Contemporary Architecture and Design
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Lecture - 25
Phases of Modern Architecture- Metabolism

Welcome students to the online NPTEL course Contemporary Architecture and Design. In the previous class we started discuss we discussed about the Brutalist movement which was one of the movement with of the end the third phase which is the last phase of modernist movement.

So, today we will discuss about the metabolist movement which sometimes it connects an amalgamates with the Brutalist movement. As we have- we have discussed that Brutalist movement is the principle of the key features of the Brutalist movement is the visual a particular kind of aesthetics, which derived from the concrete the reinforced concrete and the robustness of the material. And it can also be with purity of the material of other element- other material for example, break for break brutalism and it can sometimes be replaced with stone as well.

So, the visual aesthetics of this brutalism sometime blend with metabolist principle because, metabolism started with the key feature of metabolism is the special arrangement. The how difference spaces of a building will be arranged that is what defines metabolism.

So, the metabolism we will discuss how what is the criteria of metabolism and how a building falls under metabolist movement with it is special arrangement and also there is other requirement like how it has to be modular it can be changed. So, this ethics or the design principle which comes from metabolism can also be blended with Brutalist movement.

So, sometime it got blended for example, this Paul Rudolfs Yale art and architecture school which we were discussing in the previous class in brutalism where we are seeing from outside the robust services where there which is we will discuss how it was a fusion of brutalism and metabolism. But, in some cases a building can be only within a metabolist movement. So, that can also happen. So, there are many examples for that as

well and as brutalism metabolism is also movement where it is only started in it is only in architecture.

Because, the functional requirement and the principle of arrangement of space is the key feature of this metabolist movement so, that is what makes the metabolist movement that is what the stylistic feature of the metabolist movement. So, it cannot be in art and cannot be in design, but there is a connection with industrial design how because the concept of metabolism few concepts of metabolism was there in industrial design in the previous era.

And we were also discussing that one few of Brutalist movement can also be classified and the critical regionalist movement and for example, the Dhaka parliament building which is designed by Louis- Kahn. So, he imbibed this material of bamboo so, one of the features of the brutalism was the form work of the concrete form work will give the texture of the from because of the exposed concrete without being plaster.

So, in that case the form work was bamboo and then the water and other elements and arches were taken from this Indian sub continents and history. So, those were there so, that is why it can be within the different architecture movement which is critical regionalism which is opposite to internationalist movement which talks about no context in the building.

So, it can also be so, that is the post modern building. So, all these cases so, which happened after this world war many of this movement which was there in third phase which ultra modern or late modern can also be translate- was translated in to the post modern movement few of this feature. And similarly metabolism did not influence architecture- design and art directly, but few of the metabolist style was later carried on in the post modern style like high tech where the exposing the services and other elements become an aesthetics feature.

So, that can that went in the industrial and auto mobile design. So, there was a connection. So, when not directly the metabolism movement- movement, if you look at the time line.

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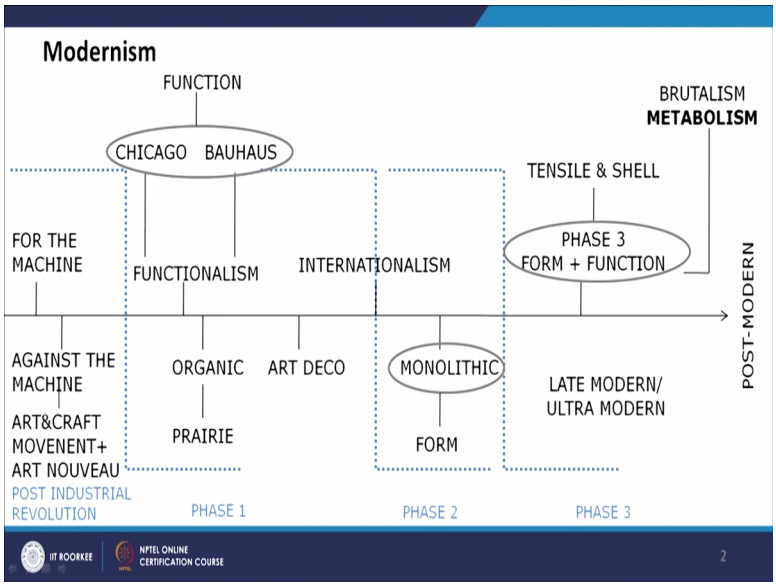

So, we will see that this brutalism and metabolism is at the end of modernism and after that post modernism started. So, these tensile brutalism and metabolism is in between modernism and post modernism and many of this features like we have also seen that shell structures the designer like Calatrava they were- used shell structure in the post modern building as well. So, as the brutalism and metabolism styles were also used in few of the post modern movement.

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So, this is one of the example of metabolism and which also falls under brutalism it designed by Louis Kahn Richard medical lab.

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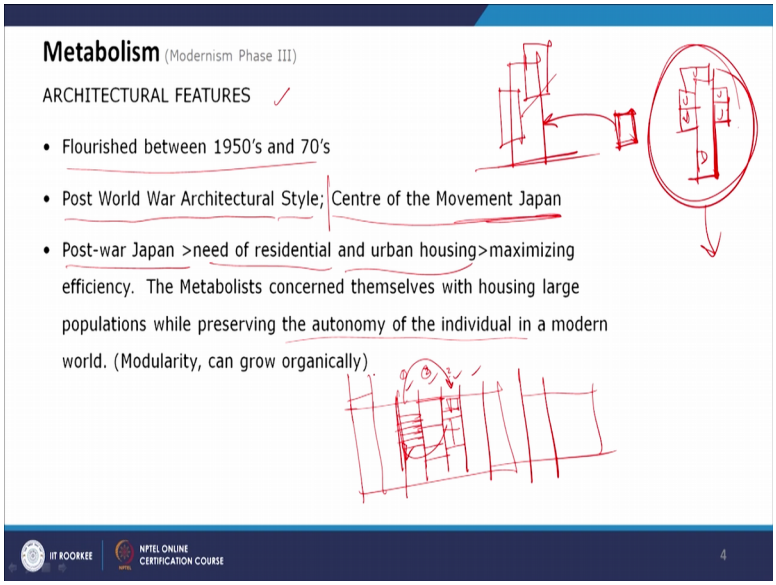

We will discuss about this in detail. So, if we look at the architectural features.

