



# 10<sup>TH</sup> LECTURE (METAL, WOOD AND GLASS)

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# Metal

Metals are among the most useful building materials. They exist in nature as compounds like oxides, carbonates, sulphides and phosphates and are known as ores. Metals are derived from ores by removing the impurities.

Those used for engineering purposes are classified as

- 1- **Ferrous metals**, with **iron** as the main constituent, e.g. cast iron, wrought iron and **steel**
- 2- and others like **Aluminum**, copper, zinc, lead and tin in which the main constituent is **not iron** as **non ferrous metals**.

## What is steel?

Steel is the most suitable building material among metallic materials. This is due to a wide range and combination of physical and mechanical properties that steels can have. By suitably controlling the carbon content, alloying elements and heat treatment, a desired combination of hardness, ductility and strength can be obtained in steel. On the basis of carbon content steel may be classified as under:



# Why we use steel ?

Steel construction has so many **positive Side** , the strength to weight ratio is excellent metals join easily efficient shapes are available, etc.

With those advantages, though, come some challenges that are best solved by a good understanding of how the metals actually perform in a structure.

For most larger buildings, metals are a key element of the structural system. Steel beams and columns, steel joists, steel studs.



## Rolled steel section

Structural steel can be rolled into various shapes and sizes in rolling mills. Usually sections having larger moduli of section in proportion to their cross-sectional areas are preferred.

Steel sections are usually designated by their cross-sectional shapes. The shapes of the rolled steel sections available today have been developed to meet structural needs.



## The types of rolled structural steel sections are as follows:

1. Rolled steel I-sections (a)
2. Rolled steel channel sections (b)
3. Rolled steel T-sections (c)
4. Rolled steel angle-sections (d)
5. Rolled steel tube-sections (e)
6. Rolled steel bars (f)
7. Rolled steel flats (g)
8. Rolled steel plates
9. Rolled steel sheets
10. Rolled steel strip



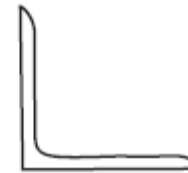
(a)



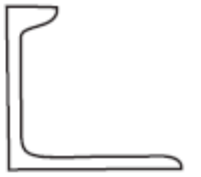
(b)



(c)



(d)



(e)



(f)



(g)



