environmental engineers' handbook

TABLE 7.1.3 TYPICAL WASTEWATER FLOW RATES FROM COMMERCIAL SOURCES

Source	Unit	Flow, gal/unit·d Range	Flow, gal/unit·d Typical
Airport	Passenger	2–4	3
Automobile service station	Vehicle served	7–13	10
	Employee	9–15	12
Bar	Customer	1–5	3
	Employee	10–16	13
Department store	Toilet room	400–600	500
	Employee	8–12	10
Hotel	Guest	40–56	48
	Employee	7–13	10
Industrial building (sanitary waste only)	Employee	7–16	13
Laundry (self-service)	Machine	450–650	550
	Wash	45–55	50
Office	Employee	7–16	13
Restaurant	Meal	2–4	3
Shopping center	Employee	7–13	10
	Parking space	1–2	2

Source: Metcalf and Eddy, Inc., 1991.
Note: l = gal × 3.7854.

TABLE 7.1.4 TYPICAL WASTEWATER FLOW RATES FROM INSTITUTIONAL SOURCES

Source	Unit	Flow, gal/unit·d Range	Flow, gal/unit·d Typical
Hospital, medical	Bed	125–240	165
	Employee	5–15	10
Hospital, mental	Bed	75–140	100
	Employee	5–15	10
Prison	Inmate	75–150	115
	Employee	5–15	10
Rest home	Resident	50–120	85
School, day			
With cafeteria, gym, and showers	Student	15–30	25
With cafeteria only	Student	10–20	15
Without cafeteria and gym	Student	5–17	11
School, boarding	Student	50–100	75

Source: Metcalf and Eddy, Inc., 1991.
Note: l = gal × 3.7854.

tion, and other nondomestic sources such as industrial wastewater discharges. Environmental engineers may need to use population forecasting to project future rates of wastewater generation in the service area of a wastewater treatment plant. Some mathematical or graphical methods used to project population data to a design year include (Qasim 1985):

- arithmetic growth
- geometric growth
- decreasing rate of increase
- mathematical or logistic curve fitting
- graphical comparison with similar cities
- ratio method
- employment forecast
- birth cohort

Water usage exhibits daily, weekly, and seasonal p terns; and wastewater flow rates can also exhibit such p terns. Figures 7.1.1 and 7.1.2 show typical hourly, da