So, this flourished between 1950's and 1970's which is on same time line of brutalism. So, they evolved together in parallely. So, it is the post world war architecture style and the centre of this movement of Japan so, many of these post world war architecture style if we look at in the phase 3.

So, these are all post world war architecture style. So, this tensile and shell and brutalism metabolism these are all post world war architecture style and after that these are almost in starting into the 1950's to 70's. So, these are the post world war architecture style and in these cases. So, the previous- during the world war there was a crises in the society that the economic crises was there and the social crises were there, there was war going on that is why the movement of these movements functionalism and other internationalist movement was during the world war and.

So, their approach towards the architecture was quiet different and then post world war architecture was very different because of the social and social cultural context was very very different from this world war era and the money was and the financial structure was different and the requirement was very different.

So, also we have seen in the international- tensile and shell structure we have seen Kenzo Tangs work in Japan and the. So, Japan also started becoming coming in to the lime light in this post world war movement. Before the world war and during the world war all of this movement was mostly in Europe and USA.

But, right now after these post world war movement after world war there was this turmoil situation and after that when then this situation was getting over come and with by this by the different countries and then it start flourishing all over the world it is not just confined in to the Europe and USA.

And why Japan because in metabolism in Japan because post this after world war 2 Japan got devastated 2 of the cities Hiroshima and nagasaki- Nagasaki was devastated by the automatic bomb blast. And the rest of the countries also in a turmoil situation and that is why the need of the Japan was a residential quick emergence of residential and other infrastructure building in urban housing. And that is why the requirement of making quick design and quick construction process which can be iterated based on the need of the people.

So, when one construction is done and if it is not functioning it should not be demolished. So, there was should be provision of changing it iterating it without creating- creating much of without investing, without losing much financial a element and destroying the building. So, there can- the building can be moldable and based on the requirement. So, that was one need and quick construction was another need.

So, that is why the metabolist- metabolist architect concerned themselves with the housing of large population while preserving the autonomy of the individual individuality in the modern world. So, the individuality of this people has to be catered to that is why . So, if there is a voice of customer the customer need is there in the design. So, there was less chance of this design of becoming the design to be failure.

So, this was not an autocratic design by an architect. So, architect is involving the uses opinion or the voice of customer into the design the process of design- design is which we have design- talked about meta design in industrial design when George Nelson was creating this process. So, this is also similar process were participatory approach of participation of all the stake holders specially the individuals were imbibed imbibed into the design. So, this is also called the process of co design where designers and the user

they design together that is why their voice and will be there in the design. So, why- how their voice is there.

So, designer will create some module or some particular element of design and users are allowed to change the design in some parts. So, together the holistic image of this design will be a manifestation of designers element as well as the users element. So, together this will create the image of a design. So, it is not just one particular only the designer is designing a whole thing and then it is nothing can be added and nothing can be subtracted.

So, this concept was also there we were discussing when George Nelson was designing the office cubicles as well as the storage wall when George nelson is designing the storage wall he is designing the module. Now, one module can have many storage of small amount and another module can have larger and few storage and there can be many other element of mixture of different kind of storage. Now, these are one different modules which is he is designing module a module b or some other numbering can be done. Now, based on this wall area user can have many numbers of module and they can have the series according to their need.

So, this can come here this can come there and they can add more they can delete few and same thing can happen in the. So, this is the this is the concept which George Nelson have design- have told in tomorrow's house which has been discussed earlier in the previous internationalist movement. And the corresponding design movement in the internationalism, but here this concept which was there in the industrial design level has been translated into the city level and building level. So, it have even so, in the building level definitely it got translated it also got translating the city planning level.

So, in these so, the same connect of modularity and the organic growth one can be added and it can organically grow in different direction because the storage wall is not a fixed does not have a fixed dimension, it can be added. It can also be added on top based on the height of this of height of this building. So, that was the concept of contemporary storage wall which also we see the kitchen cabinets are designed based on the similar concept. So, these concept has been translated into the architecture by this Japanese metabolist architects.

So, the process of metabolism why this term metabolism came. So, metabolism came from the way of living organism how they maintain the lives specially the plants.

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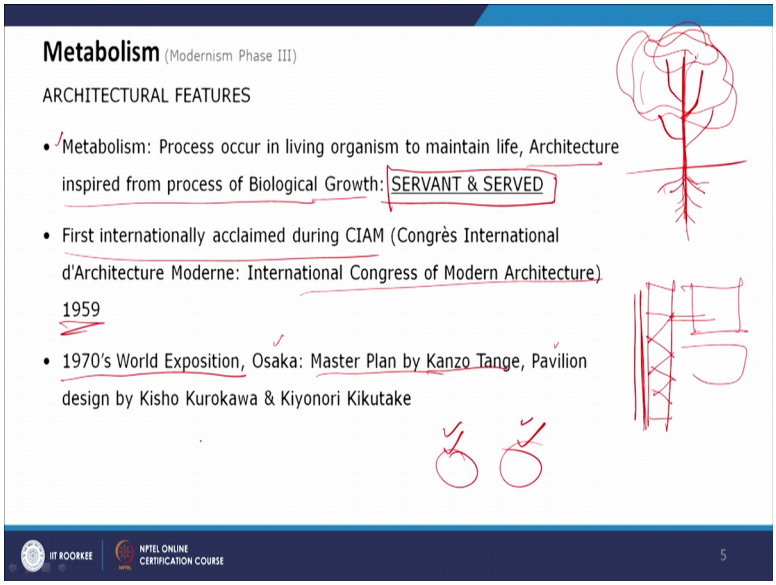

So, if we look at the plants and the architect inspired- got inspired from this process of biological growth and this concept is called the servant and served. So, in in the architecture they have divided 2 spaces, one is servant spaces and another is served spaces. So, in plant also they have conceptually divided into 2 spaces.

