Cost of Service for the Public Fire customer class

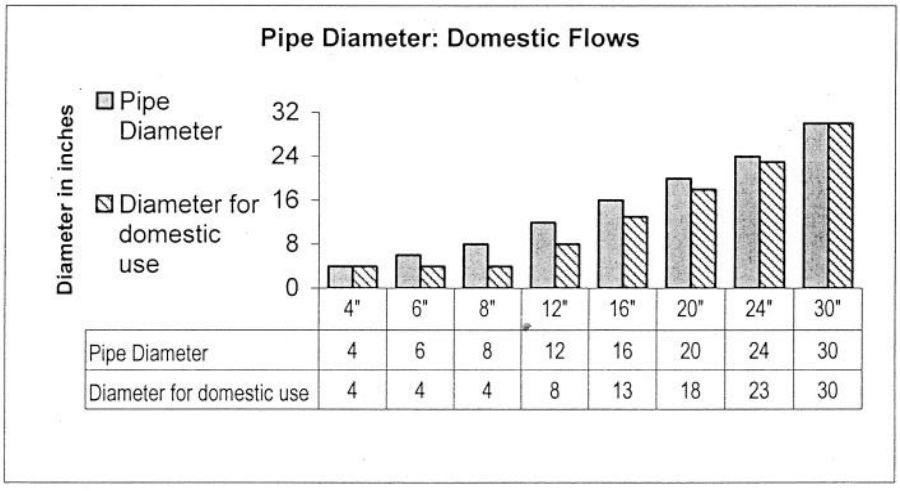
The Public Fire customer class is allocated four costs:

- **Hydrants**. This is simply the capital and O&M costs of the hydrants themselves. One hundred percent is allocated to public fire.
- **Reservoirs**. Public Fire is allocated 2% of reservoir costs based on an engineering analysis of the proportion of capacity devoted to each use (peaking requirements, fire protection, and longer storage for emergencies, e.g. earthquake).
- **Watermains**. Watermains are sized to meet fire flow requirements and domestic demands for water. Public fire is allocated 47% of watermain costs based on the analysis below.
- **Composite Allocator**. Public fire is allocated a portion of "overhead" costs based on the overall allocation of all directly allocated costs.

Calculation of Watermains Allocator

Watermains are sized to meet fire flow requirements and domestic demands for water. In sizing the watermain, the pipe must have sufficient capacity to meet two separate criteria; (i) peak hour domestic demand and (ii) peak day domestic demand + fire flow requirements. For medium and small-size pipes (8 inch diameter or less) the second criteria will be the binding constraint. For larger size pipe i.e., pipes that are serving very large areas or areas with very dense developments, the first criteria (peak hour demand) will be the binding constraint.

The most common size pipe in Seattle's system is, by far, an 8 inch diameter pipe. In areas served by 8 inch mains, domestic peak hour flows, i.e., the first criteria, can typically be met with a 4 inch mains. The oversizing from 4 inch to 8 inch is needed to meet the second criteria. Taking into account that hydraulic capacity grows exponentially with the diameter of the pipe, this means about 25 percent of the 8 inch pipe is serving domestic flows and 75 percent is providing fire protection. For pipes larger than 8 inch, the share of capacity needed for fire flows shrinks until we reach pipes with diameters of 30 inch or more. The graph below shows the relationship between pipe size and fire flow requirements expressed in diameters.



	4"	6"	8"	12"	16"	20"	24"	30"
Pipe Diameter	4	6	8	12	16	20	24	30
Diameter for domestic use	4	4	4	8	13	18	23	30

The cost of watermains is split between fire protection and domestic uses based of the shares of hydraulic capacity discussed above. The first step is to compute the installed cost for all the mains in the system.

[Step 1] Installed Cost $= \sum (\$Cost/ LF_d) \times (LF_d)$ summed over all diameters.
where $\$Cost/ LF_d$ = the installed cost per lineal feet of a pipe of diameter 'd' ,and
where LF_d = the number of lineal feet in the system of pipe of diameter 'd'.

The second step is to determine cost associated with fire protection service.

[Step 2] Fire Protection Installed Cost =
$\sum$(Hydraulic Capacity for $Fire_d$)÷(Hydraulic Capacity of $Pipe_d$)x($\$Cost/ LF_d$)x($LF_d$)

The final step is to determine the proportion of the installed cost devoted to fire protection.

[Step 3] Proportion of installed costs for fire protection =
(Fire Protection Installed Cost) ÷ (Installed Cost)

The percentage share determined in Step 3 is then used to assign watermain costs to fire protection. As it turns out, the cost share for fire protection for the entire system comes to 47 percent.