Role of Craft and Technology in Interior–Architecture
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Lecture – 23
Craft and Technologies in Interior Architecture: Transformation through Time

Namaste! Hello everyone. Welcome to the NPTEL course Role of Craft and Technology in Interior-Architecture. Today we will discuss module 23, Craft and Technology in Interior Architecture Transformation through time. We will be talking about craft and technology in interior architecture transformation through time where will be focusing mainly the material terracotta.

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So, we have seen this panel in one or two more of the previous lectures and today we are going to discuss in detail this transformation and with her permission I have taken the important findings from the research of architect Priyanka Mangaonkar from the Brick School of Architecture. She also delivered this lecture during the GIAN course which was coordinated by me in 2016 and she has been working on terracotta since almost 8 years now, and here we see how she has documented the stages of transformation of terracotta.

From terracotta used as a material for daily needs, here we see to the expression for religious needs. So, for votive purposes to create pseudo effect for surface embellishment, object in architecture and finally as a construction material which can be used for structural purposes as well. So, terracotta has been designated with the first creative expression of civilisation and we see different ancient objects the drawings of which have been put over here and this is the construction detail the structural part which terracotta has attained now with different kinds of transformations, editions, innovations and then there is this entire journey from here till here.

And this is what we are calling is transformation through time and technology. So, with changing time with advancement of technology, with the availability of different new methods and machines and tools and different understanding of the material, there have been these transformations and transitions and different ways of using the same material which was used only as an object of daily use.

So, and that happens with all the materials whether we talk about stone or terracotta or timber and the idea behind mapping this transformation is to understand how one material goes through you know different stages and then from one particular usage it reaches another level. Lot of people also call it as dilution and not transformation because how originally it was used and to what it has been taken now could also be a dilution of an original way of utilising that material.

Now, everybody has a different perspective and I am just calling it as a transformation through time and technology.

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So, here we see this dish container you this is from the Harappan civilisation it is terracotta polished ware. So, we find a mention of terracotta you know even in the Harappan civilisation and seeing this dish container over here and again the kind of objects of daily use that we see across this panel and then how it has moved from here to here is the entire discovery and the discussion.

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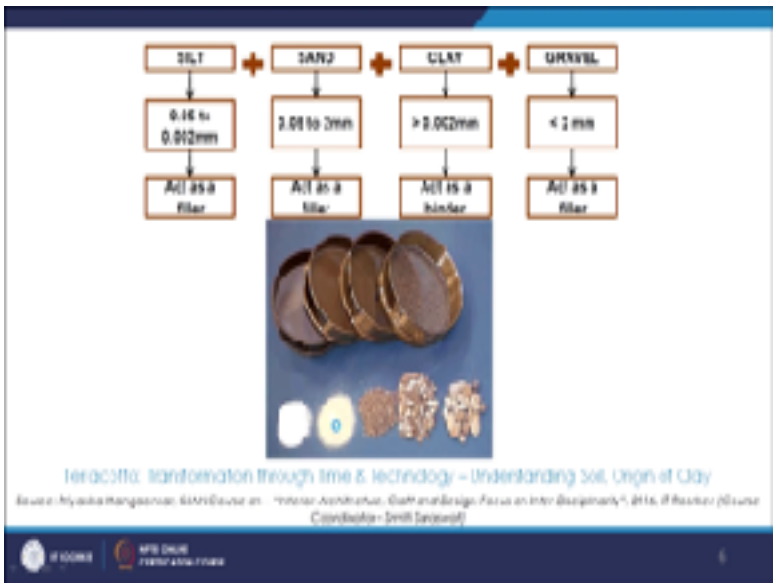

Before beginning that transformation just trying to understand what is soil and how did clay originated and you know what are the different, how the soil is composed.

So, we mainly see silt, sand, clay and gravel so these are different components, there are different sizes and then they have you know different roles to play and thats how our soil is made up of. And that is how we try to understand you know which material with what property, which component is good for what kind of making. So, because until and unless we understand the composition and we break down the material into final elements we would never understand the properties and the kind of benefits we could get out of it or the kind of admixtures which are not good.

So, the entire composition depends on understanding the ingredients and the material properties.

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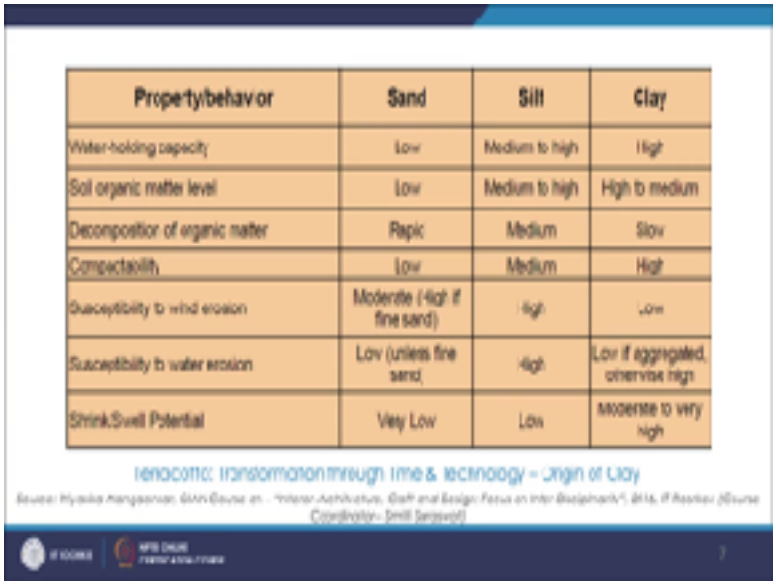

So, if we see some properties that have been listed over here; sand, silt and clay of course, behave very differently and again this is a part of understanding the material. Because when we talk about terracotta or we talk about brick we have to first understand what all it consists of and what all properties are acquired by that material because of those components.

