GRUM UNDERGROUND

INTERIM REPORT

MAY 10th, 1977

019624

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CANADIAN MINE SERVICES LTD.

745 CLARK DRIVE, VANCOUVER, B.C. V5L 3J3

May 10th, 1977

Kerr Addison Mines Ltd.
P.O. Box 90
Commerce Court West
Toronto, Ontario
M5L 1C7

Attention: Mr. M.D. Rowswell, Executive Vice-President

Dear Mr. Rowswell:

Further to our letter of February 3rd, 1977, we have now assembled the data referred to. A copy of our report is enclosed.

We have calculated unit costs for the various components of an underground operation, with the idea that these unit costs can be applied to layouts related to current ore interpretations.

As you are aware, at the time this work was done the final geological interpretations of the ore zones were not complete.

In addition to unit costs for capital installations and development, we have calculated unit costs related to sub-level caving system of mining.

On receipt of most recent geological data, we feel that we can apply this information and arrive at overall cost of mine development and operations quickly.

We hope that you will find this document useful. We would certainly be pleased to progress the specific studies further upon your direction.

Yours very truly,

CANADIAN MINE SERVICES LTD.

John C. Folinsbee

J.C. Folinsbee, P. Eng.,

MANAGER, PROJECT DEVELOPMENT

JF/cem

2. PRODUCTION PARAMETERS

1. The shaft design is based on production rate of 900,000 metric tons per year.

2. Mill feed would be 2,500 TPD - 7 days a week,
   Hoisting 3,600 TPD - 5 days a week.

3. Hoisting will be 16 hours/day, 5 days/week skip payload 5.5 Tonnes.

4. Shaft depth will be 590 meters.

5. Present ramp from surface will be extended to the lowest minning level. The length of the ramp is 2,511 meters.

6. Shaft stations will be excavated at 100 meter intervals.

7. Total fresh air requirements are calculated at 460,000 CFM. One fresh air raise and 2 exhaust raises are costed.

8. Permanent headframe is scheduled for shaft sinking.

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3. SHAFT

A 16 foot diameter concrete shaft is costed. The cost as shown further does not include supervision and over head cost and should be considered as direct cost. Labour rates include fringes, bonus and board.

3.1. SHAFT COST SUMMARY

SHAFT COLLAR	$ 165,000
SHAFT SINKING	2,475,000
SHAFT STATIONS EXCAVATION (4)	110,000
LOADING POCKET	129,000
CONVEYOR DRIFT	15,000
SHAFT SINKING EQUIPMENT	600,000
HEADFRAME	2,750,000
SKIPS (3)	75,000
CAGES (2)	40,000
COUNTERWEIGHTS	10,000
ROPE ATTACHEMENTS	90,000
DEFLECTION SHEAVES	20,000
SKIP HOIST	445,000
CAGE HOIST	352,000
LOADING POCKET WEIGHING SYSTEM	25,000
COST TOTAL	$7,300,000

3.1. SHAFT COST SUMMARY (CONT'D)

The hoisting system costed above is based on a tower mounted friction hoist capable of hoisting 3500 metric tonne of ore during a 16 hour period with the ore having a density of 162 lbs./cubic foot broken.

Alternatives to the tower mounted friction system, namely the floor mounted friction hoist and the double drum ground mounted hoist have been partially costed and further work is required to ascertain the most effective method.

Budget prices of the hoisting systems are included in the "Quotations" section.

3.2. CONCRETE

An average thickness of one foot has been allowed for concreting the shaft walls and is based on a reasonable thickness to control spalling and movements of rock.

Water does not appear to be prevalent in the area in any magnitude but as stated by J.E.G. Schwellnus in his report dated March 4th, 1976 "With the presence of water either as a flow source or merely seepage the rock mass strength in many cases approaches zero" - the rock when moist could be a problem thus containment of the rock by concrete is necessary.

It is envisaged that the shaft will be used for ventilation requirements. A smooth concrete wall will provide the least resistance to the flow of ventilation.

3.3 CALCULATION FOR SIZE OF STEEL FOR SHAFT SETS

ONLY HORIZONTAL LOAD FACTOR IS CONSIDERED FOR DETERMINING THE SIZE OF THE STEEL BEAM AS THE VERTICAL LOADING IS NEGLIGIBLE.

HORIZONTAL LOADING WOULD BE $\frac{W}{6}$

WHEREBY W = THE WEIGHT OF CONVEYANCE LOAD AND ATTACHMENTS.

GRUM SKIP WEIGHT	10,000 lbs.
PAYLOAD	11,000 lbs.
ROPE ATTACHMENTS	2,500 lbs.
GUIDE ROLLERS	100 lbs.
TOTAL	23,600 lbs.
or	23.6 KIPS (1 KPS = 1,000 POUNDS)

BASED ON THE ABOVE CRITERIA AND THE FACT THAT EACH BEAM IN THE SHAFT IS FIXED AT EACH END

MAXIMUM BENDING MOMENT FOR THE SKIP DIVIDER WOULD BE

$$\frac{W\ a^2\ b}{l^2}$$

HORIZONTAL LOADING

$$W - \frac{W}{6} - \frac{23,600}{6} - 4 \text{ KIPS}$$

$$\frac{4 \times 2.62^2 \times 4.92}{7.54^2} - 2.37 \text{ KIP FEET}$$

OR 28.44 KIP INS.

$$\frac{M}{I} = \frac{P}{Y} \qquad S = \frac{I}{Y \text{ MAX.}}$$

WHERE M = BENDING MOMENT KIP IN
I = SECOND MOMENT OF AREA
P = BENDING STRESS
Y = DISTANCE FROM NEUTRAL AXIS

M = 28.44 KIP INS.

FOR W8 x 35 I = 42.5 y-y AXIS

Y = 4.013 y-y AXIS

$$P = \frac{My}{y} = \frac{28.44 \times 4.013}{42.5}$$

$$= 2.68 \text{ K/IN.}^2$$

ALLOWABLE BENDING STRESS 22 KSI OK

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3.3 CALCULATION FOR SIZE OF STEEL FOR SHAFT SETS (CONT'D)

AT 31 POUNDS $\frac{28.44 \times 4}{37} = 3.07$ KSI.

AT 24 POUNDS $\frac{28.44 \times 3.25}{18.2} = 5.07$

SELECT 8W @ 24 POUNDS/FOOT S.F. $\frac{22}{5.07} = 4.33$

MAIN BEAM SKIP

$0 = 2.62 \times 23.6 - 7.54\ H_2$

$R_2 = \frac{8.2}{6}$ KIP

$R_1 = \frac{15.4}{6}$ KIP

M MAX. $= \frac{WL}{8} = \frac{15.4 \times 15.4}{6 \times 8}$

$= 4.94$ KIP FOOT

$P = \frac{My}{I} = \frac{4.94 \times 12 \times 4.013}{42.5}$

$= 5.59$ KSI OK

SF $= 3.93$

CAGE

WT. OF CAGE	8,500 POUNDS	
CONTENTS	5,200 POUNDS	
GUIDE ROLLERS	100 POUNDS	
ROPE ATTACHMENTS	1,850 POUNDS	
	15,650 POUNDS	15.65 KIP.

LOADING HORIZONTALLY $= \frac{15.65}{6}$

$= 2.60$ KIPS.

3.3 CALCULATION FOR SIZE OF STEEL FOR SHAFT SETS (CONT'D)

$$M_{MAX} = \frac{2.60 \times 7.2^2 \times 8.2}{15.4^2}$$

$$= 4.65$$

$$P = \frac{4.65 \times 4.013 \times 12}{42.5}$$

$$= 5.26 \text{ KSI} \qquad \underline{\text{O.K.}}$$

$$SF \quad \frac{22}{5.26} = 4.18$$

SECONDARY BEAM FOR CAGE

$$W = \frac{15.65}{6} = 2.6 \text{ KIPS}$$

$$M_{MAX} = \frac{2.6 \times 6.88^2 \times 7.21}{14.09^2}$$

$$= 4.46$$

$$P = \frac{4.46 \times 4.013}{42.5} = 5.05 \text{ OK.}$$

$$SF = 4.35$$

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3.4 COST-COLLAR

16 ft. diameter shaft

	LENGTH	COST/M	COST TOTAL
LABOUR	15 M	8,442.00	$126,630.00
EQUIPMENT MAINTENANCE	15	99.84	1,497.60
EXPLOSIVES	15	99·84	1,497.60
STEEL & BITS	15	95.75	1,436.25
PIPES & FITTINGS			
6" AIR	15	15.97	239.55
4" PUMP	15	8.79	131.85
4" WATER (PEN)	15	24.28	364.25
VENT DUCT	15	23.68	355.20
CABLES	15	11.09	166.35
ROCKBOLTS	15	33.81	507.15
STEEL SETS	15	555.86	8,337.90
SMALL TOOLS	15	32.80	492.15
CONCRETE	15	1,323.43	19,851.45
FUEL & OIL	15	21.68	325.20
GUIDES	15	216.79	3,251.85
GROUT	15	14.00	210.00
SCREEN	15 M	7.00	105.00
		TOTAL	$165,399·31

COST/M $11,026.62

COST/FT. 3,360.95

BASED ON 1 METRE ADVANCE/DAY LENGTH 15M

LABOUR

THE ESTIMATED TIME TO COMPLETE THE EXCAVATION AND CONSTRUCTION OF THE COLLAR IS 45 WORKING DAYS. (810 manshifts.)

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3.4 COLLAR COSTS (CONT'D)

LABOUR (CONT'D)

BASED ON THE FOLLOWING LABOUR:

SHAFT LEADER	3 x 168 =	$ 504.00
SHAFT CLAMOP.	3 x 168 =	492.00
SHAFT MINER	6 x 164 =	984.00
MECHANIC	3 x 146 =	438.00
ELECTRICIAN	1 x 146 =	146.00
TRUCK OP.	1 x 125 =	125.00
LABOURER	1 x 125 =	125.00
TOTAL		$2,814.00/DAY

$126,630 TOTAL

EQUIPMENT MAINTENANCE

	COST/M
LOADER	$21.65
HOSES	4.33
SMALL TOOLS	21.65
ELECTRICAL	4.33
TRUCK	8.66
CONCRETE HOSES	4.33
FORMS	4.33
STAGING	4.33
JACKLEGS	22.95
VENT DUCT	3.28
	$99.84

3.4 COLLAR COSTS (CONT'D)

EXPLOSIVES

THE DIAMETER OF THE COLLAR WOULD INCREASE BY 2 FT. TO ALLOW FOR A MINIMUM OF 2 FT. OF CONCRETE.

THUS CSA. = $\pi (20/2)^2$

= 314.20 sq. ft.

COMPARED TO 255.06 sq. ft. (16 ft. diameter shift)

EXPLOSIVE COST = $81.05 x $\frac{314.90}{255.06}$

= $ 99.89/M

STEEL & BITS

$77.56 x $\frac{314.2}{255.06}$

= $95.75/M.

PIPES & FITTINGS

6" AIR	15.97/M.
4" PUMP	8.79/M.
PERMANENT 4"	

VENT DUCT - SMALL TOOLS INDENTICAL TO SHAFT

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3.4 COLLAR COSTS (CONT'D)

CONCRETE

Allow 0.5 ft. overbreak

$(\overline{11}\ 10.5^2 - \overline{11}\ 8^2)$

$= \overline{11}\ 46.25$

= 145.64 CU. FT/FT.

5.39 CU. YD./FT.

4.12 CU. M./FT.

or 13.51 CU. M./ M.

at 97.96/ CU. M.

= $1,323.43/ M.

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3.5 SHAFT SINKING COST

SHAFT SINKING SUMMARY

	LENGTH	COST/M.	TOTAL COST
LABOUR	575 M.	$2,319.00	$1,333,425.00
EQUIPMENT MAINTENANCE	"	138.04	79,373.00
EXPLOSIVES	"	81.05	46,605.25
STEEL AND BITS	"	77.56	44,597.00
PIPES AND FITTINGS	"		
TEMP. 6"	"	15.97	9,182.75
4"	"	8.79	5,054.25
PERMANENT 4"		24.28	13,961.00
VENT DUCT	"	23.68	13,616.00
CABLES	"	11.09	6,376.75
ROCKBOLTS	"	26.01	14,955.75
STEEL SETS	"	555.86	319,619.50
SMALL TOOLS	"	32.80	18,860.00
CONCRETE	"	728.82	419,071.50
FUEL AND OIL	"	21.68	12,466.00
GUIDES	"	216.79	124,654.25
GROUT	"	14.00	8,050.00
SCREEN	"	3.45	1,983.75
		$4,304.09	$2,474,851.75

$1,312.22/FT.

SHAFT

LENGTH = 4,376' - 2443'

= 1,933 FT. DEEP = 589.32 M.

SAY 590 M. DEEP

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3.5 SHAFT SINKING COST (CONT'D)

LABOUR

SHAFT LEADER	1	@ $168/DAY	168 x 3 SHIFTS	= $	504.00
SHAFT CLAM OP.	1	@ 164/DAY	164 x 3	=	492.00
SHAFT MINER	2	@ 164/DAY	164 x 6	=	984.00
DECKMAN	1	@ 130/DAY	130 x 3	=	390.00
HOISTMAN	1	@ 130/DAY	130 x 3	=	390.00
MECHANIC LEADER	½	@ 168/DAY	168 x 1.5	=	252.00
MECHANIC	1	@ 146/DAY	146 x 3	=	438.00
ELECTRICIAN	1	@ 146/DAY	146 x 3	=	438.00
TRUCK OP.	1	@ 125/DAY	125 x 3	=	375.00
LABOURER	1	@ 125/DAY	125 x 3	=	375.00
			TOTAL		$4,638.00

COST/M. = $2,319.00/M.

TOTAL COST $1,368,210.00

EQUIPMENT MAINTENANCE

	COST/M.
HOIST	$ 21.65
HEADFRAME	10.82
CRYDERMAN	21.65
HOSES	4.33
JUMBO	22.95
SMALL TOOLS	21.65
ELECTRICAL	4.33
TRUCK	8.66
CONCRETE HOSES	4.33
FORMS	4.33
STAGING	4.33
JACKLEGS	5.73

3.5 SHAFT SINKING COST (CONT'D)

EQUIPMENT MAINTENANCE (CONT'D)

	COST/M.	
VENT DUCT	3.28	
TOTAL	$138.04	$138.04/M.

EXPLOSIVES

$81.05/M.

STEEL AND BITS

BASED ON $.3078/M. DRILLED
COST/M. 63 HOLES .3078 x 8 FT ÷ 2
= $77.56/M.

PIPES AND FITTINGS

PERMANENT WATER LINE
TEMP. AIR
TEMP. PUMP

AIR 6"	15.97/M.
TEMP. PUMP	8.79/M.
WATER 4"	11.39/M.

PIPE SCHEDULE 40 20 FT. LENGTHS flanged pipe

PRESSURE DROP VALVE	4"
SHUT OFF VALVE	4"
MAKE-UP PIECES	5
T PIECES	3
REDUCER 4"	2
2" VALVE	

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3.5 SHAFT SINKING COST (CONT'D)

VENT DUCT

$23.68/M. 24" Ø PIPE

CABLES

$11.09/M.

ROCKBOLTS

DIAMETER CIRCUMFERENCE

19 FT. Ø $c = \overline{11}\ d$

$= 59.83$ FT.

SAY 60 FT. 18.29 M.

18.29 M. ON A 5 FT. PATTERN (GROUND NOT GOOD)

$= \frac{18.29}{1.5}$ = 13 BOLTS/1 1/2 M.
= 9 BOLTS/M.

AT $2.89 EACH

= $26.01/M.

STEEL SETS

BASED ON 8" WIDE FLANGE @ 35 LBS./FT.

8" WF 5.1 M.
4.3 M.
.3 M. x 2
2.4 M.
12.4 M. = 1,423.52 LBS.

4" x 4" x 3/8" 9.8 LB/FT.

13.33 FT. = 130.63 LBS.

TOTAL WT. = 1,554.15 LBS.

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3.5 SHAFT SINKING COST (CONT'D)

GUIDES

15 FEET GUIDES 8" x 6" x $\frac{5}{16}$ R.H.S. @ 26.99 LB./FEET
10 GUIDES REQUIRED
10 GUIDES x 15 FEET x 26.99 LBS. = 4040.50 LBS.
ADDITIONAL PLATE @ 5.66 LBS.. EACH
16 REQUIRED = 90.56 LBS.
TOTAL WEIGHT = 4131.06 LBS.

MANWAY AND LANDINGS

546.73 LB./SET

TOTAL WEIGHT OF STEEL SETS AND MANWAY AND LANDINGS

STEEL SETS	1554.15 LBS.	
MANWAY AND LANDINGS	546.73 LBS.	
	2100.88 LBS.	
2100.88 LBS. @ $1.21/LBS.	=	$2,542.06
GUIDES 4131.06 @ $0.24/LBS.	=	991.44
		$3,533.50

COST/FOOT = $\frac{\$3533.50}{15}$ = $235.56

COST/METER = $772.63

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3.5 SHAFT SINKING COST (CONT'D)

CONCRETE

2.97 CU. YARDS/FT.
@ 74.90/CU. YARDS
= $222.45/FT.
= $729.63/M.

FUEL AND OIL

$21.68/M.

GUIDES

SEE PREVIOUS INFORMATION

GROUT
Allow
$14.00/M.

SCREEN
Allow
$3.45/M.

STEEL FOR SHAFTS

COST/LB. FRABICATION STEEL SETS AND GUIDES
$261,285.98 FOR A TOTAL OF 322,804 LBS.

COST/LB. $\frac{261,285.98}{322,804.00} = 81¢/LB$

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3.5 SHAFT SINKING COST (CONT'D)

STEEL FOR SHAFTS (CONT'D)

OF WHICH GUIDES $32,202.85 133,747 LBS.

COST/LB. GUIDES = $\frac{32,202.85}{133,747}$ = 24¢/LB.

COST OF STEEL SETS

$\frac{261,285.98 - 32,202.85}{322,804.00 - 133,747}$ = $\frac{229,083.13}{189,057.00}$ = $1.29/LB. INCLUDING TAX

COST OF CONCRETE

BASED ON INFORMATION OBTAINED FOR QUINTETTE $70/CU. YARD DELIVERED TO THE HEAD FRAME EXCLUSIVE OF TAX $74.90 WITH TAX.

3.5 SHAFT SINKING COST (CONT'D)

Shaft 4" Pipeline Permanent

4" Flanged Pipe 20 Ft lengths	124.51 Each
4" x 4" Flange to victaulic	77.14 Each
4" Flanged gate valve 421A	140.70 Each
2" 208 victaulic gate valve	23.66 Each

Cost of Pipeline:

Pipe 515m x 3.28 x $\frac{\$124.51/\text{Ft}}{20}$ = 10,516.11

6 Stations equipped

Gate valves 3/station 6 stations 140.70 Each	2,532.60
Flange to Victaulic 1/station $77.14	462.84
2" gate valve 1/station 23.66 Each	141.96
T pieces 77.14 Each 2/station	925.68
90 bends two/station 57.14 Each	805.68
Straight 1/station 57.14 Each	342.84
Hangers 2 per 20 Ft 3.59 Each 85 Required	305.15
Reducing valves 2/station 12 required $350 Each	4,200.00
TOTAL	20,232.86
TAX 7%	21,649.16

Base stand & steel support

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3.5 SHAFT SINKING COST (CONT'D)

ESTIMATE OF HEADFRAME FROM V.B. COOKE THUNDER BAY

Single ore bin
Collar floor foundation 15 Ft below surface
Electrical floor included 97' above collar
Hoist floor 113' above collar
Roof elevation 140' above collar
Total height of headframe 155 Ft.
Ore bin completely lined
All structural requirements including passenger hoist, ventilation & electrical requirements.
Only skip, cage & counterweight,installation & purchase costs to be added.
Based on summer slip form conditions
No collarhouse or tunnels
Collar not included, Waste bin not included
Dimensions of building 36' x 50 inside clear dimensions. Internal hoisting system no overhang.
No hoists included
Cost $2.7 million

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3.5 SHAFT SINKING COST (CONT'D)

SHAFT SINKING

EQUIPMENT	UNIT PRICE	NUMBER OF UNITS	TOTAL PRICE
HEADFRAME		1	114,000 *
HOIST		1	346,420 *
ROPES	21.84/M	710 M	15,506
CRYDERMAN	69,550	1	69,550
GALLOWAY STAGE	11,560	1	11,560
ROPES FOR STAGING	7.41/M	2560 M	18,970
TUGGERS	16,478	4	65,912
SHEAVE DECK	364	8	2,911
DUMP BIN & DUMPING ARRANGEMENT	11,473	1	11,473
X-HEADS	2,000	2	4,000
BUCKET	2,675	2	5,350
SAFETY DOORS	2,576	1	2,576
SHAFT FORMS	19,847	1	19,847
HANGING RODS	-	-	-
CONCRETE BUCKET	3,745	1	3,745
FAN	1,766	1	1,766
HEATER	10,700	1	10,700
PROPANE TANK	2,000	1	2,000
DRILL JUMBO	123,916	1	123,916
DRILL STEEL	16.67/M	14.63 M	244
PLUGGERS	2,182	4	8,731
STOPERS	2,066	3	6,198
STEEL	10.84/M	17.07 M	185
CHIPPER	600	1	600
FLOOD LIGHTS	300	1 SET	300
SUMP PUMP	2,000	2	4,000
SHAFT PUMP	14,500	1	14,500
MISCELLANEOUS	1,200	1 SET	1,200
CRYDERMAN HOIST	3,210	1	3,210
SURVEY TUGGERS	1,500	1 SET	1,500

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3.5 SHAFT SINKING COST (CONT'D)

SHAFT SINKING

EQUIPMENT	UNIT PRICE	NUMBER OF UNITS	TOTAL PRICE
JACKS	330	3	990
SIGNAL SYSTEM	1,000	1	1,000
AIR COMPRESSORS			
900 CFM	71,262	1	71,262
700 CFM	57,673	1	57,673
HOSES	2,500	1 SET	2,500
CONCRETE AGITATOR	400	1	400
ROPE ACCESSORIES	3,800	1 SET	3,800
ELECTRICS			5,000 *
LIGHTING TRANSFORMER	5,211	1	5,211
LIGHTING CABLE	0.36/M	610 M	220
630 LOADER	34,978.30	1	34,978
PUMP CABLE	10.73/M	610 M	6,546
			600,030

* USE OF PERMANENT HOISTS & HEADFRAME ELECTRICS.
$5,000 ALLOWANCE FOR ELECTRICS FOR STAGING.

