Strategies for Sustainable Design
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Lecture 42
Case 4: A Comparative Analysis of International Design Projects

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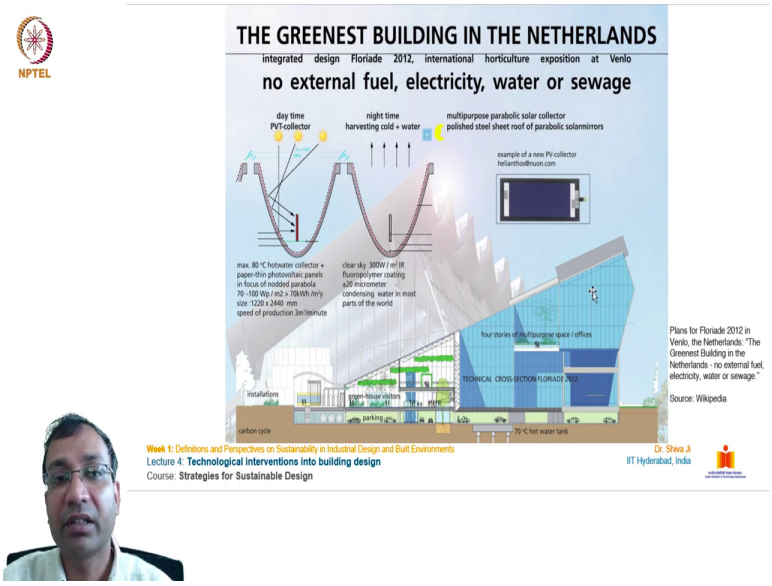

Hello everyone, in this lecture we will discuss about a comparative analysis of international design projects. So, we will see like how architectural projects from across the world are dealing with this actually overall climates and how they are actually going further like a sustainable designs. So, one of the actually a beautiful examples, I have taken is from like this Netherlands, so this is the greenest building actually called in the like a Netherland.

So, it does not uses any external fuel, any external electricity you know water or even like a sewage. It actually caters to all if its needs from the site itself and it actually recycles everything on the site itself. So, this is one of the actually most amazing actually projects from across the world you know, so that is why I have chosen this to give you the first example of this building.

So, you see this it has actually followed a unique design you know for like these solar photovoltaic like a panels, so on this actually there is a parabolic actually the shape in the daytime they use for like collecting the actually for this power generation and in the night time

they use this actually trough for like a you know harvesting water from the like a dew and the atmospheric actually the (()) (1:30).

So and this is actually typical cross section so you can see the parking level in the like a basement service areas, greenhouse like a visiting areas over here technically like this technical cross section of florid like a 2012 and this is further here like a four storeys of like multipurpose spaces and offices.

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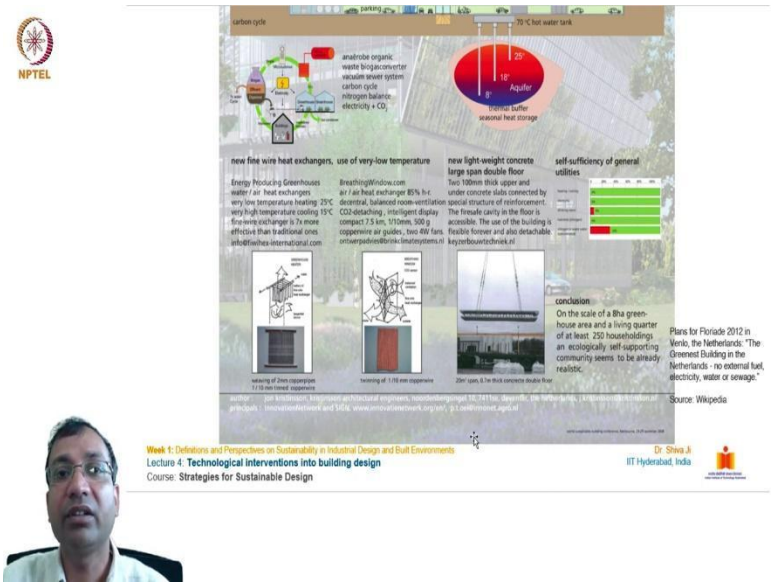

Further in the lower level you can see this building utilizes this thermal actually you know this energy of this the ground beneath this actually project you know and like it uses this fine wire heat exchangers use of a very low temperature actually this thing. So, you see like how this water is being sent actually in the lower floors for like a heat exchange and all that and the secondly like it uses like a lightweight concrete large span double actually flooring system you see one unit is suspended here in the air, so to cover actually the floors you know wider floors with the minimal amount of actually energy and self-sufficiency in general utilities.

So, this building it practically has achieved a self-sufficiency it does not require actually any type of like a fuel or energy or anything that is also from the outside you know so one of the actually most beautiful and amazing actually examples you must actually look for this project for like a detailed you know understanding of this project you know once you are done with this lecture.

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So, one by one I will show you some examples from across the world. This is actually a rainwater harvesting tank from Kerala, so well this kind of like efforts are being used you know everywhere is Kerala is known for like this water surplus actually state you know there is a huge amount of water you know available in there like a ground water you know as well as it receives like a huge amount of like this rainfall also every year but still they have actually this kind of like a systems in the place which is worth praising.

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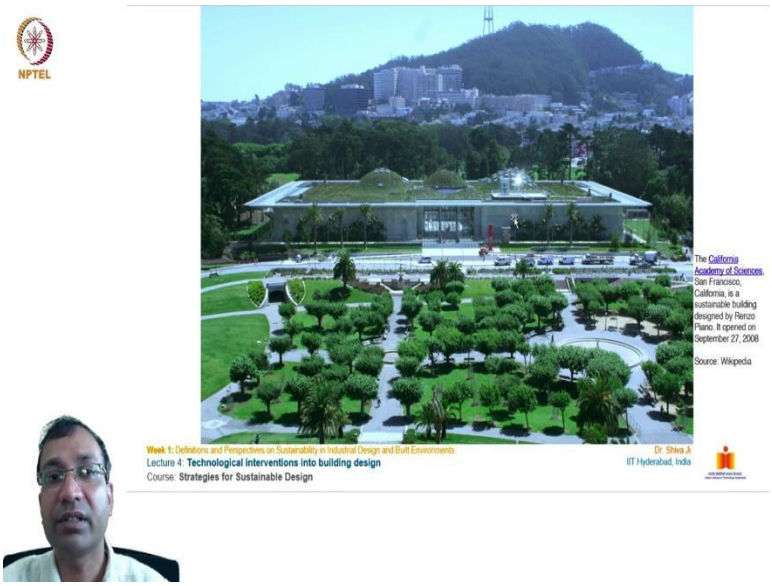

The next example of this California Academy of Sciences from San Francisco, California. So this is a sustainable building designed by a famous architect Renzo Piano so you can see like how they have used this an extensive actually this landscaping on this campus and there is urban heat island effect to counter they have used actually this green actually surface on the top of this building.

