ALUMINIUM DOORS, WINDOWS & STRUCTURAL GLAZINGPOLICY

The aim of this release of Façade policy addresses guidelines recommended for the Sliding Doors/Windows, Casement windows & Structural glazing across project segments:

- Casa Residential
- Aspirational Residential
- Hi-end Residential
- Luxury Residential
- Excellus / Supremus /iThink Office
- Experia Retail
- Boulevard Retail

Note: Any sliding window having height greater than 1.8 is referred to as a sliding door.

The main factors contributing to the Design of the Sliding Doors/Windows, Casement windows & Structural Glazing are as mentioned in Table – 1 below:

TABLE - 1 - FACTORS FOR DESIGN OF SLIDING WINDOW/DOORS, CASEMENT WINDOW

SL NO	FACTORS	DEPENDENT ON	REMARKS
1	**WIND LOAD**	Height of Building, Environment	Refer Table - 3
2	**SIZE OF OPENING**	Windows or Doors	
3	**TYPE OF WINDOW**	Sliding Door , Sliding Window, Casement Window, Bay Window	
4	**LOCATION**	Window on exterior wall with or without Chajja / Roof over, Box window, Sliding Door with Deck etc	
5	**WATER INFILTRATION**	Performance, Profile selection, No of seals	
6	**AIR INFILTRATION**	Indoor Air Quality, Seals	
7	**PERFORMANCE - THERMAL / ACOUSTICS / SERVICEABILITY**	Indoor Comforts, Durability etc	
8	**PROJECT SEGMENT**	Architectural Choice, Accessories, Sight lines	

The Floor Heights & Window openings recommended for various project segments are as mentioned in Table – 2 below:

TABLE -2- Key Dimensions for various project typologies:(all dimensions in mm)

SL NO	PROJECT SEGMENT	SLIDING WINDOW / DOOR - CASEMENT WINDOW			GLAZED PANELS			REMARKS
		FLOOR HEIGHT	LINTEL HEIGHT	Max. WIDTH	WIDTH OF PANELS	FLOOR TO FLOOR HEIGHT	VISION PANEL HEIGHT	
1	CASA RESIDENTIAL	3000	2100	4000	NA	NA	NA	LINTEL BEAM AT 2150 ABOVE RAW SLAB LEVEL
2	ASPIRATIONAL RESIDENTIAL	3150	2100	4000	NA	NA	NA	
3	HIGH END RESIDENTIAL	3450 - 3600	2400	6000	NA	NA	NA	LINTEL BEAM AT 2450 ABOVE RAW SLAB LEVEL
4	LUXURY RESIDENTIAL	3600	2400	6000	NA	NA	NA	
5	EXCELLUS / SUPREMUS / I THINK OFFICES	NA	NA	NA	1200 - 1500	4050	2100 -2400	
6	EXPERIA RETAIL	NA	NA	NA	1200 - 2000	4200 OR GREATER (IF PERMISSIBLE) FOR GF(LG/UG), 1ST & 2ND. For FLOORS ABOVE second, 4200	FTF	
7	BOULEVARD RETAIL	NA	NA	NA	1200 - 1500	3600 IF STAND ALONE; SAME FTF AS BUILDING TYPICAL FLOOR IF AT THE BASE OF BUILDING. ALL INTERNAL BEAMS, DOOR OPENINGTOP & WINDOW OPENING TOP (IF APPLICABLE) TO BE STANDARDIZED @ 2400 ABOVE RAW SLAB LEVEL		LINTEL BEAM AT 2450 ABOVE RAW SLAB LEVEL

(Please note that above limits are the maximum and can be decreased in increment of 150 mm).

DESIGN OF SLIDING DOORS / WINDOWS & CASEMENT WINDOWS:

The design of Sliding Door/Windows & Casement windows shall be based on the Height of the building & Wind Pressures as mentioned in Table – 3 below:

TABLE - 3 BASIS FOR DESIGN SLIDING DOORS / WINDOWS / CASEMENT WINDOWS

Applicable for building only upto height of 150 m – for buildings above 150 m height, follow results of the wind tunnel test and design shall be as per façade consultants:

SL NO	HEIGHT ABOVE GROUND OF FLOORS CONCERNED	DESIGN WIND PRESSURE IN Kpa	DESIGN
1	0 TO 50 M	1.5	INHOUSE REFER TABLE - 4
2	51 TO 100 M	2	INHOUSE REFER TABLE - 4
3	101 TO 150 M	2.6	CUSTOM DESIGN BY FAÇADE CONSULTANTS

The Aluminium Profiles, Glass & Hardware recommended are in general as mentioned in **Table – 4**(please refer attached excel sheet)tables-4.xlsx

General guide lines for Sliding door/Window, Casement window

1. For sliding door windows, no. of tracks should be restricted to 3 (maybe 4 in exception circumstances due to extreme room dimensions, but generally 4 tracks are to be avoided). 2 tracks can serve upto 4 m wide opening (2 tracks x 2 shutters from each side x 1 m width of each shutter = 4 m) and 3 tracks upto 6 m wide opening (3 tracks x 3 shutters from each side x 1 m width of each shutter = 6 m).
2. Sliding door or Window shutter size shall be as far as possible not exceeds 1000 mm wide.
3. Maximum sliding door opening shall be 6000 mm wide which shall be custom designed with testing for performance parameters.
4. Casement windows shall as far as possible be avoided as it is expensive.
5. Bottom Tracks for sliding Door & Window & Casement window Sub frame shall be hollow sections with drain chambers.
6. Drain holes in Tracks / Drain Frame shall be staggered & slot holes.
7. All aluminium sections shall be powder coated with AKZONOBEL / JOTUN or equivalent with minimum 10 year Warranty.
8. All Sliding Door / Window & Casement Windows shall have double seals weather strips with EPDM Gaskets. Wool pile / Mohair to prevent air, noise & water infiltration in case of sliding door/window only.
9. All Aluminium Sliding doors & windows sections shall be checked & cleared with Structural Calculations by vendor.
10. All customized windows shall be performance tested as per ASTM E 283/ 330 /331/501.
11. Restrict the height of Glass Doors to 2400 mm & single shutter width to 1000mm & 80 Kg weight. All Glass doors shall be toughened.
12. All toilet windows to be aluminum casement operable windows, glass louvers not to be used in toilets except for Casa.
13. All external walls which will have the façade anchorage (e.g. windows, stone cladding, etc.) to be minimum 150 mm thick RCC wall.
14. Tinted glass looks very bad when used in windows for buildings and should be avoided. It can be used only for fully/largely glazed

buildings.

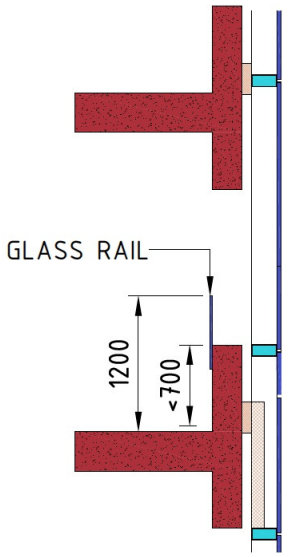
General guide lines for Glazing:

If glazing is used in residential building, total window area should be minimum 30% of carpet area of any habitable room (35-40% is desirable). Due to Indian climatic conditions, operable windows should be maximized and their % of opening should also be maximized. However, following safety factors to be taken into account:

