Contemporary Architecture and Design
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Lecture - 23
Phases of Modern Architecture- Tensile and Shell Structure Part II

Welcome students to the online NPTEL course, Contemporary Architecture and Design. In the previous class we started discussing the Tensile and Shell Structures, which comes under the, where architecture was seen as a blend between form and function where both the things were equally important and there was a manifestation the structural manifestation in to the form was also there. So within that we have discussed there is a measure movement was a shell and tensile structure which comes as a structural manifestation of two different new material which is concrete and steel; so concrete was used in a different way as a shell structure; which is more dynamic and not just as a beam column and straight flat roof.

So, it was a shell and a dynamic form of shell is covering is acting as a roof, and in tensile structure the tensile member were steel and the steel tensile members steel post, and the tensile steel members, which is hanging from the which will hang from the post will create the will take the span of this building.

So, most of these cases the buildings were Olympic stadium or different stadiums, museums and places or the airports where there was large span of spaces were required. So we need; so now, we will give we will discuss more few more examples from tensile structure we have discussed shell structures examples, we will discuss tensile structure and then we will discuss what was happening in the design field, the industrial design field during this movement which was happening in the architecture.

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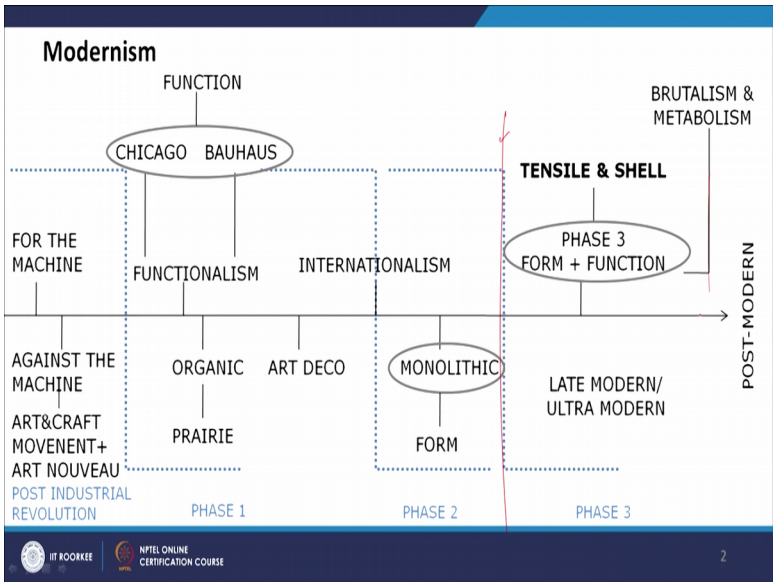

So, if we look at this phase; so this phase is in this third phase of modernism of the last phase of modernism which is around 1950's it started and this phase and mostly the 1960's, 70's and till 80's this got continued and few of this style like neo futurist style got carried forward into the post modern style by few of the post modernist architect

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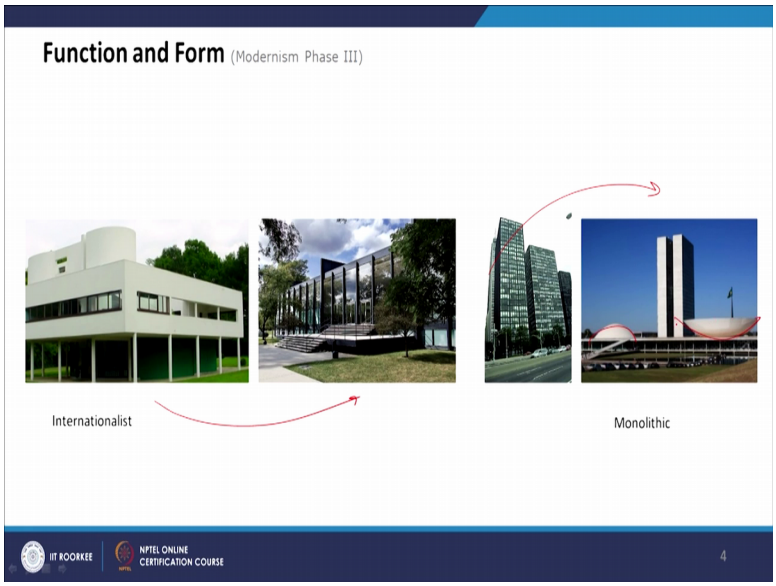

Now, this is the example of this particular style and which got translated from this internationalist movement and gradually form a started becoming more complex and more dynamic. So from this rectilinearity of the form also there was curves as, but few geometric curves and from there and this where the form was important monolithic there was more curvilinearity, and more dynamic forms in the shell and tensile structure.

