Guidelines for Plumbing

1. In buildings other than low-rise (<=30 m), desired water pressure at all fittings is 150 Kpa (1.5 bar) with a minimum of 100 Kpa(1.0 bar).

2. Where gravity based system is used, a separate terrace loop and a booster pumpset may be needed for the domestic water downtakes for the floors which fall within 12 m of the bottom of water tank. Boosting shall not be required for flushing water downtakes wherever cistern tanks are used.

3. Where Hydro-pneumatic system is used, no boosting & terrace looping is required for any line.

4. Maximum pressure in the water transfer riser should not exceed 12 bar.

5. The standard fixture pressures are between 1.5 bar to 4 bar. We will have to ensure that the selected CP sanitary fixtures are suitable for this kind of pressure. It needs to be ensured that flexible connectors can withstand the design pressure with factor of safety as 1.5.

6. The Water hammering of the plumbing line shall be evaluated during design phase and water hammer arrestors shall also be included in the BOQ.

7. Following piping systems are to be used:

Type of Pipe	**Low-Rise (<=30 m)**	**Mid-rise (30 m – 70 m)**	**High-rise (70 m – 150 m)**	**Very High Rise (150 m+)**
Vertical Transfer Pipes OR Hydro-pneumatic systems?	a)Uptake(Transfer) : CPVC b) Hydro pneumatic: GI Class B(medium duty)	GI Class B (medium duty)	GI Class C(heavy duty)pipes with combination of welded joints and Grooved fittings	GI Class C (heavy duty) pipes with Grooved joints For above 150 meters height buildings: intermediate pressure break tanks to be provided at intermediate mechanical floor, to restrict the pressure.

				Vertical pipe length shall not exceed 150 m.
Down take Pipes	Indian UPVC sch 40 */CPVC	CPVC. PRV to be used to moderate pressures so that design pressure ratings of water heaters and CP ware at any point is not exceeded and pipeline pressure is kept below <=4 bar.	CPVC. PRV's are needed to moderate pressure to the values not exceeding rated design pressures of water heaters and CP ware at any point . For above 150 m height buildings down take shall be taken from intermediate break tank provided at intermediate mechanical floor, to restrict the pressure.	

All fittings should be capable of withstanding pressure which is 1.5 x the design pressure in the pipes in that relevant segment of the building. While selecting pipes / fittings, appropriate de-rating factor w.r.t. temperature to be taken care of.

* It is presumed that Indian UPVC pipes can be used only for test pressure not exceeding 10 bar. Pressure rating of fittings needs to be verified as these would normally limit working pressures in the lines.

** GI pipes with combination of welded joints & Grooved fittings to be used wherever necessary to compensate for Building Sway movement, seismic consideration & column shortening.

Cost ladder: Indian UPVC sch40 < CPVC < GI with welded joints < GI with victaulic fittings < International-standard UPVC < PB. GI pipes are cheaper than CPVC for sizes> 100 mm and it is recommended to use GI for higher sizes.

CPVC or UPVC (UV treated), piping shall be used for terrace looping and exposed piping.Exposed UPVC pipes need to be given a coat of latex paint for UV resistance.If GI used for terrace looping, 2 coats of 250 micron epoxy coating to be provided internally.

CPVC shall be used for hot water piping.

CPVC / uPVC Sch 40 piping & fittings to be used for internal piping for toilets/kitchen.

8. Following piping systems are to be used for Drainage vertical stacks/Fire Pipes:

	Low-Rise (<=30 m)	**Mid-rise (30 m – 70 m)**	**High-rise (70 m – 150 m)**	**Very High Rise (150 m+)**
Soil/Waste/Storm water Stacks	Indian origin UPVC SWR Type B	Indian origin UPVC (Class 3) with velocity breaker	UPVC (Class 3) with velocity breakers	EN 1329 UPVC push fit drainage pipes with velocity breakers and expansion joints (@every 50meters or thereabouts). At transfer floors and 3 floors above the horizontal runs are advisable in LA class CI pipes.
Vent Stacks	Indian origin UPVC SWR Type A	Indian origin UPVC SWR Type A	Indian Origin UPVC SWR Type A	Indian UPVC SWR Type A
Fire risers	GI pipes (12 bar rated)	GI pipes (Working pressure up to 12 bars).	ERW GI PIPES (Working pressure up to 16 bar).	ERW /seamless GI pipes with grooved fittings. (Test pressure to be limited to 16 bars with pressure break tank & stage pumping at intermediate mechanical floor).
Internal Drainage piping (shall be read in conjunction with sl. No 11 and 13)	Indian Origin uPVC SWR Type B	Indian Origin uPVC SWR Type B	Indian Origin uPVC SWR Type B	Indian Origin uPVC SWR Type B