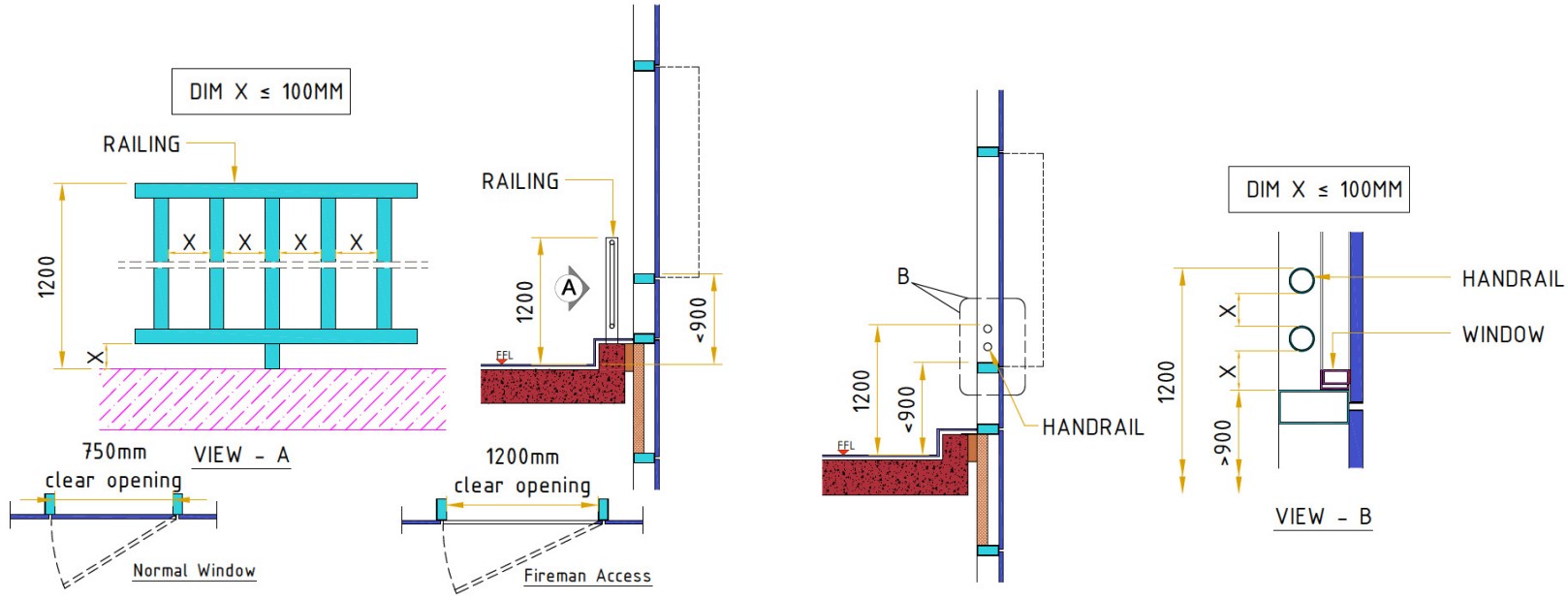
- Casement window width are suggested as below:
    1. 750mm where access is required and opening ≤10˚
    2. 600mm where no access required and opening ≤15˚
- Curtain wall / Structural Glazing shall be limited as far as possible with WWR (Window Wall Ratio) of not greater than 60%WWR (Window wall Ratio) is the ratio of Vertical Fenestration area to gross exterior wall area. Gross exterior wall area is measured horizontally from the exterior surfaces: it is measured vertically from top of the floor to the bottom of the roof. All areas (including the frames) in the building that let in light on vertical surface of building (i.e. Vision area) is Vertical fenestration area.

- For operable in fully glazed building below criteria to be followed:
    1. **Operable At Fully Glazed High Rise Residential Building** :
        a) Window to be provided at every 10M (minimum) along the periphery of the building or one window minimum at each room.
        b) Preferably window typology should be side hung (outside) with maximum opening or sliding window for more ventilation in room. Width of Side hung shall be maximum 750 mm.
        c) Window sill to start not less than 900mm from FFL / last stepable. In case window opening is starting at lesser sill level, glass rail to be provided up to a height of 1200 mm from FFL.
        d) In-case of full height sliding window with no balcony outside, railing to be provided upto a height of 1200mm from FFL.

e) Handle to be provided within 1050mm height from FFL



2. **<u>Operable At Fully Glazed Commercial Building</u>** :
   a) Window to be provided at every 10M (minimum) or one window minimum at each office (for Supremus).
   b) Window sill to start not less than 900mm from FFL / last stepable. In case of lesser sill level, guard rail to be provided.
   c) Fireman access operable window to be provided as per CFO requirement
   d) Smoke vents to be provided as per CFO requirement
   e) Handle to be provided within 1050mm height from FFL



- All interior glass which may fall from more than 3m height shall be laminated & bolted

- All interior glass in key common areas (e.g. Entrance lobby) which is in contact with heavy human traffic & falling within 3 M height shall be Toughened +Heat Soaked Glass or Heat Strengthened or Laminated Heat strengthened Glass whichever is Cheaper.
- All suspended Glazing shall be laminated
- All glass Parapet in Super High rise buildings (greater than 150 M) high end shall be Sentry Glass Plus laminated Glass.
- Fully Glazed Commercial building with Mechanical ventilation shall use Insulated Glass units.

- Interfacing options of fully glazed system with the flooring & false ceiling are shown in Case-7a & Case-7b.
- Follow 1200 mm to 1500 modules for glass /ACP optimization
- Panel size of clear glazing panel should not exceed 2200 m. Balance height (if any) should be made up by slab / beam / spandrel panel
- Provide 2 Hr Fire rated Glass in Refuge area lobbies.
- Provide operable window at every 10M minimum or one window at each room
- Vision area shall be DGU with SHGC 0.4, U Value 3.5 W/Sqm deg K
- Spandrel area Single Glass with painted back pan & Rock wool insulation.'

- Selection of the hardware shall match fit the Aluminum profiles to intended Performance & Finish of the Architect.
- All new Façade systems shall be performance tested before procurement.
- Glass selection shall be done carefully keeping in view of
    1. Aesthetics
    2. Thermal performance
    3. Sound reduction-Average Indian street noise is 70-80dBA.Wherever building is located within 100feet of busy road, the window glazing on the sides affected by the street noise to be upgraded as below:
        - High end/Luxury residential/ Office / retail- Provide DGU-6+12+6 (gives 32 dBA sound reduction) to restrict sound level to 48dBA during daytime & 38dBA during night time.
        - Casa/Aspiration residential- Provide SGU (gives 25dBA sound reduction) to restrict sound level to 55dBA during daytime & 45dBA during night time
    4. Local availability

- As far as possible provide Unitized system for:
    1. Quality
    2. Safety
    3. Speed of installation.
- Specify the Structural expansion joints in Concept drawings.
- Allow for reasonable depth of the glazing from edge of RCC slab.
- All windows which can lead to direct fall viz. no ET / Deck / Flower bed of min. 0.75 m width outside it, should
    1. Generally start at height of 100 mm above FFL to maximize L&V within room. In such window the panel upto 1050 mm / (1200 mm in case of buildings with height > 70 m above ground level) above FFL should be fixed for protection reasons.
    2. In select cases (for cost reasons), this can be substituted by wall upto height of 600/1050/1200 mm above FFL and sliding window above that. In such cases, if the wall/fixed panel is < the height required as per '*External openings-Fall Protection'* (façade) Policy, then an internal or external railing (no more than 150 mm from the window) shall be required as per provisions of the said policy.
- Methodology for replacement of the broken glass / damaged members for all the glazing elements shall be planned at the design stage.
- Maintenance Manual & As built Drawings for the project specific shall be prepared & handed over to the Facilities Management Team
- Avoid Glazing sloping outwards by more than 600 mm
- Avoid single glass panels bigger than 2000 mm wide & 2200 mm height as it increases cost.
- Indoor lighting(daytime) not required in fully Glazed building at least unto 3000mm

- Avoid too many Non Typical panels as they require additional time & cost.
- Do not vary the setting space /modules as it reduces the optimization of the system.
- Do not approve the drawing until the structural calculations OK.
- Costing to be done based on the finalized Elevation & as per the detailed specification.

