BUROHAPPOLD ENGINEERING

BH-ZSG-CAL-P-0001

PLUMBING CALCULATIONS

Revision	Description	Issued by	Date	Checked by
00	Tender	TA	Nov-15	TA
01	Tender	TA	Dec-15	TA

BUROHAPPOLD ENGINEERING

Project:	Lodha Clarient		
		Revision	00
Area of Project:	Plot C-Sales gallery	Prepared by	TA
		Date	01/12/15
Description:	Water supply calculation	Checked by	TA
		Date	01/12/15

				Domestic Water		Flushing Water	
				NBC		NBC	
Area Reference		**Fixtures**	**Quantity**	**Fixture units**	**Total FU**	**Fixture units**	**Total FU**
Plot C-Sales Gallery	**Male Toilet**	**Wash Basin**	**3**	2	6		
		Toilet Spray	**2**	1	2		
		Urinals	**4**			4	16
		Water Closet	**2**			3	6
TOTAL / LEVEL					**8**		**22**
No. of levels		**1**					
Total					**8**		**22**

				Domestic Water		Flushing Water	
				NBC		NBC	
Area Reference		**Fixtures**	**Quantity**	**Fixture units**	**Total FU**	**Fixture units**	**Total FU**
Plot C-Sales Gallery	**Female Toilet**	**Wash Basin**	**3**	2	6		
		Toilet Spray	**3**	1	3		
		Urinals	**0**			4	0
		Water Closet	**3**			3	9
TOTAL / LEVEL					**9**		**9**
No. of levels		**1**					
Total					**9**		**9**

				Domestic Water		Flushing Water	
				NBC		NBC	
Area Reference		**Fixtures**	**Quantity**	**Fixture units**	**Total FU**	**Fixture units**	**Total FU**
Plot C-Sales Gallery	**Toilet Near Pantry**	**Wash Basin**	**1**	2	2		
		Toilet Spray	**1**	1	1		
		Urinals	**0**			4	0
		Water Closet	**1**			3	3
TOTAL / LEVEL					**3**		**3**
No. of levels		**1**					
Total					**3**		**3**

				Domestic Water		Flushing Water	
				NBC		NBC	
Area Reference		**Fixtures**	**Quantity**	**Fixture units**	**Total FU**	**Fixture units**	**Total FU**
Plot C-Sales Gallery	**Kitchen (Pantry)**	**Wash Basin**	**1**	2	2		
		Kitchen Sink	**1**	2	2		
		Urinals	**0**			4	0
		Water Closet	**0**			3	0
TOTAL / LEVEL					**4**		**0**
No. of levels		**1**					
Total					**4**		**0**

Total FU	**Total FU**
24	**34**

FU		**Flow Rate GPM**		**Peak Operation Hours**	**Water Consumption in Litres/Day**		**Water Consumption in Litres/Day 30% Extra**		**Water to Septic Tank**	**Remarks**
Domestic	**Flushing**	**Domestic**	**Flushing**		**Domestic**	**Flushing**	**Domestic**	**Flushing**	**LPD**	
24	34	16.9	21.8	1.5	5761	7418	7489	9643	15527	

Total Tank Size	**17**	**m^3**

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Project:	Lodha Clarient		
		Revision	00
Area of Project:	Plot C-Sales gallery	Prepared by	TA
		Date	01/12/15
Description:	Drainage calculation	Checked by	TA
		Date	01/12/15

				Waste		Soil	
				NBC		NBC	
Area Reference		Fixtures	Quantity	Fixture units	Total FU	Fixture units	Total FU
Plot C-Sales Gallery	Male Toilet	Wash Basin	3	1	3		
		Floor Drain	4	1	4		
		Urinals	4			4	16
		Water Closet	2			4	8
TOTAL / LEVEL					7		24
No. of levels		1					
Total					7		24

				Waste		Soil	
				NBC		NBC	
Area Reference		Fixtures	Quantity	Fixture units	Total FU	Fixture units	Total FU
Plot C-Sales Gallery	Female Toilet	Wash Basin	3	1	3		
		Floor Drain	4	1	4		
		Urinals	0			4	0
		Water Closet	3			4	12
TOTAL / LEVEL					7		12
No. of levels		1					
Total					7		12

