Glass in Buildings: Design and Application
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Lecture - 07
Glass Design Tools for Safety, Sustainability and Aesthetics

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So, there is a tool called glass wizard which helps you to understand two important parameters which is very basic need when you do a glass design, one is called the thickness analysis, another one is called the cause benefiting or the payback analysis. So, to do a thickness analysis what are the basic design conditions you need? You need to know what is the building location, based on the location we need to calculate the actual wind speed as per the highest 875 new code, new version.

So, once I know the basic principle I need to know; what is the panel size I am going to design in my wizard. Once I know the panel design I might have to have some basic understanding whether this building I am going to use a single glazing unit or a double glazing unit. So, once this basic 3 things are defined, I know my wind speed and I know my panel size and I know my glass combination. Only challenge now I have is in this glass combination what should be the glass thickness I am supposed to use to make the building safer this is an important criteria called safety.

To go through this to check the safety there are codes available like ASTM E 1300, Bs

6262 or the American standard Australian standard AS 1288 or there is a Singapore code which is called CP 96. These are the 4 different codes are available internationally to suggest us how to design or how to understand the glass deflection and based on the wind speed when there is a deflection happens to understand what is the maximum tolerance I can design.

So, this tool in this tool it will help you to understand the standard if you if you can see the screen there are 4 different codes available. So, you can select the codes and then you have a provision to enter your wind speed based on your internal experiment or if you do not have any understanding on the wind speed the tool help you to select. So, you have to select the building criteria, you have to select the building criteria, the height of the building the location of your project and what is the height of your top panel. So, that to understand whether the building is a medium or a extremely high race building.

So, once you know this we are we have to integrate your, what is the panel height and the panel width that has been decided. Once this is decided we need to know whether I am going for a single glazing application or a double glazing application. Based on the kind of application then I have to select what kind of processing I am supposed to use as per the NBC. Say for example, if it is the first hour where I am going to access it or a going to be a slope or going to be an vertical or horizontal, based on it I have to select whether it is annealed, toughened, heat strengthen and laminated or laminated.

Once this option is selected I have a provision to select the glass thickness if I have an idea or if I do not have an idea I can just click the execute button. So, that it goes it gives me an report like this which says what is the panel size which is 1250 cross 1245.

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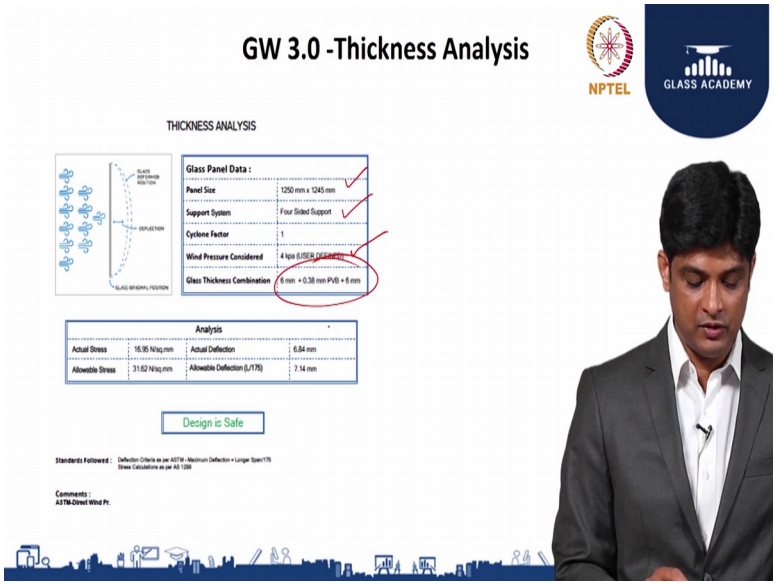

And it I have mention it as a 4 sided support means I have a frame on all the 4 sides I have selected the cyclone factor one because that is a new addition as per the IS 825. The wind pressure considered in this case I have just given an example where I have done a internal experiment where the wind speed has to be considered higher than what is suggested or proposed in IS 825.

