

## Water Consumption in Buildings

Water consumption dependent on type of building

### **Factors that influence the water consumption**

- Hours of operation
- Days of occupancy
- Building systems water consumption – air conditioning
- Landscape
- Occupancy rate

# Water Consumption in Buildings

## Residential

*7-day week/24-hour occupancy*

- Domestic
- Landscape
- Swimming pool
- Water feature

## ***High-rise***

*Common Facilities*

## Water Consumption in Buildings

### **Non-Residential**

- Office (*5 or 6-day week/8 to 10-hour*)
- Retail (*7-day week/12-hour*)
- Hotel (*7-day week/24-hour*)
  - Landscape
  - Swimming pool
  - Water feature
  - Air conditioning (cooling tower make-up)
  - F&B

Water Consumption in Buildings - Residential

**Residential**

## Water Consumption in Buildings - Residential

### Residential

*7-day week/24-hour occupancy*

### Domestic Consumption

Population

- *No. of rooms/units*
- *Occupancy*

Apartment

*No. of units : 40*

*Occupancy : 5 person/unit; 1.5 person per room*

## Water Consumption in Buildings - Residential

### Water Usage Pattern

Type	No. of uses per day per person		Duration per use	
	Male	Female		
Water Closet	5	5	1	flush
Bib tap	5	5	5	seconds
WH Basin	6	6	30	seconds
Shower	1	1	300	seconds
Baths	1	1	1	per day
Cooking	1	1	1	per day
Washing Dishes	2	2	130	seconds
Laundry	1	1	1	per day

## Water Consumption in Buildings - Residential

### Residential – Fixture Types

Fixture Type	Flowrate	Duration per use
Water Closet	9	L/flush
Dual Flush (avg)	3.60	Avg/flush
WH Basin	0.15	L/s
Bib tap	0.133	L/s
Shower	0.217	L/s
Cooking	10	L/day
Sink tap	0.133	L/s
Laundry tap	45	L/day
Bath	176	L/day

#### Notes

*a - Based on 6/3 L WC with 1 full flush + 4 half flush usage*

*b - Consumption per person*

## Water Consumption in Buildings - Residential

### Baseline Case Water Consumption

		No. of person	Usage per day	Consumption			
				Fittings Type	Flow	Duration	L per day
Water Closet	All	200	5	Water Closet	9	1	9,000
Bib tap	All	200	5	Bib tap	0.133	5	665
WH Basin	All	200	6	WH Basin	0.15	30	5,400
Shower	100%	200	1	Shower	0.217	300	13,020
Baths	0%	0	1	Bath	176	1	0
Washing Dishes	All	200	2	Sink tap	0.133	130	6,916
Sub-total for fittings usage, X1							35,001
Cooking	All	200	1	Cooking	10	1	2,000
Laundry	All	200	1	Laundry tap	45	1	9,000
Total Daily Volume, X2							46,001
Total Daily Usage per person							230



Water Consumption in Buildings – Residential Club Facilities

# **Residential Club Facilities**

## Water Consumption in Buildings – Residential Club Facilities

### Residential Club Facilities

*7-day week/24-hour occupancy*

### Domestic Consumption

Population

- *No. of rooms/units*
- *Occupancy*

Apartment

*No. of units : 200*

*Occupancy : 5 person/unit*

## Water Consumption in Buildings – Residential Club Facilities

No. of rooms/apartments	:	200	
Occupancy (person/unit)	:	5	
Usage rate	:	10%	
Total no. of occupants using facilities	:	100	
Population distribution			
Male	50% distribution	=	50
Female	50% distribution	=	50
Staff	:	20	
Male	50% distribution	=	10
Female	50% distribution	=	10
General Washing for common area			
WC	=	10	nos.
Urinal	=	4	nos.
Shower	=	6	nos.
WH Basin	=	14	nos.
Floor area (cleaning)	=	800	m <sup>2</sup>

## Water Consumption in Buildings – Residential Club Facilities

Fixture Type	Flowrate		Duration per use	
Water Closet	9	L/flush	1	flush
Urinal	3.8	L/flush	1	flush
WH Basin	0.15	L/s	15	seconds
WH Basin (S/C)	0.15	L/s	12	seconds*
Showers	0.217	L/s	360	seconds
Ablution tap	0.133	L/s	30	seconds
Sink tap	0.133	L/s	15	seconds
Bib tap	0.133	L/s	5	seconds
WC (cleaning)		L/flush	1	flush
Urinal (cleaning)		L/flush	1	flush
WH Basin (cleaning)		L/s	5	seconds
Showers (cleaning)		L/s	8	seconds
General cleaning	0.1	L/m <sup>2</sup>	1	per use

