Bauhaus and Heating, Ventilation Technology, and Building Science

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100 years after the Bauhaus was founded, the preoccupation with this avant-garde school continues unabated. The ideas and maxims developed at the Bauhaus continue to stimulate thought in a wide variety of fields, from teaching methods and contemporary design to architecture, living and working and production methods, as well as lifestyles.

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Introduction

2019 was the 100th anniversary of Bauhaus. Many films have been made in Germany to celebrate this. And many of them were broadcast on the German public stations, ARD and ZDF.

I watched the following films:

1.100 Years of Bauhaus *(100 Jahre Bauhaus)*

2.Women of Bauhaus (Bauhausfrauen)

3.Report on Bauhaus (Berichte zum Bauhaus)

3-1. The Newly Opened Bauhaus Museum in Weimar (Das neu eröffnete Bauhaus Museum Weimar)

3-2.The Bauhaus Style (Der Stil Bauhaus)

4. A History of Bauhaus in Pictures (*Die Bauhaus Geschichte in einem Foto*)

5. The Bauhaus Revolution (Die Bauhaus Revolution)

6. Lotte at the Bauhaus (Lotte am Bauhaus)

7. The New Age (*Die neue Zeit*)

7-1 : The Postwar Era (":Nach dem Krieg")

7-2 A Photographic History of Bauhaus. (" Der Prinz von Theben")

7-3. Victims of the March Protests (: "Märzgefallenen")

7-4. The Classroom for Women ("Die Frauenklasse")

7-5 The Honor Court ("Das Ehrengericht")

7-6 The End of Bauhaus in Weimar (*"Das Ende in Weimar"*)

1.New knowledge

Through these movies I learned some things about Bauhaus.

The history of the Bauhaus parallels the history of the Weimar republic. Although the Weimar Republic had a very democratic constitution and looked like an ideal nation, the regime changed constantly and the republic was never stable.

Director Gropius managed Bauhaus with the cooperation of artists with rich personalities.

Gropius himself was also very charismatic and persuasive.

While an officer in World War 1 (1914 \sim 1918), he learned how to command and inspire subordinates. These skills later proved very helpful when he served as director of Bauhaus.

He had free access to the Bauhaus faculty, and initially allowed students great intellectual freedom. As a result, Bauhaus was able to exert tremendous influence on the design world. Gropius was a great manager and in addition his first wife, Alma, was a great assistant.

Alma was once the wife of the famous composer, Gustav Mahler. Gropius lured Alma away from Mahler and made her his wife. As a result, Mahler became nervous and sought help from well known psychologist Sigmund Freud. Alma kept company with many artists and helped Bauhaus recruit artistic teachers from around the world. Johannes Itten was invited to Bauhaus by . Alma.

But Gropius was a womanizer. While still married to his second wife,Ise, he tried to marry his very talented student, Dörte Helm. The incident caused her to return to her hometown, Rostock, instead of going on to Dessau with Gropius.

The Bauhaus in Weimar attained an avant garde reputation for its free body culture called FKK(Freie Körper Kultur, Noodism)

The conservative land council in Weimar opposed the director, Gropius, for his corrupting people's morals. This

contributed to Bauhaus being banished from Weimar.

Bauhaus had many female applicants, and director Gropius was accepting of them. Female students received Johannes Itten's basic education in preparatory courses. The female students wanted to study architecture, as well, but were rejected. Gropius felt that architecture is three-dimensional and that women could not see things that way. Bauhaus's architecture classes were not just held in a studio. Male students also worked at construction sites. The reason was that plastering and painting at high places were deemed impossible for women.

The Bauhaus in the Weimar era was a national school. Bauhaus was financially and ideologically influenced by the regime at that time. At first, the German Socialist Party government had budget to invite many famous artists from abroad. But when they lost power to a right-wing party, Bauhaus became financially troubled and was forced to earn its own way.

The women students worked in the textile workshop as artisans, where they took advantage of the colors and forms they learned from Johanes Itten to produce fine fabric. Bauhaus sold this product, and they became a major source of funding for the school. However, the position of the textile studio in the Bauhaus was the lowest. Stölzl, the first woman to become a textile studio teacher (Meister), sent a letter to Gropius in protest, but the response to it was very cold.

It is Bauhaus's characteristic that many women did a great job under difficult circumstances.

