

**Glass in buildings : Design and Application**  
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**Lecture – 75**

**A Case Study of Building Envelope in the Context of Environmentally Sustainable Design**

Greetings and welcome to today's session of a Case Study of Building Envelope Design.

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Today I am going to talk about the Hand in Hand Academy for Social Entrepreneurship which is located in Kanchipuram and built in 2015. This is a project that effectively combines sensitive architectural design with very efficient building envelope design which ensures that the internal spaces are cool and comfortable without the excessive use of mechanical conditioning. This is built for a NGO called Hand in Hand who is has an international base with the head quartered in Kanchipuram.

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A little bit about our firm before I move on. Our firm Green Evolution focuses on holistic sustainable design and construction, where we effectively combine sensitive and thoughtful architecture with efficient design of systems and other engineering to ensure that the building is holistically sustainable and is built in harmony with the natural environment. And this also ensures that you know we mitigate the harmful effects on the environment because, of the extensively polluted construction industry that is happening today.

The speakers for today is myself Anupama, I am an architect with a passion for environmental design and construction. Along with me Jaideep Vivekanand who is our expert in green technologies and systems. So, he will be talking a little more about the green systems and the technology measures that we have used in the project.

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**Project Summary**

**Project:** Hand in Hand Academy for Social Entrepreneurship

**Typology:** Institutional (Educational) Building

**Location:** Kanchipuram, Tamil Nadu

**Size:** 18,000 SFT across 3 floors

**Space Conditioning:** Mostly a naturally ventilated building. Some spaces such as the auditorium and a few training rooms required conditioning.

**Project Owner:**  HAND IN HAND INDIA

**Project Team:**

- Architect & Green Consultant: Green Evolution
- Structural Design: Sangameswaran Consulting Engineers
- Contractor: G.R. Construction

The slide features the NPTEL logo in the top left, the Glass Academy logo in the top right, and a presenter on the right side. A decorative city skyline graphic is at the bottom.

Moving on I will brief you on the project summary first this is an 18,000 square feet building built across 3 floors. It is a G plus 2 construction, mostly designed as a naturally ventilated structure, some of the spaces like there is an auditorium and there are training halls which needed conditioning in case of you know excessive heat during summers. The building caters to providing courses for social entrepreneurship for an international clientele.

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**The Design & Planning**

The slide features the NPTEL logo in the top left, the Glass Academy logo in the top right, and a presenter on the right side. An image of a Buddha statue in a modern interior is on the left. A decorative city skyline graphic is at the bottom.

I am going to start with the design and planning of the facility.

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### The Design Brief

(a collaborative effort)

Hand In Hand, being a global NGO focused on rural upliftment, wanted to ensure that the new facility would provide a platform for effective international level training for budding social entrepreneurs.

The facility should reflect the international presence of Hand in Hand and yet be rooted in the local cultural context of place and time.

The facility should be environmentally sustainable – consistent with Hand in Hand's sustainability initiatives.

Designed for an NGO, the facility's design should be cost effective and not extravagant



Initially we were provided a design brief which we again you know evolved along with the client. Hand in Hand as I told you is an NGO with the focus on rural upliftment, but they wanted to bring their experience of rural initiatives from the social aspects into the international you know field. And they wanted to provide a platform where they can actually train people who are budding social entrepreneurs. It was very important that this facility had to reflect the international presence of Hand in Hand as well as it has to be rooted in the local cultural context where it is located.

One of the other design briefs is the facility had definitely to be environmentally sustainable which is very much inconsistent with Hand in Hand's sustainability initiatives. And of course, last, but not the least can be designed a facility which is cost effective and not extravagant considering the client is an NGO and the building is to be built purely out of donation funding.

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## Sustainability Goals

Facility to be designed to comply with the IGBC Green New Building rating.

