Increasing use of Architectural Glass

– Need for regulation
About CCPS

The Confederation of Construction Products and Services is a non-profit organisation which is dedicated to the sustainable growth of construction products sector by working collectively to improve quality and efficiency in building industry in India.

Main Objectives:

Work with Construction Industry, Government bodies, Users, and Specifies to:

1. Contribute towards improvements in the quality and efficiency in construction in the country

2. Influence the development of the construction sector as organized, forward-looking and responsible
CCPS Focus Areas:

1. Develop appropriate Standards and Code of Practices

2. Develop and Conduct Training Programs and initiatives

3. Improve Standardization and Pre-assembly in building industry

4. Setup systems to collect and disseminate market data
CCPS Activities

- Prepared “Guidelines on Use of Glass in Buildings- Human Safety”
- Published “Manual on Hand Held Power Tools”
- Associated with Central PWD for preparing “Manual on Door & Window Details for Residential Buildings.”
- Published four in series “Construction Products in India”
- Organised 32 workshops for 1125 professionals at 8 places on “Selection of appropriate glass in buildings.”
- Organised 5 workshops for 224 professionals at 4 places on “Passive Fire Protection in buildings”
- Organised “Basic training course on systems & concepts of waterproofing”
- Organised training programme on “Birla White Contractor’s Meet”
- Organised more than 19 workshops on “Guidelines on use of glass in buildings-Human Safety”
OUR JOURNEY

PRODUCTS STANDARDS AND CODE OF PRACTICE

1. Standardization of Doors and Windows Sizes for Residential Buildings


PROJECTS IN PIPELINE

PRODUCTS STANDARDS AND CODE OF PRACTICE

1. Selection of Hardware for use in buildings and interiors- Doors, Windows, Furniture and Glass

2. Selection and Application of Organic coated Adhesive Backed Polymeric films in glazing for Safety and Solar control purpose

3. Selection, Installation & Maintenance of Ceramic Tiles

4. Selection and Application of Façade

5. Selection of Fire Seals for Buildings
Some of the publications brought out by CCPS.
Representation of CCPS in the various Organizations and Committees:

- **Bureau of Indian Standards (IBC):** “Building Construction Practices Including Painting, Varnishing and Allied Finishes Sectional Committee CED 13”.

- **Bureau of Indian Standards (IBC):** “Glass, Glassware and Laboratory ware Sectional Committee CHD 10”.

- **Panels on Use of Glass in Buildings P1 & P2:** ‘Use of Glass in Buildings’ and ‘Glazing System’ under CED 13

- **CII-Indian Green Building Council (IGBC)**

- **Indian Building Congress:** Governing Council Member

- **National Committee on Real Estate & Housing by CII:** Ar. Deepak Gahlowt, Convener CCPS was Chairman of National Committee on Real Estate & Housing (CII) for 2013-14
Glass

The material of the future or a curse?
Glass use is increasing world wide

- Fashion
- Economic reasons
- Changing life styles requiring people to spend time indoors – need to stay connected
- Daylight – Physiological and physical need
- Changing society – Democracy, open home / office
## Glass sale data

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Human Safety Codes

Objective

- Establish minimum level of safety to reduce injury to people from breakage of glass used in and around buildings.
Glass Regulations

• **Human Safety** - Human Impact / Falling Glass
  - CCPS Guidelines on use of glass in buildings – Human safety

• **Energy**
  - Energy Codes (Indian – Energy Conservation Building Code (ECBC 2007))

• **Fire Safety**
  - Municipal Corporation of Greater Mumbai initial work
Safety Codes - History

- 1960s First standards including American National Standard Z97.1, initiated by the glass industry to ensure safety and reduce glass related injuries.

- In 1972, the Consumer Products Safety Act passed, establishing a federal commission, the Consumer Product Safety Commission (CPSC).

- 1977, the CPSC standard 16 CFR part 1201 enacted by federal government. Unlike the voluntary ANSI Z97.1, this was mandatory for all parts of the United States.