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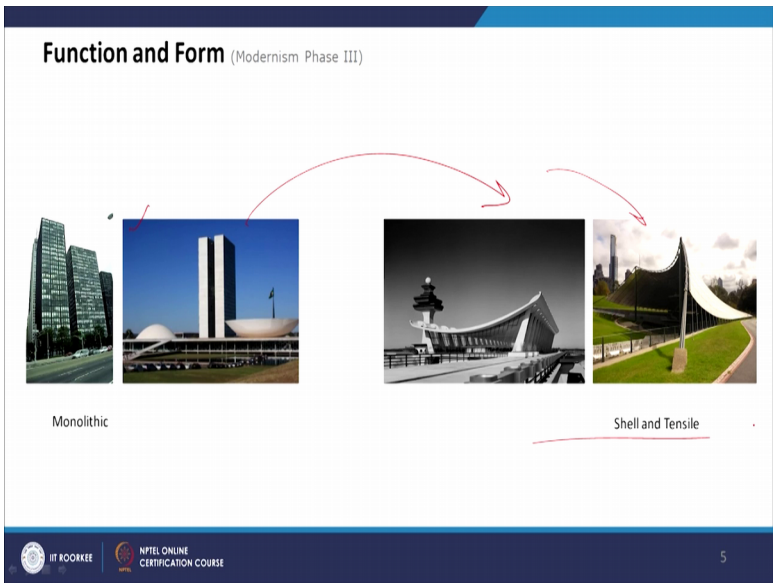

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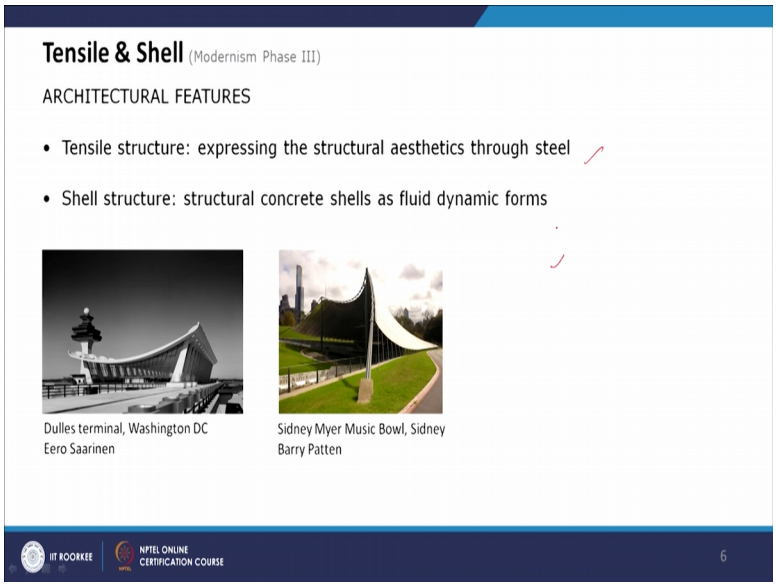

So, we have discussed few of this examples, how the shell and tensile structure were there.

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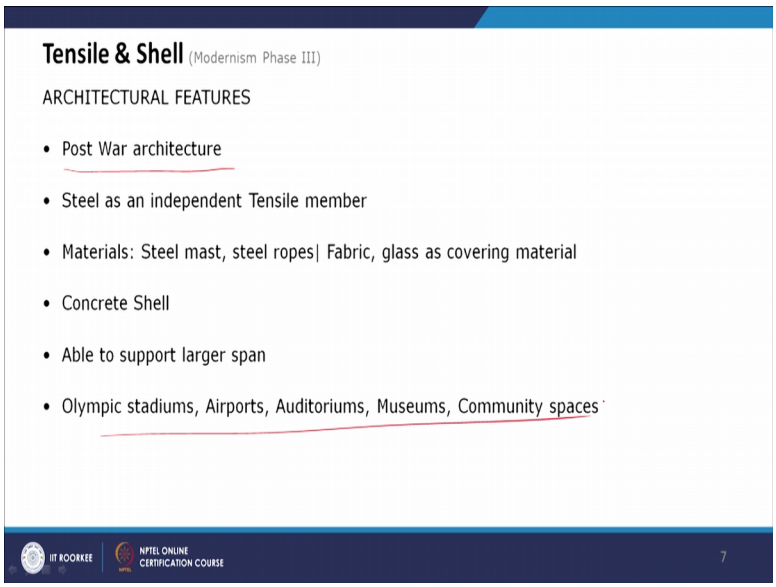