**The Most Strong  
Section Is (H) ,while  
the least stiff is Tee**

Most stiff



Least stiff

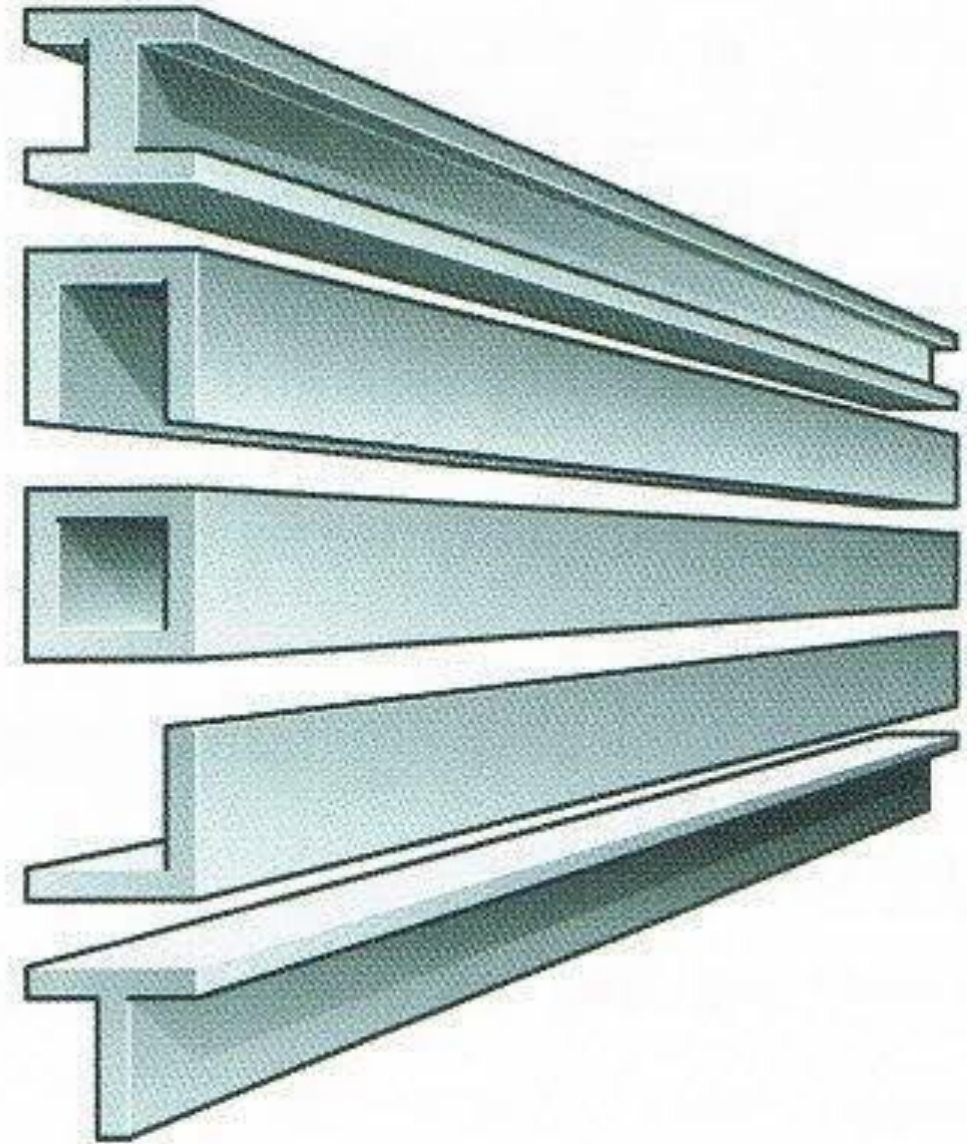
'H'

channel

square

angle

'tee'



# **ADVANTAGES OF USING STEEL IN BUILDING STRUCTURES**

From skyscrapers and grand bridges to beautiful contemporary houses, steel is used in almost any type of structure. The following are Advantages of Steel

## **1- Adaptability**

Steel can be adjusted or changed according to the owner's requirement. For instance, wall frames made from this type of material can be repositioned or altered easily in order to widen the space or create a new interior building layout. This ability to adapt to changes allows for easier expansions, at the same time helps extend the lifespan of the structure.

## **2- Beauty**

It offers a stylish way of creating large, column-free interiors, thereby giving the building a sense of openness. It giving structural designers the freedom to explore ideas in terms of creating stylish shapes and textures in order to make the building distinct.

## **3- Cost- effectivity**

It is light-weight compared to timber, which makes it easier to transport

## **4- Ductility**

It does not buckle, distort, rotate, clink, warp or splinter; but it can be rolled or cut and turned into a variety of sizes and shapes without changing its composition

## **5- Durability**

It can withstand extreme forces or harsh weather conditions, such as strong winds, earthquakes, hurricanes and heavy snow

# WOOD / TIMBER / LUMBER AS A CONSTRUCTION MATERIAL

Wood has been used as a building material for thousands of years, The chemical properties of wood are inherently complex the material is commonly used to **build houses, shelters and boats**, but it is also extensively used in the **furniture and home decor industry** as well.

The use of wood generates less waste and speeds up construction times. Greater energy efficiency. Wood contributes to energy efficiency due to its ability to conduct heat, which makes it a better insulator than other materials. In fact, it is 400 times better than steel and 15 times better than concrete.

## ADVANTAGE OF WOOD IN CONSTRUCTION

- 1- natural resource, making it readily available and economically feasible.
- 2- It is remarkably strong in relation to its weight,
- 3- it provides good insulation from the cold.
- 4- it is highly machinable, and can be fabricated into all kinds of shapes and sizes to fit practically any construction need.
- 5- Wood is also the perfect example of an environmentally sustainable product





Wood is generally classified as **hardwood** and **softwood**.