So, my testing has given highest wind possibilities are 4 kPa. So, in this case I wanted to check whether the suggested lamination combination can be used. And it says for the actual deflection for this lamination for the design wind speed is 6.84 whereas, allowable is 7.14 mean the allowable deflection is higher than the actual. So, the design is safe.

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So, once I do the glass thickness calculation the second portion I can do is to understand what kind of product and what how it going to make an impact on my building. So, in this base glaze I can select it as an option, so whether it can be the clear or the clear double glazing or ECBC as your basic requirement as a base case requirement.

Then you can select the products from the list and you are supposed to give some basic details like direction wise. Direction wise you are if you have a shading device, we have to give the details about the shading device you have to give the glazing area respect to east direction what kind of chillers you are going to use, and what its efficiency, what is the cost of electricity and you can even select, what is a kind of a building you can select the operating days in a week whether it is a 5 day operational building or 6 days or a 7 day and whether the building is to be operational for 8 hours, 12 hours or 24 hours, or the months of operation because there can be some officers which can have a standardised location period. So, you can understand even that, you can input that data.

Moment you put all these basic required data you re glazing area your glazing area respect to direction, your cooling system details and your operational details. Based on the product that you have selected you can get a detailed report like this which will help you to understand what is the ac requirement compared to the base base option that you have selected versus proposed option.

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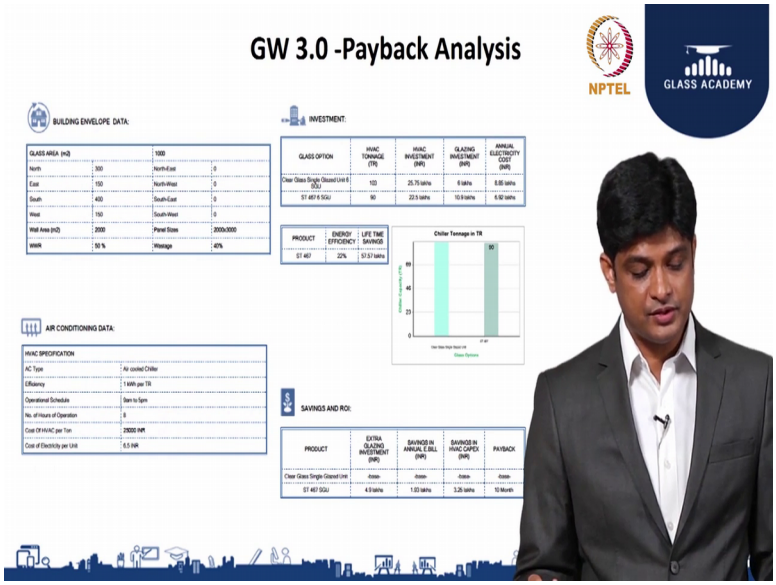

In this case for an example you have selected or you have wanted to compare single systematic clear float glass versus product which has a lower solar factor and lower light transmission. So, very clearly you can see there is a huge reduction about 15 percent reduction in your HVAC, the overall tonnage requirement which has a again investment, which has an impact on your overall electricity cost which is going to be consumed in the entire year. Plus, you can understand what is the investment required in case of a glazing overall savings and what is your savings on your HVAC part, and even considering even considering the HVAC capex savings as your savings, just by the maintenance saving it hardly need 10 month period to recover the investment that has been done on the glass.

So, this is a very simple tool where during the design phase of your building you know the basic dimension of your building and basic area of your glass area of your building. You can input into the software which helps you to give a very clear understanding, what is the investment of the glass I am going to do, what is the kind of a glass I am going to select whether it is from generation 1 to generation 5, based on the generation of the glass there is an difference on your overall impact on your building energy demand which is what the tool can help you.