And then the architectural qualities because it was a post war architectural architecture that's why the curvilinearity and the dynamism can be constructed and the building types we have already discussed which requires more larger span and this was the building types which started evolving after the post world scenario.

So, few of the examples from the tensile structures, we have discussed shell structure.

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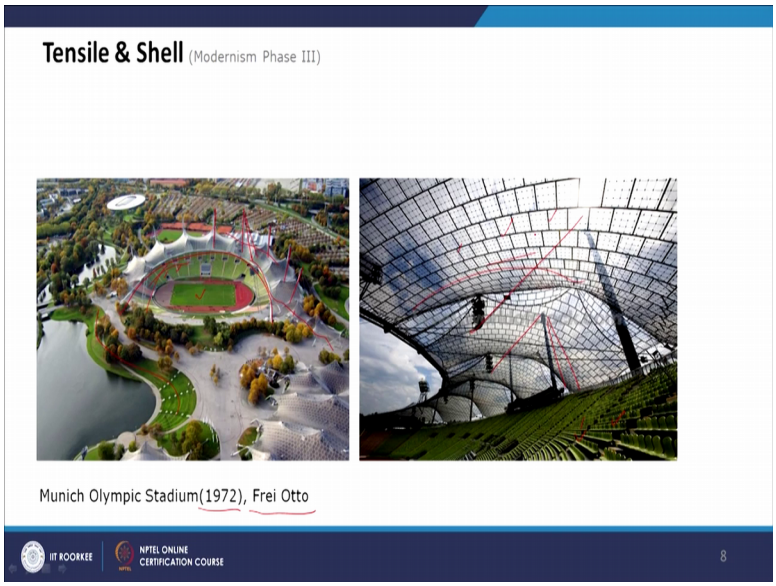

So, tensile structures one of the famous architect was Frei Otto, so this is the Munich Olympic stadium; which is designed in the 1972 by Frei Otto. So if you look at this has a series of steel mim; steel mast which is holding this roof form of this on the gallery so gallery with a this tensile members. So these are the tensile members you can see in this photograph which is on top of this gallery.

So, here if you look at this green space of this and green garden is blended with the galleries green seats. So these are the actually green seats of the gallery which blends the same color combination and this structure this tensile structure acts as a (Refer Time: 04:33) and like a transparent and translucent membrane, which is covering this green otherwise green field and to blend with this green field the all the seats of this stadium was also taken in the same tone of the green color; and this is acting as just as a translucent glass members, so all this glass panels were on top of this steel structure and this gives a very translucent feeling and all this light will come from the top.

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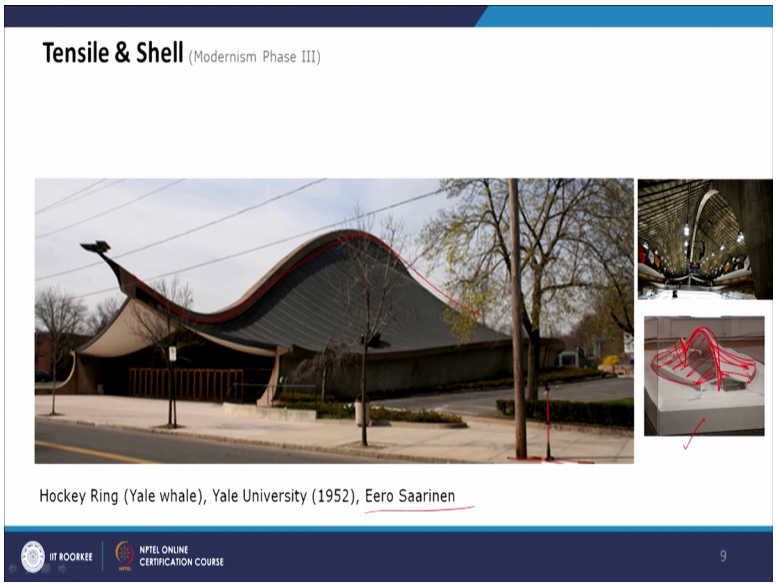