## Water Consumption in Buildings – Residential Club Facilities

### Baseline Case Water Consumption

Fixtures		No. of person	% Usage Factor	Usage per day	Consumption			
					Fittings Type	Flow	Duration	L per day
WC	Female	50	100%	1	Water Closet	9	1	450
WC	Male	50	30%	1	Water Closet	9	1	135
Urinal	Male	50	70%	1	Urinal	3.8	1	133
Bib tap	All	100	100%	1	Bib tap	0.133	20	67
WH Basin	All	100	100%	1	WH Basin	0.15	15	225
Shower	All	100	15%	1	Showers	0.217	360	1,172
<b>Staff</b>								
WC	Male	10	100%	1	Water Closet	9	1	90
WC	Female	10	100%	4	Water Closet	9	1	360
Urinal	Male	10	100%	3	Urinal	3.8	1	114
Bib tap	All	20	100%	1	Bib tap	0.133	20	13
WH Basin	All	20	100%	4	WH Basin	0.15	15	180
Shower	All	20	25%	1	Showers	0.216	360	391
Ablution	All	20	25%	2	Ablution tap	0.133	30	40
<b>Total Daily Volume, X1 (L)</b>								<b>3,370</b>

## Water Consumption in Buildings – Residential Club Facilities

### Baseline Case Water Consumption (cont'd)

Washroom cleaning		Qty	Units	Usage per day	Fittings Type	Flow	Duration	L per day
WC	Nos.	10	nos.	1	Water Closet	9	1	90
Urinal	Nos.	4	nos.	1	Urinal	3.8	1	15
WH Basin	Nos.	14	nos.	1	WH Basin	0.15	5	11
Shower	Nos.	6	nos.	1	Showers	0.217	8	10
Cleaning	Area	800	m <sup>2</sup>	1	General cleaning	0.1	1	80
Total Daily Volume, X2 (L)								6,946
Total Annual Volume in m <sup>3</sup>								2,535

## Water Consumption in Buildings – Office

**Office**

## Water Consumption in Buildings – Office

### Office

*5 or 6-day week/8 to 10-hour occupancy*

### Domestic Consumption

Population

- *Nett lettable area*
- *Occupancy*



## Water Consumption in Buildings – Office

### Occupancy

Nett floor area (m <sup>2</sup> )			:	12000	
Occupancy (m <sup>2</sup> /person)			:	10	
Total no. of occupants			:	1200	
Population distribution					
Male	50%	distribution	=	600	
Female	50%	distribution	=	600	
General Washing for common area					
WC			=	48	nos.
Urinal			=	24	nos.
Shower			=	0	nos.
WH Basin			=	48	nos.
Floor area (cleaning)			=	1000	m <sup>2</sup>

## Water Consumption in Buildings – Office

### Water usage per day

	Type	Uses per day per person		Duration per use	
		Male	Female		
Occupant	WC	1	4	1	flush
	Urinal	3	0	1	flush
	Bib tap	4	4	5	seconds
	WH Basin	4	4	15	seconds
	Pantry	1	1	15	seconds
	Ablution	2	2	30	seconds
Cleaning		Uses per day			
	WC	1		1	flush
	Urinal	1		1	flush
	WH Basin	1		5	seconds
	Floor	0.1	L/m <sup>2</sup>	1	per m <sup>2</sup>

## Water Consumption in Buildings – Office

### Fixture Types

Fixture Type	Flowrate	Duration per use
Water Closet	9 L/flush	1 flush
Urinal	3.8 L/flush	1 flush
Basin tap	0.15 L/s	15 seconds
Sink tap	0.133 L/s	15 seconds
Bib tap	0.133 L/s	20 seconds
Ablution tap	0.133 L/s	30 seconds

## Water Consumption in Buildings – Office

### Baseline Case Water Consumption

Usage		Nos.	Usage per day	Consumption			
Occupant Use		People		Fittings Type	Flow	Durati on	L per day
WC	Female	600	4	Water Closet	9	1	21,600
	Male	600	1	Water Closet	9	1	5,400
Urinal	Male	600	3	Urinal	3.8	1	6,840
Bib tap	All	1200	4	Bib tap	0.133	5	3,192
WH Basin	All	1200	4	Basin tap	0.15	15	10,800
Pantry	All	1200	1	Sink tap	0.133	15	2,394
Ablution	50%	600	2	Ablution tap	0.133	30	4,788
Total Daily Volume (L)							55,014
Total Working Days per year							260
Total Annual Volume in m3 (X)							14,304