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3.5 SHAFT SINKING COST (CONT'D)

SCHDULE OF OPERATION

DRILL, BLAST, LOAD, INSTALL CONCRETE, INSTALL STEEL, - DRILL.

DRILLING

NO. OF HOLES 63
8 FT. HOLES 7 FT. ADVANCE
TOTAL FT. DRILLED = 63 x 8 = 504 FT.

DRILLING WITH A JUMBO FOUR DRILLS AT 2 FT./MIN. = 63 MINUTES
HOIST JUMBO TO MID-POINT IN THE SHAFT (1,933 FT. DEEP) 966 FT.
AT 2 FT./SEC. = 8.05 MINUTES
RETURN JOURNEY= 8.05 MINUTES
SET-UP = 15 MINUTES
DISMANTLE = 15 MINUTES

TOTAL DRILLING CYCLE	63 MINUTES
	16.1 MINUTES
	30 MINUTES
	82.1 MINUTES

BLASTING

LOADING OF HOLES AT 1 MIN./HOLE. TWO OPERATORS LOADING AT THE SAME TIME 63 HOLES = 31 1/2 MINUTES

MAKING CONNECTIONS	15 MINUTES
BLASTING	15 MINUTES
ALLOWANCE FOR FUMES TO CLEAR	30 MINUTES
TOTAL	91 1/2 MINUTES

3.5 SHAFT SINKING COST (CONT'D)

MUCKING

DIAMETER OF EXCAVATION 16' + 2' + 1' = 19'

VOLUME OF SOLID MUCK/FT. $= \frac{\pi (19)^2}{(2)^2}$

VOLUME OF BROKEN MUCK $= \frac{\pi (19)^2}{(2)^2} \times 1.5$

$= 426.29$ CU. FT.

SAY 427 CU. FT.

7 FT. ADVANCE WOULD BE $\frac{7 \times 427}{27} = 110.70$ CU. YARDS

UTILIZING TWO BUCKETS

DENSITY OF MATERIAL = 177.00 LB./CU. FT. SOLID

= 118 LB./CU. FT. BROKEN

1.59 TON/CU. YARD BROKEN

81 CU. FT. BUCKET WOULD BE 4.77 TONS.

108 CU. FT. BUCKET WOULD BE 6.36 TONS

DIMENSIONS OF A THREE CU. YARD BUCKET WOULD BE 4 FT. DIAMETER

$\pi r^2 = \pi 2^2 = 12.59$ FT.^{2}

LENGTH OF BUCKET WOULD BE $\frac{81}{12.59} = 6.43$ FT. LONG

DIMENSIONS OF A FOUR CU. YARD 4 FT. DIAMETER

$\frac{= 108}{12.59} = 8.57$ FT. (TOO LONG)

81 CU. FT. BUCKET IS REASONABLE

BASED ON THE MID-POINT OF THE SHAFT HOISTING DISTANCE (1,933 FT DEEP)

966 FT.

HOISTING CYCLE

LOADING 3/4 CU. YARDS BUCKET (LOADING 1/2 CU. YARD/BUCKET)

81 CU. FT. BUCKET	6 LOADS
LOWER	15 SECS.
GRAB LOAD	15 SECS.
HOIST	20 SECS.
DUMP	10 SECS.
	1.0

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3.5 SHAFT SINKING COST (CONT'D)

MUCKING CONT'D)

6 LOADS 6 MINUTES

110.70 CU. YARDS

TOTAL TIME $\frac{427 \times 7}{81} \times 6 = 221.4$ MINUTES

HOISTING CYCLE

ATTACH BUCKET	15 SECS.
HOIST CREEP TO GUIDES	15 SECS.
ACEL. 2.80 FT./SEC. 160.8 FT/MIN.	10.7 SECS.
644.4 FT. @ 1,800 FT./MIN.	21.0 SECS.
RETARD 160.8 FT. AT 2.80 FT./MIN.	10.7 SECS.
DUMP	30 SECS.
ACEL	10.7 SECS.
644.4 FT. AT 1,800 FT./MIN.	21.0 SECS.
RETARD	10.7 SECS.
CREEP	15.0 SECS.
DETACH BUCKET	15 SECS.
TOTAL ROUND TRIP	174.80 SECS.
	2.91 MINS.

SET-UP TIME FOR CRYDERMAN ASSUME REMAINS IN SHAFT SUPPORT FROM CONCRETE 15 MINUTES

DEMOBILIZATION TIME FOR CRYDERMAN 15 MINUTES

TOTAL TIME = 221.4 + 30 + 18.45 MINUTES (ATTACH AND DETACH BUCKET)

= 4.49 HOURS

ALLOWANCE FOR CLEAN-UP 30 MINUTES

TOTAL TIME = 4.49 + 5

= SAY 5 HOURS

CYCLE OF DRILL BLAST LOAD IS (7 FT. ADVANCE)

.../25

3.5 SHAFT SINKING COST (CONT'D)

HOISTING CYCLE

MID SHAFT POUR POINT	
LOAD BUCKET WITH CONCRETE ON SURFACE	5 MINUTES
HOIST INTO SHAFT	30 SECONDS
ACCEL	10.7 SECONDS
TRAVEL	21.0 SECONDS
RETARD	10.7 SECONDS
DUMP	15 MINUTES
RELOCATE IN GUIDES ETC.	5 MINUTES
ACCEL	10.7 SECONDS
TRAVEL	21.0 SECONDS
RETARD	10.7 SECONDS
REMOVE FROM SHAFT	30.0 SECONDS
TOTAL TIME/CYCLE	27.41 MINUTES

TO MOVE THE CONCRETE WOULD TAKE 41 x 27.41 MINUTES

= 1,123.81 MINUTES

18.73 HOURS

SET-UP TIME AND DEMOBILIZE TIME	1 HOUR
DELAYS DUE TO VIBRATING	1 HOUR
TOTAL TIME	20.73
SAY	21 HOURS
ALLOWANCE FOR REMOVING AND INSTALLING FORMS	4 HOURS
TOTAL	25 HOURS

INSTALLING STEEL

10 SECTIONS TO BE HANDLED SEPARATELY

4 SECTIONS HANDLED AS ONE

10 GUIDES

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3.5 SHAFT SINKING COST (CONT'D)

HOISTING CYCLE (CONT'D)

DRILL	82.1 MINUTES
BLAST	91.5 MINUTES
MUCK	300 MINUTES
	473.6 MINUTES

3 CYCLES WOULD BE 1,420.8 MINUTES

23 HOURS 40.8 MINUTES

THIS WOULD GIVE 21 FT. ADVANCE

INSTALLATION OF CONCRETE

UTILIZING CONCRETE BUCKET

DENSITY CONCRETE 2.18 TON/CU. YARDS

4.66 TON BUCKET WOULD TAKE $\frac{4.66}{2.18}$ CU. YARDS CONCRETE

(SIZE OF BUCKET WOULD CHANGE)

= 2.13 CU. YARDS

VOLUME OF CONCRETE TO BE INSTALLED

$(\pi r^2 - \pi r^2)$

$(\pi 9^2 - \pi 8^2)$

17 π = 53.53 CU. FT./FT.

50% ALLOWANCE FOR OVERBREAK

= 53.53 x 1.5

= 80.29 CU. FT.

30 FT. FORM = 80.29 x 30 CU. FT.

= 89.2 CU. YARDS (2.97 CU. YARDS/FT.)

NUMBER OF BUCKETS = $\frac{89.2}{2.13}$ = 20.93 BUCKETS

41 BUCKETS

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3.5 SHAFT SINKING COST (CONT'D)

INSTALLING STEEL (CONT'D)

HOISTING TIME FOR EACH SECTION:

ATTACH TO ROPE	5	MINUTES
HOIST INTO SHAFT	1	MINUTES
DESCEND 966 FT. AT 2 FT./SEC.	8.05	MINUTES
LOCATE INTO POSITION	30	MINUTES
CROSS-LEAD TO SURFACE	.7	MINUTES
PULL ROPE BACK TO ATTACHING POSITION	10	MINUTES
	53.75	MINUTES

24 SECTIONS 1,290 MINUTES

21.5 HOURS

TWO HOURS FOR ALIGNMENT

TWO HOURS FOR GROUTING

TOTAL TIME 19.22 HOURS

TOTAL TIME FOR 30 FT. ADVANCE	HOURS	MINUTES
DRILL BLAST MUCK	32	8.0
INSTALL CONCRETE	25	
INSTALL STEEL	21	30.0
TOTAL TIME	78	38.0

AT 80% UTILIZATION TOTAL TIME REQUIRED

$= \frac{78.63}{8} = 98.29$ HOURS

$\text{ADVANCE/DAY} = \frac{30}{98.29} \times 24$

= 7.3 FT./DAY

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4. SHAFT STATIONS

COST CALCULATION - STATIONS 3 M x 4 M
LENGTH 17M.

	LENGTH	COST/M.	TOTAL COST
LABOUR	17M.	$1,169.00	$19,873.00
EQUIPMENT MAINTENANCE	17M.	139.85	2,377.45
EXPLOSIVES	17M.	65.40	1,111.85
STEEL AND BITS	17M.	21.44	364.50
PIPES AND FITTINGS 6"	10M.	15.97	159.70
4"	10M.	11.38	113.80
ROCKBOLTS	17M.	10.39	176.63
SMALL TOOLS	17M.	32.80	557.60
CONCRETE	17M.	82.65	1,405.12
FUEL AND OIL	17M.	21.68	368.56
GROUT	17M.	14.00	238.00
SCREEN	17M.	3.45	58.65
FORMING MATERIALS	17M.	41.17	700.00
	TOTAL		$27,504.86

COST/M. = $1,617.93

COST/FT.= $ 493.27

SHAFT STATION

EXCAVATION

LENGTH OF STATION FROM SHAFT 15M.
HEIGHT 3 M
WIDTH 4.15 M.
ELECTRIC STATION 2.7M HIGH x 2.4M WIDE x 2.1 METERS
ACCESS TO MANWAY 1M x 3M x 4.5 M.

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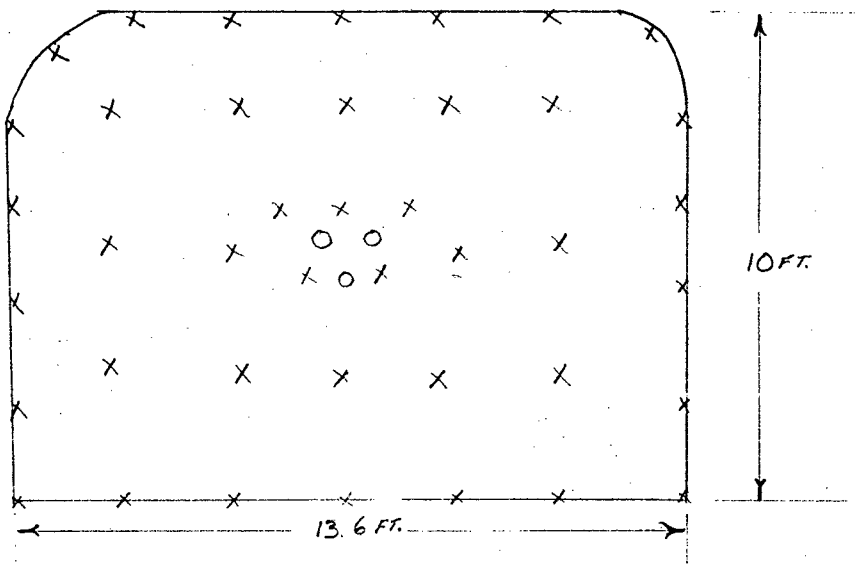
4. SHAFT STATIONS (CONT'D)



DRILLING

UTILIZING JACK-LEGS
8 FT. x 44 HOLES DRILLED =
352 FT.
3 JACKLEGS AT 1 FT./MIN. =
117.30
10 MINUTES TO SET-UP
10 MINUTES TO REMOVE EQUIPMENT ETC.

TOTAL TIME 137.3 MINUTES

.../30

4. SHAFT STATIONS (CONT'D)

MUCKING

UTILIZING ELECTRIC OPERATED LOADER DUMPING MATERIAL INTO SHAFT.

EIMCO 621 1/2 YD. BUCKET.

INITIAL TWO ROUNDS BLASTED INTO SHAFT AND MUCKED AT BY CRYDERMAN

VOLUME/7 FT. ADVANCE

7 x 10 x 13.61

= 952.70 CU. FT.

35.28 CU. YARDS x 1.5 = 52.92 CU. YARDS

1 YD. BUCKET

25 FT. AVERAGE DISTANCE AT 1 M.P.H.

= 1.46 FT/SEC.

= 17.12 SECS.

LOAD	30 SECS.
TRAVEL	17.12 SECS.
DUMP	30 SECS.
TRAVEL	17.12 SECS.
TOTAL	1 MIN. 34.24 SECS.
SAY	1 MIN. 35 SECS.

LOADING TIME = 53 x 1M 35 SEC.

= 83.74 MINUTES

FINAL CLEAN-UP 15 MINUTES

= 98.74 MINUTES

BLASTING

41 HOLES LOADED AT 30 SECS./HOLE

=20.5 MINUTES

CONNECT CIRCUITS 5 MINUTES

GET INTO BUCKET TO SURFACE

AND BLAST 15 MINUTES

4. SHAFT STATIONS (CONT'D)

BLASTING (CONT'D)

TOTAL TIME 40.5 MINUTES
ALLOWANCE FOR FUMES TO CLEAR 30 MINUTES

INSTALLATION OF ROCKBOLTS

5 x 5 FT. PATTERN
4 BOLTS/5 FT. = 6 BOLTS/7 FT.
8 FT. BOLTS 6 x 8 = 48 FT. DRILLING
3 STOPERS = 16 MINUTES
INSTALLATION OF BOLT AND TIGHTEN UP 10 MINUTES/BOLT
20 MINUTES
ROCKBOLTING SET-UP 5 MINUTES
REMOVAL 5 MINUTES

TOTAL TIME = 46 MINUTES

TOTAL TIMES

DRILL	137.3 MINUTES
BLAST	70.5 MINUTES
MUCK	98.74 MINUTES
ROCKBOLTING	46 MINUTES
WASH DOWN FACE	15 MINUTES
	367.24
=	6.12 HOURS

7 FT. ADVANCE/SHIFT IS POSSIBLE

THUS 50 FT. OF STATION WOULD TAKE 8 SHIFTS TO COMPLETE.
3 DAYS (EXCAVATION ONLY).

CONCRETE REQUIRED FOR THE STATION:

4. SHAFT STATIONS (CONT'D)

TOTAL TIMES (CONT'D)

11.4 M. x 9" x 12'
336.52 CU. FT.
12.5 CU. YARDS
OVERBREAK 50%
18.75 YARDS CONCRETE

BUILDING OF FORMS AND INSTALLATION OF CONCRETE

WOODEN FORMS
BASED ON 50 SQ. FT./HOUR 2 MEN
3/4" ply
AREA = 12' x 11.4M.
= 448.70 SQ. FT.
= 9 HOURS

POURING OF CONCRETE 18.75 YARDS AT 116.14 MINUTES PER YARD
DEGREE OF DIFFICULTY 2
TIME = 16.14 x 2 x 18.75
= 605.25 MINUTES
SAY 10 HOURS

TIME ALLOWED FOR INSTALLING CONCRETE = 19 HOURS
SAY 1 DAY

TOTAL TIME FOR A STATION 4 DAYS

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4. SHAFT STATIONS (CONT'D)

SHAFT STATIONS COSTS LENGTH 50 FT.
15 M.

LABOUR

6 MAN CREW			
SHAFT LEADER	1 @ 168	=	168
SHAFT CLAM OPER.	1 @ 164	=	164
SHAFT MINER	2 @ 164	=	328
DECKMAN	1 @ 130	=	130
HOISTMAN	1 @ 130	=	130
MECHANIC	1 @ 146	=	146
ELECTRICIAN	1 @ 146	=	146
TRUCK OP.	1 @ 125	=	125
LABOURER	1 @ 125	=	125
	TOTAL		1,462.00

1,462 x 3 x 4
= $17,544.00

EQUIPMENT MAINT.

	COST/FT.	COST/M.
HOIST	6.60	21.65
HEADFRAME	3.29	10.82
CRYDERMAN	6.60	21.65
HOSES	1.32	4.33
JUMBO		
SMALL TOOLS	6.60	21.65
ELECTRICAL	1.32	4.33
TRUCK	2.64	8.66
CONCRETE HOSES	1.32	4.33

4. SHAFT STATIONS (CONT'D)

EQUIPMENT MAINT. (CONT'D)

	COST/FT.	COST/M.
FORMS	1.32	4.33
STAGING	1.32	4.33
JACKLEGS	6.99	22.95
MUCKING UNIT	3.29	10.82
TOTAL	$42.61	$139.85

STEEL AND BITS

BASED ON $.13/FT. DRILLED

8 x 44 HOLES = 352 @ $.13/FT.

= $45.76

or $ 6.53/FT. ADVANCE

$21.44/M. ADVANCE

EXPLOSIVES

41 x 7 FT. LOADED

$\frac{41 \times 7 \times 12}{60" \times 70}$ x 60 LB. EXPLOSIVES

= 184.50 Lbs. POWERMEX

@ 61.40/100 Lbs. = $113.28

DETONATORS @ .75 x 1.07 EACH

.80 x 41 = $26.32

TOTAL COST/ 7 FT. = 113.28 + 26.32

= $19.94/FT.

= $65.42/M.

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4. SHAFT STATIONS (CONT'D)

PIPES AND FITTING

6"	15.97/M.	$4.86/FT.
4"	11.38/M.	$3.46/FT.
2"	-	

VENT DUCT -

ROCKBOLTS

8 FT. BOLTS

SET 4/5 FT. = $\frac{50}{5}$ x 4 = 40 BOLTS

+ 15 AT STATION BROW

= 55 BOLTS

COST/BOLT 2.71 + 7% TAX

= $2.89

55 @ $2.89 = $158.95

COST/FT. = $ 3.17

COST/M. = $ 10.39

SMALL TOOLS

32.80/M. OR $10.00/FT.

CONCRETE

18.76 CU YARDS @ $74.90/CU. YARDS

= $1,405.12

COST/FT. 28.10

COST/M. 92.16

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4. SHAFT STATIONS (CONT'D)

FUEL AND OIL

21.68/M.
6.60/FT.

GROUT

ALLOWANCE $14.00/M.
$ 4.26/FT.

SCREEN

ALLOWANCE $ 3.45/M.
$ 1.05/FT.

FORMING

3/4" PLY 448.7 SQ. FT.
20 SHEETS @ $25/SHEET
= $500.00
ALLOWANCE FOR OTHER MATERIAL $200.00
COST/FT. $14.00
$45.92/M.

