

GLASS – INDISPENSABLE BUILDING MATERIAL



Er. Shashi Kant

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PLANNING COMMISSION

In old days, use of glass in construction considered fragile and had very limited applications, mostly in window and ventilator panels. During last few years, glass became a favored feature in buildings and is used extensively in both exterior and interior applications. The skylines of Metros are dotted with high-rise buildings clad in glimmering glass, boasting affluence & style. Popularity gained not because of fashion, competition or fascination of architects, designers, specifiers and consultants but due to inherited properties, unmatched quality and advantages glass has which may be spelled out as freedom from conventional building shapes, adds beauty and aesthetics to the building, does not deteriorate, corrode, stain or fade, pure and sustainable material, transparent to visible light, optimal use of day light, satisfies sense of openness and harmony, helps to maintain clean environment because of zero degeneration, can be recycled indefinitely, helps to maintain hygienic environment with easy maintenance, saves the space inside the building, no extra design is required for floor/roof slab for making glass partition on upper floors being lighter in weight, as cladding fulfill functional requirement of lighting, heat retention and energy saving, excellent material for thermal insulation, water proofing and energy conservation, as bad conductor of heat saves energy in air conditioning of building etc.

However, glass being fragile in nature, needs care while selecting thickness, type and size and adequate consideration for imposed loads, supporting structure, human safety and installation etc. Another, contentious issue is that of energy efficiency, which can be addressed by selecting proper and value added glass, controlling solar radiation and UV light, shading, implementing Energy Conservation Building Code (ECBC) etc.

Today glass is utilized in the construction of several elements of exterior and interior architecture. Exterior glass architecture includes facades, display windows' skylights, skywalks, entrances, revolving doors, canopies, winter gardens and conservatories. Attraction is homes are bathed in natural sunlight with gorgeous outdoor views. Interior glass architecture can be used for doors, partitions, shelves, staircases, elevated walkways and even as traditional walls. There are some houses in which all of the walls are actually glass. Selecting glass can be a challenge and the decision for right type of glass for different applications, in terms of type of building, uses, requirement, performance, quality, eminence etc is very crucial. Different types of glass available are jotted down below.

1. Flat Glass: This is the basic glass that was available for use before the discovery of the float process. It is no longer in use for most architectural use, but is used in glass art to create sculptures and decorative items.
2. Float Glass: Float glass or annealed glass is a term for perfectly flat, clear glass manufactured by the float process invented in the UK by Sir Alastair Pilkington in 1959. It is the most basic type of glass and forms the basis for several fabricated glasses that are used in construction.
3. Tinted Glass: Colorants are added to the normal clear float during manufacture in order to achieve tinting and solar-radiation absorption properties. The color is achieved upon the addition of a mineral admixture. Tinting reduces heat penetration in buildings.

Application: Using tinted glass is the simplest form of introducing an element of solar control to a building. In terms of its ability to reduce the heat intake, tinted glass is better than clear float glass, but is exceeded in terms of performance by reflective and laminated glass. In interiors, tinted glass can be used for partitions, furniture, table tops and doors. Because of its solar properties and aesthetic appeal, it is common choice

for the atria in commercial buildings.

4. **Reflective Glass:** Glass that is coated to reflect radiation striking the surface of the glass, thereby reducing solar heat gain, is called reflective glass.

Applications: The major application for reflective glass is on the exteriors, for facade glazing in commercial, educational, industrial and residential buildings. In interiors, it is used for effects only.

5. **Low-e Glass:** Low-e glasses are innovative coated glass that has the unique ability of preventing heat loss in cold weather while reducing heat intake in warm weather.

Applications: It is popular in residential, commercial and industrial applications where thermal control is a priority.

6. **Toughened Glass:** Toughened or tempered glass is produced when float glass panels are heated and then cooled rapidly in a controlled environment. This process makes the glass several times stronger than regular glass. It also makes it safer because when broken it yields small pebble-like fragments.

