

## 4.2. UNDERGROUND MINING--CAPITAL COSTS

## 4.2.4. TRANSPORTATION

## 4.2.4.4. RAILROAD CONSTRUCTION

The cost in this section covers the capital expense for laying standard-gage trackage for main lines and spurs. The cost reflects railway installation by a crew that works on a one-shift-per-day schedule; furthermore, the cost is based on trackage that is fully ballasted.

## BASE CURVE

The total capital cost is based on a single cost curve having a railroad length (X), in total kilometers. The curve is valid for a length range of 1 to 60 km, operating one shift per day.

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

Construction labor cost.....	26%
Construction supply cost.....	69%
Purchased equipment cost.....	5%

The total railroad construction capital cost is  $(Y_C) = 188,530.000(X)^{1.000}$  and is distributed as follows:

(L) Construction Labor Cost  $(Y_L) = 49,017.800(X)^{1.000}$

(S) Construction Supply Cost  $(Y_S) = 130,085.700(X)^{1.000}$

(E) Purchased Equipment Cost  $(Y_E) = 9,426.500(X)^{1.000}$

## ADJUSTMENT FACTORS

Ballast Factor For the installation of standard-gauge trackage without ballast, multiply the cost obtained from the base curve by the following factor:

Ballast factor  $(F_B) = 0.85$

Roadbed Construction For construction expenses resulting from roadbed clearing, drill and blast, and excavation, refer to Access Roads sections (4.2.7.1.1.-4.2.7.1.3.) and apply a roadway width of 6.1 m to the applicable cost equations; the additional railway expenses so derived should then be added to this section's capital cost.

Equipment Factor When it is necessary to purchase equipment or to have a subcontractor perform the work, multiply the equipment operation value by the following factor in order to obtain the total value of equipment expense for ownership and operation:

Equipment operation factor  $(Y_E) = 1.7$

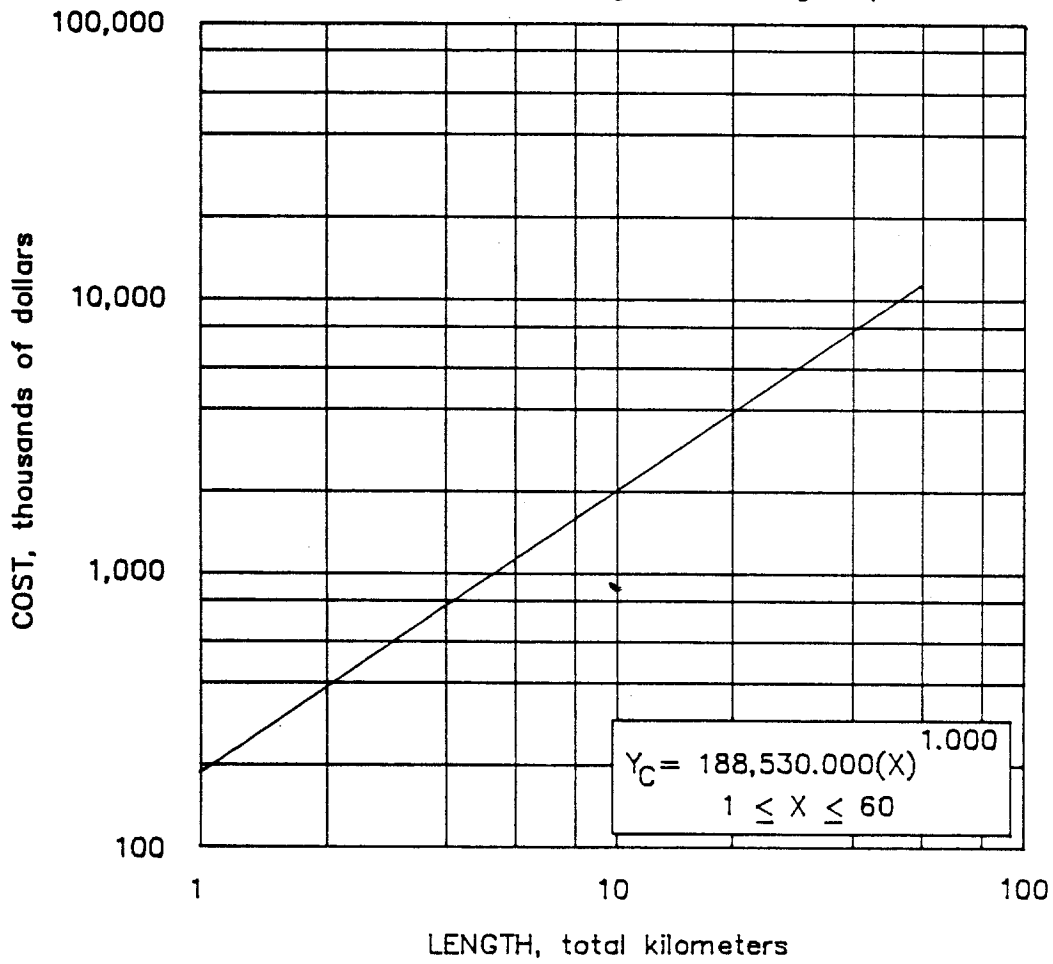
Subcontractor Factor If a subcontractor is used, to compensate for the subcontractor's markup, multiply the costs obtained from the curves by the following factors:

Labor factor  $(Y_L) = 1.5$

Supply factor  $(Y_S) = 1.2$

Equipment operation factor  $(Y_E) = 1.2$

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4.2.4.4. Railroad construction

## 4.2. UNDERGROUND MINING--CAPITAL COSTS

## 4.2.4. TRANSPORTATION

## 4.2.4.5. LONG-DISTANCE SURFACE CONVEYOR

The cost curve shown is for the acquisition and erection of a long-distance surface conveyor. The conveyor is a single-flight belt conveyor made with high-strength steel belting. The conveyor is designed for a 10° slope and 1-km distance. Usually, the material is crushed or screened at the mine site before being conveyed. Screen and crusher capital costs are not included in this cost but are covered in separate sections.

## BASE CURVE

The total cost is based on a single cost curve having a production rate (X), in metric tons material per day. The curve is valid for production rates of 15,000 to 150,000 mtpd, operating three shifts per day. The curve includes all costs associated with acquisition, installation of the belt, idlers, motors, channel, and frame, and site preparation.

The long distance surface conveyor capital cost derived from the curve is a combination of the following costs:

Construction labor cost.....	31%
Construction supply cost.....	5%
Purchased equipment cost.....	64%

A typical breakdown of a long distance surface conveyor major cost components is:

Conveyor belt.....	36%
Idler assembly units.....	44%
Motors, drive trains, belt cleaners, and other mechanical items.....	20%

The total long distance surface conveyor capital cost is  $(Y_C) = 81,292.281(X)^{0.309}$  and is distributed as follows:

(L) <u>Construction Labor Cost</u>	$(Y_L) = 25,200.607(X)^{0.309}$
(S) <u>Construction Supply Cost</u>	$(Y_S) = 4,064.614(X)^{0.309}$
(E) <u>Purchased Equipment Cost</u>	$(Y_E) = 52,027.060(X)^{0.309}$