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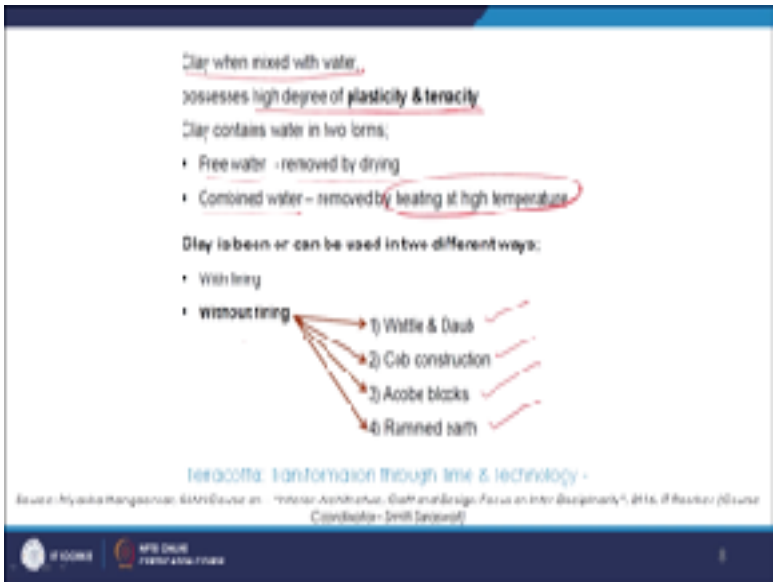

So, when clay is mixed with water it possesses high degree of plasticity and tenacity, that is what makes it very plastic. And it contains water in two forms free water which can be removed by drying and then there is combined water which is removed by heating at high temperature because otherwise the moisture would remain. Now, clay can be used in two different ways with firing and without firing.

We will see few examples of without firing. So, there is Wattle and Daub, Cob construction, Adobe blocks and Rammed earth; this is all when clay is not fired.

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Here we are seeing the Wattle and Daub, you see the clay over here.

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This is the Cob construction all the examples that we see Cob construction. This is Adobe blocks so, Adobe blocks are being made over here, there are two processes here also the dry and the wet.

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So, that is Adobe. And here we see the rammed earth construction. So, all of these are the examples when we are not firing the clay.

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Now, coming back actually to what is terracotta is a material. So, clay based unglazed porous ceramic, sometimes with a course texture. Terracotta literally means baked earth, this is how it has been simply explained. There is a widespread use of terracotta all over the world and it has been modified and used at varied stages of development to fulfill different needs of human beings as per the needs of the time and as per the changing technology.

So, is brick a terracotta? The difference between brick and terracotta is primary difference between brick and terracotta is that terracotta is not a load bearing structure material which of course now we saw in the overview and also we will see in the following slides that it is now of course used as a structural material. It is used primarily for facing or veneer. It is often ornamental, having been made in moulds and then fired in the same fashion as ceramics.

So, this is a originally we differentiated between brick and terracotta, but with lot of advancement and lot of changes with time and technology it becomes a load bearing structural material now, and their different ways in which it is used in the construction industry. So, we also see a timeline when we are talking about mapping the transformation through time.

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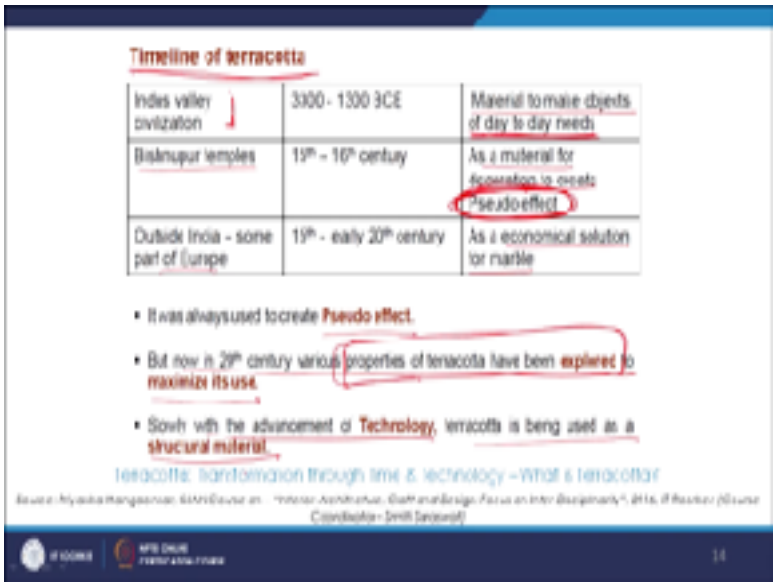

So, Indus valley civilisation starting from there we see terracotta being used as a material to make objects of day to day needs. Then we see a lot of elaborate application of terracotta and Bishnupur temples which have been extensively studied documented and archived.