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5. LOADING POCKET COST

	EQUIVALENT LENGTH	COST/M^3	TOTAL COST
LABOUR	5 M.	$169.09	$32,466.00
EQUIPMENT MAINTENANCE		3.59	690.20
EXPLOSIVES		2.18	418.56
STEEL AND BITS		1.95	375.57
ROCKBOLTS		.65	125.95
STEEL		106.49	20,447.80
SMALL TOOLS		.85	164.00
CONCRETE		53.26	10,227.02
FUEL AND OIL		.56	108.40
GROUT		--	70.00
SCREEN		--	17.25
	TOTAL		$65,110.75

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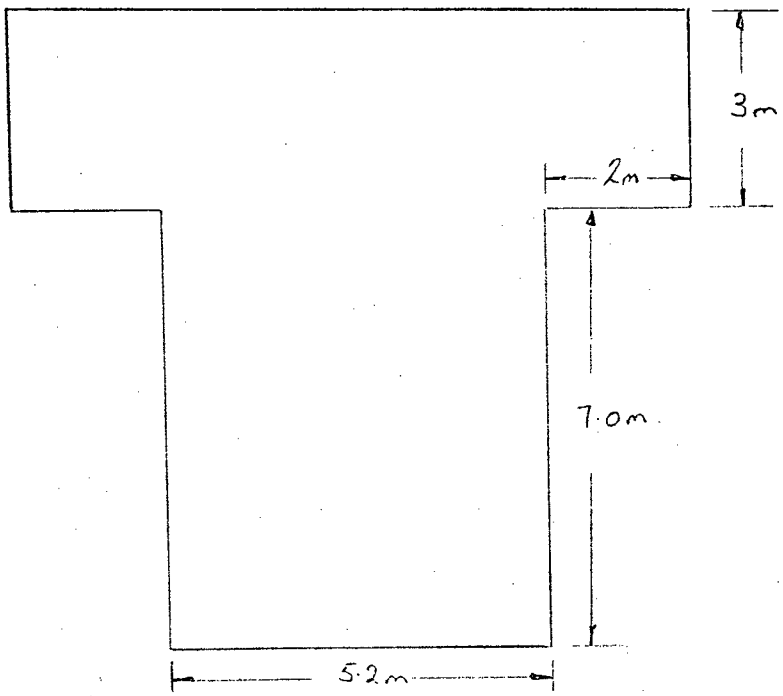
5. LOADING POCKET COST (CONT'D)

SIZE OF LOADING POCKET 23' x 10' x 17 7.01 M. x 3.04 x 5.18

VOLUME TO BE REMOVED = 3,910 CU. FT. 7 x 3 x 5.2 M.

144.81 CU. YARDS



DEPTH 3 M.

VOLUME OF MUCK = (3 x 9.2 x 3) + (7 x 5.2 x 3)

= 192.00 CU. M.

EXPLOSIVE COST/ CU. M. = $\frac{86.27}{39.65}$ (FROM SHAFT COSTS)

= $2.18/C.M.

COST FOR LOADING POCKET = 192 x 2.18

= $418.56

.../39

5. LOADING POCKET COST (CONT'D)

LABOUR

FROM COST/CU. M. = $\frac{2,319}{39.65}$ = $58.58

COST OF LABOUR = 192 x $58.48

= $11,228.16

5 DAYS @ $4,638/DAY

EQUIPMENT MAINTENANCE

BASED ON SHAFT 192 CU. M. = 4.84 M. EQUIVALENT ADVANCE

SAY 5 M.

STEEL

COLUMNS 10 M. LONG 3 WITH CONNECTORS EVERY 3 M.

STEEL WEIGHTS W. 14 @ 136 LB./FT.

CONNECTIONS W. 14 @ 53

30 M. @ 136 LB./FT. = 13,382.40 LBS.

5.2 x 3 = 15.6 @ 53 LB./FT. = 2,711 - 90

ALLOWANCE 5% FOR CONNECTORS =

TOTAL WEIGHT (13,382.40 + 2,711.90)x 1.05

16,899.01 LBS.

@ $1.21/LB.

= $20,447.80

CONCRETE

1 FT. THICKNESS

VOLUME = 2 (2 M. x 3 M.) + (7 x 3 M.)2 + (5.2 x 3)

= 12 M. + 42 M. + 15.6 M.

= 69.60 CU. M. x 1.5 (ALLOWANCE FOR OVERBREAK)= 104.4 CU.M.

@ $97.96/CU. M.

= $10,227.02

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6. CRUSHER AND CONVEYOR

6.1 CRUSHER

The crusher exacavation costs are $52,659.

To reduce the depth of the shaft a conveyor feed system was designed into the system which would transport ore from the crusher station to the loading pocket.

Budget pricing for the crusher has been obtained inclusive of vibratory feeders. The cost is $314,000 exclusive of crusher station.

Installation of the crusher, concrete requirements are required to be added to the above costs to obtain the complete direct cost of the crusher installation.

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6.1 CRUSHER (CONT'D)

COST OF WIDENING CRUSHER STATION

VOLUME TO BE REMOVED 704 CU. M.

	VOLUME	COST/CU. M.	TOTAL COST
LABOUR	704 CU. M.	$32.82	$23,266.00
EQUIPMENT MAINTENANCE	704	3.88	2,732.00
EXPLOSIVES	704	6.81	4,794.00
DRILL STEEL AND BITS	704	1.41	993.00
PIPES	704	.35	246.00
SMALL TOOLS	704	1.06	745.00
FUEL OIL	704	.35	246.00
ROCKBOLTS	704	.71	500.00
		TOTAL	$33,522.00

$47.39/CU. M.

$1.342/CU. FT.

WIDENING OF THE STORAGE BIN

1,218 CU. FT. @ $1.34/CU. FT. = $1,632.00

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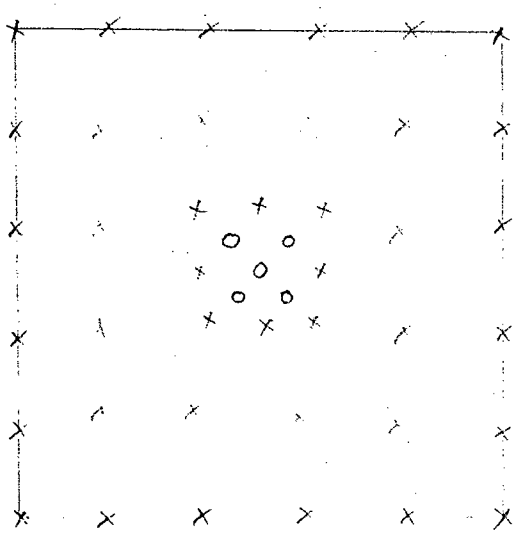
6.1 CRUSHER (CONT'D)

WIDENING OF CRUSHER STATION

VOLUME TO BE REMOVED = 24,840 CU. FT.

TAKING A 10 FT. BY 10 FT. ROUND 8 FT. DRILL STEEL



38 HOLES BLASTED

43 DRILLED

EXPLOSIVES

$\frac{38 \times 7 \times 12 \times 60}{16 \times 70}$ = 171.00 LBS. EXPLOSIVES

@ $61.40/100 LBS. = $104.99

DET. = 38 x $0.80 = $30.40

TOTAL $135.39

COST/CU. FT. = $0.193/CU. FT.

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6.1 CRUSHER (CONT'D)

LABOUR

4 MEN @ $164/SHIFT = $656.00

COST/CU. FT. = $ 0.93

EQUIPMENT MAINTENANCE

	COST/HOUR	OPERATING HOURS	COST/DAY
EIMCO 911	7.50	15 HOURS	$ 112.50
SLUSHER	2.0	15 HOURS	30.00
JACKLEGS, STOPERS	$.09/FT. DRILLED		92.88
PUMPS			2.00
			$ 237.38

COST/CU. FT. = $.11/CU. FT.

DRILL STEEL AND BITS

COST/METER DRILLED = $0.3078

$\frac{43 \times 8 \times 0.3078}{3.28 \times 700}$ = /CU. FT.

$.04/CU. FT.

PIPES

EXTRA HOSE .01/CU. FT.

SMALL TOOLS

$10.00/M. = $\frac{10}{3.28 \times 100}$ = $0.03/CU. FT.

.../44

6.1 CRUSHER (CONT'D)

FUEL OIL

2.09/M. ADVANCE

$$\frac{2.09}{3.28 \times 100} = \$.01/\text{CU. FT.}$$

ROCKBOLTS

$\frac{30 \times 30 \times 5}{5 \times 5}$ = 180 BOLTS AT $2.89 EACH

$520.20 COST/CU. FT. = $0.02

6.2 CONVEYOR DRIFT COST

27M. LONG

	LENGTH	COST/M.	TOTAL COST
LABOUR	27M.	$232.38	$ 6,274.26
EQUIPMENT MAINTENANCE	27M.	28.71	775.17
DRILL STEEL AND BITS	27M.	18.28	493.56
PIPES AIR	22M.	13.71	301.62
PUMP	22M.	8.43	185.46
WATER	22M.	4.70	103.40
VENT DUCT	15M.	23.68	355.20
ROCKBOLTS	27M.	8.67	234.09
SMALL TOOLS	27M.	10.00	270.00
FUEL OIL	27M.	1.94	52.38
GROUND SUPPORT	27M.	170.15	4,594.05
SCREEN	27M.	3.45	93.14
EXPLOSIVES	27M.	62.24	1,680.48
			$15,412.42

$570.83/M.
$174.03/FT.

LABOUR

LEADER AT $168/SHIFT	$168.00
DRILLER $164/SHIFT	164.00
LOADER OP.$164/SHIFT	164.00
	$496.00

$ 70.85/FT.
$232.38/M.

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6.2 CONVEYOR DRIFT COST (CONT'D)

EQUIPMENT MAINTENANCE

	COST/HOUR	OPERATING HRS.	COST/DAY
EIMCO 911	7.50	9	$ 67.50
JACKLEGS	$.09/FT. DRILLED		101.52
STOPERS	$.09/FT. DRILLED		10.80
FAN AND DUCT			2.00
PUMPS			2.00
			$183.82
			$ 28.71/M.

DRILL STEEL AND BITS

COST/METER DRILLED = $0.3078

$$\frac{47 \times 8}{3.28} + \frac{5 \times 8}{3.28} = 126.82$$

$18.28/M.

PIPES

AIR 6"	13.71/M.
4" PUMP	8.43/M.
2" WATER	4.70/M.

VENT DUCT

IDENTICAL TO SHAFT 23.68/METRE

CABLES

NOT REQUIRED

6.2 CONVEYOR DRIFT COST (CONT'D)

ROCKBOLTS

3 REQUIRED/M. @ 2.89 = $8.67/M.

SMALL TOOLS

$10.00/M.

FUEL OIL

911 BASED ON .45 LBS./HPHR.

$\frac{38.5 \text{ H.P.} \times 9 \times 0.45}{8} \times \$0.6 = \$11.69/\text{DAY}$

$= \$ 1.82/M.$

+ 15% OILS

= $1.94/M.

GROUND SUPPORT

SHOTCRETE ROADWAY

AREA TO BE SHOTCRETED = $\frac{13 \times 20}{3.28} \times 1$ SQ. M.

10.06 SQ. M. x .04 M. THICK

= .4 M^3/M. ADVANCE

.4 M^3 = 14.11 CU. FT.

ONE M. WOULD REQUIRE 29 1/2 CU. YARD BAGS x 1.25

FOR REBOUND 36.25 BAGS @ 3.50 EACH

= $126.87/M.

LABOUR COST/M.

FULL CREW 496

APPLYING 6 YARDS/SHIFT

ADVANCE/SHIFT = $\frac{6 \times .764}{.4} \approx 11.46$ M./SHIFT

6.2 CONVEYOR DRIFT COST (CONT'D)

LABOUR COST/M. (CONT'D)

$$\text{COST/M.} = \frac{496}{11.46} = 43.28$$

TOTAL COST = $126.87

43.28

$170.15/M.

EXCAVATION OF THE CRUSHER STATION AND ASSOCIATED RAISES

LEVEL ROADWAY 13' x 10' x 90'

108 FT. 8' x 9' RAISE

50 FT. 5' x 5' RAISE

STORAGE RAISE WIDENING = (12' x 12' x 14) + (1/2 5.5 x 12 x 14) - (8 x 9 x 17.5)

1,218 CU. FT.

= 34.5 M^3

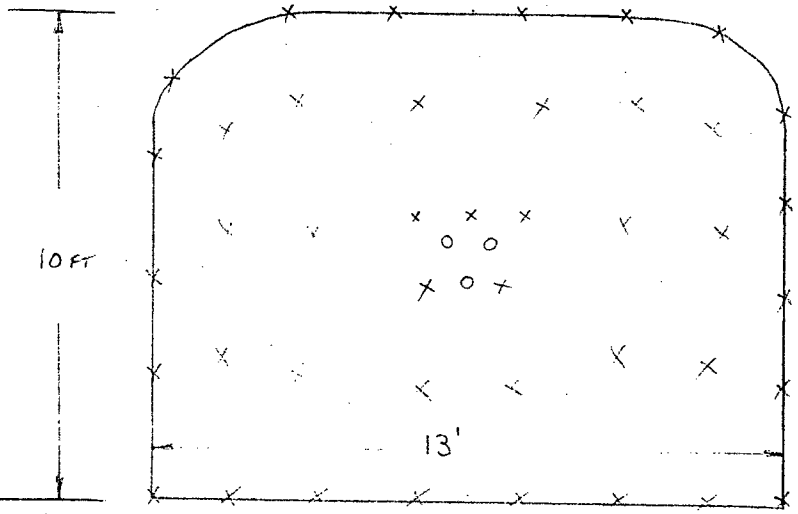
WIDENING AND BENCHING OF CRUSHER STATION

VOLUME = (30' x 30' x 30') - (30' x 8' x 9')

= 24,840 CU. FT.

= 703 M^3

10' x 13' LEVEL DRIFT



44 HOLES LOADED

3 NOT LOADED

.../49

6.2 CONVEYOR DRIFT COST (CONT'D)

EXPLOSIVES

POWERMEX 1 1/4" $\frac{31 \times 7 \times 12 \times 6}{70 \times 16}$

= 139.5 LBS. OF EXPLOSIVE @ 61.40'/100

= $85.65 $78.06

XACTEX $\frac{13 \times 7 \times 12}{24 \times 100} \times 50$ = 22.75 LBS. @ 52.71/100

= $11.99

DETONATORS

44 @ $.80 EACH	35.20
TOTAL COST/7FT. ADVANCE =	85.65
	11.99
	35.20
	132.84

COST/FT. = $18.98

COST/M. = $62.24

DRILL CYCLE

47 HOLES AT 8 FT EACH

376 FT.

ONLY 90 FT. DRIFT REQUIRED THUS JACKLEGS USED AND 630 LOADER (AIR OPERATED)

DRILLING 3 JACKLEGS AT 1.5 FT/MIN. =	83.55	MINUTES
15 MINUTES TO SET UP	15.00	
10 MINUTES TO REMOVE	10.00	
TOTAL	108.55	
SAY	109	MINUTES.

.../50

6.2 CONVEYOR DRIFT COST (CONT'D)

LOAD AND BLAST

44 HOLES AT 1 MIN./HOLE =	44 MINUTES
MAKE CONNECTIONS	15 MINUTES
BLAST FROM UPPER LEVEL	20 MINUTES
WAIT FOR SMOKE TO CLEAR	30 MINUTES
TOTAL	109 MINUTES

MUCKING

EIMCO 911 NARROW MACHINE 1 YARD BUCKET

TRAVEL AVERAGE 45 FT.

CYCLE TIME:

LOAD	30 SECS.
TRAVEL 45 FT. 5.86 FT/SEC	8 SECS.
TURN	20 SECS.
DUMP	30 SECS.
RETURN	20 SECS.
TRAVEL	8 SECS.

TOTAL TIME = 1 MINUTE 56 SECS. SAY 2 MINUTES

VOLUME TO BE MUCKED = $\frac{10 \times 13 \times 7 \times 1.5}{27}$ CU. YARDS

= 50.55 CU. YARDS 51 LOADS

TIME REQUIRED = 102 MINUTES

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6.2 CONVEYOR DRIFT COST (CONT'D)

ROCKBOLTING

13 FT. WIDE 3 BOLTS/5 FT.

$3 \times \frac{7}{5} = 5$ BOLTS

5 x 8 FT. BOLTS 40 FT. DRILLING

AT 3 FT/MIN. = $\frac{40}{3}$ = 14 MINUTES

INSTALLATION 4 MINUTES/BOLT	=	20 MINUTES
SET-UP TIME & REMOVAL TIME	=	15 MINUTES
TOTAL		49 MINUTES

WASHDOWN FACE

15 MINUTES

TOTAL CYCLE TIME

DRILL	109 MINUTES
LOAD AND BLAST	109 MINUTES
MUCKING	102 MINUTES
ROCKBOLTING	49 MINUTES
WASHDOWN	15 MINUTES
	384 MINUTES

DUE TO THE FACT THAT THE TRAVEL TIME WOULD BE A MINIMUM A ROUND/SHIFT IS POSSIBLE.

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7. ACCESS RAMP

7.1 COST SUMMARY

LENGTH 2,511 M. SIZE 4 M. x 5.5 M.

	LENGTH	COST/M.	TOTAL COST
LABOUR	2,511	$484.48	$1,216,529.00
EQUIPMENT MAINT.	2,511	93.08	233,723.88
EXPLOSIVES	2,511	88.00	212,168.00
STEEL AND BITS	2,511	23.21	58,280.31
PIPES 4" PUMP	2,511	8.43	21,167.73
2" WATER	2,511	4.70	11,801.70
VENT DUCT	2,511	18.20	45.700.20
CABLES	2,511	23.19	58,230.09
ROCKBOLTS	2,511	11.56	29,027.16
SMALL TOOLS	2,511	10.00	25,110.00
FUEL OIL	2,511	56.33	141,444.63
GROUND SUPPORT	2,511	40.85	102,574.35
			$2,155,756.85
	$858.53		
	$261.75/FT.		

7.2 COST CALCULATIONS

LABOUR COST/SHIFT

JUMBO OPERATOR	@	$164.00/DAY	$ 164.00
ST8 OPERATOR	@	$164.00/DAY	164.00
MTT-F40-44 OPERATOR	@	$164.00/DAY	164.00
ROCKBOLT MISCELLANEOUS	@	$164.00/DAY	164.00
MECHANIC	@	$147.00/DAY	147.00
ELECTRICIAN	@	$147.00/DAY	147.00
LEAD MECHANIC	1/2	$168.00/DAY	84.00
		TOTAL	$1,034.00

$147.71/FT.

$484.48/M.

EQUIPMENT MAINTENANCE

	HOURS OPES.	COST/HR.	COST/DAY
ST8 LOADER	15	$12.50	$187.50
JUMBO	482 M./DAY	.23/M. DRILLED	110.86
MTT 44F-40 TRUCK	12	15.00	180.00
UTILITY VEHICLE	15	5.00	75.00
GRADER	6	5.00	30.00
FAN	24	.10	2.40
PUMPS	24	.10	2.40
MINE LIGHTS	24	.10	2.40
STOPERS	5	1.00	5.00
GRINDERS	5	.10	.50
		TOTAL	$596.00

21 FT. ADVANCE

$28.38/FT.

$93.08/M.

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7.2 COST CALCULATIONS (CONT'D)

EXPLOSIVES

COST/M. $88.00/M.

STEEL AND BITS

COST/METER DRILLED = $0.3078

66 x 8 FT. DRILLED/SHIFT

= 528 FT.

$$\text{COST} = \frac{528}{3.28} \times 0.3078$$

$49.54/7 FT. ADVANCE

= $23.21/METRE ADVANCE

PIPES

6" AIR	13.71/M.
4" PUMP	8.43
2" WATER	4.70

VENT DUCT

EQUIPMENT

		H.P.
JUMBO		50.00
ST8	OPERATED	250.00
MTT-F44-40	TOGETHER + ONE MORE	270.00
GRADER	UNIT	180.00
UTILITY 975		76.00

THE GRADER WOULD NOT BE GRADING DURING OPERATION OF THE TRUCK.

7.2 COST CALCULATIONS (CONT'D)

VENT DUCT (CONT'D)

CFM. REQUIRED= (270 x 100) +(250 x 75) +(76 x 50)
= 27,000 + 18,750 x 3,800
= 49,550
SAY 50,000 CFM.

ASSUMING THAT THE SHAFT COMMENCED AT THE SAME TIME AS THE RAMP THE SHAFT COULD BE USED AS EXHAUST THUS LIMITING THE DISTANCE TO PUSH THE AIR TO APPROXIMATELY 700 METRES.
50,000 CFM. 700 METRES WOULD REQUIRE.
48" DUCT WOULD REQUIRE 12.62" WG.

48" DUCT RIGID DUCT UTILIZING EXHAUSTING VENTILATION

$14.28/FT.
HANGERS $ 2.00 EACH 1 PER 10 FT.

$$\text{COST/700 M.} = (700 \times 3.28 \times 14.28) + \left(\frac{700 \times 3.28}{10} \times \$2.00\right)$$

= $33,246.08

COST/M. = 47.49
USED 3 OCCASIONS COST/M. = $15.83
15% ALLOWANCE FOR LOSSES COST/M. = 15.83 x 1.15
$18.20/M. ADVANCE

CABLES

6.09/FT. FOR JUMBO 1,000 FT. 750 VOLT #0, 3 COND.
FOR FAN #4 3 COND. 1,000 FT. $2.87/FT.
7.5Kv #2/0 # COND. $4.93/FT.
MINE POWER CENTRE 6.9 KU 550 V.
300 KVA. $40,660.00

CABLE COST

1,000 FT.	@	6.09/FT.	=	$ 6,090.00
1,000 FT.	@	2.87/FT.	=	$ 2,870.00
10,000	@	4.93	=	$49,300.00
		TOTAL		$58.260.00

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7.2 COST CALCULATIONS (CONT'D)

CABLES (CONT'D)

$$\text{COST/M.} = \frac{58,260}{8,237} \times 3.28$$

$$= \underline{\$23.19/M.}$$

ROCKBOLTS

8 FT. BOLTS 2.89 EACH

8 BOLTS/7 FT.

= 4 BOLTS

COST/M. = 4 x 2.89

= $11.56/M.