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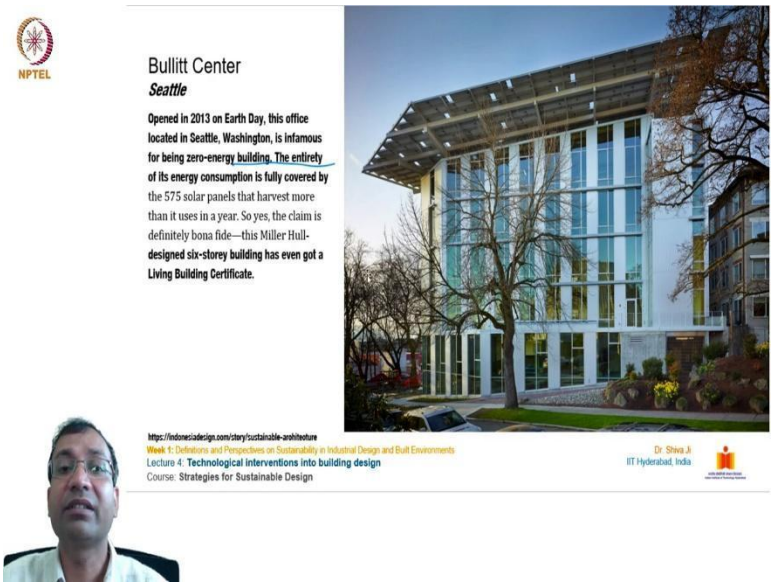

The next building is from like a Seattle you know this was opened in 2013 on the earth day. This office located in Seattle Washington is infamous for being a zero energy building. The entirety of its energy consumption is fully covered by the 575 solar panels on the top you can see, that harvest more than it uses in a year. So, yes the claim is definitely bonafide. This Miller Hull design 6 storey building has even got a living building certificate.

So, one of the very unique features like we have been discussing buildings are like a living organism but here they have started already giving this certification system also like and this building has received it's like a living building a certificate.

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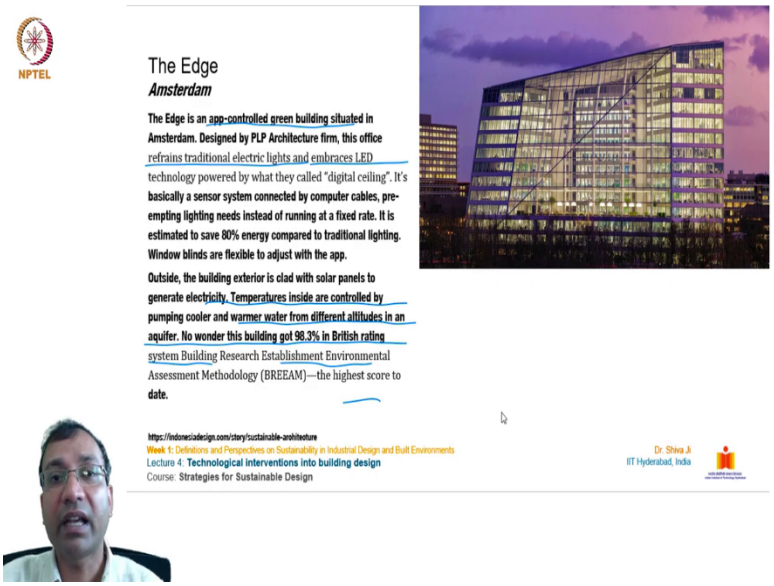

The next is The Edge from Amsterdam. The Edge is an app control green building you know situated in Amsterdam designed by PLP Architectural firm. This office refrains to actually traditional electric lights and embraces led technology powered by what they call digital ceiling. It is basically a sensor system connected by computer cables, pre-empting lighting needs instead of running at a fixed rate and it is estimated to save 80 percent of the energy compared to traditional lighting.

Window blinds are flexible to adjust with the app. Outside the building exteriors is clad with solar panels to generate electricity. Temperatures inside are controlled by pumping cooler and warmer water from different altitudes in an aquifer. No wonder this building got 98.3 percent in British rating system Building Research in Etablishment Environment Assessment Methodology commonly we know it has BREEAM you know.

The highest score you know received by any building till date. So, this is one of the actually beautiful examples of how the buildings can be integrated with the technology you know and can be actually optimized for like energy as well as like resource consumption.

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Next, we have this Copen Hill. This is from Copenhagen. So, Copen Hill is an eco-friendly power plant that incinerates waste to generate electricity, opened just a few years back in 2017. The multi-purpose project was commissioned to Bjarke Ingels Group BIG, where genius young architect Bjarke Ingels is the founding partner and creative director.

The 16000 square meter structure is designed to convert 400000 tons of waste per year into scads of clean energy enough to power over 100000 homes within the region emitting zero toxin in the process to the atmosphere's advantage. As outstanding it is a as a waste to energy plant Copen Hill is also a superb sports facility capped by over 500 meter ski slope design, visitors cozy could use it for like hiking trails, snowboarding you know playground, trail running, etc, wall climbing and skiing, etc.

The last one is what locals are most thankful for because even though Denmark receives heaps of snow in the winter. It is a generally geographically flat preventing it from being ideal to reinforce key and snowboards and enthusiasts. So, you see like how this building is converted into a recreational arena also in the like a winter month is like a ski arena you know so and with no actually toxic like effluents or exhaust you know this building consumes waste to generate energy. So, one of the actually amazing examples of like a sustainability in the like recent times.

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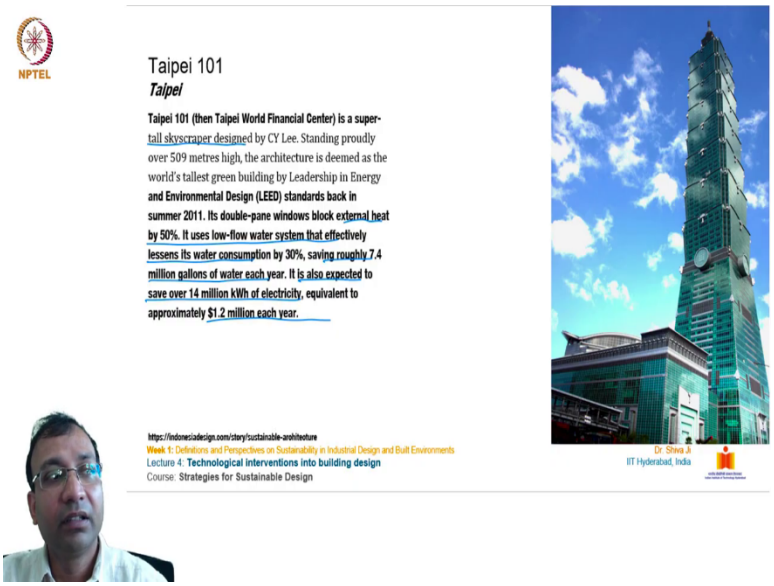

The next example is a Taipei 101. You may have seen this building in pictures or you may have been to this place in Taiwan. This is from Taipei; Taipei 101 is a super tall skyscraper designed by CY Lee. Standing proudly over 509 meters high. The architecture is deemed as the world's tallest green building by leadership in energy and environmental design lead certification system. Back in like a summer of 2011 it is a double pane window block external heat by 50 percent.

It uses low flow water system that effectively lessens its water consumption by 30 percent, saving roughly 7.4 million gallons of water each year. It is also expected to save over 14 million kilowatt hours of electricity equivalent to approximately 1.2 million dollars each year.