Now, this another example which is again designed by Eero Saarinen whose examples we have see in the shell structure like Dallas airport, TWA airport Washington and New York. So this is the hockey ring in Yale university and because of this shape it was called Yale whale and because it looks like a whale. And if you look at the tensile this structural thing in this design if you will see this arch is going like this from this arch all this tensile steel members are taking the supporting this roof of this hockey ring.

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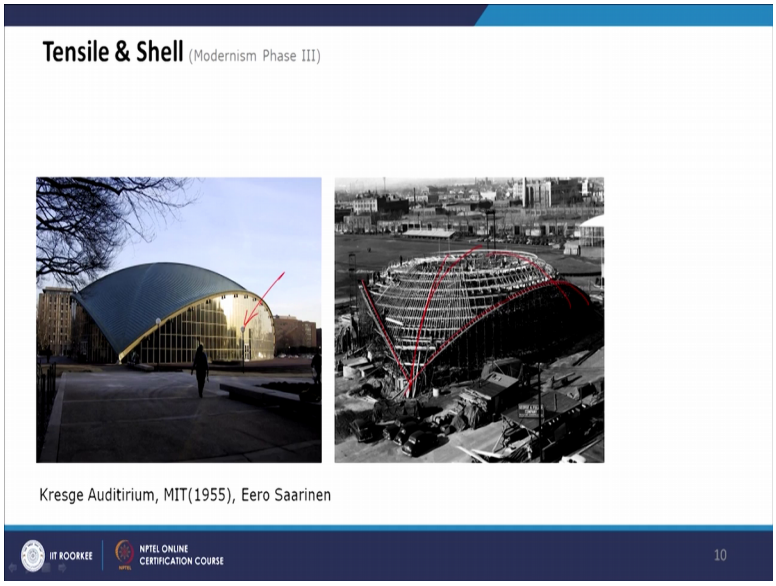

Another example is again designed by Eero Saarinen as a within this tensile structure if you if you look at the how it has been constructed; so you will see the tensile steel members are there and then there is a covering material on top and also you will see the glass curtain wall which is the giving the feeling of the new age design is there. So this is in this is the auditorium in MIT, which is designed in 1955 in the similar timeline.

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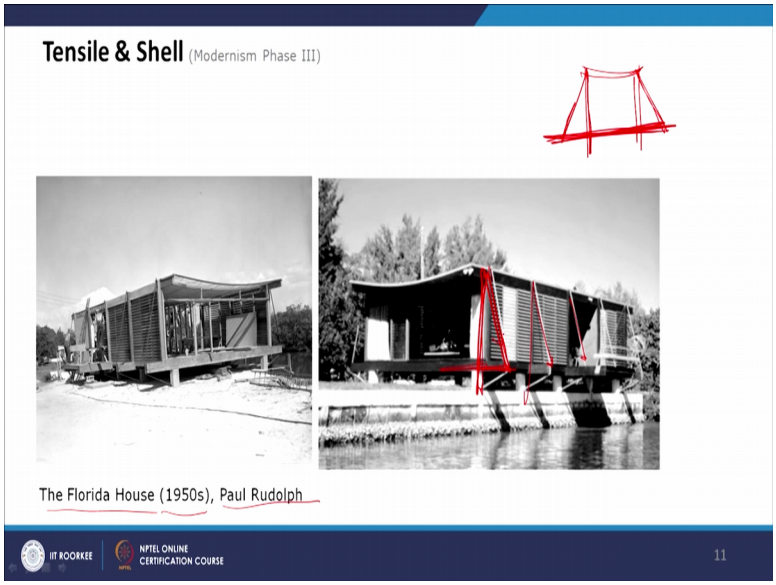

So, this is the Florida house designed by Paul Rudolph in 1950's this is the temporary house and then it got the dismantle; so here the steel members are this is the main steel members, this is the roof and from this steel member this floor of this roof is; floor of this house is getting hang from this steel member. So this is the structure members from here a tensile member is supporting this roof, so this roof is getting supported this supporting this floor, so this floor is getting supported by this member.

