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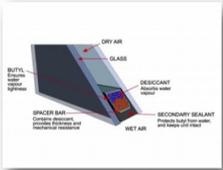
**Lecture - 37**  
**Insulating Glass Unit**

Let me take you through the introduction and the benefits of using a IGU, ok.

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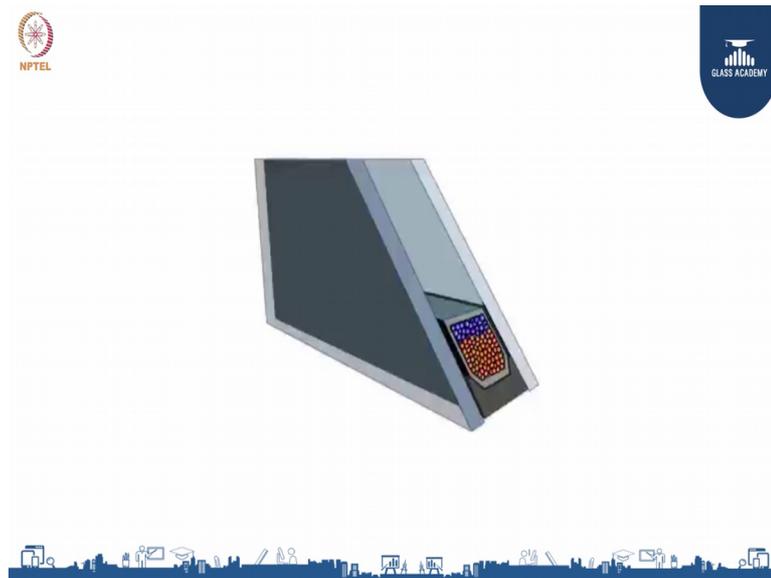
 **3.1.2. DEFINITION - INSULATING GLASS (IG)** 

- First let us understand the definition of Insulating Glass or IG.
- Insulating glass is a combination of two or more panes of glass spaced apart with a spacer bar and hermetically sealed with a primary sealant and secondary sealant to form a single glazed unit with one or more air spaces in between.
- It is also called double glazing. Now let us get into the technical fundamentals of IGU.



So, what is a IGU? Ok, you can also call it a double glaze unit. It is a combination of 2 or more panes of glass spaced apart with the spacer bar and hermetically sealed with a primary sealant, and a secondary sealant to form a single glazed unit of one or more spaces in between.

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Now what constitutes a IGU?

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 **3.1.3. TECHNICAL FUNDAMENTALS OF IGU** 

- ✎ To construct an insulating glass unit follow the steps given here:
  - ✎ Bend a hollow aluminium spacer bar into the desired shape.
  - ✎ Drill holes on the spacer bar.
  - ✎ Fill the holes in the spacer bar with a desiccant - such as silica gel or zeolites - that helps in absorbing the water vapour.



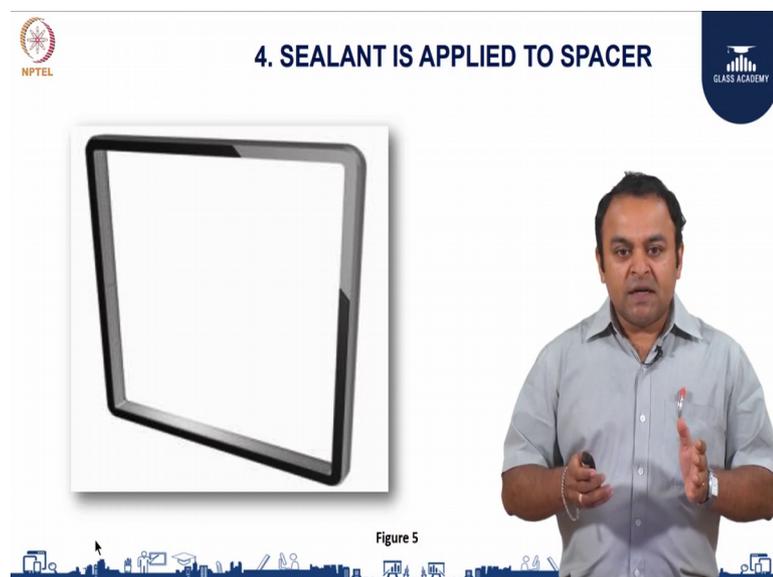
You have aluminium spacer which is filled with desiccant, and that is you fix a primary sealant to it. Fix that to the in between the glass, and you press the glass at a 6 bar pressure.