				Waste		Soil	
				NBC		NBC	
Area Reference		Fixtures	Quantity	Fixture units	Total FU	Fixture units	Total FU
Plot C-Sales Gallery	Toilet Near Pantry	Wash Basin	1	1	1		
		Floor Drain	1	1	1		
		Urinals	0			4	0
		Water Closet	1			4	4
TOTAL / LEVEL					2		4
No. of levels		1					
Total					2		4

				Waste		Soil	
				NBC		NBC	
Area Reference		Fixtures	Quantity	Fixture units	Total FU	Fixture units	Total FU
Plot C-Sales Gallery	Kitchen (Pantry)	Wash Basin	1	1	1		
		Floor Drain	1	1	1		
		Urinals	0			4	0
		Water Closet	0			4	0
TOTAL / LEVEL					2		0
No. of levels		1					
Total					2		0

Total FU	Total FU
18	40

Drainage FU		Pipe Size	
Wate	Soil	Waste	Soil
18	40	Φ80	Φ100

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Project:	Lodha Clarient		
		Revision	00
Area of Project:	Plot C-Sales gallery	Prepared by	TA
		Date	01/12/15
Description:	Septic Tank Sizing (As per IS-2470)	Checked by	TA
		Date	01/12/15

	WC	Urinal	WB	
Nos	6	8	8	
FU	1	0.5	0.5	
Total FU	6	4	4	
Grand Total	**14**			

System Selected from IS-2470 : **User upto 100 40 FU**

Tank Size Std	L(m)	W(m)	H (water)(m)	Vol
	5.7	2.1	1	12.0

Tank Size Selected	L(m)	D(m)	H (water)(m)	Vol	Req. Numbers
	2.5	1.8	1.5	6.75	2

Soak Pit Size	D(m)	Eff Depth(m)
	1.5	1.5

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Project	Lodha Clarient		
		Revision	00
Area of Project	Plot C-Sales Gallery	Prepared by	TA
		Date	01/12/15
Element Description	Pressure Vessel Sizing	Checked by	TA
		Date	01/12/2015

Input	Output	Calculated

Pump Type			
Type of Booster Pump System		**Capacity Control**	
Mean Flow Rate per Pump	Q	8.9	m^3/hr
Minimum Flow Rate per Pump	Q_{min}	0.9	m^3/hr
System Pressure Setpoint	P_{set}	1.5	bar
Parameters			
On/Off Band	ΔH	0.3	bar
Tank precharge pressure	P_0	1.0	bar
Q_{min}/Q_{nom}	K_Q	10%	-
$\Delta H/P_{set}$	K_H	20%	-
P_0/P_{set}	K_F	0.7	-
Maximum number of start-stop/hour	N	85.0	/hr
Required Pressure Tank Size	**V_0**	**82**	**Litres**
		22	**Gallons**
Selected Pressure Tank Size (From Manufaturer's Data)	**V_0**	**100**	**Litres**
		26	**Gallons**

Table 1 Water Requirements for Buildings Other than Residences

(*Clause* 4.1.2)

Sl No.	Type of Building	Consumption per Day, litres
(1)	(2)	(3)
i)	Factories where bath rooms are required to be provided	45 per head
ii)	Factories where no bath rooms are required to be provided	30 per head
iii)	Hospital (including laundry):	
	a) Number of beds not exceeding 100	340 per head
	b) Number of beds exceeding 100	450 per head
iv)	Nurses' homes and medical quarters	135 per head
v)	Hostels	135 per head
vi)	Hotel (up to 4 Star)	180 per head
vii)	Hotel (5 Star and above)	320 per head
viii)	Offices	45 per head
ix)	Restaurants	70 per seat
x)	Cinemas, concert halls and theatres	15 per seat
xi)	Schools:	
	a) Day schools	45 per head
	b) Boarding schools	135 per head

NOTE — For calculating water demand for visitors a consumption of 15 litres per head, per day may be taken.

Table 23 Fixture Units for Different Sanitary Appliances or Groups

(*Clause* 5.5.3.5.1)

Sl No.	Type of Fixture	Fixture Unit Value as Load Factors
(1)	(2)	(3)
i)	One bathroom group consisting of water-closet, washbasin and bath tub or shower stall:	
	a) Tank water-closet	6
	b) Flush-valve water-closed	8
ii)	Dath tub[1]	3
iii)	Bidet	3
iv)	Combination sink-and-tray (drain board)	3
v)	Drinking fountain	½
vi)	Floor traps[2]	1
vii)	Kitchen sink, domestic	2
viii)	Wash basin, ordinary[3]	1
ix)	Wash basin, surgeon's	2
x)	Shower stall, domestic	2
xi)	Showers (group) per head	3
xii)	Urinal, wall lip	4
xiii)	Urinal, stall	4
xiv)	Water-closet, tank-operated	4
xv)	Water-closet, valve-operated	8

[1] A shower head over a bath tub does not increase the fixture unit value.