Cost Management Dept to take the guidance from Façade Engineer of the system & built in costs. .

- For glass selection, see '**Selection of glass type for external glazing works (including windows)' below.**

Selection of glass type for external glazing works (including windows):

1) **CASE-1- If there is a deck/accessible surface of min. 1.2m depth outside the window line– (refer sketch 1)**

   a. The window to be provided with Heat Strengthened (H.S) glass (Casa projects – Annealed glass).

2) **CASE-2- If there is no deck outside the full height window but it is resting on RCC upstand of min 100mm and we need to provide full height glazing without any mid transom - (refer sketch 2)**

   a. The window to be provided with Laminated glass (generally not permitted for Casa projects)

3) **CASE-3- If there is no deck outside the window but it is resting on RCC upstand of min 100mm height and we need to provide sliding/ operable panel above mid transom and bottom panel is fixed glass - (refer sketch 3)**

   a. The top sliding/ operable window to be Heat Strengthened (H.S) glass (Casa projects – Annealed glass)

b. i) If bottom fixed panel width is greater than 1200mm then Laminated glass to be used (width > 1200 mm not permitted for Casa projects)

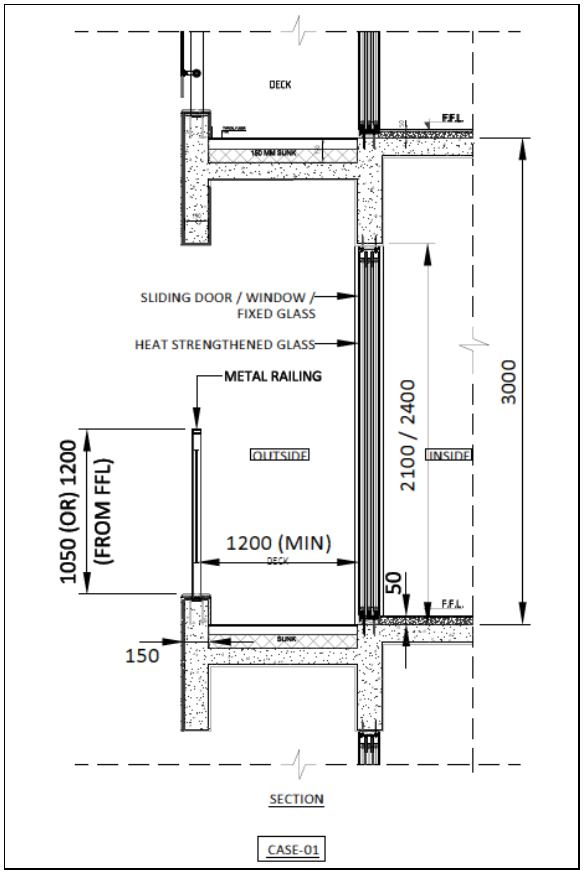
ii) If bottom fixed panel width is lesser than 1200mm then Heat Strengthened (H.S) glass to be used
(H.S glass to be used in case of Casa projects also)

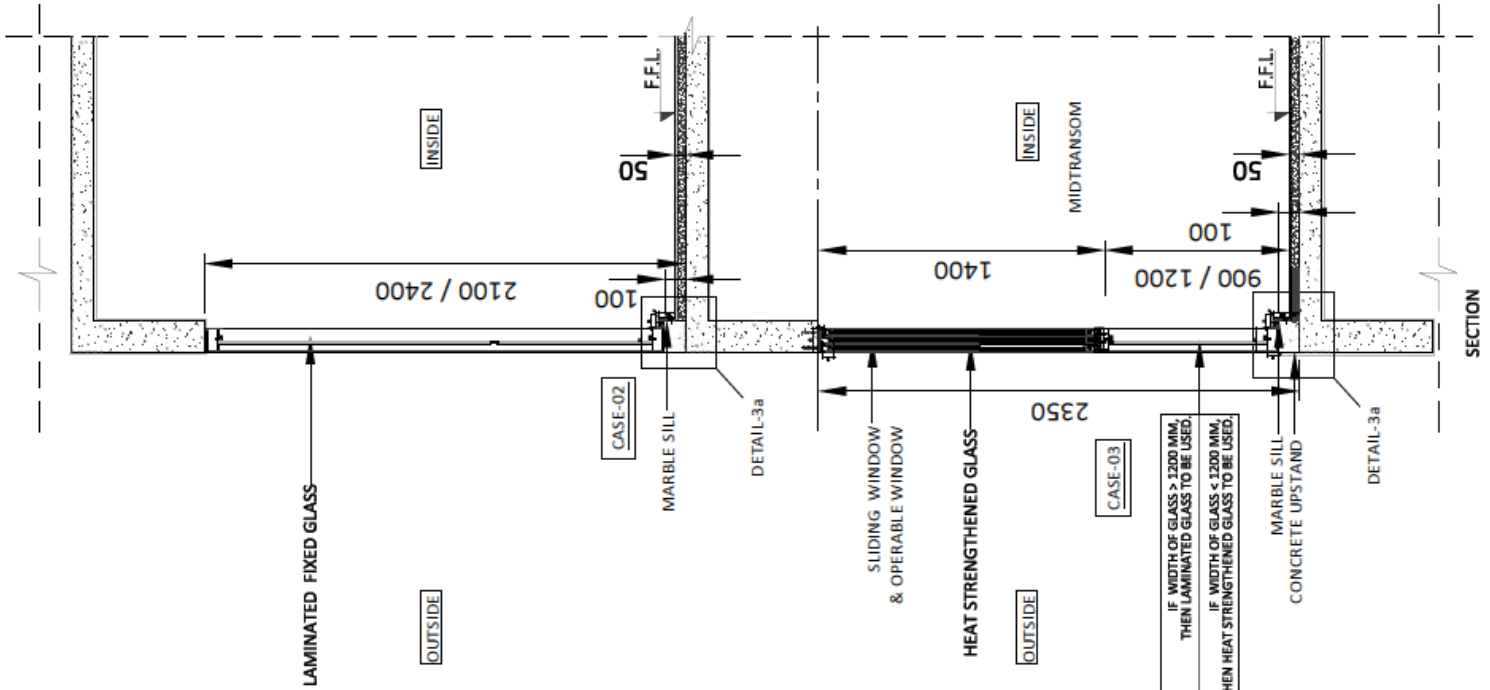
4) **CASE-4- If there is no deck outside the window but it is resting on RCC upstand of min 1050/ 1200 mm and we need to provide sliding/ operable panel above - (refer sketch 4) (Applicable only in selected cases where budget is a constraint)**

a. The top sliding/ operable window to be Heat Strengthened (H.S) glass (Casa projects – Annealed glass).
b. Marble below the window is removed & only bottom step cill provided from inside as shown in Detail-4a.

