Modern Indian Architecture
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Lecture 36
Search for a New Architecture - Part 1

Hello students. As we reach the fag end of this course, we will now look at what to expect in the days to come in the 21st century. We will begin today with a series of 4 presentations on search for a new architecture. What are we searching for? What are the questions it will confront Indian architects and planners in the days to come? What are the critical issues that are important for students of architecture to learn, as we move forward in the coming decades, we already know that the world is changing very, very rapidly.

And the biggest thing that is really changing the world is digital technology. You and I, may have read about it, you may have studied history books about the great impact of the Industrial Revolution, the 19th century and how it totally changed the way of life in every possible way. And how that industrial revolution, then spread all over the world, starting from England and Europe, and the tremendous impact it has had all the industrialization that we see is a consequence of the beginning that was made in the 19th century.

In a similar fashion, we can talk of the digital revolution today, and it is having the same kind of impact or very similar impact as industrial revolution had done. It is completely revolutionising the way we work, the way we study, the way we interact with each other, the way we communicate, the jobs the kind of jobs we have, social cultural, these social cultural interactions that take place, the economy of our country, or economy globally, how trade is done between nations, today, anything you want to buy as is as far away as a click away from you, you can buy anything from anywhere at any time 24 by 7, just buy a click of an app on your cell phone or your tablet or on your laptop.

And this technology that is so rapidly changing is going to become even more radical in the days to come. But along with that are coming up many many serious problems that we will have to deal with. One of the problems for example, in the case when we look at the construction sector is that increasing urbanization.

Now, the same thing happened during the time of the beginning of the, from the time industrialization setting, that there was a movement from land to cities to urban areas. And

this has momentum has only increased as time has passed by. For example, in India, the urban population in 2001 was 286 million or 28.6 crore people and this is going to shoot up to around 59 crore for 590 million people by 2030.

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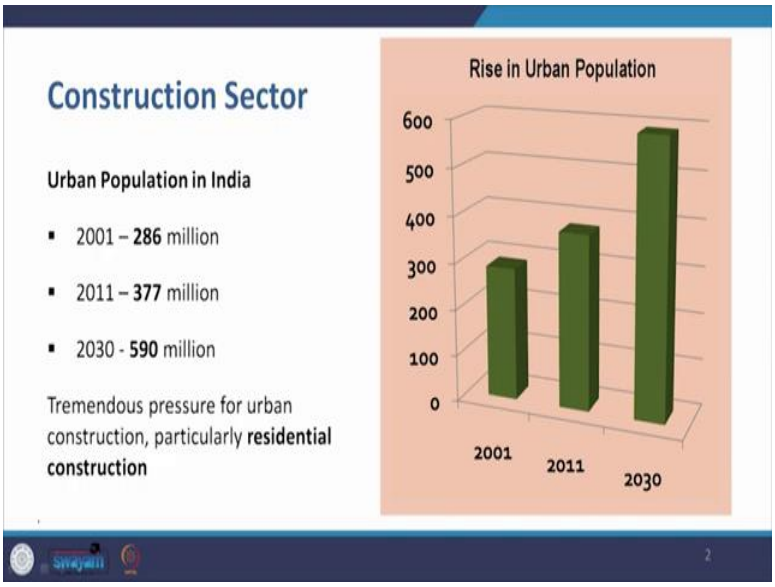

There will be at that point on time approximately 40 percent of our population. Tremendous pressure is coming on urban construction, particularly residential construction. Now, it is obvious that increasing construction activity though necessary for a growing economy like India is going to lead to some repercussions.

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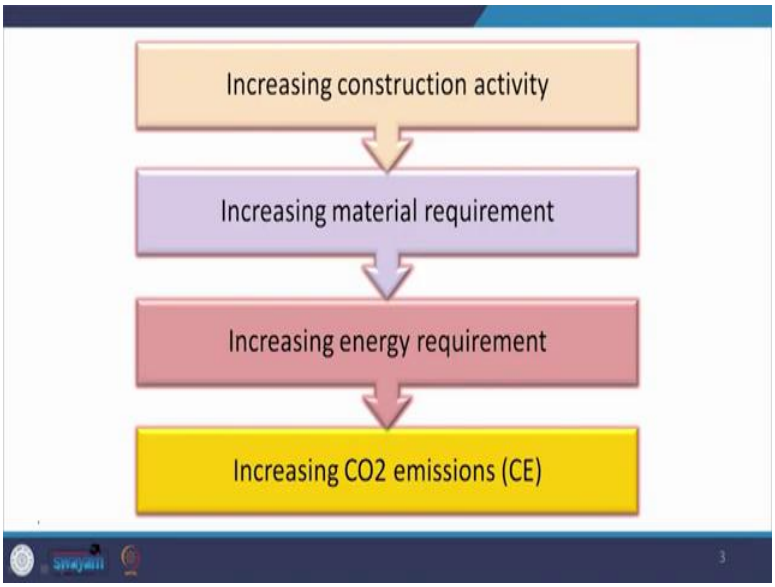

It will require increasing amount of materials that will require increasing energy to manufacture them. And that increasing energy will result in increasing carbon emissions because we use non renewable resources like coal, for example, to produce the energy needed to manufacture the materials as a result of, because this is a global impact. And this is not only happening in India, it is happening all over the world, in both industrialized and industrializing nations.

Carbon emission rise will lead to rise in global warming, you might have read about it, heard about it. And it is said that if there is a 1.5 degrees centigrade rise in temperature from pre industrial levels, that means right at the very cusp level of an industrial revolution actually began the very point from that moment, if the temperature rises globally by 1.5 degrees celsius, there will be an near irreversible change in our climate system.

Now you might think that this is global, we can control it, but please understand the real problem the real problem is that recently you might have heard of COP26, that was held. And around that time, the UN came up with a report and they declared what is called as cold red, which means that the global temperature is likely to rise by 5 degrees celsius in the next 20 years.

So, that totally throws out of the window, the point the 1.5 degrees celsius to industrial level rise, because this is way too much, the impact is going to be extreme heat waves, drought, flooding, melting glaciers, rising sea levels, and this is already happening.

Floods for example, in Germany that have never heard of before. Recently, there have been massive floods in Pakistan, in regions that normally have never really seen that level of flooding, droughts are happening in parts of the world, when there were never any droughts. Forest fires are happening with increasing degree. And as a result of this, there are rapid and far reaching changes needed in all sectors of the economy.

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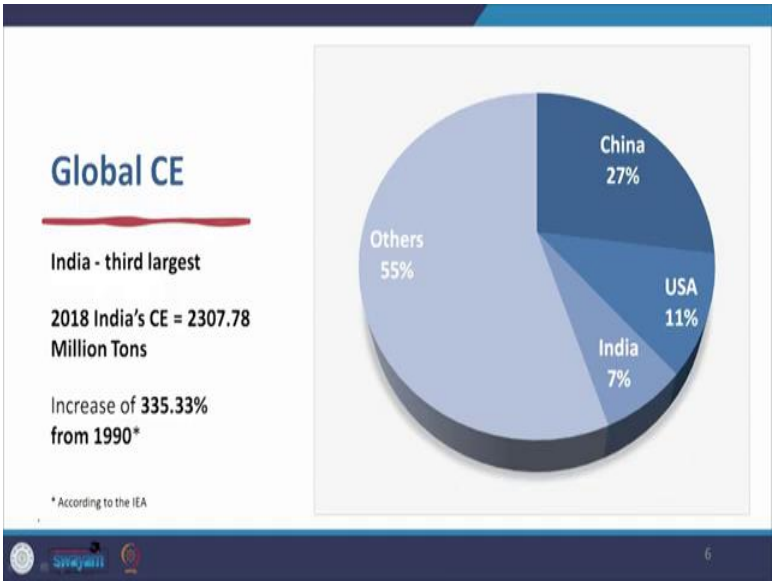

One of the sectors is the one we deal with you and I, that is the construction sector. And India, for example, is the third largest emitter of carbon in the world after the US and China. Now, of course, comparatively, it is much less as a nation, China is 27 percent, India is 7 percent that is still huge.

