Glass in buildings : Design and Application
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Lecture - 49
National Building Code 2016

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So what are the kind of so, I have done a safety study, I have done an energy study. Now, I know what is a safety requirement, I know what is an energy requirement for my building. So, there is an options available you have an online coating and offline coated products. So, how do I know what are the parameters I have to test in the performance of the glass. Like I have a perform, like I have a requirement for safety testing. What is the requirement for a performance glass testing? What are performance have to test? So, ideally you have to test the visible light transmittance, solar direct transmittance, solar direct reflectance or which is ideally called help shoot calculate your shading devices.

So, these are the 3-4 values which you are supposed to measure for any coated glass. We just a manufacturer is been declared, but again there are laboratories outside where we can send the samples which is been tested to understand the performance values declared by the manufacturer. Plus there are few other durability test which has to be done for this kind of high performance glasses, which is your condensation resistance test for the coated glasses acid resistance or a salt spray analysis which helps you to understand the

durability of the testing. And, there are some kind of abrasion resistant test because, the glass has to pass through lot of value addition whether, it can be a processing or even after processing if it is a single glazing there is a provision for the glass to go through a cleaning process at the site after installation.

So, do the coatings or durable enough to take such kind of abrasion resistance. So, these are the kind of durability test which has to be tested before the product being coming out of the factory. But, even after it been launched as a end user we also has a provision to test this products in the third party laboratories.

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So, there are some portions in NBC refers specific to glass which is on the fire and life safety. So, there is a transparent fire protection and the fire resistance glazing system which is available.

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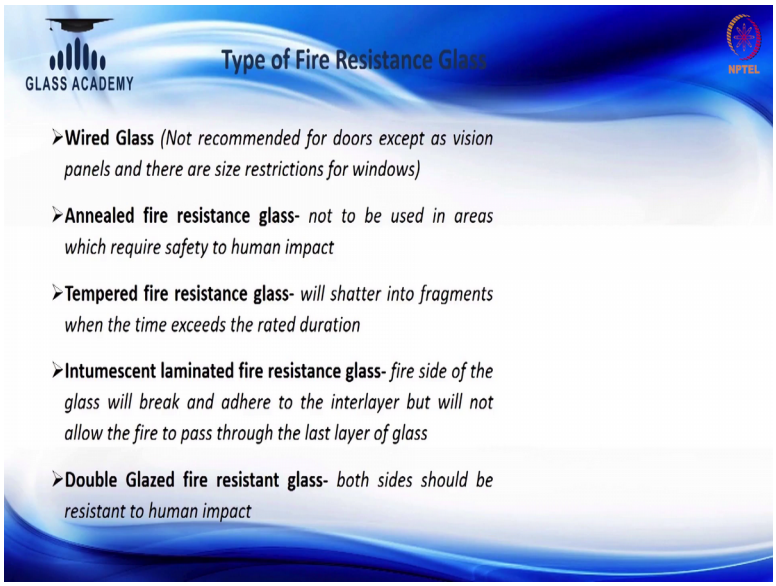

So, under part 4 and life safety what it gives a basic a direction is, it helps you to understand what are the kind of fire resistance glass available in the market so, that you will be a wise you can make a wise decision in selecting; what kind of fire resistance glass I have to use based on the location and application. So, there are the some basics like wired glass which is not recommended to use in a bigger format. It can be very simple view panel as a part of your dose because, it does not has an impact resistance. And, it is quite of a banned product in many part of the world. There are annealed fire resistance glass where a different material, different basic composition is used to make this glass or coating has been used.

There are tempered fire resistance glass where it has the dual property of both fire and resistance to human impact. So, since I can refer you to the safety glass required for the building which ideally means a tempered safety glass. So, here if the fire resistance glass can be tempered then it improves the efficiency of the product. So, it can address both fire and it have both the human impact. And, there are products in the market which is used an intumescent layer between the glasses as a gel which helps to fire, which helps to resist the fire or which going to fight with the fire for just stipulated time of 30 minutes or 60 or 90 or 120 minutes.

And even there are now double glazed fire resistance glasses available. So, for an example in your project it comes the part of your external facade. So, you will no need to

compromise on the colour or shade because, of the fire resistance glass. The fire resistance glass can be double glazed with the current coated glass. So, that for aesthetics it still remains the same, but functionally it going to be a fire resistance application glass.