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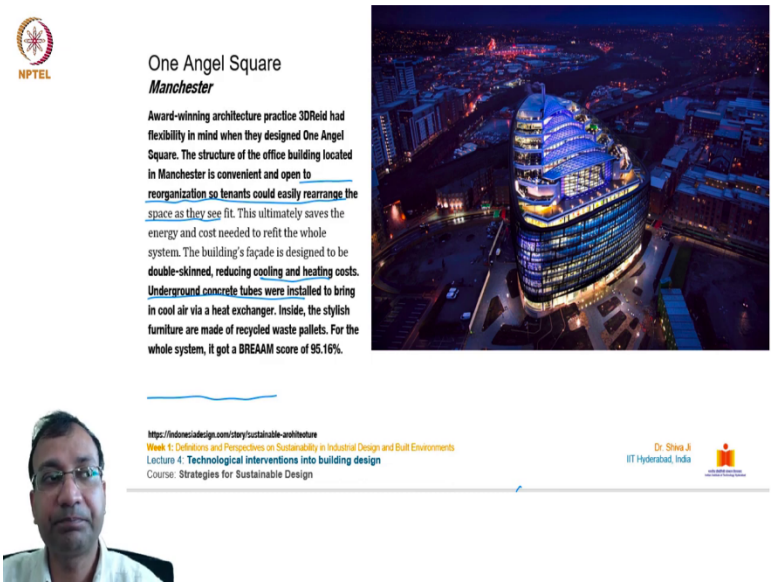

Further we have this example of One Angel Square from Manchester. Award-winning architecture practice 3DRied had a flexibility in mind when they designed One Angel Square. The structure of the office building located in Manchester is convenient and open to reorganization so tenants, schools could easily rearrange the space as they see fit.

This ultimately saves the energy and cost needed to refit the whole system. The building's facade is designed to be double skinned reducing cooling and heating costs. Underground concrete tubes were installed to bring in cool air via a heat exchanger. Inside the stylish furniture are made to recycle of like a waste pallet for the whole system it got a BREEAM score of 95.16 percent.

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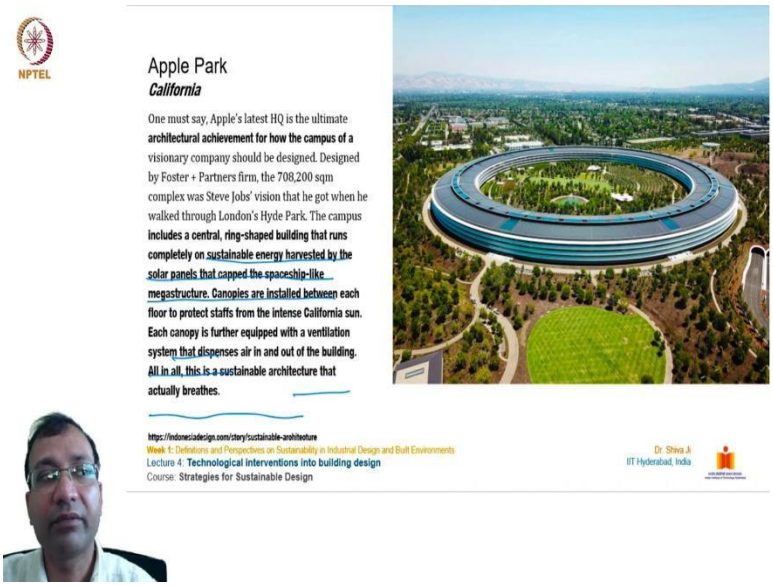

Okay, this you must be aware of this is like a Apple Park from California, it is recently actually a completed building. One must say Apple's latest headquarter is the ultimate architectural achievement of how the campus of a visionary company should be designed. Designed by Foster plus Partners Firm. The 708200 square meter complex was Steve Jobs vision, that he got when he walked through the London side park.

The campus includes a central ring-shaped building that runs completely on sustainable energy harvested by the solar panels that cap the spaceship like megastructure. The canopies are installed between each floor to protect staffs from the intense California sun. Each canopy is further equipped with the ventilation system that dispenses air in and out of the building. All in all this is a sustainable architecture that actually breeds.

So, here you can see from the site itself the rest of the actually area you know apart from this building you know looks like a place of like a landscape you know like a densely landscape area. Green space even inside this circle if you see it is a highly vegetated area you know and this building is capped by these solar photovoltaic panels for like harvesting energy. So, this building is also one of the best examples of sustainable projects in the recent times.

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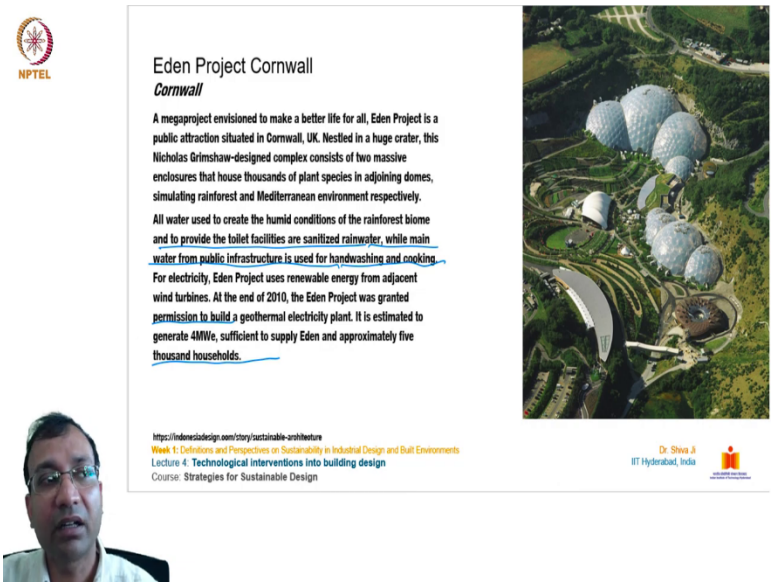

The next one Eden Project Cornwall from Cornwall. A megaproject envisions to make better life for all. Eden project is a public attraction situated in Cornwall, UK. Nestled in a huge crater, this Nicholas Grimshaw designed complex consists of two massive enclosures that house thousands of plant species in adjoining domes, simulating a rainforest and Mediterranean environment respectively. All water used to create the humid conditions of the rain forest biome and to provide the toilet facilities are sanitized rain water, while main water from the public infrastructure is used for like a hand washing and cooking.

For electricity when a project uses renewable energy from adjacent and wind turbines, at the end of 2010 the Eden project was granted permission to build a geothermal electricity plant. It is estimated to generate 4 megawatts of sufficient to supply hidden and approximately 5000 like a household also. So, you see the unique actually you know structure and the unique adaption like in this actually a place like how they have built this structure.

