Interior Design
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Lecture - 22
Interior Design: Green Interiors: Attributes –IAQ, IEQ, Furniture

Namaste. Hello, everyone. Welcome to my NPTEL course on interior design. Last time we started our discussions focusing on green interiors and I'm going to continue with the same and we are going to discuss you know different dimensions, different aspects, different attributes which come within the purview of green interiors. So today we are going to talk about green interiors especially focusing on the attributes which are IAQ, IEQ and furniture.

So we talked about IAQ, IEQ, you know, in an overview manner and what is the importance of attaining a certain indoor air quality and indoor environment quality, which is important for health and well-being for the users when they inhabit an interior space. So broadly speaking, the contents for today are materials and VOCs. So these are volatile organic compounds like we just came across this term last time. The permissible limits, the minimum air quality requirements, green products rating, you know, especially standards for furniture and some references. So when we talk about materials and VOCs, let us look at the IEQ credit 4, which focuses on using low emitting materials.

So used materials having low VOCs and for all of these, which are very, very handy when we talk about interior architecture projects. So whether it's paints and coatings, adhesives, sealants, flooring system that we are, you know, designing and executing, composite wood, laminate adhesives, system furniture, seating, So for all of these we must try to utilize materials which have low volatile organic compounds which is VOC. Now the concerns with the VOC are also in place and we have to keep in our mind you know how to mitigate them or how to take care of them. So paints contain solvents which contain the VOCs.

VOCs readily vaporize into the air. They react with sunlight and nitrogen oxides. They form ground-level ozone, which causes air pollution and health ill effects. Oil-based

paints are high in VOCs. Whereas water-based paints are low in VOCs or may not have any VOCs at all.

So we have to be responsible and make our selections and choices accordingly. Some of the references and products that we see in the market, whether paints and coatings or certain kinds of adhesives and sealants that we come across, some of these are listed here. We discussed LEED CI: what LEED Commercial Interiors is and why it is so important. Why are we talking about it during this course for pedagogy and practice related to interior design as a discipline or interior architecture as a broader umbrella? Referring to LEED CI, we can find these VOC limits.

If we look at different kinds of applications, whether architectural or specialty applications, or substrate-specific applications listed in this column and table—sealant primers or sealants— For all these applications, based on the category or classification seen here, the VOC limit has been calculated and is already a standard practice with prescribed units. We could find values as low as 30 for metal-to-metal substrate-specific applications. It could also be up to 850 for specialty applications, such as sheet-applied rubber lining operations. These are some handy references, useful for keeping a check on VOC limits. Now, when discussing IEQ Prerequisite 1, it emphasizes minimum IAQ performance.

And there are two cases that we can look at. So, the first is mechanically ventilated spaces. And they must comply with ASHRAE Standard 62.1, sections 4 to 7. Now, I am trying to... put this information together. A few among us may already be aware of these standards, codes, practices, and rating systems. But there may be many more who are probably not aware of these.

So it's a very vast course. It's very difficult to explain each section and every case scenario and code. But broadly speaking, what is the most important and crucial aspect The aspects which are most important and crucial are what I'm trying to discuss here. Then there is case two, which is for naturally ventilated spaces, and compliance must be achieved with ASHRAE 62.1, section 5.1.

So these are very important documents and references that can help us achieve green ratings for our interior spaces and ensure health and well-being for the users. So when we talk about minimum fresh air requirements, we are referring to the outdoor airflow

required in the breathing zone of occupied spaces. And there are also ways to calculate this using equations and mathematical formulae. So I'm not going to discuss that in detail, but we already have those in place. So if we have to understand minimum pressure requirements, let's refer to this table, which helps us understand the minimum ventilation rates in the breathing zone.

We can try to read this table and understand it broadly. So, let's say there are these occupancy categories, and there are some correctional facilities such as cells, day rooms, guard stations, waiting or booking areas. Then there are educational facilities such as daycare. Even the age bracket is also sort of identified and defined here. So, age 4, classrooms for ages 5 to 8, classrooms for ages 9 plus, lecture classrooms, lecture halls, art classrooms, science laboratories.

So, for all of these facilities and for all of these different occupancy categories, there are ways to calculate and, you know, have this kind of reference and understand what would be the minimum ventilation rates in the breathing zone and what the minimum fresh air requirements are. So, again, when we try to work on interior architecture projects and when we are part of the industry and working on the ground, it's very important to understand these technical aspects to discuss with, you know, the entire team, to have your experts in place, to be aware of these kinds of benchmark numbers and base numbers, and to be aware of how to make healthy and, you know, interesting spaces that do not do much harm to the environment. So again, let's say if you have to calculate the minimum fresh air requirement and we are talking about some heat load calculations. We also have some AHU in mind, the air handling units.