5) CASE-5- In case of staircase, top hung window with inbuilt restrictor to be provided to restrict opening up to 200mm.(refer sketch 5)

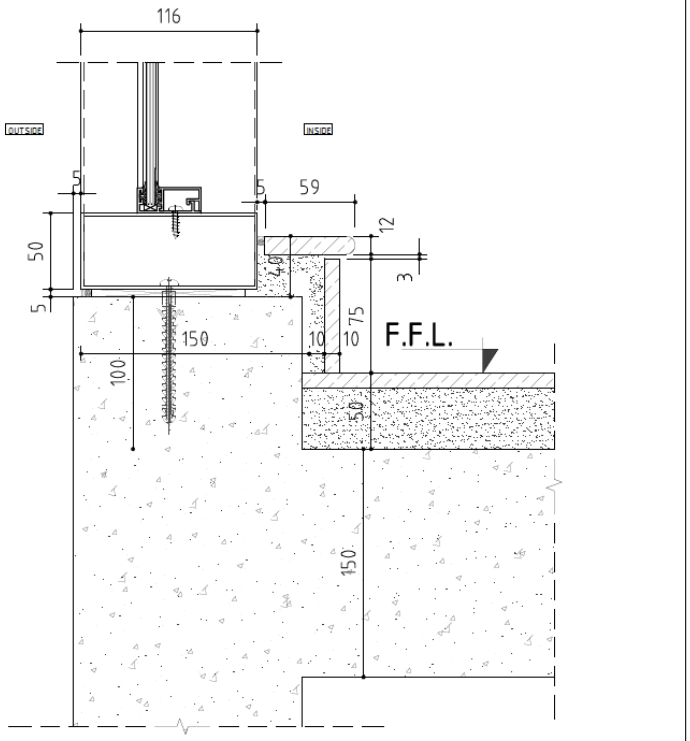
6) CASE-6- Kitchen Utility Door :-3 Track 3 shutter Sliding Door to be provided in place of operable door to allow maximum light & clear opening for passage of washing machine in to utility.(refer sketch 6)


DECK
F.F.L.
SLIDING DOOR / WINDOW / FIXED GLASS
HEAT STRENGTHENED GLASS
METAL RAILING
OUTSIDE
INSIDE
1050 (OR) 1200 (FROM FFL)
1200 (MIN)
2100 / 2400
3000
50
150
SECTION
CASE-01

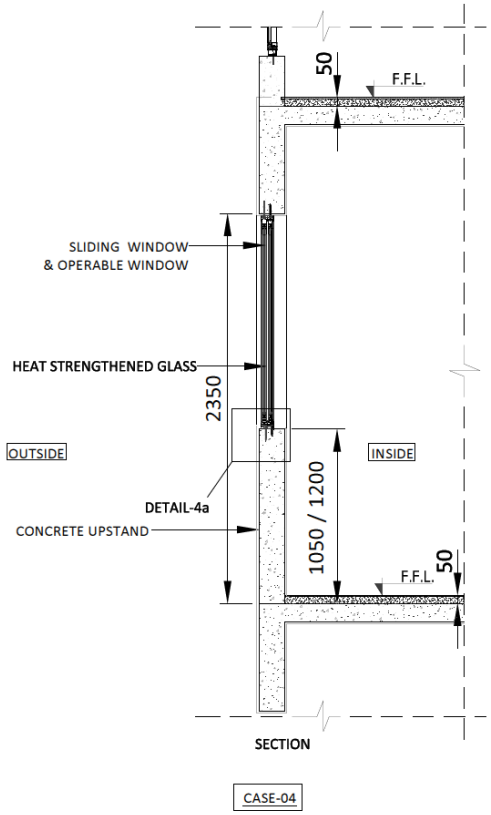


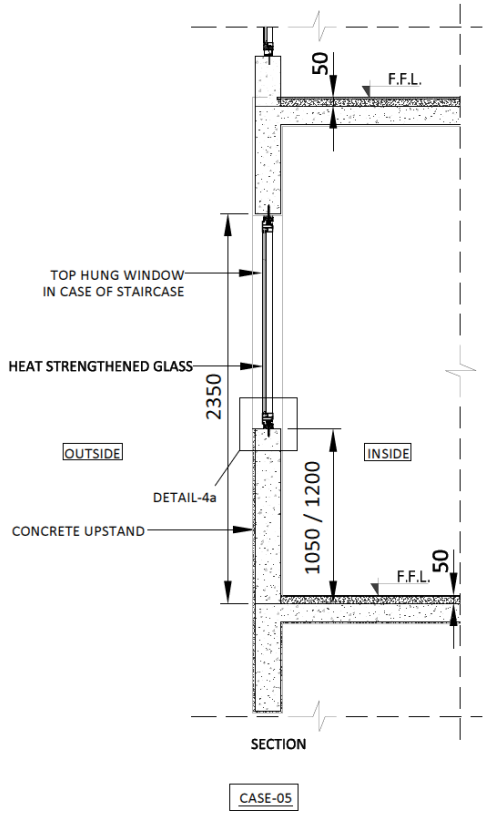
NOTE FOR SLIDING DOORS/WINDOWS (FLUSHED TO EXTERNAL BUILDING LINE) :-

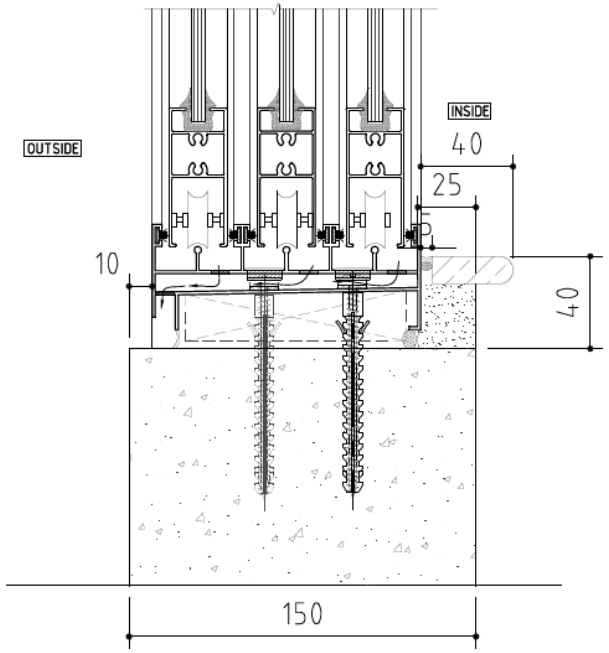
1) WHEREVER THERE IS A INSULATING GLASS UNIT (IGU) THEN BOTH INNER/OUTER LITES CAN BE HEAT STRENGTHENED GLASS.