Application: Toughened glass is used wherever strength is required and regular annealed glass will not be sufficient, like in high traffic uses like entrances, in conditions where high wind loads need to be taken by the glass surface, etc. Glass facades, sliding doors, building entrances and bath and shower enclosures are the most common uses. Fire knock-out panels, fireplace enclosures and kitchen objects like vegetable chopping board and cooking pot lids are other uses.

7. **High Strengthened (HS) Glass:** This is a particularly heat treated glass that is popular for vertical spandrel applications and as the base material for lamination.

Application: Its mechanical strength is twice that of annealed glass and half of fully tempered glass, and it retains all the properties of annealed glass-chemical resistance, hardness, expansion, and deflection.

8. **Heat-Soaked Toughened Glass:** This is simply fully tempered glass that has been processed to eliminate nickel sulfide inclusion that can cause spontaneous breakage. Heat soaked glass has shown 98.5% reliability in tests.

9. **Laminated Glass:** Simply put, this is glass which is composed of two sheets of glass

permanently bonded together with a sheet of transparent plastic between the sheets. The plastic is known as interlayer and different inter layers can impart different properties.

Application: Laminated glass is used as safety glazing in public buildings, commercial and retail structures in overhead usage, and large facades. It also serves as security glazing in residences, embassies, banks, and combat vehicles and sound control in offices, institutions, malls, residences, airport, bus terminals, and recording studios. Other applications include skylights, aquariums, entrance doors and glass floors.

Safety: Laminated glass does not shatter like ordinary glass and has ability to absorb impact and resist penetration. It does not shatter and remains intact when broken, holding glass fragments in place. It is the correct glass to use for overhead applications.

Security: This same property is useful for security, and burglar intrusion is minimized using laminated glass. The interlayer continues to be in place even if the glass is broken, increasing security. Ordinary glass cutters and break-in tools are not effective on laminated glass as it needs to be cut in from both the sides. Infact, laminated glass is the only glass to provide post-breakage strength. It is necessary to use multiple glass sheets and inter layers if laminated glass is to be used into resist bullets, blasts and explosions. Alarm Glass is a particular form of laminated glass that is used for security purposes. The glass has 0.1mm wires embedded in the interlayer. The wires form an electrical circuit which, if broken in the event of the glass sheet being smashed, sets off an alarm. An alarm glass is formed when an interlayer is embedded with a very thin wire and then "sandwiched" between two or more sheets of glass.

Bullet-resistant glass is a transparent material or multiple layers of laminated glass that provides the light transmittance of normal glass but varying degrees of protection from firearms. A type of bullet-resistant glass is formed when a polycarbonate layer, usually consisting of products such as Cyrolon, Lexan and Tuffak, is sandwiched between layers of regular glass. A bullet can pierce the exterior glass layer, but through polycarbonate layer before it can pierce the inner layer of glass. This type of bullet resistant is

usually 70-75mm thick.

Disaster resistance: Many special inter layers have been developed to help the glass withstand earthquakes, high wind speed and other disasters.

Sound Control: Use of inter layers can considerably reduce entry of noise. The visco-elastic properties of interlayer have a dampening effect on noise.

Solar Energy: When used with tinted glass, laminated glass is effective in reducing solar heat gain and ultra-violet rays. In warm climates, when laminated glass is used to combine with reflective coated glass or low-e glass, it can give good shading and energy savings as well as increase comfort level. Since UV rays cause deterioration and fading of fabrics, picture and furnishings, laminated glass will give interiors a longer life as well. UV control inter layers screen up to 99 per cent of UV rays.

Durability: Inter layers lend durability to the glass. It is also easy to clean, like ordinary glass.

Fire-resistance: Standard laminated glass does not meet code requirements for fire-resistant glass. However, since it does not disintegrate easily when exposed to heat, it will provide more time for evacuation and fire control.

10. **Insulating Glass (IG Units):** This is a double glass unit used instead of single glazing.

Application: They are commonly used in offices and institutions. Often, insulating glass is used on the surface that takes the maximum direct sunlight. Insulated glass is mandated in many countries for residential buildings in order to save on heating costs in the cold weather.

