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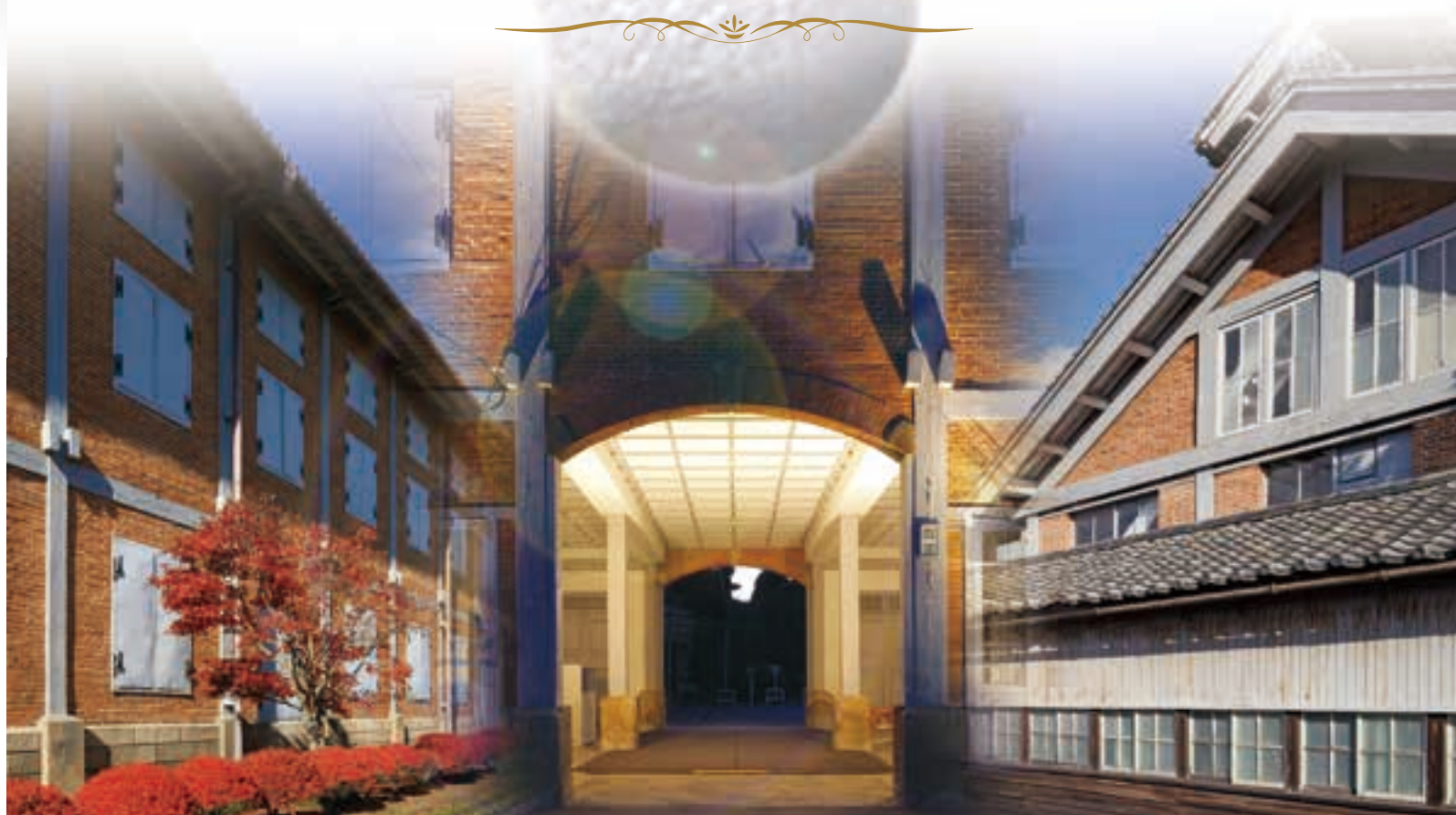


Tomioka Silk Mill  
and Related Sites  
inscribed on the World  
Heritage List in 2014

Uniting the world through silk

# Tomioka Silk Mill and Related Sites

富岡製糸場と絹産業遺産群



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Silk Heritage of Gunma

**Kinumeguri** : Navigating Gunma's silk heritage sites

This app is designed to help you have fun  
while visiting Gunma's silk heritage sites,  
some of which include World Heritage sites  
and Japan Heritage sites.



