Chapter 7
Sanitary Fixtures, Fittings
Appliances & Appurtenances
Plumbing
Fixtures, Fittings, Appliances and Appurtenance

- Plumbing Fixture
  - Water Closet

- Plumbing Appliance
  - Water Heater

- Plumbing Appurtenance
  - Backflow Prevention Device
Good

Indian Plumbing Association
Bad
Ugly
Funny
Plumbing Fixtures

• A device that is supplied with water and discharges such wastes into the drainage system directly or indirectly.
Fixtures

- Lavatory/ washbasin
- Shower
- Bathtub
- Clinical sink
- Drinking fountain
- Emergency shower
- Emergency eye wash
- Kitchen sink
- Laundry sink
- Mop sink
- Bar sink
- Urinal
- Water closet
- Bidet
Maximum Flow Rate

Existing fixture fittings for private or public use shall be provided with water conserving devices (aerators or flow restrictors) in accordance with the following fixture fittings and maximum flow rates at the maximum permitted working pressure of 4.0 bar as per NBC.
<table>
<thead>
<tr>
<th>Fixture Fitting</th>
<th>Max. Flow Rates Litres/minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lavatory, Faucet (Public – Non-metered)</td>
<td>2</td>
</tr>
<tr>
<td>Lavatory Faucet (Public – Metered)</td>
<td>1 litre per use</td>
</tr>
<tr>
<td>Lavatory Faucet (Private)</td>
<td>8</td>
</tr>
<tr>
<td>Showerhead</td>
<td>10</td>
</tr>
<tr>
<td>Handheld Shower</td>
<td>10</td>
</tr>
<tr>
<td>Sink Faucet</td>
<td>8</td>
</tr>
<tr>
<td>Hand-held bidet spray</td>
<td>8</td>
</tr>
<tr>
<td>Water Closet</td>
<td>6 litre per flush</td>
</tr>
<tr>
<td>Urinal</td>
<td>3.8 litre per flush</td>
</tr>
</tbody>
</table>
Water Closet and Urinal
Integral Traps

Floor-Mounted Water Closet

Wall-Hung Water Closet

Wall-Hung Urinal
Materials – General Requirements

Plumbing fixtures shall be made of dense, durable, non-absorbent materials and shall have smooth, impervious surfaces, free from concealed fouling surfaces.
## Table 419.1 Min. Plumbing Facilities

<table>
<thead>
<tr>
<th>Type of Building Or Occupancy</th>
<th>Water Closets (fixtures per person)</th>
<th>Urinals (fixtures per person)</th>
<th>Lavatories (fixtures per person)</th>
<th>Drinking Fountain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly Places Theaters, Auditoriums, Convention Halls, etc. For public use</td>
<td>Male: 1-100 Female: 1-25</td>
<td>Male: 0-25</td>
<td></td>
<td>3.13.18</td>
</tr>
<tr>
<td>2: 101-200</td>
<td>2: 26-100</td>
<td>2: 101-200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3: 201-400</td>
<td>4: 101-200</td>
<td>3: 201-400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6: 201-300</td>
<td>8: 301-400</td>
<td>4:401-600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 400, add one fixture for Each additional 500 males and One for each 150 females</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail or Wholesale Stores</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public or Professional Offices</td>
<td>Same as Office or Public Buildings for employee use</td>
<td>Same as Office or Public Buildings for Employee use</td>
<td>Same as Office or Public Buildings for employee use</td>
<td></td>
</tr>
<tr>
<td>Restaurants, Pubs and Lounges</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

14 The total number of water closets for females shall be at least equal to the total number of water closets and urinals required for males. This requirement shall not apply to Retail or Wholesale Stores.

15 For smaller type Public and Professional Offices such as banks, dental offices, law offices, real estate offices, architectural offices, engineering offices, and similar uses. A public area in these offices shall use the requirements for Retail or Wholesale Stores.
<table>
<thead>
<tr>
<th>OCCUPANCY*,**, Group A</th>
<th>OCCUPANT LOAD FACTOR (square feet) (CBC 2001, Table A-29A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Auditoriums, convention halls, dance floors, lounge rooms, stadiums and casinos (use &quot;one-half&quot; the number of fixed seating)</td>
<td>15 (no fixed seating is provided)</td>
</tr>
<tr>
<td>2. Conference rooms, dining rooms, drinking establishments, exhibit rooms, gymnasiums, lounges, stages and similar uses including restaurants classified as Group B occupancies.</td>
<td>30</td>
</tr>
<tr>
<td>3. Worship places; principal assembly area, educational and I can a unit (use &quot;one-half&quot; the number of fixed seating) (or no fixed seating is provided)</td>
<td>30</td>
</tr>
<tr>
<td><strong>Group B</strong></td>
<td></td>
</tr>
<tr>
<td>4. Office of public buildings (area accessible to the public)</td>
<td>200</td>
</tr>
<tr>
<td><strong>Group E</strong></td>
<td></td>
</tr>
<tr>
<td>5. Schools for daycare, elementary, secondary</td>
<td>50</td>
</tr>
<tr>
<td><strong>Educational Facilities Other than Group E</strong></td>
<td></td>
</tr>
<tr>
<td>6. Colleges, universities, adult centers, etc.</td>
<td>50</td>
</tr>
<tr>
<td><strong>Group F</strong></td>
<td></td>
</tr>
<tr>
<td>7. Workshop, foundries and similar establishments</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Group H</strong></td>
<td></td>
</tr>
<tr>
<td>8. Hazardous materials revocation and storage</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Group I</strong></td>
<td></td>
</tr>
<tr>
<td>9. Hospital general use areas, Health Care facilities</td>
<td>200</td>
</tr>
<tr>
<td><strong>Group M</strong></td>
<td></td>
</tr>
<tr>
<td>10. Retail or Wholesale stores</td>
<td>200</td>
</tr>
<tr>
<td><strong>Group R</strong></td>
<td></td>
</tr>
<tr>
<td>11. Congregate residents, Group R-1</td>
<td>200</td>
</tr>
<tr>
<td><strong>Group S</strong></td>
<td></td>
</tr>
<tr>
<td>12. Warehouse</td>
<td>5,000</td>
</tr>
</tbody>
</table>
### Similar Table from NBC