Multiple Glass Combinations: Following the same principle as insulating glass using two surfaces, it is possible to construct an insulating unit using several glasses. These are used in special application where high levels of insulation are required.

11. **Wired Glass:** This is a flat rolled glass reinforced with wire mesh and used especially for glass doors and roofing to prevent objects from smashing through the glass and also to hold pieces of broken glass together. In general, it is going out of use as better options are available now. Also, there have been controversial incidents where people have sustained injuries because of wired glass.

Applications: Exteriors and interiors of general

construction. Doors and windows of buildings where fire protection and locations where fallout protection is required.

12. **Mirrors:** A mirror is a type of glass that has a highly reflective surface and is used for seeing reflections.

Different types of Mirrors: Mirrors can be vacuum coated, UV coated or copper free. In a vacuum coated mirror, a metal film is coated on the glass in high vacuum chamber to ensure film purity and better adhesion. This type of mirror has a longer life and the coating is more durable. In a UV coated mirror, a UV treated polymer is coated over the paint coat. The polymer coat is applied by a roller and this coating provides better scratch resistance, removes black spot problems, and reduces the effect of moisture. In a copper-free mirror, a coating of palladium is used instead of copper, which eliminates black spots and is environmentally friendly.

Application: Mirror have been used for centuries, specially hand mirrors, and have a wide range of applications. In architecture, it is mostly used for decorative purposes, in furniture, panels, doors, etc. as well as to create spatial effects.

13. **Antique Mirror:** It is a decorative silvered glass mostly used for interiors.

Application: Has decorative properties and is used in homes, hotels and restaurants, in museums, etc.

14. **Stained Glass:** Stained glass refers to glass that has either been painted and fired or colored by adding metallic salts during its manufacture and often both. Metals such as copper or gold are used to bring in colors like blue, green, oranges, red, etc.

Application: Widely used in churches and mosques. Used extensively for decorative purpose in furniture, panels, lampshades, windows, doors, partitions.

15. **Sandblasted Glass:** Sandblasted glass is one that has a design or form done on it by spraying sand. This texture is rougher than the rest of the glass and its translucent.

Application: Sandblasting can be used in residential or commercial establishments. It is often used as partitions, shower curtains, interiors screens, on furniture, etc.

16. **Etched or Patterned Glass:** This is a form

of decorative glass obtained by etching one side. It is visually appealing. An industrially produced glass ensures uniformity of coating and will not show patching.

Application: Acid-etched glass is used extensively as partitions, shower curtains, paneling, furniture, doors, etc.

17. Lacquered Glass: This is another kind of decorative glass meant for interiors use.

Application: Bathrooms and kitchens are the most common application required with low maintenance finishes.

18. Screen-printed Glass: Screen-printed or enameled glass is one that is tempered or heat-strengthened glass, one face of which is covered, either partially or totally, with mineral pigments.

Application: Used for glazing, cladding in facades and roofs. Its malleability makes it useful for a variety of applications.

19. Fire Resistant Glass: Fire resistant glass is a special laminated glass that has properties to protect from heat and fire. When exposed to fire, the pane facing the flames fractures but remains in place and as the heat penetrates the glass, the interlayer begins to foam and form a thick insulating shield that blocks the fire.

Application: In the interior fire resistant glass is used in windows, doors, walls and partitions. Facades and sloped glazing applications are some exterior uses.

20. Bent Glass: It is a normal glass that has been curved with a special process to give it a different look.

Application: It has uses in external as well as internal spaces. It can be used for facades, shop fronts, panoramic lifts or showcases, shower doors, refrigerator cabinets, etc.

21. Extra Clear Glass: It is pure and absolutely clear glass.

Application: It is used for windows while displaying expensive or rare objects, like crystal, jewelry, watches, art, etc. It is also used in scientific applications, like photovoltaic modules.

22. Photovoltaic Glass: Photovoltaic glass is special glass with integrated solar cells, to convert solar energy into electricity. This means that the power for an entire building can be produced within the roof and facade areas.

Application: It is used on facades and roofs, where maximum amount of solar energy can be collected.