Now, carbon emissions in buildings, that which concerns us is primarily because of two things. One is in constructing the building and the second is an operating the building. When we construct the building, when we use materials that are manufactured by using energy leading to carbon emissions, that is called as embodied carbon emissions that is the carbon emissions embedded within the building because of the materials.

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The second is operating carbon emission that happens as a result of operating the building air conditioning, heating, digital equipment, lighting, all fixtures et cetera, electrical fixtures, and the total carbon emissions from both these works out to be 38 percent, about 28 percent from operational and about 10 percent from embodied.

Now, this is the figure that has come up in 2020 Global Status Report by United Nations energy program. Now, therefore, both these have to be targeted in order to reduce this carbon emission. I personally work in the area of embodied carbon. But there are a whole lot of people who are focusing a lot of attention on operating carbon. In this particular presentation will tell you the focus that we will be looking at is, on the reduction of operational energy and this operating carbon.

Now, there is sometimes an overlap in the usage of the term sustainable and green, sustainable building and green building of course there is an overlap, but green building happens to be a subset of sustainable building.

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A sustainable building or a sustainable environment includes both environmental, social and economic sustainability, green buildings primarily are focused on environmental sustainability. Therefore, if this is sustainability, it talks about both, 3 things acceptability, equitability, and viability of whatever technology that we are trying to use, for the sake of environment for the sake of people in general the socio social responses, how they, how can we can prevent damage to the social structure and how it can be economically profitable, because any venture that we take up to bring about sustainability must be an economically viable model.

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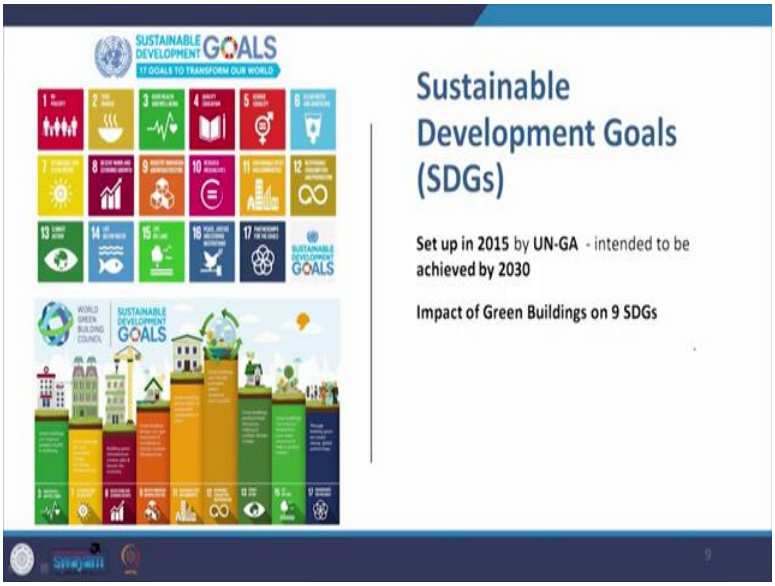

Now, you must have heard of sustainability development goals SDGs, as they are normally called, that initially when assembly in 2015, came up with 17 SDGs are targets sustainability in all sectors of the economy. And the impact of green buildings is associated with nine of these SDGs. As you can see in this slide, you can read it up later.

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Now, green buildings are focused on 3 important things, the SDGs that are linked with it. So, there are 3 things that we focus on, we focus on reducing the negative environmental impact through design, construction and operation of the building.

The picture that you see here is that of the first platinum rated green building in India and continues to be one of the most one of the greenest buildings in India, and that is the IGBC godrej building in Hyderabad it is designed by Karan Grover.

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Now, the green buildings or for, to use a simple term and use the word climate responsive buildings because green talks about many more things, it talks about water deficiency and resource efficiency et cetera, life, because that all of it forms the ambit of environmental sustainability, my focus is going to be on energy and the reduction of energy by, that we can do through buildings and thus leading to reduction in carbon emissions.

Now, why do we need climate responsive buildings or energy efficient buildings? In the earlier days, as I have talked about, when I was talking about critical regional buildings, I was telling you and right from the beginning. We had looked at it, and I had repeatedly mentioned to you that climate is one factor, no architect in working in India can ever neglect, it could not be neglected by the people who came earlier than the modern times, earlier than even the British, the Mughals, all of them had to put in the factor of climate, factor of climate into their buildings.

The British had to do that, Latent and Bakers had to do that and other British architects had to do that commercial Louis Kahn had to do that. And then Indian architects who followed them with modernism they also have to do that, even when AP Kanvinde brought in and Habib Rehman brought in Bauhaus functionalism into India, in its probably purest form, they still

had to modify that Bauhaus concept for Indian climatic conditions by providing Brise soleil and Sun Breakers, et cetera and modifications had to be made.

Now, so as we carried on so many buildings that we have seen in this present course, we were looking at, we were I was constantly repeating the fact that there was a limitation with regard to technology with regard to materials with regard to resources in general.

So, therefore, the architects could not design buildings that were, for example, centrally air conditioned, because that kind of financial resources were very limited to be very constrained in our resources to have buildings like that and run buildings like that. And plus the kind of building technology required, the kind of materials required to produce these buildings in an economically viable manner, was also severely constrained at the time.

Therefore, because of this constraint, the architects were compelled to design the buildings with passive controls. That means the climate response, the building has to be climate responsive, so that the climate will help in providing you occupant comfort, thermal comfort, daylighting without glare, et cetera, et cetera.

So, many buildings you have seen of Korea, Videshi and ontology and so many other architects. So, the focus then was that you have we do not have the resources. Therefore, we have to make our buildings climatically responsive, without the need for mechanical controls, which were severely constrained.

Now when we come to the 21st century, so we are talking about a pre liberalisation period, post liberalisation, India's economy opened up, we have the highest GDP rise in the world, we are a tremendously fast growing economy. We are now one of the strongest economies rising economies in the world.

And we are one in the overall global economic setup, a very important role we are playing right now, as a result of that, we have the required technology, the materials, the resources, the facilities, the economic weight, to create buildings that are actively controlled, centrally conditioned, lot of corporates have entered into India, and they have given us that global image with their buildings and so for, for a fair period of time when there was rapid growth in India, these buildings were built, but now what has happened is there we have the resources, the technology, the materials, et cetera

We suddenly realized as everybody else has realized across the world, is that these buildings are energy guzzling carbon emitting buildings, not directly, but because of the energy they consume.

As a result of that, sustainability today is not a choice. It is a necessity, India has targeted itself, it is committed itself that we will bring down our carbon emissions to about 50 percent of the current levels by 2030 and become carbon neutral by 2070. I mentioned this factor here also, this is an immense target. Please understand this and get it clearly in front of you today. Tomorrow's buildings will be driven by technology.

