about a third of the way into the cave, there is a point where people who get acrophobia (scared of heights) or feel they are unable to complete the strenuous tour may pull out and cross over to the exit path. Several of the less fit in our tour group opted to wait at the junction so the guide gave them one carbide lamp. I guess for light, but maybe

also warmth, as they were bitterly cold and shivering deeply when our tour returned to them an hour later.

Overall the experience was unforgettable and I would recommend the tour to anyone fit and able to climb the total of 1400 steps on the cave tour.

General Information

The walk up the mountain was very pleasant on the day we visited, however it was probably the exception to the norm. Hence be sure to take warm clothes and raincoat for the walk up the mountain and include gloves to be able to hang onto the frozen metal handrails inside the cave. Also wear good insulating shoes with thick socks. Needless to say the temperature inside the cave is just below 0°C.

I didn't see any calcite speleothems on the route taken by the tour, however there may well be some further into the cave.



*Cable car to Dr Oedl-Haus restaurant.
Photo. Garry K. Smith*

Depending upon the outside temperature, it is either warmer or cooler inside the mountain and this causes the air to circulate upwards or downwards. Eisriesenwelt is basically a dynamic or cyclical cave which is influenced by the chimney effect airflow. During winter, when the air inside the cave is warmer than outside, cold air streams into the cave and reduces the temperature of the lower areas of the cave to below freezing point. During our spring visit a strong breeze was rushing out of the lower entrance when the door was opened. This was due to the colder heavy air in the cave sinking to the lowest point and rushing out the lower entrance, thus dragging in slightly warmer air from an entrance higher up on the snow capped mountain. The melt water entering the lower chambers through cracks in the rock freezes to create the wonderful ice sculptures.

The oldest layers of ice in Eisriesenwelt have been dated at approximately 1,000 years, however the cave itself has formed over 50 to 100 million years. Hence the ice formations are an extremely recent phenomenon in comparison to the age of the cave.

Opening Times and Entry Fee

Eisriesenwelt is open to tourists from 1 May until 26 October. The guided 75-minute tours start at 9 am, with the last tour departing at 3:30 pm, (4:30 pm in July and August).

A combined cablecar/cave ticket is priced at €20 for adults, €18 for members of mountaineering or caving clubs, and €10 for children of 14 and under. If you're feeling super energetic it is possible to save some money by hiking up and down the mountain or taking the cablecar in just one direction. Up-to-date information can be found at the official website [www.eisriesenwelt.at]

Concerns Related to Management Practices

We were told that the tour basically covered most of the cave containing ice decorations. What we saw illuminated by the burning magnesium ribbon was very impressive despite no fixed lighting. Due to the environmental conditions within the cave, it could be difficult to maintain fixed lighting if it were installed.

I asked the guide how they clean up the magnesium oxide and was told that they just wash down the caves at the end of each season and the decorations rejuvenate with fresh water seeping in and freezing. I personally can't see that this approach is an environmentally friendly solution to the magnesium oxide waste. There are certainly many lighting options which would better fulfil the requirements of displaying this cave to the public.

The hand held carbide lamps, provided to tourists for lighting, had exposed naked flames shooting out the front of each lamp. As most people are not experienced with the use of these lamps, there is a real chance that those with the lamps may burn themselves or other tourist. I witnessed several near burnings while on the tour, particularly when our group bunched up on the narrow timber walkway. When in the large chambers the



*Fossils at 1640m ASL at the entrance to Eisriesenwelt.
Photo. Garry K. Smith*

area illuminated by each carbide lamp was not much more than the timber walkway immediately in front of each lamp bearer, so they had very little benefit in lighting the cave. When held by the wire handle the lamps dangled at kneecap level, so had excellent potential as kneecap warmers!!!?, not to mention the possible hole burns in expensive clothing.

At the start of the tour season when we visited there were approximately 200 visitors per day and in the peak season visitor numbers rise to above 2000 per day, with tours starting every 6 minutes. Due to the low number of tourists on the day of our tour, our group of 40 people was not overly rushed. However, I suspect in the peak season the feeling would be more like cattle class – hurry up - keep moving, as the timber walkways are mostly one person width. I personally prefer a little time to admire the decorations, not moved along in a constantly moving crush of people.



*Guide burning magnesium ribbon.
Photo. Garry K. Smith*

There were sections of metal handrail on steep staircases which were covered in sharp ice crystals. Good handrails are a must for the safety of visitors. Sharp ice crystals could be potentially hazardous to visitors not wearing gloves, although where metal hand rails were free of ice, they were just too cold to grab more than a few seconds with bare hands. In hindsight it would be a good idea if the Eisriesenwelt management warned visitors to bring gloves in all promotional literature.

Brief History

The existence of the cave was only known to hunters and poachers at the end of the nineteenth century. In 1879 Anton Posselt from Salzburg explored 200 metres into the cave until he reached a huge flowstone wall and was unable to continue due to a lack of equipment. One year later he published a detailed account of his exploration of the cave in a mountaineering magazine. He is now recognised as the “discoverer” of Eisriesenwelt.