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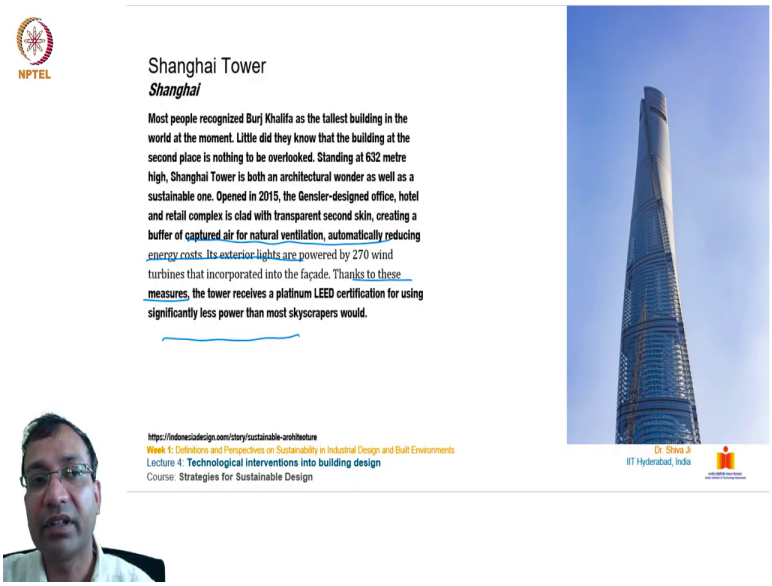

Further we have this Shanghai Tower from Shanghai. Most people recognized Burj Khalifa as the tallest building in the world at the moment. But little did they know that the building at the second place is nothing to be overlooked. Well, a new building has also come up in those like actually countries you may be aware of who have actually overtaken all to be the tallest building. Well, this building standing at 632 meter high, Shanghai Tower is both an architectural wonder as well as a sustainable one also.

Opened in year 2015, the Gensler design office, hotel and retail complex is clad with transparent second skin, creating a buffer of captured air for natural ventilation, automatically reducing energy cost. Its exterior lights are powered by 270 wind turbines that incorporated into a façade. Thanks to these measures, the tower receives a platinum LEED certification for using significantly less power than most skyscrapers would.

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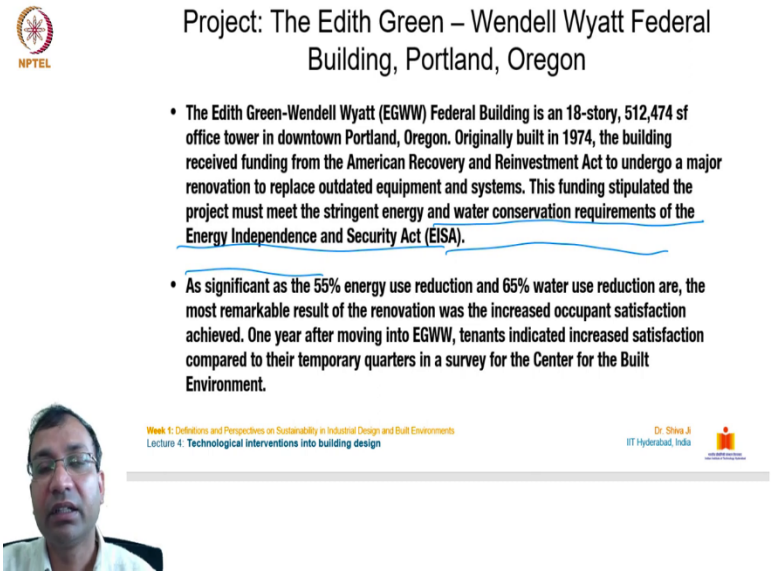

Further I would like to explain one project in detail. This is the project The Edith Green from a Wendell Wyatt Federal Building Portland, Oregon. The Edith Green Wendell Wyatt EGWW Federal Building is an 18 storey, 512474 square foot office tower in Downtown Portland, Oregon. The originally built in 1974 the building received funding from American Recovery and Reinvestment act to undergo a major innovation to replace outdated equipment and systems. This funding actually stipulated the project must meet the stringent energy and water conservation requirements of the energy independence and security act EISA.

As significant as the 55 percent energy use reduction and 65 percent water use reduction are the most remarkable result of the renovation was the increased occupant satisfaction achieved. One year after moving into EGWW tenants indicated increased satisfaction compared to their temporary quarters in a survey for the center for the built environment.

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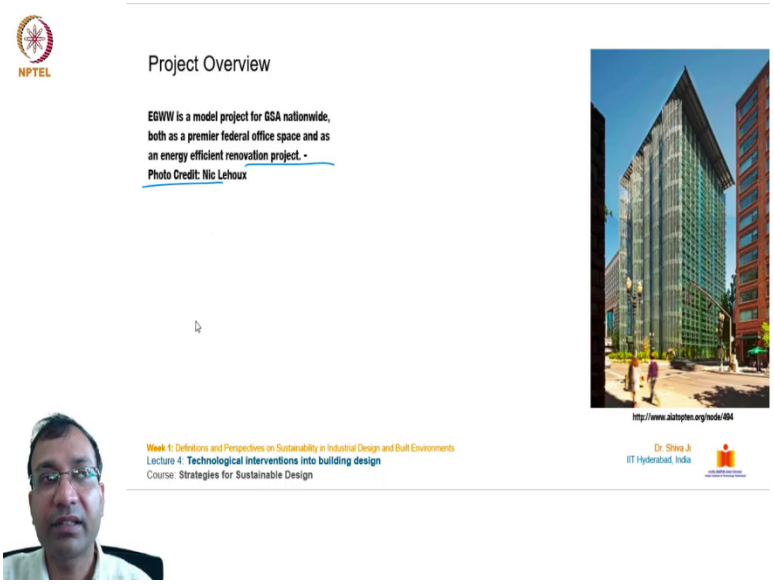