SMALL TOOLS

$10.00/M.

FUEL OIL

BASED 0.45 LBS./H.P HOUR (8 LB. TO A GALLON)

ST8 LOADER	250 - 15 HOUR	=	3,750
JUMBO	50 - 2 HOUR	=	100
UTILITY	75 - 15 HOUR	=	1,125
GRADER	180 - 6 HOUR	=	1,080
TRUCK	270 - 12 HOUR	=	3,240
			9,295

$$\frac{9,295 \times 0.45}{8} \times \$0.6$$ 60¢/GALLON

$313.70/DAY

$$= \frac{\$313.70}{21} \times 3.28/FT.$$

$48.99/M. + 15% LUBRICANT

= $56.33/M.

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7.2 COST CALCULATIONS (CONT'D)

GROUND SUPPORT

20% SHOTCRETE

ROADWAY 5.5 M. x 4 M.

AREA TO BE SHOTCRETED 9.5 M .04 M. THICK

THICK QUANTITY/M. = 9.5 x .04

.38 CU. M./M.

60 LBS./1/2 CU. FT. 13.40 CU. FT. x 1.25

27 BAGS/M. AT $3.50/BAG

= $94.50/M. MATERIALS

20% ONLY THIS COST/M. = $\frac{94.5}{5}$

= $\underline{\$18.90}$ x 1.25 $23.62/M.

LABOUR COST ADDITIONAL

FULL CREW @ $1,034.00/DAY

BASE ON APPLYING 6 YARDS/SHIFT

ADVANCE/SHIFT = $\frac{6}{.38}$ x .764

= 12 M./SHIFT

COST/M. = $\frac{1,034}{12}$

BASED ON 20% OF TOTAL LENGTH

COST/M. = $\frac{1,034}{12x5}$ = 17.23

17.23

TOTAL COST = $40.85/M. ADVANCE

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7.2 COST CALCULATIONS (CONT'D)

RAMP

TO UTILIZE 988 LOADER AND CMS 40 TON TRUCK, THE ROADWAY SIZE WOULD BE:

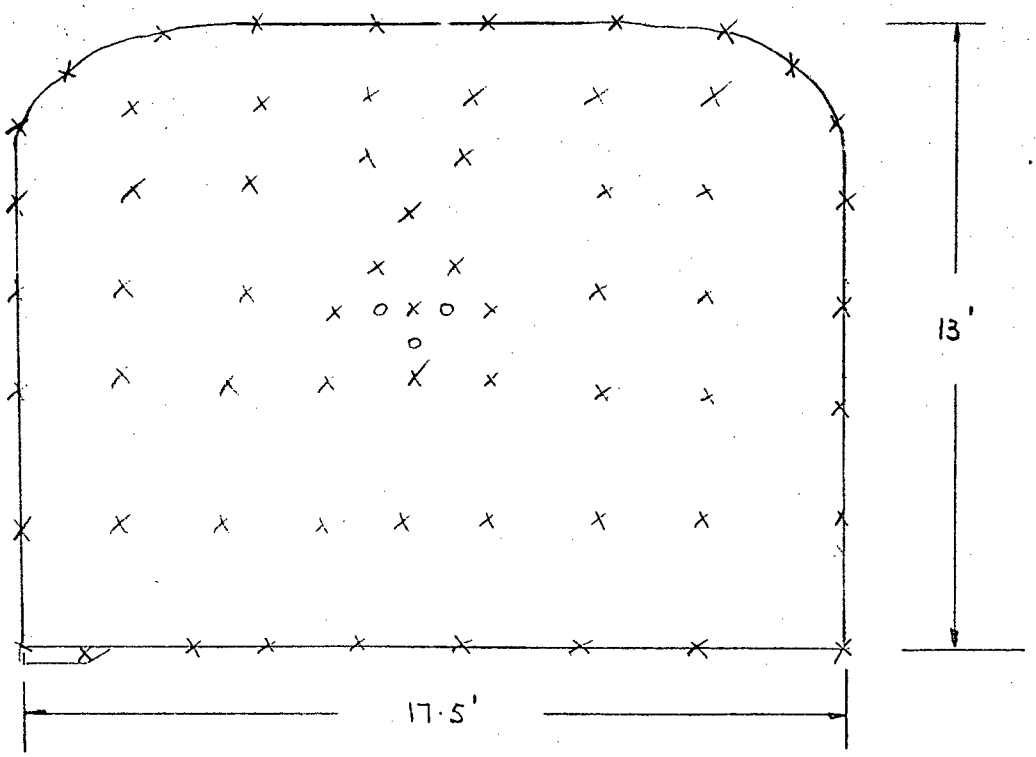
HEIGHT - 9' 7" + 3' (ABOVE OPERATOR'S HEAD)
= 12' 7" MINIMUM

WIDTH - 10' 4" + 7' (LEGAL REQUIREMENT)
= 17'4"
SAY, 17'6" MINIMUM

THUS SIZE OF ROADWAY WOULD BE 13' HIGH x 17' 6" WIDE.

A 988 LOADER WOULD REQUIRE A MINIMUM OF 14' HEIGHT TO WORK IN AND TO PROVIDE ADEQUATE WORKING HEIGHT - 15' TO 16'.

IT IS NOT FEASIBLE TO MAKE THE HEADING 15' HIGH 17' 6" WIDE THUS AN ST8 COMBINED WITH A MTT-F40-44 IS USED.



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7.2 COST CALCULATIONS (CONT'D)

NO. OF HOLES

CAP NO.	NO. OF HOLES		
-	3 NOT LOADED		
1	1		
2	1		
3	1		
4	1		
5	1		
6	4		
7	5		
8	6		
9	2		
10	6		
11	2		
12	8		
13	11	11	XACTEX
14	14	6	XACTEX
15	10	10	XACTEX
	66 HOLES	27	XACTEX
	63 LOADED	22 SQ M	

DRILL - 8 FOOT ROUND

36 HOLES AT 7 FT. EACH

POWERMEX A AT 1 1/4" x 8"

$$\frac{38 \times 7 \times 12 \times 60}{16 \times 70} = \text{LBS. EXPLOSIVES}$$

= 171.00 LBS.
@ $61.40/C. LBS.

= 104.99

XACTEX

$$\frac{27 \times 7 \times 12}{24 \times 100} \times 50 = 47.25 \text{ LBS. @ } \$52.71/\text{C. LBS.} = \$24.90$$

7.2 COST CALCULATIONS (CONT'D)

DETONATORS

4 @ 74.86/100	$2.99
11 @ 76.68/100	12.26
18 @ 79.07/100	14.23
35 @ 81.51/100	28.52
	$58.00

TOTAL COST EXPLOSIVES:

$104.99
24.90
58.00
$187.89

COST/M = $88.00/M

DRILLING

66 HOLES AT 8 FT./HOLE = 528 FT.
THREE BOOM JUMBOS AT 2 FT./MIN. = 88 MINUTES
15 MINUTES TO SET UP AND 10 MINUTES TO REMOVE MACHINE FROM THE FACE
TOTAL TIME = 108 MINUTES

LOAD AND BLAST

63 HOLES TO LOAD AT 30 SECS./HOLE
= 31.5 MINUTES

CONNECTION OF WIRES	15 MINUTES
RETREAT AND BLAST	15 "
WAIT FOR FUMES TO BE REMOVED	30 "
BLASTING TOTAL TIME	91.5 "

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7.2 COST CALCULATIONS (CONT'D)

MUCKING CYCLE

22 SQ. M 7 FT. ADVANCE
= 1,657 CU. FT.
= 61.4 SQ. YDS.
EXPANSION FACTION 1.5 VOLUME = 92.1 CU. YDS.

UTILIZING A ST8 SCOOPTRAM AND MTT-F40-44 TRUCK

VOLUME OF MUCK TO BE REMOVED
NOMINAL HEAPED LOAD 8 CU. YDS.
WASTE MATERIAL DENSITY BROKEN

$$\frac{176.21}{1.5} = 117.47 \text{ LBS./CU. FT.}$$

8 CU. YDS. = 8 x 27 x 117.47
= 25,373.52 LBS.

WEIGHT OF MAXIMUM PAYLOAD ST8 = 24,000 LBS.

$$\text{THUS MAXIMUM VOLUME} = \frac{24{,}000}{27 \times 117.47} = 7.56 \text{ CU. YDS.}$$

NO. OF TRIPS = 12.28
SAY, 13

REMUCK STATIONS EVERY 500 FT.
HALFWAY POINT 250 FT.

CYCLE TIME

LOAD	30 SECONDS
TRAVEL 250 FT. AT 2.93 FT./SEC.	1.42 MINUTES
TURN	20 SECONDS
DUMP	20 "
RETURN	20 "
TRAVEL 250 FT. AT 8.8 FT./SEC.	47 "
TOTAL	3.39 MINUTES/LOAD

(1 TRIP) 13 LOAD = 44.07 MINUTES

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7.2 COST CALCULATION (CONT'D)

15 MINUTES ALLOWANCE FOR CLEAN-UP

TOTAL TIME = 59.07 MINUTES

SAY, 60 MINUTES

ROCKBOLT

BOLTING PATTERN 4' x 4'

WIDTH OF ROADWAY 5.5 M

NO. OF BOLTS/7 FT. ADVANCE $= \frac{5.5 \times 3.28}{4} \times \frac{7}{4}$

$= 8$

DRILLING 8 FT. HOLES AT 2 FT./MIN. = 32 MINUTES

INSTALLING 8 BOLTS - 10 MIN. EACH 3 PERSONS.

30 MINUTES

SET-UP & REMOVE - 15 MINUTES

TOTAL TIME = 77 MINUTES

WASH DOWN FACE = 15 MINUTES

CYCLE TIME/7 FT. ADVANCE

DRILLING	108	MINUTES
BLASTING	91.5	"
LOADING	60	"
ROCKBOLTS	77	"
WASH DOWN FACE	15	"
TOTAL	351.50	MINUTES

5.85 HOURS

7 FT. ADVANCE/SHIFT

.../63

7.2 COST CALCULATION (CONT'D)

CREW SIZE

JUMBO OPERATOR
ST8 OPERATOR
MTT-F40-44 OPERATOR
ROCKBOLT & MISCELLANEOUS
MECHANIC
ELECTRICIAN

RE-MUCKING WITH ST8

40 TON TRUCK 7.5 CU. YDS./ST8 BUCKET
20 CU. YD. TRUCK
= 3 BUCKETS

LOADING

LOAD	30	SECONDS
TURN	20	"
DUMP	20	"
RETURN	20	"
TIME/BUCKET	1.5	MINUTES

3 BUCKETS = 4.5 MINUTES

TRAVEL 5,079 FT. AT 2.93 FT./SEC.	=	28.89 MINUTES
SURFACE TRAVEL AT 6 MPH 8.8 FT./SEC.		
1,000 FT.	=	1.89 "
DUMP	=	1.0 "
TRAVEL SURFACE	=	1.89 "
TRAVEL INBY AT 5,079 6 MPH 8.8 FT./SEC.	=	9.61 "
LOADING	=	4.5 "
TOTAL TIME/20 CU. YDS.		49.79 MINUTES

TOTAL QUANTITY TO BE MOVED = 92.1 CU. YDS.
5 TRUCK LOADS
TOTAL TIME = 5 x 49.79 MINUTES
= 248.90
= 4.14 HOURS

.../64

7.3 ACCESS RAMP VENTILATION

1/ RAMP CONNECTED TO THE SHAFT AT 100 M. VERTICAL INTERVALS

RAMP AT 15%

$$\text{TAN } x = \frac{100}{y}$$

$$y = \frac{100}{.15} = 666.66 \text{ M.} \quad \text{SAY } 667$$

VENTILATION IS REQUIRED TO COVER THIS LENGTH

667 METRES

EQUIPMENT

ONE ST 8		225 H.P.
ONE MTT420		180 H.P.
ONE DIESEL JUMBO		40 H.P.
INITIAL MACHINE		22500 CFM.
SECOND MACHINE	75%	13,500
THIRD AT	50%	2,000
TOTAL		39,000 CFM.

TOTAL H.P. = 53.5 H.P.

$$\text{RATIO H.P. TO AIR QUANTITY} = \frac{45,875}{535}$$

$$= 85.74 \text{ CFM./H.P.}$$

MAX H.P.

ST 8	250 H.P.
MTT420	195 H.P.
DIESEL JUMBO	78 H.P.
1st MACHINE	25,000 CFM.
SECOND AT 75%	14,625
	3,900
	43,525 CFM.

.../65

7.3 ACCESS RAMP VENTILATION (CONT'D)

MAX H.P. = 490 H.P.

CFM./H.P.= $\frac{41,875}{490}$ = 83.45 CFM./H.P.

MAXIMUM LENGTH AIR WILL BE REQUIRED TO BE PUSHED WILL BE 666.6 M. + ALLOWANCE FOR OVERLAP AT THE START OF THE VENT DUCT AND TERMINATION OF THE DUCT. ALLOW 20 M. AT INITIAL POINT AND 10 M. AT TERMINATION POINT. TOTAL REAL LENGTH 696.6 M.

ALLOWANCE FOR BENDS 10% OF TOTAL LENGTH

696 + 69.6 M. = 765.6 OR SAY 766 M.

41,875 CFM.TO BE DELIVERED 766 M. (2,512.48 FT.)

USING A BLOWING SYSTEM

36" DUCT	RESISTANCE/100 FT.	42,000 CFM.	1.6"
42" DUCT			.62"
48" DUCT			.37"

TOTAL PRESSURE LOSS	36" DUCT	40.19"
	42" DUCT	15.57"
	48" DUCT	9.29"

9.29" IS FEASIBLE

ALTERNATIVE TWO DUCT EACH PROVIDING 50% OF AIR

21,000 CFM. EACH

24" DUCT	3.2" WG./100 FT.
30" DUCT	1" WG./100 FT.
36" DUCT	.41" WG./100 FT.

TOTAL PRESSURE LOSS

24" DUCT	80.38" WG.
30"	25.12" WG.
36"	10.29" WG.

TWO 36" DUCT ARE ALSO FEASIBLE

EXHAUST SYSTEM	42,000 CFM.
36"	.82" WG.
42"	.35" WG.
48"	.23" WG.

TOTAL PRESSURE LOSS

36" 20.59" WG.

.../66

7.3 ACCESS RAMP VENTILATION (CONT'D)

TOTAL PRESSURE LOSS (CONT'D)

42"	8.79" WG.
48"	5.77" WG.

48" DUCT WOULD APPEAR THE MOST SUITABLE SOLUTION.

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7.4 TIME SCHEDULE

CREW SIZE AND HEADING

HEADING DRIVEN UTILIZING A JUMBO THREE BOOM HYDRAULIC ELECTRICALLY OPERATED, DIESEL PROPULSION.
CYCLE OF OPERATIONS.
DRILL, HEAD, BLAST, MUCK OUT ROCKBOLT, WASH FACE, DRILL.

DRILL CYCLE — 1 MAN

49 HOLES TO BE DRILLED
SET-UP TIME 15 MINUTES
DRILLING AT 2 FT./MIN./BOOM = $\frac{49 \times 12}{2 \times 3}$ = 98 MIN.
REMOVAL OF JUMBO FROM THE FACE ETC. 10 MIN.
DRILLING CYCLE TOTAL 123 MIN.

LOAD — 2 MEN

LOAD 46 HOLES ALLOWANCE ONE MINUTE/HOLE
TEN MINUTES TO SET-UP AND REMOVE EQUIPMENT
TOTAL — 66 MINUTES

BLAST

15 MINUTES TO BLAST
30 MINUTES TO ALLOW BLASTING FUMES TO BE REMOVED
15 MINUTES TO CHECK OUT THE FACE AND SCALE BACK
TOTAL — 60 MINUTES

MUCKING OUT — 1 MAN ST8

15% GRADE — 1 MAN MTT420
REMUCK STATIONS EVERY 550 FT.
ST8 SCOOPTRAM - AVERAGE SPEED 4 MPH. 6 MPH DOWN GRADE
2 MPH UP GRADE.

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7.4 TIME SCHEDULE (CONT'D)

MUCKING OUT (CONT'D)

6 MPH 8.8 FT./SEC.
2 MPH 2.93 FT./SEC.

CYCLE TIME

LOAD	30 SEC.	.5	MIN.
TRAVEL 550 FT.	AT 2.93 FT./SEC	3.12	MIN.
TURN	20 SEC.	.33	MIN.
DUMP	20 SEC.	.33	MIN.
TURN	20 SEC.	.33	MIN.
RETURN 550 FT.	AT 6.6 FT./SEC	1.38	MIN.
TOTAL TIME		5.99	MINUTES
		SAY, 6	MINUTES

VOLUME OF ROCK TO REMOVE

$\frac{17 \times 11 \times 11 \text{ CU. YD.}}{27}$ = 76.18 SOLID

BASED ON SG OF ROCK AT GRUM LOADER CAR MOVES
7.25 CU. YDS. MAXIMUM (WEIGHT RESTRICTION)
76.18 x 1.5 = BROKEN VOLUME EXPECTED
= 114.27

NO. OF LOADS = $\frac{114.27}{7.25}$ = 15.76 SAY 16 LOADS

TIME REQUIRED 16 x 6 = 96 MINUTES
15 MINUTES ALLOWANCE FOR FINAL CLEAN-UP
TOTAL TIME 96 + 15 111 MINUTES

ROCKBOLTING

USING THE JUMBO
15 MINUTES TO SET UP 8 BOLTS/11FT. ADVANCE
DRILLING TIME 8 FT. BOLTS $\frac{8 \times 8}{2}$ = 32 MINUTES
SETTING TIME 2 MINUTES/BOLT = 16 MINUTES
TOTAL TIME = 63 MINUTES

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7.4 TIME SCHEDULE (CONT'D)

ROCKBOLTING (CONT'D)

WASH DOWN FACE AND CHECK FOR BOOTLEGS = 15 MINUTES

TRAVEL TIME IN - OUT

TOTAL DISTANCE 7,150 FT. PLUS (583 M) 1,912 FT. PLUS SURFACE TRAVEL (160 M) 524.8 FT.

TOTAL TRAVEL = 9,645 FT.

MIDWAY POINT BASED ON TIME

SURFACE TRAVEL IN 524.8 FT. AT (8 MPH) 11.73 FT./SEC.

= .74 MINUTES

TRAVEL IN 9,062 FT. AT (6 MPH) 8.8 FT./SEC.

= 17.16 MINUTES

TOTAL TIME = 17.90 MINUTES

AVERAGE = $\frac{17.90}{2}$ = 8.95 MINUTES

TRAVEL OUT 9,062 FT. @ (2 MPH) 2.93 FT./SEC.

= 51.54 MINUTES

OVER SURFACE = .74 MINUTES

52.28 MINUTES

AVERAGE = 26.14 MINUTES

SHIFT TIME WOULD BE:

TRAVEL IN	=	8.95 MINUTES
DRILL	=	123.00 "
LOAD	=	66.00 "
BLAST	=	60.00 "
MUCKING OUT	=	111.00 "
ROCKBOLTING	=	63.00 "
WASH DOWN FACE	=	15.00 "
TRAVEL OUT	=	26.14 "
TOTAL	=	473.09 MINUTES = 7.88 HOURS

ONE ROUND/SHIFT

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7.4 TIME SCHEDULE (CONT'D)

CREW SIZE

JUMBO OPERATOR	1
ST8 OPERATOR	1
MT420 OPERATOR	1
ROCKBOLT & MISCELLANEOUS	1
SHIFTBOSS	1
MECHANIC	1
ELECTRICIAN	1

MUCKING OUT WITH MT 420

TOTAL TIME FOR TERMINATION OF THE RAMP
MTT420
1,000 FT. ON SURFACE
9,062 FT. UNDERGROUND
LOAD 12.61 CU. YDS.

TWO BUCKETS	LOAD	30 SECONDS
	TURN	20 "
	DUMP	20 "
	TURN	20 "
		90 SECONDS

TWO LOADS 3 MINUTES
TRAVEL 4,531 FT. OUT AT 2.93 FT./SEC.
= 25.77 MINUTES

SURFACE TRAVEL OUT AT 11.73 FT./SEC.	=	1.42 MINUTES
DUMP	=	1.00 MINUTE
TRAVEL TO FACE	=	8.58 MINUTES

TOTAL TIME TRAVEL:

LOADING	=	3.00 MINUTES
TRAVEL OUT	=	25.77 "
SURFACE	=	1.42 "
DUMP	=	1.00 "
SURFACE	=	1.42 "
TRAVEL TO FACE	=	8.58 "
		41.19 MINUTES

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7.4 TIME SCHEDULE (CONT'D)

114.27 = 9.06 LOADS SAY, 10 LOADS
12.61

411.9 MINUTES 6.86 HOURS

TO DUMP AT THE SHAFT MAXIMUM DISTANCE WOULD BE (700 M)
2,296 FT. PLUS DISTANCE TO THE SHAFT FROM THE RAMP (130 M) 427 FT.

