

This factsheet offers an overview on an alternative methodology for sizing water pipes in new residential buildings. This methodology, contained in the 2021 Uniform Plumbing Code (UPC) Appendix M “Peak Water Demand Calculator,” offers local jurisdictions an opportunity to encourage water and energy savings by adopting this provision into local plumbing code.




The statewide Reach Codes team has also published a [Report](#) and [Executive Summary](#) analyzing the benefits of using the UPC Appendix M based on actual data for hot water flow rates in 20 multifamily buildings, ranging in size from eight to 384 apartments. The monitoring period ranged from nine days to over two years.

BASICS OF 2021 UPC APPENDIX M






2021 UPC Appendix M provides a method for estimating the demand load for the building water supply, principal branches, and risers for single family and multifamily dwellings.

BENEFITS

Using the 2021 UPC Appendix M “Peak Water Demand Calculator” to size water pipes results in a range of benefits, including:

-  Water and embedded energy savings due to faster hot water delivery times.
-  Additional energy savings due to decreased heat loss in the hot water distribution system, particularly in multifamily buildings with a recirculation system.
-  Construction cost savings due to smaller diameter pipes and fittings, less pipe insulation material, and reduced water service entrance size.

KEY POINTS

-  Peer-reviewed alternative pipe sizing methodology that was developed in response to the increased prevalence of low-flow fixtures in California and other states.
-  Culmination of a multi-year project, 2011- 2017, sponsored by the International Association of Plumbing and Mechanical Officials (IAPMO).
-  First major update of water pipe sizing in buildings in over 80 years.
-  Calculator is available as an Excel-based tool.
-  Added as Appendix M “Peak Water Demand Calculator” to 2018 IAPMO UPC for the first time; Appendix M was approved to remain in 2021 UPC.

STATUS OF LOCAL OR STATE ADOPTIONS

California

In the 2022 California Plumbing Code (CPC) code cycle, 2021 UPC was adopted but not its Appendix M. The California Department of Housing and Community Development has proposed to adopt UPC Appendix M for pipe sizing in the intervening cycle, which, if adopted, is effective July 1, 2024.

Local jurisdictions in California can adopt 2021 UPC Appendix M within their jurisdiction to capture water and energy savings prior to that time. Four jurisdictions in California have already adopted Appendix M into their local plumbing code provisions.

Foster City

Effective with the 2019 CPC edition
[Foster City Municipal Code](#)

City of San Jose

Effective with the 2019 CPC edition
[San Jose Municipal Code](#)

City of Oakland

Adopted in 2023
[City of Oakland Legislative Record](#)

County of Santa Cruz

Adopted in 2022
[Santa Cruz County Building Code](#)

Outside California

Numerous states and local jurisdictions have already adopted Appendix M into their plumbing code provisions.

State of Hawaii

Adopted in 2020
[Uniform Plumbing Code 2018 of Hawaii](#)

State of Nevada

Adopted in 2018
[2018 Nevada Plumbing Code](#)

State of New Mexico

[2021 New Mexico Plumbing Code](#)

State of North Dakota

Adopted in 2020
[2018 North Dakota Plumbing Code](#)

State of Oregon

Adopted in 2021
[2021 Oregon Plumbing Specialty Code](#)

City of Seattle and King County, Washington

[2018 Seattle Plumbing Code](#)

Model Municipal Code Language

Jurisdictions intending to incorporate Appendix M into their local codes could use the following model language:

“The following portions of the California Plumbing Code or CPC 2022 Edition appendices are approved, adopted, or incorporated by reference unless otherwise noted.

...

CPC Appendix M,
Peak Water Demand Calculator...”

RESOURCES AND MORE INFORMATION

[2021 UPC, Appendix M](#)

“Peak Water Demand Calculator”

[Water Demand Calculator](#) from IAPMO (International Association of Plumbing and Mechanical Officials)

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

[2020 Study on Water Demand Calculator](#) by Stantec (assessment of cost savings from using Water Demand Calculator)

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

[Case Study on Applying Water Demand Calculator on a Project](#) in the State of New York

[Short 3-min Intro Video](#) by Towle Whitney

[Training Presentation on How to Use Water Demand Calculator](#) from 2017 IAPMO Annual Conference

[2022 California Energy Code \(2022 Title 24, Part 6\), Proposed Measure C “CPC Appendix M Sizing”](#)