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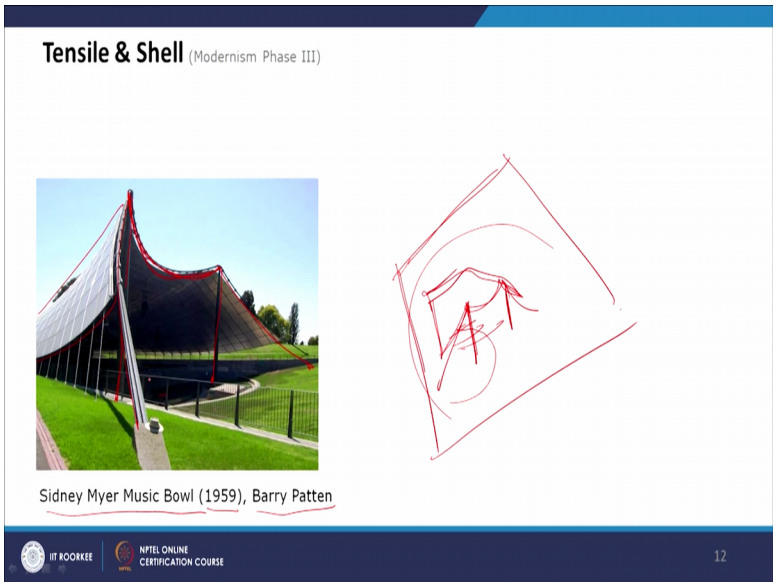

So, another example of tensile and tensile structure is Sidney Myer Music Bowl which was this picture has been shown earlier, this is designed by Barry Patten and this is in Sidney and all almost in the similar frame time 1959 it was designed. So if you look at so there is this steel masts are taking load of all this membrane and if you look the design of this, so this look like from this green patch of this of this greenery one particular members so these two steel members are just taking a members aw[ay]- away from this green patch so this steel members are just lifting this members out of this green field.

So, it looks like there was a continues green field, but this two steel members are lifting this members from the top and the galleries are going down from this same field. So this field is visually is not disturbed and this field from this field the galleries are going down and just like a member is coming out of this. Particular this field and if you look at this other structural elements from this there was two main rods, which are supporting this members, which is these two and then another steel tensile members are holding this two rods together and then there is a fabric which is covering this acting as a covering material and the gallery, which is covering the gallery as a acting as the roof of this gallery.

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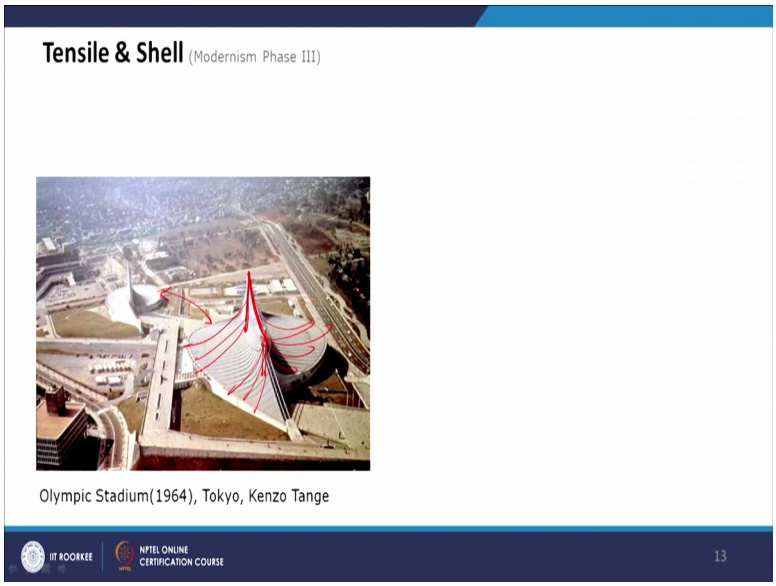