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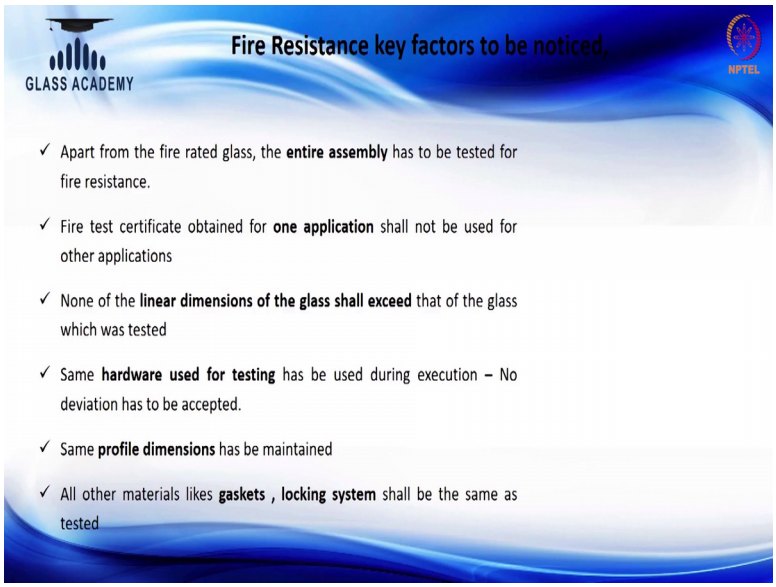

So, in case of fire resistance the key parameter is the glass alone cannot perform, it has to be the entire assembly. So, NBC part 4 very clearly says glass or glass assembly or the testing or the test document that I am going to get it as a customer has to be very precisely mentioning few of the details. Like it has to it has to give the what is the kind of application this glass has been tested for. Whether it has been tested for a single door or a double door or a sliding or a partition wall; it has to be very clearly mentioned in the test reports.

What are the list kind and dimensions of hardware used for testing and what is the profile I have been used for my section. Because, here the fire resistant glass during a huge fire will have an due to the higher temperature there is a chances of expansion and contraction happens to the glass. So, the system I am going to use should have the provision to hold the glass firmly for the entire fire rater timeline, whether it can be 30, 60, 90 or 120 as per the requirement.

Then the entire report should carry the gaskets I used to the locking system use, the opening provisions I have has to be listed in your system. So, to recap fire resistance product means it is not a one single element, it has to be tested as a system. Here a

system I mean it is glass, frame and all other accessories include your sealant, your hardwares which is part of the execution has to be tested and it has to get recorded in your test reports.

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So, there are 3 kinds of products available which you can which you call it as stability which is ideally the E category product which has a tendency to stop the fire and smoke. There is a next category which is called integrity which is EW which has a resistance or which has a provision to stop the fire, smoke and the thermal heat transfer that happens through the glass. We know glass u values are quite higher and when the glass temperature on one side is going to be increasing the heat transfer that happens through the glass it will be very high.

So, the second category which is been there which helps you to even cut the kind of thermal heat that transfer happens from the basic version. The third version which is called the insulation as a name indicate it is a complete insulation. So, the non fire side even we can have a provision or we can imagine to touch the glass in non fire side. Ideally it mean it can block the fire, smoke and the thermal heat transfer. So, these are the basic 3 types of fire rated products which is been identified or listed in the NBC or the referring standards NBC in referring standards which helps you to identify based on the location and the type and the kind of a product you can use.

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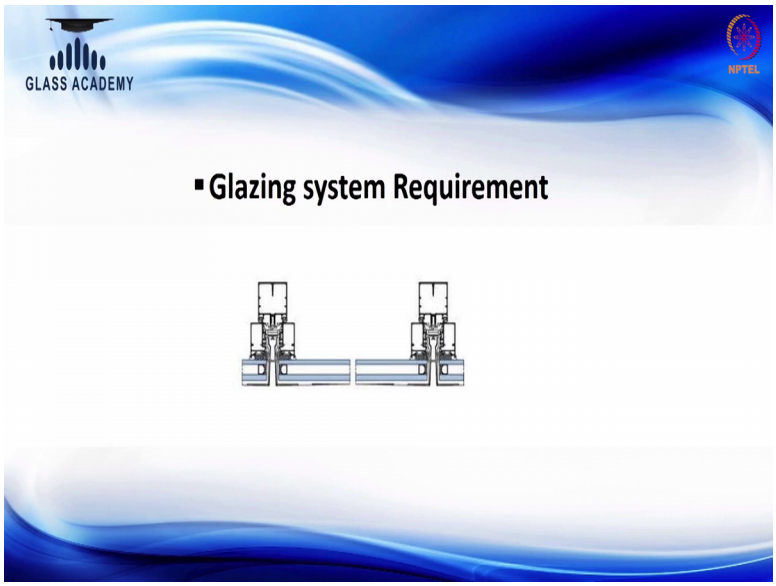

So, just to have a small brief about we have gone through the glass. Similar, like in fire how the systems are important respect to the glazing also, the systems are very important.