- United Kingdom established standard in early 1990s


- International Residential Code, Europe and most countries in the Asia Pacific Region already control glass use.
Glass pain haunts hotel one more time

3 months after a boy crashed to death at a city hotel, a worker almost lost his life on Sunday after colliding with glass panel on the 5th floor

By Vipul Rajput
Posted On Monday, February 16, 2009 at 03:30:06 AM

Accidents are happening once too often at Hotel Fortune Landmark, on Ashram Road. And oddly enough, the culprit remains the same glass sheets that make up the facade of the hotel. Three months after 11-year-old Ahad Sayyed of Vapi lost his life after a fall from the seventh floor of the hotel, a worker escaped death by the skin of his teeth on Sunday when he crashed through the glass, but didn’t fall.

In the latest accident, a worker carrying out a repair job on a ladder in the lobby of the hotel on the fifth floor, lost his balance and crashed into the glass sheet that doubles up as a wall in the hotel. Hitting the glass with his back, he ended up precariously hanging with his back jutting out of the broken pane. He cried for help and was pulled back inside the lobby by the staff.

HANGING ON: A worker (circled) seconds after he dashed against a glass panel on the hotel’s fifth floor on Sunday
The hotel staff at first called up emergency ambulance service '108' when the accident happened at 2:30 pm. But soon, they realised that calling a public ambulance would invite unwanted attention and landing them in trouble, and hence hastily shifted the injured worker to a private hospital before the '108' ambulance arrived.

By then, enough commotion had taken place for the matter to be hushed up. Passers-by gathered to see the worker hanging out of the glass at the hotel. Some even clicked pictures of the unusual sight.

The scene left little scope for the hotel to deny the incident. The hotel's floor manager Radhakrishna said, "A worker did get hurt after crashing into the glass, but he didn’t fall. We have got him medical treatment, and he’ll be fine."

Back on November 10, 2008, Ahaad too had crashed through a similar glass sheet and fallen to death while playing Frisbee with his sister in the lobby. Ahaad’s family, which had put up in the hotel, had come to the city for treatment of his sister Khushboon’s sinus complaint.

Soon after that incident, AM got architects and experts to test the strength of the glass to find out if a stronger one could have saved Ahaad’s life (Cheap glass culprit in boy’s death, November 12).

The tests revealed that the glass was weak and of low quality. Experts were shocked that a hotel of the standard of Fortune Landmark could use glass of such poor quality.

Forensic Science Laboratory officials confirmed that the hotel had fitted 4 mm thickness glass in a 6 mm thickness aluminium frame. Such glass breaks easily, they said.

Months on, and a fatal accident and laboratory tests later, the hotel did not find the glass panel unsafe and life-threatening enough to need replacement, leading to another serious accident. Whether we have seen the last of the mishaps involving the glass panel at the hotel, only time will tell.
Man killed in freak accident

Chandigarh, July 26
Mystery shrouds the death of the general manager of a Baddi-based shoe-manufacturing unit, who was critically wounded after he allegedly walked through a glass door at Naaz Saloon in Sector 20-D here this morning.

The victim, Nileendra Singh Chauhan, in his mid-forties, was rushed to the Government Multi-Speciality Hospital, Sector 16, where he was declared brought dead. A visit to the second floor of the building, where the saloon is located, presented a horrifying sight as the blood was splattered all over the place, including in the saloon, on the staircase and in the corridors outside the saloon. The saloon was covered with blood and the broken pieces of glass and the sofa on which the victim was reportedly made to sit, was soaked in blood.

Abrahim and Mohammad Hanif, who run the saloon, told TNS that Chauhan frequented their saloon to buy wigs and had come today for purchasing some wigs. He was in a hurry and made quick enquiries. “He was paying Rs 1,000 per wig, but I demanded more. During the discussion he said he was in a hurry and would buy on old price. He gathered the wigs in a bag and was leaving when he walked into the glass door and injured himself,” said Ibrahim.