Now, another famous example of this tensile structure Kenzo Tanges Olympic stadium, which is in Tokyo in 19 designed in 1964 around on the similar time frame. There was two stadium of similar design and here this two tensile are two masts which is taking the load and from there the tensile members are passing through and between two mast there is again another member, which is intension and taking this load and acting as a covering acting as a roof of this Olympic stadium. So most of the cases we have seen the Olympic stadiums airports and the other kind of buildings which is which has to take the largest span is acting as a the tensile structure and the shell structures are used

Now, during this phase which is happening in architecture there was streamlining in design which was a has a similar design and visual principals. So we have discussed we just mentioned streamline before when we are discussing international movement; because from the internationalist movement monolithic and neo futurist shell and tensile structures evolved and from this internationalist movement of product design or furniture design and in industrial design industrial designs; streamlining evolved.

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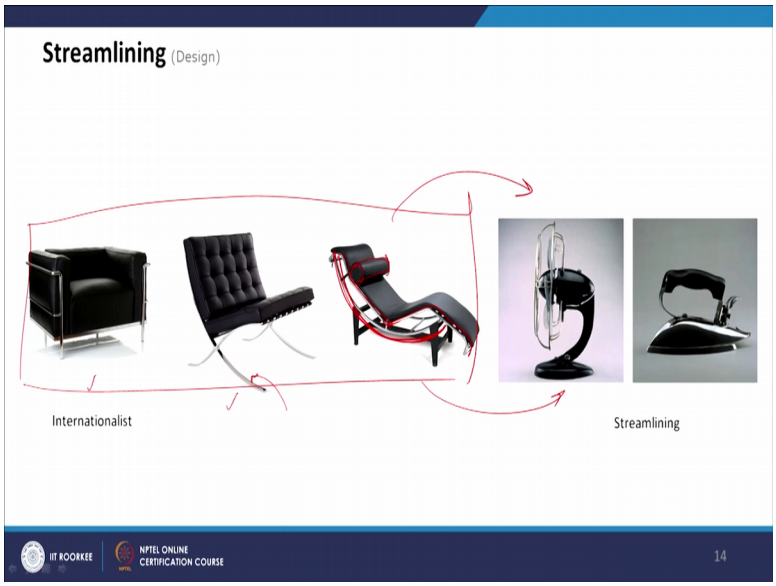

So, this is Corbusier design this is Barcelona chair by Mies Van Der Rohe which falls under internationalist movement where the rectilinearity is there and the steel is used as its own material beauty and the black color is black, white and those particular colors were used.

Now, from there quite in a similar tone there was a an lot of similarity in the visual style will also be seen in the in this design, even in the if you think about this streamlining in neo futurist style the white color is used and then concrete was used as a exposed concrete, there was no different colors were used in the previous examples what we have discussed and in TWA terminals, in Calatravas design, in Frei Ottos design the material was used as the material. So some continuity was definitely there from the international style, but the form got the more curvilinum.

So, some of the examples like this form by Corbusiers this reclining chair there was curvilinearity, but this is a part of this is a cylinder and this is just given as a shape from this ergonomic shape this is also has also lot of rectilinearity and this is supported by a pure semicircle, but here in this streamlining there was more fluidity in the curve and the curve was more biomorphic and more dynamic forms were there, and this curve came from the function and the fluid sometimes aerodynamics was used sometimes ergonomics used to generate this forms.

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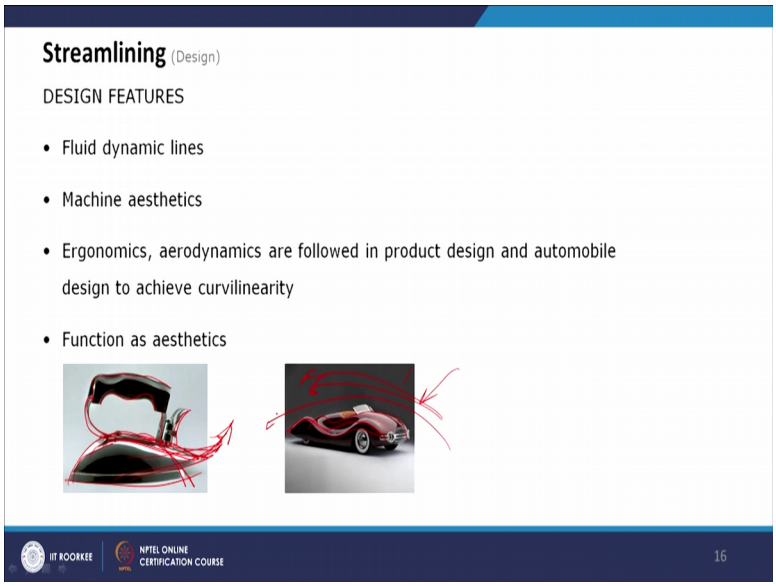

