PRIMARY SEDIMENTATION

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PRIMARY SEDIMENTATION TANK DESIGN

Basic Design Criteria

- Surface loading ($m^3/m^2 \cdot hr$)
- Hydraulic retention time (hr)
- Weir Loading ($m^3/m.gün$)

Table 5–20
Typical design information for primary sedimentation tanks[a]

Item	U.S. customary units			SI units		
	Unit	Range	Typical	Unit	Range	Typical
Primary sedimentation tanks followed by secondary treatment						
Detention time	h	1.5–2.5	2.0	h	1.5–2.5	2.0
Overflow rate						
Average flow	gal/ft²·d	800–1200	1000	m³/m²·d	30–50	40
Peak hourly flow	gal/ft²·d	2000–3000	2500	m³/m²·d	80–120	100
Weir loading	gal/ft·d	10,000–40,000	20,000	m³/m·d	125–500	250
Primary settling with waste activated-sludge return						
Detention time	h	1.5–2.5	2.0	h	1.5–2.5	2.0
Overflow rate						
Average flow	gal/ft²·d	600–800	700	m³/m²·d	24–32	28
Peak hourly flow	gal/ft²·d	1200–1700	1500	m³/m²·d	48–70	60
Weir loading	gal/ft·d	10,000–40,000	20,000	m³/m·d	125–500	250

Table 5–21
Typical dimensional data for rectangular and circular sedimentation tanks used for primary treatment of wastewater

Item	U.S. customary units			SI units		
	Unit	Range	Typical	Unit	Range	Typical
Rectangular:						
Depth	ft	10–16	14	m	3–4.9	4.3
Length	ft	50–300	80–130	m	15–90	24–40
Width[a]	ft	10–80	16–32	m	3–24	4.9–9.8
Flight speed	ft/min	2–4	3	m/min	0.6–1.2	0.9
Circular:						
Depth	ft	10–16	14	m	3–4.9	4.3
Diameter	ft	10–200	40–150	m	3–60	12–45
Bottom slope	in/ft	3/4–2/ft	1.0/ft	mm/mm	1/16–1/6	1/12
Flight speed	r/min	0.02–0.05	0.03	r/min	0.02–0.05	0.03

[a] If widths of rectangular mechanically cleaned tanks are greater than 6 m (20 ft), multiple bays with individual cleaning equipment may be used, thus permitting tank widths up to 24 m (80 ft) or more.

PRIMARY SEDIMENTATION TANK DESIGN

PRIMARY SEDIMENTATION TANK REMOVAL EFFICIENCIES

German ATV-DVWK-A 131 E (May, 2000)
Dimensioning of Single-Stage Activated Sludge Plants

Table 1: Inhabitant-specific loads in g/(I·d), which are undercut on 85 % of the days, without taking into account sludge liquor

Parameter	Raw wastewater g/c.d	Flow time in the primary settling stage with $Q_{h,DW}$	
		0.5 to 1.0 h	1.5 to 2.0 h
BOD_5	60	45	40
COD	120	90	80
DS	70	35	25
TKN	11	10	10
P	1.8	1.6	1.6

PRIMARY SEDIMENTATION TANK DESIGN

Metcalf & Eddy (2003)

BOD and TSS Removal. Typical performance data for the removal of BOD and TSS in primary sedimentation tanks, as a function of the detention time and constituent concentration, are presented on Fig. 5–46. The curves shown on Fig. 5–46 are derived from observations of the performance of actual sedimentation tanks. The curvilinear relationships in the figure can be modeled as rectangular hyperbolas using the following relationship (Crites and Tchobanoglous, 1998).

$$R = \frac{t}{a + bt} \qquad (5\text{–}45)$$

where R = expected removal efficiency
t = nominal detention time T
a, b = empirical constants

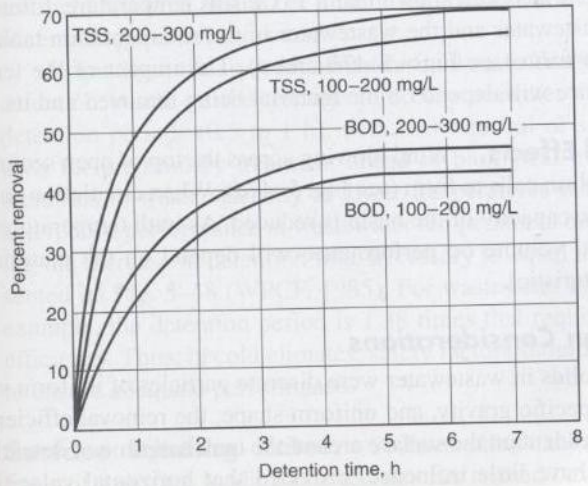

Figure 5–46
Typical BOD and TSS removal in primary sedimentation tanks. (Greeley, 1938.)