We see the terracotta used as a material for decoration to create pseudo effect to create an effect which is not there originally, but it is a pseudo effect been created through a material. Outside India also we see lot of examples and there is it also used as an economics solution to marble. So, it was used for creating pseudo effect it was used for creating surface embellishment, it was used for creating objects of day to day needs and now it is being used as a material used for building construction which is structural.

In 20th century various properties of terracotta have been explored to maximise its use. So, properties being explored means again with changing time and technology and with the available research tools and methods and technology. There are different kinds of properties that have been explored maybe which were not known earlier or maybe which were known earlier and they have been kind of not documented or they have been changed or diluted over a period of time all of these are debatable and then they are different perspectives on that like I said before.

So, slowly with the advancement of technology terracotta is being used as a structural material in the construction.

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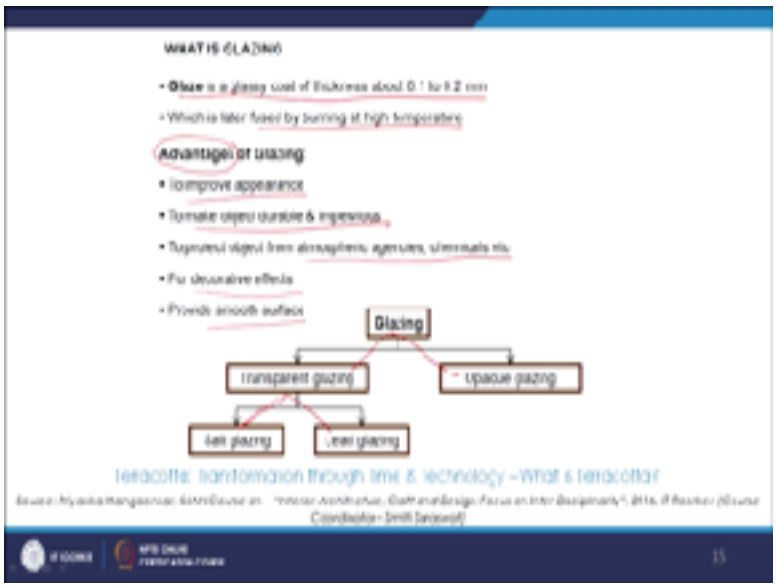

Now, what is glazing, we often talk about you know terracotta, ceramics, glazing not glazing. So, glaze is a glassy coat of thickness about 0.1 to 0.2 mm and it is fused by burning at high temperature. It has several advantages, it improves the appearance, makes object durable and impervious, protect the object from atmospheric agencies chemicals etcetera, for decorative effects, for providing smooth surfaces and the glazing could be transparent and opaque and within transparent salt and lead.

So, it is again a very fine layer and it helps protect the object and material from varied things, now again this is also understanding the material it is properties and trying to see what maximises it is use and which is the best way to do it. So, this is in line with understanding the material.

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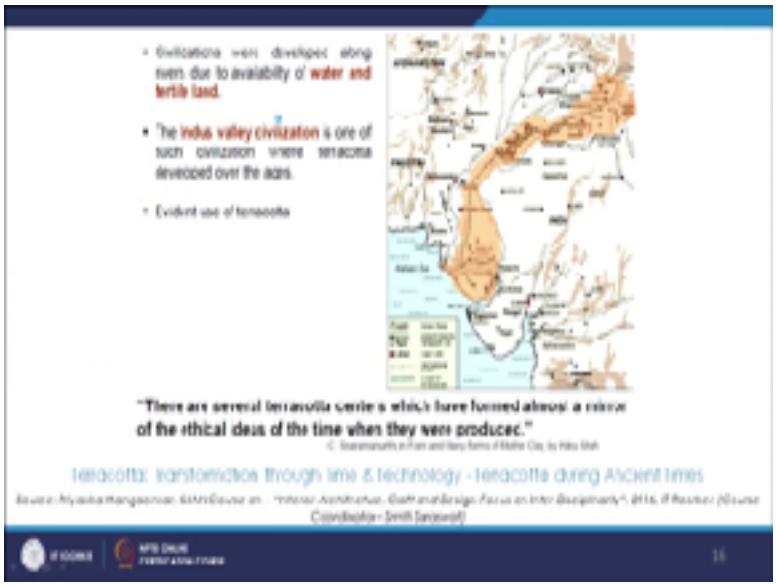

And here again, we see you know the different centres where terracotta was used and it was being predominantly taken up as a material for different kinds of purposes to fulfil the needs. Indus valley civilisation is one of the civilisations where terracotta developed over the ages and we see a very significant use of terracotta in Indus valley civilisation and while terracotta was being used for making objects of utility,

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It was also being understand that you know there were different shape size and forms that could be studied depending on what was the objective of use and what purpose it fulfilled and you know so, form followed function, it has a unique form and it has a function attached to it and with these kind of ancient objects being studied it also helps to understand patterns of social and economical organisation, because within this object also one would see very simple objects to complex objects from less ornate to more ornate from different kinds of sizes.

So, that reflects on the society and the economics, further it also helps to understand patterns of continuity and change this is very interesting. So, documenting different objects over a large span of time also helps us understand the continuity and change how the needs have changed, how the purposes have been redefined, how the expressions have been reinterpreted and the way these objects have been collected and documented curated, exhibited, displayed, studied. It gives the reflection of different kinds of ways of utilising them and learning the methods of making and the purposes they solved.