23. Electro-Chromic Glass: This is an effective electricity saving component for buildings. The glass changes according to the harshness of sunlight.

Application: It can be used in facades and windows in office buildings and malls.

24. Self Cleaning Glass: It is an ordinary float glass with a special photo-catalytic coating.

This type of glass has a natural cleaning property. The active integrated coating on the outside of the glass absorbs the sun's ultraviolet rays. This causes a reaction on the surface which breaks down dirt and loosens it from the glass. It also has hydraulic properties. When it rains or water is poured over it, it washes the dust off the glass, instead of leaving it on the glass like other glasses.

25. Anti Reflective Glass: It is a normal float glass, but with a special coating that allows very little reflection of light. This type of glass has maximum transparency and lowest light reflection rates. It allows optimum viewing through the glass at all times.

Application: Has wide range of applications in exterior as well as interiors including windows, walls, partitions, panoramic restaurants, air traffic control towers, petrol station windows, high quality picture framing, display cabinets and interior display windows, dividing screens in cinema projection rooms, television studios, machine control rooms, etc.

Design considerations and parameters influencing selection of suitable, appropriate and right type of glass and its application should be decided taking into account heat gain, sound insulation, thermal breakage, human impact, security, fire, wind load, allowable span, installation, and thickness etc. Various codes and references are available for meeting the above requirements. But human safety due to impact, fire, natural and manmade disaster is a very important aspect which needs utmost attention. Authorities react and show serious concern only when such untoward incidences occur but dilute the priority instead of taking immediate adequate measures to prevent losses in future. Recently blaze at Commercial Complex in the Bandra-Kurla Complex in Mumbai on 7th September 2012, at Amri Hospital at Dhakuria in Kolkata, at Diamond Square at Kalina in Mumbai on 8th April 2011 and at many similar instances, firemen faced problem to access in the building,

undertake rescue operation and fire fighting due to fixed glass façade which again forced authorities to think seriously for enactment of safety norms and incorporation in building byelaws.

In India no guidelines, standards/byelaws governing use of glass in buildings existed till 2007. In fact even the National Building Code 2005 which serves as a Model Code for adoption by most departments and agencies involved in building construction is completely silent on this issue. Even major construction departments in the country do not have any documented or specified guidelines to refer to enable them to follow or include in their specifications architectural drawings, tender documents etc to ensure safe use of glass in buildings. Prevailing Building Bye Laws adopted by the local bodies absolutely do not have any mention or reference of glass in their documents to ensure human safety or combat calamities like fire etc. Construction/building plans are sanctioned by the local bodies without taking into consideration of human safety aspects and precautionary measures required to be taken care while using glass in buildings.

Considering the utmost importance of this issue, Confederation of Construction Products and Services (CCPS) - a nonprofit organization has brought out the "Guidelines on Use of Glass in Buildings - Human Safety" in November 2007 through PPP mode using consensus method involving experts from Central & State Govt. Departments. The recommendations of the Guidelines are based on test standards as outlined by Bureau of Indian Standards (BIS) and conform to the IS 2553 (Part 1): 1990 - Safety Glass - Specification, General Purpose and suggest how to regulate glass in relation to human safety by either, restricting use of glass or specifying use of Safety Glass at critical locations where chances of injury due to glass breakage are high. Consideration for manifestation, fire fighting and smoke exhaust is also included and recommend in case of external laminated glass facades, openable portions have to be left at regular distances as required for fire fighting and smoke exhaust.

Recognizing the importance of the subject and increased use of glass, Andhra Pradesh was the first state to initiate action to ensure human safety by issuing G.O.Ms. No. 205 on 27.02.2009 to all

authorities in the State to follow and ensure the guidelines and conditions whenever permissions are accorded for usage of glass in buildings. Following the GO, Greater Hyderabad Municipal Corporation (GHMC) has also issued Circular No. Glass/TPS/HO/GHMC/2009 dated 10.11.2009 to indicate as one of the condition on usage of glass in the plans while releasing the building permission. Now the responsibility lies with the authorities and departments of Andhra Pradesh to strictly follow the GO and Building owners, developers, builders, licensed Engineers, Registered Architects should be made accountable and authorities should insist for a joint certificate to the effect that the uses of glass in building is done properly according to and as specified in the CCPS Guidelines.

