

Uniform Plumbing Code Appendix M: Alternative Methodology for Sizing Water Pipes

Opportunity for Early Adoption

Date: December 12, 2022

What is UPC Appendix M?

Water Demand Calculator (WDC v2.0)

PROJECT NAME :
Click for Drop-down Menu →

6th Avenue

Multi-Family Building

Total Number of Apartments in the Building →

24

Total Apartments in this Calculation →

24

Tuesday, July 27, 2021
6:24 PM

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	0.54	5.5	5.5
	2	Bidet	0	0.60	2.0	2.0
	3	Combination Bath/Shower	24	2.08	5.5	5.5
	4	Faucet, Lavatory	24	1.37	1.5	1.5
	5	Shower, per head (no Bathtub)	0	1.42	2.0	2.0
	6	Water Closet, 1.28 GPF Gravity Tank	0	0.60	3.0	3.0
Kitchen Fixtures	7	Dishwasher	0	0.36	1.3	1.3
	8	Faucet, Kitchen Sink	24	1.37	2.2	2.2
Laundry Room Fixtures	9	Clothes Washer	2	2.01	3.5	3.5
	10	Faucet, Laundry		1.37	2.0	2.0
Bar/Prep Fixtures	11	Faucet, Bar Sink	0	1.37	1.5	1.5
Other Fixtures	12	Fixture 1	0	0.00	0.0	6.0
	13	Fixture 2	0	0.00	0.0	6.0
	14	Fixture 3	0	0.00	0.0	6.0

DOWNLOAD RESULT

RESET WDC

↓ Select Units for Water Demand ↓

↓

↓

↓

RUN WDC

COMPUTED RESULTS FOR PEAK PERIOD CONDITIONS

Total No. of Fixtures in Calculation
n = 74

99th Percentile Demand Flow
Q = 17.5 GPM

Hunter Number
H(n,p) = 1.20

Stagnation Probability
Pr[Zero Demand] = 30%

An alternative method for estimating the demand load for the building water supply, principal branches, and risers for single- and multi-family dwellings