Hanif said he ran out after hearing the noise of the broken glass and saw Chauhan holding his thigh, which was bleeding. “We made him sit on the sofa, bandaged the wound with a sheet and called the police for ambulance. As the police did not come in time, without wasting much time I put him in my car and rushed to the hospital,” stated Hanif.

Raising doubts over the incident, a police officer said it was a coloured glass with brown hue and as it was being said the victim was a regular visitor, the chances of his walking into the door were far less.

Moreover, he came out of the cabin, which was adjacent to the door, and it was also doubtful that he gained as much speed to break into the glass.

The SHO of the Sector 19 police station said Chauhan was declared brought dead in the hospital. Ruling out possibility of any foul play, the SHO said there was no altercation between the parties and it was an accident. He said they had initiated inquest proceedings into the matter and would get the postmortem conducted tomorrow to rule out doubts, if any, behind the death.

Chauhan was working for Nikhil International factory in Baddi, which manufactures shoes products for Action Shoes. He was reportedly in the city to visit Mansa Devi Shrine and had come to the saloon to buy some wigs. Chauhan is survived by his wife, a son and a daughter. They live in Gwalior while he hailed from Kanoj in Uttar Pradesh.

Cops indifferent on ransom complaint
Through the glass door, painfully

When Jabeer Ahmed visits a mall he moves around with a slow step. It’s not that the 85-year-old businessman is short-sighted, but he is wary of bumbling through an ultra-clear glass door, the invisible kind that malls love to flaunt to look modish. “I have presence of mind, but looks can deceive,” says Ahmed. “I walk carefully, inside malls and complexes that have sliding glass windows, transparent partitions and knobless glass doors, since the speed at which you walk determines the extent of injury I know from experience.”

Glass is one of the vanities of modern architecture, but it’s the most duplicitous. There have been innumerable cases of people suffering from deep cuts and scratches, to say nothing of shattered nerves, after marching straight into plate-glass in restaurants, museums and shops. Referred to as ‘walk-through injuries’, medical experts say that these collisions with glass usually cause damage to facial soft-tissue, which can be both dangerous and disfiguring.

According to Deepak Gahlot, architect and convener of The Confederation of Construction Products and Services (CCPS), an estimated 20,000 people across the world, most of them children, suffer from injuries sustained from glass furniture. “Many countries have made it mandatory to use safety glass (non-brittle glass) in critical locations and also require that the glass be manifested. Many Londoners for instance have a white sheet of paper pasted on the glass pane with the words ‘Don’t walk into me’.

There was no such statutory warning at the Ooty church that Coonoor resident Anna David had a painful encounter with. A regular parishioner, David had grown so familiar with its corridors, little windows and doors that she began to glide through the church absently-mindedly. “My confidence suffered a major blow when, nose first, I dished into a newly installed glass door,” recalls David, who was so embarrassed that she quickly covered her smarting nose with a handkerchief and stumbled away. It took a few days for the church authorities to realize that it wasn’t just hapless sparrows that were going splat.

Soon, a sign went up: ‘Don’t walk into this glass’.

One of the standard gags of comedians, walking-into-glass videos are all too popular on YouTube. The embarrassed expressions, swollen noses and sandbagged looks that follow are well-documented for all to watch. In fact, many users have said that they get a kick out of watching unsuspecting victims, usually the short-sighted or those in a rush, slam into glass.

On a serious note, doctors and architects say that good design should foster in the transparency of glass and provide adequate warning. “Why not place a sticker or even a yellow Post-It on the super-clear glass to indicate the presence of a door?” asks Jabeer. Prem Nath, chief architect of several city malls and multiplexes adds, “To avoid accidents, it is advisable to place a sculpture, mannequin, lamp stand in front or behind the glass.”

CCPS, a Delhi-based NGO, is pushing for India to frame laws to ensure that glass is used safely in its recommendations to the Planning Commission titled ‘Guidelines for use of glass in buildings: Human Safety’. It specifies safety standards such as special glazing, tempered glass and laminated glass to reduce transparency.