CONCRETE UPSTAND DETAIL
Detail-3a

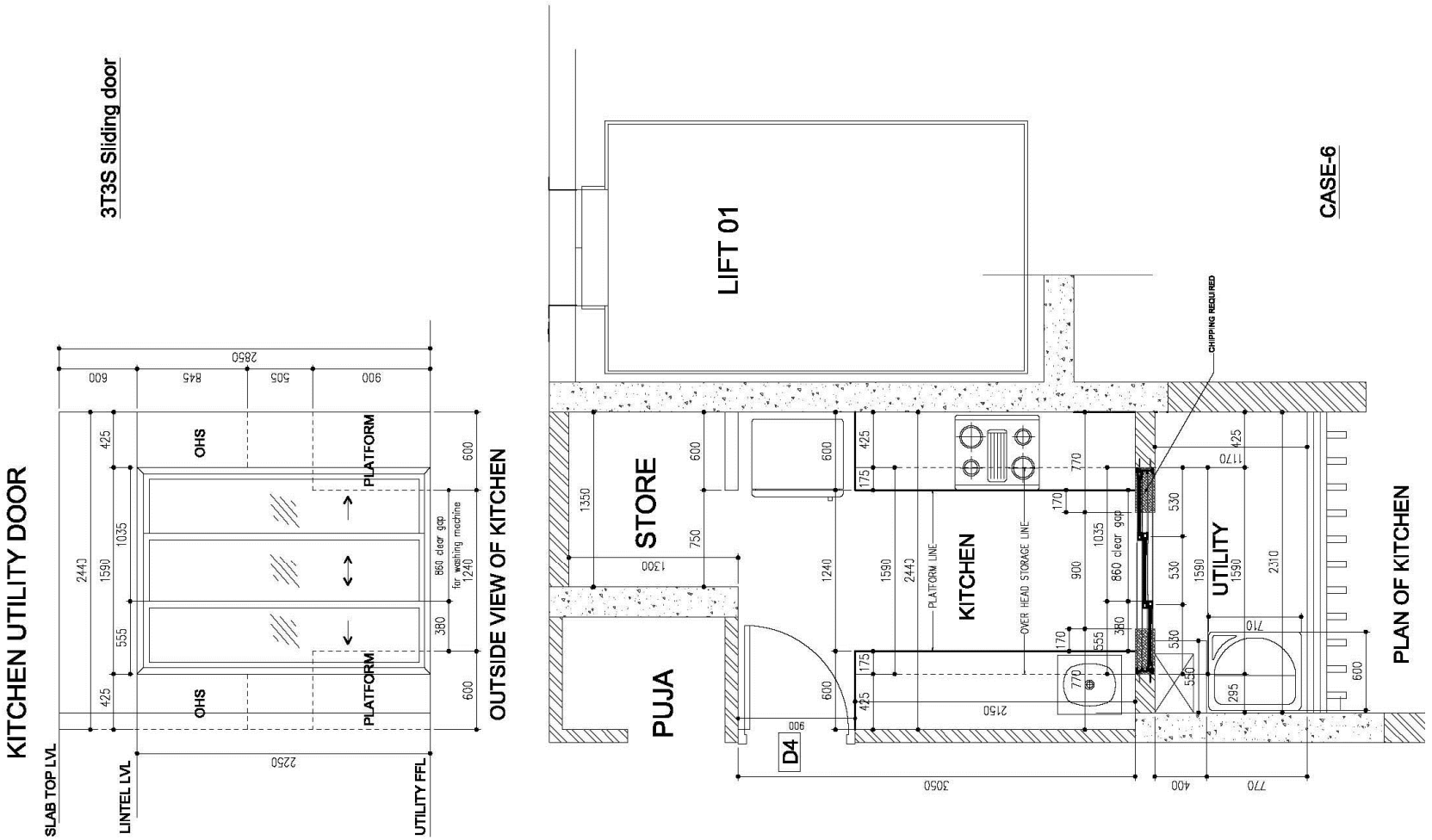

50
F.F.L.
SLIDING WINDOW
& OPERABLE WINDOW
HEAT STRENGTHENED GLASS
2350
OUTSIDE
INSIDE
DETAIL-4a
CONCRETE UPSTAND
1050 / 1200
F.F.L.
50
SECTION
CASE-04

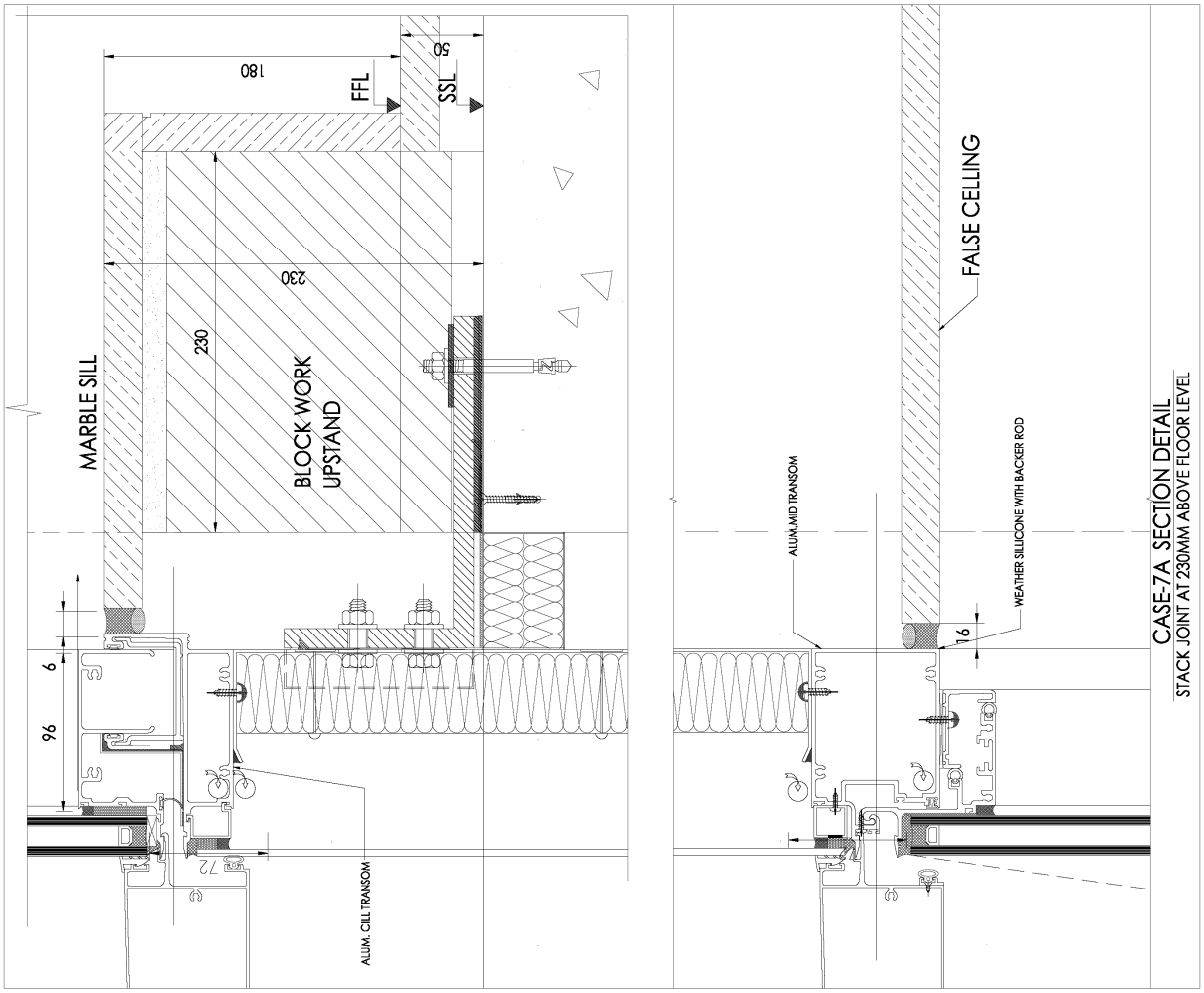

50
F.F.L.
TOP HUNG WINDOW
IN CASE OF STAIRCASE
HEAT STRENGTHENED GLASS
2350
OUTSIDE
INSIDE
DETAIL-4a
CONCRETE UPSTAND
1050 / 1200
F.F.L.
50
SECTION
CASE-05