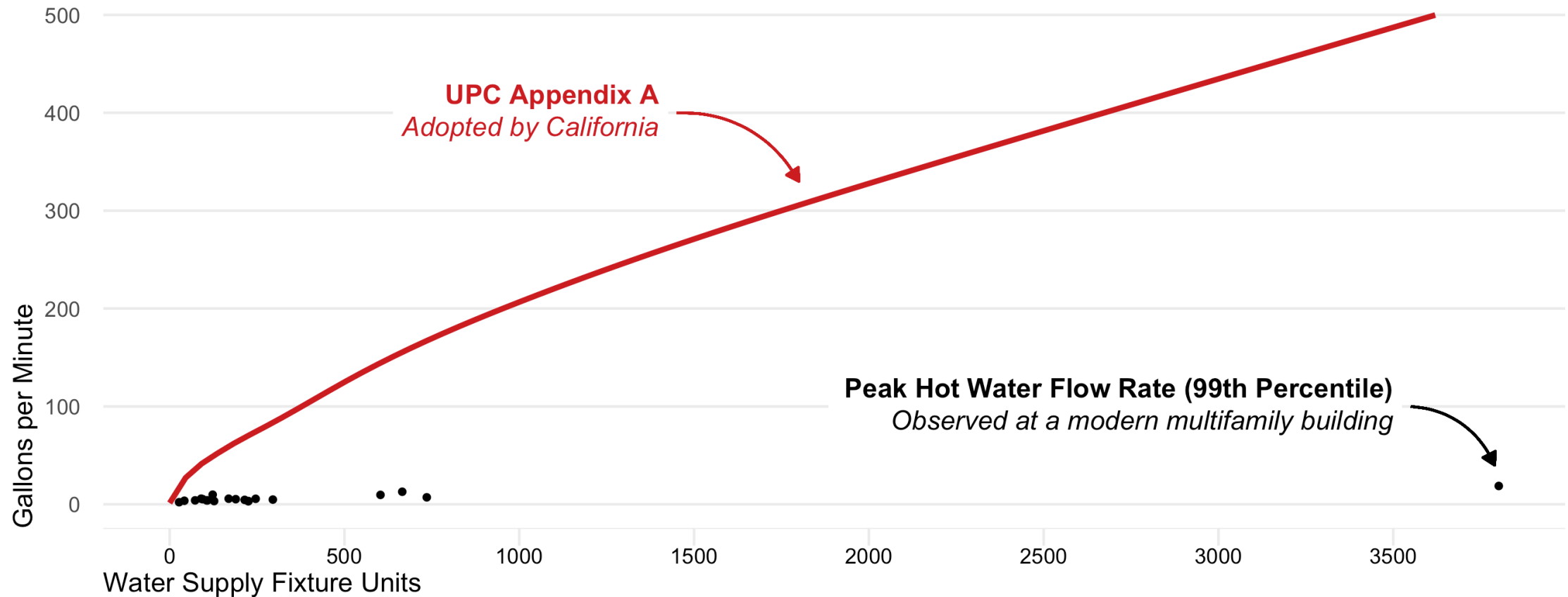
Benefits of Using UPC Appendix M

- **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
- **Reduced public health and safety risk** and improved water quality due to shorter water dwell times in plumbing systems