HALFWAY POINT WOULD BE 427 FT. FLAT 1,148 FT. AT 15%.

TOTAL TIME FOR ONE LOAD 12.61 CU. YDS. WOULD BE:

LOAD	3.00 MINUTES
TRAVEL OUT 1,148 FT. @ 2.93 FT./SEC.	6.53 "
427 FT. @ 7.33 FT./SEC.	.97 "
DUMP	1.00 "
TRAVEL BACK 1,575 FT. @ 8.8 FT./SEC.	2.98 "
TOTAL	14.48 MINUTES

10 LOADS	144.8 MINUTES
	2.41 HOURS

THIS WOULD REQUIRE TEMP SKIP POCKET AT EACH STATION.

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8. LEVEL DEVELOPMENT

8.1 DRIFTS

COST/METER FOR ROCK DEVELOPMENT - 14' x 11' (DIRECT COSTS)

	SINGLE HEADING COST/METER	MULTIPLE HEADING COST/METER
LABOUR	$377.65	$265.67
EXPLOSIVES	76.55	76.55
EQUIPMENT MAINTENANCE	59.54	59.54
STEEL & BITS	18.99	18.99
PIPES AIR	13.71	1.37
WATER	4.70	.47
VENT DUCT	3.77	3.77
ROCKBOLTS	5.83	5.83
SMALL TOOLS	10.00	10.00
FUEL & OIL	25.45	25.45
TOTALS	$596.19	$467.64
COST/FOOT	$181.76	$142.57

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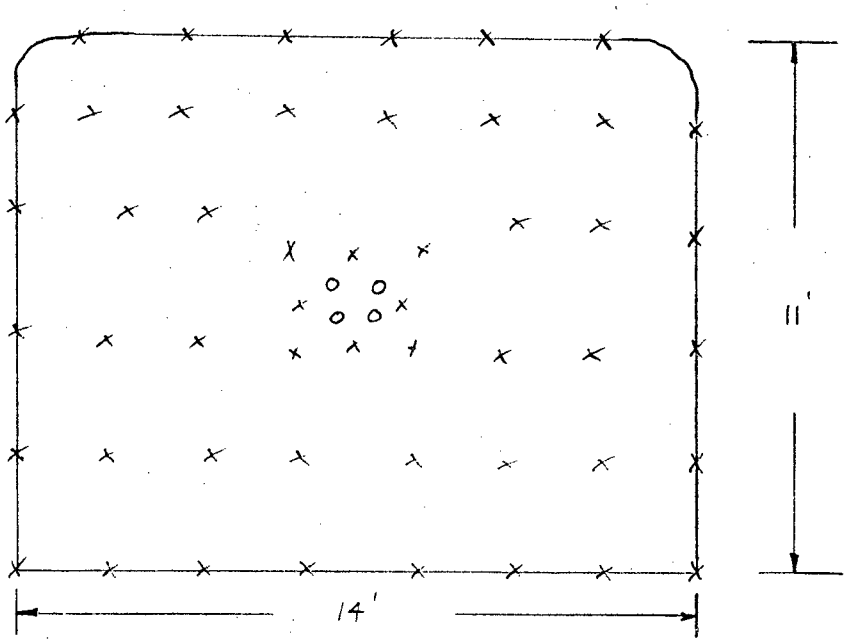
8.1 DRIFTS (CONT'D)

ROCK DEVELOPMENT - 14' x 11' DRIFT



HOLES DRILLED = 54

HOLES LOADED = 50

8 FOOT DRILLING BASED ON A ROUND/SHIFT.

LABOUR

LEADER	@	$168/SHIFT	$168.00
DRILLER	@	$164/SHIFT	164.00
LOADER	@	$164/SHIFT	164.00
MECHANIC	@	$146/SHIFT	146.00
MINER	@	$164/SHIFT	164.00
		TOTAL	$806.00

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8.1 DRIFTS (CONT'D)

COST/FOOT = $115.14

COST/METER = $377.65

EXPLOSIVES

$\frac{42 \times 7 \times 12 \times 60}{16 \times 70}$ = LBS. EXPLOSIVE = 189 LBS.

189 LBS @ $61.40/100 = $116.04

XACTEX

$\frac{8 \times 7 \times 12 \times 50}{24 \times 100}$ = 14 LBS. @ 52.71 LBS./100 = $7.37

DETONATORS

50 @ 0.80 EACH = $40.00

TOTAL COST =	116.04
	7.37
	40.00
	$163.41

COST/FOOT = $23.34

COST/METER = $76.55

EQUIPMENT MAINTENANCE

	COST/HOUR		COST/DAY
ST 8	15.0	16 HOURS	240.00
DRILL JUMBO	.23/M DRILLED	395.14 M.	90.87
FAN & DUCT	$1/FOOT		21.00
STOPERS	.09/FOOT DRILLED	104 FT/DAY	9.36
PIPES			10.00
CABLES			10.00
			$381.23

.../75

8.1 DRIFTS (CONT'D)

COST/FOOT = $18.15

COST/METER = $59.54

STEEL & BITS

COST/METER DRILLED = $0.3078

54 x 8 x 3.28 x 0.3078 = $62.30/METER
$18.99/FOOT

PIPES

AIR	13.71/METER
WATER	4.70/METER

VENT DUCT

$37.72/M REUSABLE USE 10% OF COST.

ROCKBOLTS

13 BOLTS/21 FT.

@ 2.89 EACH	=	$37.57
COST/FT.	=	$1.78
COST/M	=	$5.83

SMALL TOOLS

10.00/M

FUEL OIL

0.45 LBS./HP HR.

ST8	250 - 16 HR.	=	4,000
JUMBO	50 - 4 HR.	=	200
			4,200

.../76

8.1 DRIFTS (CONT'D)

$$\frac{4,200 \times 0.45 \times \$0.6}{8} = \$141.75$$

15% ALLOWANCE FOR OIL

= 163.01

COST/FT. = $7.76

COST/M = $25.45

.../77

8.2 RAISES

8' x 9' RAISE COSTS

LENGTH 108 FT. = 33 M.

	LENGTH	COST/M.	TOTAL COST
LABOUR	33	$348.59	$11,503.47
EQUIPMENT MAINTENANCE	33	27.18	896.94
EXPLOSIVES	33	60.10	1,983.30
DRILL STEEL AND BITS	33	14.42	475.86
PIPES 4"	30	8.43	252.90
2"	30	4.70	141.00
VENT DUCT	25	23.68	592.00
SMALL TOOLS	33	10.00	330.00
FUEL OIL	33	2.09	68.97
TIMBER	33	26.63	878.79
ROCKBOLTS	33	11.56	381.48
			$17,504.71

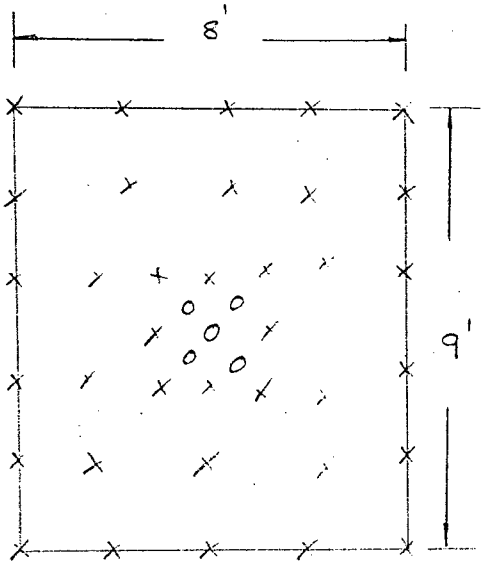
COST/M. $530.45

$161.72/FT.

.../78

8.2 RAISES (CONT'D)

RAISE 108 FT. 8 x 9 FT RAISE DRIVEN CONVERTIONALLY



OF HOLES LOADED 36

OF HOLES DRILLED 41

EXPLOSIVES

$\frac{36 \text{ HOLES} \times 7 \text{ FT.} \times 12 \times 60}{16 \times 70}$ = 162.00 LBS. EXPLOSIVES

AT $61.40/100 LBS. = $99.47

DETONATORS @ $.80 EACH = 28.80

TOTAL $128.27

COST/FT. = $18.32

COST/M. = $60.10

.../79

8.2 RAISES (CONT'D)

CYCLE TIME

DRILLING

41 HOLES 8 FT. LONG = 328 FT.

UTILIZING TWO DRILLERS AT THE FACE AT 1.5 FT./MIN.	=	110 MINUTES
SET-UP TIME AND REMOVAL TIME	=	15 MINUTES
TOTAL TIME		125 MINUTES

LOAD AND BLAST

REMOVE DRILL EQUIPMENT FROM RAISE	15 MINUTES
CLIMB RAISE WITH EXPLOSIVES AT 1 FT./SEC. (54 FT.)	1 MINUTE
LOAD 41 HOLES AT 1 MINUTE EACH	41 MINUTES
CONNECT	10 MINUTES
RETREAT FROM RAISE AND REMOVE STAGING	15 MINUTES
BLAST	5 MINUTES
ALLOW FUMES TO CLEAR	30 MINUTES
TOTAL	117 MINUTES

MUCKING

ONE ROUND = $\frac{7 \times 8 \times 9}{27}$ CU. YARDS = 18.66 CU. YARDS = 27.99 CU. YARDS x 1.5 = 28 LOADS

UTILIZING THE 911 THIS IS EQUIVALANT TO LOADS

CYCLE TIME

LOAD	30 SECONDS		
TRAVEL 90 FT. AT 2.93 FT./SEC.	31 SECONDS		
TURN	20 SECONDS		
DUMP	30 SECONDS		
RE-TURN	20 SECONDS		
DUMP	30 SECONDS		
TOTAL/LOAD	151 SECONDS	=	2 MIN. 31 SEC.

28 LOADS WOULD REQUIRE 70.28 MINUTES

.../80

8.2 RAISES (CONT'D)

TIMBERING AND MANWAY

EXTEND STULLED MANWAY AND CHUTE ARRANGEMENT THREE MEN
AVERAGE HOISTING DISTANCE 54 FT. 2 HOURS

BUILD DRILL PLATFORM

1 HOUR

EXTEND PIPES AND VENT TUBE

1 HOUR PER 21 FT. ADVANCE
7 FT. ADVANCE 20 MINUTES

TOTAL TIME

DRILLING	125 MINUTES
LOAD AND BLAST	117 MINUTES
MUCKING (REMOVAL OF SUFFICIENT TO ENTER RAISE)	30 MINUTES
TIMBERING	120 MINUTES
DRILL PLATFORM	60 MINUTES
EXTEND PIPES AND VENT TUBE	20 MINUTES
TOTAL	472 MINUTES
	7.86 HOURS

ESTIMATED RATE OF ADVANCE
14 FT/DAY

LABOUR

DRILLER	@ $164/DAY x 3	=	$ 492.00
LEAD	@ $168/DAY x 3	=	504.00
LOADER OP.	@ $164/DAY x 3	=	492.00
	TOTAL		$1,488.00

COST/FT. $106.28

COST/M. $348.59

.../81

8.2 RAISES (CONT'D)

EQUIPMENT MAINTENANCE

	COST/HOUR	OPERATING HOURS	COST/DAY
EIMCO 911	$7.50	6 HOURS	$ 45.00
JACKLEGS	$.09/FT. DRILLED		59.04
STOPERS			
FAN AND DUCT			10.00
PUMPS			2.00
			$116.04/DAY

= $27.18/M.

DRILL STEEL AND BITS

COST/METER DRILLED = $0.3078

$\frac{41 \times 8 \times 0.3078}{3.28}$ = $30.78

= $14.42/METRE ADVANCE

PIPES

AIR 4"	8.43/M.
WATER 2"	4.70/M.

VENT DUCT

$23.68/M.

SMALL TOOLS

$10.00/M.

.../82

8.2 RAISES (CONT'D)

FUEL OIL

911 BASED ON .45 LBS./ H.P. HOUR

$\frac{38.5 \times 6 \times 0.45 \times \$0.6}{8}$ = 7.79/DAY

= 1.82/M. ADVANCE

ALLOW 15% FOR OIL = .27

TOTAL $2.09/M. ADVANCE

TIMBER REQUIREMENTS

5" ROUND 7 FT. ADVANCE

4 x 7' + 2 x 16 = 60 FT. = 98.40 BOARD FT.

PLANK (7' x 2" x 12")8 = 112 BOARD FT.

(7 x 2 x 4")1 = 4.66

MISCELLANEOUS 10 BOARD FT.

ALLOWANCE WASTE 20%

TOTAL = 271.27 BOARD FT.

SAY 272 @ $209/1000 BOARD FT.

$56.84/7 FT.

COST/M. = $26.63/M.

ROCKBOLTS

4/M. @ $2.89 EACH = 11.56/M.

.../83

8.2 RAISES (CONT'D)

COST/M. 7' x 7' ALIMAK RAISE (100 M. RAISE) (DIRECT COST)

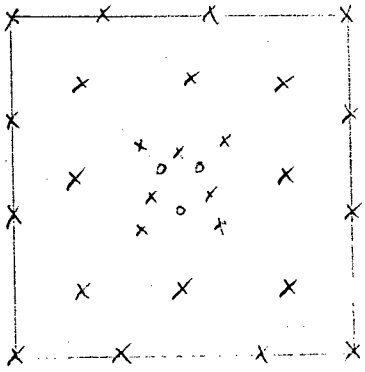
	COST/M.
LABOUR	$230.54
EXPLOSIVES	45.10
EQUIPMENT MAINTENANCE	112.18
ESTABLISH STATION	63.85
ROCKBOLTS	7.87
SCREEN	5.74
DRILL STEEL AND BITS	22.52
SMALL TOOLS	10.00
	$497.80/M.

COST/FT. = $151.77

.../84

8.2 RAISES (CONT'D)

7' x 7' ALIMAK RAISE



27 HOLES BLASTED

30 DRILLED

EXPLOSIVES

27 HOLES AT 7 FT.

$\frac{27 \times 7 \times 12}{7 \times 16} \times 60 = 121.50$ LBS.

AT $61.40/100 LBS.

= $74.60

27 DET AT $0.80 EACH

= $21.60

TOTAL COST/7 FT. = $96.20/7 FT.

= $45.10/M.

LABOUR

3 MEN @ $164.00/SHIFT = $492.00

COST/M. = $230.54

.../85

8.2 RAISES (CONT'D)

EQUIPMENT MAINTENANCE

$34.20/FT.
$112.18/M.

ESTABLISH ALIMAK STATION

$6,385.00
100 M., RAISE = $63.85/M.

ROCKBOLTS

1 PER FOOT OF ADVANCE @ 2.40 EACH
= $7.87/M.

SCREEN

1.75/FT. $5.74/M.

DRILL STEEL AND BITS

COST/M. DRILL = .3078/M.

$$\frac{30 \times 8 \times .3078}{3.28}$$

= $22.42/M.

.../86

9. VENTILATION

PRODUCTION FROM THE MINE WILL BE 3600 TON/DAY
BASED ON 125 CU. FT. PER MIN./TON PRODUCED VENTILATION REQUIREMENTS WILL BE 450,000 CFM.
THE RAMP DUE TO ITS LENGTH WOULD PROVIDE HIGH PRESSURE DROPS AND SHOULD BE USED FOR LEAKAGE RETURN ONLY.
THE SHAFT COULD PROVIDE FOR LIMITED QUANTITY OF AIR AT MAXIMUM VELOCITY 1000 FT./MIN.

AVAILABLE AREA OF THE SHAFT
= CSA OF THE SHAFT - AREA OF STEEL
πr^2 - (4.9 M. + 2.3 + 8 + 4) x 8" -(3.5 M. x 5 M.)
201.53 - 26.24 - 18.82
EFFECTIVE AREA OF SHAFT = 156.47 SQ. FT.
SAY 156 SQ. FT.
MAXIMUM QUANTITY DOWN SHAFT WOULD BE
156 x 1000
= 156,000 CFM.
THIS LEAVES APPROX. 300,000 CFM. TO BE TAKEN VIA A RAISE.
UTILIZING A K FACTOR OF 0.01×10^{-6}
PRESSURE DROP OF SHAFT

$$P = \frac{K\ SQ^2}{A^3}$$

$$= \frac{0.01 \times 50.38}{156} \times 1{,}588 \text{ FT.}$$

5.12 LB./FT.^{2}

= 1" W.G.

$$P = \frac{K\ SQ^2}{A^3}$$

$$\frac{A^3}{S} = \frac{K\ Q^2}{P} = \frac{0.01 \times 300 \times 3 \times 1{,}588}{5.2}$$

.../87

9. VENTILATION (CONT'D)

$$= \frac{1 \times 300 \times 3 \times 1588}{5.2}$$

$$= 274,846$$

$$\frac{(xy)^3}{2x + 2y} = 274,846$$

LET x = 10 FT.

THEN $1,000y^3 = 274,846\ (20 + 2y)$

$1,000y^3 - 549,692y - 5,496,920 = 0$

y = 22

x = 12

RAISE SIZE WOULD BE 12' x 22'

BASED ON MAX. 1,500 FT./MIN.

SHAFT WOULD TAKE 1,500 x 156

= 234,000 CFM.

QUANTITY REQUIRED FOR RAISE WOULD BE

450 - 234 = 216,000 CFM.

$$\text{PRESSURE DROP} = \frac{0.01 \times 50.38 \times 1.5 \times 1.5 \times 1,588}{156 \times 1 \times 1}$$

$= 11.53$ LB/FT.^{2}

= 2.21" WG.

2.21" WG.

$$\frac{A}{S}^3 = \frac{0.01 \times 10^{-6} \times 216 \times 216 \times 1,588}{11.53}$$

64,258

10' x 15' RAISE WOULD SATISFY

RAISE WOULD BE REQUIRED TO BE 10' x 15' TO SATISFY QUANTITY

RETURN RAISES WOULD BE REQUIRED TO HANDLE 450,000 CFM. - THAT AIR RETURNED UP THE RAMP. ALLOWANCE OF 50,000 CFM. VIA THE RAMP. THIS WOULD ALLOW DIESEL EQUIPMENT TO NEGOTIATE THE RAMP AT ALL TIMES AT A COMBINED H.P. OF 660 H.P.

ASSURE TWO RETURN AIR RAISES. 200,000 CU. FT./MINUTE VELOCITY 1,500 FT/MIN. AREA 133 SQ. FT. SIZE OF RAISE WOULD BE 10'x 14'EACH.

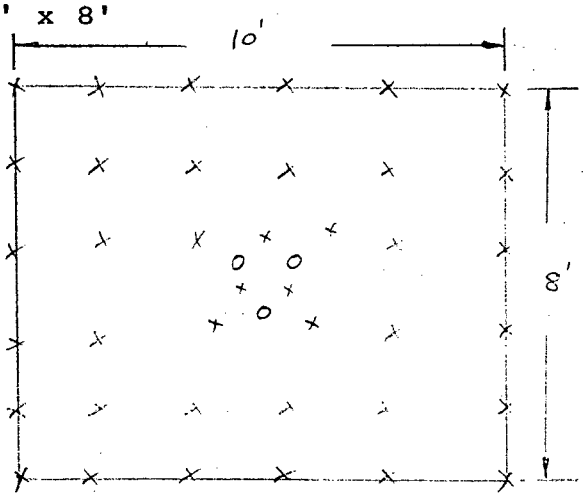
.../88

9. VENTILATION (CONT'D)

RAISE COST 10' x 15'

TAKEN IN TWO LIFTS 10' x 8' AND 10' x 7'

10' x 8'



39 HOLES 42 DRILLED

8 FT. ROUND 7 FT. LOADED 1 1/4" POWERMEX

$\frac{7 \times 39 \times 12}{8 \times 28} \times 50$ = LBS. EXPLOSIVES

= 159.96 LBS.

159.96 @ 61.40/100

= $98.21

COST/FT. = $14.03

COST/M. = $46.01

.../89

9. VENTILATION (CONT'D)

TOTAL TIME

DRILLING	135.43 MINUTES
BLASTING	107.43 MINUTES
SCALING	38.43 MINUTES
ROCKBOLTING	48.00 MINUTES
INSTALLATION OF RAIL	54.00 MINUTES
	383.29 MINUTES
	6.38 HOURS

ONE ROUND/SHIFT

LABOUR

THREE MAN CREW @ $164.00/SHIFT	$492.00
MECH./ELEC.	48.66
	$540.66

COST/M. = $253.33

ROCKBOLTS

8/7 FT. AT $2.89 EACH = $23.12 = $10.83/M.

SCREEN

30% SCREEN 1 M. $\times \frac{(20 + 8)}{3.28} \times \frac{\$2.64}{1.85} \times .3$ $3.65/M.

DRILL STEEL AND BITS

COST/ FT. DRILL = $0.09

$\frac{42 \times 8 \times 0.09}{7} \times 3.28 = \$14.16/M.$

.../90

9. VENTILATION (CONT'D)

ESTABLISH ALIMAK STATION

10' x 10' x 35 FT. LONG $182.43/FT.

= $6,365.00

MAINTENANCE

$34.20/FT. $112.17/M.