9. For all buildings over 70m, last bend shall be Cast Iron with flange connectors suitable for dissimilar materials of drainage system.

10. Vertical Drainage (sewage+waste water) downtake stack for building >90m, bottom 3 floors should have independent riser of UPVC pipe connected to common horizontal header of CI LA class. For the downtake stack emanating from the higher floors, bottom 3 floors should be of CI LA class connected to common horizontal header of CI class.

11. In case of UPVC piping, fittings need to be one grade higher than the pipes. Thrust support shall be provided on the last bend.

12. For all the buildings over 70 meters the last two/threefloors shall be independent of the main drainage downtake. It will be worthwhile to consider an offset in the last bend and a separate downtake for the last two/three floors to reduce the pipe rupture or the backflow to the lowest floor toilets.

13. Tanks which are located in the vertical part of the building viz. above ground floor should be planned in GRP/FRP to reduce dead load on building and ease construction. Required capacity of such tanks can be maximized by having side access as opposed to top access.

14. Under-slung piping is preferable for toilets/kitchen in order to avoid sunken slabs and expedite construction cycle. Where feasible in overall design, the plumbing shafts may be located in such a manner that the outlet of EWC trap can be directly connected to vertical down takes in the shaft, thereby saving acoustic under slung pipes for EWC. In case wherever acoustic pipes cannot be used , UPVC pipes can be wrapped with acoustic insulation . Where the under-slung piping occurs in bathrooms directly above one another, and false ceilings are provided, only soil pipes need acoustic insulation to mute noise created by flushing of water. Other alternatives to UPVC pipes with acoustic insulation can include ‘noiseless’ UPVC pipes or polypropylene pipes.

15. Two separate water supply lines to be provided for water supply:
    a. Domestic water –Kitchen, utility areas, basins &showers,jet spray in toilets.
    b. Flushing – For flush tanks, irrigation (with treatment) & cooling towers (if applicable)

16. In case of separate waste pipe, a filter should be provided at the ground/below ground level before the waste enters the horizontal drainage system. This filter should be easily accessible for regular maintenance.

17. As far as possible no tanks should be located below building footprint so as to enable the building construction to progress with minimal excavation – in case there is surplus space in the building footprint on account of structural reasons (deep strata, parking levels etc.), same can be considered for use as underground water tanks as long as there is no/minimal additional excavation due to this. In developments with multiple underground water tanks, it is necessary to ensure that the water supply pressure from the municipal connection is virtually equal at all UG tanks. In order to ensure this, the water distribution system has to be devised in a loop (any other solution which ensures equitable water supply to all UG tanks is also acceptable).

18. All water supply systems (and for that matter, all other utilities like STP, Electric substations) can be combined within a set of buildings which are likely to form a society or have the same usage (viz. either all residential, all office, all retail etc.). This may also be combined for all the buildings within a given location, even if these are of different usage and/or different societies, if there is significant cost saving and subject to approval from Director-Operations. For such cases, Automatic tank filling mechanism to be considered with centralized Pumps and solenoid/Motorized valves with Level Switch for tank filling.

19. Fire tanks and domestic water tanks should be co-located, since water will flow from below the baffle wall through overflow of fire water tank into domestic water tank.

20. Sewage Line manhole covers exposed to rain shall be Ductile Iron double sealed. In case domestic water tank is below car parking slot or driveway, FRP manhole covers with double seal is to be used. No upstand is required for such manholes.