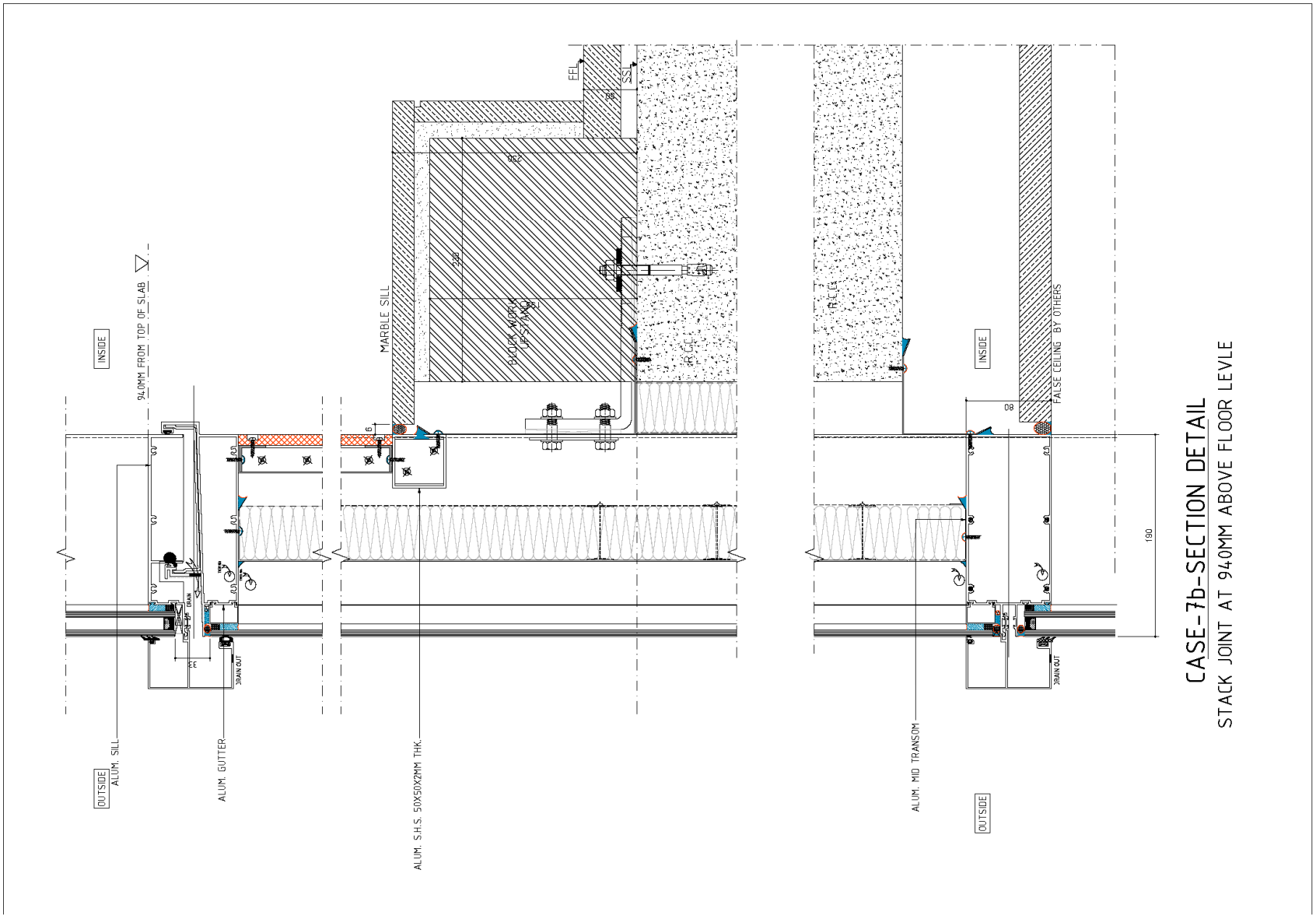


SILL DETAIL IN WINDOWS @1050MM FROM FFL

Detail-4a


KITCHEN UTILITY DOOR
3T3S Sliding door
OUTSIDE VIEW OF KITCHEN
SLAB TOP LVL
LINTEL LVL
UTILITY FFL
OHS
PLATFORM
860 clear gap for washing machine
LIFT 01
STORE
PUJA
KITCHEN
UTILITY
PLATFORM LINE
OVER HEAD STORAGE LINE
CHIPPING REQUIRED
D4
CASE-6
PLAN OF KITCHEN


180
50
FFL
SSL
230
230
MARBLE SILL
BLOCK WORK
UPSTAND
6
96
72
ALUM. CILL TRANSOM
FALSE CELLING
ALUM.MID TRANSOM
WEATHER SILLICONE WITH BACKER ROD
16
CASE-7A SECTION DETAIL
STACK JOINT AT 230MM ABOVE FLOOR LEVEL



CASE-7b-SECTION DETAIL

STACK JOINT AT 940MM ABOVE FLOOR LEVLE

EXTERNAL ENTRY / EXIT DOOR POLICY

Aim : This policy addresses guidelines recommended to control air loss and water penetration through the External Entry / Exit Door across project segments:

Types of Projects are :

- Casa Residential
- Aspirational Residential
- Hi-end Residential
- Luxury Residential
- Excellus / Supremus / i-Think Office
- Experia Retail
- Boulevard Retail

Types of Doors :

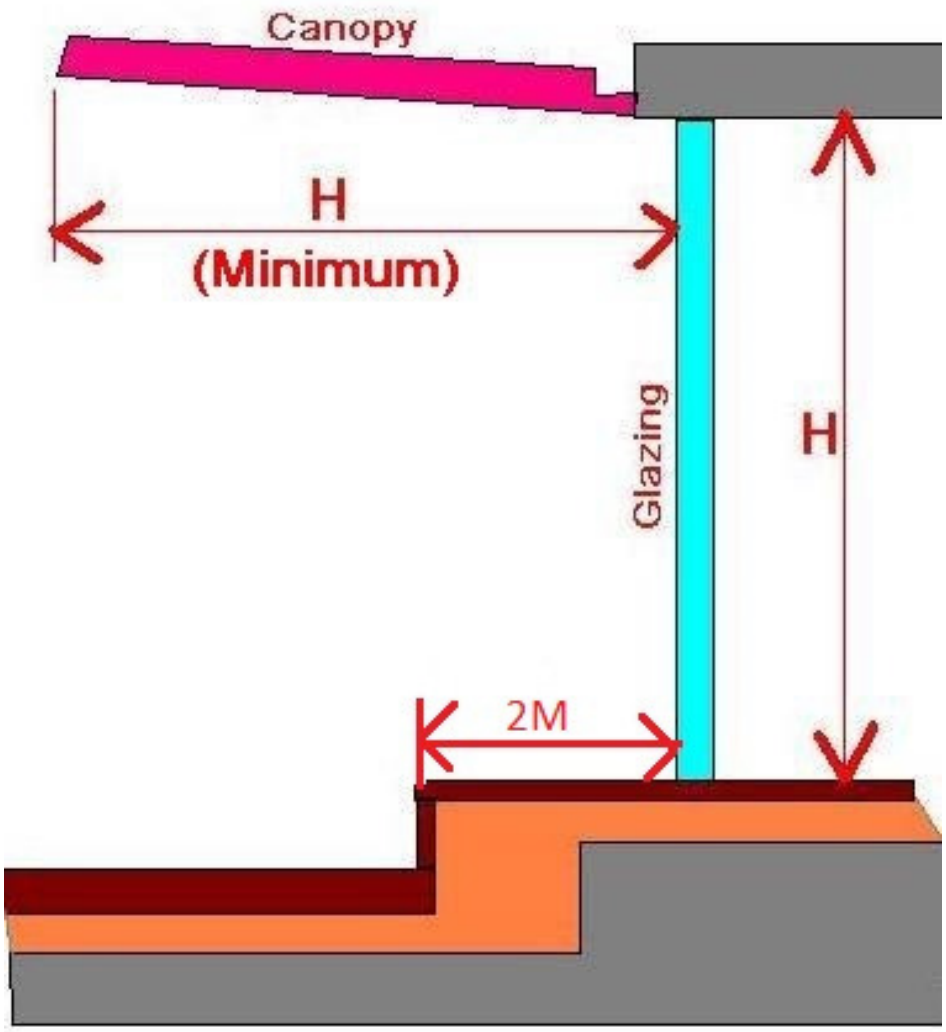
- Framed Door
- Frameless Door
- Auto Sliding Door
- Revolving door

The main factors to be kept in mind to restrict the entry of water through external doors is that the door should be recessed away from the external building line.



Wherever it is not practically possible to recess the doors, then it is important to provide a canopy above the doors. Canopy could be in glass / metal or RCC as per budget availability for individual projects.