This was a motivating, inspiring and encouraging effort to be followed by other States and departments. Till date total 13 States, Central & state Govt. departments and PSUs which include Govt. of Andhra Pradesh, Govt. of Rajasthan, GHMC, Central PWD, NBCC, Airport Authority of India, Govt. of Delhi PWD, Haryana PWD (B&R), Delhi Development Authority, Rajasthan Housing Board, Town Planning Deptt, Govt. of Rajasthan, Govt. of Manipur PWD and Andaman PWD mandated the Guidelines. Some of the orders issued in this regard are on next pages.

CCPS has always been showing its commitment to propagate safe use of glass in buildings to ensure human safety in public interest and offer to provide all sorts of information and organize capacity building workshops to highlight and acquaint engineers, architects, consultants, builders, planners, fire fighters, government officials etc about the salient features of the guidelines. Now its time to join hands to include the recommendations of the CCPS Guidelines in Buildings Byelaws of all municipal bodies and development authorities to ensure human safety while using glass in buildings without waiting until a number of people lost their lives sacrificed their limbs or accidents to occur.

[References: Guidelines on use of glass in buildings-Human Safety (CCPS), Construction Products in India (CCPS), Guidelines for Use of Glass in Buildings (Dr. N.K. Garg), Article in Kanch, Apr-June 2012 issue by Shashi Kant]

Government Order/Circular issued in Andhra Pradesh to ensure use of Safe Glass

**GOVERNMENT OF ANDHRA PRADESH
ABSTRACT**

Support on ensuring safe use of glass in buildings through appropriate Building bye-laws – Guidelines – Issued

MUNICIPAL ADMINISTRATION & URBAN DEVELOPMENT (M1) DEPARTMENT

G.O.Ms. No. 205

Dated 27.02.2009

Read the following:

1. From the representation of Convener, Confederation of Construction Products & Services (CCPS), New Delhi Dated 07.04.2008 & 07.08.2008
2. From The DTCP, Lr. Roc. No. 7049/2008/A, Dt: 21.08.2008.
3. From G H M C, Lr. No. 2378/HNC/TPS/G H M C/2008, Dated: 31.12.2008.

* * *

ORDER:

In the modern lifestyle, increased glass use in buildings offers many advantages; those who spend more time indoors have intuitively understood benefits of improved daylight and vision on human psychology and health. Recent research findings underscore these indisputably. However, this increased use of glass in Indian buildings is not without risks. Wrong selection of glass type is widespread and does result in increased heat gain/loss in buildings and the higher risk of injuries to humans. Further, safety glazing (glass) is required by the International Residential Code (IRC) in a number of locations and is intended to reduce the potential for injury in the event of accidental impact with the glass. The placement of safety glass is in areas that are more likely for people to fall into on or through. Examples include glass in or near to doorways, bathtubs, sliding doors, and near the floor.

2. The two most common types of safety glazing are tempered and laminated. Tempered is the most common type of safety glass used in residential applications because it far less expensive than laminated glass. It has a higher tolerance to impact without breaking. Further, when tempered glass does break, the entire pane of glass crumbles into large granules that resemble large pieces of rock salt. Crumbled glass is less likely to cause serious injury than the shards that result from broken annealed glass. The safety glazing is required, where people are at risk from colliding with glass windows etc, where the glass should be robust enough not to break or be constructed of safety glass, or have suitable guarding. Large sheets of glazing needs to be made obvious so that people do not collide with it.

3. The Confederation of Construction Products and Services (CCPS), in their representation 1st read above have represented that which is a non profit organization took the lead and has prepared the "Guidelines on use of Glass in Buildings part A: Human Safety". The Government organizations like CPWD, NBCC were also involved in the consensus process while preparation of the guidelines. The CCPS has therefore requested this department to issue instructions to the concerned authorities in the public interest and to help in minimizing glass usage and to avoid human risk and ensure safety while using glass in the buildings and to take necessary steps to include the guidelines in the NBCC for better adoption.