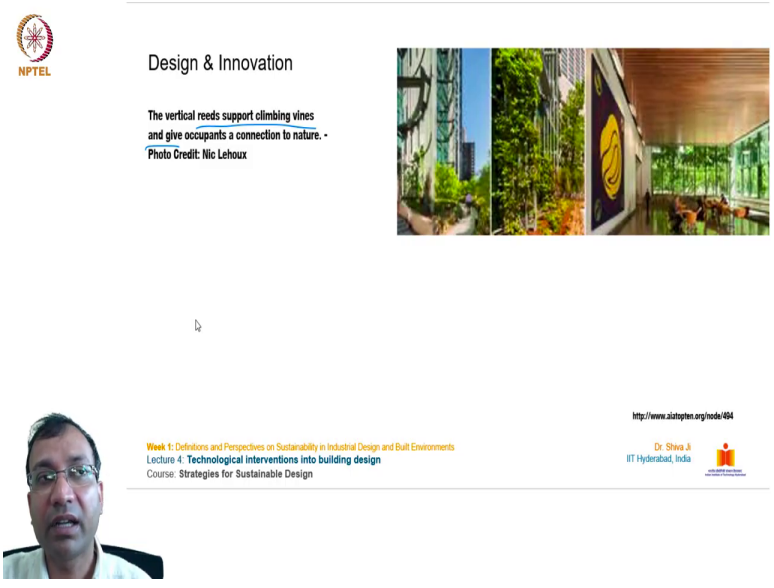

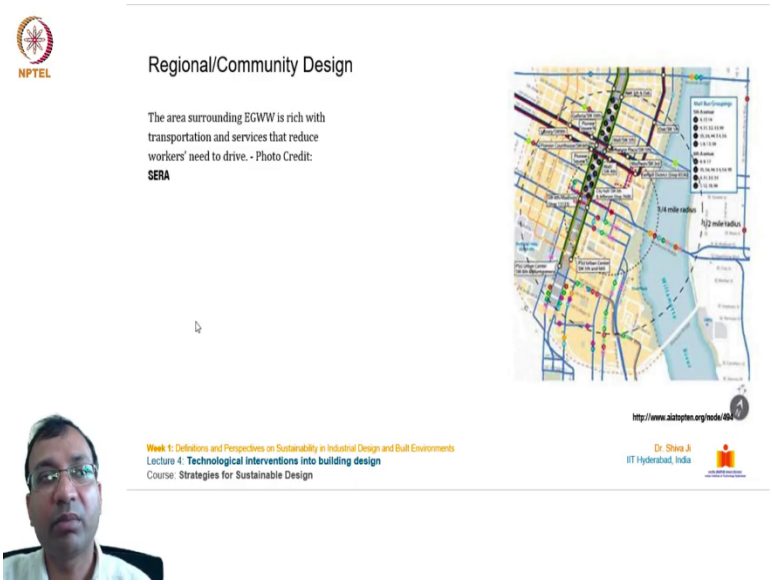

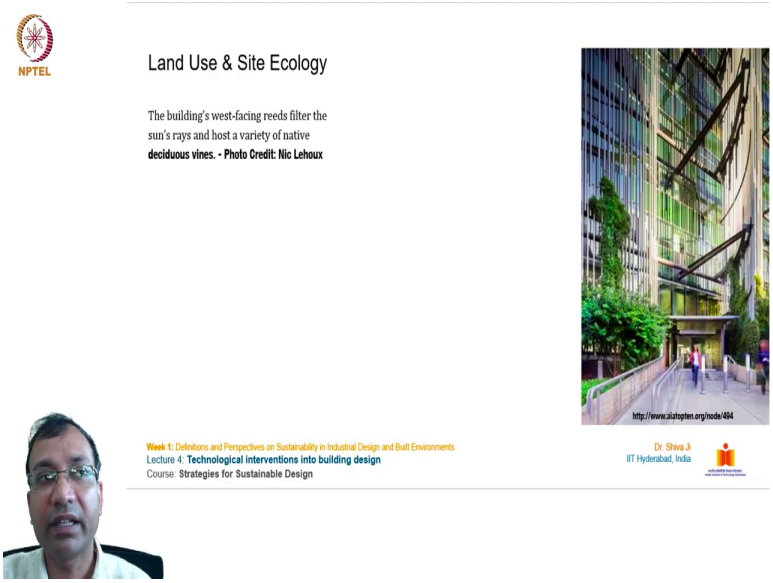

So, we will see some images and like a details more details of this project. So, this is actually building so it was not actually existing building and a retrofitting exercise was actually carried out here to make it sustainable and also this is actually a model project for GSA nationwide both as a premier federal office space and as an energy efficient renovation project.

Well on the design and innovation front, the vertical reeds support climbing vines and give occupants a connection to the nature.

Now, while regional and community design the area surrounding EGWW is rich with transportation services that reduce workers need to drive, so they actually rely mostly on like a public transport.

Land use and site ecology, the building's west facing reeds filter the sun's rays and host a variety of like native deciduous wines.

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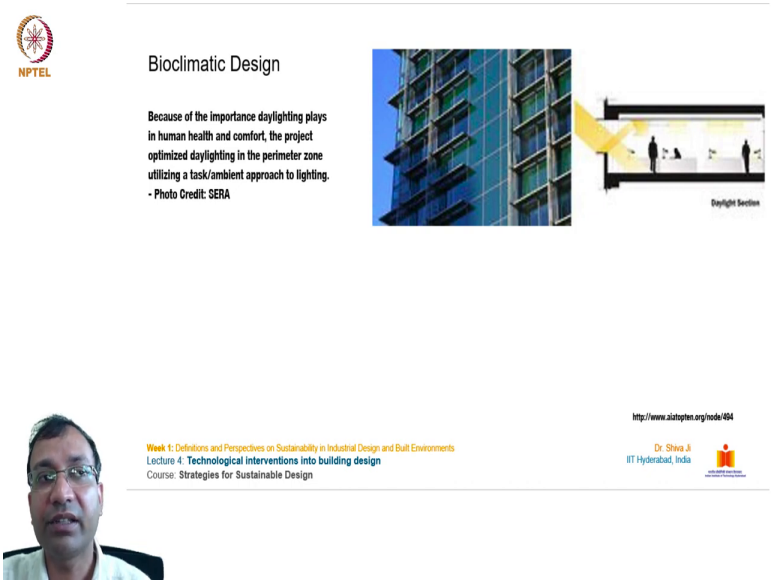
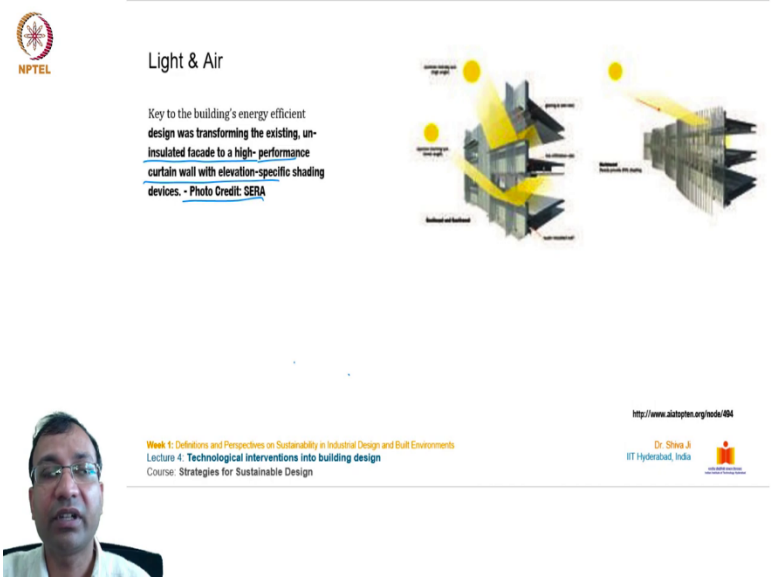
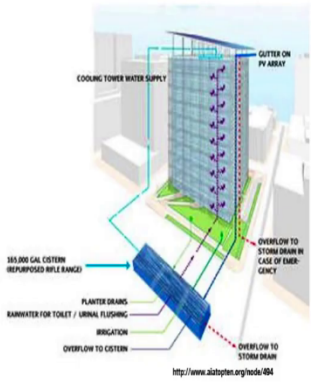




Water Cycle

65% water savings has been achieved through a dual strategy of incorporating water conserving plumbing fixtures together with a rainwater collection system. - Photo Credit: SERA



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Energy Flows & Energy Future

Since its completed renovation, EGWW's energy consumption has been cut in half. Post-occupancy studies have allowed for fine-tuning of its systems and thus additional energy savings. - Photo Credit: SERA