Image courtesy: p4 bottom left, p9 East cocoon warehouse, Tomioka City / p10 middle, Gunma prefectural Library  
p13 above left, Fujioka City Board of Education / p15 above right, Shimonita Town.



# Uniting the world through silk

“Tomioka Silk Mill and Related Sites” is an ensemble of heritage related to the modern silk industry, which contributed technological innovation that achieved mass production of high-quality raw silk and technological interchange between Japan and the world. Silk was considered a rare fiber that was produced in limited amounts and only available to the privileged classes. The mass-production technology developed by Japan brought silk to the ordinary people of the world, further enriching lifestyles and culture. Tomioka Silk Mill and 3 sites related to sericulture (Tajima Yahei Sericulture Farm, Takayama-sha Sericulture School, and Arafune Cold Storage) are important testimonies to that story.



## Located in the center of Japan's sericultural region

“Tomioka Silk Mill and Related Sites” is located in Gunma Prefecture, which is in the center of the main island of Japan, Honshu. In times past, the sericultural region was spread throughout central Honshu, and sericulture, silk reeling, and textile manufacturing flourished in Gunma Prefecture from the Edo Period. Tomioka Silk Mill was constructed in a location where a large supply of cocoons could be procured.





Silk was first produced in China before the Christian era and in time reached Japan and Europe. Machine reeling started in the 19th century in Europe where the Industrial Revolution had a head start, but a shortage in raw materials arose due to the diffusion of silkworm diseases. Around that time, Japan had opened its doors to the world and was importing machine-reeling technology. Tomioka Silk Mill was built in 1872 as a model factory, and the technology used spread throughout Japan. Moreover, technological innovation in sericulture occurred domestically, resulting in the successful mass production of the raw materials, cocoons. Continual innovation in silk reeling also took place, and in the early 20th century Japan became the world's top exporter of raw silk, making the luxury fiber of silk more accessible. Furthermore, after WWII, Japan succeeded in the automation of raw silk production, and automatic reeling machines were exported all over the world. The sericulture and silk-reeling technologies developed in Japan still support the global silk industry today.

## Chronology of Silk

Period	Globally	In Japan	Tomioka Silk Mill and Related Sites
3000 BC	Silk production begins in China		
3rd century BC	Raw silk and silk fabrics are introduced to the Roman Empire		
Around AD		Sericulture/silk-reeling technology are introduced from China	
6th century	Sericulture/silk-reeling technology are introduced to the Byzantine Empire		
8th century		<b>Late:</b> Cocoons/raw silk/silk production extends from Kyushu to Southern Tohoku	
13th century 14th century	Sericulture/silk-reeling technology are introduced to Northern Italy	High-grade silk goods are primarily imported from China.	
15th century	Sericulture/silk-reeling technology are introduced to France	Raw silk imports increase due to trade with European trading vessels	
16th century		<b>1685:</b> Raw silk imports from China are restricted	
17th century	Sericultural/silk-reeling regions are formed mainly in Italy/France	<b>1713:</b> Sericultural regions are formed in Central Honshu due to the shogunate government's promotion of domestic raw silk, and raw silk production flourishes	
18th century			
19th century	<b>Early:</b> Silk reeling factories using steam boilers are built in France		
	<b>1840s:</b> Pebrine disease spreads in Europe, and silkworm eggs and raw silk are sought after in Asia		
	<b>1859:</b> Ports are opened to foreign trade and raw silk exports begin (mainly to Europe).	<b>1863:</b> The farmhouse at Tajima Farm is built	
	<b>1860:</b> A machine-reeling factory is built in Shanghai, China	<b>1872:</b> The government establishes Tomioka Silk Mill as a modern model factory; machine reeling spreads in Japanes	<b>1872:</b> Tomioka Silk Mill is built
20th century		<b>1884:</b> America becomes the no. 1 destination for raw silk exports	<b>1884:</b> Takayama-sha company is established
			<b>1891:</b> The farmhouse at Takayama-sha is built
		<b>Early:</b> Commercialization of sericulture in summer and fall	<b>1905:</b> Arafune Cold Storage No.1 is built
	<b>1909 :</b> Japan becomes the world's top exporter of raw silk	<b>1906:</b> The F1 hybrid silkworm is developed	
		<b>1914:</b> Distribution of F1 hybrids to farms begins	<b>From 1912:</b> Tomioka Silk Mill, Tajima Farm, Takayama-sha, and Arafune Cold Storage work together to outsource raising of foreign-bred silkworms and hybrids; later, they also undertake F1 hybrid silkworm egg production
	<b>1920s:</b> Demand for raw silk for stockings increases sharply in America	<b>1920s:</b> The automatic cocoon dryer, Minorikawa-style multi-ends reeling machine are put into practical use	<b>1924:</b> Tomioka Silk Mill adopts the Minorikawa-style multi-ends reeling machine <b>1927:</b> Takayama-sha is closed
		<b>1930s:</b> Raw silk from Japan comprises 80% of the global market	<b>1935:</b> Operation of Arafune Cold Storage ceases
		<b>1952:</b> Automatic reeling machines are successfully put into practical use	<b>1952:</b> Tomioka Silk Mill adopts the K8 automatic reeling machine
			<b>1960:</b> Tajima Farm/Takayama Farm engage in sericulture until around this time
	<b>Late:</b> Raw silk production flourishes in China and Brazil due to technology transfer from Japan	<b>Late:</b> Automatic reeling machines are exported to other countries	<b>1987:</b> Operations at Tomioka Silk Mill cease