#### Table 1 Office Building

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Fixtures</th>
<th>Public Toilets</th>
<th>Staff Toilets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>(1)</td>
<td></td>
<td>(3)</td>
<td>(4)</td>
</tr>
</tbody>
</table>

**Executive Rooms and Conference Halls in Office Buildings**

- i) Toilet suite comprising one WC, one wash basin (with optional shower stall if building is used round the clock at user’s option)
- Pantry optional as per user requirement

**Main Office Toilets for Staff and Visitors**

- ii) Water closets
- iii) Ablution tap with each water closet
- iv) Urinals

- See Note

**Wash basins**

- See Note

**Drinking water fountain**

- See Note

**Cleaner's sink**

- 1 per floor

**NOTE** — Staff and public toilet utilities are generally common in office buildings. Where public toilets are to be provided independently, similar requirements as that of staff toilet may be provided.

Unit could be common for male/female or separate depending on the number of users of each facility.
For individual officer rooms

- 1 in each water closet
- 1 per 25
- 1 per 15
Water Closets

- Floor mounted EWC
  - siphonic
- Wall mounted EWC
- Asian (Indian/Orissa) WC
- Combination or
- Anglo-Indian WC

- Single/Dual Flush
- Flush tank
  - Low level
  - High level
  - Concealed
  - Pneumatic
- Flush Valve
  - Exposed
  - Concealed
  - Sensor operated
Select sanitary fixtures/fittings before work starts

- Wall hung WC with flush valve
- Wall hung WC with flush tank, on a carrier fitting
- Floor mounted WC with pneumatic flush tank
- False ceiling
Squatting Pan (Asian/Indian WC)
Squatting Pan Trap

PVC Trap
With 50 mm trap seal

Ceramic trap
With inadequate trap seal

Indian Plumbing Association
Bidet

- Purpose
- Soil fixture
- Trap required
Urinals

Urinals shall have integral trap and an average water consumption of not more than 3.8 liter of water per flush at 4 bar pressure.
Urinals

In absence of integral trap, approved, non-corrosive trap with 50 mm water seal may be used.

- Urinal suction with horizontal discharge
- With Water Seal
- Suitable for flushing volumes of 1-4l
- Urinal suction with vertical discharge
- Suitable for flushing volumes of 1-4l
- With Water Seal
Non-water Urinals

Water Efficient Products-India (WEP-I), a joint publication of IPA and IAPMO India, provides additional considerations in use of non-water (waterless) urinals
Wash Basin

• Shape
• Material
• Below counter
• Above counter
• Full pedestal
• Half pedestal
• Trap/bottle trap
• Hot water option
Shower compartments, regardless of shape, shall have a minimum finished interior size of 800 mm x 800 mm and a height of 1,800 mm.
Bath Tubs

- Flood rim
- Filler
- Drain plug
- Pop-up
- Overflow
- Trap
- Floor trap
- Stack
Overflows

Integral Overflow

Combination Waste and Overflow Fitting
Trough Urinals (Prohibited Fixtures)
Prohibited Fixtures
Plumbing Fittings

- Flush tank
- Shower
- Four way diverter
- Pillar tap
- Sink cock
- Bib tap
- Ablution faucet
- Floor trap
- P trap

- Single lever
- Quarter turn
- Half turn
- Full thread
- Elbow operated
- Foot operated
Metered Faucets

Self-closing metering faucets shall be installed on lavatories intended to serve the transient public toilets such as service stations, train stations, airports, restaurants, public toilets and convention halls.

Metered faucets shall deliver not more than 1 liter of water per use.
Emergency Showers

Emergency safety showers and eye wash stations shall not be limited in their water supply flow rates.
Limitation of Hot Water Temperature for Public Lavatories

• Hot water temperature till inlet of lavatory's mixer shall be as per code.