**Hardwood** is typically heavier and denser than softwood and is usually utilized for construction of walls, ceilings and floors.



Softwoods are generally used to make more of the inner structures to the frame of hardwoods, such as doors and window frames. It is also used to produce furniture.



# Glass

Glass is a hard substance which may be transparent or translucent and brittle in nature.



## **Definition of Glazing in Construction**

The act of installing glass in windows, doors or fixed openings. To glaze a unit would be the actual installation of a piece of glass within a frame or sash. to as all the glass within a structure. The glazing required within a structure would be described as all of the glass required to accommodate that structure.

## Engineering Properties of Glass

- Transparency
- Strength
- Workability
- Transmittance
- Recycle property



**Define each of them with an example in construction???**

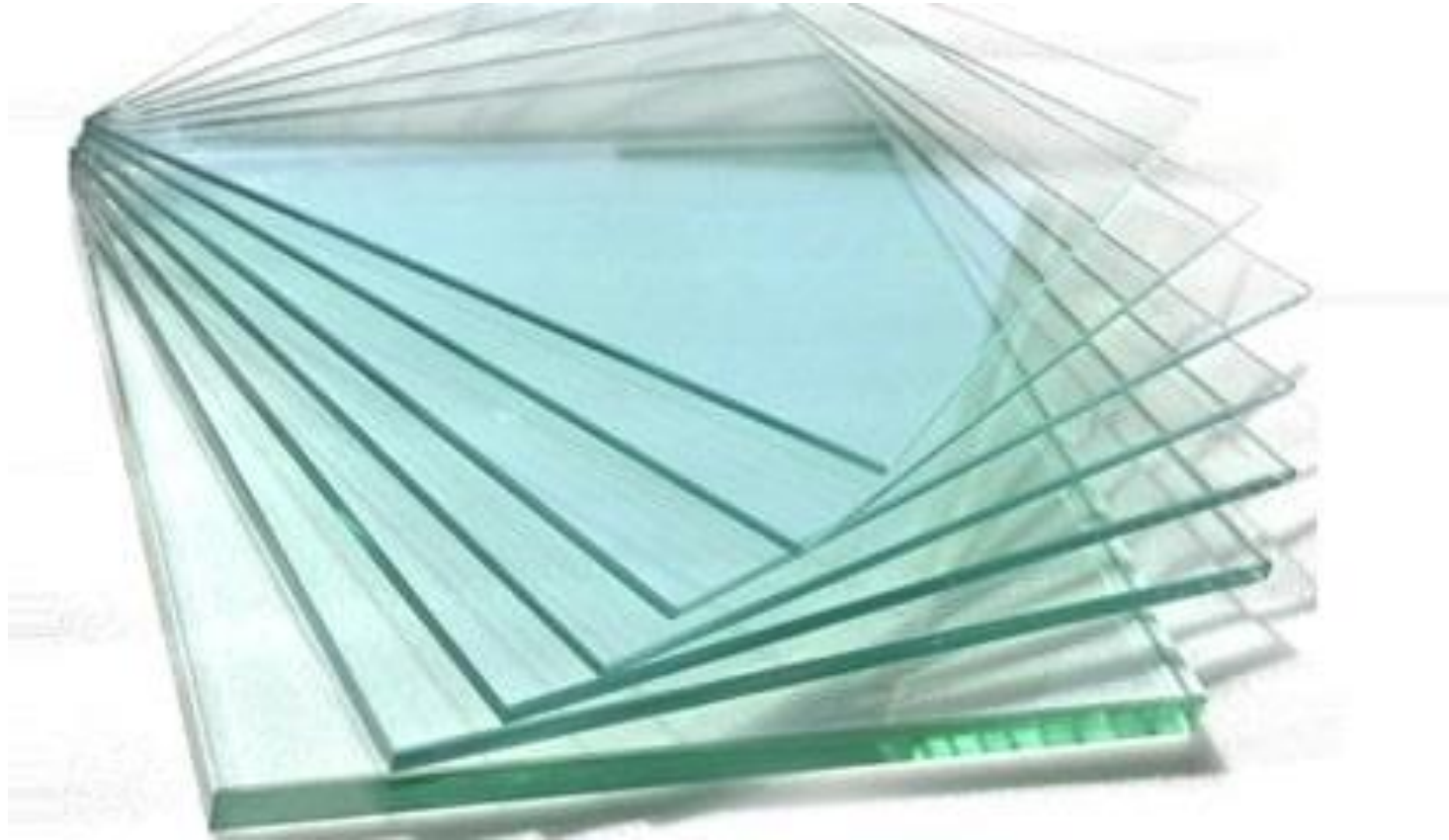


## **Types of Glass and their Uses in Construction Works**

The types of glass used in construction are:

1. Float glass
2. Shatterproof glass
3. Laminated glass
4. Extra clean glass