The sericulture and silk-reeling technologies developed in Japan still support the global silk industry today.

## Sericulture/Silk Reeling

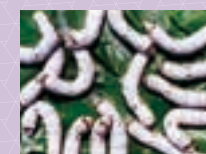
Raw silk is produced from cocoons made by silkworms (silkworm moth larvae) that feed on mulberry leaves. A series of activities that includes growing mulberry, raising silkworms and harvesting cocoons is called sericulture. Silk reeling produces raw silk from these cocoons. A single thread of raw silk is created from several to dozens of cocoon filaments. This raw silk is further processed, dyed and woven to create silk goods.

## Sericulture

Rearing silkworms on mulberry leaves until they produce cocoons.



Silkworm Eggs



Silkworms eating mulberry leaves



Cocoons spun by silkworms

## Silk reeling

Reeling out raw silk from dried cocoons.



Automatic reeling machines



Rawsilk

## Textiles

Dyeing and weaving to create silk fabrics.



## Technical term

**F1 hybrid:** A cross-breed silkworm born from a parent that produces a cocoon of superior quality and a parent that produces a cocoon superior in volume will make a cocoon of both good quality and volume. It was the Japanese scientist, Kametaro Toyama who proved that F1 hybrid silkworms inherit the superior characteristics of their parents. The practical application of this principle dramatically increased raw silk production volume in Japan.



# About World Heritage

World heritage sites are natural and/or cultural properties that have been registered on the World Heritage List compiled by the United Nations Educational, Scientific and Cultural Organization (UNESCO). They are properties belonging to humanity that possess outstanding universal value exceeding national and ethnic boundaries that should be shared. Cultural heritage is prescribed in evaluation criteria (i)–(vi). A world heritage site must fulfill at least one of those criteria.



Tomioka Silk Mill



Tajima Yahei Sericulture Farm

Technological interchange and technological innovation brought about developments in the global silk industry resulting in popularization of silk.

## Proposed value as a World Heritage

“Tomioka Silk Mill and Related Sites” is an excellent example of the mutual exchange of industrial technology between Japan and other countries that resulted in the growth of the silk industry through the realization of mass production of high-quality raw silk. Japan developed machine-reeling technology adopted from Western Europe and promoted technological innovation in sericulture, and those technologies spread to other countries around the world. Tomioka Silk Mill, Tajima Yahei Sericulture Farm, Takayama-sha Sericulture School, and Arafune Cold Storage became center stage for technological innovation in the various processes involved in raw silk production, and these innovations significantly impacted all of Japan through education, publication, and trade.

Based on this, “Tomioka Silk Mill and Related Sites” is believed to be a property with outstanding universal value required in a world heritage that fulfills evaluation criteria (ii) to exhibit an important interchange of human values on developments in architecture, technology, etc., and evaluation criteria (iv) to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history.