So, what happens in plants? So, plants root and stem according to them is a servant spaces. So, they what do they serve? So, they collect the nutrition and the water and the nutrient raw elements and the water from the soil and then they transfer this to the steam to the canopy or the body of the plant. Now, the canopy or the body of the plant now the canopy of the plant gets all these nutrition and then they do the photosynthesis and transfer the nutrition of the food in the in the total body of this plant. So, this is acting as a service- servicing and the transferring elements or the transfer the transportation of the different element.

So, in this architecture similarly this plumbing lines civil lines they transport different element. So, plumbing line supply the water- water and civil line takes the solid ways and transfer it away from this building. Similarly, also the staircase they serve for this vertical transportation of people from one floor to the other and the corridors. So, these are the services and of course, the electricity line.

So, these electricity shafts and these plumbing and civil shafts those are the servant or the service course. And the rest of the things like the rooms and the conference hall other class rooms of a departmental building or the there is in the residential building bed rooms or living come dining kitchen- not kitchen and other rooms will be the served spaces where people will leave and do the other functions.

So, so, they have divided this servant and served into 2 different functions and here it is already it is not they have divided because it is already there, but they designed these 2 into different way. So, earlier if you look at the other examples of the building for example, if you look at Robbie house or the lake shore drive apartment which is a designed by Van Der Rohe which is just a cube.

And you will not see these servant spaces or staircases and other spaces which is serving the building from outside, even if you look at the (Refer Time: 16:55) we will not see the servant spaces from outside. So, it will be a form, form was more important holistically, but here in this metabolism servant spaces and serve spaces, but designed in different way and they are visually equally important.

So, all the servant spaces from outside of the building the servant spaces of the skeletal structure and the services will be visible and from outside you will make out that these are the areas where the servant spaces are there. The level changing devices was- for example, staircases and lift lobbies lift lifts are there are the vertical services or shafts are there and that creates a visual element.

So, that was function- visually that also that is not subdural, that is does not come in to the back ground that also comes as a focal point. So, here in the term this metabolism first internationally acclaimed during the CIAM Congress International d'Architecture Modern in English International Congress, Congress of modern architecture 1959, almost in the between 1950's and at the end of 1950's.

In 1970's world exposition which happened in Japan Osaka, this exposition was designed according to the metabolist style. So, this master plan of the planning of the arrangement of this symposium was done by Kanzo Tange and the pavilions were designed by Kisho Kurokawa and Kiyonori Kikutake. Who are also metabolist architect and designer they have designed this pavilions.

Similarly, we have seen this involved exposition there was Chicago movement, arts nouveau movement. many of the movements come from this exposition and this metabolist movement came from this Japan Osaka's world exposition in 1970's.

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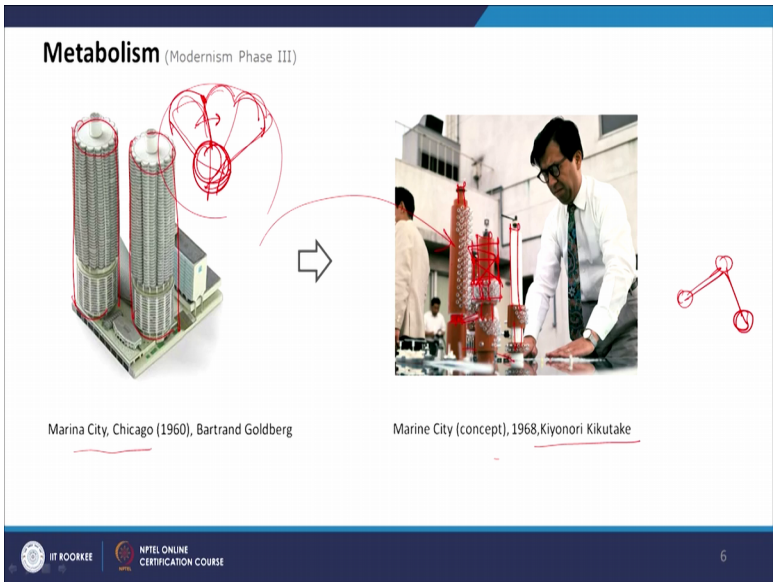

So, one of the example which in the city level which was Marine city concept it is design- given by Kiyonori Kikutake.

So, this was only a concept this was not build, but this concept was again a coming from these Japans need of a quick infrastructure and hosting larger population in a particular small area. So, as it got devastated after the post war- war situation. So, Kikutake have envision that it can also flow on the water and the water they can be a concept of a city, but due to the other construction issues on the water earth quake and other disaster- because of this disaster it was just a concept, but it was form a metabolist aspect.

So, and this concept was you- we have already designed Marina city, the concept of Marina city has been translated here in the Marine city concept of Japan Marina city was designed in Chicago and which comes under the monolithic movement. Because, in the Marina city the concept of design was creating twin cylinders, it was not creating servant and serve spaces in a different in a different way.

But, if you look at the design on the plan if you member that this has a service core which contains all the services the level changing devices of the lift lobbies. And the

shafts which will contain the plumbing and civil line and electricity line in the centre and from outside there is this services spaces of this rooms were they are from the outside and that creates the cylinder.

So, the same concept was translated here and a what he is doing in Marine city here this is more exaggerated because in some time- some area there was punctuation and you see this service core and from outside this rooms will be added. So, sometime it is just the service core visible and the room will be added.

So, if there is more need and then the room will be added over here as well and it can grow and these cities are connected with this sky line, we can see this is connected with service core to service core is connected that is why there is a punctuation. And also this service core this or this horizontal member will be also visually visible- seen from outside and many of the time this service core will be just without the cladding. So, that is why the servant and serve spaces will be interlocked with each other service cores and now based on this need of the user it can be they can-. So, all these elements are modular.

So, this can be contextualized as a modular unit and then can be joined or can also be removed. But, here in the Marina city this concept was not there they can join too or is this modular concept was not there. Because, the Marine city is coming from a totally visual perspective of creating cylinder , but this concept of Marina city is coming from a concept of a creating a cylinders.

But, Marine city is coming from a concept of a metabolism where services will be design- designed and then served spaces will be fitted into according to the modular need. So, he is using these modular elements to create different change and that will be totally based on the users requirement when the user feel like a creating more there is a need from the user side, it will be created. So, this is not design which is fixed.

