TABLE 1. PROPER FLOW AND PRESSURE REQUIRED DURING FLOW FOR DIFFERENT FIXTURES

FIXTURE	FLOW PRESSURE[a]	FLOW gpm
Ordinary basin faucet	8	3.0
Self-closing basin faucet	12	2.5
Sink faucet—3/8 in.	10	4.5
Sink faucet—1/2 in.	5	4.5
Bathtub faucet	5	6.0
Laundry tub cock—1/4 in.	5	5.0
Shower	12	5.0
Ball-cock for closet	15	3.0
Flush valve for closet	10–20	15–40[b]
Flush valve for urinal	15	15.0
Garden hose, 50 ft, and sill cock	30	5.0

[a] Flow pressure is the pressure in the pipe at the entrance to the particular fixture considered.
[b] Wide range due to variation in design and type of flush-valve closets.

In general, a daily per capita water consumption of 40 gal can be used as a safe design figure for *housing projects*.

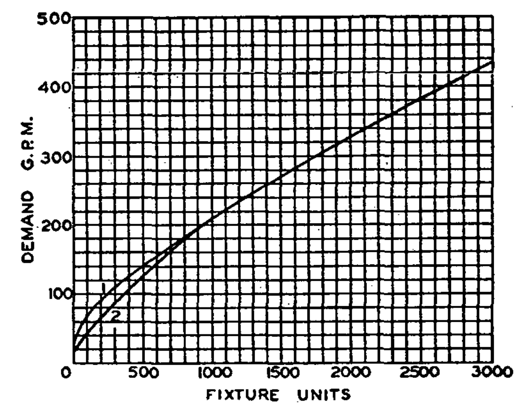
Table 1 gives the rate of flow desirable for many common types of fixtures, and the average pressure necessary to give this rate of flow. The pressure necessarily varies with fixture design; with some, a much greater pressure is necessary to give the same rate of flow than with others. In general, the lower the quality of the faucet the greater will be the pressure required.

In estimating the load, the rate of flow is frequently computed in *fixture units*. One *fixture unit* is equivalent to 7.5 gal per min. Table 2 gives the demand weights in terms of fixture units for different plumbing fixtures under several conditions of service, and Fig. 1 gives the estimated demand in gallons per minute corresponding to any total number of fixture units. Fig. 2 shows an enlargement of Fig. 1 for a range up to 250 fixture units.

TABLE 2. DEMAND WEIGHTS OF FIXTURES IN FIXTURE UNITS[a]

FIXTURE OR GROUP[b]	OCCUPANCY	TYPE OF SUPPLY CONTROL	WEIGHT IN FIXTURE UNITS[c]
Water closet	Public	Flush valve	10
Water closet	Public	Flush tank	5
Pedestal urinal	Public	Flush valve	10
Stall or wall urinal	Public	Flush valve	5
Stall or wall urinal	Public	Flush tank	3
Lavatory	Public	Faucet	2
Bathtub	Public	Faucet	4
Shower head	Public	Mixing valve	4
Service sink	Office, etc.	Faucet	3
Kitchen sink	Hotel or restaurant	Faucet	4
Water closet	Private	Flush valve	6
Water closet	Private	Flush tank	3
Lavatory	Private	Faucet	1
Bathtub	Private	Faucet	2
Shower head	Private	Mixing valve	2
Bathroom group	Private	Flush valve for closet	8
Bathroom group	Private	Flush tank for closet	6
Separate shower	Private	Mixing valve	2
Kitchen sink	Private	Faucet	2
Laundry trays (1-3)	Private	Faucet	3
Combination fixture	Private	Faucet	3

[a] For supply outlets likely to impose continuous demands, estimate continuous supply separately and add to total demand for fixtures.
[b] For fixtures not listed, weights may be assumed by comparing the fixture to a listed one using water in similar quantities and at similar rates.
[c] The given weights are for total demand. For fixtures with both hot and cold water supplies, the weights for maximum separate demands may be taken as 3/4 the listed demand for the supply.



No. 1 for system predominantly for flush valves.
No. 2 for system predominantly for flush tanks.

FIG. 1. ESTIMATE CURVES FOR DEMAND LOAD

The estimated demand load for fixtures used intermittently on any supply pipe will be obtained by multiplying the number of each kind of fixture supplied through that pipe by its weight from Table 2, adding the products, and then referring to the appropriate curve of Figs. 1 or 2 to find the demand corresponding to the total fixture units. In using this method it should be noted that the demand for fixture or supply outlets other than those listed in the table of fixture units is not yet included in the estimate. The demands for outlets (such as hose connections, air conditioning apparatus, etc.) which are likely to impose continuous demand during times of heavy use of the weighted fixtures, should be estimated separately and added to the demand for fixtures used intermittently, in order to estimate the total demand.

So far, the information presented makes possible the determination of the *design rate of flow* in any particular section of piping. The next general step is to determine the *size* of piping.

As water flows through a pipe, the pressure continually decreases along the pipe, due to loss of energy from friction. The problem is then one of ascertaining the minimum pressure in the street main, and the minimum

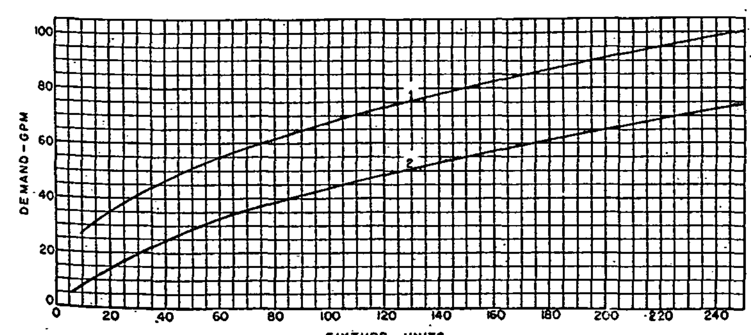


FIG. 2. SECTION OF FIG. 1 ON ENLARGED SCALE