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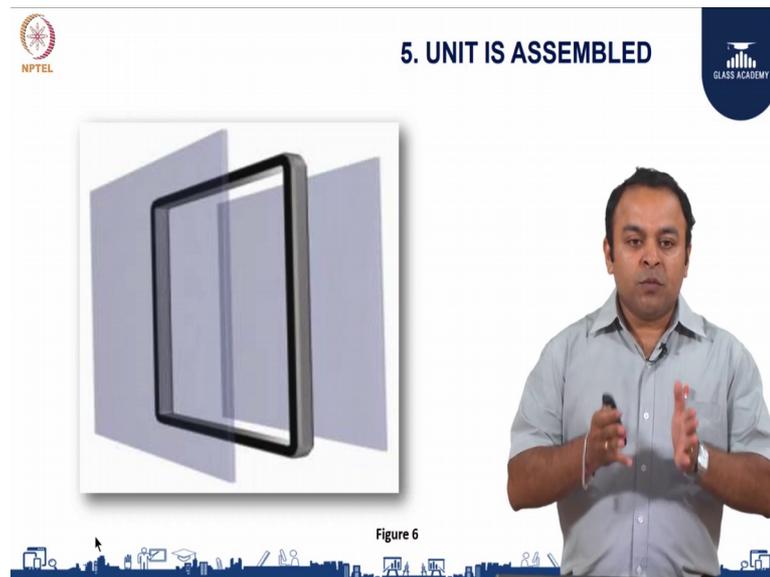
So, in a aluminium spacer what you do is, you drill a hole fill 85 to 90 percentage of desiccant inside it. Seal the hole with the primary sealant, and then use this as a between the 2 glass.

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Now, the primary sealant is extruded on the 2 surfaces of the aluminium spacer.

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And that you fix it between the 2 panes of glass.

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Now, once that is done, you apply secondary sealant. Let it be silicon or polysulphide and then fill the gap between.

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Please remember you need to have use gloves to handle any of this IGU unit while assembling.

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3.1.3. TECHNICAL FUNDAMENTALS OF IGU

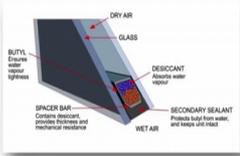
- ⚠ Note that while assembling the IG unit, the surfaces of the glass lites must be very clean to ensure good adhesion.
- ⚠ Use of gloves while manually assembling the IG unit is mandatory.

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 **3.1.3. TECHNICAL FUNDAMENTALS OF IGU** 

Let us now look at the cross-section of the IG unit.

- In this unit, the butyl or primary sealant ensures water vapour tightness, while the secondary sealant protects the butyl from water and keeps the whole unit intact.
- The desiccant absorbs any vapour from inside the unit, and the spacer bar - which contains the desiccant - provides thickness and mechanical resistance.

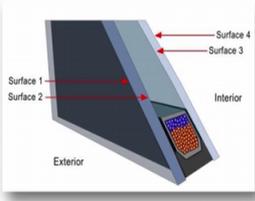


Now, let me take you to the technical fundamentals of a IGU. Why butyl and what is the purpose of using a sealant, ok. Now primary sealant or a butyl that gives a water tightness, or that will not allow any water to come inside the IGU. And the desiccant which is filled in a aluminium spacer, that tries to absorb all the water vapour or the moisture which is trapped in a IGU; which gives the durability of a single IGU unit.

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 **3.1.3. TECHNICAL FUNDAMENTALS OF IGU** 

- There is continuous seepage of water vapour into the glass, especially under high humidity.
- The desiccant absorbs the water vapour, thus avoiding condensation.
- The desiccant that has absorbed the water vapour is shown in blue.