They will be driven by issues of resilience, climate adaptability or sustainability, they will be driven by digital technology. As a result of that it is vital for you to build your foundation in more and more technology. I am not saying that you have to do advanced level courses, but I am saying that you have to have a very good idea of how buildings are evolving technically.

Now, safe in the post liberalisation era, what has happened is that we are now designing sustainable buildings because of the necessity of carbon neutrality or lowering carbon emissions. And therefore we are again going back to passive controls. But the amazing thing that has happened is, the very technology that is causing these problems is also giving us the solutions to solve these problems.

And what is that, that we can now take from traditional knowledge systems, and convert them with highly efficient mathematical technical models and apply them in our buildings. Let us look at a couple of examples. This is kalaka academy. Charles Correa did this building in Goa, empirical design of pergolas for shedding but here in the British school by morphogenesis.

The pergola has been designed computationally, this is much more efficient, and much more mathematically correct in terms of the kinds of shading and comfort it provides. Similarly, when we look at the jali work that we saw in AI International Center, as a case study that we started the work by Stein, the Jali work is very efficient for thermal comfort, it does a great job in letting in the wind blowing faster because it is power purchase increasing wind velocity providing the cold breeze entering into the building, the accordion doors opened up, you can look back on the slides that go into that, and how the entire room becomes into turns into a deep varandah etcetera.

Now, the same concept applied by Sanjay Puri in 72 screens a building we will study is again then competitionally, which is a far more efficient, Jali, but it is a modern child. So, what has really happened is, it is an amazingly wonderful manage of traditional systems and modern technology. And that is producing the modern times critical regional building, the critical regional buildings of the 21st century.

Sanjay puri is one of those people driving that change. He was born in 65 graduated from the Academy of architecture in 88, apprentice with Hafeez contractor then started self practice in 1992.

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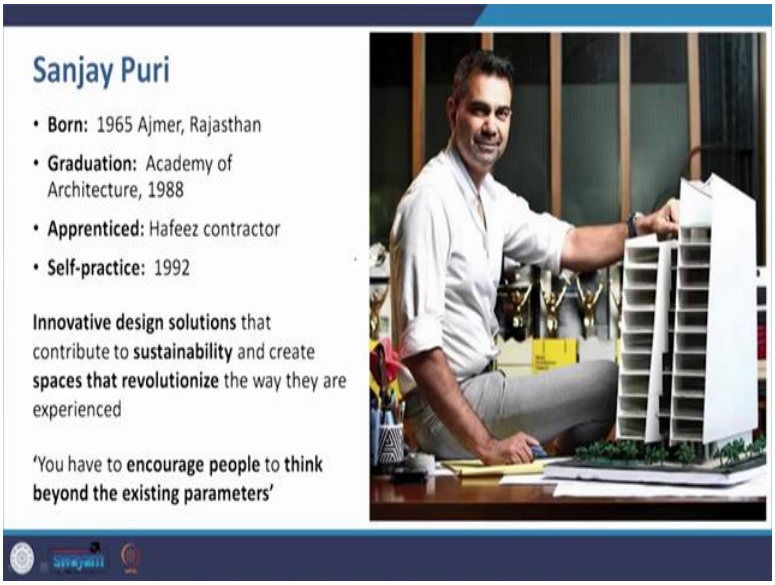

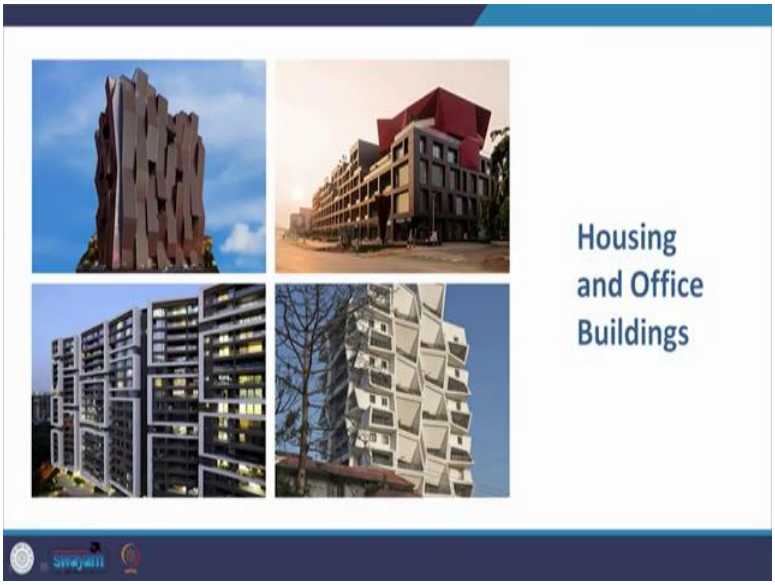

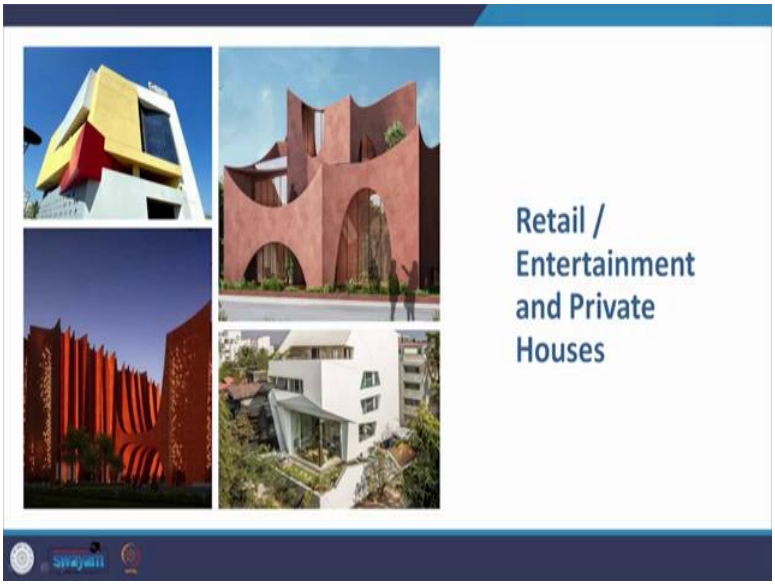

He promotes innovative design solutions that are contributing to sustainability and spaces that has been revolutionize the way we experience them. He says you have to encourage people to think beyond the existing parameters. And so he has done very interesting and iconic buildings which have come up which are coming up enhousing office, buildings, retail, entertainment and private houses.

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One of the houses is he did in 2011 was a courtyard house, very famous house done in Ajmer by Sanjay Puri. Now, this picture shows you the slide shows you the difference between a modern Indian courtyard house and traditional courtyard house Kerala courtyard house for example, and this is a vernacular space interpreted for the modern house, the principle is the same, but the idea is interpreted in terms of modern architecture and that is why it is so important for us to focus on traditional knowledge systems, not to neglect them.

That knowledge that has evolved that our forefathers picked up over centuries of learning from a particular region to hit in trial experiences, et cetera, is a vast source of information of principles and concepts that can be applied in modern houses. For example, let us take the, let me give you an example. Classical Architecture, Greek architecture, talks to us about classical symmetry. Now, classical symmetry is a principle it is not just okay, it is not just there for the Greek temples, any building can adopt a classical symmetry and it has been adopted widely by so many architects.

So, that is one way in which we can just pick the principles and adopt them to model building or adapt them to modern buildings. So, in the courtyard housing, Ajmer, Sanjay Puri does, one thing very differently and that is, the rooms are not inward facing towards an internal courtyard, the rooms are outward facing towards the landscape.