**Energy Efficiency**

- Building to be naturally ventilated except for a few conditioned spaces
- Interior spaces to be designed to be cool and comfortable naturally

**Water Efficiency**

- Effective rain water harvesting to capture 100% of runoff from site
- Minimize water use through water efficient fixtures

**Sensitive Material Use**

- Avoid unnecessary use of materials and maximize use of low energy materials

**Good Indoor Environment**

- Access to abundant, glare-free natural light
- Well ventilated and airy spaces with cross ventilation
- Low emitting finishes to minimize exposure to chemicals



So, with this is the overall design brief for the project and just to elaborate a little bit on the sustainability initiatives, we looked at definitely energy efficiency and water efficiency; how we can harvest 100 percent of the rainwater. Sensitive material use which also leads to cost reduction, good indoor environment of course, was the most important factor that had to be a result of the design and management which included access to abundant light and ventilation and also low emitting finishes inside.

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## The Location



- Located on the outskirts of the temple town of Kanchipuram
- **Warm and Humid** climatic zone
- Location has a rich history and cultural heritage ~ world renowned for its temples and sarees



Moving on to the location as you see in the map, this is located in Tamil Nadu. It is a 2 hour drive from Chennai the town is Kanchipuram. It is almost a rural setting. Kanchipuram is known for its very very rich history and its cultural heritage in terms of the temples, monuments and its weaving which is silk sarees are very popular from here. The climate zone is warm and humid.

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 The 1.5 acre site is a linear strip with access from the West.



### The Cultural Context



It was essential that the design had to ensure a strong sense of identity for local staff and also create a cultural flavour for the international audience

- : The logo that is cut out of stone forming an interesting entry landscape wall
- : A façade tile pattern reminiscent of their rural weaving pattern
- : Sloped roof form to mimic local aesthetics
- : Rustic Aesthetics

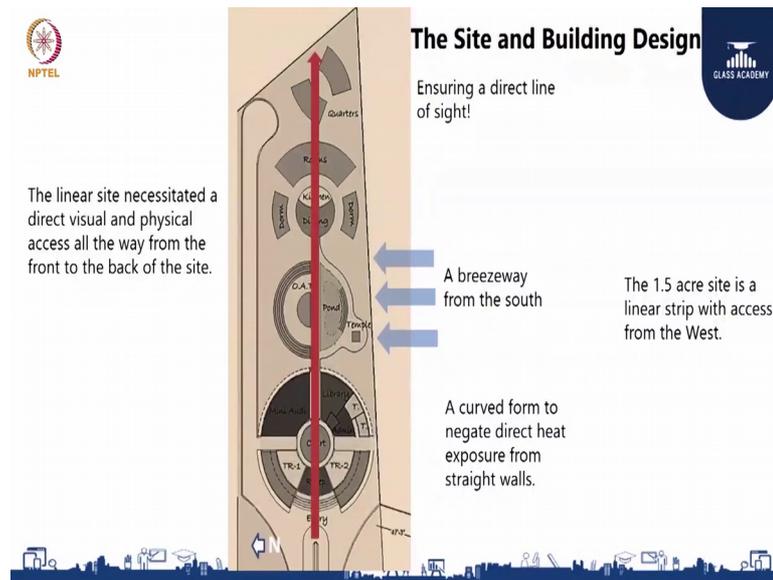




So, considering this the cultural context became very important and we had to make sure that the design had to have a strong sense of identity and also create a cultural flavor for the international audience to which it would cater to ultimately. So, how did we do that? One thing was if you see here, there is a logo the building logo that has been cut into stone walls and that is used as a landscaping wall. This is a view of the entrance that you are looking at straight and this logo provided us a strong sense of identity for the people who are employed there.

Also a facade tile pattern was created where we actually custom design tiles and the design of the tiles represents the one of the weaving patterns used by the local weaving community there. Sloped roofs were created and the sloped roofs helped in you know mimicking the existing rural aesthetics as well as sloped roofs provide you know a better heat reduction on the internal spaces. Picture on the left you see there is a satellite image of the facility as it is today.

