

Future Nordic Concrete Architecture



Introduction

Through the 20th century concrete has become the most used building material in the world. The usage of concrete has led to a new architecture which exploits the isotropic properties of concrete to generate new shapes. Despite the considerable amount of concrete used in architecture, the concrete is surprisingly little visible. Often concrete is only used as the material for the load-bearing structures and afterwards hidden behind other facade-materials.

But concrete has a big unexploited potential in order to create beautiful shapes with spectacular textures on the surface. This potential has been explored through a number of buildings which can be characterized as concrete architecture. In this context concrete architecture is defined as:

- Architecture where concrete is used as a dominating and visible material and/or
- Architecture where concrete is expressed through the geometry.

In the following, a number of projects characterized as Nordic concrete architecture is presented together with a description of the epochs of the history of concrete architecture to which they belong.

Nordic Concrete Architecture

In Scandinavia, conditions different from the most other places in the world prevail. The Nordic climate causes significant changing weather conditions during the 4 seasons. This results in significant fewer hours with sun. Add to this that the sun stands low in the sky – especially in the winter season. This condition has had great influence on the architecture combined with the cultural development in Scandinavia. The style of building has always been inspired of the neighbours in the south – but always with a local interpretation and the usage of local building materials.

Concrete has not played a bigger role in the Nordic architecture compared to other countries. But special about the Nordic concrete architecture is among other things the distinguished usage of concrete with a special feeling for the interaction between the detail and the whole.

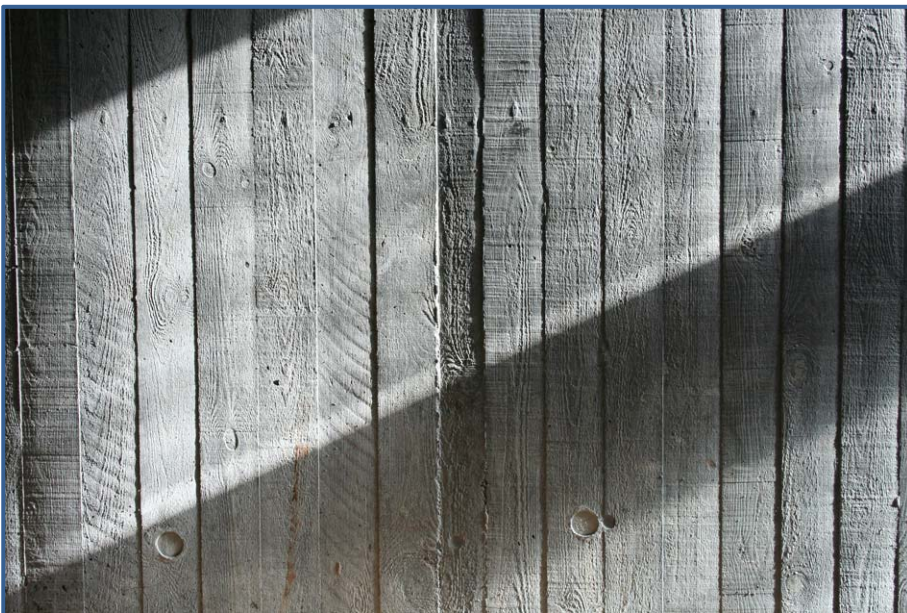


Fig. 7: Concrete wall cast against rough wooden boards.

The modern white reinforced concrete



The exhibition in Stockholm in 1930 was an important event for the Nordic architecture – and especially for the usage of concrete. It marked a shift from the classicism in the 1920's to the modernism. In the Nordic countries the modernism was called functionalism – first of all the architecture should be functional, and everything that did not serve the purpose of the building should be removed and the architecture could thereby be released from earlier styles. The characteristics of this period were the pure – often white painted surfaces. Therefore this style was also referred to as the white style.