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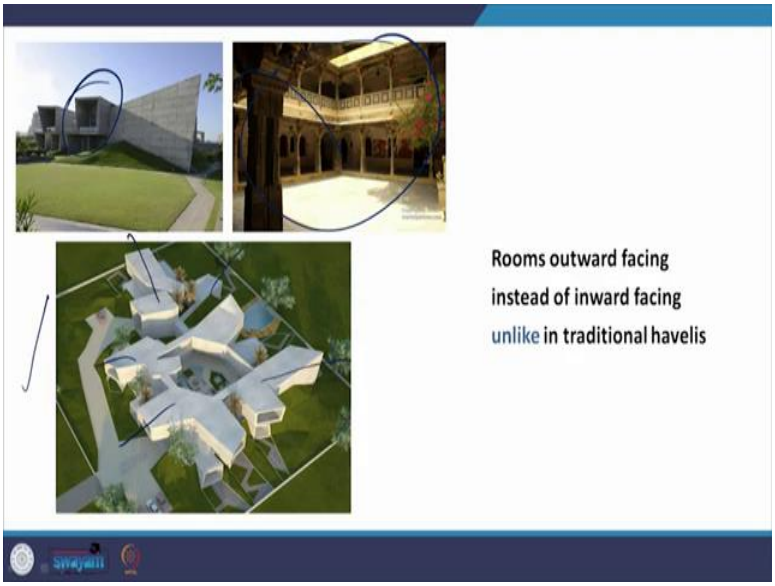

So, here if you see this is an standard courtyard, where all the rooms are looking into the internal courtyard, but here in his house, as you can see in this model, all the rooms are facing towards the away from the internal courtyard.

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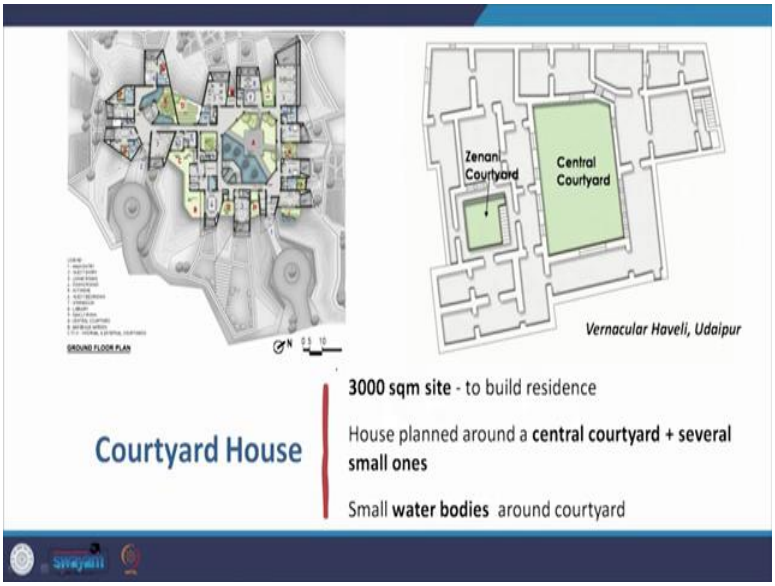

Now, if I compare his house with a very vernacular courtyard house, this is an example from Udaipur having a central courtyard and smaller courtyards. So, this is a 3000 square metre house, the courtyard house and it is planned around the central courtyard. And then there are a smaller courtyard split throughout. And there are also small water bodies around the courtyard, very simple principles of green and blue and blue infrastructure to cool the building and may keep it thermally comfortable.

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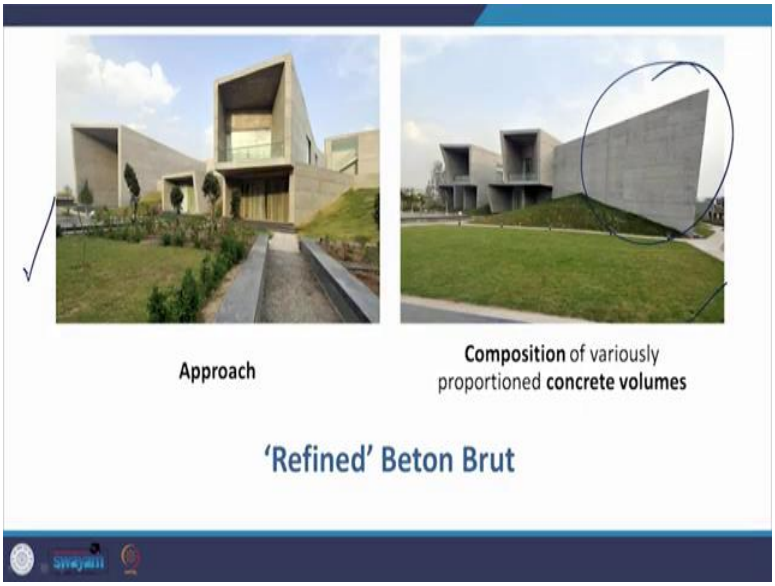

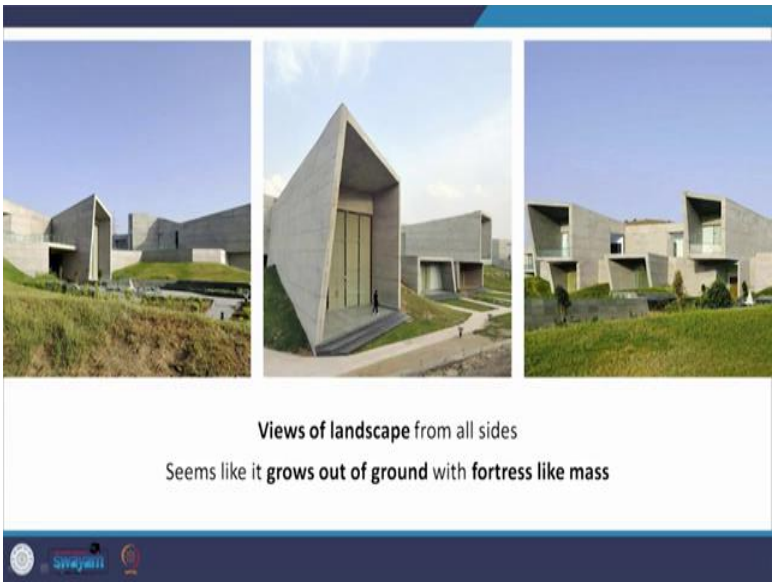

So, this picture indicates the approach, and this picture indicates the composition of the variously proportion concrete volumes and they are amazing. Architecture in its form and aesthetics is not neglected in technology that is a statement.

I mentioned earlier to you, that sounds are not leading to bad buildings bad aesthetically design, bad aesthetics in buildings, in fact, it is contributing to better aesthetics, because we can do with their buildings, things that would not have been possible before.

So, here in this building, for example, this is an monumental scale. And within this one double height room is accommodated 2 floors and the rear of the house. So, this is an amazing form that he has generated out of refined the top, here it is the views of the

landscape from all sides. And it seems as if the house is going out of the ground, and it is a fortress like mass.