So, it can be added, it can be subtracted and this is dynamic. So, there was a conceptual difference between these 2, but the concept came from the Marine city Marina city.

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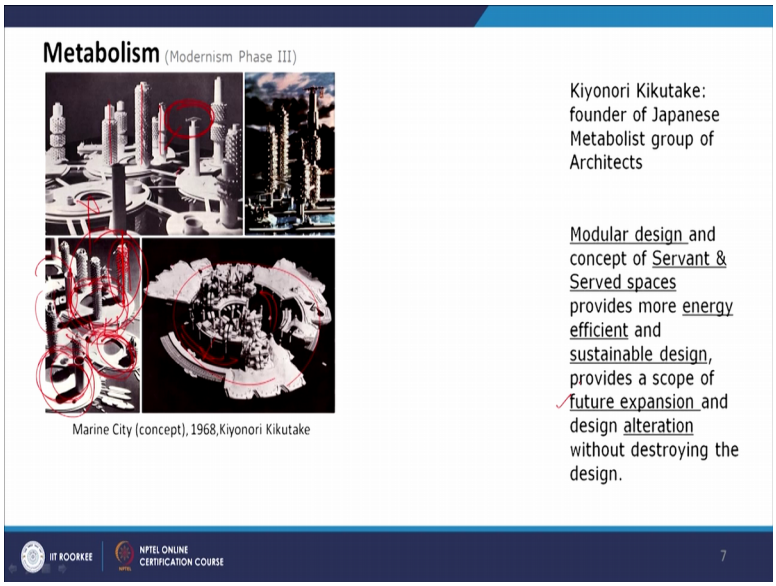

Now, from plan it looks like there is. So, this is floating on a water and these service cores design and then this service cores creates a common space and these neighborhood level can be joined as a many other neighbor neighborhood and it can create a city and it can grow. And now this is not just one module where there is a services. So, if you consider this the servant and served is different.

So, in this module servant is the service core and served spaces are the modules around this. So, this is only the service core is visible. Now, if you consider this the servant space is this and these are the modules. So, modularity is changing so, here the modular's modularity is the smaller apartments. So, here the modular is 1 or 2 floating platforms these are the module and now you add more module it can be it can you can add another module over here or you can subtract one module from here and it can grow organically.

So, this is the modularity is added in a different concepts. So, totally in this city will look like this and many other another row can be added. So, this is a fluid design. So, Kiyonori Kikutake is also the founder of Japanese metabolist group of architects. So, he is one of the pioneer and the modular design is one of the concept of servant serve spaces provides more energy, efficiency because a the there was no requirement to change the services because that that will be design first.

And this is most sustainable because you do not need to demolish the building; you just change the served spaces according to the need of the user. And there is a future

expansion is very easy and that the design concept is evolved from the future perspective of future expansion and as well as alteration without destroying the design.

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Now, another example of in a building level is a Nagakin Capsule- capsule tower which is designed in 1972 by Kisho Kurokowa who was also part of this pavilion in the 196 70's explosion.

So, here in this building level same concept is designed. So, this is a service core which is visible and has a different color into it and this is protruding out from this serve spaces. So, here in this- you can see. So, this has a visual- visual element and because of this arrangement which is very dynamic arrangement of this different module, the you can visually think there is steam inside this and which is protruding out.

So, this there is a access is which is also visually protruding out is having lot of emphasis because, other form is very dynamic and does not have a particular a strong facade. So, this is very fluid, but the strong thing is the access. So, the access is getting a very important visual attention in the design, the 2 access are there. These 2 access are getting a visual attention that is why the services are has a visual importance in this design. So, here also the prefabricated capsules were manufactured by shipping container manufacturer.

So, you can see so, it looks like a shipping container, but these is not design form a shipping container which has a toxic element that is why it is designed form a shipping containers manufacture- by shipping containers manufacture and looks like a shipping container, but not a reuse of a shipping container. And this is these are the modular elements and it can be a combined 2 modules can be combined and it can be reoriented in different direction. So, in this is oriented in this direction, this is the oriented in the other direction from the same service core based on the requirement.

So, their designed requirement also changes based on changes and that is getting reflected in the design. So, it is not a fixed design and it changes and from inside if you look at. So, this has a within a very small space an incorporating industrial design and other elements.

So, these are all industrial design interventions based on these it is interior is fitted within a very small space of a small livable space. All these and all these amenities are there in a very small space without losing the life style of a city life. It got constructed within one month because of this modularity and it is definitely fluid. So, it can be translated. So, 1 140 modular capsules like habitable unites by plugged into 2 service cores.

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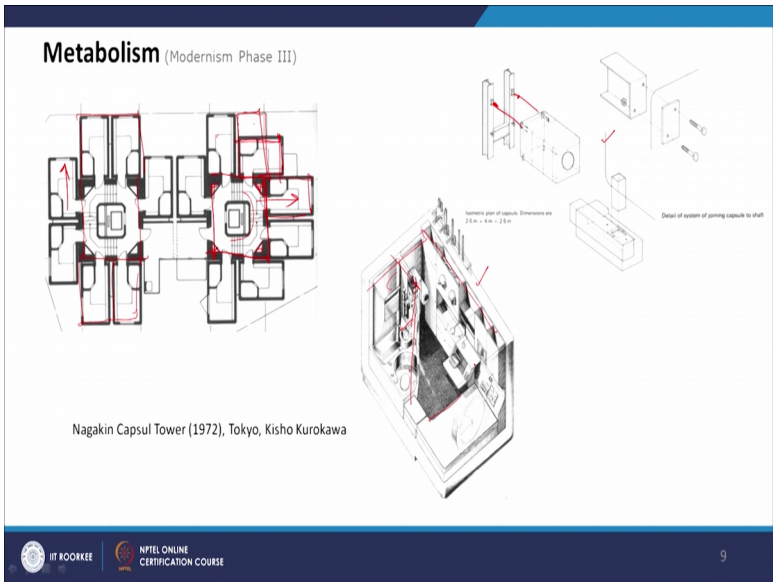

So, this a if you look at this plan so, this is the service core with the staircase and lift lobby together and this ducts with other services which are which can be there from

within. So, here from this there can be different arrangements. So, this arrangements are shown in different way.

