

8.1. INFRASTRUCTURE--CAPITAL COSTS

8.1.6. WASTEWATER TREATMENT

8.1.6.1. CLARIFICATION

Clarification capital cost is for the acquisition and installation of equipment for water clarification and softening by precipitation and/or coagulation. The all metal solids-contact clarifier combines into one operation--quick mixing, flocculation, clarification, and sludge thickening. The unit will selectively or simultaneously remove turbidity, color, organic matter, manganese, iron, hardness, alkalinity, taste, and odor. The cost curve is based on clarifiers ranging in diameter from 2.74 m to 45.72 m (cross-sectional area ranging from 5.9 to 1,642 m²).

BASE CURVES

Total cost is based on a single cost curve having a tank diameter of (X) in meters. The curve includes all costs associated with acquisition and installation of concrete pad, clarifier structure, and control-monitor equipment for sludge level and sludge density control.

The total clarification capital cost derived from the curve is a combination of the following costs:

Construction labor cost.....	19%
Construction supply cost.....	5%
Purchased equipment cost.....	76%

The total clarification capital cost is $(Y_C) = 15,631.070(X)^{0.991}$ and is distributed as follows:

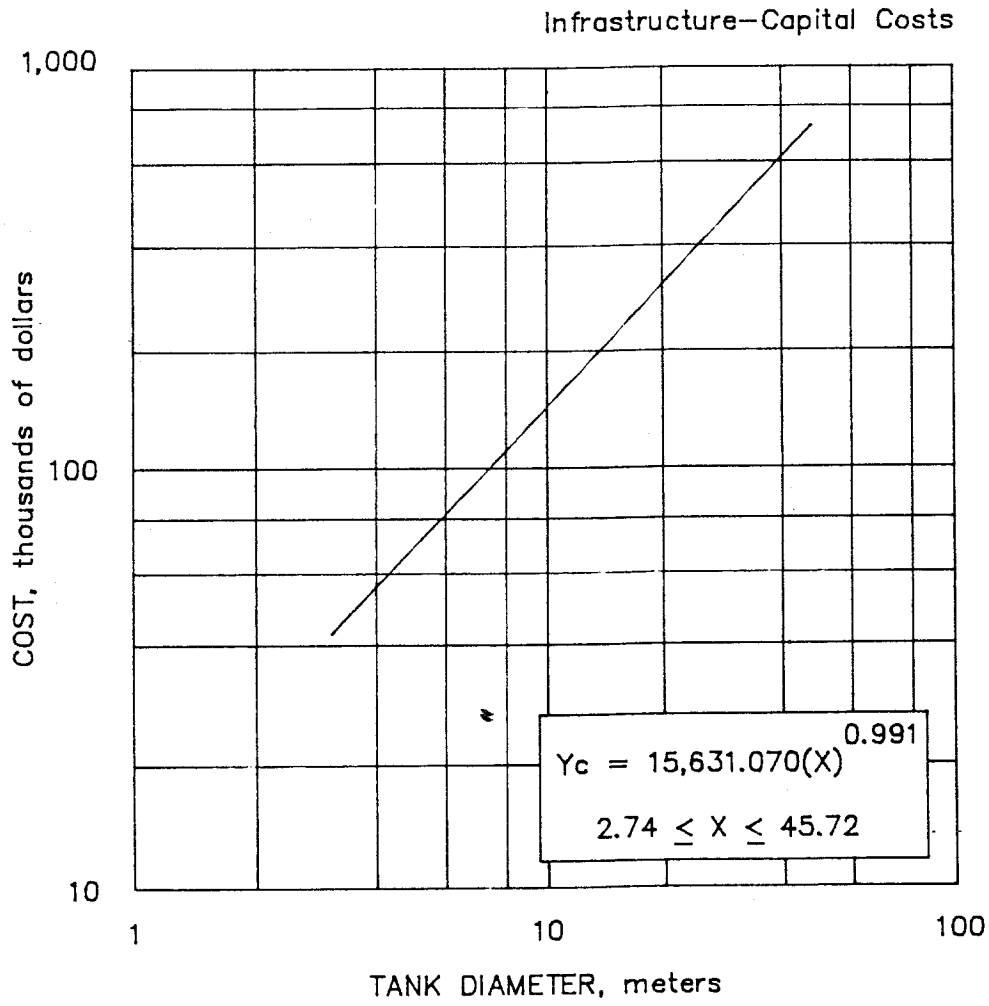
(L) <u>Construction Labor Cost</u>	$(Y_L) = 2,969.910(X)^{0.991}$
(S) <u>Construction Supply Cost</u>	$(Y_S) = 781.550(X)^{0.991}$
(E) <u>Purchased Equipment Cost</u>	$(Y_E) = 11,879.610(X)^{0.991}$

Note--Sizing, of clarifier is based on one principal parameter--'rise rate', the vertical velocity of the stream through the clarifier. If the diameter or cross-sectional area of the clarifier is unknown, and the feed flow rate is known and the rise rate is assumed to be 0.015 m/min, then the diameter (D), or equivalent cross-sectional area, of the clarifier can be estimated with the equation:

$$\text{Clarifier diameter } (D) = 1.128[(Q)/(R)]^{0.500}$$

where R = rise rate, in meters per minute,
and Q = design flow rate, in cubic meters per minute.