## Water Consumption in Buildings – Hotel

**Hotel**

## Water Consumption in Buildings – Hotel

### Hotel

*7-day week/24-hour occupancy*

### Domestic Consumption

#### Population

- *Number of rooms*
- *Occupancy per room*
- *Staff*
- *Day guest/Functions*

#### *Others*

- *F&B outlets*
- *Laundry*

## Water Consumption in Buildings – Hotel

### Guest

No. of rooms	:	500
Occupancy (person/room)	:	1.5
Total no. of occupants	:	525

### Population distribution

Female	50% distribution	=	263
Male	50% distribution	=	263

### Staff

Female	50% distribution	=	250
Male	50% distribution	=	250

### Day guest/Functions

Diversity	:	1500	
Female	50% distribution	=	150
Male	50% distribution	=	150

### General Washing for common area

WC	=	66 nos.
Urinal	=	32 nos.
Shower	=	10 nos.
WH Basin	=	80 nos.
Floor area (cleaning)	=	8600 m <sup>2</sup>

## Water Consumption in Buildings – Hotel

### Water Fixtures

Ref	Fixture Type	Flowrate		Duration per use	
<b>Residential</b>	Water Closet	9	L/flush	1	flush
	WH Basin	0.15	L/s	60	seconds
	Sink tap	0.133	L/s	15	seconds
	Bib tap	0.133	L/s	20	seconds
	Showers	0.217	L/s	360	seconds
	Bath	176	L/use	1	use
<b>Non-residential</b>	Water Closet	9	L/flush	1	flush
	Ablution tap	0.15	L/s	30	seconds
	Urinal	3.8	L/flush	1	flush
	WH Basin	0.15	L/s	15	seconds
	WH Basin (S/C)	0.15	L/s	12	seconds*
	Sink tap	0.133	L/s	15	seconds
<b>Cleaning</b>	Bib tap	0.133	L/s	20	seconds
	Water Closet		L/flush	1	flush
	Urinal		L/flush	1	flush
	Shower		L/s	8	seconds
	WH Basin		L/s	5	seconds

\* Use of automatic self-closing faucets



## Water Consumption in Buildings – Hotel

### Baseline Case Water Consumption

		No. of person	Usage per day	Consumption			
				Fittings Type	Flow	Duration	L per day
<b>Guest rooms</b>							
WC	All	750	5	Water Closet	9	1	33,750
Bib tap	30%	225	5	Bib tap	0.133	5	748
WH Basin	All	750	5	WH Basin	0.15	60	33,750
Shower	95%	713	2	Showers	0.217	360	111,399
Shower	5%	38	1	Showers	0.217	360	2,969
Bath	5%	38	1	Bath	176	1	6,688
<b>Guest room cleaning</b>		Nos.					
WC	Rooms	500	2	Water Closet	9	1	9,000
Shower	Rooms	500	1	Showers	0.217	8	868
WHB	Rooms	500	1	WH Basin	0.15	5	375

## Water Consumption in Buildings – Hotel

### Baseline Case Water Consumption (cont'd)

		No. of person	Usage per day	Consumption			
				Fittings Type	Flow	Duration	L per day
<b>Staff</b>							
WC	Female	250	5	Water Closet	9	1	11,250
WC	Male	250	1	Water Closet	9	1	2,250
Urinal	Male	250	4	Urinal	3.8	1	3,800
Bib tap	30%	75	2	Bib tap	0.133	20	499
WH Basin	All	500	5	WH Basin	0.15	15	5,625
Pantry	All	500	2	Sink tap	0.133	15	1,995
Ablution	50%	250	2	Ablution tap	0.15	30	2,250
<b>Day guest/Functions</b>							
WC	Female	150	5	Water Closet	9	1	6,750
WC	Male	150	1	Water Closet	9	1	1,350
Urinal	Male	150	4	Urinal	3.8	1	2,280
Bib tap	50%	150	1	Bib tap	0.133	20	499
WH Basin	All	300	5	WH Basin	0.15	15	3,375
Total Daily Volume (L)							241,470
Total Days per year							365
Total Annual Volume in m <sup>3</sup> (X)							88,137

## Water Consumption in Buildings – Hotel

### Baseline Case – Miscellaneous usage

		No. of rooms	L/lb L/meal	lb/room meals/rm	L/day	Design days/yr	m3/yr
<b>Laundry</b>							
Washing	All	500	9.5	8	38,000	365	13,870
<b>F&amp;B</b>							
Kitchen	All	500	30	2.2	33,000	365	12,045

Water Consumption in Buildings – Pools & Water Features

# **Pools & Water Features**

## Water Consumption in Buildings – Pools & Water Features

### Pools & Water feature Usage

	Pool area (m <sup>2</sup> )	Evaporation rate (mm/day)	L/day	Design days/yr	m <sup>3</sup> /yr
Water Feature Consumption	120	5.0	600	365	219
Pool Water Consumption	180	5.0	900	365	329

## Water Consumption in Buildings

**Thank you**

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