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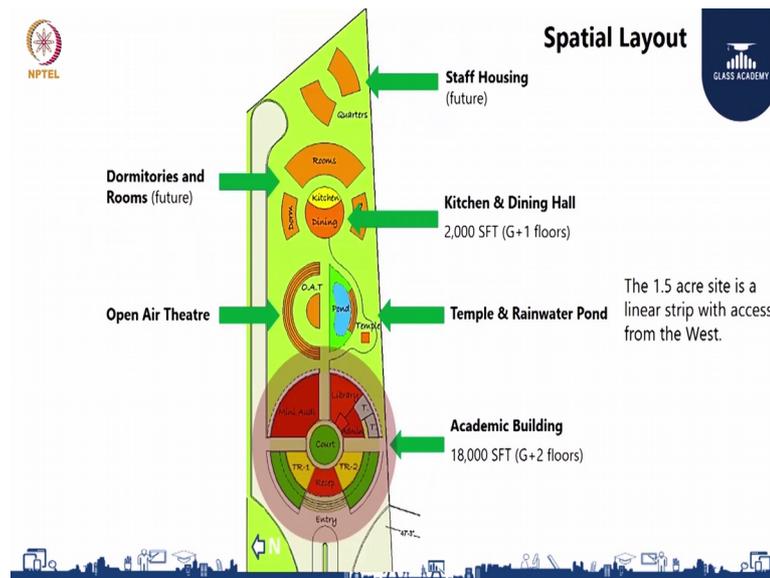
So, when we first saw the site, the site layout it is a very linear site it is a 1.5 acre site set in a rectilinear fashion as you see here. So, the first step was in a linear site like this, how do we get the full effect of the site? You know it was very important for us, then to ensure a direct line of sight that goes all the way from the front to the back and it was important to have this not only as a visual access, but also a physical access. Only this will help people experience the full extent of the site.

Also if you look at the I know there is a breezeway the site is oriented with south to the right, the access main access is from the west. So, the front facade of the building will face west or the breezeway the main prevailing wind direction is from the south which is from the right. And a few of the features that were determined because, of the shape of the site included like I said the linearity of the voids that we had to create and also we need to trap needed to trap the prevailing breeze from this south and. So, it was very important to provide open spaces adequately to trap these breezes. A curved form, if you look at this the buildings are all curved, if you look at the first part of the structure that is the academic block.

And this curved form what happens is it actually cuts you know the direct heat gained from straight forms. So, a curved form will reduce your heat gain into the building because it diffuses the heat. So, this was you know already facing west it was important to try and negate the heat from a direct west facing wall. So, the curved form helped that.

Also one more thing about the curved form is it also reduces the cost of construction, if you look at a perimeter of a curved surface versus a perimeter of a square surface for the same built up area, the perimeter of a curved surface is much less. So, which means you use less material to build and which directly leads to cost reduction. So, that was one of the big aspects being an NGO that we looked at here.