- **Construction cost savings** due to smaller diameter pipes and fittings, less pipe insulation material, and reduced water service entrance size

Standard Practice Overestimates Peak Flow Rates

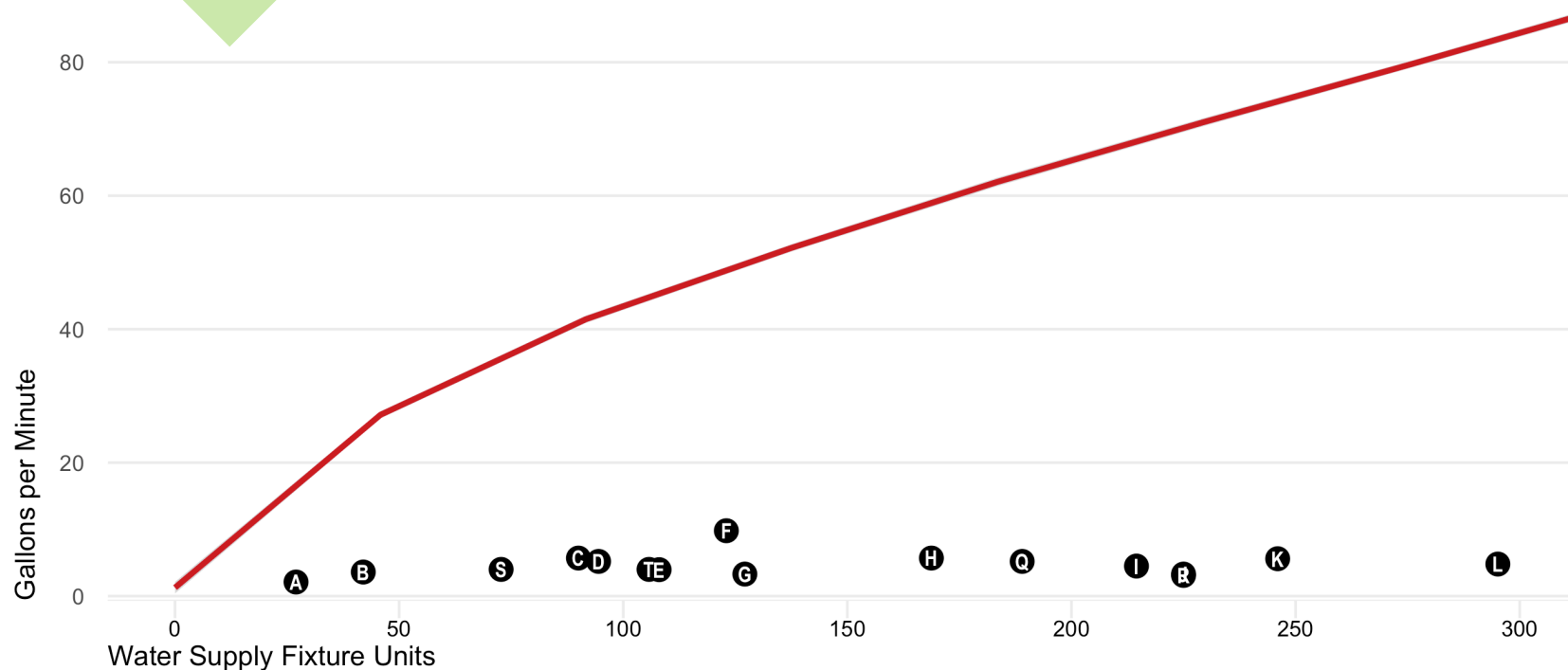
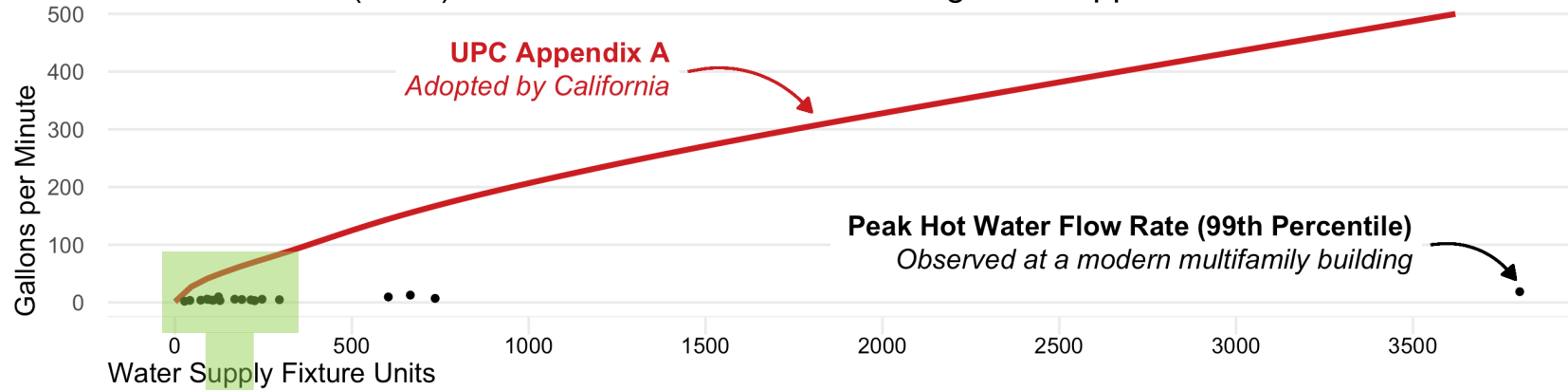
Comparing Hunter's Curve to Actual Peak Flow Rates

