History of Architecture and Culture – 5
Lecture - 9

19th Century Architecture - 1

If you look at 19th century from an architectural point of view there was not one style which was in 19th century we cannot say that there was one style that was predominant in 19th century.

Buildings were recognized by the function rather than their style. From the 19th century buildings if you want to say ok this is 19th century building what would you first see, you won't look at the materials, you won't look at the looks, you won't look at how they look, what you actually see is your first look at the function of the building and then you can probably tell ok this is 19th century building. Some buildings were resembling a single particular style for example slim design in neoclassical style, some building were designed in neogothic style, some buildings followed traditional manners and neogothic styles for cathedrals some buildings followed clearly the renaissance style of revivalist style, some people followed the baroque and Rococo style and they followed rules and rationality pertaining to the style whereas some other buildings happened was they did follow one style pick out elements from lot of styles and they blended altogether and you get a style that is a mixture of all these styles. So you take elements and things from all the things and you put it on a mixture and you turn it and your building is produced. This kind of architecture became more relevant to 19th century than the buildings that were actually built of one particular style so that is the reason why 19th century did not have a particular style of its own. They also had certain trademark style structures for example churches need to be done in neogothic style, civil building means neoclassical style is correct thing for you. They had this trademark things that were associated with certain typologies of building. Certain

typologies need to be built in certain style and there is another thing that is very prominent in 19th century.

Decorative motives which people were using so far in the previous architecture style the decorative motive is actually made in every single thing where in 19th century they started mass producing these decorative materials. The rise of factories and industries, thanks to them they started mass producing all decorative details – window grill detail, door detail or column capitals or lanterns all those things started mass produce – mass manufacture. So in a lot of particular style and particular motive the creative was available in numbers if you want 100 types that is available for you, such was the power of industrial revolution and back to which created the architecture in 19th century.

Let's take a look at metals, the role of metals in architecture. Before 1800 metals performed majorly an auxiliary role because they were used in bonding masonry such as dowels and clamps, used for tension members for chains, sometimes for strengthening domes, sometimes the rods to tie across arches to reinforce the vaults, sometimes for roofing, sometimes for doors, windows and decorations, sometimes to fix two pieces of wood together with clamp and then they start building together, riveting together, sometimes they used for decoration. But 19th century saw the first use of mass usage of iron, not just in auxiliary role but also as primary building material. So that is the major thing in 19th century. What is the major thing in 19th century? They had all the styles, that ahd the style of their own, they even started mass manufacturing. What is the important thing about 19th century? If you ask that question, this is probably the answer, they started using iron as most important material and it is the fundamental material in the buildings. Wrought iron was invented. Wrought iron was low carbon malleable metal but using iron and charcoal to form a bloom. It is a spongy mixture from

which ash and other impurities mixed were removed by repeated beating and folding and then beat and fold again. So you do this process repeatedly and you get wrought iron. Let's take a look what was available at that thing of time in 19th century. You had brass, aluminium, you had cast iron, copper, you had steel, steel was produced later by mixing cast iron and wrought iron together, you had bronze, you had some bit of metal sludge. If you see this picture, you can see Williams and co. i.e. a metal manufacturing facility they produced boiler tubes apparently. They produced different types of metal products and this is how a typical 19th century factory look like. They had huge very prominent way in which they brand themselves and the branding is so loud and clear and the building automatically shows at the moment, when you look at the building it automatically shows out even if it not written here it shows out it is a factory.

In 19th century iron was available in three different forms. The least processed of all the three is the cast iron which is very brittle, it has high percentage of impurities, but yet it displayed impressive amount of compressive strength. Second is wrought iron, which is really more refined form of iron malleable, low tensile strength, not very high tensile strength but good compressive strength though because it is more refined and it is more malleable. Wrought iron is formed by burning coal and things together which we saw in previous slide. Wrought iron is produced by mixing iron and charcoal together by burning them and clearing of all the impurities. Finally steel is produced which has very high tensile and compressive strength than any other previously made material available and its capabilities revolutionized the way we look at architecture. Steel and concrete are two materials that entirely revolutionized the way we look at architecture, if there is something called architecture revolution we must attribute to steel and concrete. That is the revolution in architecture.

Let see the first thing that was produced iron on mass manufacture they were used in large amount. The most useful component in 19th century that was the rails. People made trains tracks are in iron this was the first basic unit of construction they made rails. They also had that feeling in that mind iron was not something that need to use for house and churches. They were usually used for arcades exhibition halls and railway stations civic buildings public buildings large scale buildings. Not generally used for houses or churches and palaces. This is not that kind of material they thought iron was cheap iron was not sophisticated for them.