Concrete was an integrated part of the functionalism. Earlier the concrete had not been popular among architects who claimed that concrete was missing symbolic value and a cultural history, but in this new style concrete became very interesting. Although white painted concrete was the aim, a lot of the buildings was actually built in bricks and plastered with mortar, and then white painted. But the white painted concrete surfaces were considered the most honest examples.

Beside the great Swedish architect Erik Gunnar Asplund who was leading architect on the exhibition in Stockholm, Sven Markelius – another Swedish architect stood behind a number of interesting works from the period. Among these are the Tekniska Högskolans Students House from 1930 and the concert house in Helsingborg from 1932.



Fig. 8: Sveaplans High School from 1936 in Stockholm, Sweden. An example of a building from the functionalism.

In Denmark, the architects Mogens Lassen, Vilhelm Lauritzen and Arne Jacobsen were successful in the new style. Arne Jacobsens Bellavista and Belevue Theater is masterpieces from this period – just in the spirit of the ideals of white, cubic buildings with white surfaces. And where Arne Jacobsen probably was most inspired by the German architect Walter Gropius, Mogens Lassen was most successful in translating the ideas from Le Corbusier into a Nordic version. This was evident through a number of one family houses.

In Norway it was primarily the architects Arne Korsmo, Ove Bang and Knut Knutsen who introduced the functionalism in architecture. Among the buildings is Villa Stenersen from 1939 by Arne Korsmo and the Ekesberg Restaurant by Lars Backer from 1929, situated beautifully on a hillside with a great view over Oslo.



Over a decade Alvar Aalto was the most internationally recognized architect in Finland. Some of his works represented a Finnish version of the functionalism. Among these are the Sanatory in Paimo and the library in Viipuri. Villa Mairea was considered a Finnish counterpart to one of the international masterpieces in the modernism; Le Corbusiers Villa Savoye. Villa Mairea also marked a shift in Aaltos architecture towards a more local and organic architecture.

The brutal concrete

As a contrast to the pure white architecture a demand for a more honest architecture came after Second World War. This new architecture was characterised by emphasized structures and raw surfaces. This period was called the brutalism and concrete played a leading role. The concrete was often exposed and untreated – cast against rough wooden boards which resulted in a very rough texture in the concrete surface with a richness in the details of the surface.

In Denmark, especially the architects Friis and Moltke adopted this new usage of concrete and developed a local Danish version of the brutalism. An examples of this is a school in Ebeltoft in Denmark where almost every structure and every surface is untreated concrete. Also Hotel Lakolk on Rømø from 1966 is worth mentioning which at that time was almost chokingly brutal both outside and inside of the building.



Fig. 9: School in Ebeltoft, Denmark by the Danish architects Friis and Moltke built in 1968.

Also Gug Kirke from 1968 in Aalborg by Inger and Johannes Exner and the college from 1967 in Holbæk by the architects Gerdth Bornebusch, Max Brüel and Jørgen Selchau is brilliant examples of how concrete can give the architecture both weight and uniformity. This is especially achieved because of the ability of the concrete both to be the building material for the main structures and at the same time the aesthetic surfaces. The Viking ship museum in Roskilde by the Danish architect Erik Christian Sørensen is a very good example to demonstrate this ability of concrete. Here you can see the powerful concrete structures with rough and untreated surfaces.

