

# Water Demand Calculator for Estimating Peak Water Demand for Indoor Residential Water Use

Version 2.2

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## **Authors:**

Steven Buchberger, (PE), PhD - Professor, Civil and Environmental Engineering, University of Cincinnati

Toritseju Omaghomi, PhD - Environmental Engineering, University of Cincinnati

Timothy Wolfe (PE) - Director, Plumbing Engineering, TRC Worldwide Engineering – MEP, LLC

Jason Hewitt (PE) - Seattle Office Manager, CB Engineers - P.E., CPD, LEED AP

Daniel Cole - Chair - Sr. Director of Technical Services, International Association of Plumbing and Mechanical Officials (IAPMO).

## **Abstract:**

The Water Demand Calculator (WDC) is an application that computes the 99th percentile of the instantaneous water demand expected during the period of peak indoor use in a residential building that is fitted with efficient (water conserving) fixtures. The WDC can be applied to estimate peak demand in residential buildings ranging from single family homes to large multi-family apartments and condominium complexes. The user provides the number and the flow rate for each type of indoor fixture in the residential building. The WDC summarizes the input data and returns an estimate of the corresponding 99th percentile of the instantaneous water demand.

## **Acknowledgments:**

Sponsors - International Association of Plumbing and Mechanical Officials (IAPMO), Water Quality Association (WQA), American Society of Plumbing Engineers (ASPE)

Code: Developed By Toritseju Omaghomi

## **System Requirements:**

The Water Demand Calculator is a Microsoft Office Excel file and requires a compatible version of Excel 2009 or later to prevent loss of functionality. This file also uses active content (macros). When downloading this file, Microsoft Office has security features causing a message bar to appear warning that the active content may contain viruses and other security hazards that could harm your computer or your organization's network and that the macros have been disabled. This does not mean that viruses have been detected. It only means that active content has been detected and the user is being warned. Since the source file comes from IAPMO, the file can be trusted and the macros can be enabled. You may need to change the settings in the Trust Center on your computer (find this in the Options section of Microsoft Office applications). Once the file is trusted, the warning will no longer appear. You may also need to check with your company's System's Administrator for security permission to download a file with macros.

## **Disclaimer:**

Although care has been taken to ensure the accuracy, completeness and reliability of the Water Demand Calculator ("Calculator"), neither IAPMO nor any other party makes any warranties, express or implied, or representations as to the accuracy of the Calculator. Neither IAPMO nor any other party assumes any liability or responsibility for any error or omissions in the information contained in or output by the Calculator. Neither IAPMO nor any other party assumes any responsibility for the consequences of use of such information, nor for any infringement of third party intellectual property rights which may result from its use.

Visit IAPMO web site for more information at

<http://www.iapmo.org/WEStand/Pages/WaterDemandCalculator.aspx>

# Water Demand Calculator (WDC v2.2)

PROJECT NAME :

Click to Select Building Type

WDC LEGEND

Multi-Family Building

Total Number of Apartments in the Building →

10

Total Apartments in this Calculation →

6

Thursday, April 27, 2023

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Enter Total Number of Apartments in the Building (integer ≥1)

NOTE: This value does not affect the results in this calculation; however, the Total Number of Apartments in Building must be ≥ the Total Apartments in this Calculation.

Enter Number of Apartments Considered in this Calculation. (integer ≥1)

White cells accept input values.

NOTE: Active cells are highlighted in yellow

Other types of fixtures.

FIXTURE GROUPS		FIXTURE	ENTER TOTAL NUMBER OF FIXTURES	PROBABILITY OF USE (%)	ENTER FIXTURE FLOW RATE (GPM)	MAXIMUM RECOMMENDED FIXTURE FLOW RATE (GPM)
Bathroom Fixtures	1	Bathtub (no Shower)	0	0.77	5.5	5.5
	2	Bidet	0	0.66	2.0	2.0
	3	Combination Bath/Shower	6	3.06	5.5	5.5
	4	Faucet, Lavatory	18	1.68	1.5	1.5
	5	Shower, per head (no Bathtub)	12	2.16	2.0	2.0
	6	Water Closet, 1.28 GPF Gravity Tank	18	0.66	3.0	3.0
Kitchen Fixtures	7	Dishwasher	6	0.42	1.3	1.3
	8	Faucet, Kitchen Sink	6	1.68	2.2	2.2
Laundry Room Fixtures	9	Clothes Washer	6	3.05	3.5	3.5
	10	Faucet, Laundry	0	1.68	2.0	2.0
Bar/Prep Fixtures	11	Faucet, Bar Sink	0	1.68	1.5	1.5
Other Fixtures	12	Fixture 1	1	0.00	3.0	6.0
	13	Fixture 2	0	0.00	0.0	6.0
	14	Fixture 3	0	0.00	0.0	6.0