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4. The DTCP, Hyderabad and the Commissioner & Special Officer, Greater Hyderabad Municipal Corporation, Hyderabad in their proposals 2nd & 3rd read above have supported the proposals and requested the Government to put certain conditions and issue guidelines on usage of glass in buildings and to ensure human safety.

Government after careful examination of the matter and taking into consideration of the recommendations made by the Confederation of Construction Products & Services (CCPS), New Delhi and the proposals submitted by the DTCP, Hyderabad and Commissioner & Special Officer, Greater Hyderabad Municipal Corporation, Hyderabad and also in order to ensure Human Safety and public interest and to minimize the usage of glass and to avoid human risk and ensure safety while using glass in the buildings, hereby issue guidelines and conditions on usage of glass in buildings particularly in commercial complexes, multiplex and multistoried buildings as follows:

1. Safety glazing material shall be used where
 - a) Any glazing is within 1.5. metre above the floor level of building,
 - b) There is danger of falling infill glass materials from overhead glazing and
 - c) There is danger of galling due to change in floor level in case of balustrades, stairs and floors.
2. Necessary precautions should be taken to enhance a person's awareness of the presence of glass by making glass visible and to minimize manual handling of large pieces of glass during installation,
3. Any glass with still height > 0.75m or with Residual Protection type of glass shall be used as vertical walls,
4. Safety glass of no risk of fall (Falling height < 1.5m) and still height<0.75m shall be used as vertical walls,
5. Safety glass of risk of fall (Falling height > 1.5m) and still height<0.75m shall be used as vertical walls,
6. Laminated Safety glass shall be used in Horizontal or sloped glazing and as a balustrade, parapet or a railing.
7. Toughened(Tempered) Glass or Laminated Safety Glass, subject to meeting the Definitions and Test standards as outlined in the IS 2553 (part I) and the Guidelines on use of Glass in Buildings
8. Part A: Human Safety" prepared by CCPS, shall be used in the building.
9. Windows, skylights and ventilators over two meters high, shall have controls, limiters and safe access for cleaning on both sides.

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10. In case of external laminated glass facades, open able portions shall be left at regular distances as required for fire fighting and smoke exhaust
11. Laminated glass with both glass panes toughened will not classify as safety glass.
12. Clear glass panels capable of being mistaken for an unimpeded path of travel shall be marked to make them visible by incorporating manifestation as mentioned in the CCPS guidelines.
13. All Safety Glass should be ISI marked along with the name or logo to identify the manufacturer of the safety glass.

6. All the Commissioners of Municipalities / Corporations and Urban Development Authorities and Metropolitan Commissioner, Hyderabad Metropolitan Development Authority, Hyderabad are requested to follow and ensure the above guidelines and conditions whenever permissions are accorded for usage of glass in buildings particularly commercial complexes, multiplex and multistoried buildings and ensure the quality of Glass with the stand set complies in the standards as required by the International Residential Code (IRC) and to make the building owner and the Engineer/Architect shall be responsible for ensuring the use of glass complies with the stands and to insist for a joint certification of the building owner and the licensed Engineer/ Registered Architect to the effect that the usage of Glass in the Building is done properly according to the standards of the International Residential Code (IRC) and Guidelines on use of Glass in Buildings and as specified in the guidelines and code of practice issued by Government of India or other agencies from time to time.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

**Dr C.V.S.K. SARMA,
PRINCIPAL SECRETARY TO GOVERNMENT**

To

All the Municipal Commissioners in the State (through C&DMA, A.P. Hyderabad).
The Commissioner & Director of Municipal Administration, A.P. Hyderabad,
The Commissioner & Special Officer, Greater Hyderabad Municipal Corporation, Hyderabad.
The Metropolitan Commissioner, Hyderabad Metropolitan Development Authority, Hyderabad.
The All Vice Chairmen's of Urban Development Authorities in the State.
The All Commissioners of Municipal Corporations in the State.
The Director of Town & Country Planning, Hyderabad.