So, it can be an arrangement in this direction, it can be an arrangement in this direction. If 2 are there so, this can create symmetry or you can lose the symmetry and creating different way. So, this can be arranged in vertical direction as well as in this direction from the similar way, way of service core and the other that is why so.

So, this design is totally depended on the how you want to use the module and it can be reoriented and this is fluid. And the way of adding the adding the module which is shown here and this design as we are saying this is design by shipping container manufacturer and it can be snap fitted into the service core. And this is one element of the design and you can see how much industrial design level treatment was there within the building.

So, this toilet also has a lot of facility in a very small space and this living area is totally imbibed with the combination with the industrial design and architecture.

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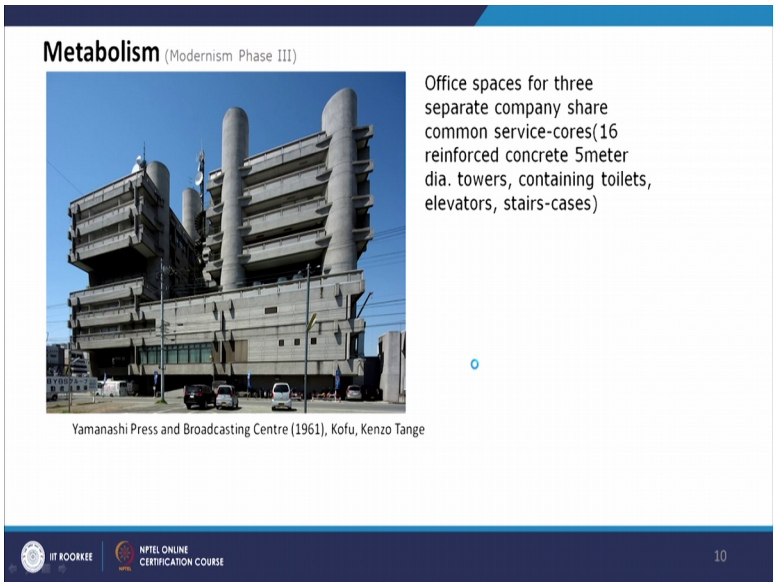

Another example of a little larger scale is Yamanashi press centre press and broadcasting centre which is designed 1961 at Kofu again in Japan Kenzo Tange himself.

So, here there are 16 this is office space of the 3 different companies are there and then companies need can also change. So, company might in want to increase their office space might also sell their office spaces that is why there is a dynamic use of need of a

requirement was catered to. And then there is a common service cores which has 16 reinforced concrete, 5 meter dia cores which are these which contains the toilet us elevators and staircases which all are servant spaces.

These are designed, these are fixed and then different floors were added in different levels to create these are the service spaces. So, from outside the servant spaces has lot of visual emphasis because they are not rectilinear the rest of building is rectilinear and this has a robust cylindrical element.

So, if this style of design from rectilinear to cylindrical it changes then cylinder will also have an emphasis if this becomes rectilinear and short and if you delete these a chunks and it becomes rectilinear. So, the emphasis visual emphasis will dilute will be diluted because, this is then it blend with a servant spaces because this is a circular and cylindrical. So, it has it is own visual importance. So, if you look at the design.

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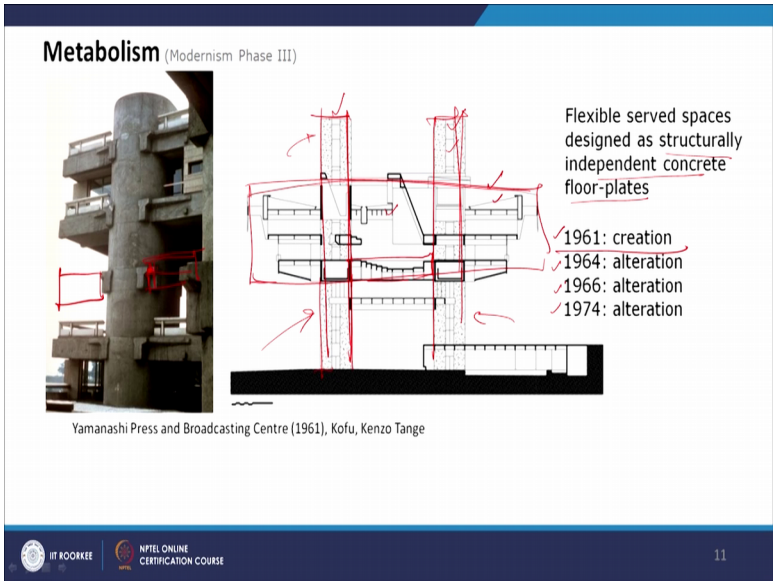

So, these designs so, here another flow can be added if required. So, here there is a there is a also the structural elements are there so, that the floor can be added so, if required. So, this design is also fluid and from inside if you look at the section, it also has a lot of visual emphasis because it can be seen from outside this robust pillars can be seen from outside.

And this looks like this servant spaces are the structural and the strong elements which are holding the canopy which is holding the served spaces like a tree and this is becoming the stem of the tree (Refer time: 32:00). And then the canopy is floating and this holding that and the flexibility of a served spaces the served spaces are flexible and that are the dynamic and servant spaces are the fixed spaces are structurally independent concrete flow plates are there.

So, as the as these spaces these are structurally independent another module can be taken and just added here in the as a floor plate because, these are structurally in independent which is there in the Nagakin capsule tower as well. That is why after the creation in 1961 in several in 3 stages this got altered, if this was a fixed design, this should could have demolished or managed within the within the building.

And because this was the servant and served spaces by change and because of this design differently and the concept of the modularity was added, that is why it was successfully altered based on the change of requirement. Another example of the similar concept was press and broadcasting tower of a Shizuoka.