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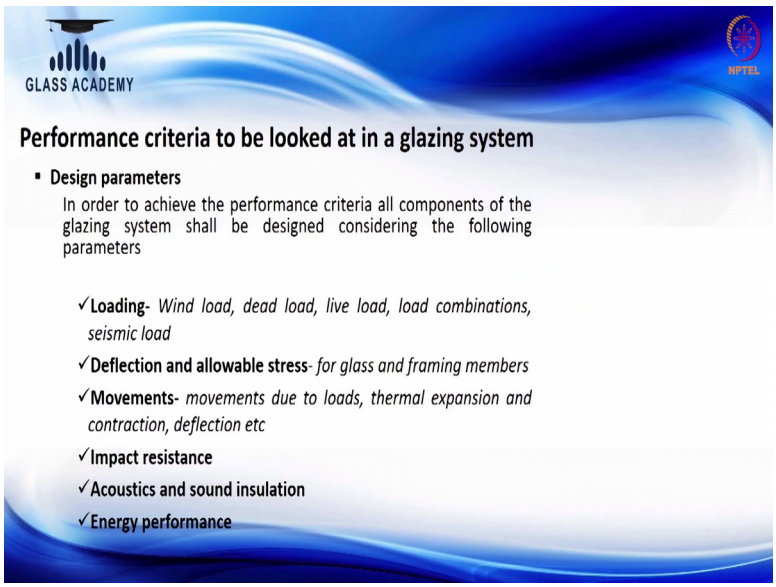

Because, it has to go through a different kinds of a test or the design requirement. Start form the loading condition which the frames are been designed for, start from the wind load or for the earthquake or for the panel dead load and the live load. So, all this has to be designed has to be considered during the design phase to define the cross section of

your members. Or we need to understand what is the deflection and the allowable stresses permitted for both the glass and the frames. What kind of movement is been designed for whether, it is been have a provision to move for horizontal during earthquake.

Or it has a provision to move vertical during the heavy higher wind speed or during high deflection of your glass. Whether, the frame have the tendency to adopt towards it or what kind of impact reason the frame also can understand. What kind of acoustic possibility that can be introduced into the current system. And, what kind of energy savings even through the frame because, a traditional box sections are very poor in your u value; but, today's there are thermal brake system which is available which can help you to reduce amount of heat coming in; not only from the glass even for the system.

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So, to understand glass and system together again there should be list of testings available. What we are saying the initial of the section is how to test the glass as an individual element whether on the processing, whether on the performance. Now, I will help you understand what are the kinds of testing has to be done as a system. It can be a structural stability or the overall energy impact glass and system, what kind of visual values can be measured. Resistance to fire, acoustic air infiltration or the leakages through for air and water has to be tested because, it is going to be the envelope of your building.

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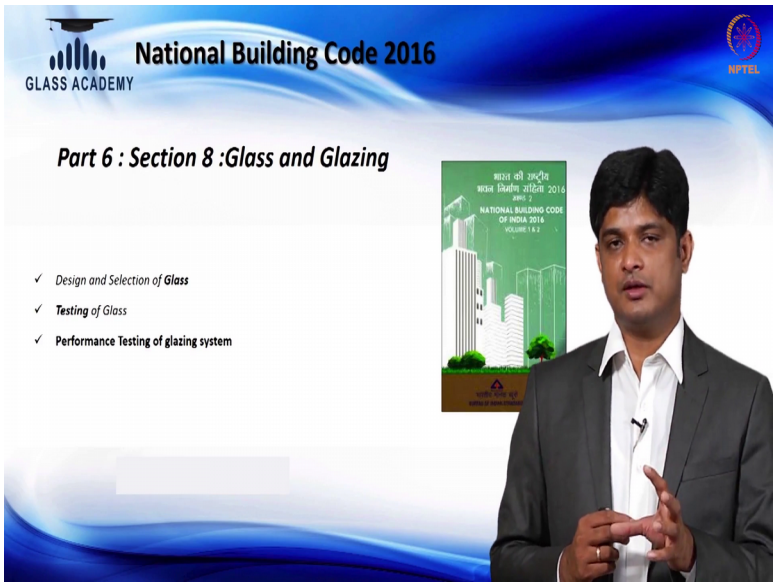

So, to recap what we have covered in the section; NBC 2016 as a new section called glass and glazing which has a section 8 which comes under part 6 structural design. So, the section is which is new and it has huge detail, it is a vast detail been covered in this. What we have taken you through the session today is to have a to give you the content or to give an idea what is covered into the overall NBC. Very precisely this this this portion of the session will help you to understand how to design or how to select glass for a building.

And then what is the kind of testing requirement for the glass again and glass for the systems so or the glazing division. To recap again on the glazing side there is 3 important parameters which has to be understood, which is a light transmittance, which is a solar factor, which is u value of the glass. The 3 important energy parameter which has to be understood and identified based on the orientation of the building, window wall ratio of the building or with a occupation of the building. Second is a safety requirement, very important where you have to understand the criticality of the location.

Whether, it is a vertical glazing, sloped glazing or skylight or a overhead glazing or it going to use the glass floors. Based on the kind of usage or the criticality the kind of safety requirements are defined. As per the NBC the safety glass means, it is called toughened safety glass or it can be laminated safety glass. So, we know the 3 parameters for energy and we know how to do the safety measurement. And, then we should be able

to be in the position to understand how to design the building for fire resistance and, how to select or check or identify the design for structural safety, for the both glass and glazing divisions.