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The edge character is also very important when we talk about terracotta and the objects made out of it. So, it is a very crucial part of the whole form and it needs a very strong shape edges give strength to the form. So, when we see over here different kinds of edges and different kinds of forms that go along with those edges, it helps us again

understand a sort of a system in the process of making, you know what is the form like what is the shape, what kind of edge is design, with which form and how does it provide strengths to it and what is so unique about it.

So, all of it over here helps us understand the character of the edge in the kind of form it goes with and the kind of role it plays and what kind of strength it gives to the object of use.

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So, we have seen terracotta also transform according to different regions because there will always be regional variations. So, here if we see this horse from Bengal, this is from Tamil Nadu and this is from Gujarat. So, it is basically horse made out of terracotta, but when we see the three different geographical locations within India we see lot of differences.

So, again this also highlights the lot of narratives about that particular place from where the objects are coming and you know the material availability, the variations within the material, the kind of colours scheme being followed up, the kind of societal you know ways of living and connotation. So, all of that we get to know when we see these different variation and transformation according to the different regions.

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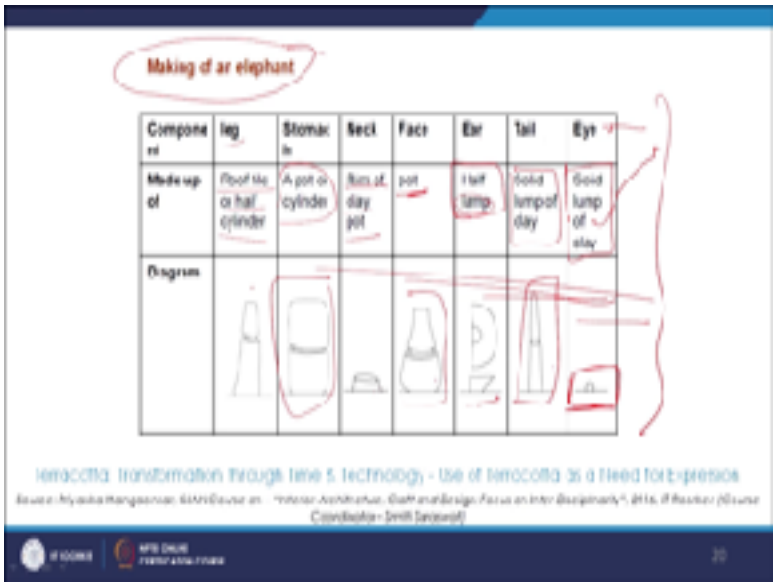

If we take as an example you know how a small elephant out of terracotta is created we see again the you know there are lot of components in which we try to break it up these components can be made and then assembled. So, leg, stomach, neck, face, half lamp, this is ear then this is the tail and the eye. So, eye; made up of solid lump of clay, tail; solid lump of clay, ear with half, this is lump and then face with a pot, for neck we could have a rim of clay pot, stomach could be a pot or cylinder and for leg we could have roof tile or half cylinder that is how we are assigning function to a form and then by the assembly of these different components, we could get a terracotta elephant.

So, again understanding, the material, the components, the system, the making, associations, relationship between form and function this is how we understanding terracotta and how it was used as a need for expression.

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Some more drawings and the methods; how it is created in terracotta used as a need for expression.

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Now, we can see lot of use of terracotta in architecture. So, starting from an object of daily use we are seeing terracotta being used in architecture. So, from here for votive purposes to surfaces, murals, then you know this is the interior of a house; this is shah house, wall panel and then here we see the Jaipur railway station, the entire facade is made out of it. So, there are different applications we see and that different scales, this scale is different, this scale is different this is just a wall panel.

So, of different scales and you know different through different medium and designs we see how terracotta has been used in architecture. Also trying to understand when terracotta is used in architecture, how is it used as a material for surface embellishment.

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So, when we see all these temples in Bengal, specially Bishnupur and we see how the art is expressed through medium of temples and we see lot of these surface embellishments and lot of details which talk about the regions, culture, religion, literature and the art.

So, these are all examples from architecture and how terracotta was used in temples.

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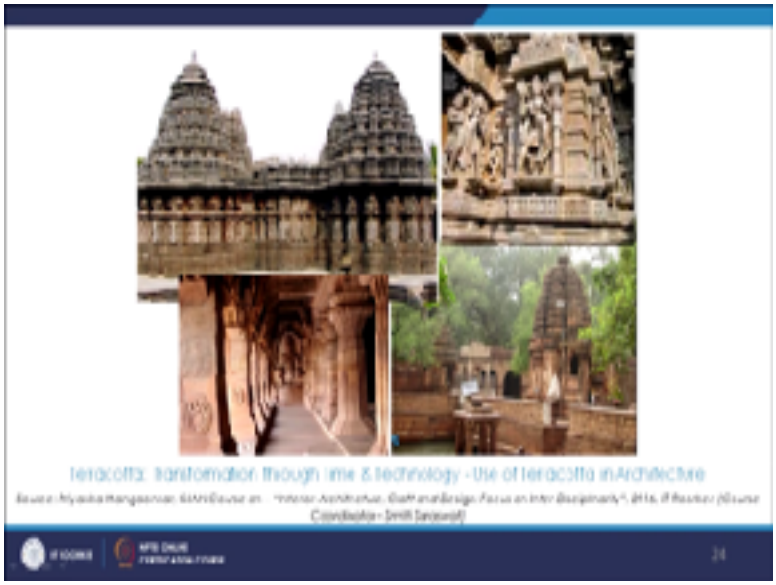

These are some more examples here that we see.