Typical values for the empirical constants in Eq. (5–45) at 20°C are as follo

Item	*a*	*b*
BOD	0.018	0.020
TSS	0.0075	0.014

PRIMARY SEDIMENTATION TANK DESIGN

Influent Structures

Feeding well diameter 15-20 % tank diameter

Depth : 1- 2.5 m

Orifice velocity < 0.75 m/sn

deflection wall : not to disturb sludge

PRIMARY SEDIMENTATION TANK DESIGN

Travelling Bridge, Sludge scraping mechanism, Oil/scum and sludge collection

- **full bridge, half bridge, 2/3 bridge**

Based on tank diameter acc. DIN

standards

- **oil/scum collection mechanism, pumps on the bridge**

- bottom slope (> 3^0) (1/12- 1/15)

  - **Sludge withdrawal** → telescopic valve

  - Sludge hopper, bottom slopes, volumes

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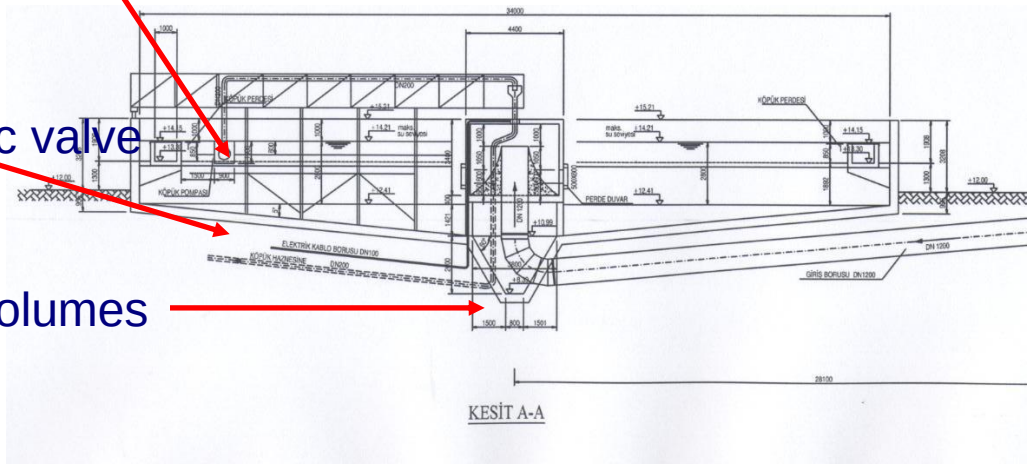
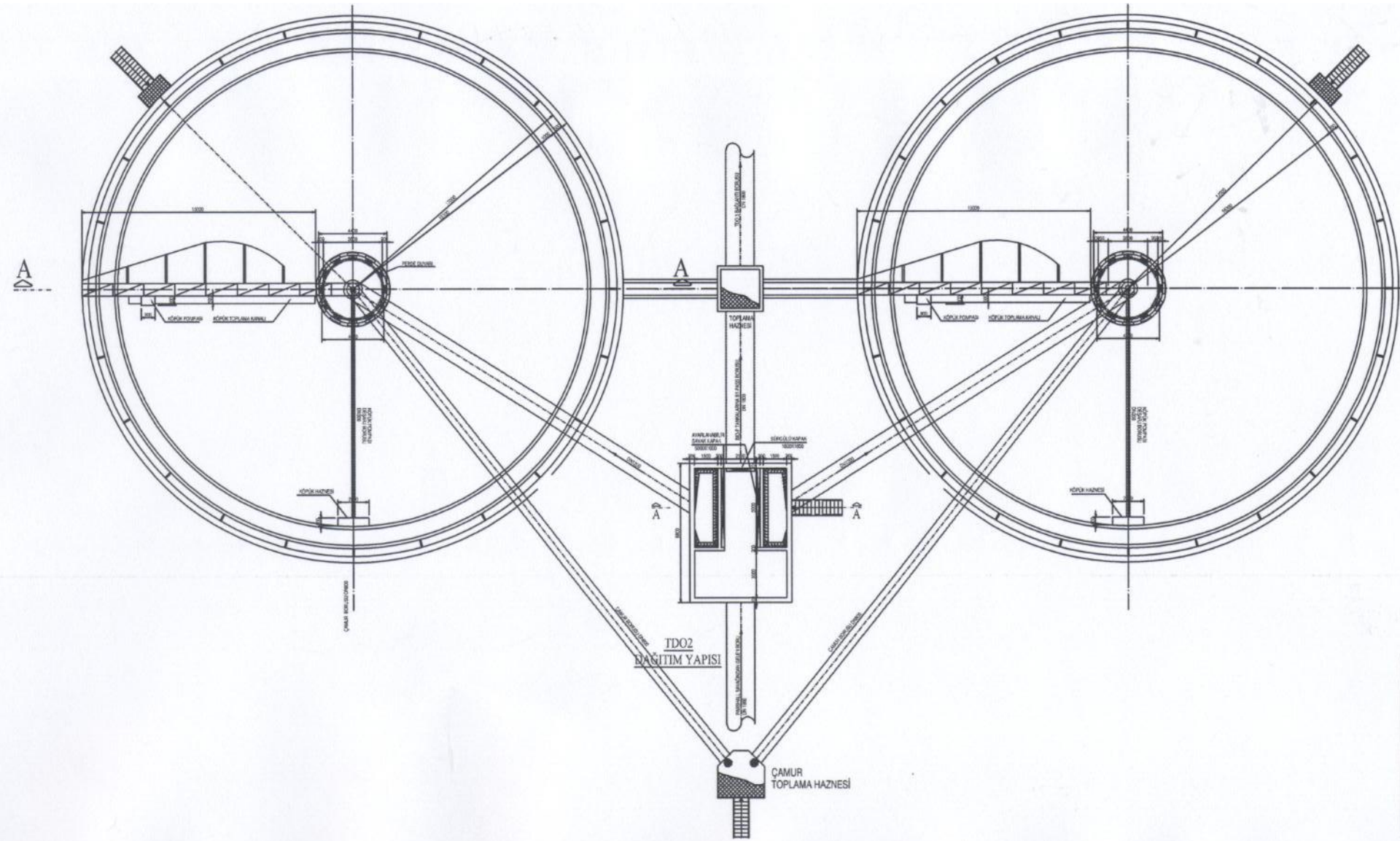


PRIMARY SEDIMENTATION TANK DESIGN

Effluent Structures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