

PEAK WATER DEMAND CALCULATOR

INTRODUCTION

This fact sheet offers an overview of an alternative methodology to determine the peak water demand in new residential buildings. This approach, contained in the Uniform Plumbing Code (UPC) Appendix M "Peak Water Demand Calculator," was adopted into the California Plumbing Code (CPC) on August 1, 2023, by the California Building Standards Commission.

The statewide Reach Codes team has also published a [Report](#) and [Executive Summary](#) validating the alternative approach based on actual flow rate data in 20 multifamily buildings.

BASICS OF CPC APPENDIX M

CPC Appendix M or the Water Demand Calculator (WDC) provides a method for estimating the demand load for the building water supply, principal branches, and risers for single family and multifamily dwellings.

The peak water demands derived using CPC Appendix M inform the recommended diameter of water supply pipes. The alternative approach of using CPC Appendix M methodology in conjunction with CPC Appendix A for pipe sizing yields lower design flow rates and smaller distribution piping when compared to using only CPC Appendix A.

BENEFITS

 Construction cost savings to builders from:

Smaller diameter pipes and fittings, valves, pumps, and other equipment

Smaller inside diameter pipe insulation

Smaller water service entrance size, resulting in smaller water meter size with lower connection fees.

 Ongoing cost savings to occupants and homeowners from:

Water savings from faster hot water delivery, resulting in smaller monthly water service charges and lower associated volumetric sewer charges

Energy savings due to decreased heat loss in the hot water distribution system.

 Faster delivery of hot water to occupants.

 Reduced public health and safety risk and improved water quality due to shorter water dwell times within plumbing systems.

 Reduced carbon emissions due to material savings and energy reductions.

FROM THE FIELD: PERSPECTIVES ON APPENDIX M FOR NEW CONSTRUCTION

“When designing domestic water systems, I had always used the Hunter curve (which is the basis for the standard approach to peak water demand sizing in the International Plumbing Code and in the Uniform Plumbing Code), and always greeted the results with a “Hmm? Seems high.” I was excited to learn about the IAPMO’s Water Demand Calculator and use it for determining the hot, cold and combined peak demands as well as for sizing the water heating equipment. I use it at multiple points throughout the piping system for pipe sizing, allowing me to right-size the water service equipment, the water heating equipment and the piping system. The Water Demand Calculator is very easy to use and customize to your specific project. Right sizing the piping and water heating equipment can result in significant first cost savings to the owner.”

— John MacArthur, MEP Engineer, Beardsley Architects + Engineers (based in the state of New York)

KEY POINTS

- Applies to new residential construction as well as justifying the reuse of existing premise plumbing for renovation or adaptive reuse projects.
- Available to use statewide in California, effective July 1, 2024.
- Available as an Excel-based tool as well as a Water Demand Calculator free app, developed by the IAPMO, from the Apple App Store or Google Play.
- First major update of water demand sizing in buildings in over 80 years. Over the past 40 years, residential plumbing fixtures and fittings have become more efficient, resulting in about 50-75% reductions in water use.
- Culmination of a multi-year (2011-2017) project, sponsored by the International Association of Plumbing and Mechanical Officials (IAPMO).
- Initial adoption as Appendix M in 2018 UPC.
- Adopted in California, Hawaii, Montana, Nevada, New Jersey, New Mexico, North Dakota, Oregon, Washington, and Wisconsin.

RESOURCES AND MORE INFORMATION

[Peak Water Demand Calculator](#) in 2022 CPC with 7/1/2024 Supplement

[IAPMO Resources](#) (short videos, announcements of webinars and trainings on the WDC)

[2017 Study on Peak Water Demand](#) by S. Buchberger et al. (basis for the WDC)

[2020 Study on the WDC](#) by Stantec (the assessment of cost savings from applying the WDC)

[2021 Report on Connection Fees and Service Charges by Meter Size](#) by Alliance for Water Efficiency
(the assessment of cost savings from downsizing meters)

[2023 Report on Energy and Carbon Savings Opportunities](#) by Arup
(the assessment of water, energy, and carbon savings from applying the WDC)

[Three-minute Intro Video](#) by Towle Whitney

[One-hour Training on How to Use the WDC](#) from 2017 IAPMO Annual Conference

FROM THE FIELD: PERSPECTIVES ON APPENDIX M FOR RETROFITS AND RENOVATIONS

“ Uniform Plumbing Code Appendix M has proven to be a great asset on our renovation projects. One of my first experiences with Appendix M was back in 2020 on a renovation project in Menlo Park, California. The owner wanted to add a washing machine to every unit in an apartment complex with 120 units. Using California Plumbing Code Chapter 6 and Appendix A would require us to upsize the entire main line. Instead, we used Appendix M. This alternative approach allowed us to get a stamped permitted set of drawings issued without upsizing any main lines. The resulting cost savings allowed the owner to proceed with the desired renovations. ”

— Robert Campbell Sr., Director of Multi-Family & Commercial Operations, Villara Building Systems (based in California)