Other safety measures include warning stickers or marking glass doors and panels with a large opaque band.
Bar on bldgs with fixed glass facades

Mumbai: Alarmed by last week's blaze at a commercial building in the Bandra-Kurla Complex (BKC), the BMC has decided to disallow the use of fixed glass sheets on façades.

Municipal commissioner Sitaram Kunte has asked the building proposal department and the fire brigade to draw up strict guidelines on façades and allow only those glass exteriors that can be dismantled. It has been found that firemen find it difficult to access the affected portion from outside if a building has a fixed glass façade.

All these changes have to be incorporated in the fire safety norms to be followed for a particular building. These will then be verified before the fire brigade issues a no-objection certificate to the building.

For existing buildings with fixed glass exteriors, the guidelines will mention certain structural changes that have to be mandatorily carried out.

These include opening up a certain portion of the façade and replacing the existing fixed glass sheets with ones that can be dismantled.

Senior fire brigade officials say fixed glass exteriors hamper rescue operations during a blaze (see box). “Due to the accumulated smoke, there is little visibility inside and the heat level also increases. There is also a chance of people suffocating due to this,” said chief fire officer Suhas Joshi.

“The fire brigade will inspect buildings that already have full glass façades and suggest changes that have to be carried out to ensure the safety of such structures,” said additional municipal commissioner Manisha Mhaskar. The fire brigade also plans to make it compulsory for buildings with glass exteriors to have ‘emergency exit’ labels pasted on sheets that can be dismantled during an emergency. This will help save time as fire-fighters do not have search for access points.
A year after a building with a glass façade in Bandra-Kurla Complex (BKC) caught fire, the city’s municipality has come up with guidelines for such buildings which are mushrooming across the city, especially in business hubs.

The guidelines prepared by the Brihanmumbai Municipal Corporation (BMC) have been put together to safeguard human life and property especially in case a fire breaks out.
CCPS Guidelines on Use of Glass in Buildings – Human Safety
Project Objectives

Develop for the Indian building industry a commonly accepted method for
a) selection and
b) installation of
   glass in buildings that is safe in relation to human safety.
Methodology for development of Guidelines

- The guidelines have been, for the first time in India, developed through the consensus method by a non profit organization.

- Adopting PPP mode involving M/o UD, CPWD, Major PWDs, Local bodies, CBRI, prominent professionals, glass processors, manufacturers, stakeholders

- Advantages
  - Fewer procedural burdens - quickly developed and modified, appeal to common sense, flexible in application,
  - Voluntary nature allows users to adapt provisions to meet unusual circumstances,
  - Much lower development cost - when compared to the state regulatory procedures.
1.0 Scope

The scope of these guidelines covers minimum safety requirements subjected to various kinds of human impact, precautions against risk of fall and falling glass.

Further this guide does not deal with the safety and security of people or goods in relation to risks of:

a) Vandalism, riots, burglary or break in protection,
b) Fire arm protection,
c) Protection from explosion (terrorist attack),
d) Natural disasters like Earthquakes, cyclone, Fire etc.,
e) Plastic glazing, safety and security glazing etc.

2.0 Safety Glass

Safety glass shall be of four types:

a) Toughened Safety (Tempered) Glass (TS)
b) Toughened Float Safety Glass (TF)
c) Laminated Safety Glass (LS)
d) Laminated Float Safety Glass (LF)
3.0 Critical Locations

The critical locations with appropriate types of glass allowed for use are listed in the following five cases.
**Case 1:**
Glass used as Vertical Walls (not likely to be subjected to Human Impact)
Hs ≥ 0.75 m or with Residual Protection
Type of Glass to be used: Any glass (Safety Glass not mandatory)

Hs = Sill height, Hf = Falling height in case of change in level between the two sides of glass
Case 2:
Glass used as Vertical Walls (Human Impact but no risk of fall)
$H_s < 0.75\text{m}$ and $H_f \leq 1.5\text{ m}$
Type of Glass to be used: Safety glass (TF or LF)