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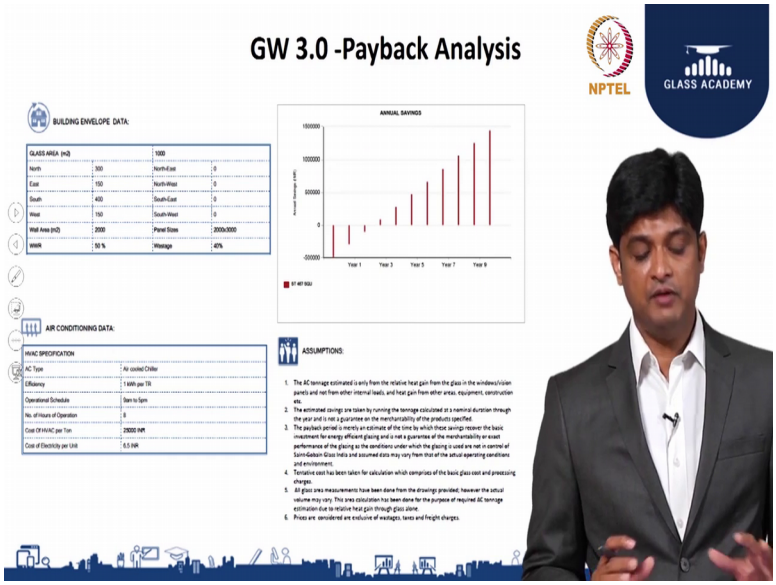

So, it can even give a very detailed plot or a bar chart and it can give you some kind of it will help you to understand the inferences and it has been very clearly backed by what are the assumptions that has been considered in during this calculation. Because in this case I will not be able to change beyond certain limit about the climatic condition because there are particular data has been spread based on the datas available with the simulation tools. So, very precise conditions cannot be done which is possible where we can do a whole building simulation understand that.

So, even the assumptions are been tabulated your building details have been given cast tabulated, outputs are tabulated product that you have selected and its performance details will be tabulated, and the impact overall impact or the payback analysis been given.

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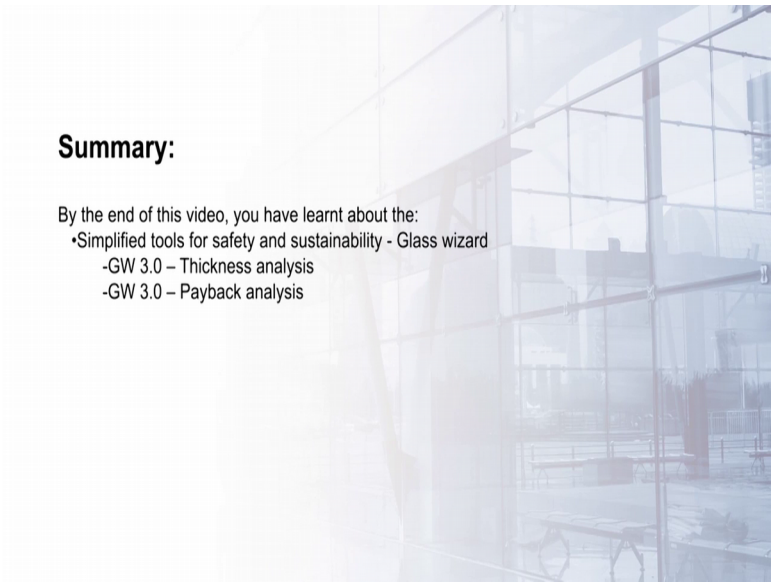

So, thank you and this session would help you to understand how the glass descent can be done based on the safety which is ideally the glass thickness, based on the location, based on the wind speed, based on the dimension. Another one is sustainability, so based on the generation of products available, how to select the bandwidth performance requirement and how can you select a product. And the third one is your aesthetics how can you select or how can you visualise the product, how can you see through. And a simple tool I have taken the simple tool called glass wizard which helps you to understand to design the glass thickness and to design the product selection for a simple condition.

Thank you.