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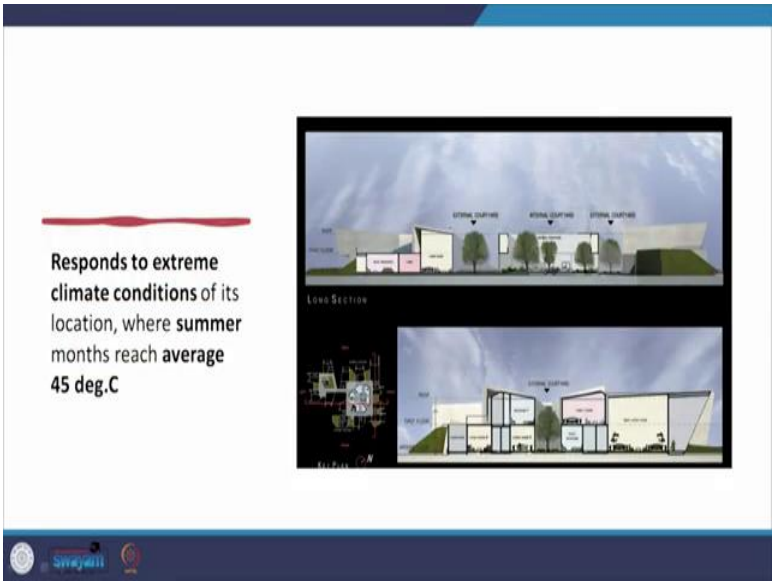

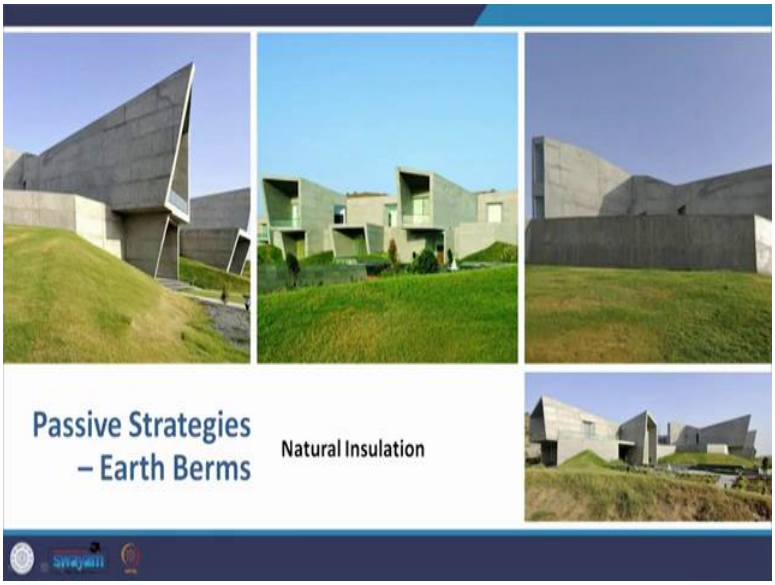

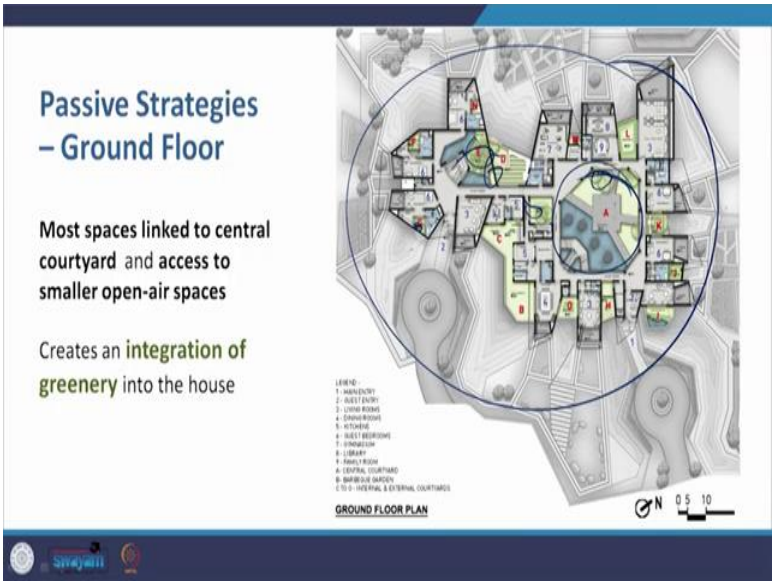

Now it responds to extreme climatic conditions of its location. That is Ajmer, where summer month temperatures can rise up can have, is an average of 45 degrees Celsius. So, the passive strategies that he employs are, one is Earth Berming. So, by providing these earth berms on the side of the house, he provides natural insulation of the earth in the ground floor, for example, most of the spaces are linked to the internal courtyard and smaller open air spaces, smaller courtyards, and he also creates this integration with the greenery into the house.

So, there is greenery all around, and there is greenery within the house and all over spread all throughout the house in smaller and bigger courtyard spaces.

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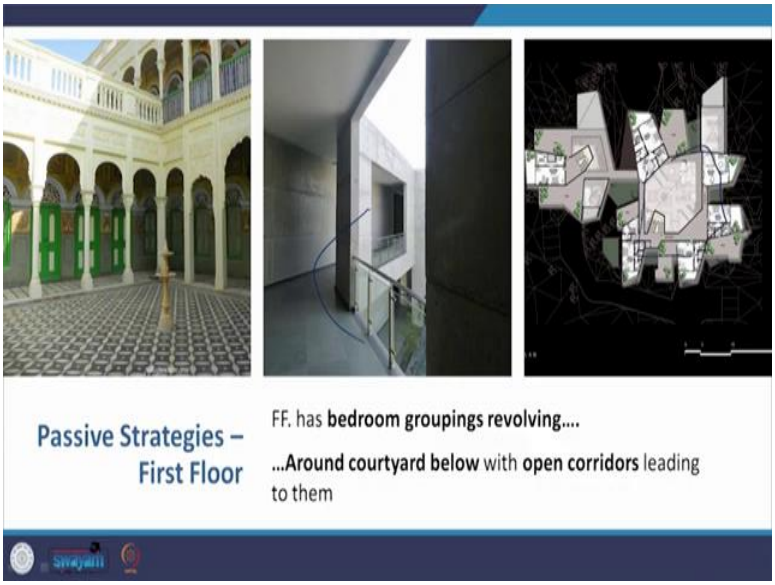

On the first floor, the bedroom groupings revolve around the internal courtyard and what he has is this open corridor that is leading to these bedrooms. So, if you look at these, these spaces, this courtyard is connecting them all.

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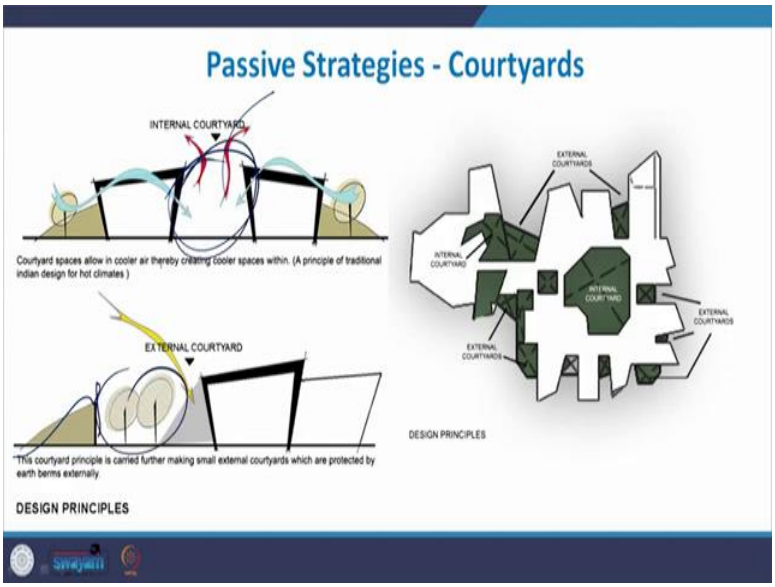

Now, this is how the the effect of the courtyard starts taking shape. The cool air moves in the hot air rises and cools this place but he does the same thing very interestingly on the outside also, because of the Earth berm, it acts like one of the walls of a courtyard. And thus this space also functions very similar to an internal courtyard.