## COMPUTED RESULTS FOR PEAK PERIOD CONDITIONS

Total No. of Fixtures in Calculation  
N = 73

Sum of fixtures entered in the calculator.

99<sup>th</sup> Percentile Demand Flow  
Q = 13.8 GPM

Demand flow in the selected units of measurement.

Hunter Number  
H(n,p) = 1.18

Average number of fixtures in use at any instant.

Stagnation Probability  
Pr[Zero Demand] = 30%

Probability of no fixtures in use at any instant.

Method of Computation  
Modified Wistort's Method

Method utilized in calculating Demand Estimate

Enter 'Other Fixture' Probability of use (0.1 - 6%) in [Column C]  
Enter 'Other Fixture' flow rate in [Column D]

If visible, there is an entry for "Other fixture".  
Enter appropriate fixture p-value and flow rate (GPM, LPM, or LPS).

DOWNLOAD RESULT

RESET WDC

Select Units for Water Demand

GPM

LPM

LPS

RUN WDC

CLICK BUTTON

Downloads the current result to a file named WDCResults-DDMMYY-hhmmss.xlsx in the "Downloads" folder.

Click to reset number of fixtures

Select from these units of measurement:  
GPM - Gallons per minute, LPM - Liters per minute, LPS - Liters per second.

If visible, fixture combination has changed.  
Therefore run water demand calculator for a new result.

Water Demand Calculator (WDC v2.2)

PROJECT NAME :  
Click for Drop-down Menu →

Pawling Congregation of JW's (KH w/2 rectories)

Multi-Family Building

Total Number of Apartments in the Building→

2

Total Apartments in this Calculation→

2

Monday, January 29, 2024  
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FIXTURE GROUPS	FIXTURE		ENTER TOTAL NUMBER OF FIXTURES	PROBABILITY OF USE (%)	ENTER FIXTURE FLOW RATE (GPM)	MAXIMUM RECOMMENDED FIXTURE FLOW RATE (GPM)
Bathroom Fixtures	1	Bathtub (no Shower)	0	1.01	5.5	5.5
	2	Bidet	0	0.71	2.0	2.0
	3	Combination Bath/Shower	2	4.17	5.5	5.5
	4	Faucet, Lavatory	7	1.98	1.5	1.5
	5	Shower, per head (no Bathtub)	0	3.00	2.0	2.0
	6	Water Closet, 1.28 GPF Gravity Tank	8	0.71	3.0	3.0
Kitchen Fixtures	7	Dishwasher	2	0.47	1.3	1.3
	8	Faucet, Kitchen Sink	2	1.98	2.2	2.2
Laundry Room Fixtures	9	Clothes Washer	2	4.24	3.5	3.5
	10	Faucet, Laundry	1	1.98	2.0	2.0
Bar/Prep Fixtures	11	Faucet, Bar Sink	0	1.98	1.5	1.5
Other Fixtures	12	Urinal 1	1	1.60	5.0	6.0
	13	Urinal 2	1	1.60	5.0	6.0
	14	Water Cooler	1	1.00	0.7	6.0

COMPUTED RESULTS  
FOR  
PEAK PERIOD CONDITIONS

Total No. of Fixtures in Calculation

N = 27

99<sup>th</sup> Percentile Demand Flow

Q = 11.0 GPM

Hunter Number

H(n,p) = 0.47

Stagnation Probability

Pr[Zero Demand] = 62%

Method of Computation

Convolution

DOWNLOAD  
RESULT

RESET  
WDC

↓ Select Units for Water Demand ↓

GPM

LPM

LPS

RUN  
WDC