Comment [SB1]: Rev.10

21. Fire fighting tanks should be sized (total capacity on ground + terrace + any other levels) to meet fire fighting needs for 60 minutes for building/podium/basement (subject to 21 below). This is as per NFPA (National Fire Protection Act – USA) standards.

22. In multi-building projects, it can be assumed that 1/4th of the wings (subject to minimum of 1) shall be on fire simultaneously. (Note: In parking podium/basement, it can be assumed that only one of the zones shall be on fire simultaneously).

23. If the Fire tank sizing as per 21 and 22 above are less than the CFO's requirements, follow the requirements as per 21 and 22.

24. Domestic water tank capacity (total capacity on ground + terrace + any other levels) should be equal to 1 day storage for buildings <=150 m and 1.5 days storage for buildings > 150 m (super high rise). 1.5 days storage capacity may also be considered for building <=150m in those locations which have extreme water shortage viz. daily water supply (even if for limited no. of hours) is not guaranteed. (Note: raw water tank for receiving tanker / bore well / open well water has to be created separately with capacity of 50 – 100 cu. m.). Water meters are to be provided at the inlet of the UGT (flushing and domestic) having capacity of 50,000 ltrs. or higher.

Comment [SB2]: Rev.10

25. Gravity based water supply systems are preferable to hydro-pneumatic systems, on account of lower capex and lower opex. However, in case of gravity based systems, it is to be ensured that sufficient pressure is available at the 3-4 habitable floors (within 12 mtrs height) immediately below any above ground water tank location (small booster pumps may be used for this purpose). This is necessary only where high pressure CP ware like rain shower or Jacuzzi area provided. In normal buildings, since overhead tanks are elevated by 1.5 and 2 meters and certain minimum water level is maintained in the tank by level controller, booster is not required. Terrace Looping header for the booster fed floors shall be restricted to pipe dia of 65mm with 80% diversity on the total fixtures units, in cases where the toilet fixture units call for increase in pipe sizes, approval shall be sought from HOC/COO.

Comment [SB3]: Rev.10

26. In case of a multi-wing / multi-building project in which some/all wings share the water supply and/or fire fighting tanks, it is to be examined as to what is more cost effective and the lowest cost option should be preferred:
    a. Separate water supply and fire fighting pumps (with their respective backups) for each wing.

27. Having software/sensor based system, which facilitates sharing of water supply and fire fighting pumps between wings (with limited backup for the pumps) and reduced capex for pumps. Level sensors with control panel to be provided for all type of tanks for control of the

water level in the tank. Sleeve's required for installation to be undertaken during design and RCC construction.

Comment [SB4]: Rev.10

28. Pumps and their back-ups to be provided as follows:

a. Fire pump (electrical): 2 working (1 for sprinkler + 1 for hydrant) + 1 common stand-by connected to common header. (Pump room to be oversized for temporary placing of one additional pump if CFO NOC calls for 2 working + 2 standby). Wet riser and sprinkler systems can be combined only when there are limited number of sprinklers in each floor. In buildings where entire floor is sprinkled , two systems will have to be independent of each other except for their interfacing thru fire alarm panel and fire fighting pumps should work on Auto ON and manual OFF.

   For Super High Rise building (150 ≤ Building Height<250m):Main Fire pumps (Sprinkler, Hydrant and common stand by) serving from UGT and also serving large basements shall be UL/FM listed and TAC/IS certified pumps. However gravity feed fire pumps which are installed at mid level or terrace need not be UL listed but TAC/IS certified pumps. UL listing is not required for Jockey pumps.

   For Super High Rise building Building Height ≥ 250m:Main Fire pumps (Sprinkler, Hydrant and common stand by) serving from water tank@basement, mid or terrace level (and also serving large basements shall be UL listed and TAC/IS certified pumps.UL listing is not required for Jockey pumps and all other pumps viz booster,transfer, etc

   For GCP/Project Parking/MLCP all fire pumps should be TAC/IS certified. No UL/FM listing is requisite.

b. Fire pump (Jockey): 1 working + 1 standby (pump rooms to be oversized for temporary placing of 2 additional jockey pumps if CFO NOC calls for 2 jockey + 2 standby).

c. Fire pump (booster): 1 working + 1 standby : The starting of terrace booster pump should be automatic with pressure switch incorporated in down-comer side so that with opening of any hydrant valve ,or hose reel on any floor, it will start automatically with fall in line pressure. In addition, there should be a manual push button starter in the starter control panel to be located on ground floor (preferably meter room) of building. Stopping of pump should be by a push button located in the same starter panel manually

d. Water supply (at all locations): For water supply transfer pumps with flow rate <30m^3/hr 1working+1assist+1standby (triplex) should be used as a cost saving option.

