TOPIC SCHEDULE

LECTURE			*PRACTICAL*
week	**Date**	**Topics**	**Topics**
9.		Building materials and their applications: GLASS	

Today's Lecture: Building materials: Glass in building constructions

Glass has been in use for a long time and has been prevalent since the late Middle Ages. Traditionally, glass was primarily used as transparent sheets in windows or rooflights as well as as semi-translucent sheets and blocks or as reinforcing fibres.

Up to the beginning of the twentieth century glass was a comparatively expensive material. Window glass was made by hand in the spun, crown glass process and later the blown cylinder process. Window glass made by these processes was cut into comparatively small squares (panes) for use in the windows of traditional loadbearing walls. Plate glass was made by casting, rolling, and grinding and polishing sheets of glass both sides. These laborious methods of production severely limited the use of glass in the buildings. Only with the development of a continuous process of drawing window glass in 1914 and a process of continuously rolling, grinding, and polishing plate glass in the 1920s and 1930s, was there a plentiful supply of cheap window-, and rolled or polished plate glass.

In the 1920s and 1930s window glass was extensively used in large areas of windows framed in slender steel sections as continuous horizontal features between under sill panels and as large metal framed windows. During the same period rolled plate glass was extensively used in roof lights to factories, the glass being supported by glazing bars fixed down the slope of roofs. Many of the sections of glazing bar that were developed for use in roof lights were covered by patents so that roof glazing came to be known as "patent glazing" or "patent roof glazing" .

The early uses of glasses a wall facing and cladding material were developed from metal window glazing techniques or by adaptation of patent roof glazing to vertical surfaces, so that the origins of what came to be known as "curtain walling" were metal windows and patent roof glazing.

a) Physical Properties:

Density: Density of glass: 2800 kg/m3 (must learn)

b) Glass aplications:

Glass for roof lights fixed in the slope of roofs is to a large extent held in place by its weight on the glazing bars and secured with end stops and clips, beads or cappings against wind uplift. The bearing of glass on the glazing bars and the overlap of bays down the slope act as an adequate weather seal. The traditional metal roof glazing bar generally took the form of an inverted T section with the tail of the T vertical for strength in carrying loads between points of support with the two wings of the T supporting glass.

The usual section of metal glazing bar, which is well suited to roof glazing, does not provide a simple, positive fixing for vertical glazing system. Hollow box section mullions were designed specifically for glass curtain walling. These mullion sections provided the strong vertical emphasis to the framing of curtain walling that was in vogue in the 1950s and 1960s and the hollow or open section transoms with a ready means of jointing and support for glass. Hollow box section mullions, transoms and sills were generally of extruded aluminium.

A range of mullion sections was available to cater for various spans between supporting floors and various wind loads. The spigot joints between mullions and mullions and between mullions and transoms, head and sill, made allowance for thermal movement and the fixing of mullion to frame allowance differential structural, thermal and moisture movements. Screw on or clip on beds with mastic or gasket sealants held the glass in place and acted as a weather seal. This form of curtain walling with exposed mullions was the fashion during 1950s, 1960s and early 1970s.

Since then the fashion has changed. The introduction of solar control thermal insulated glass, and use of gaskets to provide a more positive rain and wind weather seal around glass has facilitated a move to systems of glass

walls where the hollow box section framing members are fixed behind the glass, which held in slender gaskets, to give the appearance of a glass wall.

Glass, however remains a very important and widely used building material, with application solutions evolving as we speak.

c) Types of glass (must learn):

Float glass
Most of the glass used in building today is produced by float method of production that was first introduced in 1959. In the float process, molten glass from the melting furnace runs on to and floats across the surface of an enclosed bath of molten tin. The glass is maintained in a chemically controlled atmosphere at a high enough temperature for the surfaces to become flat and parallel. The glass is cooled as it moves across the molten tin, until it is hard enough to be taken out. The range of glass thickness produced is from 3 to 15 mm.