Copy to:

The Convener, Confederation of Construction Products & Services (CCPS), New Delhi.
The PS to Special Secretary to CM / M (MA)/ PrI. Secretary / Secretary (MA&UD) Sf/Sc.

// FORWARDED :: BY ORDER //

SECTION OFFICER

[www.ap.gov.in]-> -Govt. orders- >Select Deptt.: -Municiple Administration & UD-> Select Section : -M- >Search- > Select GO NO. 205 dated 27.02.09, (Sequence ID 59554)]

GREATHER HYDERABAD MUNICIPAL CORPORATION

Office of the Chief City Planner,
Town Planning Section
Hyderabad.

CIRCULAR

No.Glass/TPS/HO/GHMC/2009

Date : 10.11.2009

Sub: GHMC – T.P.Section – Support on ensuring safe use of glass in building through appropriate Building Bye-laws – Guidelines – Reg.

Ref: G.O.Ms.No.205 MA, dt:27.02.2009

In G.O.Ms.No.205 MA, dt:27.02.2009, Government have issued guidelines and conditions on usage of glass in buildings particularly in commercial complexes, multiplex and multistoried buildings (copy enclosed).

Therefore, same shall be indicated as one of the condition in the plans while releasing the building permission.


Chief City Planner,
G.H.M.C.

Copy to:
All Addl. CCPS / CPs / ACPs of H.O.
All TPAs of H.O.
All T.P.Staff.

Copy to
Sh Shashikant, Advisor, confederation of Construction Products and services. (CCPs),
New Delhi with reference to letter dt:13.8.09

Office Memorandum issued by Central PWD and NBCC to follow Guidelines in their Departments throughout the Country



No. 129/SE(TAS)/2007/212

Dated: 04-08-2009

Office Memorandum

CPWD has developed "Guidelines on use of glass in buildings- Human safety" through Public Private Partnership with Confederation of Construction Products and Services (CCPS). These guidelines are developed through consensus approach involving all stake holders, various PWDs and other Govt. departments etc.

The use of glass in buildings has increased manifolds. The worldwide increase in use of glass has become a matter of concern from human safety point of view.

Recognizing the gravity of the problem and uncertainty faced by the Engineers, Architects and users, the guidelines for selection of appropriate safety glass suitable for a particular location have been brought out.

CPWD has already issued instructions vide O.M. no. 109/SE(S&S)/EE-III/Tech. Misc./26 dated 18/2/2008 to all the officers in the department to promote awareness about Human Safety while finalizing specifications for glazing. The purpose of guidelines is not to sell more safety glass but to exhibit the wide choice that exists and allow the use of glass with precautions in order to reduce the risk of accident.

It should be ensured that henceforth, these guidelines shall be followed in the department to ensure safe use of glass while planning, designing and executing the buildings.

This issues with the approval of DG(W).

Encl: As above

(PRITHPAL SINGH)
Executive Engineer (S&S)-III

To

- 1) All ADGs, CPWD/Engineer-in-Chief (PWD), GNCTD.
- 2) All Chief Engineer (Civil/Elect, CPWD/PWD, GNCTD.
- 3) All Superintending Engineer(Civil/Elect), CPWD/PWD, GNCTD
- 4) All Executive Engineer(Civil/Elect), CPWD/PWD, GNCTD

Copy to:

- 1) Member (HUD), Planning Commission with reference to OM No. 20/1/2007-Tpt dated 6/1/2008.
- 2) Secretary, Ministry of Urban Development, Nirman Bhawan, New Delhi.
- 3) Secretary, Ministry of Housing & Poverty Alleviation, Nirman Bhawan, New Delhi.
- 4) Adviser (HUD), Planning Commission, Yojana Bhawan, New Delhi.
- 5) PPS to DG (W), CPWD, New Delhi.
- 6) CCPS, G-4, Raj Tower, Alaknanda Shopping Complex, New Delhi- 110019

Executive Engineer (S&S)-III

नेशनल बिल्डिंग्स कॉन्स्ट्रक्शन कॉर्पोरेशन लिमिटेड
(एन बी सी सी)
NATIONAL BUILDINGS CONSTRUCTION CORPORATION LIMITED
(A Government of India Enterprise)

Safety Management CrI.
Corporate Office,
NBCC Bhawan, Lodi Road,
New Delhi-110003.
Dated, 25th January, 2012.