It was meant for these kind of buildings that is the mindset. Castiron was firstly used in bridge buildings as early as 1779. The engineer Wilkinson assisted Darby and his architect T.F.pritchard in designing and erecting the first cast iron bridge. Which is little more than 30 meter span built in coalbrookdale in 1779 as earlier 1779 the first cast iron was built. Not even a 19th century in 18th century in 1796 Thomas telford made his debut as a bridge builder by building the bridge close to 40meters. From 30 meters in 1779 to 1796 we had a 40 meter span bridge. Then there is person called William strut who built cotton mill built that six floor at Darby and 1792 late in 18th century. Charles bage who designed the flax spinning mill at employed cast iron columns.

This flax spinning mill what he did was that had columns are made completely by cast iron instead of traditional brick and plaster column.They had employed cast iron columns they shed traditional use of stone and brick. They started using steel iron for columns. If you wondering what how this coalbrookdale bridge look like which is built in 1779 and this is how it looks. Its beautiful bridge made of cast iron made into arch the bridge works just fine. We have piers either side of severn and this span is little more than the 30 meter big huge arch.

People can go bridge over here this is the bridge Thomas telford designed.

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The crystal palace is not technically a palace it called a palace. Because huge building made of glass and iron. It was built by joseph Paxton at the great exhibition 1851 it was very early example of iron and glass construction. It was iron elements and glass panel of which were supported between iron element and the entire house was built by iron and glass. Cast and wrought iron products had been used extensively in building especially in the 19th century but were largely superseded by the beginning of the 20th century by hot rolled steel members. Even though in the 19th century the cast iron and wrought iron are very much widely used. When steel came it swept all these thing when the steel came people no longer make built with cast iron or wrought iron.Cast iron or wrought iron aren't used for building when after steel came.

If you wondering what crystal palace look like this is how it looks. This is the picture of crystal palace before it was turn taken down. Wrought iron masonry reinforcement in France had its origins in Paris in Perrault's east façade of louvre in louvre museum and soufflot portico of ste-genevieve. In France the louvre building the louvre museum the east façade had a wall made of masonry but it reinforced by wrought iron. This was revolutionary improvement in use of iron and building industry. But this was very early there was use of wrought iron and louvre museum very early it was revolutionary. Soufflot portico of ste-genevieve also used wrought victor Louis also use wrought iron roof or theater Francis of 1786 in theater in palasi royal.

The roofs of theater were used to build by wrought iron because of two important reason first thing is in a theater the most important things is

not a roof. The most important things is a stage so if we use such material like wrought iron nobody will really care. Because people would more interest in what is happening in the stage not in the roof. Number two is if you span a big audience such as theater in a theater large congregation of people. If you span such a big span without column in between because if you add columns in between the visibility become very difficult. So if you want do something without columns the only means that point of time was wrought iron. Because it otherwise very difficult for people to make this possible.

American James Finlay's he invented of stiffened flat deck suspension bridge in 1801 more than 250 years before. He invented the stiffened flat deck suspension bridge. Suspension bridge are type of bridge the main road way are that thing carries like motors the vehicle or pedestrian people. That surface expended from cables which are connecting from the Top. So this is the building this is the bridge this is the house were James Finlay's were born. Britain browns wrought iron flat bars were used in union bridge. The wrought iron suspension construction bridges started in Britain in 1829 and Bristol by Brunel Clifton Bridge. Here suspension bridges are very new to Britain because it was only invented in 1800 by in the America in 30 years it come to Britain.

Stephenson and Fairbairn Britannia designed a tubular bridge. It's an over wide it had plated wrought iron too. Plated wrought iron before people were used a flat bars wrought iron. Now they start to make plated wrought iron which can be made into tubes. Stephenson and Fairbairn Britannia designed a tubular bridge. The Britannia Bridge comprised of iron plated box tunnels which bridge the straits in 70 meters span. Then the period of time were iron was used for a utility structure like bridges and other things for buildings at neat stiffing in inside the buildings. Bridges were only used for those kinds of things. In 1889 things change

drastically when the Paris exposition happened which had the Eiffel tower it was designed by Gustave Eiffel with overall height of 300 meters was completely made of iron. Not even cladded and the tower structure was completely made of iron revolutionized the way people started looking at material.