So if we discuss the design features of the streamlining, so there was a fluid dynamic line was there which is not part of the internationalist furniture designs, there was no fluid dynamic lines there are some lines, but this is mostly they are trying to fit into this pure geometric form for example, this is half semicircle this also a semicircle and there is a little blend into in to the curve. But more in the streamlining there were more dynamic forms and there was no pure geometric curve and machine aesthetic is there, which is taken from this internationalist movement.

Ergonomics and aerodynamics and other principles were they used in product design, automobile design to achieve the curvilinearity and sometimes it is just for aesthetics, sometimes this ergonomics are taking the human body and the ease of use into consideration and sometimes the aerodynamics into for the automobile design was taken into consideration to create the shape of this car, but sometime into just for aesthetics the car was designed and function is blended with the aesthetics.

So, if we look at this iron machine so this curve is giving the helping will help the user to hold the this iron in with better grip and with this all this lines are getting fused with each other and creating this shape of this iron. So all this forms and giving a dynamic motion of the dynamic movement of this form. So this form could have been more static if it was designed like this, but because of this curve this is getting more dynamic approach and

because these two lines are getting fused together and there was a directional sense of direction in this line, so there is more dynamism in the form.

And if you look at this automobile this has lot of dynamisms in this form; so and it has a curve which is passing from the from the end to end of this curve and all this lines and curves are fused together to get this form; and if you look at some other designs of this car and also this design so aerodynamic principles were used to achieve this shape of this car.

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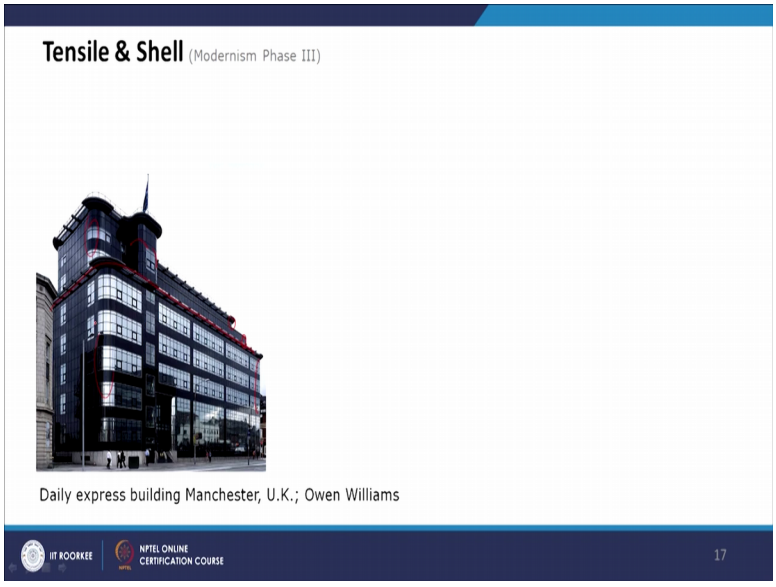

Now, also this style of design was there in the architectures, so this is the daily express building in Manchester, UK; design by Owen Williams. So this is a streamlining architecture and in this building if you look at all this lines are getting fused so there is no particular edge.

In the building so all this wherever the edges are coming this is streamline or the chamfering is; the curvilinear chamfering is happening all over the edges in the building and also if you look at the building this building has its from its glass curtain wall or this glass cladding of this building, this building is giving the machine aesthetics and this similar color tone is used in this building.

There few other examples of this streamlining in architecture which has a similarity with the streamlining in the product design because of the similar concept.

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So Kem Webers lounge chair is one of the famous example of streamlining; so all this supporting element, hand rest is blended together and creating a curvilinear pattern which is not up geometric curve. Now which is getting repeated over here, but if you look at this colors and the textures which are used, which has lot of similarity with the internationalist movement, but not all ah, but sometimes the colors and textures were also there was jazzy colors and textures were added.