[2] Size of floor trap shall be determined by the area of surface water to be drained.

[3] Washbasins with 32 mm and 40 mm trap have the same load value.

Table 25 Maximum Number of Fixture Units that can be Connected to Branches and Stocks

(*Clause* 5.5.3.5.1)

Sl No.	Diameter of Pipe	Maximum Number of Fixture Units[1] that can be Connected			
		Any Horizontal Fixture Branch[2]	One Stack of 3 Storeys in Height or 3 Intervals	More Than 3 Storeys in Height	
				Total for Stack	Total at One Storey or Branch Interval
	mm				
(1)	(2)	(3)	(4)	(5)	(6)
i)	30	1	2	2	1
ii)	40	3	4	8	2
iii)	50	6	10	24	6
iv)	65	12	20	42	9
v)	75	20	30	60	16
vi)	100	160	240	500	90
vii)	125	360	540	1 100	200
viii)	150	620	960	1 900	350
ix)	200	1 400	2 200	3 600	600
x)	250	2 500	3 800	5 600	1 000
xi)	300	3 900	6 000	8 400	1 500
xii)	375	7 000	—	—	—

[1] Depending upon the probability of simultaneous use of appliances considering the frequency of use and peak discharge rate.

[2] Does not include branches of the building sewer.

Table 26 Maximum Number of Fixture Units that can be Connected to Building Drains and Sewers

(*Clause* 5.5.3.5.1)

Sl No.	Diameter of Pipe	Maximum Number of Fixture Units that can be Connected to Any Portion[1] of the Building Drain or the Building Sewer for Gradient			
	mm	1/200	1/100	1/50	1/25
(1)	(2)	(3)	(4)	(5)	(6)
i)	100	—	180	216	250
ii)	150	—	700	840	1 000
iii)	200	1 400	1 600	1 920	2 300
iv)	250	2 500	2 900	3 300	4 200
v)	300	3 900	4 600	5 600	6 700
vi)	375	7 000	8 300	10 000	12 000

[1] Includes branches of the building sewer.

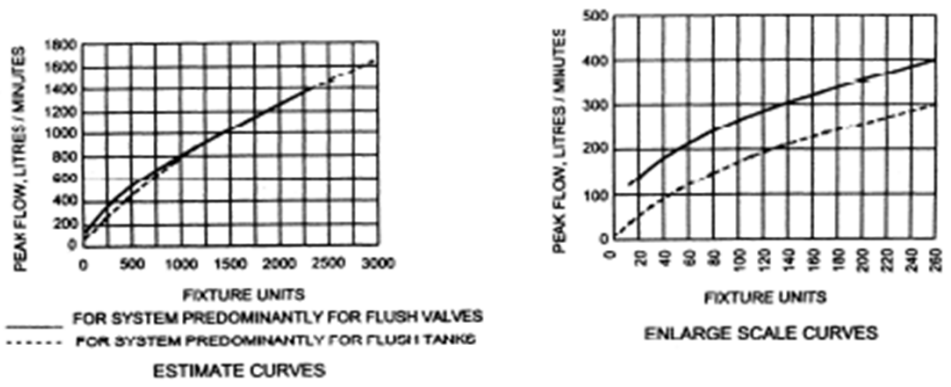


FIG. 13 PEAK FLOW LOAD CURVES

Table 5 Probable Simultaneous Demand

(*Clause* 4.6.3.2)