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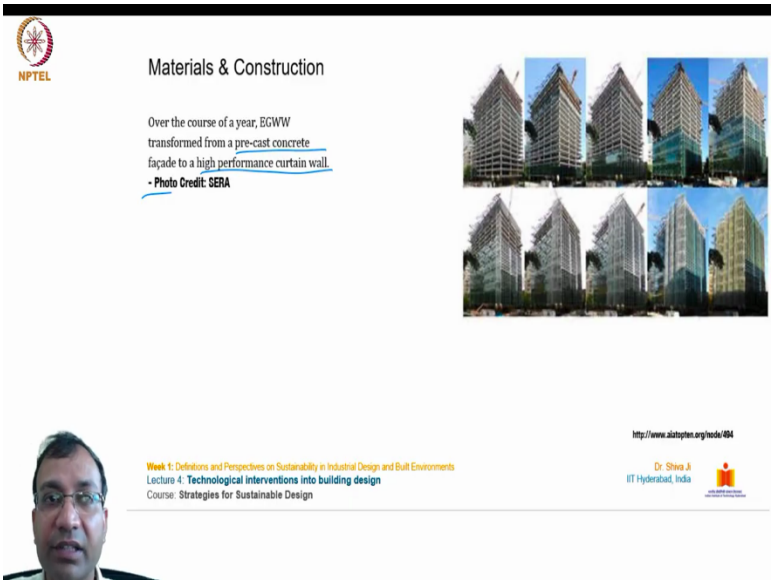

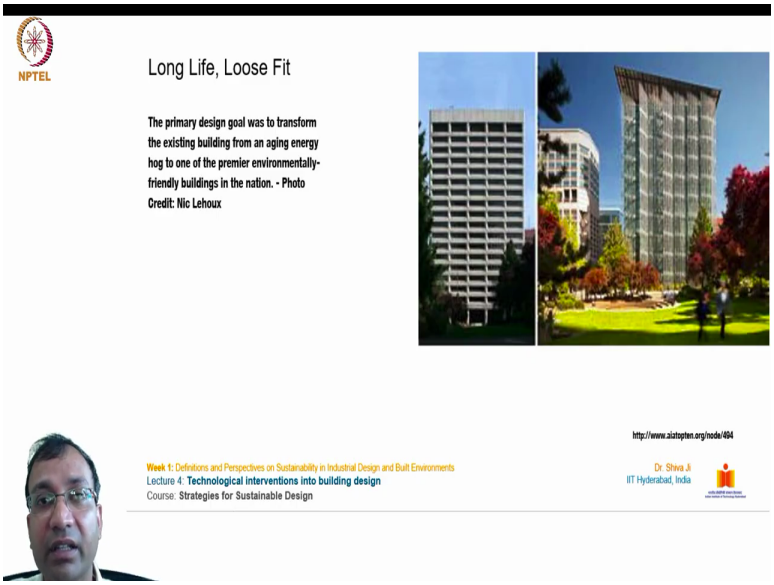

Bioclimatic Design, as you can see here on this section because of the importance daylighting plays in human health and comfort the project optimized daylighting in the perimeter zone utilizing a task ambient approach to the lighting.

Light and air, key to the building's energy efficient design was transforming the existing uninsulated facade to a high-performance curtain wall with elevation specific shading devices.

Water cycle, 65 water savings has been achieved through a dual strategy of incorporating water conserving plumbing fixtures together with the rain water collection system.

Energy flows and Energy Future site, since its completed renovation EGWW's energy consumption has been cut in half, post occupancy studies have allowed for fine tuning of its systems and thus additional energy savings. Materials and construction, over the course of a year EGWW transformed from a precast concrete facade to a high-performance curtain wall, you could see in this picture how the transformation has taken place.

Long Life, Loose Fit- the primary design goal was to transform the existing building from an aging energy hog to one of the perimeters, premier environmentally friendly buildings in the nation. So, this is the how this project has actually succeeded in its like intent.

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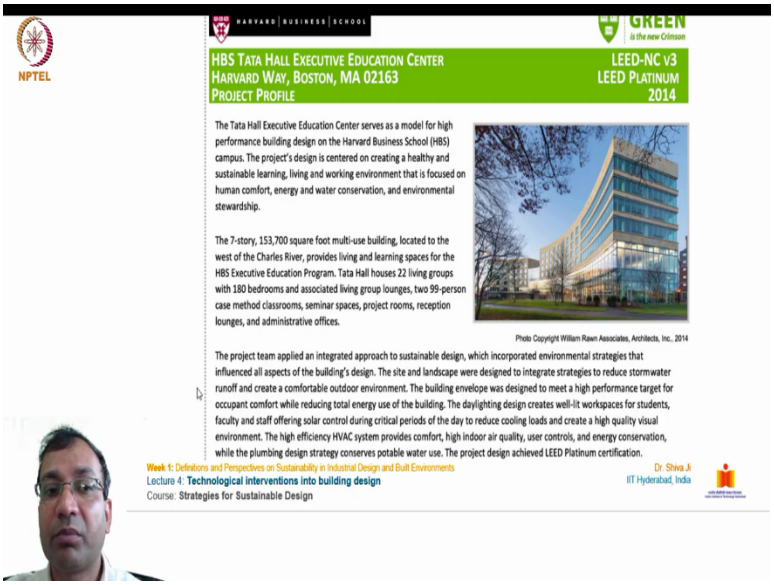

Finally, we will see one more example of a sustainable building constructed in the recent times. This is Harvard Business Schools, Tata Hall Executive Education center on the Harvard Bay Boston Massachusetts this is in United States of America and this was rated under the LEED new construction version 3 and it has received LEED platinum rating in year 2014.

So, I would briefly give you information about this project where why is it called like a Tata Hall. This was actually funded by the honorable Ratan Tata from India, as a like a philanthropic

work he has studied in his like early days from this Harvard Business School. So, like this Tata Hall Executive Education Center serves as a model for a high-performance building design on the Harvard Business School campus.

The project's design is centered on creating a healthy and sustainable learning you know living and working environment that is focused on human comfort energy and water conservation and environmental stewardship. The 7 storey 153700 square foot multi-use building located to the west of the Charles River provides living and learning spaces for the HBS Education Executive Education program.

Tata Hall houses 22 living groups with 180 bedrooms and associated living group lounges, 299 percent case method classrooms, seminar spaces, project rooms, reception lounges and administrative offices. The project team applied an integrated approach to sustainable design which incorporated environmental strategies that influenced all aspects of the building's design. The site and landscape were designed to integrate strategies to reduce storm water runoff and create a comfortable outdoor environment.

The building envelope was designed to meet a high-performance target for occupant comfort while reducing total energy use of the building. The daylighting design creates well-lit workspaces for students, faculty and staff offering solar control during critical periods of the day to reduce cooling loads and create a high-quality visual environment. The high efficiency HVAC system provides comfort high indoor air quality you know user control and energy conservation while the plumbing design strategy conserves portable water use. The project design achieved LEED platinum certification.