Comment [SB5]: Rev.10

e. Where rating of valves is PN25, maximum pressure in the risers will be restricted to 20 bars. For higher pressures, valve rating has to be enhanced.
f. The flange connection for the connecting standby jockey pump shall be provided in the pipe network.

29. It has been observed that from time to time, our developments need additional water supply in the form of water-tankers. Water-Tanker inlet-points for domestic and flushing water (connected to the respective water tanks) must be provided for this purpose. They must be planned in such a manner that water tanker can easily approach the same and while water tanker is standing, it does not impede regular vehicular traffic. Possibility of using breeching connection to decant water into fire tank should be checked and location of BC selected to facilitate the same. Water meter to be provided at Ground floor of each tanker fill inlet.

Comment [SB6]: Rev.10

30. If any common area (e.g. lift lobby, staircase) on a habitable / entrance floor is open viz. rain water can come in, adequate provisions for drainage need to be made, along with appropriate slope in the flooring. Weather protection chajja outside these openings as per 'Weather Protection Outside external openings' should be made.
31. For all AC's (whether for use by the unit or in common area), attention should be paid to how the water rejected by the machine will be drained. Similarly, in utility areas, it should be ensured that water supply outlet for washing machine and drain for the washing machine are co-located in a manner which would allow easy usage of the washing machine.

32. Flushing water storage where Treated waste water is used should not have common wall(s) with domestic or fire storage. Minimum 300mm separation to be provided.

33. Pressure requirements of the proposed CP and sanitaryware needs to be ascertained while designing the system to ensure sufficient minimum and maximum pressure.

Comment [SB7]: Rev.10

34. For buildings with solar water system (as per MOEF requirements), hot water generated from system shall feed one toilet per apartment for top 5 floors. Incoming water supply to Solar

water system should be taken from terrace domestic booster pump loop and down take shall be directly connected to the geyser with NRV, to enable that generated hot water is being utilised during working of solar system and during non-working of solar system, geyser shall work normally on electricity. To maintain equal pressure in other fixtures for the above toilets, it essential to feed domestic water from the booster terrace loop upto 5 floors.

35. Fire hose cabinet station/wet riser shaft shall be of size 650mm x 1200 mm min. which will be located within core and next to staircase.

36. All internal riser floor penetrations shall be fire stopped (with 2Hrs/as per CFO NOC) material @ each floor.

Comment [SB8]: Rev.10

Points below are Applicable only for mechanically ventilated toilets:

37. Following minimum shaft sizes shall be considered for central mechanically ventilated toilets

Type of service	**Low-Rise (<=30 m) mm x mm**	**Mid-rise (30 m – 70 m) mm x mm**	**High-rise (70 m – 150 m) mm x mm**	**Very High Rise (150 m+)# mm x mm**
Toilet shaft (includes central toilet extract duct +water supply & drainage pipes)	550 x1550* Clear	550 x1800* Clear	a) Single toilet 550 x1850* Clear b) Back to Back toilet 650x1850* Clear	a) Single toilet 550 x1850* Clear b) Back to Back toilet 650x1850* Clear

* Service platform (RCC/M.S.) inside the shaft is required for maintenance.

considering intermediate mechanical floor within 120 metres height

All central ventilated shafts shall have access door for regular maintenance. The door size shall be of 900mm wide x 1200 mm ht. to be considered to access all services. Also the door to be positioned to access water supply valves and drainage pipe cleanouts. In case of multiple toilets served by the same shaft, access to shaft shall be required from any one toilet only.

Comment [SB9]: Rev.10