This one.

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So, here there are lot of details there is lot of surface embellishment, there are figural motifs, there are a lot of stories, there a natural motifs, there are lot of details over here.

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Again here, surface embellishments in the kind of effects they create, they are still talking about the surface here, more details.

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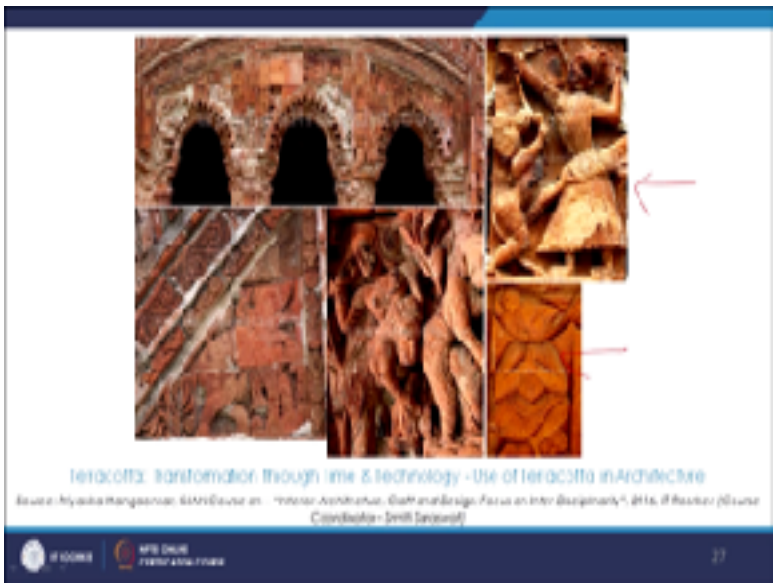

Here, terracotta being used in architecture.

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Some more use we see here in images this is the drawing, this is the terracotta tile and we see the section over here we see the details, this one, this is another section here, this terracotta tile over here.

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Varying brick sizes to create make believe effect, we see the varying brick sizes, and we see here the detail, the kind of effect is created by using varying size and proportion.

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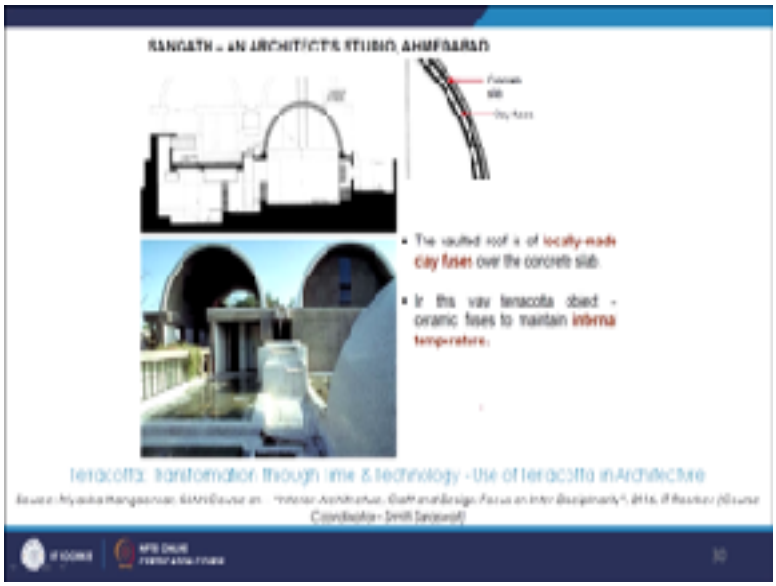

Some more examples; this is Sanghat, Doshi sir studio and here also we see the use of clay fuses.

Vaulted roof is of locally made clay fuses over the concrete slab in this way terracotta object. So, terracotta is being used as an object in architecture. So, in this way terracotta

object ceramic fuses to maintain internal temperature, we see over here the details. So, this is also being used as a microclimate modifier. This is a very famous example of the fired house *AGNIJATA* in AUROVILLE.

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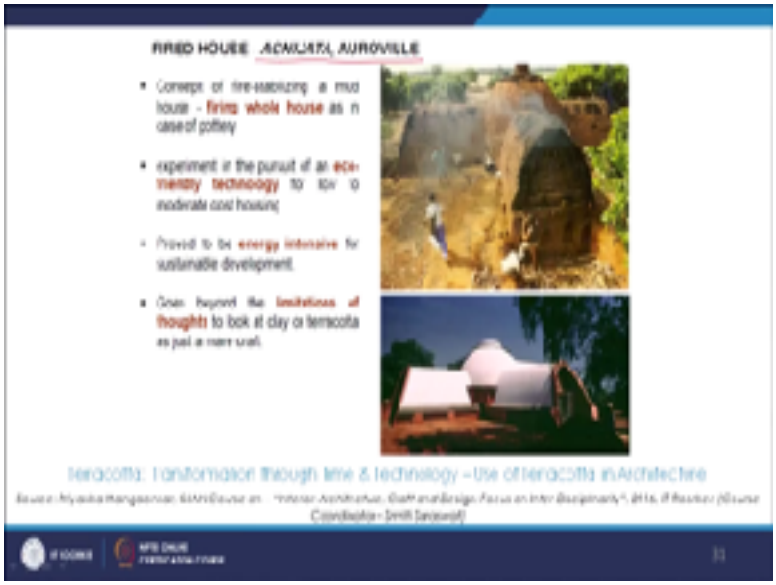

And the concept that was used here was fire stabilising a mud house for that firing the whole house as in the case of pottery.