Please remember, you always have a continuous seepage of water vapour into the glass, especially, under high humidity, like a tropical climate, like India. Now that is where the

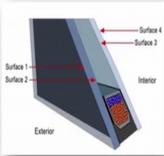
importance of desiccant comes into the play. Desiccant absorbs the water vapour thus avoids the condensation, and improves the durability of the IGU. The desiccant that has been absorbed a water that is shown in blue colour in the picture ok.

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 **3.1.3. TECHNICAL FUNDAMENTALS OF IGU** 

The IG unit consists of 4 surfaces.

- Surface 1 is that side of the glass lite that faces the exterior of the building.
- Surface 2 is the other side of Surface 1.
- Surface 4 is that side of the glass lite that faces the interior of the building.
- And surface 3 is the other side of surface 4.



Now, let us come back to the 4 surfaces of a normal IG unit.

You have 4 surfaces; surface one is the side of the glass that faces the exterior of the building which is facing to the sun. Now surface 2 that is inside side of the surface one, then you have the surface 4 which you can feel from the building which is from the inner part of the building. And surface 3 is inside the IGU unit.

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- There are three different types of IG units based on the type of gas filled between the glass lites.
  - The most commonly used type is the regular IG unit with no filling - it has dry air inside.
  - The second type is the one with inert gas filling. Inert gases such as argon, krypton, and xenon are used as a filling in this type of IG unit.
  - They are more efficient than dry air, but expensive.
  - The third type of IG unit is where vacuum exists between the glass lites.



The most commonly used type of IGU. It has got a dry air inside it. You also can have the inert gas which can be filled which is like argon, krypton, xenon various types of inert gas. That is only to improve the performance of a IGU. And the third type which is like a vacuum between the 2 glass.

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### 3.1.4. BENEFITS OF INSULATING GLASS

- Some of the main benefits of insulating glass are energy conservation, perfect transparency, sound insulation, increased wind load strength, reduced infiltration, and reduced condensation.
- The table here shows how insulating glass helps in conserving energy in hot climate, as compared to monolithic glass.



And now let us come back to the benefits of using a IGU. You have various benefits of using IGU, you have the energy conservation, prevent transparency, sound insulation,

increase wind strength, reduce infiltration and reduce condensation. So, let us come to it one by one.

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Monolithic Glass	Insulating Glass
There is only a thin glass barrier to prevent the outside heat from coming in - resulting in excessive loss of energy	Due to convection, air circulates inside and acts as a barrier, preventing outside heat from coming inside and the cool air inside from escaping - results in energy saving
It gets heated directly by sunlight	Double glazing prevents direct contact with sunlight
When air conditioner is used inside the building, the temperature difference between the inside and outside the building is very high	When air conditioner is used inside the building, the temperature difference between the inside and outside of the building is very less
There is only a thin glass barrier to prevent the outside heat from coming in - resulting in excessive loss of energy	Due to convection, air circulates inside and acts as a barrier, preventing outside heat from coming inside and the cool air inside from escaping - results in energy saving