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8.1.6.1. Wastewater treatment
CLARIFICATION

8.1. INFRASTRUCTURE--CAPITAL COSTS

8.1.6. WASTE WATER TREATMENT

8.1.6.2. NEUTRALIZATION

The Environmental Protection Agency's publication EPA-600/2-82-00/d "Treatability Manual, Vol. IV, Cost Estimating," April 1983, was the source of cost development. One is referred to this manual if further detail in neutralization costs is needed. Additionally, other waste water treatment methods are costed in this EPA manual.

The capital cost curves cover neutralization of waste water effluent (out-of-pipe) when required. The basic design variable is waste water flow. Applicability of the curves are for effluent to be neutralized that ranges in volume from 0.001 to 876 L/s (22.8 gal to 20 million gal/d). It is assumed that flow equalization is provided by a tailings pond. The costs apply to the neutralization of either acidic or basic waste water streams originating from mine, mill, or combined mine and mill after it flows 'out-of-pipe' from the central impoundment pond. In most mining operations further waste water treatment costs are not required. The system consists of chemical addition and two-stage neutralization tanks. It is assumed that pH and suspended/dissolved solid content of influent to the system will be unknown at this level of costing. Basis of design uses a standard dosage of 100 mg/L lime and 100 mg/L acid to achieve a pH of 7.0 over a pH range of 6.5 to 8.0.

BASE CURVES

Total costs are described by two sets of cost curves based on daily average waste water flow rate (X), in liters per second. The curves include all costs associated with the construction of the treatment facility including mixing tank, attenuation tank, chemical storage, agitators, piping, electrical, and instrumentation. These costs are distributed as follows:

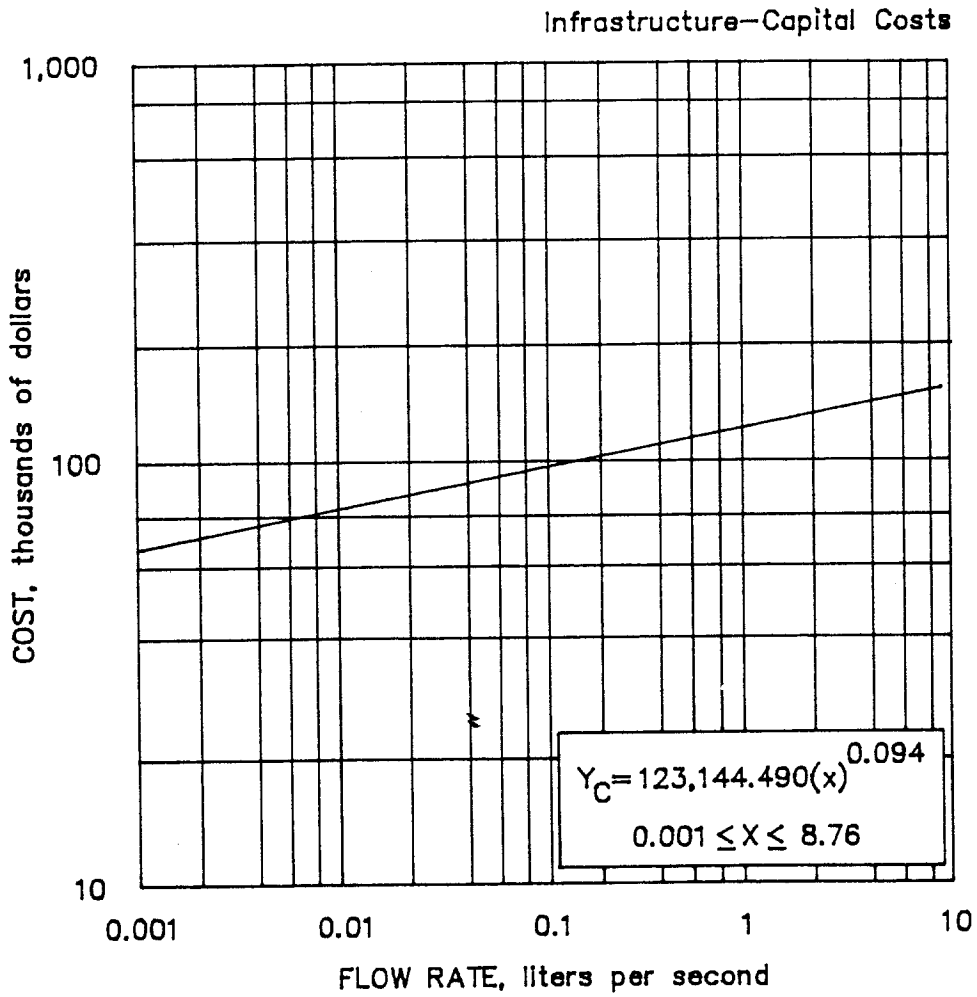
Construction labor cost.....	22%
Construction supply cost.....	13%
Purchased equipment cost.....	65%