EQUIPMENT

ALIMAK RENTAL	$280.34/M.
DRILLS 4 2,334 EACH	10.21/M.
VENT FAN	1.93/M.
VENT DUCT	11.29/M.
SWITCHGEAR	5.85/M.
SMALL TOOLS	3.00/M.
TOTAL	$312.62/M.

COST/M. ALIMAK RAISE

	COST/M.	
LABOUR	$253.33	
ROCKBOLTS	10.83	
EXPLOSIVES	46.01	
SCREEN	3.65	
STATION	15.91	
DRILL STEEL AND BITS	14.16	
MAINTENANCE	34.20	
EQUIPMENT	312.62	
TOTAL	$690.68	COST/FT. = (210.57)

TOTAL COST/M. RAISE 10' x 15' = $1,381.36

.../91

10 MINING METHODS

10.1 MINING METHODS - COST COMPARISON

(Direct Cost per short ton)

	SUBLEVEL MINING	CUT AND FILL
Slot raise	0.254	
Sublevels	1.386	
Ramp	0.128	0.427
Vent Raise	0.124	0.404
Ore waste pass	0.034	
Access drift	0.277	0.464
Dumps	0.043	
Drilling	0.842	0.752
Blasting	0.330	1.094
Mucking	0.535	0.732
Silling		0.420
Widening		0.725
Backfilling		2.090
Rockbolting		0.654
Cost per ton total	$ 3.953	$ 7.76
Cost per metric ton	$ 4.34	$ 8.55
Dilution	35%	15%
Recovery	80%	95%

.../92

10.2 SUB-LEVEL MINING

DIRECT MINING COSTS

SLOT RAISE	$ 391,808
SUB-LEVELS - ORE	1,326,125
SUB-LEVELS - ROCK	810,938
RAMP	198,664
VENT RAISE	192,032
ORE & WASTE PASS	53,726
ACCESS DRIFTS	427,710
DUMPS	66,865
BLASTING 1,213,105 TONS	509,504
DRILLING 1,213,105 TONS	1,298,022
MUCKING 1,213,105 x 1.215	825,397
(BASED ON 80% RECOVERY AT 35% DILUTION)	
TOTAL	$6,100,791

PRODUCTION OF 231,210 TON + (1,213,105 x 1.08) = 1,541,363

$$\text{OVERALL DILUTION} = \frac{1,213,105 \times .35}{1,541,361}$$

$$= 22\%$$

$3.95/TON MINED

(1,274,480) $4.78 TON ORE PRODUCED AT 0 DILUTION

.../93

10.2 SUB-LEVEL MINING (CONT'D)

STOPE LAYOUT

500 FT. LONG @ 40 FT./DRIFT INTERVAL

OF SUB-LEVELS = $\frac{500}{40}$ = 12 LEVELS

TOTAL SUB-LEVELS	12 50 M HIGH
ORE 130 FT.	16' x 11 1/2'
ROCK 79 FT.	14' x 11'
10' x 10' RAISE	310 FT. x 2
7' x 7' ORE PASS	$\frac{355'}{2}$ LONG
DUMPS 5	8' x 9' x 13'
ACCESS DRIFTS	11 x 14' x 11' 500 FT. LONG
RAMP AT 15°	1,093 FT.
WASTE PASS	7' x 7' $\frac{355'}{2}$ LONG

VOLUME OF ORE

= 656 x 20 x 3.28 x 500

= 21,516,800

= 2,888,630 TONS ORE

50 METERS INTERVAL

= 1,444,315 TONS ORE

ORE IN SUB-LEVELS

= $\frac{12 \times 130' \times 16' \times 11\ 1/2' \times 6}{2,000} \times 179 \times 1.5$

= 231,210 TONS

THIS LEAVES 1,444,315 - 231,210 TON REMAINING

= 1,213,105 TONS MINING

.../94

10.2 SUB-LEVEL MINING (CONT'D)

COSTS

SLOT RAISE

70 FT. x 12 x 3 x 2 = 2,520 FT.
@ $77.74/FT. $ 195,904

SUB-LEVELS

12 x 130 FT. @ 16' x 11 1/2 x 6 = 9,360 FT.
@ $141.68/FT. $1,326,125

ROCK DEVELOPMENT SUB-LEVELS

14' x 11' 79 FT. @ $142.57/FT.
12 x 6 x 79 x 142.57 $ 810,938

ROCK DEVELOPMENT RAMP

1,093 FT. LONG @ $181.76/FT. $ 198,664

10' x 10' RAISE

620 FT. @ $309.73/FT. $ 192,032

7' x 7' ORE RAISE & WASTE PASS EACH -

177 FT. @ $151.77/FT. $ 53,726

ACCESS DRIFTS 500 FT. x 6 @ $ 427,710
142.57 14' x 11'
DUMPS 5 x 13' @ 8' x 9'
$161.72/FT. $ 21,023

CONCRETE FOR DUMPS 2' x 4' x 26' x 6 = 46.22 CU. YDS.

27

@ $75.04 CU. YDS. $ 6,992
WIDENING 2 (40' x 11' x 8') 6 @ $.92/CU. FT. $ 38,860
BLASTING $0.42
DRILLING $1.07/TON IN PLACE TONNAGE

MUCKING TO ORE PASS $.56/TON (TRAMMED)

.../95

10. 2 SUB-LEVEL MINING (CONT'D)

COST OF MUCKING

UTILIZING ST8 BASED ON 5 YD. CAPACITY OF MACHINE
TOTAL WEIGHT = 24,000 LBS.

5 x 27 x 179 = 24,165 LBS.

BASED ON PREVIOUS WORK ROUND TRIP FOR A SCOOP WOULD BE 5 MIN./LOAD
ONE UNIT UTILIZING 50 MINUTES/HOUR 6 HOUR/SHIFT
WOULD PRODUCE $\frac{50 \times 6 \times 12}{5}$ = 720 TON/SHIFT

ALLOWANCE FOR SECONDARY BLASTING 25% OF TIME 720 x .75
= 540 TONS

LABOUR

ONE MAN AT $164/SHIFT
COST/TON = $\frac{164}{540}$ = $0.30

EQUIPMENT MAINTENANCE

COST/HOUR	NUMBER OF HOURS	
$15.00	6 HOURS	$90.00

COST/TON = $0.16

FUEL & OIL

0.45 LBS./HP HR.

$\frac{0.45 \times 250 \times 6 \times \$0.06}{8}$ = $50.625

15% OIL = $58.22

COST/TON = $0.10

.../96

10.2 SUB-LEVEL MINING (CONT'D)

DIRECT COST/TON MUCKING:

LABOUR	$0.30
EQUIPMENT MAINTENANCE	0.16
FUEL & OIL	0.10
	$0.56/TON

BLASTING - PRIMARY AND SECONDARY

UTILIZING AMEX II WITH 1 1/2" x 16" POWERMEX 70% AT CENTRE AND COLLAR LOCATIONS. SHORT PERIOD DELAY WITH PRIMA CORD.

50 FT. HOLE x 3	LOADED 44 FT.
48 FT. HOLE x 2	42 FT.
39 FT. HOLE x 2	33 FT.
23 FT. HOLE x 2	17 FT.

AMEX II @ 1.36 LB./FT.

EACH HOLE 1 1/2" x 16" x 2 49 TO AT 60 LB.
1 1/4" x 16" 70 AT 60 LB.

POWERMEX $\frac{19}{49}$ x 50 = 23.26 LBS. @ $61.40
= $14.28

9 DET. @ $0.80 EA. = $ 5.60

1.36 x 255 = 364.8 LBS. @ 47.95 = $174.92

@ $\frac{(\$68.75 \times \$24.15)}{2}$/100 LBS. = $47.95

389 PRIMA CORD @ 7.3¢/FT. = $28.39

TOTAL COST = 174.92 + 28.39 + 5.6
= $208.91

SECONDARY BLASTING COST

EXPLOSIVES 25% OF PRIMARY COST 208.91 x 1.25 = 261.13/RING

COST/TON = $\frac{261.13}{828}$ = $0.31/TON BLASTED

.../97

10.2 SUB-LEVEL MINING (CONT'D)

LABOUR

320 FT. OF HOLES TO BE LOADED

TWO MEN @ $164/SHIFT

BASED ON A LOADING RATE OF 20 SECS./FT.

$= 320 \times \frac{20}{60} =$ 106 2/3 MINUTES

SET-UP & DEMOBILIZATION TIME = 30 MINUTES

TOTAL TIME = 136 2/3 COST/TON = $\frac{95.67}{828}$

= SAY, 140 MINUTES

= $0.11

COST/ROUND = $\frac{140}{480} \times 2 \times 164 =$ $95.67

.../98

10.2 SUB-LEVEL MINING (CONT'D)

COST/M. FOR ORE DEVELOPMENT

	COST/M.
LABOUR	$227.25
EXPLOSIVES	94.88
EQUIPMENT MAINTENANCE	24.71
STEEL AND BITS	77.31
PIPES 6" AIR	1.37
2" WATER	.47
VENT DUCT	3.77
CABLES	3.28
ROCKBOLT	12.00
SMALL TOOLS	10.00
FUEL OIL	9.66
TOTAL	$464.70/M.

COST/FT.	$141.68
COST/TON	$ 5.73

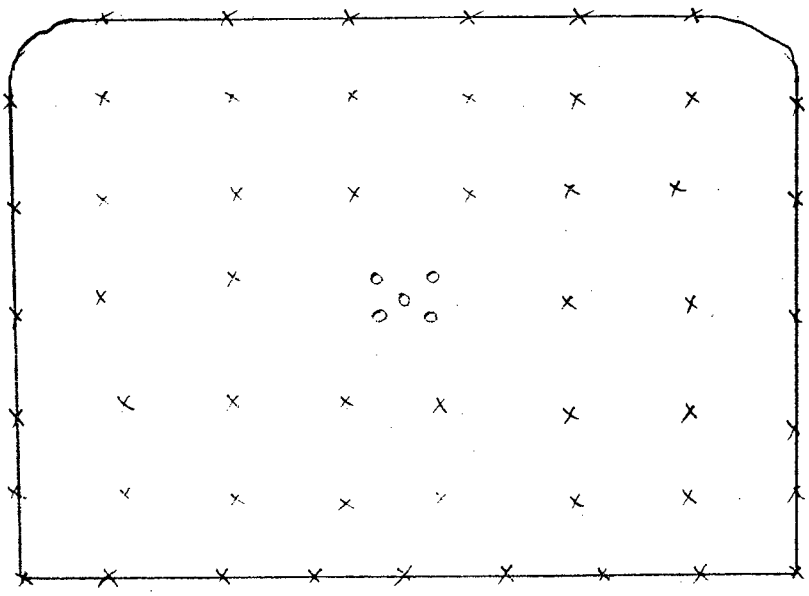
.../99

10.2 SUB-LEVEL MINING (CONT'D)

SUB-LEVEL CAVING COSTS

41 FT. CENTRE TO CENTRE OF DRIFTS HORIZONTAL 30 FT. VERTICAL. RUNG LAYOUTS 1.35 TON/FT. DRILLED. RING INTERVAL 5.5 FT. DRILLING HEIGHT APPROXIMATELY 60 FT. DRIFT SIZE 16'.0 WIDE 11.5' HIGH.

DRIFT DRIVAGE



62 HOLES BLASTED (10 HOLES XACTEX)

67 DRILLED

.../100

10.2 SUB-LEVEL MINING (CONT'D)

DRILLING CYCLE IS 105 MINUTES FOR A SEVEN FOOT ADVANCE. THUS BASED ON AVAILABLE TIME OF 6 HOURS AND EACH HOUR 50 MINUTES. 105 MINUTES WOULD PROVIDE FOR A CYCLE OF 2 ROUNDS DRILLED OF PER SHIFT.
SINCE THE DRILLING CYCLE IS THE MAJOR CYCLE TIME THEN THIS WOULD BE THE GOVERNING ITEM.

LABOUR

LEADER	1 @ 168/SHIFT	x	3 SHIFTS	=		504
DRILLER	1 @ 164/SHIFT	x	3 SHIFTS	=		492
LEADER OP.	1 @ 164/SHIFT	x	3 SHIFTS	=		492
MINER	2 @ 164/SHIFT	x	3 SHIFTS	=		984
MECHANIC	1 @ 146/SHIFT	x	3 SHIFTS	=		438
						$2,910/DAY

ADVANCE/DAY = 6 x 7 = 42 FT.

COST/FT. = $\frac{2,910}{42}$ = 69.29

COST/M. = $227.25

PRODUCTION/DAY WOULD BE $\frac{6 \times 7 \times 16 \times 11.5}{2,000}$ x 179 TON

691.7 TON OR 627 TONNE PER DAY

EXPLOSIVES

52 HOLES LOADED WITH POWERMEX

$\frac{52 \times 7 \times 12 \times 60}{70 \times 16}$ = 234.00 LBS. EXPLOSIVES

AT $61.40/100 LBS.

= $143.67

.../101

10.2 SUB-LEVEL MINING (CONT'D)

EXPLOSIVES (CONT'D)

XACTEX $\frac{10 \times 7 \times 12 \times 50}{24 \times 100}$ = 17.5 LBS.

@ $52.71/100 LBS. = $9.22/7FT. ADVANCE

DETONATORS 62 HOLES @ $0.80 EACH =$49.60

TOTAL COST = $49.60
9.22
143.67
$202.49

$28.92/FT.
$94.88/M.

EQUIPMENT MAINTENANCE

	COST/HOUR	OPERATING HOURS	COST/DAY
ST 8	15.0	12 HOURS	$180.00
DRILL JUMBO	.23/M./DRILLED		225.50
FAN AND DUCT	$1/FT.		42.00
STOPERS	.09/FT. DRILLED		10.80
PIPES			10.00
CABLES			10.00
			$316.30

COST/M. $24.71

STEEL AND BITS

COST/METER DRILLED = $0.3078

$\frac{67 \times 8}{7} \times 3.28 \times 0.3078$ $77.31/M.

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10.2 SUB-LEVEL MINING (CONT'D)

MUCKING

VOLUME OF MUCK = $\frac{11.5 \times 16 \times 7}{27} \times 1.5$ BROKEN

= 71.6 CU. YARDS

UTILIZING A ST 8 YARD SCOOPTRAM MAXIMUM VOLUME/LOAD

= $\frac{\text{MAXIMUM TRAMMING CAPACITY}}{\text{DENSITY}} = \frac{24000}{179 \times 27}$ CU. YARDS

= 4.965 CU. YARDS

SAY 5 CU. YARDS MAXIMUM

TOTAL YARDAGE TO BE MOVED = 71.6

NO. OF TRIPS = $\frac{71.6}{5}$ = 15

CYCLE TIME/LOAD

AVERAGE SPEED OF SCOOPTRAM CONSIDERED AS 4 M.P.H. 5.87 FT/SEC.
AVERAGE HAUL DISTANCE BASED OF 300 METRE LONG STOPE 40 M. WIDE ORE IS 451 FT.

LOAD	0.5 MINUTES
HAUL 451 FT. @ 5.87 FT./SEC.	1.28 MINUTES
TUM	.33 MINUTES
DUMP	.5 MINUTES
RE-TUM	.33 MINUTES
HAUL	1.28 MINUTES
TOTAL	4.22 MINUTES
SAY	5 MINUTES/LOAD

NO. OF LOADS 15

MUCKING TIME 75 MINUTES

ALLOWANCE OF 15 MINUTES FOR FINAL CLEAN-UP

TOTAL TIME 90 MINUTES

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10.2 SUB-LEVEL MINING (CONT'D)

PIPES

AIR 6" 13.71/METER REUSABLE 10% OF COST ONLY/M.
WATER 2" 4.70/METER

VENT DUCT

SUFFICIENT AIR TO OPERATE ST 8 AT 250 H.P.
25000 CU. FT./M.
MAX. LENGTH 95 + 20
= 115 M.
36" DUCT $ 10.75 x (1.07 TAX)
11.50
COST/M. = $37.72 REUSABLE COST/M. = 10%

CYCLE TIMES

DRILLING

67 HOLES DRILLED WITH 3 BOOM JUMBO 8 FT. DRILLING 7 FT. ADVANCE
DRILLING RATE 2 FT./MIN.
$\frac{67 \times 8}{2 \times 3}$ = 89.33 MINUTES SAY 90 MINUTES
SET-UP AND REMOVAL TIME 15 MINUTES
TOTAL TIME 105 MINUTES

LOADING AND BLASTING

62 HOLES LOADED @ 30 SECS./HOLE 31 MINUTES
15 MINUTES TO CONNECT WIRES
15 MINUTES TO BLAST
30 MINUTES FOR FUMES TO CLEAR
TOTAL TIME 91 MINUTES

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10.2 SUB-LEVEL MINING (CONT'D)

ROCKBOLTING

THE ROADWAY 16 FT. WIDE. ROCKBOLTING PATTERN 5 x 5 FT.

THUS/ROUND REQUIRES $\frac{16}{5} \times \frac{7}{5}$ = 5 BOLTS (AVERAGE)

5x6 FT. BOLTS = 30 FT. DRILLING

30 FT. AT 2 FT/MIN. = 15 MINUTES

INSTALLATION OF BOLTS 4 MINUTES EACH

= 20 MINUTES

SET-UP AND REMVOVAL TIME 15 MINUTES

TOTAL TIME 50 MINUTES

WASHDOWN AND INSPECT FACE

ALLOWANCE 15 MINUTES

TOTAL TIME

DRILL	105 MINUTES
LOAD AND BLAST	91 MINUTES
MUCK	90 MINUTES
ROCKBOLT	50 MINUTES
WASHDOWN FACE	15 MINUTES
	351 MINUTES
	5.85 HOURS

CABLES

$1/FT. 3.28/M.

ROCKBOLTS

6 FT. 5/M.

5 x 2.40 $12/M.

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10.2 SUB-LEVEL MINING (CONT'D)

SMALL TOOLS

$10.00/M.

FUEL OIL

0.45 LBS./H.P. HR.

ST 8 250 - 12 HR. = 3,000
JUMBO 50 - 4 HR. = 200

$$\frac{3200 \times 0.45 \times \$.6}{8} = \$108/\text{DAY}$$

$$= \$8.4/\text{METRE}$$

15% ALLOWANCE FOR OIL $9.66/M.

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10.2 SUB-LEVEL MINING (CONT'D)

SUB-LEVEL CAVING 60° DIP (20 METERS WIDE)

COSTS

SLOT RAISE	443,118
SUB-LEVELS	991,760
ROCK DEVELOPMENT - SUB-LEVELS	498,995
RAMP	382,787
VENT RAISES	207,519
ORE PASS & WASTE PASS	88,026
ACCESS DRIFTS	627,308
DUMPS	85,832
BLASTING	436,645
DRILLING	1,112,406
MUCKING	707,365
	$5,581,761

COST/TON MINED = $4.41/TON

COST/TON ORE @ 0% DILUTION = $5.95/TON

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10.2 SUB-LEVEL MINING (CONT'D)

STOPE AT 60° SLOPE - 20 METERS WIDE ORE - 300 FOOT HEIGHT - 400 FEET LONG

DEVELOPMENT COSTS

SLOT RAISE

5' x 5'	57 FT. LONG 5 x 10 x 2 @ $77.74/FT.	=	$443,118.

SUB-LEVELS

10' x 11.5'	10 x 70' x 10 @ $141.68/FT.	=	$991,760.

ROCK DEVELOPMENT SUB-LEVELS

14' x 11'	10 x 35 x 10 @ $142.57/FT.	=	$498,995.

RAMP

14' x 11'	2,106 FT. @ $181.76/FT.	=	$382,787.

VENT RAISES

10' x 10'	335 FT. x 2 @ $309.73/FT.	=	$207,519.

ORE & WASTE PASS

7' x 7' @ 290 FT. EACH @ $151.77/FT.		=	$ 88,026

ACCESS DRIFTS

14' x 11'	440 FT. EACH @ $142.57/FT.	=	$627,308.

DUMPS

8' x 9'	2(15' x 9) @ $161.72/FT.	=	$ 43,664.
CONCRETE	2' x 4' x 26' x 18 x $75.64	=	$ 10,488.