First they thought it was sacred on the face Paris because it was so it considered too ugly. Nobody like iron and iron was the material that only mint for bridges and other utility thing not for the things supposed to beautiful. When industrial exposition as placed people were learn about different type of business and different type of invention. People from different country participate that and to produce such kind of building and world exposition was scare the face of Paris according to lot of people. Later Eiffel tower were became world's most famous building and attraction on today. Eiffel tower attracts world's maximum number of tourist so what was the scare on the face of Paris it's now the pride of Paris. Because it attract most number of tourist across the world.

So far steel was only used sparely most of bridges done with cast iron and wrought iron. The first major structure built entirely of steel was the cantilevered forth bridge in Scotland in 1890. This is the bridge how looks the portion that cantilever building if you wondering how this is even standing. These two are huge piers and these piers rise the arms. These arms in turns support the piers. First when people designed this bridge the designers made this bridge showed it to people. People are not very happy people thought there is no way that building going to stand. This bridge defied all known lot of bridge in so far. And this building going to not stand and people were criticizing the design. Finally the main lead engineers made a presentation to the people. The lead engineer was Benjamin baker was not in the picture. He made a famous demonstration on the queen's ferry. If you take a look at picture behind

the scene here this is the elevation of forth bridge was drawn by the engineers and look at how the building is. This is the pier and these are the two arms this is the cantilever portion here.

They have exact same thing drawn in elevation over here in simpler form. So actually what happening his demonstration staged in queens ferry baker of the structural principle of the Forth Bridge. The weight of the engineer kaichi wantanabe in the center kaichi wantanabe is an engineer who sitting in the center there wooden plank on the sitting which is not supported anywhere. Which is not supported from the back it is not supported in ground. He is actually sitting on the plank which is not supported anywhere by the arms of the men on either side acting under tension. These people are holding sticks like this their arm are in tension. Tension means pulling force so the weight of the engineer pulling down which means the arm are being stretched from their bodies. But to prevent them stretching their bodied they have introduced another thing.

A rod which is attached from here this rod prevents the arms from stretching these rod acting compression these rod acting tension. This compression tension is here and with this action they were able to demonstrate that. There is pier which is grounded they were showing with few bricks there and these two arms are these two lines. This man was sitting here represent the pier this man represent the pier on the same way these two arms are here. And central portion which is actually cantilever portion what is a here which means they demonstrate that this portion of the bridge doesn’t need a direct base. So they need not to supported anywhere here it can simply be supported from the pier themselves. This is the demonstration of the forth bridge and this is how looks they existed even today in a good condition.

The arched eads bridge over the Mississippi river at St. louis Missouri designed by an engineer called james eads and the bridge named after him. It was completed in 1874 this is first steel bridge in the United States. This was the first steel bridge in the United States at the time the eads bridge was built it was the longest structure in the united states to be ever build. And that building was steel building each bridge has three main span. The center span is longest which about 160m and spans on the either side are each 153m foot in length. If you wondering the building looks like this is how it looks. This is the center span which is 160m and these two are side span which are little less in span. But pretty much the same principle and pretty much the same concept. This is an arch bridge were in the steel arches steel is bend to form an arch on this pier. And there is a road around on top that.

John Roebling and Washington Roebling design and built Brooklyn Bridge which at the time of completion was the world's largest suspension bridge back in 1883. It having a span of 486m it close to half a kilometer span of 486m he world's largest suspension bridge at that time. This is how the bridge looks the completion of the Brooklyn Bridge was a land mark thing it was a land mark achieved. Because this marked beginning of the 80 year old long period of large scale suspension bridge designed by US. Suspension bridges of different span larger span higher suspension bridges were built in the next 80 years. Only because of Brooklyn Bridge was possible thanks to joint in Washington Roebling. Next we look very interesting personality called George fuller. His innovative steel cage system for building has a beautiful steel mess cage. For the building and then he supports masonry unit around the steel cage building. Because the building can be very strong and it can be built with enormous number of floors that was his idea.

It involved a unified steel framework to support the weight of tall building created the multi-story factories and the skyscrapers. He has considered to father if skyscrapers. The masonry bearing wall was transformed to the steel frame. The building skeleton could be erected quickly and the remaining components hung on it to complete it. The either side of the screen you see a building which is called as flat iron building because it look like a flat iron box. So it is flat iron building the triangular building were very acute angle. This building also called a fuller building for incorporation of his name and contribution to the architecture.