So, the whole house was fired as we do it in the pottery. So, that the fire stabilisation is done and this house is quite strong and stable and this was an experiment in the pursuit of an eco-friendly technology. It proof to be energy intensive and it goes beyond the limitations of thoughts to look at clay or terracotta as just a mere craft. So, these are all examples of you know experimentation and application and somebody's attempts to see how the material can also be used not just for making a pot or an object of use, but by making a whole house and then firing it.

So, all of these possibilities this material allows and lot of experiments are being done and I am sure they would be more that would be done in times to come.

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Now, here if we see terracotta and technology. So, through technology terracotta has transformed a lot and there are different kinds of usages and different kinds of prototypes which are possible there are also standard products which are available in the market. So, there are product ranges of terracotta, we see different kinds of tiles, we see different kinds of blocks which could be used in construction.

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Here we see roofing country tiles, we see these kinds of tiles and we see the details of construction, how this could be used in building construction.

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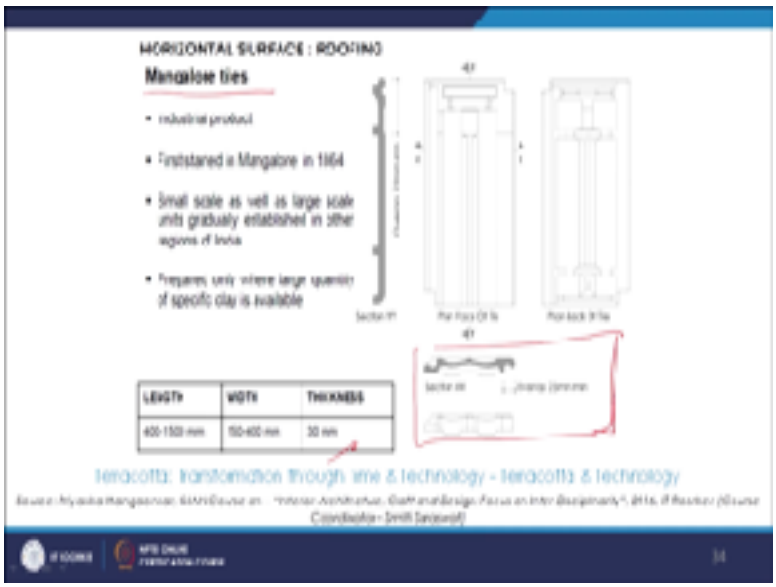

This is another one this is about the Mangalore tiles which are made out of terracotta and it is dimensions and how they have been used in construction.

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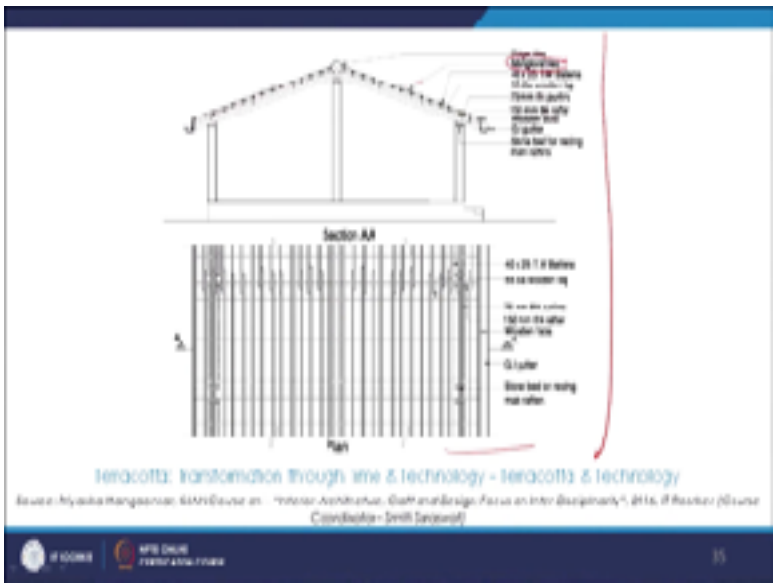

Some more details drawings here we see the Mangalore tiles.

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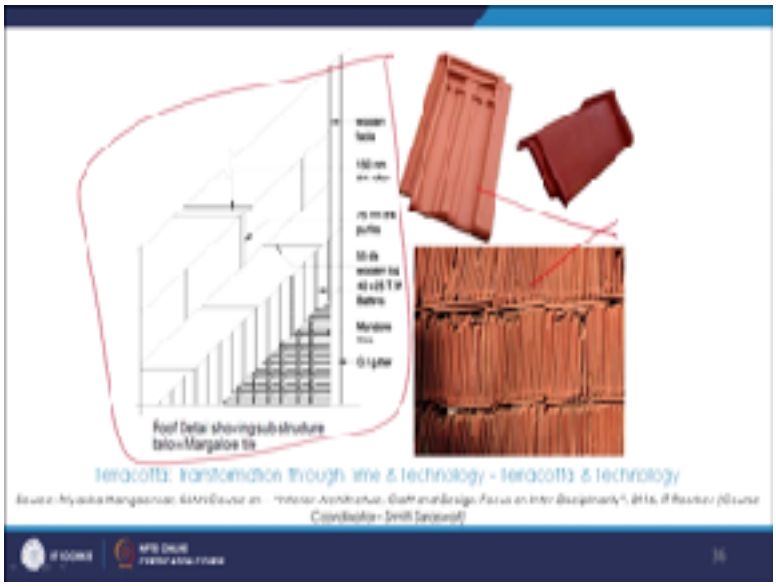

Again some more details, tiles and how they have been used in construction.