10.2 SUB-LEVEL MINING (CONT'D)

DUMPS (CONT'D)

WIDENING	9(40' x 11' x 8') 2 @ $0.92/CU. FT.	=	$ 31,680.
BLASTING	$0.42/TON IN PLACE	=	$436,645.
DRILLING	$1.07/TON IN PLACE	=	$1,112,406.
MUCKING	$0.56/TON TRAMMED	=	$707,365.

$$\text{TONNAGE IN STOPE} = \frac{60.5 \times 400 \times 320 \text{ CU. FT.} \times 179 \times 1.5}{2{,}000}$$

$$= 1{,}039{,}632 \text{ TONS}$$

$$\text{TONS TRAMMED} = 1{,}039{,}632 \times .90 \times 1.35$$

$$= 1{,}263{,}152 \text{ TONS}$$

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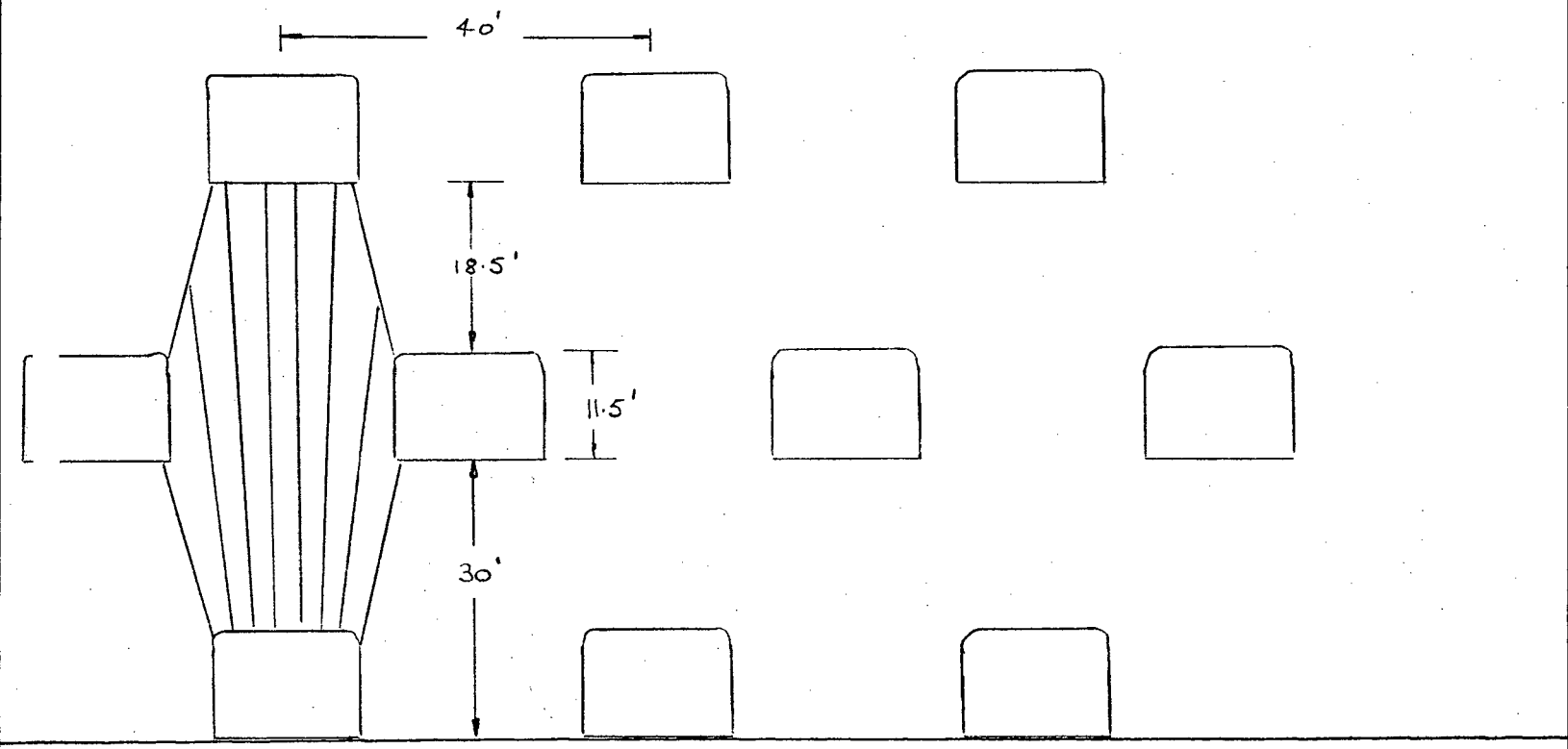
10.2 SUB-LEVEL MINING (CONT'D)

RING DRILLING MACHINE WRDJ-3 2" HOLES



FROM SINGLE LOCATION 51' x 2 + 50' x 3 + 39 x 2 + 23 x 2 @ 75°

THUS TRUE LENGTH = $\frac{L}{\text{SINE } 75°}$

= $\frac{376}{\text{SINE } 75°}$

= 389 FT. DRILLING/RING

COST OF DRILLING UTILIZING

BASED ON ONE MAN OPERATION OF UNIT DRILLING SPEED 1FT./MIN. EACH DRILL.

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10.2 SUB-LEVEL MINING (CONT'D)

CYCLE TIME

SET-UP	5.00 MINUTES
DRILLING AT 1 FT./MIN. (2 DRILLS)	194.00 "
DEMOBILIZATION	5.00 "
MOVE TO NEW LOCATION	10.00 "
TOTAL TIME	214.00 MINUTES

214 MINUTES TO DRILL ONE RING
30 MINUTES LUNCH PERIOD
6 HOUR SHIFT
FULL UTILIZATION OF 50 MINUTES/HOUR

$$\text{FOOTAGE DRILLED PER SHIFT} = \frac{6 \times 50}{214 + 30} \times 318$$

$$= \frac{300}{244} \times 318$$

$$= 390.98 \text{ FT./SHIFT}$$

SAY, 390 FT./SHIFT

LABOUR

ONE MAN @ $164/DAY

$$\text{COST/M DRILLED} = \frac{164}{390} \times 3.28$$

$$= \$1.37/M$$

EQUIPMENT MAINTENANCE

$0.09/FT. DRILLED = $.295/M DRILLED

DRILL STEEL & BITS

$.3078/M DRILLED = $.3078/M

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10.2 SUB-LEVEL MINING (CONT'D)

HOSES

= $.03/M. DRILLED

OIL ETC.

+ $.10/M. DRILLED

SMALL TOOLS

$0.05/FT. = $.164/M. DRILLED

TOTAL COST

LABOUR	1.37
EQUIPMENT MAINTENANCE	.295
DRILL STEEL AND BITS	.3078
HOSES	.03
OIL ETC.	.10
SMALL TOOLS	.164
	$2.267/M.

COST/TON

TONS/FT.

$$5 \text{ FT.} \times \frac{(16 + 34)}{2} 18.5 + 34 \times 11.5 + \left(\frac{16 + 34}{2} \times 18.5\right)$$

= 1,315 CU. FT. x 5 CU. FT.

= 6,575 CU. FT.

$$= \frac{6{,}575 \times 252}{2{,}000}$$

= 828 TONS

TONS/FT. DRILLED = 2.12

COST/TON FOR DRILLING = $\frac{2.267}{2.12}$ = $1.07/TON = $1.07/TON/SHORT

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10.2 SUB-LEVEL MINING (CONT'D)

HOSES

= $.03/M DRILLED

OIL ETC.

= $.10/M DRILLED

SMALL TOOLS

$0.05/FT. = $.164/M DRILLED

TOTAL COST

LABOUR	1.37
EQUIPMENT MAINTENANCE	.295
DRILL STEEL & BITS	.3078
HOSES	.03
OIL ETC.	.10
SMALL TOOLS	.164
	$2.267/M

COST/TON

TONS/FT.

Area Drilled

$$5 \text{ FT.} \times \left[\frac{(16 + 34)}{2} \times 18.5 + 34\right] \times \left[11.5 + \frac{(16 + 34)}{2} \times 18.5\right]$$

= 6575 CU. FT.
@ 8 CU. FT./TON

6575 ÷ 8 = 828 TONS

$$\text{TONS/FT. DRILLED} = \frac{828}{389} = 2.12$$

$$\text{COST/TON FOR DRILLING} = \frac{2.267}{2.12} = \$1.07/\text{TON}$$

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10.2 SUB-LEVEL MINING (CONT'D)

COST/METER SLOT RAISE (DIRECT COST)

	COST/METER
LABOUR	$153.69
EXPLOSIVES	30.10
EQUIPMENT MAINTENANCE	16.37
DRILL STEEL AND BITS	10.55
PIPES	1.33
SMALL TOOLS	5.00
FUEL AND OIL	4.55
TIMBER	21.84
ROCKBOLTS, PINS	11.56
	$254.99

COST/FT. 77.74/FT.

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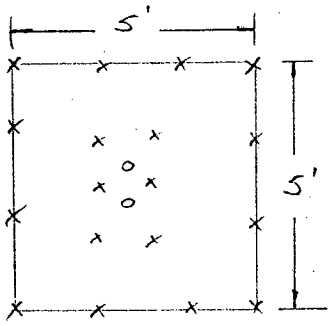
10.2 SUB-LEVEL MINING (CONT'D)

SLOT RAISE

5 x 5' RAISE CONVENTIONALLY DRIVER 60 FT. LONG
18 M. LONG



HOLES BLASTED 18
HOLES DRILLED 20

LABOUR

BASED ON TWO MEN ONE ROUND/SHIFT DRILL 8 FT. ADVANCE 7 FT.
TWO MEN $164.00/SHIFT = 328
COST/FT. = $46.86/FT.
COST/M. = $153.69/M.

EXPLOSIVES

$\frac{18 \text{ HOLES} \times 7 \times 12 \times 60}{16 \times 70}$ = 81 LBS. EXPLOSIVES

@ $61.40/100 LBS.
= 49.73
DET 18 @ $.80 EACH
= $14.40
$64.13/7 FT.
COST/M. = $30.10

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10.2 SUB-LEVEL MINING (CONT'D)

EQUIPMENT MAINTENANCE

MUCKING UTILIZING ST8

$\frac{5 \times 5 \times 7}{27}$ = 6.4 CU. YARDS = 2 BUCKET LOADS

AT 5 MINUTE/LOAD = 10 MINUTES LOADING TIME

ALLOWANCE MUCKING 1 HOUR/ROUND

	COST/HOUR	HOUR	COST/DAY
ST8	15	3	$ 45.00
JACKLEGS	$.09/FT. DRILLED		64.80
STOPERS			
VENT DUCT			5.00
			$104.80

$16.37/M.

DRILL STEEL AND BITS

COST/METER DRILLED = $0.3078

$\frac{30 \times 8 \times 0.3078}{3.28}$

= 22.52/7 FT.

COST/M. = $10.55/M.

PIPES AIR AND WATER

AIR 4"	8.43/M.	10%
WATER 2"	4.70/M.	10%

SMALL TOOLS

$5.00/METER

FUEL AND OIL

based on .45 LBS./ H.P. HOUR

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10.2 SUB-LEVEL MINING (CONT'D)

FUEL AND OIL (CONT'D)

ST8 $\frac{250 \times 3 \times .45 \times \$.60}{8} = \$25.31/DAY$

$\frac{25.31}{21} \times 3.28 = \$3.95$

OIL 15% x 1.15 = $4.55/M.

TIMBER REQUIREMENTS

7 FT. ADVANCE

5" ROUND 2(4 x 5) + (2 x 16)

= 62 FT. 101 BOARD FT.

(7' x 2" x 12")5	=	70
(7' x 2" x 4")1	=	4.66
MISCELLANEOUS		10.00
WASTE ALLOWANCE		20%

TOTAL = 223 BOARD FT.

@ $209.00/1,000 BOARD FT.

$46.61/7 FT.

= $21.84/M.

ROCKBOLTS AND PINS

4/M. @ $2.89 EACH = $11.56/M.

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10.3 CUT AND FILL (500 FT. LONG 45 FT WIDE 10 DEGREE DIP, 20 M. HIGH)

ORE IN PLACE	187,958 TONS
DILUTION 15%	216,151 TONS

COSTS

SILLING		$ 90,880.00
WIDENING		156,860.00
RAMP		92,334.00
PRODUCTION DRIFT		100,470.00
RAISES		87,045.00
DRILLING $.8211/TON	197,850 TONS	162,455.00
BLASTING 1.1948/TON		236,391.00
POURING OF SAND/CEMENT 2.2829		451,672.00
MUCKING $0.7321/TON	216,151 TONS	158,244.00
ROCKBOLTING $.7147/TON	197,850 TONS	141,403.00
	TOTAL	$1,677,754.00

EXCLUDING SAND, CEMENT, SUPERVISION MECHANICAL AND ELECTRICAL PERSONNEL.
FREIGHT AND OVERHEADS.

$ 7.76/TON PRODUCED

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10.3 CUT AND FILL (CONT'D)

CUT AND FILL MINING

ORE WIDTH 20 M. (65.5 FT.)
DIP 10 DEGREES
STOPE WIDTH 45 FT. (VARIABLE)
STOPE LENGTH 500 FT. (VARIABLE)

REQUIREMENTS

RAMP 14' x 11'
10 DEGREE DIP RAMP 15 DEGREES LENGTH 53.33 SAY 54 FT.
TWO REQUIRED
AUXILIARY ACCESS RAMP TO STOPE 30 FT. VERTICAL DIFFERENCE
LENGTH = $\frac{30}{.15}$ = 200 FT. TWO REQUIRED

PRODUCTION DRIFT 14' x 11'

540 FT. DRIFT ENLARGED AT CHUTE AREA TO ACCOMODATE TRUCK.

RAISES

ORE PASSES 7' x 7' x 3 x 30 FT. RAW. AND CHUTE
VENT RAISE 8' x 9' x 2 x 95 FT. TIMBERED
ORE PASSES STEEL LINED 65 - 10 FT.
VENT RAISES TIMBERED 65 - 10 FT.

ORE IN PLACE

500 x 45 x 65.5 CU. FT. @ 100% EXTRACTION
95% RECOVERY = $\frac{1,400,063 \times 179 \times 1.5}{2,000}$ TONS
= 187,958 TONS

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10.3 CUT AND FILL (CONT'D)

FILL TO REPLACE TONNAGE

VOLUME TO BE FILLED = 1.4 MILLION CU. FT.

SAND DENSITY = 95 LB./ CU. FT.

REPLACEMENT 65 - 70%

USE 70% OF IN PLACE VOLUME

$\frac{1.4 \text{ MILLION} \times 95}{2{,}000}$ TONS

= 66,500 TONS

EVENTS

DRILLING

BLASTING

MUCKING

ROCKBOLTING

SCALING

ERECT BARRIERS AND EXTERIOR TO FILL TOWER AND ERECTION OF LINING AGAINST WALLS POURING OF SAND/CEMENT MIXTURES.

SILLING

SILLING OUT DRIFTS.

INITIAL DRIFT DRIVER WITH ST8 ULTILIZING TRUCK HAULAGE FROM ORE PASS AT THE END OF STOPE

14' x 11' = 154 CU. FT.

45 FT. X 11 = 495 CU. FT.

CU. FT. WIDENING = 495 - 154 = 341 CU. FT.

14 x 11 DRIFT @ $181.76/FT.

500 FT. @ 181.76 = $90,880.00

WIDENING

@ $141.68/FT. 14 x 11

= $.92/CU. FT.

TOTAL COST = $.92 x (495 - 154)

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10.3 CUT AND FILL (CONT'D)

WIDENING (CONT'D)

= .92 x 341
= $313.72
$313.72 x 500 FT.
= 156,860.00

RAMP

14' x 11' @ $181.76/FT.
TOTAL FOOTAGE = 108 + 400
= 508 FT.
508' @ $181.76 = $92,334.00

PRODUCTION DRIFT

540 FT. 14' x 11' @ $181.76/FT.
= $98,151.00
WIDENING AT CHUTE AREA TO ACCOMODATE TRUCK
14' HIGH OVER 20 FT. = 3 x 14 x 20
= 840 CU. FT.
840 FT. x 3 @ .92/CU. FT.
= $ 2,319.00

RAISES

30 x 3 @ 7' x 7' @ $151.77/FT.
= $13,660.00
65 FT. CIRCULAR STEEL CHUTE FOR RAISE
7 FT. DIAMETER 1/4" PLATE
65' x 3.149 x $\frac{49}{4}$ = AREA OF PLATE

ALLOW 10% FOR BOLTS AND JOINTS
= 2,758 SQ. FT. @ 10.20 LBS./SQ. FT.
WT. = 28,132 LBS. @ 1.21/LB.
= $34,039 NOT REUSABLE

10.3 CUT AND FILL (CONT'D)

RAISES CONT'D)

INSTALLATION:

HOIST VIA MANWAY	1 MAN HOUR
LOAD INTO SCOOP	1/2 MAN HOUR
DELIVERY TO LOCATION	1/2 MAN HOUR
INSTALL 3 PIECES	2 MAN HOURS
TOTAL	4 MAN HOURS PER 5 FT. SECTION

$$\text{COST/FT.} = 4 \times \frac{164}{8 \times 5} =$$

= $16.40/FT.

55 x 3 x 16.40 = $2,706.00

VENT RAISE

8 x 9' 95 FT. LONG TIMBERED (CRIBBED) WITH STEEL SLIDE AND MANWAY.
TIMBER REQUIREMENTS WITH MANWAY EVERY 21 FT.
CRIBBING USING 5" ROUND MATERIALS
LENGTH OF ONE SET WOULD BE 8 + 9 + 8 + 9 = 34 FT.

$$34' \times \overline{11} \times \frac{2\ 1/2"}{12"} \times 2.5" \quad \text{BOARD FT.}$$

= 55.76 BOARD FT./5' OF RAISE
MANWAY 2" x 10" PLANKS 4' x 9' + 4' x 8' = 68 FT.

$$\text{BOARD FT.} = 68' \times 2" \times \frac{10"}{12"}$$

113.33 BOARD FT.
STRINGERS 6" x 6" x 8' x 3
= 72 BOARD FT.
LADDERS 2' x 4' x 25' + (2 x 2 x 1)25
16.66 + 8.33
= 24.99 BOARD FT.
ADDITIONAL 100 FT.

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10.3 CUT AND FILL (CONT'D)

VENT RAISE CONT'D)

TOTAL FOR 21 LINEAL FT. =

$$55.72 \times \frac{21 \times 12}{5}$$

=	2,805.26 BOARD FT.
	113.33
	72.00
	25.00
	100.00
	3,115.59 BOARD FT.

3,115.59 BOARD FT. SAY
3,200 BOARD FT. @ $225.00/1,000 BOARD FT.
= $720/21 FT.
COST/FT. = $34.28

8' x 9' RAISE @ 161.72 + 34.28
= $196.00
FOOTAGE REQUIRED = (65 + 30)2
= 190 FT. @ 196.00
= $37,240 $37,240.00

DRILLING

8 FT. DRILLING 7 FT. ADVANCE
BASED ON ONE HOLE/6 SQ. FT.
NUMBER OF HOLES = 40 HOLES

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10.3 CUT AND FILL (CONT'D)

DRILLING (CONT'D)

40 HOLES @ 8' = 320 FT. DRILLING

UTILIZING A 3 BOOM JUMBO AVERAGE RATE OF DRILLING 1 1/2 FT./MIN./BOOM

UTILIZING = 72 MINUTES

ALLOWANCE 15 MINUTES TO SET-UP

10 MINUTES TO DISMANTLE

25 MINUTES

TOTAL TIME = 97 MINUTES

COST 2 MEN @ $164/SHIFT = $\frac{97}{360} \times 164 \times 2 = \$88.37$

TONS PRODUCED = $\frac{22.5 \times 10 \times 7 \times 179 \times 1.5}{2,000} = 211.5$ TONS

DRILLING COST $0.41/TON. LABOUR.

LABOUR

$0.41/TON

$ .27/FT. = $0.88/M.

EQUIPMENT MAINTENANCE

$0.09 $295/M.

DRILL STEEL AND BITS

$.3078/M. DRILLED

HOSES

$.03/M. DRILLED

SMALL TOOLS

$0.05/FT. $.164/M. DRILLED

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10.3 CUT AND FILL (CONT'D)

OIL ETC.

$.10/M. DRILLED

TOTAL COST

	$/M. DRILLED
LABOUR	.88
EQUIPMENT MAINTENANCE	.295
DRILL STEEL AND BITS	.3078
HOSES	.03
OIL ETC.	.10
SMALL TOOLS	.164
	1.777/M. DRILLED

TOTAL FOOTAGE/211 TONS = 97.5 M.