Bauhaus is characterized by students living together, cooking and eating together, and working together to create works. The students also had considerable freedom.

The Bauhaus started shortly after World War I. At that time it was tired of war and called for international cooperation instead. The result was the International Federation. Under such circumstances, Gropius attracted talented artists from around the world as Bauhaus teachers..

There were many foreigners in the Bauhaus faculty. For example, Herbert Bayer (graphic designer and painter) from Austria, Marcel Breuer (architect) from Hungary, Lyonel Feininger (painter) from the U.S. Hannes Meyer (architect) from Switzerland, Laszlo Mohogy Nagy (photographer and painter) from Hungary, Paul Klee (painter) from Switzerland, Wassily Kandeinsky (painter) from the USSR, and Johannes Itten (painter, theoretician) from Switzerland.

A new way of thinking emerged from this group of

internationally-minded teachers. The students were not only from Germany but also from all over Europe, the U.S., Israel, and Japan.

The city of Dessau was not well financed, so its city council opposed paying foreign teachers. Director Gropius's international outlook and liberal practices were sharply criticized by the largely conservative city council. There were also right-wingers and communists in the Bauhaus. In particular, the director, Hannes Meyer, was a hardcore communist, who came under increasing verbal attack from the city council. Eventually, he was forced to resign.

Mies van der Rohe succeeded Meyer as director of Bauhaus. The Nazis grew in power and eventually closed the school in Dessau. Consequently, Mies van der Rohe established a private Bauhaus school in Berlin. But this was soon closed by the Nazis, and many artists fled the country. Gropius and Mies van der Rohe designed many high-rise iron and glass buildings in their new world, America. Gropius became Dean of Architecture at Harvard University. Likewise, Mies van der Rohe became the Director of Architecture at Illinois Institute of Technology. Laslo Mohori Nagi founded the New Bauhaus in Chicago, in 1937. Hannes Meyer was a Professor at the Moskow University of Architecture WASI. Josepf Albers taught architecture at Black Mountain College in the U.S. Max Bill created the Ulm University of Art and Design in West Germany, and taught the spirit of Bauhaus there. He later became a member of the Swiss parliament. Even as a politician, in the true sprit of Bauhaus, he tried to change the world through art.

2. Heating Technology at Bauhaus

Bauhaus was an art college that was established in Weimar, Germany in 1919. The school was closed in 1933. It seems that a highly artistic education took place. However, the school in Dessau also provided training in heating and ventilation systems. The curriculum included classes in heating and ventilation and building sanitary systems. However, it is not clear from the materials at Archive Bauhaus, who taught the lessons. Director Gropius insisted on the integration of art and technology. The Bauhaus was relocated to Dessau in 1927 due to poor relations with the City Council of Weimar. In Dessau there was a big company Junkers which produced airplanes including military combat aircraft, along with radiators and water heaters and a big chemical company IG Farben, which lacked living guarters for its employees and workers. So, Bauhaus was invited by Dessau.



Photo. 1. Natural ventilation and the irregularly placed radiator. . (Bauhaus building in Dessau, Stair Landing)



Photo. 2. Irregularly positioned radiator in Bauhaus Building in Dessau, Auditorium)

Gropius installed radiators at irregular places, on the higher reaches of inner walls, where paintings might normally be hung. He said this is the integration of art and technology.

I believe a radiator must instead be installed under the window of an outside wall to prevent cold drafts. Today almost all German houses are well insulated and kept airtight. In such cases, radiators may be installed on a higher part of an inner wall. But in the Bauhaus era, houses were not so well insulated. So, I am somewhat skeptical about his theory.

Ventilation during the Bauhaus era was exclusively natural. The Bauhaus building in Dessau had a large glass area, so the cooling load would have been very large in summer. Gropius developed a device that opens the glass windows in conjunction with each other to achieve natural ventilation. Windows were opened and closed by hand ,using an iron chain. This device has also been used in schools built in Bernau by the second director of Bauhaus, Hannes Meyer. Hannes Meyer and the Dessau building department planned the extension of the Dessau Törten estate. In these houses a warm water heating system was used.

The city of Weimar was a cultural city where Goethe and Schiller were active. A bronze statue of Goethe and Schiller stands on the town square. It was made by Ernst Rietschel, the father of Hermann Rietschel. Hermann Rietschel is called the father of heating and ventilation technology. He established a method for calculating thermal load, a method for calculating natural ventilation, and a method for estimating the required diameter of heat piping.