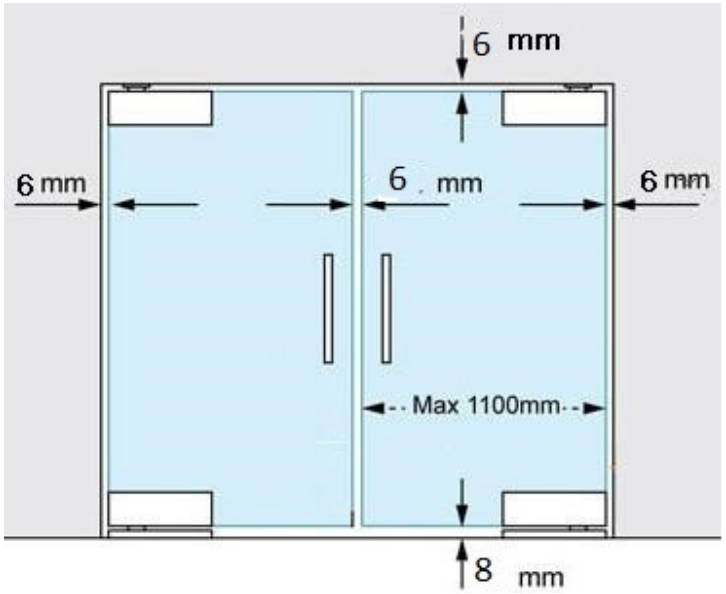
The extent of canopy should be equivalent to the height of canopy above ground level.


Canopy
H
(Minimum)
Glazing
H
2M

All below referred door options should have a canopy.

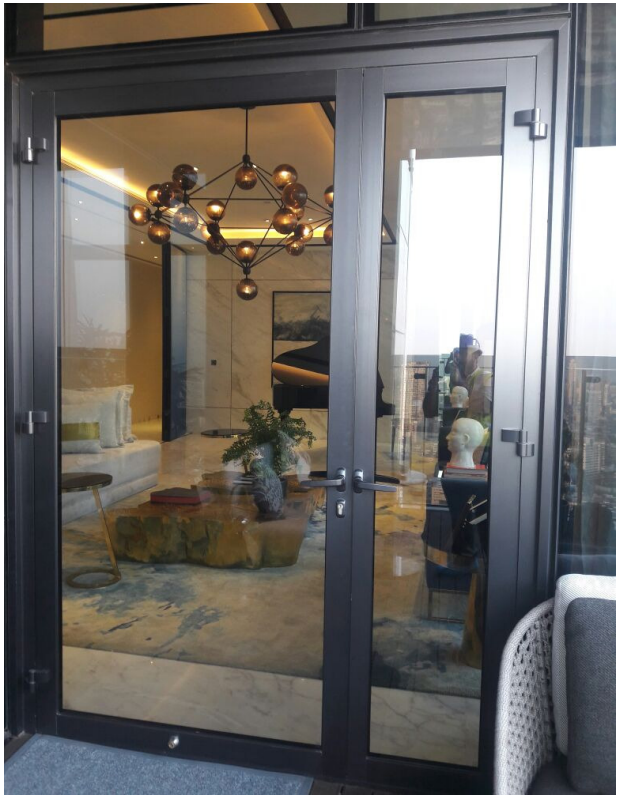
The different type of external door's generally used in a project are as below:-

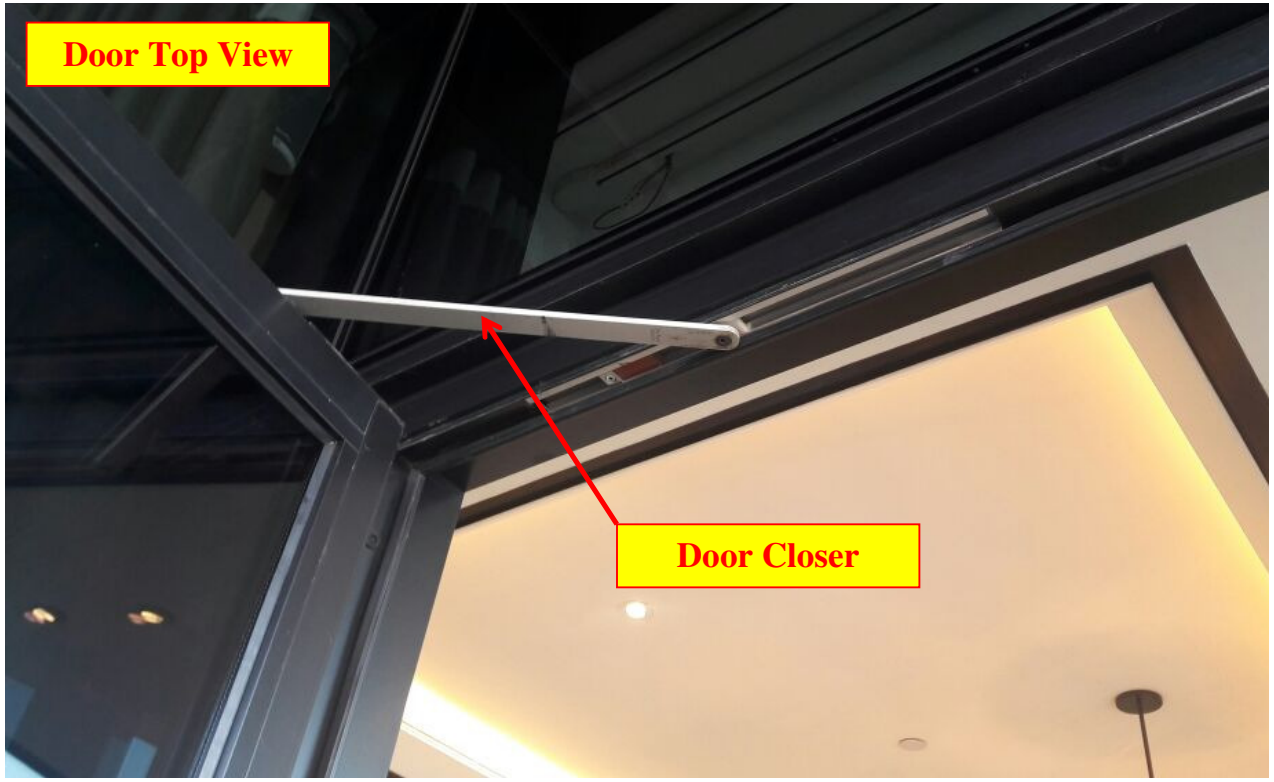
Option-1 Frameless Door: These are frameless patch fitted door. There will be clear gap of approx 6mm at top and vertical grooves and 8mm at bottom. If sufficient length of canopy is not provided, water will ingress through these gaps during monsoon. While designing AC load, the MEP team has to consider these gaps and/ or make any other provision like Air curtain etc to curtail the air loss.