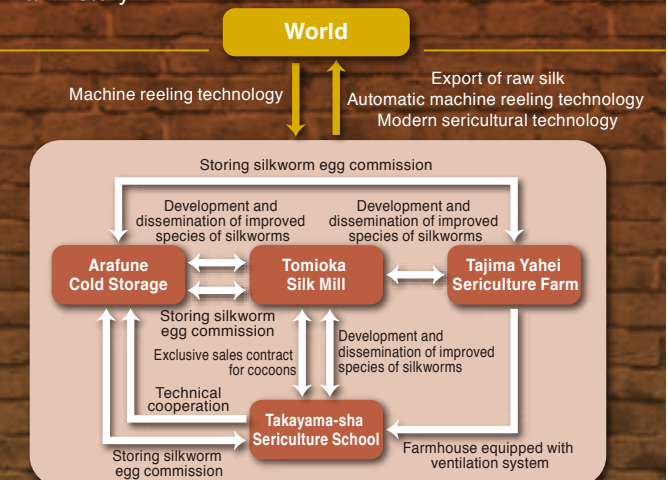
Takayama-sha Sericulture School



Arafune Cold Storage

The development and dissemination of high-quality cocoons through mutual cooperation.

The 4 sites comprised of “Tomioka Silk Mill and Related Sites” are each places of both technological innovation and technological interchange through cooperation. In particular, when Tomioka Silk Mill strove to improve cocoons to ensure mass quantities of high-quality cocoons, the Tajima Farm, Takayama-sha, and Arafune Cold Storage worked together for the development and dissemination of superior species, including test rearing, silkworm egg production, breeding instruction, and silkworm egg storage.





# Tomioka Silk Mill

The first full-scale raw silk factory to introduce machine-reeling technology from France

## History

Following the opening of the port in 1859, the Meiji government established Tomioka Silk Mill in 1872 to boost the production and quality of raw silk, which accounted for the majority of Japan's exports. Tomioka Silk Mill was equipped with western technologies including a steam engine and reeling machines from France. It was from here that machine-reeling technology was transmitted to all of Japan. Even after privatization, the silk mill continued to be at the forefront of silk reeling technology advancement, and led the development and dissemination of improved species of silkworms (F1 hybrids) in collaboration with sericulture farmers. In 1952, the newly developed automatic reeling machine was fully adopted and Tomioka Silk Mill became a model factory for automation. However, in 1987 Tomioka Silk Mill ceased operations due to the impact of global price competition on raw silk, bringing an end to 115 years of raw silk production.



▲ East cocoon warehouse



▲ Interior of silk reeling plant



▲ East cocoon warehouse



▲ Iron water tank



▲ Brunat house

## Highlights

### A magnificent cluster of buildings that tells the history

Buildings dating from the early Meiji era when Tomioka Silk Mill was first founded remain nearly unchanged. They are the first large-scale factory buildings in Japan and feature a mix of east and west techniques.

#### ● Silk-reeling Plant

This facility central to the silk mill is where raw silk was reeled from cocoons. The 140m-long timber-framed brick building houses the automatic reeling machines that stand exactly as they were when operation stopped.

#### ● Cocoon Warehouses

There are 2 cocoon warehouses located in the east side and the west side of the grounds. Both warehouses are 104m-long, 2-story buildings.

#### ● Iron Water Tank (Generally closed to the public.)

This water tank that supplied water to the mill was built in 1875. It is the one of the oldest iron structures made in Japan.

#### ● Brunat House (The inside is generally closed to the public.)

Paul Brunat, the French expert who supervised construction and operations, lived with his family in this house.

## Visitor Information

**Address:** 1-1 Tomioka, Tomioka City

**Hours:** 9:00 a.m.–5:00 p.m. (last admission at 4:30 p.m.). Internet or fax reservations are required for groups. Closed December 29th–31st. Occasionally closed for inspection and maintenance.

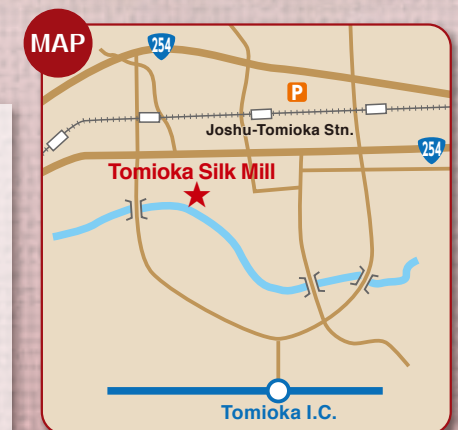
**Fee:** Adults 1,000 yen, high school/university students 250 yen (show your student ID card), and elementary/junior high school students 150 yen.

**Directions:** Approx. 15min. walk from Joshi-Tomioka Station, Joshin Dentetsu Line. Approx. 10min. by car from Tomioka I.C., Joshinetsu Expressway to free parking and 20 min walk from there. No parking available in the site.

Use the contact information/website below for the latest information, tour, and group reservations.