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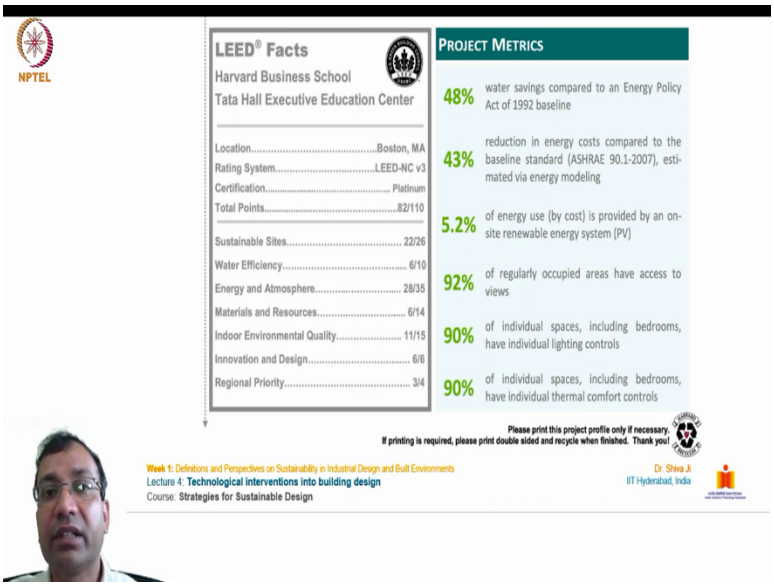

Some major actually project metrics you see 48 percent water savings compared to an energy policy act of 92, 1992 baseline, 43 percent reduction in energy costs compared to the baseline standard. A 5.2 percent of energy used by cost is provided by an on-site renewable energy system photovoltaic solar cell. 92 percent of regularly occupied areas have access to views. 90 percent of individual spaces including bedrooms have individual lighting control. 90 percent of individual spaces including bedrooms have individual thermal comfort controls also.

So, you see some of the facts are given here on the left side, the location in Boston you know rating system was used like a LEED new construction version 3, certification it has received platinum, total points it has received 82 out of 110, 110. On the like sections these are actually sections in the LEED certification system. So, on the sustainable sites it has received 22 out of 26. Water efficiency is 6 points out of 10, energy and atmosphere 28 out of 35, materials and resources 6 points out of 14, indoor environmental quality 11 out of 15, innovation and design 6 out of 6, regional priority 3 out of 4.

So, you can see like innovation and design it has received the maximum actually like a criteria point. So, which shows the kind of emphasis and attention given by the architects and the designer and the other stakeholders involved in this actually project.

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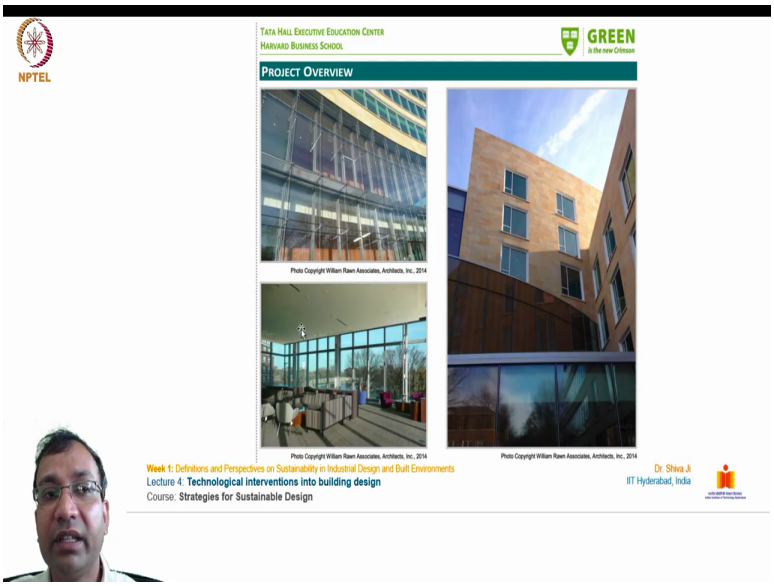

So, some of the actually pictures you can see from here like a how this building is utilizing these actually a glazed you know these surfaces to create like a huge and wider spaces from even if while you are sitting inside you can have a look till like how far places, maximizing even the like a daylight in intake inside this space, you see like here the sunlight this shade is actually falling from this side so it is entering till like a deeper inside this particular space reducing the actually need of like electricity based luminaires.

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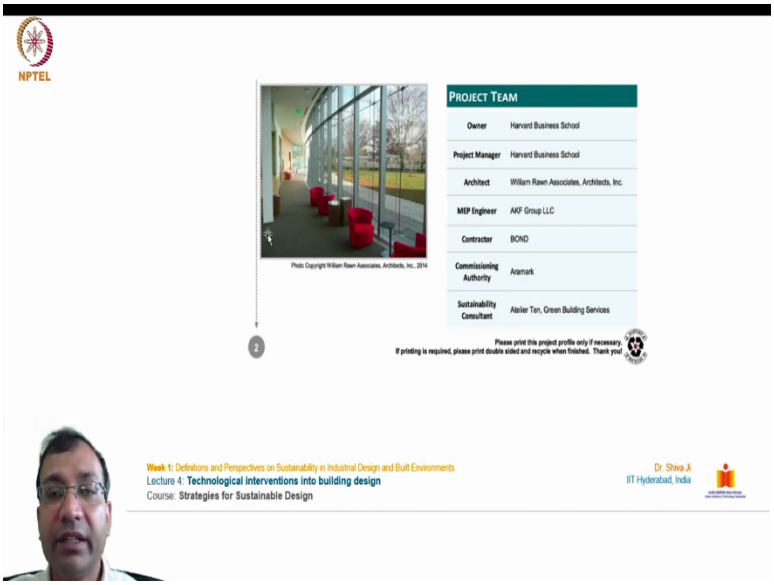

See, the landscaping is also like designed in such a way that it feels like as if we are sitting integrated with the outside and the outer like a landscape of this particular place.

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On the energy efficiency and indoor environmental quality if you see like how they have actually worked to actually for like a fresh air change you know using actually in these methods in the like a summer condition and in the winter condition.

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In the like a indoor environmental quality like high efficiency lighting with appropriate light levels, filtered outdoor air for ventilation, occupancy sensors and control, daylight access and views, high performance double skin façade.

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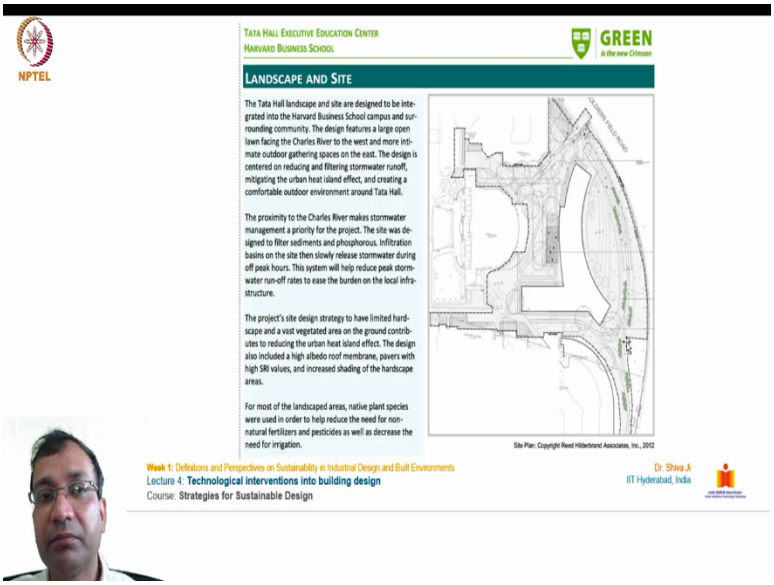

For the landscape and site, you can see in this like a diagram this site plan over here, this is the building you know and how they have actually integrated with the neighboring actually building which are existing from before over here and how they have responded with the actually language of this curvaceous-ness. The neighboring buildings have actually this curvaceous front lines. So, the same language is adopted here in this building as well.