No. AGM / Safety /2011-12 / 311

To,
All Executive Directors,
H-RBG's, H-SBG's,
HoD's at Corporate Office,
NBCC Ltd

Subject: Guidelines on use of Glass in Buildings Human Safety.

Dear Sir,

The use of glass in buildings has increased manifolds. The worldwide increase in use of glass has become a matter of concern from human safety point of view.

Recognizing the gravity of the problem and uncertainty faced by the Engineers, Architects and users, "Guidelines on Use of Glass in Buildings- Human Safety" has been brought by Confederation of Construction Products and Services, New Delhi.

These guidelines suggest how to regulate use of glass or specifying use of Safety Glass at critical locations where injury due to glass breakage is high. As per the guidelines, following are the conditions on uses of glass in buildings:

1. Safety Glazing material shall be used where
 - a) any glazing is within 1.5 metre above the floor level of building
 - b) there is danger of falling infill glass material from overhead glazing and
 - c) there is danger of falling due to change in floor level
 - d) in case of balustrades, stairs and floors.
2. Any type of glass in locations having Sill Height H_s ≥ 0.75 m or with Residual Protection shall be used as vertical walls.
3. Safety glass in locations having no risk of fall (Falling height H(F) ≤ 1.5 m) and Sill Height H_s < 0.75 m shall be used as vertical walls.
4. Safety glass in locations having risk of fall(Falling height H(F) ≥ 1.5 m) and Sill Height H_s ≥ 0.75 m shall be used as vertical walls.
5. Laminated Safety Glass shall be used in horizontal or sloped glazing and as balustrade, parapet or a railing.

-2/-

CORPORATE OFFICE
एन बी सी सी, लोदी रोड, नई दिल्ली-110003
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नेशनल बिल्डिंग्स कॉन्स्ट्रक्शन कॉर्पोरेशन लिमिटेड
(एन बी सी सी)
NATIONAL BUILDINGS CONSTRUCTION CORPORATION LIMITED
(A Government of India Enterprise)

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6. Toughened (Tempered) or Laminated safety Glass , subject to meeting the definitions and test standards as outlined in the IS : 2553 and the Guidelines on use of glass in buildings , prepared by CCPS shall be used in buildings.
7. In case of external laminated glass facades, openable portions shall be left at regular distances as required for fire fighting and smoke exhaust.
8. Clear glass panels, capable of being mistaken for an unimpeded path of travel should be marked to make them visible by incorporating manifestation as mentioned in the CCPS guidelines.
9. However, if the smaller dimension of pane is 250 mm or less, and its area is 0.50 sqm or less, glass not conforming to safety requirements can also be used.

It is, therefore , enjoined upon all engineers, architects of NBCC to ensure that these guidelines are followed in its true letter and spirit , while planning, designing , executing, and approving buildings / projects to ensure safe use of glass.

A copy of the said guidelines is enclosed for your ready reference and perusal and wide publicity to all the zones, units, sites etc of NBCC under your administrative control and other stakeholders, and including the same as a part of technical specifications of NBCC tender documents.

This issues with the approval of Executive Director (PMG)

[N.P. Akhand]
Addl. General Manager (Safety)

Encl:- Guidelines on use of Glass in Buildings- Human Safety-as stated.

Copy to :-
DGM to CMD for kind information of CMD pl
EO to Director (Projects) for kind information of Director (Projects) pl.
Sr EO to Director (Finance) , for kind information of Director (Finance) pl.
EO to CVD for kind information of CVO pl.

✓ Confederation of Construction Products & Services, S1 &S2, 2nd floor, Abhishek Tower D2, Alaknanda Commercial Complex, New Delhi- 110 019 - Kind Attn. Er. Shashikant, Adviser.

Addl. General Manager (Safety)

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