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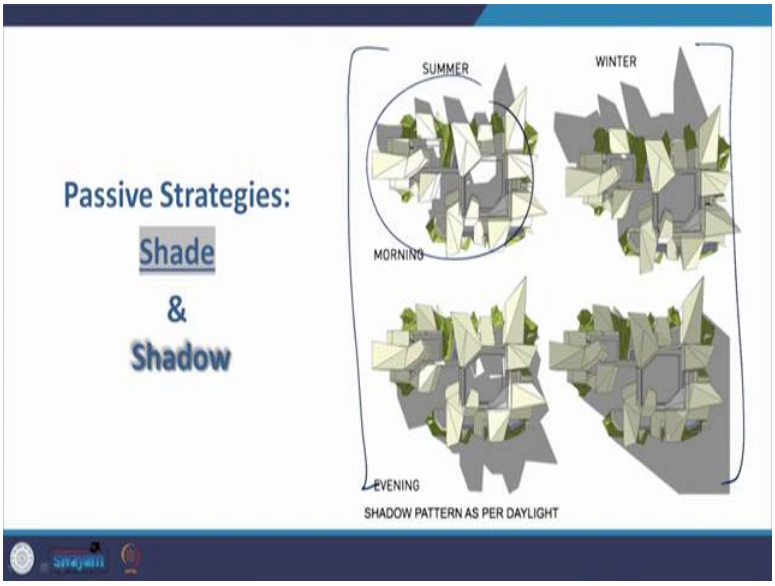
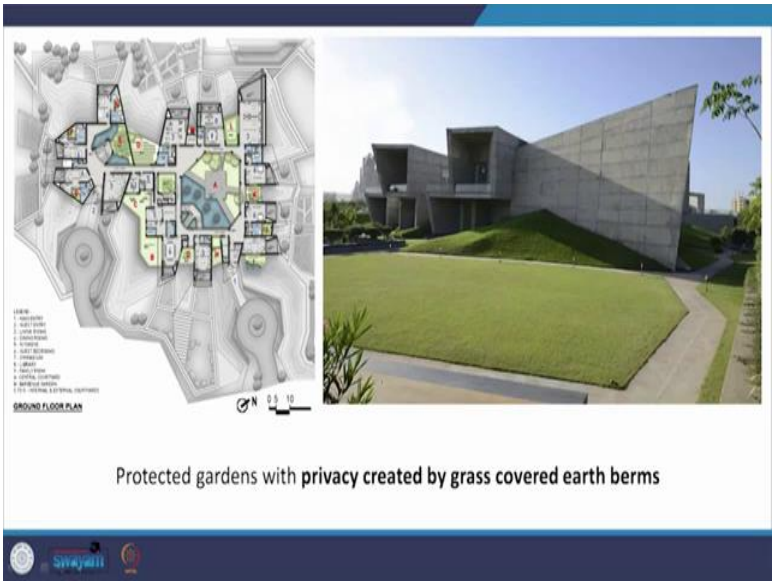
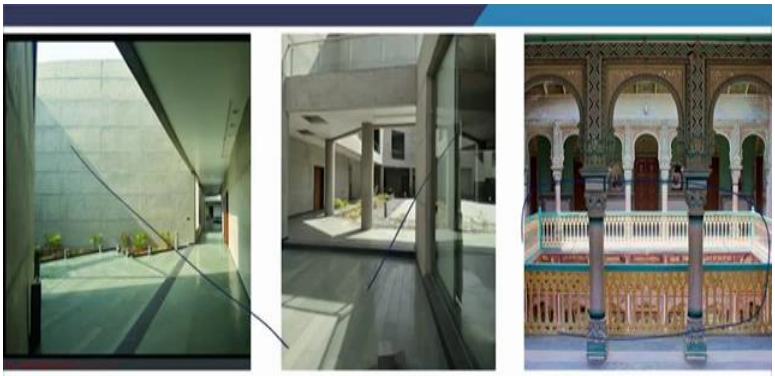




Protected gardens with **privacy created by grass covered earth berms**

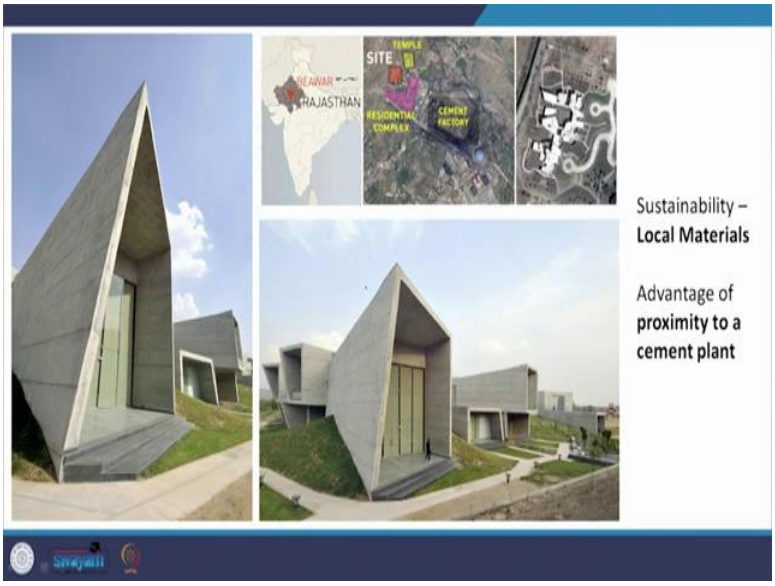


Passive Strategies – Corridors

Link interior with exterior

Cross-ventilation through all areas of the house

Screened to block sunlight



Sustainability – **Local Materials**

Advantage of **proximity to a cement plant**

Then he talks about shade and shadow. This shows you how shading shadow impacts the building in summer, morning and evening and in winter, morning and evening. And you can see that the building does a lot of let us do not, if you just keep aside the winter because there it will not be important. But in the summer as you can see, at a particular time, because this is the shadow pattern of a particular moment of the day.

It shows you the how much of the house is mutually shaded by its form, and how much of shade is available to us. Then the gardens are protected with having privacy created because of the earth berms. The earth berms are not only serving the function of providing natural insulation, they are also serving the function of providing greater privacy to the occupants.

When there is a passive strategy, the corridor sensors they are linked in the length the interior with the exterior, they provide cross ventilation to all the areas of the house just as it would happen in a standard courtyard in a standard corridor in a courtyard house and they are screened to block out the glare of the sun, they allow diffused light to enter into the interior spaces of the room.

Interior spaces of the house. Now, sustainability comes through the use of local material, which is another thing that happens in green buildings that the materials have to be sourced within a particular diameter of the project here. The advantage is that he is using exposed concrete. The advantage is that the houses is closely is enclose proximity to cement plant.

So, the massive amount of cement required to build this big house could easily be sourced from the cement plant.