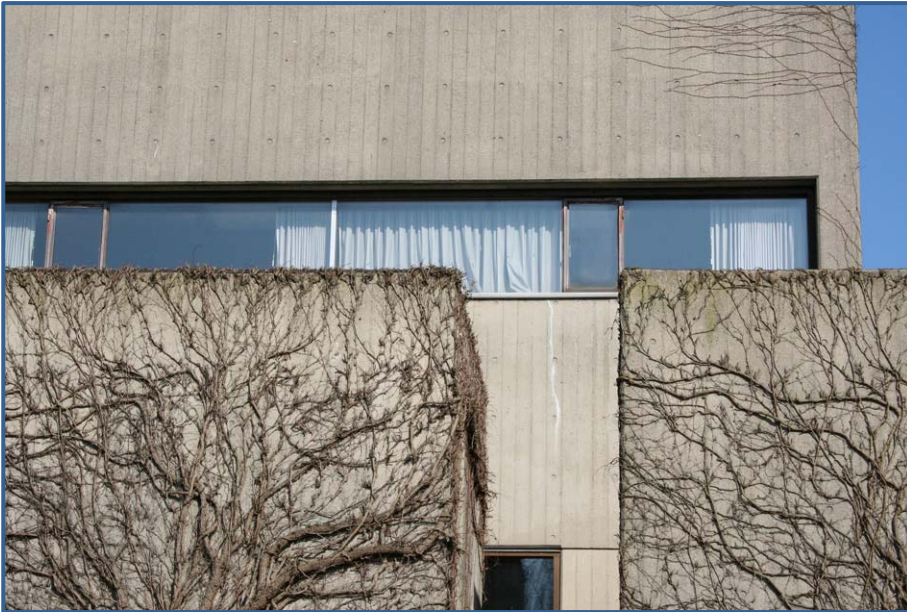


Fig. 10: High School in Holbæk, Denmark by the Danish architects Gerdth Bornebusch, Max Brüel and Jørgen Selchau – built in 1967.

In Norway, it was especially the architects Kjell Lund and Nils Slaatto who developed a Norwegian version of the brutalism. Among the representative works is St. Hallvard church with powerful structures in concrete with infill of red brickwork and the Norwegian Student society in Oslo. Also Gratangen Church by the architect Oskar Norderval where two triangular shaped concrete slabs raise to the air is a masterpiece of the period.

In Finland, the dominating architect who used the concrete rough and untreated was Aarno Ruusuvuori. Especially through several churches he used concrete as the dominating building material – and with a distinguished detailing in the facade where the vertical patterns from the wooden boards used in the formwork emphasized the horizontality of the buildings. This is also shown in Huutoniemi church from 1964 and Järvenpää church from 1967. In these examples concrete has been used as a total dominating material both inside and outside.

In Sweden the rough, untreated concrete surfaces wasn't used as often as in the rest of the Nordic countries. An exception is the library from 1967 in Norrköping by the architect Sten Samuelson.

Organized concrete elements

The industrialisation reached the Nordic countries in the late 1950's – and as a solution to the alarming need for housing, a mass production of building component was started – just like in the rest of Europe. This caused a demand for standardisation of building components which could be seen in the architecture the following years. The architecture became rational and without variation.

Concrete elements were a key to this new architecture. Almost identical concrete elements could be used for floors, walls and roof – without further treatment. Furthermore, they could be produced fast and cheap. But what seemed like a very good idea in the first place slowly changed towards massive criticism of the huge housing complexes and the concrete was pointed out to be the villain. Even though it wasn't the concrete's fault, the concrete was in a long period afterwards mainly used as a construction material covered with other building materials.



Even though the focus was on the trivial housing complexes, the period did have some very good examples of concrete architecture where concrete elements were used more interestingly.

The Norwegian architect Erling Viksjø was successful in using concrete elements as the dominating building material for several works. Among these is Bergen Town Hall from 1974. He got a patent on his so called 'nature concrete' which was a production method where gravel was placed in the mould and hereafter exposed using sandblasting. Among the most well known works is a gathering of buildings housing government offices in Oslo.

Sweden was just like the other Nordic countries dominated by the monotonous housing complexes. But one of the brilliant examples of interesting usage of concrete elements is Bergwaldhallen in Stockholm of the architects Erik Ahnborg and Sune Lindström in 1979.

In Denmark, the hospital in Herlev of Bornebusch, Selschau and Brüel was a brilliant example of powerful architecture made as an industrialised assembling building. Also the Roskilde Town Hall of the Danish architect Knud Munk is a fantastic illustration of the possibilities with concrete elements.



Fig. 11: Hospital in Herlev, Denmark by the Danish architects Gerdth Bornebusch, Max Brüel and Jørgen Selchau – built in 1976.