Solar control glass
Solar heat gain through clear sheet glass, in he early days of the use of large window areas and curtain walling, did produce uncomfortable conditions of heat inside buildings by transmission of solar energy directly through glass. Most buildings that have more recently constructed with large areas of glass exposed to solar radiation, use one of the solar control glasses to reduce solar heat gain.

These solar control glasses reduce the transmission of solar energy by absorbing or reflecting some of the energy of the sun. The heat absorptive glasses are produced with a colour tint throughout the thickness of the glass or a colour tint to one surface. Heat reflective glasses are produced by coating one surface of the glass with a thin reflective film which gives the glass a colour by reflection.

Toughened glass
Toughened glass is made by process of heating and cooling which causes compressive stresses in the surface of the glass which are balanced by tensile stresses in the centre thickness of the glass. These counter balancing stresses give toughened glass its increased strength. Toughened glass is up to five times stronger than ordinary glass of he same thickness.

Thermal insulated glass
Thermal insulated glass is produced through layering glass sheets of 2 or 3 (or more) to increase the thermal insulation (and noise insulation) qualities of the glass construction. Normally the glass sheets are separated by air or inert gases and joined with low heat transmission aluminium elements. Thermal insulated glass is glued together into a factory made unit that is delivered to the installation site in one piece.

Laminated glass
Lamination is a process where a film is either applied onto the glass or in between several layers of glass. Both the single layer and the multi-layer construction will serve to increase the physical properties of the glass (shattering, breaking etc.) producing in extreme cases (layers of 5+ and resin lamination) bulletproof etc. glass.

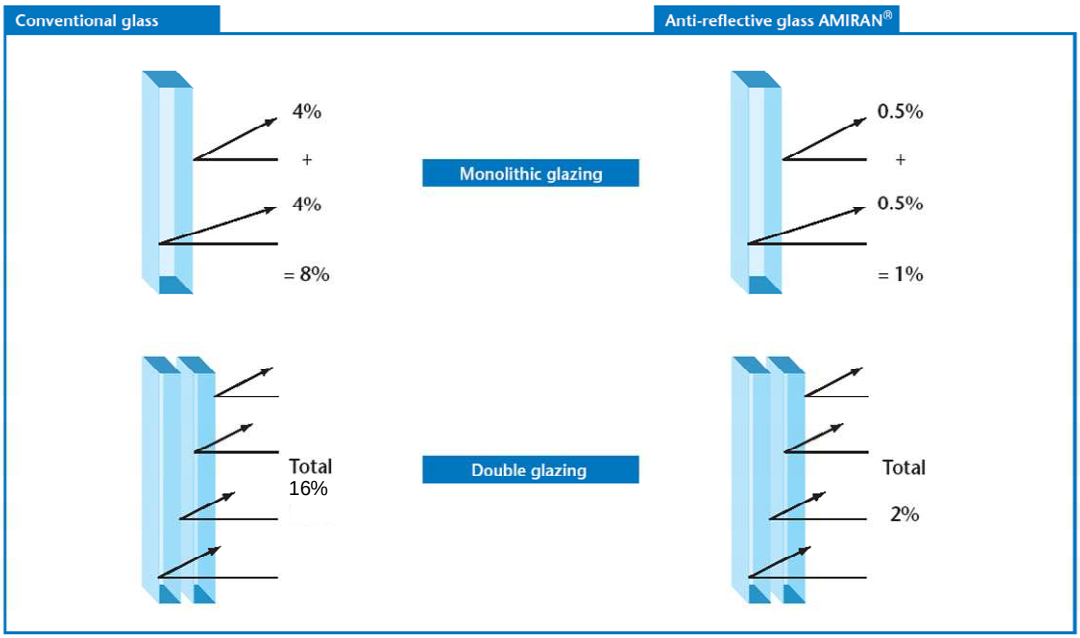
APPLICATIONS FIELDS OF GLASS (short, must-learn list):