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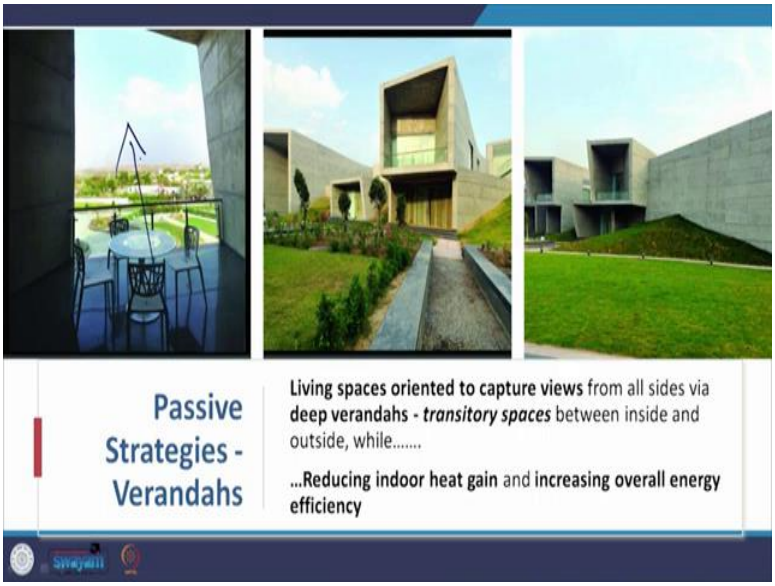

Now the verandas, the living spaces are oriented to capture the views from all sides via these deep veranda so this is what I was talking about. The veranda looking out towards the the outer areas and these veranda service transitory spaces between the inside and the outside.

They provide that kind of a barrier as you move from inside from outside, then there is the veranda leading into the room and thus reduce indoor heat gain and increase the overall energy efficiency. Because when we reduce heat gain, we reduce air conditioning loads and thus efficiency in terms of energy increases.

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Now, passive strategies in conclusion for a house is, but the concrete structure itself works as a thermal mass and thus it is able to retain heat within itself in the daytime. And when in the nighttime in the desert climate it becomes cool or colder, then it releases the heat and makes it comfortable.

The principle of traditional Indian courtyard house to tackle heat and create a cooler environment and cross ventilation is there all throughout the house. And also there is increased privacy along with the provision of shade for the occupants are being througout in a very summarized manner. You can study this in great detail it is, it is available online, and it is available in literature.

This shows you how principles of traditional courtyard houses of Rajasthan have been applied here. When you look at the house, it does not at all seem like a traditional dwelling. It is a totally brutalist data growth refined data growth house, but when you look at it closely, you start seeing the traditional principles behind it.

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Then there is a 72 screens project by him in Jaipur in 2013. And this is a corporate office headquarters, which is 6 storeys high located in Jaipur, average temperature goes from 30 to 50 degree Celsius most part of the year, the main office areas are spread on these 5 levels. This is below that is the ground level and underneath the ground level is the basement car parking.

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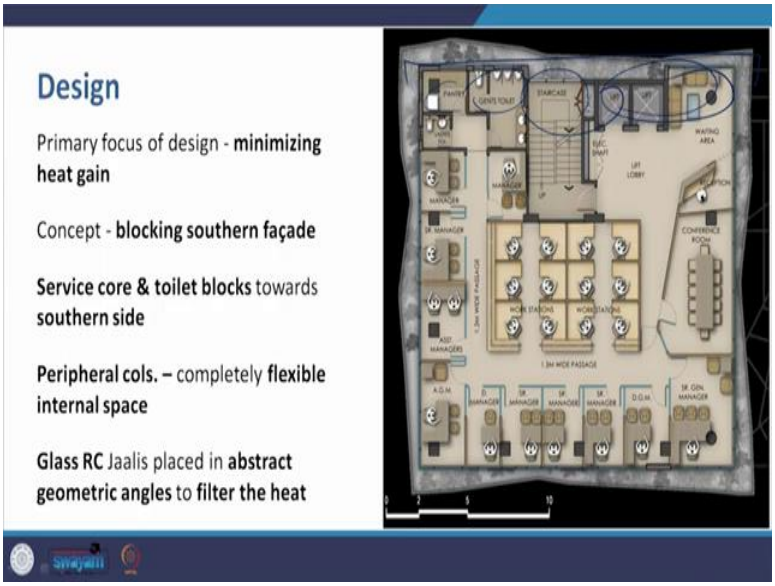

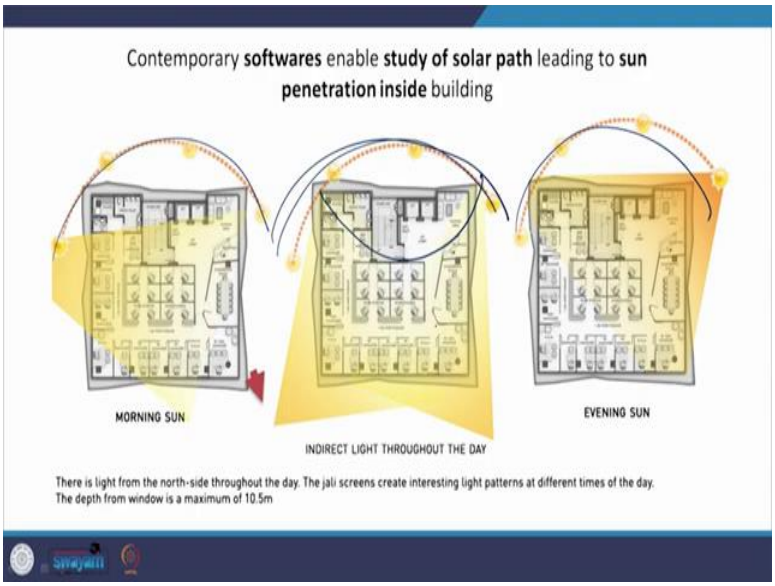

Now, the primary focus of design was to minimize heat gain. Now these case studies the first one the courtyard house and this one is in hot and dry climate belt of India. So, here, what he does is he blocks the southern facade from where the heat would penetrate. And how he does that is he provides the services on the south side, he provides the pantry, the gents toilet, the staircase, the lift, et cetera, on the south side and blocks it.

And thus not only that the columns are on the periphery, and thus, the internal workspace is completely flexible. And there are glass reinforced concrete jallies all around the building, which are in an abstract Angular geometry to filter out the heat.

Now, one question will arise in our mind why the south side? It should not be the west side, we have always been taught, the West should be kept like a blank wall no fenestrations he should have provided the services et cetera, on the base side. Why does not he do that? Because it is an office building.

And this is what happens. First of all, like I told you, technology is helping us today, contemporary software's have enabled the study of the solar path, to be able to understand some penetration inside the building. As a result of that, this is how the morning solar path is, this is how it is indirect light throughout the day. And so somewhere, let us say in the middle of the day, the sun will be coming through like this, and this is how it will be in the evening.

Now, please understand this, in the evening office mostly will shut off, people will go back home that work time for most people will be over as it is, it is during this time when we require maximum thermal comfort, I mean, we want to keep out the heat gain from this side. And that is the southern side when the world is at its peak. And this is what it is doing. And then the other thing is because of the jali very interesting light patterns are created within the building. We will have a look at that later.

So, if you watch it very carefully, in this, this segment shows us that the light the sunlight is not able to penetrate into the workspaces from this side.