Utzons floating concrete structures

Jørn Utzon is probably the Danish architect who has had most influence on the development of the Danish concrete architecture. He has challenged the potential of concrete and created unique architecture, and especially his creativity with concrete elements is worth mentioning.

There are especially five of Utzons works which can be characterised as actually concrete architecture. The first one is a water tower in Svaneke in Denmark. Here, a pyramid shaped water tank is lifted up by three sloping concrete legs which make the structure thin but yet powerful.



Fig. 12: Water tower in Svanke, Denmark by the Danish architect Jørn Utzon. Built in 1952.

The next one – The Opera House in Sydney – became Utzon's main work and probably the most famous building in modern history of architecture. Even though the Sydney Opera House was built a long way from Scandinavia, some of the inspiration concerning the situation plan was gathered from the castle Kronborg in Denmark. Concerning the concrete, especially the expressive shells is a masterpiece on its own. Inside they are shaped like an organic rib-structure with untreated concrete surfaces.

If the Sydney Opera House was his International masterpiece, Bagsværd Church was his masterpiece in Denmark. Again the roof structure in concrete shows some of the possibilities to show the plasticity of the concrete. In this building the light is very important – broken down to the characteristic soft Nordic light.



Fig. 13: Bagsværd Church in Denmark by the Danish architect Jørn Utzon. Built in 1976.

In 1982, the Kuwait National Assembly was built. As in the Sydney Opera House it was mainly prefabricated concrete elements which were joint together creating the large concrete structures. Especially the monumental cover creating a big wave towards the ocean is impressive. It is stretching the possibilities with concrete.

The Paustian furniture house from 1987 is another Danish example where Utzon uses the concrete columns to create varying spaces inside the building with the inspiration from the Danish forests.

Fehns site-storytelling in concrete



The Norwegian architect Sverre Fehn is probably the most recognized architect in modern Norwegian history of architecture and concrete was often a preferred building material in his works.

The first project chosen here is a very Nordic house – but placed in Venice in Italy! It was the Nordic pavilion for the Expo 62. With the slim concrete beams in two layers the sunlight is broken down to a soft indirect light and thereby creating an almost Nordic mode on the inside.

In the Hedmarks Museum from 1969, Fehn demonstrates how concrete – a modern building material – can interact in co-existence with old stones from the Middle-age. With the Glacier Museum in Norway from 1991 he shows how an important part the site and the landscape play in his architecture. Both in shape and the choice of materials he tells a story of the rocks the glaciers has formed and left behind - and he does this with concrete.

Fehn built a number of one family houses. Among these is the Villa Busk. The house is built on a sloping rock ground and concrete was chosen to create a strong base and a building that could harmonize with the dramatic landscape.

Large scale concrete structures

Concrete has since the end of the 19th century been widely used in connection to large scale structures in Scandinavia. This has lead to a number of impressive large scale concrete structures, and the development can be seen in a number of bridge structures where concrete has been used as the dominating building material.

Among these are the Svinesund Bridge by the architects Lund and Slaatto – connecting Norway and Sweden over the Svinesund Inlet. Another bridge is the Big Belt Bridge in Denmark by the Danish architects Dissing and Weitling in 1998, which is a demonstration of how concrete structures at the same time can be both powerful and elegant. Also the Øresund bridge connecting Denmark and Sweden is impressive with the 4 almost 200 meters high concrete towers in the middle of Øresund which is the culmination on the elegant structure.



Fig. 14: The Big Belt Bridge in Denmark from 1998.

New concrete ideals

Except for a few projects the concrete is not very visible in the 1980's – a period dominated by the postmodernism. As a rebellion against the historical view in postmodernism the deconstructivism arose – characterised by a fragmented architecture. The deconstructivism never really gets popular in Nordic



architecture as in other parts of Europe, probably because of a too big contrast compared to the Nordic tradition where uniformity and harmony is a beloved quality. Nevertheless at least one significant deconstructive work was built in Denmark – Arken, a new museum for modern art by the Danish architect Søren Robert Lund – built in concrete.