1. Load bearing and supporting constructions - glassl
1.1. All-glass curtain walls and roofs (rare)

2. Coverings
2.1. Decorative wall coverings

3. Doors and windows
3.1. Curtain walls or roofs and traditional door/window applications

Anti-reflective glass AMIRAN® vs. conventional float glass



SCHOTT glass made of ideas

Anti-reflective Glass AMIRAN®

Conventional float glass

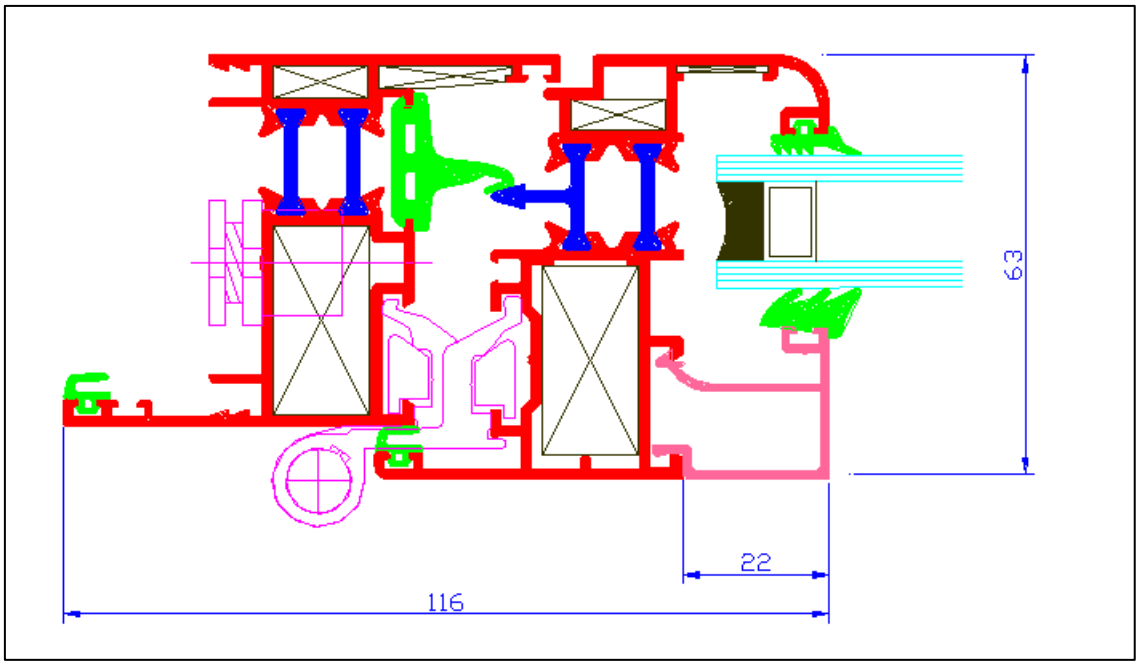
Residual reflection: 8%

Glazing performed with AMIRAN®

Residual reflection: <1%

- ✓ anti-reflection through dip-coating
- ✓ nearly free of glare
- ✓ highly transparent
- ✓ can be processed just like ordinary float glass, e.g. to tempered safety glass, laminated safety glass and DGU
- ✓ very resistant hard coating
- ✓ easier to clean than sputtered coatings
- ✓ conserves energy

SCHOTT glass made of ideas



EKU WINDOW

Schüco Fassade FW 50+/FW 60+
Schüco Façade FW 50+/FW 60+

Die Schüco Standardfassaden-systeme FW 50+ und FW 60+ sind ausgereifte Lösungen, die sich millionenfach bewährt haben. Zusätzlich können die Fassadensysteme innerhalb der Schüco Systemwelt frei kombi-niert werden. Damit sind der Kreativität fast keine Grenzen gesetzt.

The Schüco standard façade systems FW 50+ and FW 60+ are tried and tested solutions, which have proven themselves time and again. In addition, the façade systems can be combined freely within the Schüco system world. There are no limits to creativity.