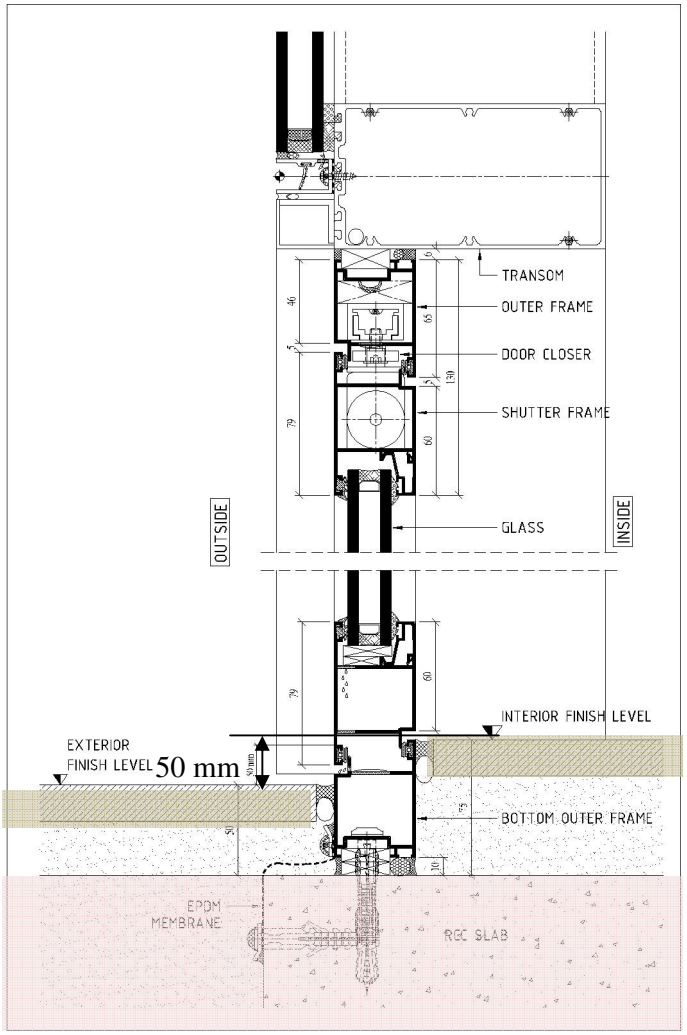
Option-2 Frame Door: Aluminum frame door with hinges gives a completely sealed system with gasket all around. However the door will be restricted to open outside only. Door closer to be provided to ensure door is in closed position by default. Frame door can restrict water and air leakage effectively.

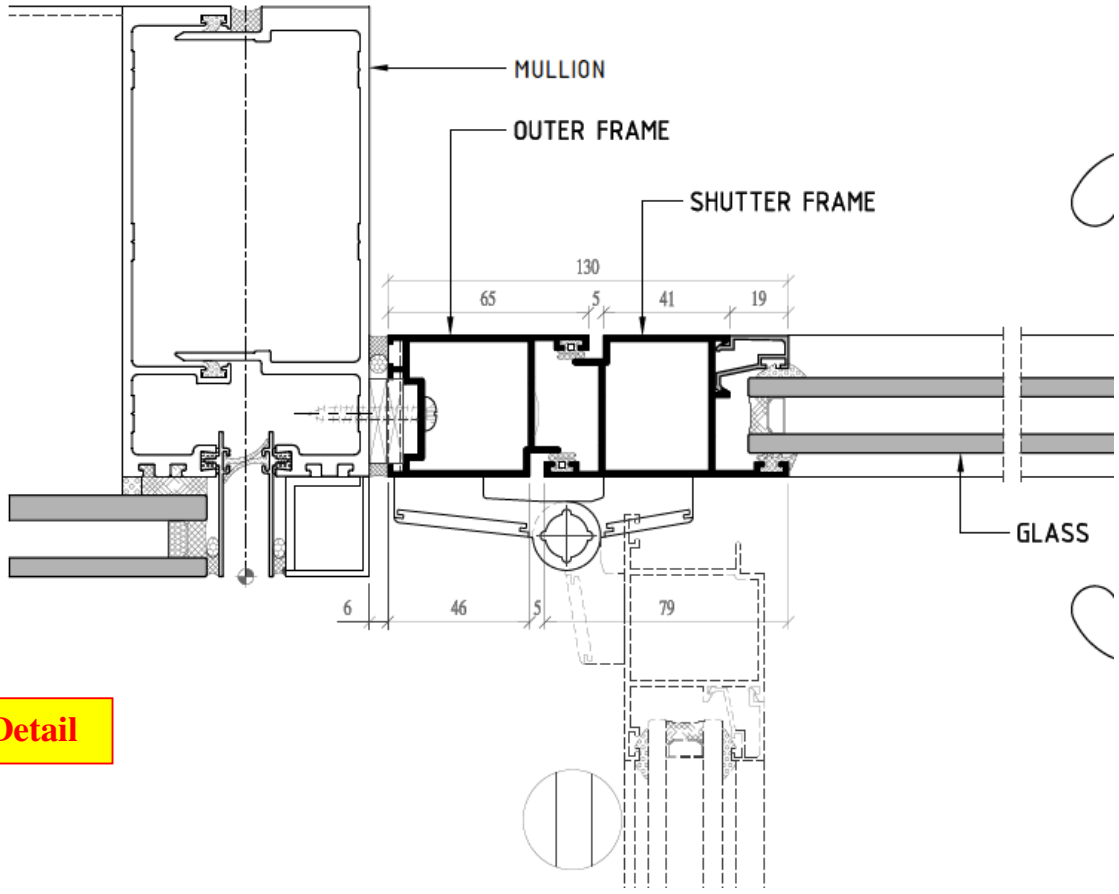



Door Top View
Door Closer

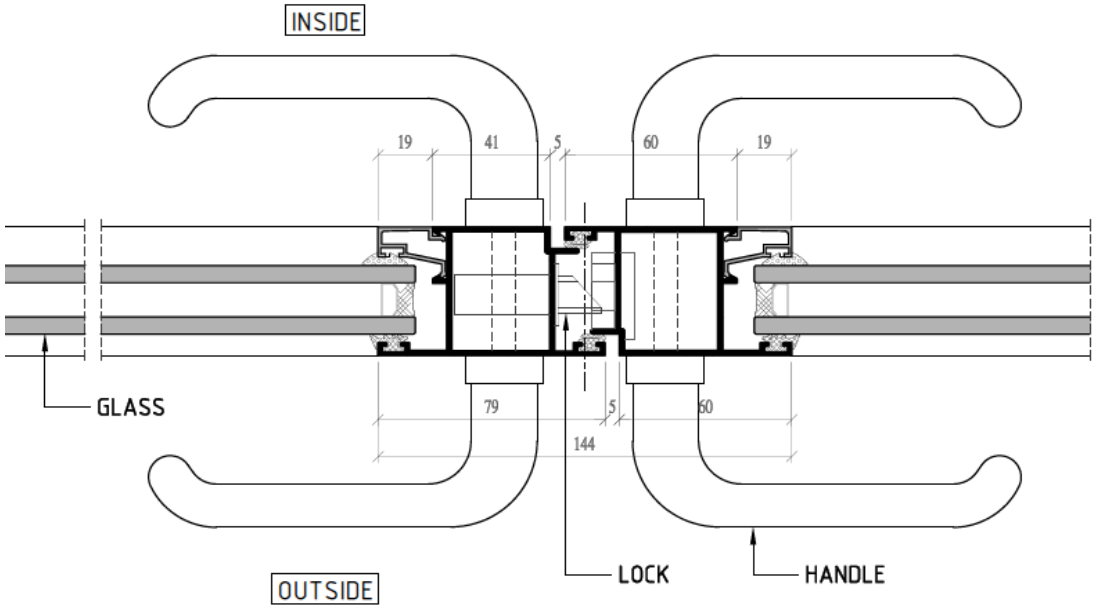

Door From Inside View
Door Bottom Profile

Door Sectional Detail





Door Jamb Detail



Door Intermediate Detail

Option-3 Auto Sliding Door: Auto sliding door is about 3-5 times costlier than regular patch fitted / hinged door. To control AC leakage due to frequent opening of shutter (mainly in commercial building) air curtain can be provided.





Option-4 Revolving Door: Revolving door can restrict both air and water leakage effectively. However it is @10 times costlier than the regular swing / hinged door. Lead time and maintenance cost for this door more.



The AC loss occurring while opening of doors can be restricted by following methods

A) Provide air lock lobby (framed / frameless)





B) Provide air curtain above door