Interest in the cave was short lived and it slipped back into obscurity until a pioneer caver, Alexander von Mörk, came across Posselt’s written article. He mounted a series of expeditions beginning in 1912 which yielded an extensive cave system. Von Mörk was killed in 1914 during World War I, and his ashes were later interred in the Mörk-Dom, or “Mörk’s Cathedral,” a chamber of ice that rises 35m above the cave floor. The discoveries soon attracted tourists and a small cabin “Forscherhütte” (Discoverer’s Refuge) was constructed in 1920 as well as a primitive climbing route established to the cave and into its interior. By 1924, the ice covered sections of cave were accessible to tourists without the need for climbing gear. However it was a long arduous steep walk up the mountain from Werden.

There is a frozen lake measuring 70m x 25m in the chamber called the Eispalast (Ice Palace). “Incredible as it may sound, this lake of ice was used in the 1930s for training purposes by a couple of ice skaters preparing for the Olympics. At that time there were virtually no ice rinks and so they prepared here with music from a wind-up gramophone and light from various Davy lamps set up around the lake” (Angermayer, E., 2005).

From 1953 onward it was possible to drive a car up Eisriesenweltstraße (Ice Caves Road) on an unsealed single lane road to the Welcome-centre. Then in 1955 the cable car was completed. This alternative reduced the walking time over the steepest part of the climb by 1.5 hours.

Today the Eisriesenwelt cave is world famous and attracts large numbers of tourists to this part of the Alps region in Austria.

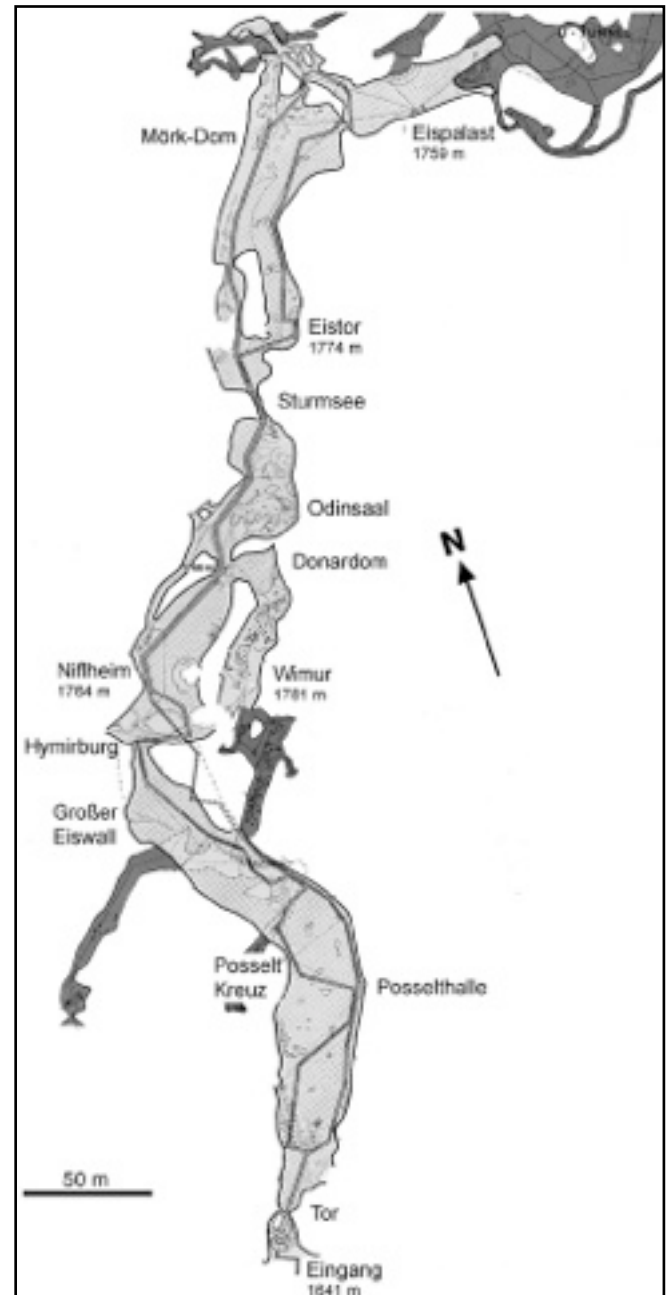
References

Angermayer, E., 2005. A Short guide to the “Eisriesenwelt – Ice World”, in the Tennengebirge mountain range near Werfen, Province of Salzburg, Austria. Published by: Eisriesenwelt GmbH, A-5020 Salzburg, Getreidegasse 21. Printed 2005.

Eisriesenwelt official website [<http://www.eisriesenwelt.at>]

May, B., et al., 2011. First investigation of an ice core from Eisriesenwelt Cave (Austria), *The Cryosphere*, **5**, pp. 81-93, 2011

Petters, C., et. al. Eisriesenwelt: Terrestrial Laser Scanning and 3D Visualisation of the Largest Ice Cave on Earth. - Institute for Cartography, Dresden University of Technology.



Map of the ice covered part of Eisriesenwelt Cave in Austria. Light grey areas are ice-covered, dark grey are ice free. Map courtesy www.the-cryosphere.net. (May, B. et al 2011)