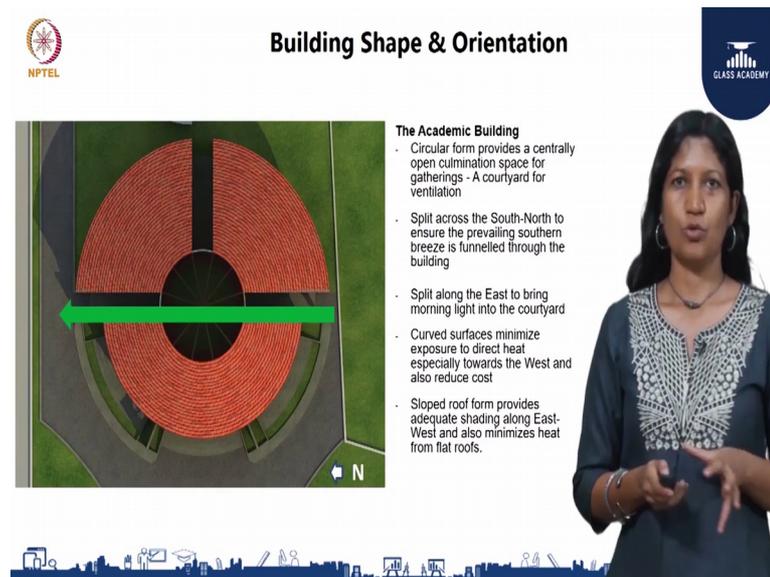
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Moving on a little bit into the spatial layout of the forms that I talked about earlier like I said the front part of the building is the academic block which has training halls, it has a mini auditorium, library, administration. And, the open space that we have created from south to north in the center of the site forms, there is an O A T there for outdoor seating and larger gatherings and also a rain water percolation pond and a small temple which again reiterates the cultural context of the place right there.

So, this open space between the front academic block and you see the dining block at the back actually helps you know trapping the wind and ventilating it keeping that breezeway open. Behind this open breezeway space is the dining block and going further down towards the east is the staff residences and housing which are yet to be built that is in their future phase.

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**Building Shape & Orientation**

**The Academic Building**

- Circular form provides a centrally open culmination space for gatherings - A courtyard for ventilation
- Split across the South-North to ensure the prevailing southern breeze is funnelled through the building
- Split along the East to bring morning light into the courtyard
- Curved surfaces minimize exposure to direct heat especially towards the West and also reduce cost
- Sloped roof form provides adequate shading along East-West and also minimizes heat from flat roofs.

This I want to talk today's presentation we will talk more about the academic block and how our planning in the academic block ensured energy efficiency, all the measures that we have taken to ensure this. So, let us take the academic block this is a top view of the block you see the roof forms, this started with the circular form like I talked about, but we did not want to close the circular form. There is a split across the south to north direction and this is again to ensure the southern breeze goes cuts right through the built environment. The circular form again culminates in a central courtyard that you see it is an open courtyard which is which can be used for gatherings you know outdoor classrooms.

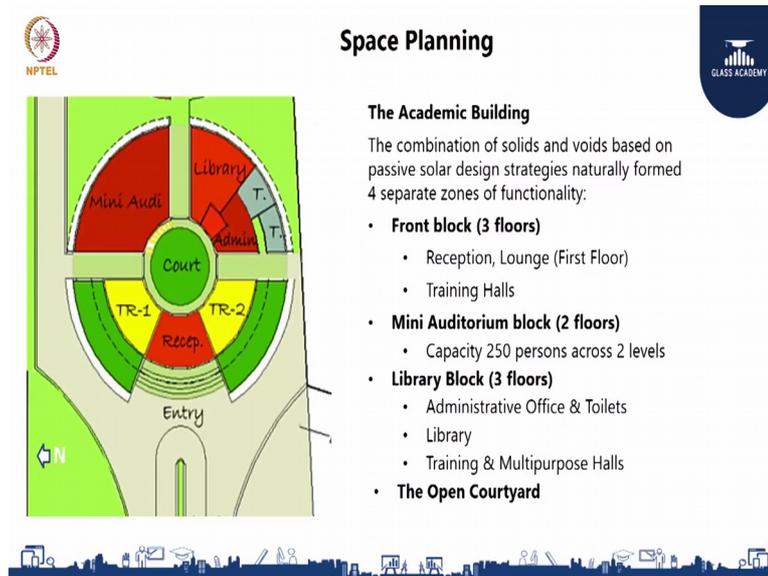
And of course, we all know in the traditional design of a muthram or a courtyard in Tamil Nadu, courtyard is used for are used to ventilate the hot air that is created because of the built form. So, the central courtyard acts as a vent and you see one more (Refer Time: 11:06) in the form that is coming from the east, one more cut through the form from the east. Now that ensure that the eastern morning light falls into the courtyard and also you know the other parts of the building get access to this eastern light.