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This is about the flooring tiles and the paver blocks. So, different kinds of paver blocks and how they could be used for flooring creating patterns out of these blocks for interesting flooring.

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Again, some flooring patterns.

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Here we see the entire facade, we see lot of terracotta used in the entire facade. So, thats again how terracotta has transformed as a material and now extensively used in building construction sector for creating vertical surfaces for creating walls.

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And which have good weatherproofing, fire resistance, which are cheaper than stone and their limitation to sizes of course, to prevent the distortion and there are two ways of cladding that have been discussed dry cladding and wet cladding, one example here we see by Renzo Piano.

So, this is being extensively used in building construction now.

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So, wet cladding dry cladding this is the mortar, and here we use metal clips and clamps which are like old methods, but then the material is transformed and the expression has changed.

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You also see product range by Jinan Sir, Mr. K. B. JINAN has come up with lot of products made out of terracotta which have been highly appreciated and they have been highly sought after and their use interior architecture.

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We see here again lot of murals, lot of surface details we see over here, gardening details.

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Also here we see these hexagonal modules which are used as the rack for keeping the bottles again, modular.

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These are perforated in hollow block which are used for construction and they are highly, it is possible to use them for structural purposes also they are highly used for structural purposes.

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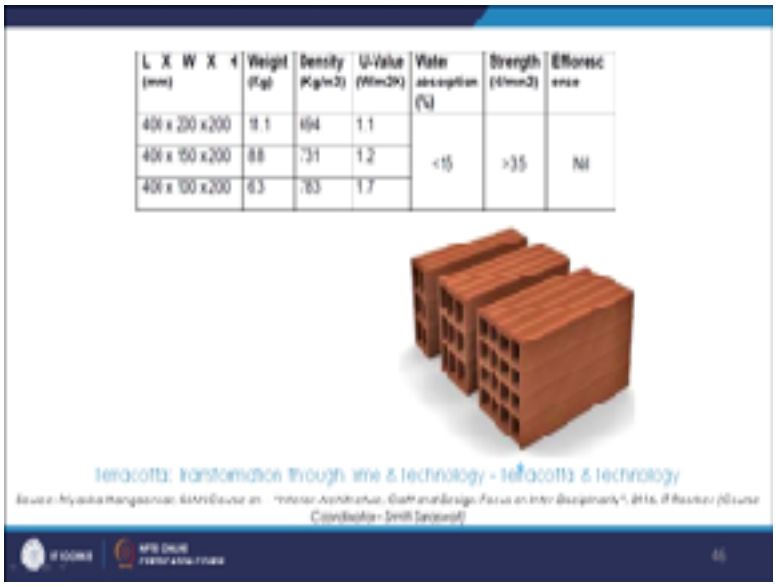

Some, dimensions and details of these hollow terracotta blocks.

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And there are lot of advantages of these clay blocks. So, their energy efficient, saving natural resources by lowering rate of consumption of topsoil, they are good in thermal insulation, reduced fuel requirements, reduction of dead load, increase production capacity, improved crushing strength, reduction in cost and logistics.

So, they have been used for construction and this is the new expression, the new form the new terracotta.

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Some examples of how it is used in construction blocks, here, this detail here with reinforcement.

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Some more details.

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More details so, there is Haurdi block which is also used on a concrete T beam. This is another way of constructing by integrating with another material and creating a composite section, this is also very structural, structurally strong I mean to say.

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It has also been used with ferrocement channel over here this section here, another structural way of integrating terracotta.

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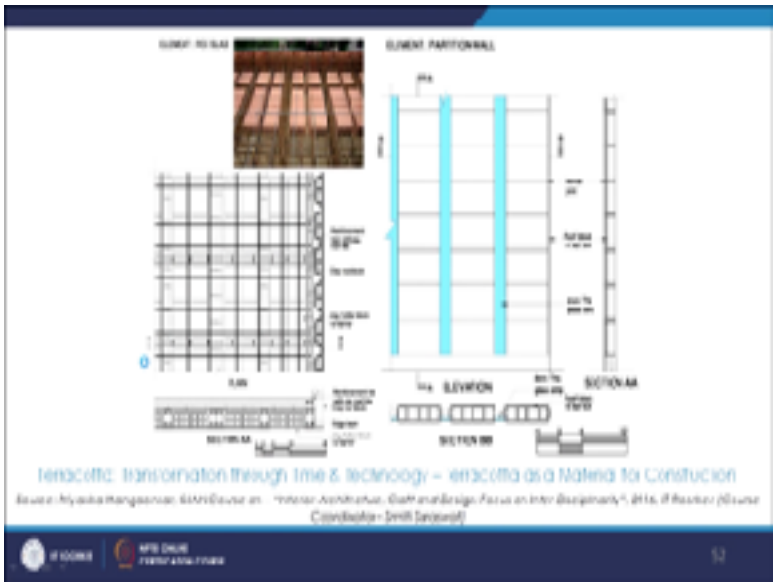

So, and also we see the use of terracotta now in different elements so, we see partition wall being made out of terracotta.