## ADJUSTMENT FACTORS

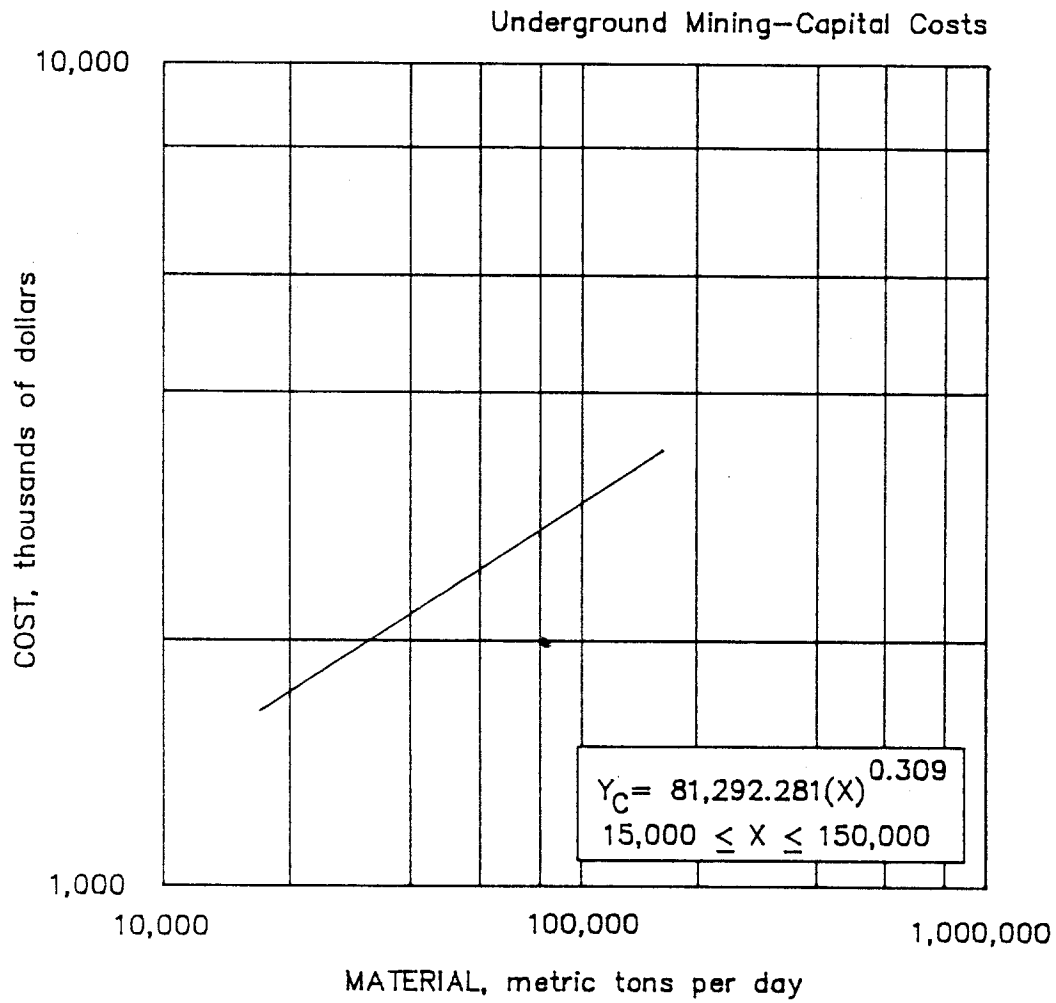
Belt Life The conveyor belt, 36% of equipment cost, has an average wear life of 8 to 10 yr of use, based on three shifts per day, 350 operating days per year, and depending on the abrasiveness of the material. The total replacement of the belt is standard procedure after excessive wear.

Conveyor Length and Slope Factor The conveyor is 1-km long and has a  $10^\circ$  slope. For other lengths and slopes, multiply the cost obtained from the base curve by the following factor:

Conveyor length and slope factor  $(F_L) = [0.917 + 0.00940(S)][L/1]$   
where: L = length, in kilometers,  
and S = slope in degrees, between  $0^\circ$  and  $15^\circ$ .

The cost for a decline conveyor is equal to that for a horizontal conveyor ( $0^\circ$  slope).

Stacker-Tripper Factor If the material is conveyed to a processing plant or other end point such as a port facility, the capital cost for unloading from the conveyor is included in those sections. If the material is waste rock, then the cost for a tripper or stacker should be added to the estimated capital cost. Costs for these items vary greatly but can range from \$600,000 for a stacker or tripper that handles 15,000 mtpd waste material to \$5,000,000 for a stacker or tripper that handles 150,000 mtpd of waste rock.



4.2.4.5. Long distance surface conveyor