5. Chromatic glass
6. Tinted glass
7. Toughened glass
8. Glass blocks
9. Glass wool
10. Insulated glazed units

**Float glass** is made of sodium silicate and calcium silicate so, it is also called as soda lime glass. It is clear and flat so, it causes glare. These glasses are available from 2mm to 20mm thickness ranges.. These are used as shop fronts, public places etc.



## Shatterproof Glass

Shatterproof glass is used for windows, skylights, floors etc. it cannot form sharp edged pieces when it breaks.



## Laminated Glass

Laminated glass is the combination of layers of normal glass. So, it has more weight than normal glass. It has more thickness and is UV proof and soundproof. These are used for aquariums, bridges etc.





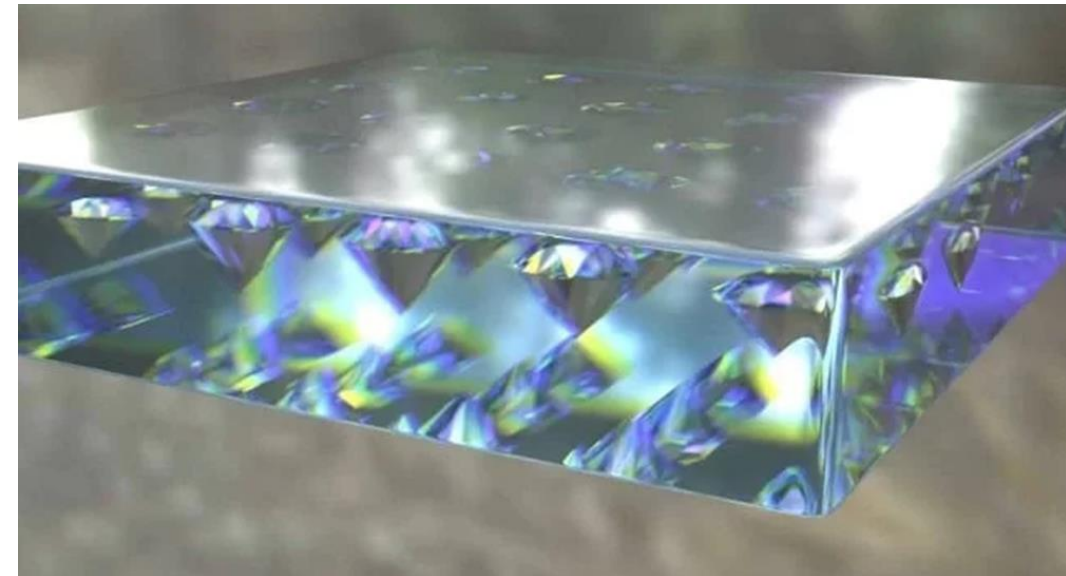
## Extra Clean Glass

Extra clean glass has two special properties, photo catalytic and hydrophilic. Because of these properties, it acts as stain proof and gives beautiful appearance. Maintenance is also easy.



## Chromatic Glass

Chromatic glass is used in ICU's, meeting rooms etc. it can control the transparent efficiency of glass and protects the interior from daylight.