**Contact:** Tomioka Silk Mill Information Center, Tomioka City TEL: +81-(0)274-67-0075  
Inquiry of group bookings Reservation Center TEL+81-(0)274-67-0088

**Website:** <http://www.tomioka-silk.jp/hp/index.html>





# Tajima Yahei Sericulture Farm

Prototype of modern sericulture farmhouses utilizing a ventilation system on its tiled roof

## History

Tajima Yahei Sericulture Farm is located in Shimamura, an area where silkworm egg production thrived from the Edo Period. Tajima Yahei studied sericulture methods for creating quality silkworm eggs and found great success with *seiryō-iku*, a method that focused on ventilation. In 1863, a farmhouse with sericulture rooms equipped with a raised roof was completed. According to *Yosan-shinron* [New Theory of Sericulture] and its companion publication, *Yosan Shinron, Sequel* written by Yahei, this construction spread to other regions and became the prototype for modern sericulture farmhouse construction in Japan. In addition, Yahei and others transported silkworm eggs to Italy from 1879 to 1882 for direct sales (direct exports). At that time, Yahei studied silkworm diseases using microscopes they brought back along with western culture. When Tomioka Silk Mill began efforts to improve cocoons, Tajima Farm cooperated in the test rearing of foreign-bred silkworms and F1 hybrids.

## Highlights

### The setting depicted in *Yosan-shinron* [New Theory of Sericulture]

There are several different structures still standing on Tajima Yahei Sericulture Farm that are related to silkworm egg production, including the farmhouse with sericulture rooms.

#### ● Farmhouse with Sericulture Rooms

This is a 2-story building with a raised-roof equipped with a ventilation system. The lower floor served as living quarters, and the upper floor was used for silkworm rearing. The room has numerous windows and a raised-roof runs along the entire length of the ridge. A microscope room was added later in the north corner of the upper floor.

#### ● Kuwaba (Storage for mulberry leaves)

Mulberry leaves were temporarily stored in this building and chopped into a suitable size in accordance with silkworm growth.

#### ● Well building

Because there were many floods in this region, wells that were important to living and silkworm egg production were built on a foundation covered with stonework, that was higher than the foundation of the living quarters.



▲ A woodblock print in *Yosan-shinron*



◀ Kuwaba  
(Storage for mulberry leaves)

▲ Well building



▲ Farmhouse with sericulture rooms

## Visitor Information

**Address:** 2243 Sakai-shimamura, Isesaki City

**Visiting Areas:** Visitors can view the farm's yard and the first floor of Kuwaba (storage area for mulberry leaves) since it is a private residence. Entrance into the building is prohibited. Reservations are required for groups.

**Directions:** Approx. 20min. by taxi from JR Honjo Station. Approx. 20min. by car from Honjo-Kodama I.C., Kan-Etsu Expressway. Park at "Shimamura Kaiko no Furusato Park." or "Information Center of Tajima Yahei Sericulture Farm"

**Related facility:** There is a small exhibition room at the Information Center for Tajima Yahei Sericulture Farm (9:00 a.m.—4:00 p.m.). Closed at year's end and New Year's.

Contact the information center of Tajima Yahei Sericulture Farm for the latest information and group reservations.

**Contact:** Cultural Property Protection Division, Isesaki City TEL: +81-(0)270-75-6672

Information Center for Tajima Yahei Sericulture Farm TEL: +81-(0)270-61-5924

**Website:** <http://www.city.isesaki.lg.jp/>

## MAP





# Takayama-sha Sericulture School

Birthplace of the *seion-iku* method, which became the standard for modern sericulture technology in Japan

## History

Chogoro Takayama conducted research to boost the production and quality of cocoons. He established *seion-iku*, a method of carefully regulating ventilation, temperature and humidity. To disseminate the method, he organized the Sericulture Improvement Takayama-sha Company in 1884. Takayama-sha accepted students in its schools not only from Japan, but also from China and the Korean peninsula. They also sent teachers to other locations within Japan, as well as to China, Taiwan, and the Korean peninsula to give instruction on sericulture. As a result, the *seion-iku* method became the standard for modern sericulture technology in Japan. This site where the *seion-iku* method originated, was utilized as a training school for sericulture for many years. When Tomioka Silk Mill began efforts to improve cocoons, Takayama-sha cooperated in test rearing of foreign-bred silkworms and F1 hybrids, and provided breeding instruction to farmers.