Hunter's Curve (1940) is the basis of Uniform Plumbing Code Appendix A



Comparing Hunter's Curve to Actual Peak Flow Rates

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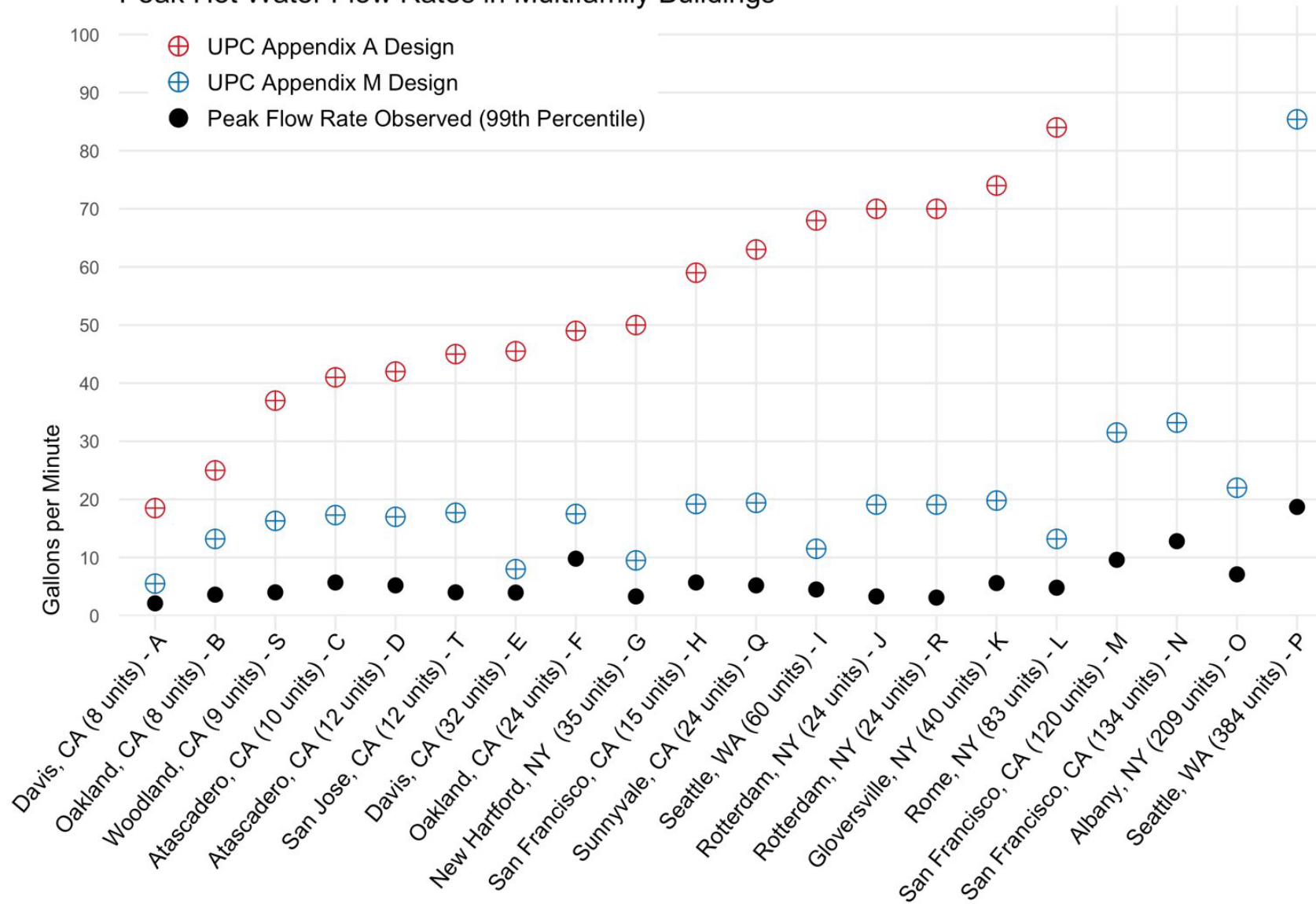


Analyzed actual hot flow rates from **20 multifamily buildings** ranging from 8 to 384 apartments

UPC Appendix A (standard practice) design values are 5 to 27 times larger than the observed peak hot water flow rates

Comparing Design Predictions to Actual Peak Flow Rates

Peak Hot Water Flow Rates in Multifamily Buildings



UPC Appendix M design values are between 2 and 6 times the observed peak hot water flow rates in 20 multifamily buildings

Monitoring period ranged from 9 days to over 2 years and logging interval ranged from 1 to 60 seconds depending on the building.
Out of order letters are for four buildings that were added after the submittal of the original 11/3/2021 petition to California state agencies.

Many thanks to Association for Energy Affordability, Ecotope, Frontier Energy, Peter Skinner, and UC Davis Western Cooling Efficiency Center for providing data.

Who Has Adopted UPC Appendix M Already?

Uniform Plumbing Code 2018 of Nevada

ADOPTS WITH AMENDMENTS:
UPC 2018

**2021 OREGON PLUMBING
SPECIALTY CODE**
Based on the 2021 Uniform Plumbing Code®

2018 North Dakota Plumbing Code

ADOPTS WITH AMENDMENTS:
UPC 2018

sanjoseca.gov

Uniform Plumbing Code 2018 of Hawaii

ADOPTS WITH AMENDMENTS:
UPC 2018

Foster City Municipal Code

TITLE 14	HOUSING AND CONSTRUCTION
CHAPTER 8	PLUMBING CODES
PART 2	2021 NEW MEXICO PLUMBING CODE

**2018 Seattle
Plumbing Code**

2018 Uniform Plumbing Code® as
Amended by the City of Seattle

Thank You

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