## Tinted Glass

A color producing ingredients is mixed to the normal glass mix to produce colored glass which does not affect other properties of glass.



## Toughened Glass

Toughened glass is strong glass which has low visibility. It is available in all thicknesses and when it is broken it forms small granular chunks which are dangerous. This is also called as tempered glass. This type of glass is used for fire resistant doors, mobile screen protectors etc.



## Glass Blocks

Glass block or glass bricks are manufactured from two different halves and they are pressed and annealed together while melting process of glass. These are used as architectural purpose in the construction of walls, skylights etc. They provide aesthetic appearance when light is passed through it.



## Glass Wool

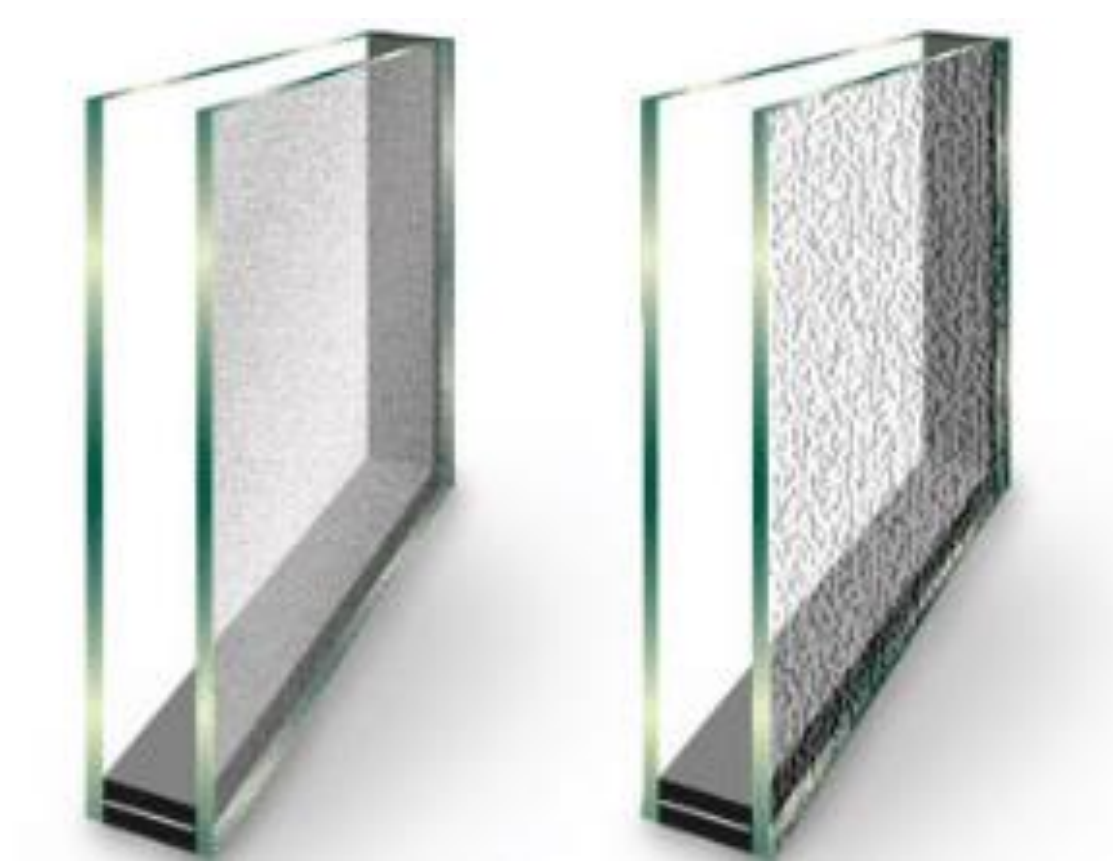
Glass wool is made of fibers of glass and acts as good insulating filler. It is fire resistant glass.





## Insulated Glazed Units

Insulated glazed glass units contain glass separated into two or three layers by air or vacuum. They cannot allow heat through it because of air between the layers and act as good insulators. These are also called as double glazed units.





**THANK  
YOU**