▲Farmhouse with sericulture rooms



▲Nagaya-mon gate

## Highlights

**Silkworm-raising room that made skillful use of wind and fire**

The farmhouse with sericulture rooms ideal for implementing the *seion-iku* method and facilities from the era when training took place still remain at Takayama-sha Sericulture School.

### ● Farmhouse with Sericulture Rooms

This building constructed in 1891 followed Tajima Yahei' s example of a raised roof. Ventilation features include large sliding windows, transoms, vent holes beneath the silkworm shelves, and a slatted ceiling. Features for temperature regulation include a sunken hearth on the lower floor, a brazier on the upper floor, and vent holes in the floor. The silkworm-raising room on the upper floor is divided into 6 smaller rooms. Each room' s temperature and humidity could be regulated.

### ● Mulberry Leaves Storage

This facility temporarily stored mulberry. The underground stonework is the only thing that remains of the building that once stood here.

### ● Nagaya-mon Gate

Built in the Edo Period, this was used for storage and to hold farm tools such as sericulture equipment.

## Visitor Information

**Address:** 237 Takayama, Fujioka City

**Hours:** 9:00 a.m.–5:00 p.m. Reservations are required for groups.  
Closed December 28th–January 4th

**Directions:** Approx. 35min. by bus from JR Gunma-Fujioka Station. Approx. 35min. by bus from JR Shinmachi Station. Approx. 20min. from Fujioka I.C., Joshinetsu Expressway.

Use the contact information below for the latest information and group reservations.

**Contact:** Cultural Property Protection Division, Fujioka City TEL: +81-(0)274-23-5997  
Takayama-sha Information Center TEL: +81-(0)274-23-7703

**Website:** <http://www.city.fujioka.gunma.jp/>



▲Mulberry leaves storage



▲Interior of a silkworm-raising room





# Arafune Cold Storage

The largest cold storage facility for silkworm eggs in Japan that used natural cold airflow

## History

From ancient times, sericulture in Japan was generally carried out once a year in spring. In the latter half of the 19th century, people learned to control the number of annual rearing cycles by storing silkworm eggs in cold storage into which a cool breeze blew even in summer. Senju Niwaya, who studied at Takayama-sha, discovered a place in this area with cool airflow, and his father, Seitaro constructed a cold storage facility for silkworm eggs from 1905 to 1914 under the instruction of experts in meteorology, sericulture, and civil engineering. Arafune Cold Storage had the distinction of having the largest storage capacity in Japan and stored silkworm eggs from 40 prefectures in Japan, and also from the Korean peninsula. It contributed to an increase in the number of breeding seasons and greater cocoon production. In addition, when Tomioka Silk Mill began efforts to improve cocoons, it played a part in storing silkworm eggs used in test rearing.



▲No.1 cold storage (front right)



▲No.2 cold storage

## Highlights

**Stonework through which cool air blows even in summer**

In the area around Arafune Cold Storage, a cool breeze around 2°C blows from between gaps in rocks even in the summer. To take advantage of this cool breeze, stonework was constructed on the mountain slope, then a mud-walled building was built on top as a cold storage facility for silkworm eggs. The mountainside stonework has gaps to allow the cool air to flow through, and the external stonework on the valley side was sealed to prevent the cold air from escaping. The cold storage facility has 3 levels, 2 underground and 1 above ground, that were used separately to coincide with the period in which the silkworm eggs were transported. The stonework still stands today. The cold storage facility that was built first farthest back (upper part of the valley) is called No.1 cold storage. The largest one in the middle is the No.2 cold storage, and the one in front that was built last is the No. 3 cold storage. In addition, an administrative building called *bansha* was built on level ground created next to the No. 3 cold storage.

## Visitor Information

**Address:** 10690-2 Minaminomaki-ko, Shimonita-machi, Kanra-gun  
**Hours:** 9:30 a.m.–4:00 p.m. (last admission at 3:30p.m.) . Reservations are required for groups. Closed to visitors in winter (December to March). Entrance into the cold storage facilities is prohibited.  
**Fee:** Adults 500 yen  
**Directions:** Approx. 30min. by taxi from Shimonita Station, Joshin Dentetsu Line. Approx. 50min. by car from Shimonita I.C., Joshinetsu Expressway. / There are traffic restrictions in the area.  
**Use the contact information below for the latest information.**  
**Contact:** Shimonita-machi History Museum TEL: +81(0)274-82-5345  
**Website:** <http://www.town.shimonita.lg.jp/>



▲Cold airflow at Arafune Cold Storage



▲Reconstruction model