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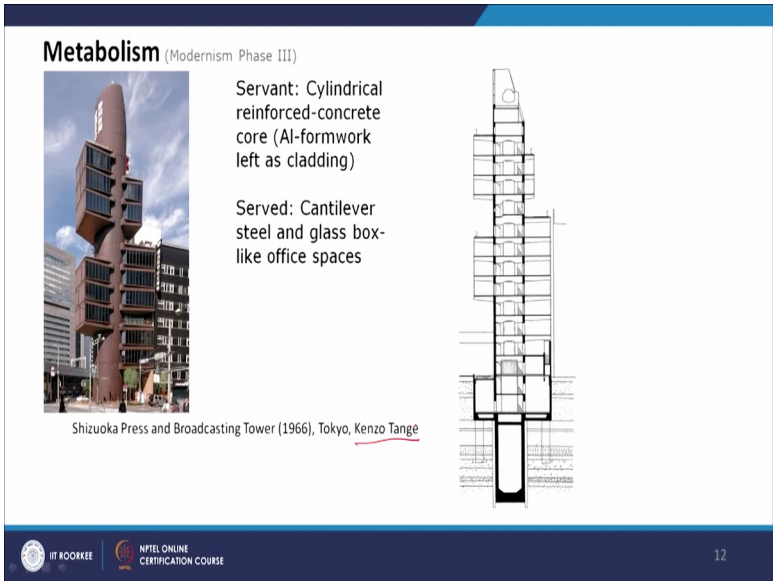

Which is again designed by Kenzo Tange in Tokyo the capital of Japan, here also you can easily understand, this is the service servant spaces, which is a cylindrical reinforced concrete core. And the core is reinforced concrete, but what we are seeing is the form work, we will discuss the form work that the concrete form work which they used to take

out and the mark will be there in the Brutalist movement. But, the here the form work was left and it looks like cladding around the concrete in reinforced concrete structure.

So, we are seeing the form work which was designed properly and left like that and here as well another module can be added and it can it is a dynamic design. And served spaces are the cantilever steel and glass box like office spaces.

So, here we will see lot of steel lot of glass. So, it look fragile and this service could looks visually heavy. So, servant always looks visually heavy and served spaces look visually fragile in metabolism, in many of the other designs. So, served spaces will be designed in a very fragile way and they will be cantilever and they will kook visually light weight and the served spaces servant spaces will look visually robust.

So, that was also happing in the Yamanashi press centre. So, the servant spaces are looking visually robust and you would not see you are not seeing anywhere fenestration from here. But, here it is it is it is like smaller plates and lot of vertical lines are there in their hanging and their just floating- they are looks like they are floating and they are just hanging from this served spaces that looks very light weight.

So, similar things are happening over here as well.

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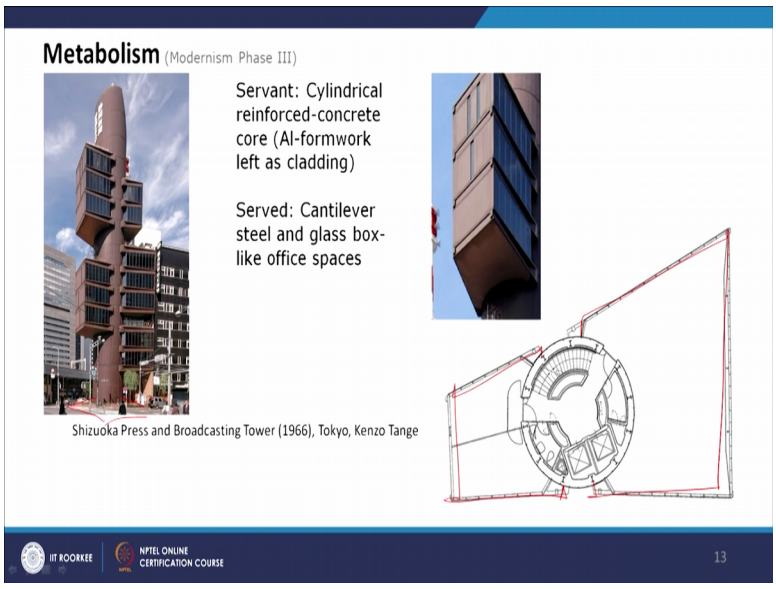

So, if we look at they are 2 different modules, one side this like this and another side is here and it is designed in a very small space. So, if you look at the footprint of the

building it is very small. So, that was also the need of Japan. So, within a very small space the infrastructure has to be developed. That is why in the, they started blending industrial design and architecture which we have seen in the Nagakin capsule tower.

And that is why they could not go for traditional construction, they had to think for differently and went to shipping continent manufacture and started designing the building by them.

So, another example of metabolism is by the famous architect Louis Kahn in Richard medical lab in Pennsylvania this image we were showing in the time line. So, here we can from just looking at the building.

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We can we can see what is the servant spaces and what is the served spaces.

So, these are visually heavy core servant or service cores. So, which we can just looking at the building we can make out. So, these are the lift and staircases and plumbing lines and electricity lines are within that.

So, here we can see after this level this is all after this is a mumty rooms. So, this level this is all void. So, this is intentionally it a protruded and we can also see from outside this facade are just protruded the on the tops. So, this is also adding extra volume is adding to towards is robustness and the visual emphasis.

So, these are actually the visual creating a visual emphasis and the focal point of this of of this building and if we look at the serve spaces they are lot of fenestration and this looks light weight because they entrance is here and this cantilever this all build this elements is hanging from this served spaces.

So, all over this is all cantilever only this service cores are coming down in the to the to the ground and this visually looks like this is taking the load of this building.

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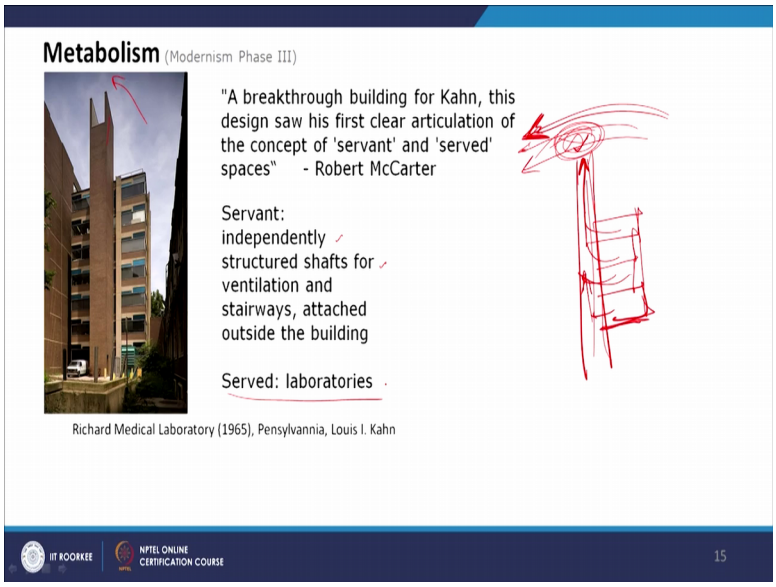

So, this is a breakthrough building for Khan and this design saw the first clear articulation of servant spaces and served spaces, which is designed by Louis Kahn and this has been converted by Robert McCartney. And he say that this is he is one of the important building of metabolist era. So, servant spaces are the independence structure shafts for ventilation as well as this stairways and these shafts also for the ventilation.