So, when we looked at all of the splits and (Refer Time: 11:27) the central open space what happened was the form was organically divided into 4 parts ok. So, the front portion here is the academic part right here and that is one part. And, then the forum on the left the piece you know the pizza slice form on the left that was created is the mini

auditorium, on the right it is a library and the central space is a courtyard space which is an open courtyard. Couple of other pointers on this like, I said again the curved surface minimize the direct exposure to the heat.

The roof forms again provides shading because, it is a sloped roof extended out, we will talk a little bit more in detail about that later on. And also the slope form you know negates the heat the impact of the heat that is caused on direct flat surfaces.

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Going on to some of the spaces that that is found inside this curved form so, it is an effective combination of solid and voids that is being formed. Like I said the front part is the academic and the training rooms along with an entry in my reception space that is right there and the lounge that is you know about the reception halls. The rest of it is a training halls, the mini auditorium which is in two levels and the library and the toilets and the administration block towards the south.

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Cut-out in form for line of sight, natural light & a breezeway



These are the some of the pictures are showing what I talked about, how the split from the east actually causes a you know direct line of sight as well as brings in eastern light inside.

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### Building Shape & Orientation

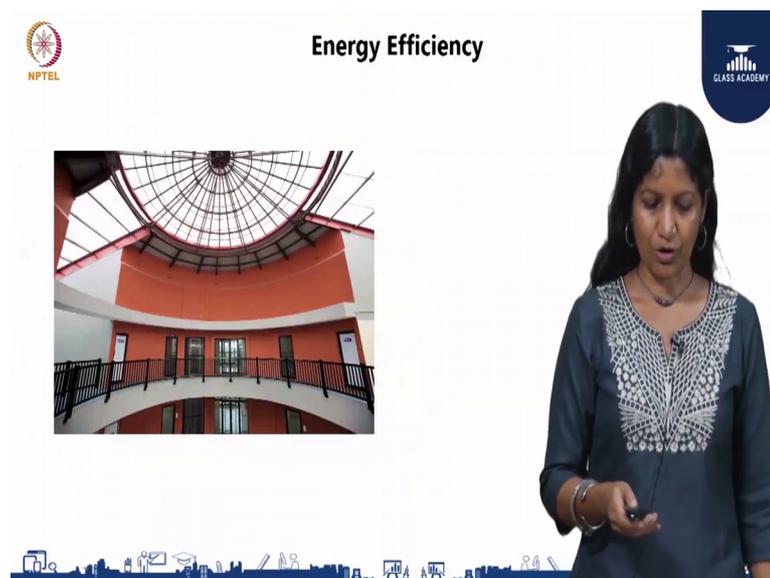


And this is a view of the facade from the exterior. Again you see the split in the built form right there that let us in breezeways that let us in light and you know breaks up the built form. So, this really effectively forms a good solid void relationship.

So, that is the basis of you know how we use the shape of the site to ensure the building orientation and you know is done sensibly and that will lead to energy efficiency and an effective indoor environment for the users. Also one more thing to add is how the built form and the exterior or the natural site is intermingled here. So, people do not you know go into one space and stay trap there indoors. They are able to come out, they are able to come out into the central courtyard or go through the cut outs you know go out then come back in. So, breakaway spaces is what we are trying to create here.

And considering it is also a no designed for an international facility. The idea of combining you know contemporary design, but yet retaining you know keeping a strong hold of the cultural context. If you notice there is a Buddha statue in the courtyard which again you know brings you into roots you into the cultural context of the place and time that it is. So, that is as far as the architectural design space planning is concerned.

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Moving on Jaideep Vivekanand is going to talk about the energy efficiency aspects and how we evolved through the rest of the design to ensure the spaces are cool and comfortable yes. So, I am going to ask Jaideep to continue from here.