Fig. 15: Arken Museum in Ishøj, Denmark by the Danish architect Søren Robert Lund. Built in 1996.

In the 1990's concrete architecture makes progress again. This was due to a number of new and young architects who could see some new possibilities with concrete – not oppressed by the history of concrete. Characteristic for the usage of concrete in the years up to today is, that the concrete is often used untreated. This results in an honest expression where the production method is visible in the concrete surface. One might say that it is a kind of a modern and distinguished version of the brutalism.

One of the new architectural firms is the Danish company Entasis. With the new head entrance for the Zoological Garden in Copenhagen they showed this honest usage of untreated concrete. In the housing complex Emaljehaven in Copenhagen they use concrete elements that are merged together – setting new standards in the construction with concrete elements.



Fig. 16: An example of new buildings in concrete. Hindemosehus in Odense, Denmark by the Danish architect Sophus Søbye built in 2006.

Also the house for the hippopotamuses in the zoological garden in Copenhagen by The Danish architectural firm Dall and Lindhardtzen is a very good example of the new ideals. A modern and distinguished version of concrete surfaces cast against rough wooden boards.



In Sweden it is the architect Gert Wingård who is experimenting with new possibilities with concrete. With the control tower in Arlanda Airport he is experimenting with different colours of the concrete. And in the housing project Villann concrete is used untreated with smooth surfaces. Other interesting experiments were performed by the Swedish architect Johan Celsing. In the office of Riksantikvarieämbetet from 2008 he uses concrete facades cast against silicone-moulds with reliefs.

In Finland the architects Heikkinen and Komonen stands for a renewal of the Finnish concrete architecture. This is among other projects illustrated through the Emergency Service College from 2005 in Kuopio.

Nordic concrete architecture in the future

Architecture of the future faces major challenges but also a number of new possibilities. Digital 3D-modelling tools are used among architect to create new advanced shapes which are characterised by the digital architecture of the future. Still, a huge gap between what can be produced digitally and what can be produced physically exists – especially when economy is taken into account. However, this is only a matter of time – in a near future the gap will be significant smaller.

The technologies are already available in order to produce advanced shaped architecture. At the Danish Technological Institute, a robot has been installed – a tool that can be used for digital fabrication. Also through a number of research and development projects, the robot has been used for research in new digital fabrication techniques where the aim has been to develop new formwork for concrete.

From the national Danish project Unique Concrete Structures, the final result was a pavilion in concrete designed using advanced optimization tools and produced using robot technology. The structure has a very complex geometry especially in the organic rib structure.



Fig. 17: Concrete pavilion from 2010 made in connection to the research project Unique Concrete Structures. The formwork was created using the robot cell at Danish Technological Institute.

Using robot technology in the fabrication of concrete structures gives some new possibilities to produce complex geometries – but also possibilities to make new textures and reliefs to the concrete. This can be illustrated by an experiment at Danish Technological Institute where 10 different concrete elements were produced using different formwork materials and different milling strategies on the robot.



Fig. 18: Experiments in concrete using robot technology at Danish Technological Institute.

Also a sculptural concrete element designed by Esben Klemann – integrated in the architecture of the art museum on Bornholm – is a good example of the possibilities with concrete surfaces.

With technologies for digital fabrication – like robot technology – a new digital architecture will be common in the future and the development in the Nordic countries will be up front. As the tradition has showed us, this new architecture will find its own interpretation in the Nordic countries.

Concrete as an aesthetic building material will most likely have an even bigger role in future architecture than today. This floating rock is an obvious building material when the future digital architecture is built. It is a material both for the freely shaped main structures of a building and the aesthetic surfaces. Add to this the sustainability due to the long lifetime. With the possibilities of digital fabrication, the architects can lose themselves further into the details which are so characteristic for the Nordic architecture. Thus the Nordic concrete architecture will most likely continue to interpret the new possibilities with Nordic poetry and distinguished sense for both the whole and the detail.