And if you are talking about the case of a discussion area, so, you know, we can make these kinds of inventories and put these parameters and data, you know, in that table and try to understand and calculate. So, the temperature in Fahrenheit is 73, relative humidity. Then there is energy, and then, you know, occupancy area and, you know, flow of air. All of that data, and then, you know, we come up with some kinds of these numbers which indicate and help us understand what the minimum pressure requirements are.

Now, again, IEQ credit 2 and it talks about increased ventilation. Now, the intent behind is to provide additional air ventilation for improved occupant comfort, well-being and

productivity. And provide enough fresh air to exceed the ASHRAE standard 62 by 30%. So, this is the intent. And there are also green rating for furniture.

And it's very, very important because furniture forms a very important, crucial and significant part of interior architecture products. So, when we talk about furniture, let's say non-wood category. Again, there is... green product rating credit and point distribution system in place which is very very systematic and has its own structure so you know there are credits there is the criteria and there are associated credit points so there are also orders such as product design product performance raw material and green supply management and there are more as we go to the next slides we will see that So credit 1.1 talks about within the order of product design.

It talks about eco vision, strategies adopted, resource allocation, implemented measures, impacts, all of that. And for these different points under the credit 1.1 within the umbrella of product design, there are credit points which are given and there are subtotals for each of these orders. Same way for product performance, there are some mandatory requirements and credit 2.1 emphasizes on all of these and the subtotal is 30. For raw material and green supply chain management, again, some mandatory requirements and credit 3.1 and 3.2 and which talk about important aspects, you know, like use of recycled material, etc., And there is also, you know, the green procurement guidelines for industry.

They also have some points. Then there is also an important order, which is manufacturing process. And within that, we have credit 4.1 for energy efficiency, 4.2 for water efficiency, 4.3 for renewable energy. And then we have all these credit points associated with it. And we are still talking about non-wood furniture here.

There is also emphasis on waste management. The sixth important point is the lifecycle approach. And there are sub parameters and credit points associated to that. We are also talking about product stewardship and innovation, and they also have important credits. Credit 7.1, 7.2.

This emphasizes on education, community outreach and engagement. 7.2, you know, extended producer responsibility. And of course, there is credit 8.1, which talks about innovations. So these are all very important discussions that we are having today. And it makes a total of 100 points in this entire tally.

We also have the green product rating, you know, credits and points distribution for furniture. And we are talking about wood specifically. And like you see over here. Again, you know, for product design, product performance, raw material, green supply chain management, and then the manufacturing process where we talked about energy efficiency, water efficiency, and renewable energy. We again have points and sub-points, and then we have associated credit points, you know, which go with all of these.

Then, of course, the waste management, lifecycle approach, and product stewardship. That also has sort of parameters listed underneath each order or each classification, and then the points associated with it. And again, innovation. So for all of these wood and non-wood furniture, we have this kind of inventory and reference points in place. Continuing further, you know, with rating standards for furniture, both non-wood and wood.

To understand each of these orders in detail, the seven points that we were seeing in the tables, you know, a few slides ago, starting with the product design. So the intention or the intent behind product design is to design the product holistically, considering all the environmental attributes where we are trying to minimize associated impacts. So we did see credit 1.1, which, you know, is part of product design. And it talks about very important aspects: the eco-vision statement and, you know, the design stage of the product, the manufacturing stage of the product, all of those in detail. Then there is product performance.

And here we would see the mention of credit 2.1. Minimize air contaminants concentration. And the intent is to reduce exposure to chemicals, contaminants from furniture during use, which cause severe impacts on health of the occupants. Continuing with the product performance, there are some mandatory requirements. So test the following as per specific standards.

So formaldehyde. TVOC or total volatile organic compounds, total aldehydes, and then there is phenylcyclohexene. So there is air chamber test or perforation methods. We could use them, you know, for testing the above parameters. And we have to, of course, achieve a certain product performance based on these standards that have been set.

Now, as per the IGBC, the Indian Green Building Council, the emission limits for the identified contaminants are also given for us to refer to. And we see these four that we

saw on the previous slide. And, you know, for a system furniture or for seating these are the different kinds of values or readings that you see and again this table here we are talking about product performance and we are talking about credit 2.1 and it talks about all these parameters and associated credit points now third one is the raw materials and here also we will see non-wood and wood furniture so for non-wood furniture the credit 3.1 And it concentrates on recycled material.

The intent is to reduce virgin material consumption by increasing the recycled content at the time of manufacturing. And we see this credit mentioned for non-wood furniture. These are the parameters, and these are the credit points that we try to achieve, refer to, and see what could be the closest that we could come to. So, again, for the raw materials and for the non-wood furniture, talking about Credit 3.1 still, which is recycled materials, there is a mandatory requirement. Use a minimum of 5% of the total weight of recycled material on a weighted average basis of furniture.