$H_s =$ Sill height, $H_f =$ Falling height in case of change in level between the two sides of glass
**Case 3:**
Glass used as Vertical Walls (Human Impact and risk of fall both)

Hs < 0.75m and Hf ≥ 1.5m

Type of glass to be used: Safety glass (LF preferred)

Hs = Sill height, Hf = Falling height in case of change in level between the two sides of glass
Case 4:
Glass used in Horizontal or sloped glazing (Risk of fall)
Type of glass to be used: Laminated safety glass (LF)
Case 5:
Glass acting as a balustrade, parapet or a railing (Human Impact and risk of fall both)
Type of glass to be used: Laminated safety glass (LF)
4.0 Manifestation

Clear glass panels mistaken for an unimpeded path of travel should be marked to make them visible by incorporating manifestation.

5.0 Identification of safety Glass

Glass shall be indelibly and distinctly marked with type of glass, name or logo to identify the manufacturer, thickness of glass etc.

6.0 Safety Glass Test Requirements

Glasses should meet the tests requirement as laid down in IS : 2553 (Part 1)

7.0 In external laminated glass facades, openable portions have to be left at regular distances as required for fire fighting and smoke exhaust
Requirements for Fire Protection

- **Fireman knock-out/openable glazing panels**
  - Glazing panels required for venting and emergency access from the exterior.
  - Knock-out panels are generally fully tempered glass to allow full fracturing of the panel into small pieces and relatively safe removal from the opening.
  - Knock-out panels are identified by a non-removable reflective dot (typically two inches in diameter) located in the lower corner of the glass and visible from the ground by the fire department.

- **Egress window**
  - Window designed to be large enough for a fire fighter to climb in or a person to climb out in an emergency.
  - Building codes often require each bedroom of a home to have an emergency exit window, with minimum sizes specified. Generally requires 20" width and 24" height opening and 5.7 sq. ft. opening.
Requirements for Fire Protection

- **Perimeter Protection**
  - A curtain wall by its very nature does not provide compartmentation
  - The use of fire sprinklers has been shown to mitigate this matter
  - Unless the building is sprinkled, fire may still travel up, if the glass on the exposed floor is shattered due to fire influence, causing flames to lick up the outside of the building
  - Fire rated assemblies may be required in unsprinklered buildings. The ratings of the Perimeter Fire Containment System must be equal to or greater than the floor rating

- **Protection against Fire Leaping**
  - Spandrels to be provided with insulation or / and projections to be provided
  - Distance between external wall and glass façade shall not be more than 300 mm

- **Protection against falling glass**
  - Safety Glass - tempered / toughened glass is the best protection
  - Safety Glass - Laminated Glass is also a solution
Wide Propagation of Recommendations of the Guidelines by CCPS
The purpose of Guidelines is to suggest how to regulate glass in relation to human safety and not to sell more safety glass but to exhibit the wide choice that exists and allow the use of annealed glass with precautions or specify the use of safety glass at critical locations.

Guidelines were reviewed by an Expert Committee under former DG, CPWD.
• Member (HUD), Planning Commission took meeting on 12.12.2008 on ‘Safe use of glass in buildings through building byelaws etc’. CCPS gave presentation.

• Planning Commission requested Municipal Adm., Housing & UD Secretaries of all State Govts./UTs to initiate appropriate action to ensure safe use of glass in buildings by insisting certain conditions (Vide letters dated 04.02.2009 and 26.11.2009)

• Organized more than 19 workshops/training programs/presentations

• Approached and contacted Central & State UD ministries, Govt. construction departments, Development Authorities & Local Bodies, Associations, Professionals, builders etc.
• Guidelines were released on the occasion of “155th CPWD DAY” on 12th July 2009 in the presence of Smt. Shiela Dixit, Hon’ble Chief Minister, Govt. of Delhi, Chief Guest, Sh. Saugata Roy, Hon’ble Minister of State for Urban Development, Guest of Honour
Presenting guidelines to Lt. General, (Retd.) Bhopinder Singh, PVSM, Lieutenant Governor, Andaman & Nicobar Islands
Presenting guidelines to Mr. Chanchal Kumar, IAS, Secretary, Building Construction Deptt. Govt. of Bihar
Discussions with Sh. T. K. Anil Kumar, IAS, Secretary, U D Deptt., Govt. of Karnataka & Sh. S. B. Hunnur, Director, TCPO on 25th January 2014
Glass use: Plea to amend building by-laws in city

Jodhpur: Pink City is growing and use of glass in commercial buildings is also growing rapidly. The Jodhpur Authority has proposed to add the “Guidelines for Glass in Buildings” to building by-laws.