So, there is a stack effect and these water- if the wind goes from top and if there is a void from this room. So, because of this motion of the wind, we know that because of the Venturi effects.

So, there will be decrease of wind pressure, because of the decrease of the a wind pressure this wind will be sucked from this void and from this room all these wind will automatically go and it will the ventilation will be easy and without.

So, the a load of ventilation mechanical load the electrical load will be less. So, it is happening automatically if the wind flows from top and the, we all know that the wind on top is much (refer Time: 39:00) the velocity of wind on top is higher than ground. Because, in the in the ground there are lot of barriers the trees are there the top the wind velocity is much more. If the velocity increases the pressure will decrease and it will suck the wind from this rooms. So, that that is also servant spaces because this is serving the building as a cooling and ventilation instead of just supplying electricity, this is another way of services.

So, that is also added as a servant spaces which is shown- seeing from outside. A served spaces are the laboratory because this is a lab and the laboratory spaces other class rooms and other elements were served spaces.

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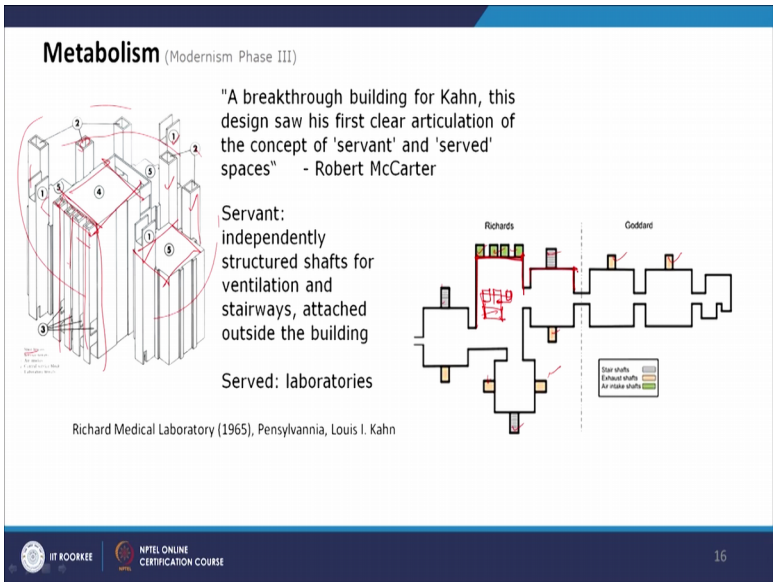

So, here if we look at so, all these are the air intake ducts, which is see a which will be visible from outside. So, this is the staircase tower and this one are the staircase towers and this is the services towers from plumbing an electricity lines. This is all elements are added around the building and only this the served spaces and services are around the facade and that creates the visual of this building and from outside we see more of the services because, volume wise the servant spaces are much lesser.

So, only these are the volume of the servant spaces. So, that creates and services spaces the laboratory areas volume wise it was much more , but servant spaces were covering

the served spaces that is why we are seeing the served spaces around the building. So, from outside all the served spaces were outside that that was intentionally kept and shown from outside. So, the servant spaces are creating as a visual as a used as a visual elements. Otherwise, in the previous connotation the servant spaces on the lift machine-lobbies and other things will be inside.

So, that nobody can see it and from outside the only the served spaces will be visible and the connotation was only the served spaces was earlier it was it was thought that served spaces look beautiful from outside. But, staircases and shafts does not look good. But, here in metabolist architect architects break the broke the connotation and they used servant spaces as aesthetics elements.

So, similar in the metabolist concept there was Tokyo bay master plan was designed in 1960 and there was many concepts designed for the Tokyo bay master plan. It was in the same line of the Marine city on the lagoon they has to be in this bay there has to be a city, which has to be developed.

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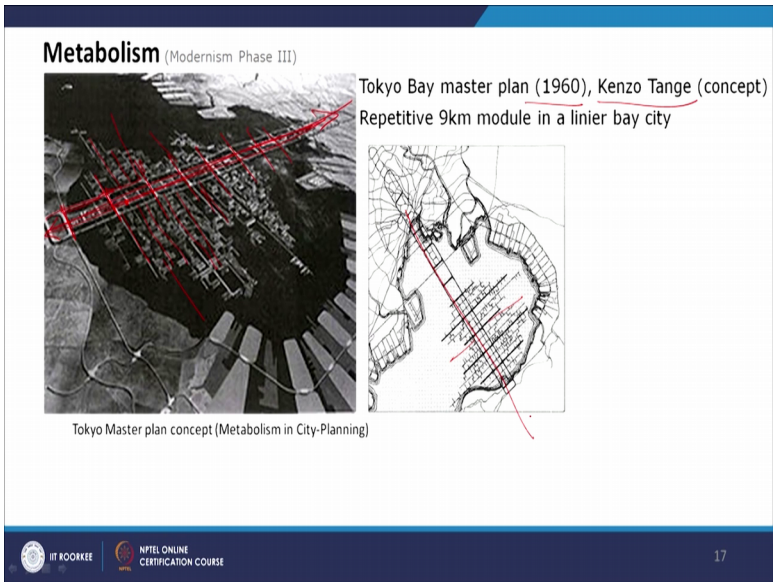

So, here in this Kenzo Tanges concept which is a repetitive 9 kilometer module in a linier bay city. So, this is the line this is the 9 kilometer module which he is designing and this is the services all the services, roads or the infrastructure will be in this access and that is the service- and the servant core and this will be the services which can grow like algae on the water.