Bauhaus architecture respected simple design. In the Bauhaus era, the flat roof was introduced. Up to that time, the gable roof was common in Germany. Bruno Taut, who built many collective houses in Berlin during the Bauhaus era, regarded the roof as an umbrella. The space under this umbrella could also be used for drying laundry. The floor under the space played the role of thermal insulation. However, this took up too much space, so a flat roof that simultaneously fulfilled both the role of waterproofing and that of thermal insulation was developed. However, the new design introduced the problems of rainwater leakage and water vapor condensation.

The am Horn House in Weimar was conceived by Georg Muche and planned by Adolf Meyer in 1922. But in fact, many Bauhaus officials and students were involved in this planning. Residents had easy access to the bathroom from the bedroom. The dining room and kitchen were adjacent. The children's room was designed by Alma Buscher and was set up to be within easy sight of the parents. This house became a model for prefabricated houses in later generations, and had a great influence on home building.

This house also had a flat roof. (Photo 3)



Photo 3 The Am Horn House in Weimar

The Bauhaus school in Dessau was designed by Walter Gropius from 1925 to 1926. A large glass window was used so that the inside could be seen from the outside. Unlike traditional architecture, it was not symmetric. This building is reminiscent of the Fagus shoe-last works that Gropius constructed in Alfeld near Hannover in 1913. The Bauhaus School in Dessau also had a flat roof. (Photo 4)



Photo 4 The Bauhaus School in Dessau

The Bauhaus teachers' dormitory was designed in 1925 by Gropius. There were three detached houses, each with an atelier, each for two teachers. There was also a detached director's dormitory where Gropius lived. These houses

had flat roofs. (Photo 5)



Photo 5 The Bauhaus teachers' dormitory in Dessau

The flat roof was problematic, but was improved by the efforts of waterproofers. As a result, flat roofs are now widely used around the world. It is necessary to pay respect to the foresight of Gropius, which spread the use of flat roofs.

Hannes Meyer, the second director of the Bauhaus, designed the Trade Union School in Bernau near Berlin in 1931. Its buildings were successfully placed on sloped land. This school also had a flat roof. (Photo 6)

In the Törten district of Dessau, Bauhaus set up multifamily apartment buildings for workers. Here the living room and dining room were joined together, which had a major impact on later generation apartments. Warm water central heating was also employed. a breakthrough, in a time when a tiled oven (Kachelofen) was typically used. Gravity warm water heating does not use a circulation pump.

Warm water does not circulate well if the pipe diameter and slope are incorrect. There were mistakes in planning



Photo 6 Trade Union School in Bernau

and construction. The inadequate performance of warm water heating also caused Bauhaus to be criticized by the city of Dessau. This apartment also had a flat roof.

(Photo 7)



Photo 7 Multi-family apartment houses in Törten, Dessau Conclusion

Bauhaus wanted to innovate through art. There are new technological challenges in Bauhaus. A flat roof was adopted despite the problems of thermal insulation and waterproofing. Bauhaus used a gravity warm water heating system, which is difficult to construct. Bauhaus developed glass windows for natural ventilation that could be opened and closed by hand, using chains. Although too difficult to do at that time, improvements were made later by others, and these technologies are now commonly used..

The Nazis expelled Bauhaus from Germany. However, the spirit of Bauhaus was preserved by the escape abroad of its officials, where new buds grew. This spirit still has a huge impact on the world.

References

8, Bauhaus Berlin, Weingarten

Bauhaus Meisterratsprotokolle des Staatlichen Bauhauses Weimar
1919-1925, Verlag Hrermann Böhlaus Nachfolger Weimar
Magdalena Droste, Bauhaus, Taschen Bibliotheca Universals
Jeannine Fiedler, Peter Feierabend, Bauhaus, h.f.Ullmann
Hans J. M. Wingler, Das Bauhaus, Dumont
Klassik Stuftung Weimar, Das Bauhaus kommt aus Weimar
Die Siedlung Dessau-Törten 1926 bis 1931, Bauhaus Taschenbuch
Christina Biundo, Kerstin Eckstein u.a. Bauhaus-Ideen 1919-1994,
Bibliografie und Beiträge zur Rezeption des Bauhausgedankens, Reimer

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