Source: DNA Pink City
Implementation of CCPS Guidelines by 17 States, Central & State Govt. Deptts., PSUs and Private Contractors
OM, GO, orders issued by various States, Govt. Deptts

1. **CPWD**, Govt. of India, **OM** dated 04.08.2009 for mandatory implementation of Guidelines in the department throughout the country and PWD, Government of National Capital Territory of Delhi.

2. **Govt. of Andhra Pradesh**, **G.O.Ms. No. 205** dated **27.02.2009** addressed to all Municipal Commissioners /Vice Chairmen of Urban Development Authorities/Commissioners of Municipal Corporations in the State, Hyderabad Metropolitan Development Authority, Hyderabad, GHMC and all other concerned to follow and ensure the guidelines and conditions whenever permissions are accorded for use of glass in buildings.

3. **Greater Hyderabad Municipal Corporation**, Circular dated 10.11.2009 to indicate as one of the condition on usage of glass in the plans while releasing the building permissions.


5. **Town Planning Department**, O/o Chie Town Planner, Govt. of Rajasthan letter No. TPR:8265:08:54/7553-68 dated 11.05.2011

6. **Rajasthan Housing Board**, Jaipur Office order No. 176 dated 08.03.2011

7. **Jaipur Development Authority UO Note No.** JDA/ ACTP / BPC(BP) /2011 /D-838 dated 26.05.2011

9. **Delhi Development Authority** OM No. EM/(10)/2010 /Circular/ Vol III/4671 dated 29.11.2010

10. **Haryana PWD (B & R)** Memo No. 5535-47/WI dated 19.08.2011

11. **Govt. of Manipur** PWD, OM No.12/10/2007-CE/819 dated 05.08.2008


14. **Airport Authority of India**, Technical Instruction No. 86, No. AAI/Member (Plg)/Tech-Inst./ 2012 dated 20.01.2012

15. **Indian Trade Promotion Organization** guidelines to be followed at Trade Fairs included CCPS Guidelines recommendation


17. **Ahluwalia Contracts (India) Limited, New Delhi** to strictly adhere the instructions/guidelines vide order dated 25.06.2014
**Bureau of Indian Standards**

**IS 16231 (Pt. 4) 2014** – “Code of Practice for Use of Glass in Buildings
Part 4: Safety Related to Human Impact” is based and derived from CCPS Guidelines
Suggestions

1. Glass Use in Buildings should be governed by regulations from human, fire, structure, energy point of view

2. Central and State, UD & Housing Ministries to ensure inclusion of CCPS Guidelines recommendations in building byelaws by local bodies and development authorities

3. Organize training workshops/seminars for Govt. officials, professionals, associations, developers and builders to acquaint about Glass Guidelines in collaboration with CCPS

4. Wide propagation of practices for safe use of glass in electronic & print media

6. Teaching glass related subjects in Educational Institutions

7. Initiate glass related training courses/ programs in ITIs to develop trained & skilled work force

8. Survey of existing buildings of Govt. Departments, Commercial Complexes, Hotels, Hospitals/ Nursing Homes, Airports etc. for appropriateness of glass used and suggest solutions

9. Collect glass injury data through hospitals with CCPS

10. Collect data on energy consumption in large occupied buildings and make public the same for study and analysis

11. Share widely fire incident reports in case of major fire incidents.
Download CCPS Guidelines and copies of orders from

www.ccpsindia.com
THANK YOU

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