For example, there was a phantom chair which we has show earlier so which falling under the streamlining phases, the phantom chair also falls the because of this curve which is falling which is designed for the ergonomics of this of human body posture, but this curve is also a just for aesthetics and this phantom chair comes in black white black and white and as well as different colors like orange and red and other colors. This is one pedestal arm chair which is also called tulip chair because of the form of the chair has a one single pedestal and designed by Eero Saarinen who was one of the pioneering architect in shell structure.

So, also this red color used, but mostly it is just the main structure is a white; red is just cushion, were which is which is also there in some of the streamlining there is design, there was different colors are used which has a connection with the post modern movement where post modern movement we will see lot of colors are coming into this movements. So there was one side there was this internationalist movement influence

which was white, black and the pure texture of pure texture of the material and then in other side there were started getting more experimental and which leaded to the post modern movement.

Now, also there is Noguchi's work we have shown earlier; the Noguchi table which was has a curvilinear form and then there was two supporting members which also has a curvilinear form also kind of falls under the streamlining form.

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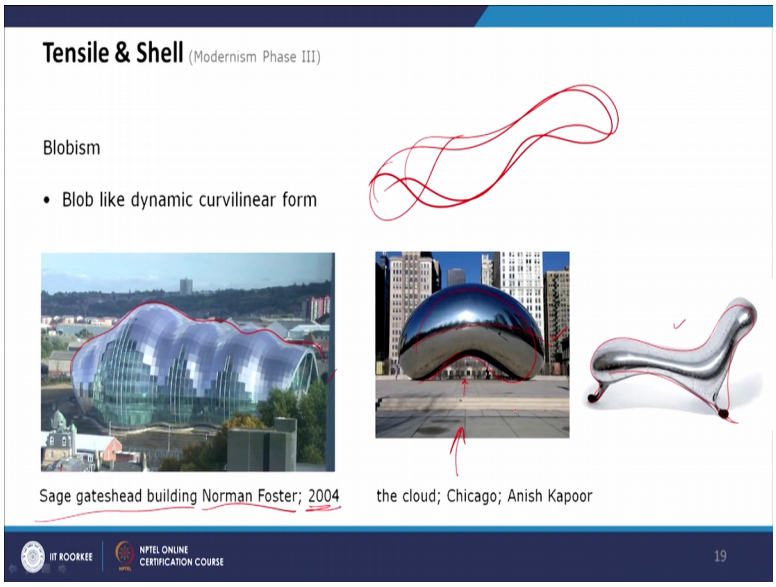

So, there is a another movement which is also similar an[d]- and it can be on the same parallel movement which is called Blobism which where the form is becoming like a blob or blob like thing or amoeboid biomorphic shape and with fluid curvilinear continues curvilinear form and this is called blobism in design and whenever it applied in architecture this is called blobitecture. So blob like dynamic curvilinear continues form this is designed by Norman Foster was one of the famous architect in a post modern movement.

So, these are the continuation of streamlining into the post modern movements. So these all examples of blobitectures are taken from the streamlining, but mostly this is post modern; the philosophy is little different. So it is not just streamlining based on ergonomic, so this looks like a blob or the amoeboid shape or the some it is like a balloon like structure. So this is the Sage gateshead building by Norman Foster; designed quite late in 90, quite after within the post modern era and its looks if you look at the

form it looks like water filled blob of member which is like a amoeba and this is a cloud which is a famous sculpture by Anish Kapoor which is in Chicago this is just reflecting the Chicago skyline into the cloud like structure.

So, here also this is this cloud like structure within you can go inside, so this is like a mirror in a twisted concave and convex mirror which shows the Chicago skyline is also falls under the blobism. And here in this product design also we will see this blob like chair is designed which has a similarity from the streamlining, but it is quite different and aesthetic is more exhilarated than the function null ergonomics and aerodynamics. So that is why it is in the post modern style, but this is the continuation from the streamlining style.

So the next class we will discuss the other phases of the third phase modernism which is brutalism and we will discuss the buildings of brutalism and later we will discuss the metabolism which is the another phases of last part of this modernism. So brutalism and metabolism was the end of modernist movement and then the post modern architectural style started.

Thank you.