• Hot water delivered from public use lavatories shall be limited to a maximum temperature of 38°C.

• The water heater thermostat shall not be considered a control for meeting this provision.
Limitation of Hot Water in Bathtubs and Whirlpool Bathtubs

• The maximum hot water temperature discharging from the bathtub and whirlpool filler shall be limited to 38° C

• The water heater thermostat shall not be considered a control for meeting this provision.
Limitation of Water Temperature in Bidets

- Hot water temperature till inlet of Bidet’s lavatory's mixer shall be as per code.
- The maximum hot water temperature discharging from mixer of a bidet shall be limited to 38°C.
- The water heater thermostat shall not be considered a control for meeting this provision.
Setting

[Diagram showing bathroom layout with dimensions for clearance between fixtures and distances between different types of toilets and wash basins.]
Standard Heights

Depends on

– Average body size of people in the country.
– General height of men, women and children.
– Physically challenged persons, depending on their disability
Other Considerations

- In children’s toilets in schools, hospitals and public places, the height of WC shall be 300 mm and height of urinal 450 mm.

- In case of toilets for disabled, height of WC shall be 450 mm.
Access
Movement
Heights
Elbow taps
Grab bars
mirrors
Modern Installations

Eccentric wall mixer

Sensor based single hole basin mixer
Rain showers
and shower trays
Toilet for Specially Abled  Macerator
Pre-plumb system
Also called
Dry-wall system
Appliances

• Hot water heater
• Tankless (Instant) water heater
• Water purifiers
• Cloth washing machine
• Dish washer
• Food waste grinder
• Water coolers
• Equipments in commercial kitchens – ice maker, rice cookers.
• Equipments in hospitals – autoclaves, sterile equipment, dental units.
Proper Connection of Dishwasher

Airgap Fitting

Dishwasher
Clothes Washer
Valves

- Valves up to and including 50 mm shall be brass. Sizes exceeding 50 mm shall be permitted to have cast-iron or brass or DI bodies.

- Fullway gate (or ball) valves are intended to be fully opened or fully closed when in service and are for providing isolation.
Valves

Valves are installed accessibly at following locations

- Discharge side of each water meter
- At each building supplied by common service or meter
- Down take/or riser in each plumbing shaft
- For each apartment, dwelling or toilet
- On discharge piping at a water tank
- On cold water supply at or near appliance
Valves

Isolating
- Ball valve
- Angle ball valve
- Gate valve
- Angle gate valve
- Stop valve
- Butterfly valve
- Float Valve
- Ball cock

Regulating
- Globe valve
- Check valve
- Non-return valve
- Pressure regulating valve
- Thermostatic mixing valve
- Ferrule
- Backflow prev.
- Back water valve

Other
- Pressure guage
- Temp. guage
- Water level indicator
- Strainers
- Air relief valve
- T&P valve
- Water hammer arrester
Ball Valve

- A quick-opening valve providing a tight shutoff.
- The name derived from its spherical-shaped gate.
Check Valve

• A valve designed to allow a fluid to pass through in one direction only.
• A common type has a plate suspended so that the reverse flow aids gravity in forcing the plate against a seat, shutting off reverse flow.
• (Not a backflow Preventer.)
Air Release Valve
Thermostatic Mixing Valve

Temperature Control Valve

A mixing valve that senses the outlet temperature and compensates for fluctuations in incoming hot or cold water temperatures.
Backflow Prevention Devices

Airgap -
Water Distribution

- The unobstructed vertical distance through the free atmosphere between the lowest opening of any faucet to the flood-level rim of any tank or fixture.
Atmospheric Vacuum Breaker

AVB is used for **backsiphonage** conditions only:
Reduced Pressure Principle Assembly

Can be used for all purposes except sewage
Water Hammer

- All building systems with quick-acting valves shall be provided with pressure absorbing devices
  
  • Mechanical devices
  • Installed per manufacturers specs and be accessible
Water Hammer
Pressure Reducing Valves

Pilot Operated
Thank you

Any Questions?

Compiled by Technical Committee - IPA

Disclaimer for IPPL Technical content prepared by IPA TC : The technical content of IPPL training presentation are developed by IPA Technical committee. The intent of the same is to impart code based technical knowledge to the participants of IPPL. These are set of recommendations to those who are involved in the design, engineering, construction or manufacturing of plumbing systems & products. In case of any conflict between any clause or recommendation in presentation and law of land such clause or recommendation shall not be adopted unless special waiver to that effect is given by Authority having jurisdiction. In case of any conflict between 2017 UIPC-I and NBC 2016 local applicable mandatory code need to be followed. IPA and its Technical committee disclaim liability for any personal injury, property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, sue of or reliance on this document. By preparing and publishing this document, the IPA and its Technical committee individually or collectively do not volunteer to render professional or other services for or any person or entity. Any person using this document shall reply on his or her independent or as appropriate, seek the advice of the competent professional for the exercise of reasonable care in any given circumstances. The question and answers will be prepared by IPA and its Technical committee & Decision of Technical Committee on any technical matter will be considered as final.