No. of Fixture Units	System with Flush Tanks Demand (Based on Fixture Units)		System with Flush Valves Demand (After Hunter)	
	Unit Rate of Flow[1]	Flow in Litre per Minute	Unit Rate of Flow[1]	Flow in Litre per Minute
(1)	(2)	(3)	(4)	(5)
20	2.0	56.6	4.7	133.1
40	3.3	93.4	6.3	178.4
60	4.3	121.8	7.4	209.5
80	5.1	144.4	8.3	235.0
100	5.7	161.4	9.1	257.7
120	6.4	181.2	9.8	277.5
140	7.1	201.0	10.4	294.5
160	7.6	215.2	11.0	311.5
180	8.2	232.2	11.6	328.5
200	8.6	243.5	12.3	348.3
220	9.2	260.5	12.7	359.6
240	9.6	271.8	13.1	370.9
300	11.4	322.8	14.7	416.2
400	14.0	396.4	17.0	481.4
500	16.7	472.9	19.0	538.0
600	19.4	549.3	21.1	597.5
700	21.4	606.0	23.0	651.3
800	24.1	682.4	24.5	693.7
900	26.1	739.0	26.1	739.0
1 000	28.1	795.7	28.1	795.7
1 500	36.1	1 022.2	36.1	1 022.2
2 000	43.9	1 243.1	43.9	1 243.1
2 500	51.1	1 446.9	51.1	1 446.9
3 000	57.8	1 636.7	57.8	1 636.7

[1] Unit rate of flow = Effective fixture units.

Table 3 Fixture Unit for Different Types of Fixtures with Inlet Pipe Diameter

(*Clause* 4.6.3.1)

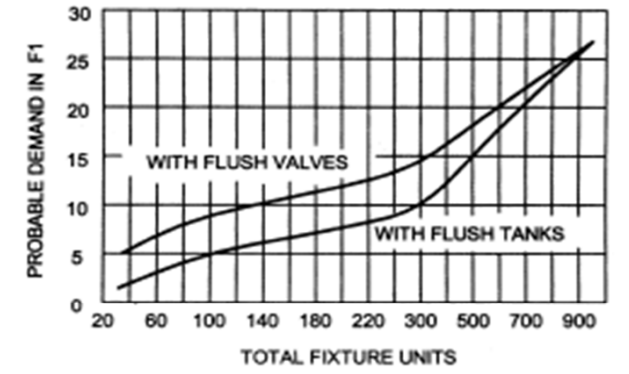
Sl No.	Type of Fixture	Fixture Unit FU as Load Factor	Minimum Normal Size of Fixture Branch, mm
(1)	(2)	(3)	(4)
i)	Ablution tap	1	15
ii)	Bath tub supply by spout	3	15
	Shower over tub does not add to the load		
iii)	Shower stall domestic	2	15
iv)	Shower in groups per head	3	15
v)	Wash basin domestic use	1	15
vi)	Wash basin public use	2	15
vii)	Wash basin surgical	2	15
viii)	Scrub station in hospitals per outlet	3	15
ix)	Drinking water fountain/water cooler	0.5	15
x)	Water-closet with cistern (single/ double flush)	1	15
xi)	Water-closet with flush or magic eye operated valve	8	25/32
xii)	Urinals with auto flushing cisterns	4	15/20
xiii)	Urinals with flush or magic eye operated valve	2	15/20
xiv)	Kitchen sink (domestic use)	2	15/20
xv)	Washing machine	3	15/20

Table 4 Fixture Unit for Different Types of Fixtures Based on Pipe or Trap Diameter

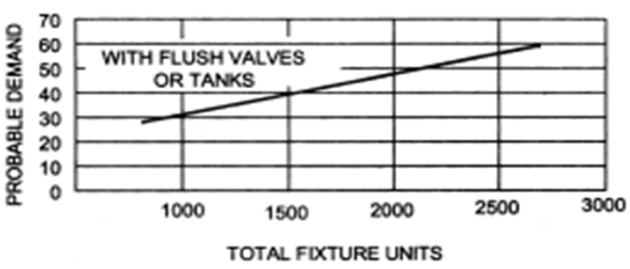
(*Clause* 4.6.3.1)

Sl No.	Drain or Trap Outlet Diameter	Fixture Unit
	mm	FU
(1)	(2)	(3)
i)	32 or smaller	1
ii)	40	2
iii)	50	3
iv)	65	4
v)	75	5
vi)	100	6

NOTE — Before using the above figures check the actual flow from the outlets of special equipment, for example, small period high discharges, for example, from washing machines, boiler blow downs, filter backwash and water tank emptying operations.



5A GRAPH FOR PROBABLE DEMAND ON PIPE LINES UPTO DEMAND OF 900 FU



5B GRAPH FOR PROBABLE DEMAND OVER 900 FU

FIG. 5 GRAPH FOR PROBABLE DEMAND