For waste water effluent rates between 0.001 to 8.76 L/s the capital cost is $(Y_C 0.001-8.76 \text{ L/s}) = 123,144.490(X)^{0.094}$ and is distributed as follows:

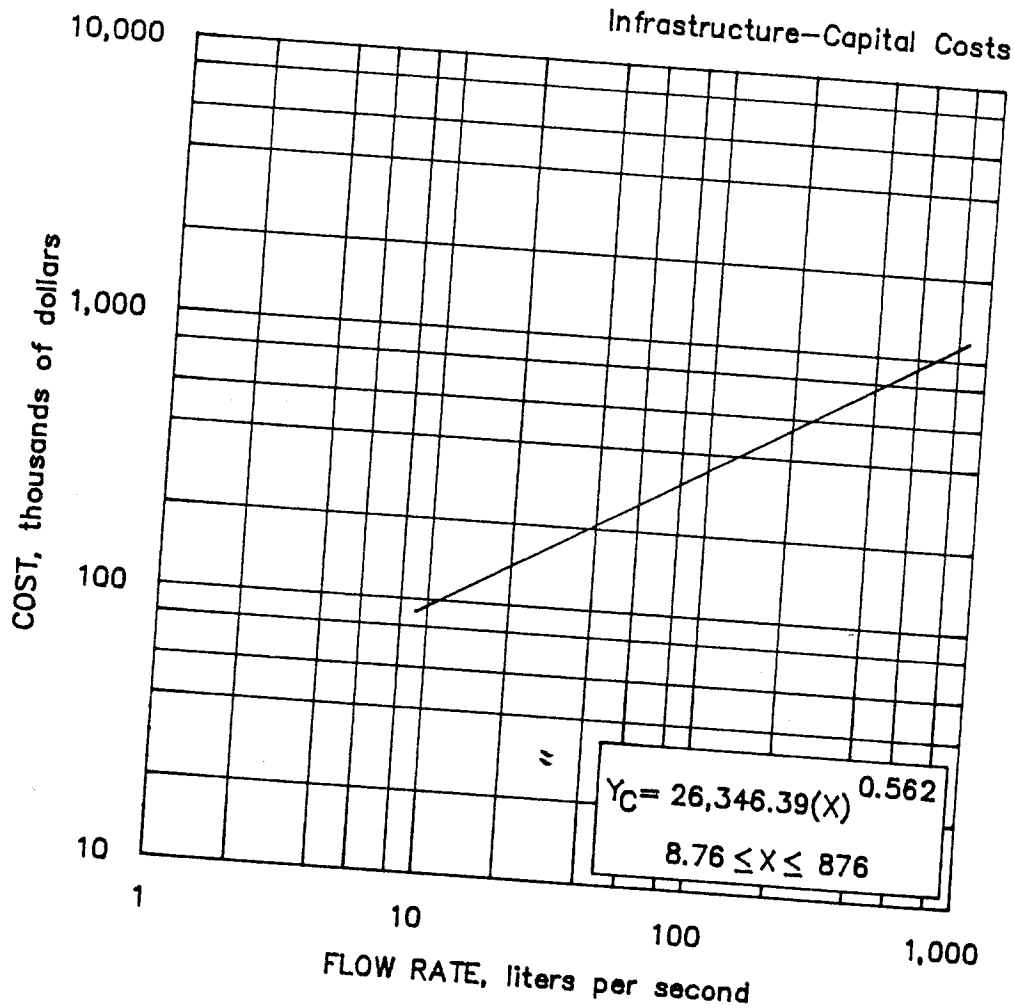
(L) <u>Construction Labor Cost</u>	$(Y_L 0.001-8.76 \text{ L/s}) = 27,091.780(X)^{0.094}$
(S) <u>Construction Supply Cost</u>	$(Y_S 0.001-8.76 \text{ L/s}) = 16,008.780(X)^{0.094}$
(E) <u>Purchased Equipment Cost</u>	$(Y_E 0.001-8.76 \text{ L/s}) = 80,043.930(X)^{0.094}$

For waste water effluent rates between 8.76 to 876 L/s the capital cost is $(Y_C 8.76-876 \text{ L/s}) = 26,346.39(X)^{0.562}$ and is distributed as follows:

(L) <u>Construction Labor Cost</u>	$(Y_L 8.76-876 \text{ L/s}) = 5,796.21(X)^{0.562}$
(S) <u>Construction Supply Cost</u>	$(Y_S 8.76-876 \text{ L/s}) = 3,425.03(X)^{0.562}$
(E) <u>Purchased Equipment Cost</u>	$(Y_E 8.76-876 \text{ L/s}) = 17,125.15(X)^{0.562}$



8.1.6.2.a Wastewater treatment
NEUTRALIZATION



8.1.6.2.b Wastewater treatment
NEUTRALIZATION