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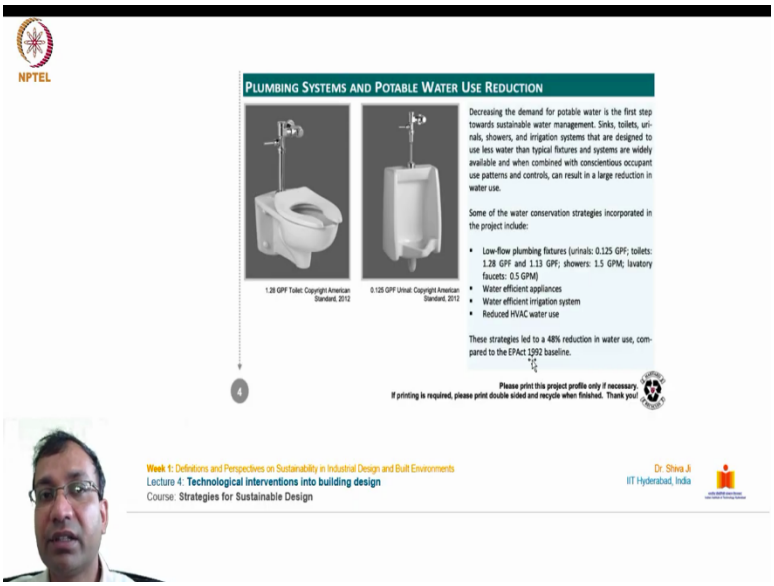

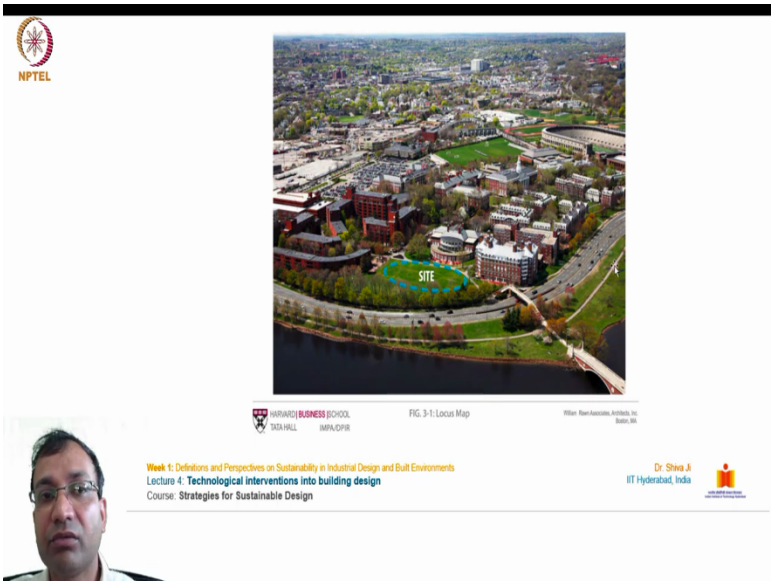

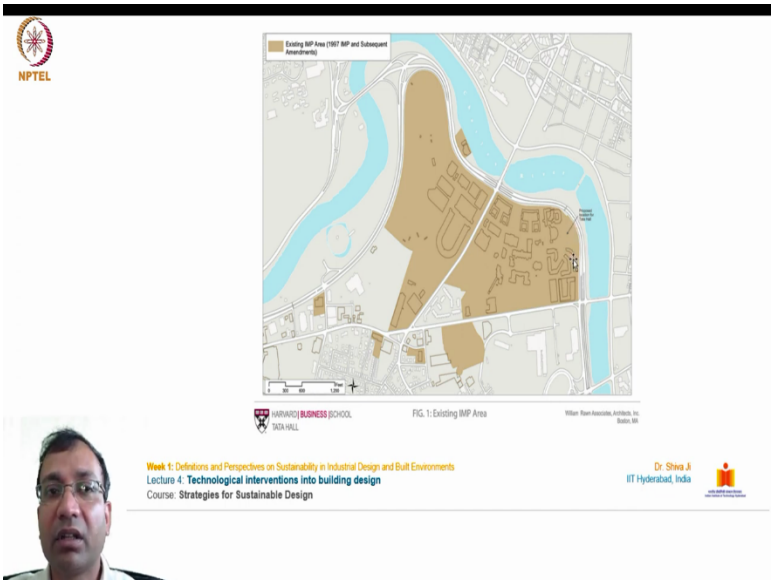

Plumbing systems and portable water use reduction so they have used low flow pumping plumbing fixtures you know water efficient appliances, water efficient irrigation systems, reduced HVAC water uses.

This is the site and this is actually location of a Harvard Business School you can see from the aerial image. In the layout in this like area you can see this is the location of this project okay and how do you see these building facades have this actually curvaceous front faces, so the building is actually following the same actually visual language okay and that is why it has received the maximum actually values in like innovation and design.

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This is actually this report card of this LEED certification, with the points given to this building you can see this slide in detail for your deeper understanding like how these actually final criteria are evaluated you know and how much like ratings are given in each of them.

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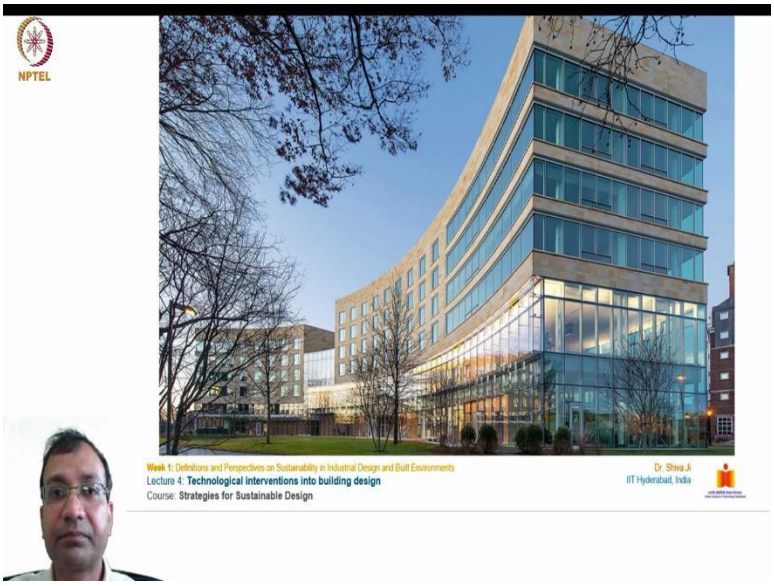

So, this is this actually building a give one of the actually best examples like how a building can actually work for like a sustainable like goals how we can minimize the impact. So, we one actually the exam the reason for giving you these actually case examples from around the world

from like a different corner of India and the world is to make you aware of the actually state of the art actually advancements happening in this area, you must actually learn from these projects you should actually apply these strategies in your designs. So, with this we have come to the end of this lecture, thank you everyone.