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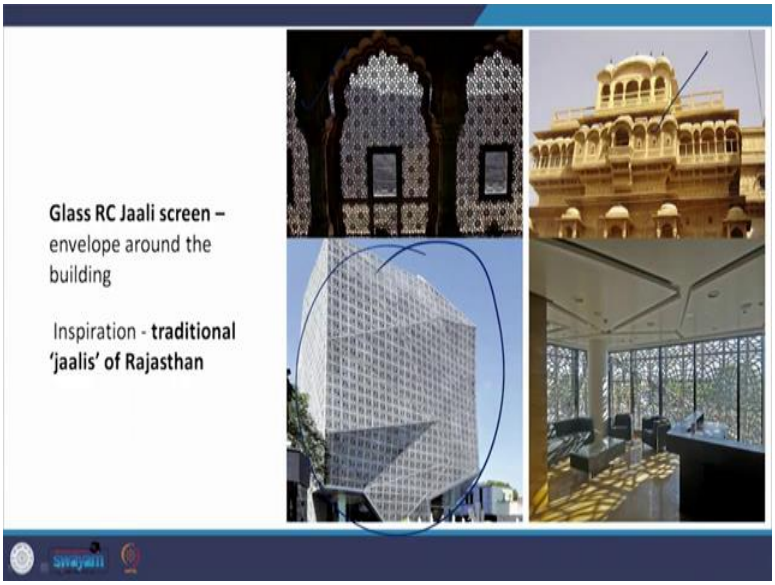

Now, the glass of RC jaali envelopes around the building. And it is a direct derivation of the jaalies of Rajasthan inspired from them. So, this is the jaali the way it is been used in

Rajasthan Haveli, this is how it is. And so this is the computationally designed jaali in glass reinforced concrete. And this is the side graphic it is creating within the building.

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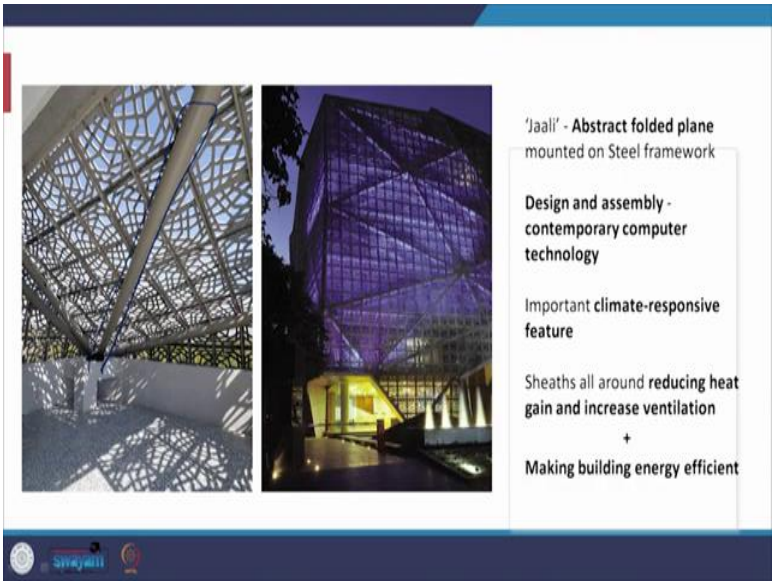

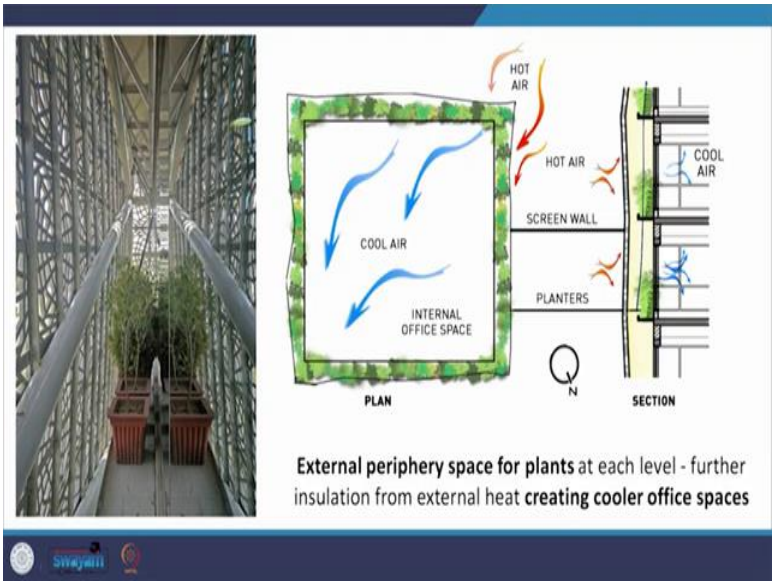

It is an abstract folded plane which is mounted on a steel framework as you can see here, and it was designed and assembled using computer technology and it is an important climate responsive feature of this building, thus preventing heat gain from all sides and also increasing ventilation because the wind flows through the jaali and that increases in velocity and make and thus that is good breeze that penetrates into the building because of the jaali the building because energy free because reduction of heat load also it provides you better day lighting without the glare and so, that reduces the lighting load also.

Now, here is how the cooling of the building is the, cool air is penetrating into the building. The other thing that happens is that between the jaali and the interior of the building, they are provided these plants within that space and that also serves to create cooler office spaces.

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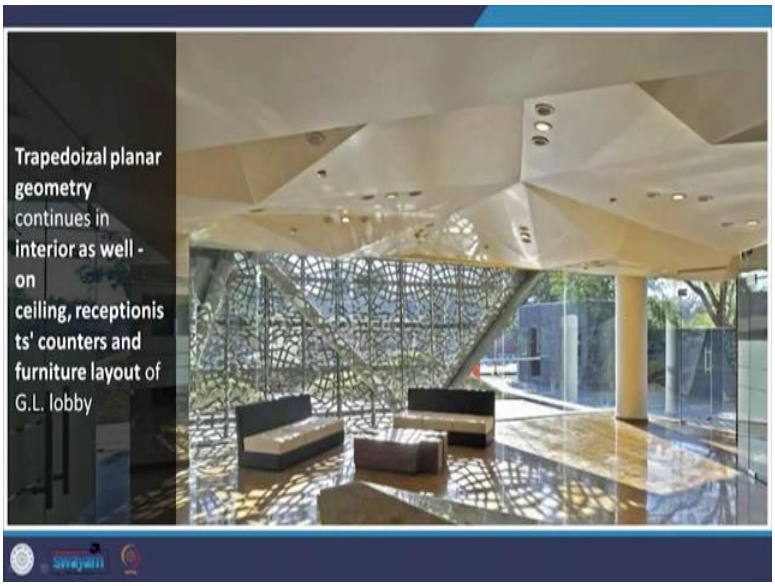

So, the screen creates pleasing ambience with the sun streaming through and this is a kaleidoscopic sociography that happens within the building. Now, architect does not neglect the architectural or the aesthetic component.

The trapezoidal planar geometry that is reflected in the glass RC jaali work continues in the interior, in the ceiling, in the counter, that has been created for the receptionist and in the layout of the furniture within.

So, the trapezoidal geometry is consisting throughout the building, it is very similar to the way in which FM right used to use geometry it would build the entire project on one geometry, if it was triangles or pentagons, the entire or hexagons, the entire geometry will be built around that polygonal shape.

So, this presentation primarily focused on why there is such a great need of climate responsiveness today because of carbon, reduce the need to reduce carbon emissions. And also the great advantage that technology is giving us today to modernize or use traditional systems in a much more efficient way in the buildings of today.

In the next presentation, I will take you through some more studies and we will look at how other architects are responding in other climatic regions. Thank you.