TABLE 30

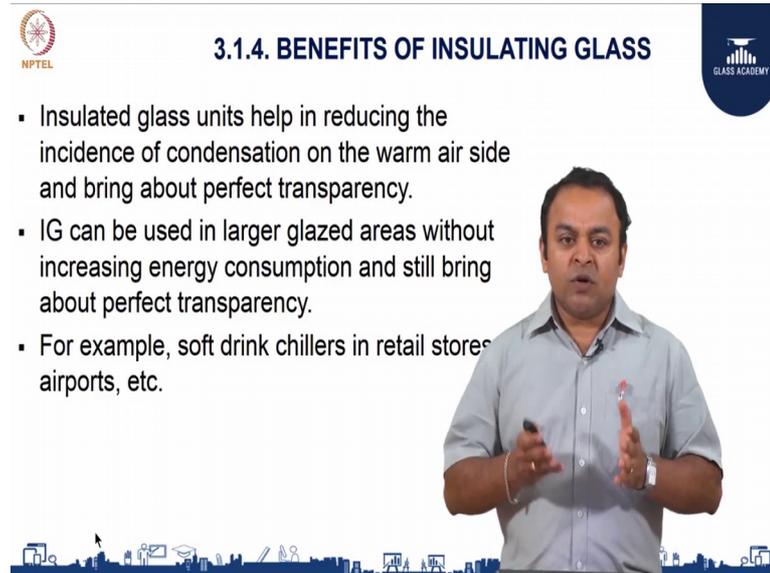
GLASS ACADEMY



You just compare a monolithic glass and let us compare a insulated unit. Monolithic glass is nothing but you have a single pane of glass; where in IGU have at least a 2 pairs of glass with either the inert gas or you have a dry trapped air. Monolithic glass that gets heated directly by the sunlight; while in a IGU it prevents any direct contact with the sunlight. So, you will not have the heat which transfers inside the room. When using an air conditioner, monolithic glass the load increases for air conditioner, because of the direct transfer of heat inside the building; while that is reduced to much extent when we use a insulated glass.

In a monolithic glass, it is only thin glass barrier to prevent the outside heat from coming in while in a IGU you have the trapped air, because of which you have a convection, and air circulation due to which it prevents any heat coming inside the building ok.

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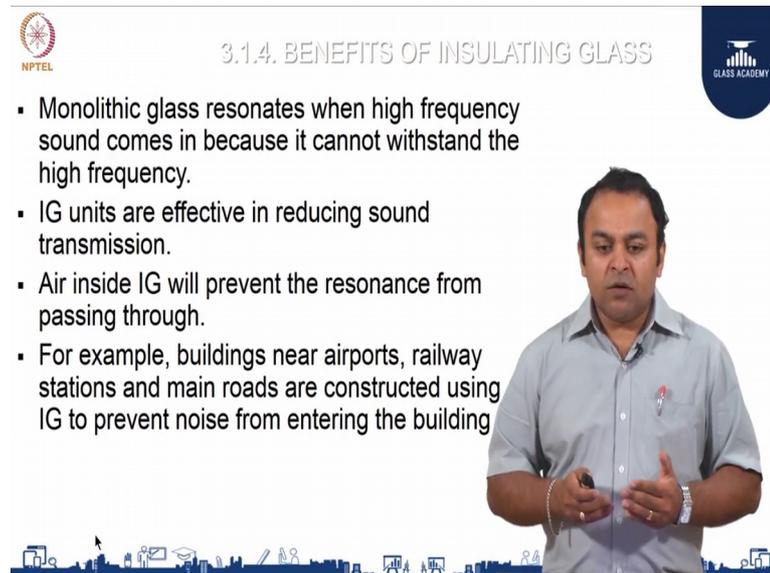


The slide features the NPTEL logo on the top left and the Glass Academy logo on the top right. The title '3.1.4. BENEFITS OF INSULATING GLASS' is centered at the top. A presenter in a light blue shirt is shown from the waist up, gesturing with his hands. The background is white with a blue city skyline at the bottom. The text on the slide is as follows:

- Insulated glass units help in reducing the incidence of condensation on the warm air side and bring about perfect transparency.
- IG can be used in larger glazed areas without increasing energy consumption and still bring about perfect transparency.
- For example, soft drink chillers in retail stores, airports, etc.

Insulated glass also prevents in condensation on the surface of the glass. If you use a single glaze unit you can see in air condition room you can see condensation happening on the surface of the glass. For example, if you see a chiller for soft drink chiller you can see mostly it is all used with a insulated gas ok.

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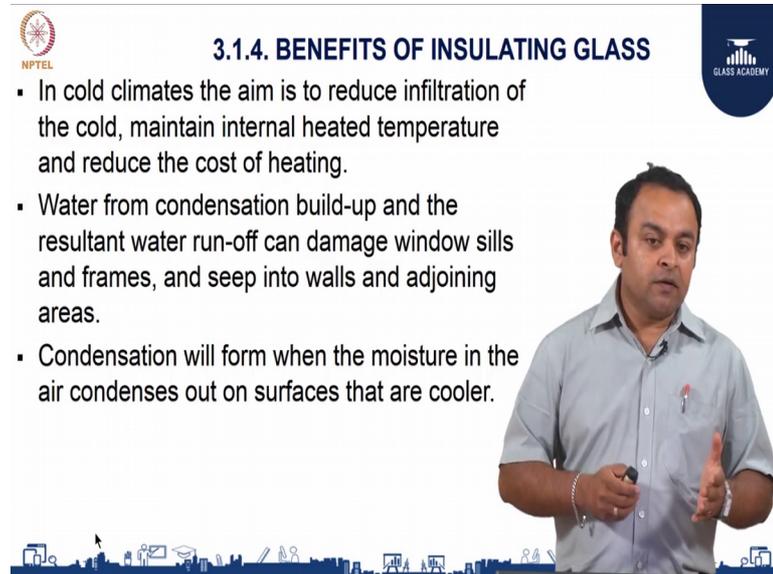
The slide features the NPTEL logo on the top left and the Glass Academy logo on the top right. The title '3.1.4. BENEFITS OF INSULATING GLASS' is centered at the top. A presenter in a light blue shirt is shown from the waist up, gesturing with his hands. The background is white with a blue city skyline at the bottom. The text on the slide is as follows:

- Monolithic glass resonates when high frequency sound comes in because it cannot withstand the high frequency.
- IG units are effective in reducing sound transmission.
- Air inside IG will prevent the resonance from passing through.
- For example, buildings near airports, railway stations and main roads are constructed using IG to prevent noise from entering the building

Now let us come back to the acoustic properties. Monolithic glass it is resonates with high frequency. So, because we cannot withstand high frequency of a sound, while that is reduced to greater extend when we are using a insulated unit ok. For example, a building

near airports, railway stations and the main roads are constructed using IG to prevent noise which is coming inside the building.

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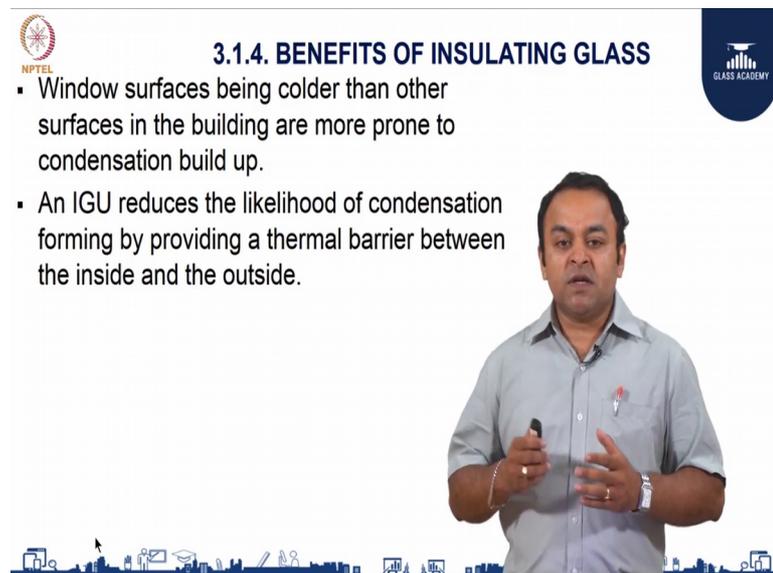
The slide features the NPTEL logo on the top left and the Glass Academy logo on the top right. The title '3.1.4. BENEFITS OF INSULATING GLASS' is centered at the top. A presenter is visible on the right side of the slide. The background includes a decorative skyline of buildings at the bottom.

**3.1.4. BENEFITS OF INSULATING GLASS**

- In cold climates the aim is to reduce infiltration of the cold, maintain internal heated temperature and reduce the cost of heating.
- Water from condensation build-up and the resultant water run-off can damage window sills and frames, and seep into walls and adjoining areas.
- Condensation will form when the moisture in the air condenses out on surfaces that are cooler.

In cold climates, the aim is to reduce infiltration of cold mainly in internal heated temperature and reduce the cost of heating. And the water from condensation build up and the resultant water runoff can damage the window sills and frames and seeps into the water and the adjoining areas. Condensation will form when the moisture in the air condenses out on the surface of that are cooler.