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We see the parapets being made out of terracotta.

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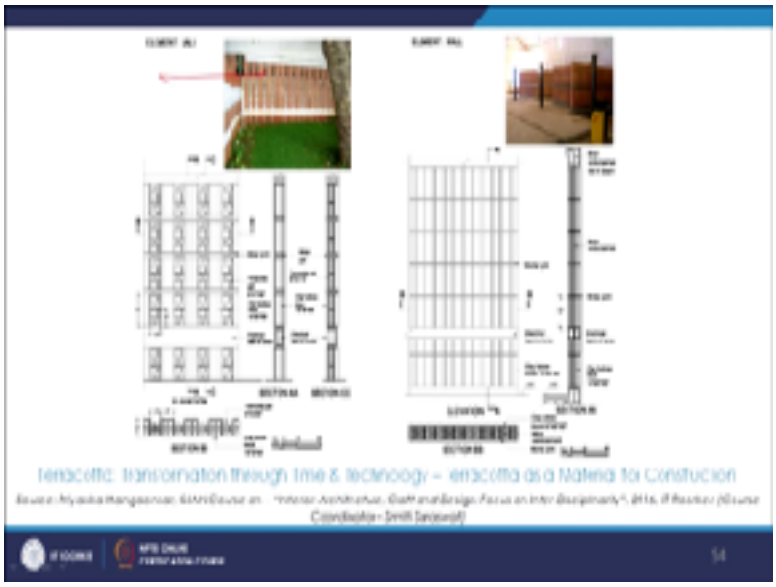

Again here we see *Jali*, this is again a wall setup parapet and wall, also here wall.

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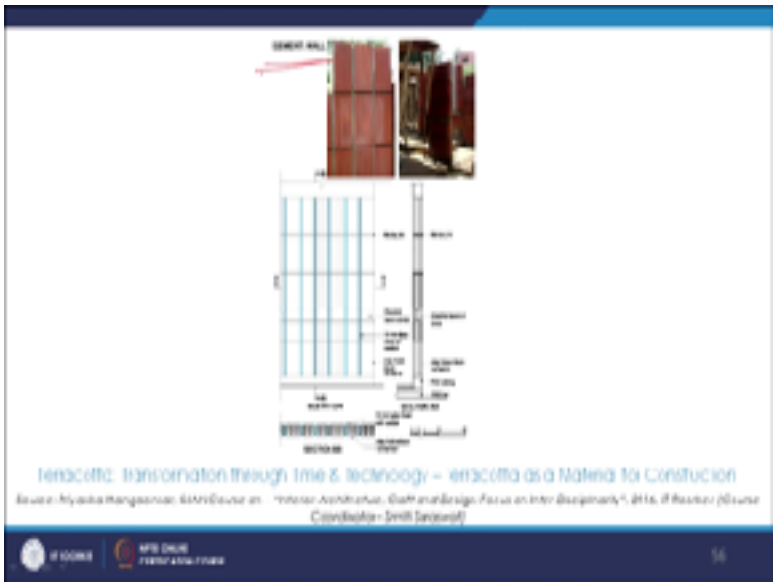

So, we saw here in this module how the transformation of material happens over a period of time through technology, through change of needs. And we saw how one object which was majorly used for utilitarian purposes and for decorative purposes is today being used for a very structural purpose and it is contributed to the building industry.

So, this kind of evolution, transformation could be traced for different materials and we will continue this quest. And in the next module also we will see craft and technology in interior architecture transformation through time.

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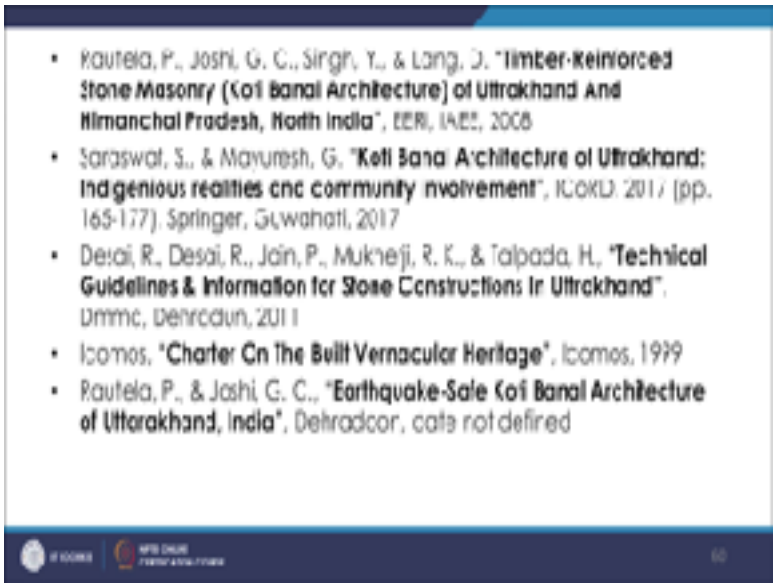

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Some references for you these are largely the combined references from the previous few lectures.

Thank you.