2. effluent from a septic tank or other pretreatment component that has $BOD_5$ greater than 170 mg/L; and/or TSS greater than 60 mg/L; and/or fats, oils, and grease greater than 25 mg/L and is applied to an infiltrative surface.

# Biochemical Oxygen Demands ($BOD_5$), Dissolved Oxygen, and Total Suspended Solids (TSS)

Biochemical oxygen demand ($BOD_5$) is the most widely used parameter applied to wastewater. $BOD_5$ is a measure of the dissolved oxygen required by microorganisms to oxidize or decompose the organic matter in wastewater. A typical $BOD_5$ value for septic tank effluent is 150 milligrams per liter. For a Type I system, the $BOD_5$ limit is 170 milligrams per liter.

When the dissolved oxygen (DO) contained in septic tank effluent is measured, it is usually very low, typically one milligram per liter. While DO in water can be as high as 12 milligrams per liter, the microorganisms in the septic tank normally use up any available oxygen to break down organic matter.

Total suspended solids (TSS) is a measure of the solids that remain in the wastewater after settling has occurred in the tank. A typical TSS value is 60 milligrams per liter. BOD and total suspended solids together measure the strength of the wastewater. They can serve as an indicator of system performance. Table 5.8 identifies estimated BOD for other establishments. The data is taken from a CIDWT Publication entitled, Analyzing Wastewater Treatment Systems Serving Residential and Commercial Facilities for High Strength and Hydraulic Loading, 2008. You can calculate the estimated concentration of $BOD_5$ by using the following equation:

Concentration (mg/L) = # lbs $BOD_5$ ÷ Q(gpd) ÷ 8.35 X 1,000,000

**TABLE 5.8 Estimate of Waste Strengths from Other Establishments**

| Type of Facility | BOD (lbs/unit/day) |
|---|---|
| Airports | |
| Per passenger | 0.02 |
| Per employee | 0.05 |
| Apartment houses– multiple family | 0.175/unit |
| Boarding houses | 0.14/person |
| Bowling alley (no kitchen) | 0.15/lane |
| Camps | |
| Construction (Semi-permanent) | 0.140/person |
| Day (no meals) | 0.031/person |
| Luxury | 0.208/person |
| Resort - night & day/limited plumbing | 0.140/person |
| Church (no kitchen) | 0.02/seat |
| Country club | 0.208/member |
| Dwelling– single family | 0.17/person |
| Employee/personnel addition | 0.04/employee |
| Factory | |
| No showers | 0.073/employee |
| With showers | 0.083/employee |
| Hospital | 0.518/bed |

| TABLE 5.8 Estimate of Waste Strengths from Other Establishments (cont'd) | |
|---|---|
| Hotel | 0.125 per room/ two person |
| Mobile home park | 0.140/person |
| Motel<br>per bed space<br>Per room w/ bath, toilet & kitchen wastes | <br>0.083/bed<br>0.14/person |
| Nursing home | 0.26/person |
| Office building (no food) | 0.05/employee |
| Park<br>toilet wastes only<br>bathhouses, showers and flush toilets | <br>0.01/person<br>0.021/person |
| Restaurant<br>Kitchen waste<br>Toilet and kitchen waste<br>Additional for bars and cocktail lounges | <br>0.015/meal<br>0.021/customer<br>0.01/customer |
| School, day<br>Add for gym/showers<br>Add for cafeteria | 0.031/student<br>0.011/student<br>0.011/student |
| School, boarding | 0.208/student |
| Service station | 0.021/vehicle served |
| Shopping center (no food service or laundry) | 0.050/employee |
| Sports stadiums | 0.20/person |
| Stores | 0.832/toilet room |
| Swimming pools and bathhouses | 0.021/person |
| Theaters<br>Drive-in<br>Indoor | <br>0.010/car space<br>0.010/seat |
| Trailer Park | 0.35/trailer |

## Types of BOD

### *Biochemical Oxygen Demand*

BOD or Biochemical Oxygen Demand is the quantity of dissolved oxygen consumed by microorganisms during the microbial and chemical oxidation of the constituents contained in a wastewater sample during an incubation period at a given temperature. The biochemical oxygen demand represents the oxygen utilized during the oxidation of both carbon and nitrogenous compounds.

### *Biochemical Oxygen Demand ($BOD_5$)*

$BOD_5$ or Biochemical Oxygen Demand – 5-day is the quantity of dissolved oxygen consumed by microorganisms during the breakdown of organic matter in a wastewater sample during a 5-day incubation period and measured in mg/L at 20°C. It is used as a means to describe the amount of organic matter present in the water.

Biodegradable organic matter is provided in terms of pounds of $BOD_5$ per person (capita) per day by using the $BOD_5$ concentration and daily flow. Biochemical oxygen demand is a measure of the oxygen required by bacteria, chemicals, and other organisms to break down organic matter over a five day period. It is an indicator of the overall strength of the wastewater. Most designs assume that all residential sources generate a concentration of 300 mg/L of $BOD_5$, and after pretreatment in a properly sized septic tank the $BOD_5$ is reduced to approximately 170 mg/L (Table 5.7). However, these concentrations can vary from site to site.