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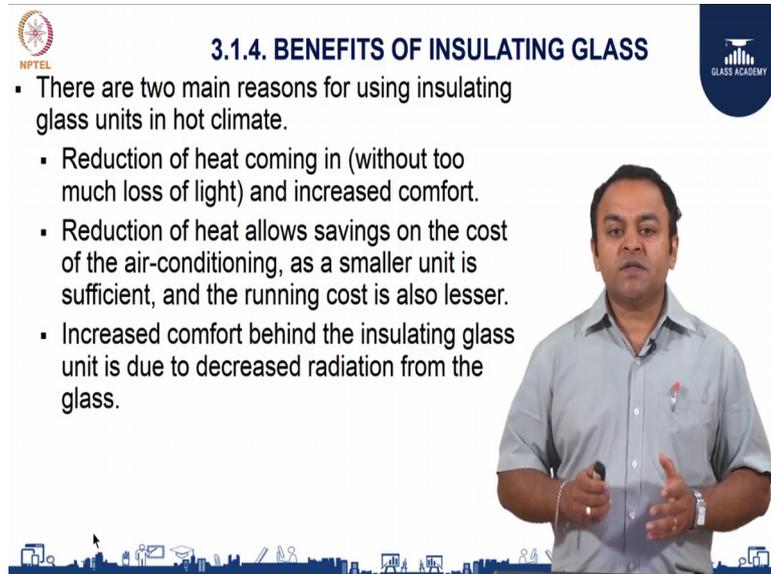
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**3.1.4. BENEFITS OF INSULATING GLASS**

- Window surfaces being colder than other surfaces in the building are more prone to condensation build up.
- An IGU reduces the likelihood of condensation forming by providing a thermal barrier between the inside and the outside.

And IGU reduces the likelihood of condensation forming by providing a thermal barrier between the inside and the outside.

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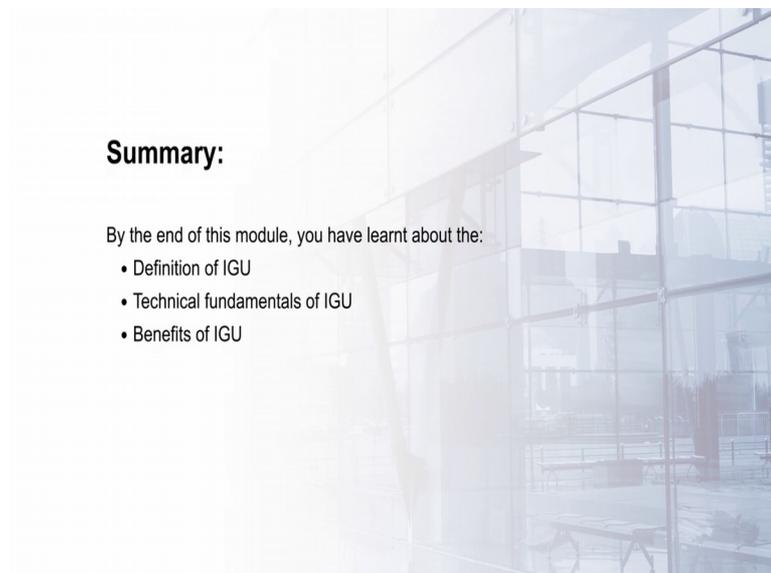


The slide is titled "3.1.4. BENEFITS OF INSULATING GLASS". It features the NPTEL logo on the top left and the Glass Academy logo on the top right. A presenter, a man in a light blue shirt, is shown on the right side of the slide. The main content is a bulleted list of three benefits of using insulating glass units in hot climates.

- There are two main reasons for using insulating glass units in hot climate.
  - Reduction of heat coming in (without too much loss of light) and increased comfort.
  - Reduction of heat allows savings on the cost of the air-conditioning, as a smaller unit is sufficient, and the running cost is also lesser.
  - Increased comfort behind the insulating glass unit is due to decreased radiation from the glass.

And there are 2 main reasons for using insulated glass unit and hot climate; that is, reduction of heat coming in. Without too much loss of light that is required in our type of climate and increase comfort. Reduction of heat allows saving on the cost of air conditioner as a smaller unit is sufficient and the running cost is also a lesser. Increase comfort behind the insulated glass unit is due to their decreased radiation from the glass.

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The slide is titled "Summary:" and features a background image of a modern glass building. The text on the slide summarizes the learning objectives of the module.

**Summary:**

By the end of this module, you have learnt about the:

- Definition of IGU
- Technical fundamentals of IGU
- Benefits of IGU