So, there is a standard practice and a reference, and we try to achieve that. For wood furniture now, Credit 3.1. Use of rapidly renewable or recycled material. The intent is to encourage the use of rapidly renewable materials in furniture to reduce deforestation. Rapidly renewable materials are agricultural products that take 10 years or less to harvest.

That's very, very important. And during the lecture on wood and timber, we also talked about ecologically grown timber. And you know the time it takes to get replenished, etc., so this credit emphasizes this aspect again. Continuing with Credit 3.1 for the wood furniture, there is a mandatory requirement: wood for furniture production must be sourced from legal and verifiable sources. That's very, very important, and this is the credit that you see over here and the associated points. Then there is the manufacturing process, and we are talking about energy efficiency, Credit 4.1. The intent is to enhance energy efficiency in the manufacturing process of the product to reduce environmental impacts.

And these are the associated credit points. Now for water efficiency, we have credit 4.2 and the intent is incorporate water efficiency measures in the manufacturing process to reduce portable water consumption. And of course, implement measures to benefit the society at large. And these are the credit points which are associated. Then we have renewable power and there is credit 4.3.

The intent is encourage the use of on-site and off-site renewable energy sources to reduce the dependence on fossil fuels and their associated environmental impacts. This is credit 4.3. These are the criteria and this is the tally of credit points associated with each criteria under manufacturing process. Then the waste management and it's very very important you know to manage waste. The intent is to ensure that the solid, liquid and gaseous waste discharged from the plant comply with all local regulations.

And the mandatory requirement is compliance to local regulations on all three kinds of waste discharged from the manufacturing location. Credit 5.1 specifically talks about waste utilization and disposal and the intent is encourage appropriate handling, create wealth out of waste or proper disposal of waste generated during manufacturing. Now this is non-wood furniture and we are talking about waste utilization and disposal and we have credit 5.1 and credit 5.2 and it talks about recyclable waste here in 5.1 and non-recyclable waste in 5.2 and this is the column for the criteria and these are the credit points. For wood furniture, we are talking about credit 5.1 and we are talking about waste utilization and disposal. And we are talking about wood waste.

For 5.2, we are talking about non-wood. And we have these important criteria. Greater than 5% reduction in waste going to landfill. Greater than 15% reduction in waste going to landfill. And, you know, the associated credit points.

Life cycle approach, credit 6.1. It talks about the life cycle analysis, and the intent is to identify environmental impact at every stage of the product's life cycle and initiate measures to reduce such impacts. It is very, very crucial. To take into account the environmental impact assessment of the projects we work on or the products we design, and to behave as responsible designers, responsible citizens, and responsible humans. So this entire module on green interiors will hopefully sensitize us to all these important aspects.

Continuing with the sixth point, which is the life cycle approach, and talking about the life cycle analysis. Here again, if we look at credit 6.1, it has this criteria and the credit points associated with it. You know, 2% impact reduction, 10% impact reduction, etc. So that's a very, very important aspect. We also saw and listed in that table the product stewardship, and within that, credit 7.1 focuses on education.

Educate those involved in handling the product at every stage post-dispatch to reap the intended environmental benefits. Education always comes as an important factor, and we need to educate not just trained architects, students, and people in the industry, but the entire value chain—whoever is involved, whether educated or not, and those with skills who are part of this value chain—must be aware of these important aspects. We must collectively try to reduce environmental damage. Then we were talking about education, and this is the table—this is how it looks—and the associated credit points. There is also Credit 7.2, which talks about extended producer responsibility.

The intent is to establish a system for take back of recycling of products at the end of life and packaging materials after use. These are some important criteria and the associated credit points for 7.2: Product Stewardship. Now we are talking about Point Number Eight, which is innovation. It is very crucial to focus upon. We are in 2025 and we are talking about innovation in every aspect of way of life, the way we think, we design, we produce, we consume.

So it's very important to focus on that. Credit 8.1 emphasizes product innovation, and the intent is to establish innovative measures and target product innovation. There are criteria and credit points for innovation. And there is a discussion over innovative measure implemented at any stage of life cycle and how it gains credit points. And there are some other interesting, you know, credentials and accolades which will also help us achieve certain credit points.

So these are like really important eight orders or eight important dimensions, you know, which we just saw and then we concluded with innovation. So I always like to put an interesting quote, and we have been talking about sustainability. We have been talking about health and well-being. We have been talking about interior spaces, rating systems, certain credit points, criteria, and how to achieve good health, well-being, and sustainability, you know, through responsible design of interior spaces. So 'healthy is the new sustainable' is, you know, what is being quoted.

So the next lecture will focus on green interiors. Again, we are still talking about green interiors. And we will showcase the physics of light and the chemistry of colors, which I find a very fascinating and interesting topic of discussion. Some of the references, as always. And there are also references on each slide.

Thank you so much. I'll see you next time.