So, this is again coming from concept of organic metabolism. So, all these nutrition of this algae will come from here, it will grow like this on the city. So, these all service cores will have the infrastructure and from here, it can be added, it can be deleted and it can grow organically from this particular this 9 kilometer module of service core.

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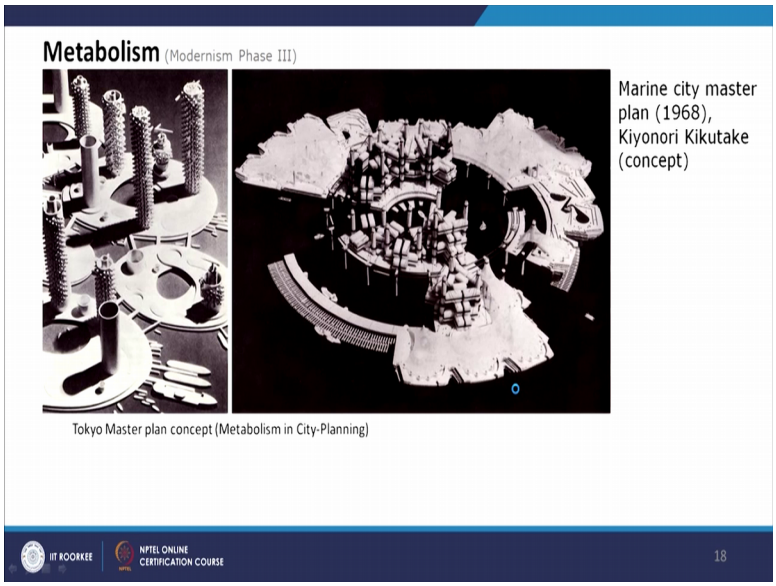

Now, another concept was definitely the Marine city itself which was designed in for the same thing.

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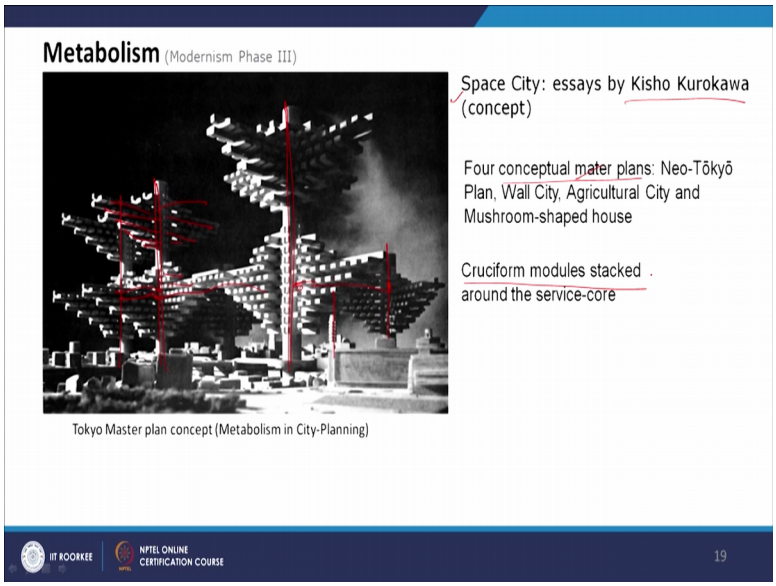

And the another concept which is design for a city designed because after destruction of major cities of Japan and this started making the concept of cities which can have a very small footprint and can grow organically with the concept of servant and served.

So, this is the space city this is also just a concept by Kisho Kurokowa he design- he gave this concept of this space city this was just a conceptual plan and then there will be this only this towers which will which will have this service cores and from here in this space a serve spaces will grow from here organically.

So, this was not on the water, but this is on the land the way the service cores will be there and from there this organically this build forms will grow and they can even merge with 2, 2 service cores for the structure stability and that is how the city will grow on the sky.

So, this is like cruciform modules and stacked around and this modules will be stacked around this service cores.

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Now, we were talking about this world exposition of 1917 Osaka which was Kisho Kurokowa and Kikutake have designed this pavilion and Kanzo Tange was given the master plan. So, in the pavilion also this similar concept was designed in a smaller level. So, it was just a pavilion so, this was the service cores and this pavilions or hung around

this service cores and also the modularity concept of modularity was added in the space frame of this vocalized-noised service core in some of the pavilion.

So, pavilion had the pure concept of the metabolism where this around this service core which is the vertical lift and other staircases were there and then served spaces were there. And just the modular concept was also added in some of the service- pavilion where it looks like extra (Refer Time: 45:10) futuristic space frame which can be which looks like a it can grow in any deduction. So, it is not a fixed particular form which was flourished in a monolithic and tensile shell there will be a particular perceivable form.

So, it looks it can grow and in any direction in organically. So, that that concept of metabolism was there in this pavilion, but there is no servant and served spaces concept was there in this pavilion. So, the impact of metabolism got carried forward in the later phases in the in the architectural design.

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In high tech architecture, which is in post modern movement will discuss that post modernist when we will discuss post modernism. So, here in Pompodou centre which is high tech a design in 1977, which is just in a in the verge of emergence of a post modernism is designed by Renzo Piano and (Refer Time: 46:10) in a Paris.

So, all this building the function functional elements are there within the building, but from outside all what you are seeing in the building facade is the services of the building.

So, all these services pipe lines and they have- they have different colors for each and different pipe lines are visible from the outside and that is the aesthetics and that is the envelop of the building. So, served spaces aesthetics becomes important in the in this building. So, similarly and in other building in London Lloyds building, Richard Rogers is the same architect who design Pompidou with the Ranzo Piano, use the same concept and this (Refer time: 47:00) falls under high tech architecture.

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But, all these services and this spaces like staircases lift rooms and then pipe lines these are all pipe lines which is visible from outside that creates the aesthetics and style of this building. next class we will discuss the new Brutalist movement where the metabolism , brutalism fuses with each other with examples of Indian architecture and where many of the Indian architects and or the foreign architects who designed in India have used this particular art architectural movement in the design.