COST/TON = $\frac{1.777 \times 97.5}{211}$ = $.8211/TON

BLASTING

EXPLOSIVES:

$\frac{40 \text{ HOLES} \times 7' \times 12" \times 60}{16" \times 70}$ = 180 LBS./ROUND

180 LBS. @ 61.40/100 LBS.

= $110.52

DETONATORS @ $0.80 EACH

40 @ $.80 = $32.00

TOTAL COST $142.80

COST/TON = $\frac{142.80}{211}$ = $0.6767

LABOUR

TWO MEN @ $164.00

TIME REQUIRED 40 HOLES @ 30 SECS./HOLE = 20 MINUTES

15 MINUTES TO SET

15 MINUTES TO WIRE ROUND

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10.3 CUT AND FILL (CONT'D)

LABOUR (CONT'D)

10 MINUTES TO RETREAT
30 MINUTES TO ALLOW FUMES TO CLEAR
30 MINUTES TO SCALE
TOTAL TIME 120 MINUTES
120 MINUTES @ $164.00/SHIFT

$$= 164 \times \frac{120}{360} \times \frac{2}{211} \text{ COST/TON}$$

= $.5181/TON

TOTAL COST BLASTING =

EXPLOSIVES	=	0.6767
LABOUR	=	0.5181
		$1.1948/TON

MUCKING

UTILIZING ON ST5 MAXIMUM CAPACITY OF MACHINE 15,000 LBS. = 3.1 CU. YARDS
BASED ON MOVING 211 TONS 125 FT. (AVERAGE HAUL DISTANCE)

TIME PERIOD

CYCLE TIME

LOAD	30 SECS.
HAUL 125 FT. @ 1 M.P.H. (1.46 FT./SEC.) =	86 SECS.
TURN	20 SECS.
DUMP	30 SECS.
RETURN	20 SECS.
HAUL EMPTY	86 SECS.
TOTAL	272 SECS. = 4.53 MINUTES

FOR 7.5 TONS
TOTAL TIME TO MUCK OUT ONE ROUND

$$= \frac{211}{7.5} \times 4.53 + 15 \text{ MINUTES ALLOWANCE FOR CLEAN-UP}$$

= 127.44 MINUTES SAY 128 MINUTES

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10.3 CUT AND FILL (CONT'D)

LABOUR COST

$\frac{128}{360}$ x $164.00 = $58.31

COST/TON= $0.27

EQUIPMENT MAINTENANCE

	COST/HOUR	NO. OF HOURS	/SHIFTS
ST5	$25.00	128 MINUTES + 50% ALLOWANCE FOR OTHER WORK	$80.00

COST/TON = $\frac{80}{211}$ = $0.3700/TON

FUEL AND OIL

$\frac{3.2 \times 180 \times 45 \times \$.6}{8}$ = $19.44

COST/TON = 0.0921

TOTAL	COST/TON
LABOUR	0.2700
EQUIPMENT MAINTENANCE	0.3700
FUEL AND OIL	0.0921
	$0.7321/TON

ROCKBOLTING

WIRE SCREEN WALL TO THE PILLAR 5' x 5' PATTERN. 4 FT. BOLTS ON SIDE AREA 10 x 7 = 70 SQ. FT. SCREEN @ $0.132/SQ. FT.		9.24
SCREEN BACK 22.5 FT. x 7 = 157.5 SQ. FT.		20.79
ROCKBOLTS 4 x 4 FT. @ $2.81 x 1.07		12.03
10 x 6 FT. @ $3.44 x 1.07		36.81
	TOTAL	$ 78.87

.../127

10.3 CUT AND FILL (CONT'D)

ROCKBOLTING (CONT'D)

COST/TON = $\frac{78.87}{211}$ = $.3737

INSTALLATION

DRILLING (4 x 4 + (10 x 6) = 76 FT.
76 FT. @ 1 FT./MIN./PER MACHINE 2 MACHINES
= 38 MIN. 2 MEN
INSTALLATION OF BOLTS AND SCREEN 4 FT. BOLT 5 MIN. AND SCREEN 5 MIN./L) SQ. FT. = 35 MIN. + 20 MIN. = 55 MIN.
6 FT. BOLT 10 MIN. 10 = 100 MIN.
TWO MEN FOR 38 + 100 MIN.
= 138 MIN.
10 MIN. FOR SET-UP
10 MIN. FOR DISMANTLE
TOTAL TIME = 158 MINUTES

COST LABOUR $\frac{158}{360}$ x $164.00 = $71.97

$.2547/TON

TOTAL = .3737
.3410
.7147

POURING OF SAND CEMENT ETC.

PREPARATION OF BARRIERS 4 MEN 2 SHIFTS
HEIGHTEN DRAIN TOWERS 4 MEN ½ SHIFT
RELOCATE GANGWAY AND PIPE LINE 4 MEN - 3 SHIFTS
POUR 125 x 45 x 10 FT. 56,250 CU. FT.
8 - 9 FT./SEC. 4" PIPE
= V x A = QUANTITY @ 1.79 SG.
8 x $\frac{\pi\ 2"^2}{12^2}$ .69 CU. FT./SEC.

.69 x 62.4 x 1.79/SEC. = 77.07 LBS./SEC.

$\frac{77.07 \times 3,600}{200}$ = 138.72 TON/HOUR

USE 100 TONS/HOUR

.../128

10.3 CUT AND FILL (CONT'D)

POURING OF SAND CEMENT ETC. (CONT'D)

POURING AT APPROXIMATELY 100 TONS/HOUR
TIME TO POUR 56,250 CU. FT. OR 3,141 TONS
WOULD BE 31.4 HOURS
POURS NOT TO EXCEED SAY 10-15 HOURS
1,000 TON MAXIMUM

LENGTH OF POUR WOULD BE $\frac{1{,}000 \times 2{,}000}{62.4 \times 1.29 \times 45 \times 10}$

= 39.74 FT.
SAY 40 FT.

BOARD FT. = 144 BOARD FT.
213
48
32
437 BOARD FT.

6	3 x 8'	(12" x 6")
2	8 x 10'	(2" x 8")
	8 x 6'	(2 x 6")
	8 x 4'	(2 x 6")

PLYWOOD SHEETS
½" x 9 SHEETS
450 SQ. FT. BURLAP

BARRIERS

TIMBER 437 BOARD FT. @ 225/1,000 =	$ 98.32
PLYWOOD SHEETS ½" 9 4' x 8' @ $15.00/SHEET	135.00
450 SQ. FT. BURLAP .76¢/SQ. YARD x 1.07	40.66
10% ALLOWANCE FOR NAILS ETC.	
	$263.98

$\frac{40 \times 10 \times 45 \times 179 \times 1.5}{2{,}000}$ = 2,416.5 TONS

TWO BARRIER REQUIRED/POUR $\frac{\$263.98 \times 2/\text{TON}}{2{,}416.5}$

= 0.21/TON

10% ALLOWANCE = .02

TOTAL COST = 0.23/TON

DRAIN TOWERS

EXTENSION BY 10 FT.

TIMBER (4" x 4" x 4')16 4

.../129

10.3 CUT AND FILL (CONT'D)

DRAIN TOWERS (CONT'D)

BRATTICE 10 x 4 x 4 SQ. FT.

TIMBER = 341.33 BOARD FT. @ $225.00/1,000	$76.79
160 SQ. FT. AT $.76 x 1.07/SQ. YARD	14.45
	$91.24

COST/TON = $\frac{91.24}{2,417}$ = $0.03

LABOUR

4 MEN 5 1/2 SHIFTS. INSTALLATION

POURING 3 MEN 2 SHIFTS

@ $164.00/SHIFT

(4 x 5.5 x 164) + (3 x 2 x 164) =

3,608 + 984 = $4,592.00

COST/TON = $\frac{4,592}{2,416.5}$ = $1.90/TON

EQUIPMENT MAINTENANCE

BASED ON 1.0 MILLION TON/PIPE SCHEDULE 40 4" @

COUPLING 10.84 EACH BUTTERFLY VALVE $65.88 EACH

PIPE $6.57/FT.

500 FT. OF PIPE @ $6.57/FT.	=	$3,285.00
COU:ONGS AT 20 FT. 25 REQUIRED AT $10.84 EACH	=	271.00
GUNS AT $65.88 EACH 4 REQUIRED	=	263.52
		$3,819.52

1,000 TON SEND FOR 2,416.5 TON ORE

$\frac{3,819.52}{1,000,000}$ x $\frac{1,000}{2,416.5}$ COST/TON

ALLOWANCE 10% FOR MISCELLANEOUS BOLTS ETC.

COST/TON =$.0015

DOUBLE COST FOR GANGWAY

.../130

10.3 CUT AND FILL (CONT'D)

EQUIPMENT MAINTENANCE

PIPES AND GANGWAY $.003/TON

SCOOPTRAM OPERATION 1 HOUR/SHIFT DURING INSTALLATION

5.5 x 1 @ $15.00/HOUR = $82.50

= $0.034/TON

FUEL OIL

$\frac{5.5 \times 180 \times .45 \times .6}{8} = \$33.41$

15% OIL 38.42

COST/TON $\frac{38.42}{2,416.50}$

= .0158

SMALL TOOLS

$20.00/SHIFT x 8.5 = $170.00

COST/TON $0.07/TON

TOTAL COST	COST/TON
LABOUR	1.90
BARRIER	0.23
DRAIN TOWERS	0.03
EQUIPMENT	0.0371
FUEL AND OIL	0.0158
SMALL TOOLS	0.0700
TOTAL	2.2829

GARDNER-DENVER COMPANY
(CANADA) LIMITED

PLEASE REPLY TO: 7481 Mandeville Ave.,
Burnaby, B.C.
V5J 4Z3

December 3, 1976
Quotation No. 741-024

Canadian Mine Services Ltd.
745 Clark Drive
Vancouver, B.C.

Attn: Mr. P. Stokes:

Dear Peter:

Further to our conversation regarding prices on Gardner - Denver equipment, I am most pleased to forward the following:

1 only FL53 c/w FL6 direct feed leg and L0-7 line oiler

PRICE----------$ 2,040.00

Integral muffler ADD----------$ 97.00

F.O.B. Vancouver.

All taxes extra.

1 only SP600D portable air compressor

PRICE----------$ 41,589.00

F.O.B. Woodstock, Ontario.

All taxes extra.

Running and maintenance costs approx. $3.00 per hour at 24¢ per gallon of diesel.

1 only ESNF Electra - Saver stationary compressor

Water Cooled PRICE----------$ 24,366.00

Built in water cooled aftercooler $ 1,290.00

Continued--------

Attn: Mr. P. Stokes
Quotation No. 741-024

Air Cooled PRICE----------$ 26,822.00

Built in air cooled aftercooler $ 1,505.00

F.O.B. Quincy, Illinois.

All taxes extra.

All prices will be held firm a period of 45 days.

We appreciate the interest you have shown in our equipment, and will look forward to a favourable reply.

Yours very truly,

Alex Mill
pc - K.K.

Alex Mill
Field Sales Representative

AM/kk
Enclosures: Terms & Conditions of Sale
Bulletin (1) 40 - 7 - 210
(1) 40 - 7 - 215
(1) 41 - 232 (Cdn.)
(1) New G-D Electra Saver Compressor

Atlas Copco

ATLAS COPCO CANADA LTD.
Compressed Air Equipment

745 MONTREAL-TORONTO BOULEVARD
DORVAL, P.Q. H9S 1A3

Telephone (514) 631-5571
Telex 05-821826

Please reply to:
1395 Grandview Highway,
Vancouver, B.C. V5N 1N2
Tel. 604 255-4676 Telex 04-51192

your reference
our quotation

VAN 491

December 2, 1976

Canadian Mine Services
745 Clark Drive
Vancouver, B.C.

Attention: Mr. Peter Stokes,
Mine Planning Engineer

Dear Sir :

In reference to your telephone call of this date we are pleased to quote as follows:

Two only Atlas Copco portable compressors Model PR700GD illustrated on our leaflet E1730c.

PRICE EA: $ 53,900.00 TOTAL: $ 107,800.00

Two only Atlas Copco portable compressors Model PT900Gd as illustrated on leaflet E1711c.

PRICE EA: $ 66,600.00 TOTAL: $ 133,200.00

** SEE ADDENDUM ATTACHED

This quotation is subject to the terms and conditions appearing on the back of the page.

DELIVERY From Stock Vancouver or Montreal

F.O.B. Vancouver

TERMS To Be Arranged

FEDERAL SALES TAX Not Applicable

PROV. SALES TAX Extra @ 7% if applicable

Atlas Copco Canada Ltd.

ADDENDUM TO VAN 491	Price Ea.	Total
6 only BBC35WTH Rockdrills	$ 1680.00	$ 10,080.00
6 only BMT90 Pusher Legs	$ 360.00	$ 2,160.00

6 only BLG30 Lubricators included at no charge if rockdrill and pusher are purchased together.

Penetration rate with above equipment in Sandstone - Granite drilling 1 1/2" diameter hole and 100 p.s.i. air pressure would be approximately 24"/minute.

Federal Sales Tax at 10% if applicable.
Provincial Sales Tax at 7% if applicable.
F.O.B. Vancouver
Delivery from Dorval, Quebec
Terms: To Be Arranged

Canadian Mine Services Ltd.

Quotation # 337 W

ALIMAK STH-5EE RAISE CLIMBER

The following is our proposal for an Alimak Raise Climber unit to drive 1,150 feet of raise.

Item I

One (1) only STH-5EE Raise Climber Base Unit comprising: Main frame with guide rollers, two U-frames with drive unit, each consisting of: Two worm gears, one electric motor 550V/60 Hz 10 HP, automatic centrifugal coupling, Canadian type foot brake, and one single and one double centrifugal brake. Safety device GA-5, support beam with rubber dampers, frame beams, extra roller assembly, one set of support legs, large Canadian type cage, 5'2" x 2'4", platform, 9' x 11', cage control box complete with up/down pushbutton controls and remote controls for air/water central.

Capacity:	1,250 lbs.
Speed-up:	60 fpm.
Speed-down (by gravity):	100 fpm.
Weight:	2,310 lbs.

PRICE: ----------$61,313.00

Item II

Thirty-four (34) only bundles of straight 2m Guide Rail. Each bundle consists of five rails 6'7" in length, complete with brackets, expansion bolts, and connecting bolts.

Price per bundle:	$3,108.00
Weight:	900 lbs./bundle

PRICE: ----------$105,672.00

Item III

One (1) only bundle of straight 1m Guide Rail. Each bundle consists of five 3'4" rails complete with brackets, spacers, expansion bolts, and connecting bolts.

Price per bundle:	$1,913.00
Weight:	500 lbs.

PRICE: ----------$ 1,913.00

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Canadian Mine Services Ltd.

Quotation # 337 W

Item IV

One (1) only bundle of Curved Guide Rail in 3'4" sections. Each bundle consists of three sections of 25 degree, two sections of 8 degree, three sections of 7 degree, and one section of 3 degree, complete with all necessary expansion bolts, spacers, and brackets.

Price per bundle: $4,609.00
Weight per bundle: 900 lbs.

PRICE: ----------$ 4,609.00

Item V

One (1) only MKV-4 Automatic Cable Reel, each complete with one K-14 air motor drive. Maximum capacity 3,300 feet.

Weight, without cable: 1,015 lbs.

PRICE: ----------$ 8,946.00

Item VI

1,250 feet of Raise Mining Cable with five conductors and two stainless steel carrying wire ropes embedded in P.V.C.

Price per foot: $6.90
Weight per foot: 0.75 lbs.

PRICE: ----------$ 8,625.00

Item VII

One (1) only Ground Station Control complete with 60 KVA transformer, ground detector relay and main controls.

PRICE: ----------$ 1,485.00

Item VIII

Eleven (11) only Anchoring Guide Rail sections, each 2m in length with four brackets, and anchoring details. To be installed after the curve and then every 100 feet.

Price each: $1,127.00
Weight each: 200 lbs.

PRICE: ----------$ 12,397.00

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Canadian Mine Services Ltd.

Quotation # 337 W

Item IX

One (1) only set of Guide Rail Accessories consisting of 4 brackets, guide rail anchor section, blasting header, drilling header, bottom stop and remote control valve station, complete with hardware.

Weight: 300 lbs.

PRICE: ---------- $ 3,922.00

Item X

One (1) only Service Guide Rail, 2m in length.

Weight: 200 lbs.

PRICE: ---------- $ 922.00

P R I C E S U M M A R Y

Item I	STH-5EE Base Unit	$ 61,313.00
II	2m Guide Rail Bundles	105,672.00
III	1m Guide Rail Bundles	1,913.00
IV	Curved Guide Rail Bundles	4,609.00
V	MKV-4 Cable Reel	8,946.00
VI	Raise Mining Cable	8,625.00
VII	Ground Station Control	1,485.00
VIII	Anchoring Guide Rail	12,397.00
IX	Guide Rail Accessories	3,922.00
X	Service Guide Rail	922.00
TOTAL PRICE: ----------		$209.804.00

All prices are F.O.B. Toronto, Ontario and sales taxes are extra, if applicable. This quotation is valid for 30 days.

Delivery is stock to eight weeks.

Terms are Net 30 days.

Installation: An installation supervisor will be provided for a period of one week at no charge to the customer. Thereafter, a charge of $175.00 per day, plus expenses to, from, and on the job would be applicable.

RHW/bd

ALLIS-CHALMERS CANADA LIMITED

QUOTATION

ADDRESS: 606 - 1200 West Pender St.
Vancouver, B.C.
V6E 2S9

CANADIAN MINE SERVICES LTD.
745 Clark Drive
Vancouver, B.C.

Attention: Mr. Joe Tatak & Mr. Peter Stokes

DATE	YOUR ENQUIRY	OUR REFERENCE
Feb. 1/77	Verbal	VA8683

PLEASE REFER TO OUR NUMBER WHEN ORDERING.

Gentlemen,

Thank you for your enquiry. Allis-Chalmers Canada Limited proposes to supply you with the following apparatus, subject to the conditions of sale on the reverse side of this form. Unless otherwise stated, prices are net 30 days, F.O.B. our factory Lachine, P.Q., exclusive of sales taxes, and subject to acceptance within 30 days.

This is to confirm the verbal information given to you.

The following sizes of Allis-Chalmers Jaw crushers as illustrated in bulletin ACC1296 and attached general specification.

60 X 48.....$400,000.00

Weight.....240,000 lbs.

V-Belt drive (motor sheave & belts)
$2,200.00

Wound Rotor Motor required (not included) 250 HP, 900 RPM.

48 X 42.....$310,000.00 Weight 160,000 lbs.

48 X 36.....$300,000.00 Weight 140,000 lbs.

V-Belt drive (motor sheave & belts).....$1,600.00

Wound Rotor Motor required (not included)- 150 HP 900 RPM.

One 3 ft. X 12 ft. vibrating feeder as illustrated in bulletin 26B9978-04
$14,000.00
Weight.....6,660 lbs.

We have just been advised of a price increase for this feeder and accounts for the difference to price shown my note January 14th.

I expect to receive dimension drawings in the very near future and will contact you at that time. Please be sure to call me if anything further is required.

We appreciate your consideration and assure you that your order will receive our careful attention.

ALLIS-CHALMERS CANADA LIMITED

Hugh McCreadie

H. McCreadie

P.S. DRAWINGS ARRIVED & ARE ENCLOSED

A-CC-1272-07-75

ALLIS-CHALMERS
CANADA LIMITED

GENERAL SPECIFICATIONS

FOR

TYPE A-1 JAW CRUSHERS

GENERAL:

Frame made in four or six pieces. Deep crushing chamber and small angle of nip reduces slippage and results in higher capacities. Steel castings are commercially annealed and weldments are stress-relieved before machining.

PRINCIPLE:

Blake type, double toggle.

FRAMES:

Four or six pieces. Side members are of rolled steel plates with re-inforcing ribs. Side members are split for a six piece frame, solid for a four piece frame. End members cast steel, box section design. All side members welded in separate sections, welded, stress relieved and securely bolted together to form one unit.

PITMAN AND CAP:

Both pitman and pitman cap are cast steel. Upper end of pitman and pitman cap lined with babbitt to receive the eccentric shaft. The pitman cap only has water cooling coils cast integral with the babbitt. The lower end of pitman has two machined recesses for toggle seats and wedge bars.

ECCENTRIC SHAFT:

Heat treated forged carbon steel, with ends key seated for flywheels.

MAIN BEARINGS:

The base (lower half of bearing) is cast steel fitted with a cast iron half shell lined with babbitt on the inside surface. Cast integral with the babbitt are the water cooling coils. The cap (upper half of bearing) is cast iron lined with babbitt.

SWING JAW:

Annealed cast steel box section construction. Face of jaw is fitted with replaceable steel wearing plates bolted to machined surface to provide backing and positioning for jaw plates. A machined recess on back of jaw received front toggle seat and bolted wedge bar.

SWING JAW SHAFT:

Forged carbon steel, machined throughout. Ends of shaft have double shoulder to prevent lateral movement and also helps to hold main frame, adding sidewise rigidity to the unit.

SWING JAW BEARINGS:

Bronze bushings, bores grooved for distributing lubricant.

JAW PLATES:

Cast manganese steel with vertical wide pitch corrugations. Jaw plates are held against the steel wearing plates by large through-bolts fitted with hardened steel cap nuts at jaw plate end and coil springs at the other. The springs prevent bolt breakage when jaw plates expand.

CHEEK PLATES:

Manganese steel - bolted to frame side members.

TOGGLES:

Two toggle arrangement, three piece design with removable ends and seats.

TOGGLE BLOCK:

Cast steel. Toggle seat clamped to toggle block by bolted wedge bar. Block is suspended from the frame by stud bolts and can be adjusted vertically and horizontally.

TENSION RODS:

Two steel rods, attached to lugs at lower end of swing jaw and tensioned at frame rear member by compression springs, keep the toggle firmly seated during back stroke. Steel straps support spring ends of rods.

FLYWHEELS:

Flywheel and flywheel sheave are cast iron with solid rims and split hubs. These are counter balanced to off-set reaction of pitman. Flywheel sheave is grooved to suit Texrope drive.

ADJUSTMENTS:

To compensate for wear, the crusher setting can be adjusted by inserting shims between the toggle block and rear frame.

LUBRICATION:

Automatic motor driven high pressure lubrication is provided to the pitman cap, main bearing shells and swing jaw bushings.

WRENCHES:

One set of special wrenches and eye bolts will be supplied.

FOUNDATION BOLTS:

Foundation bolts not included as standard equipment.

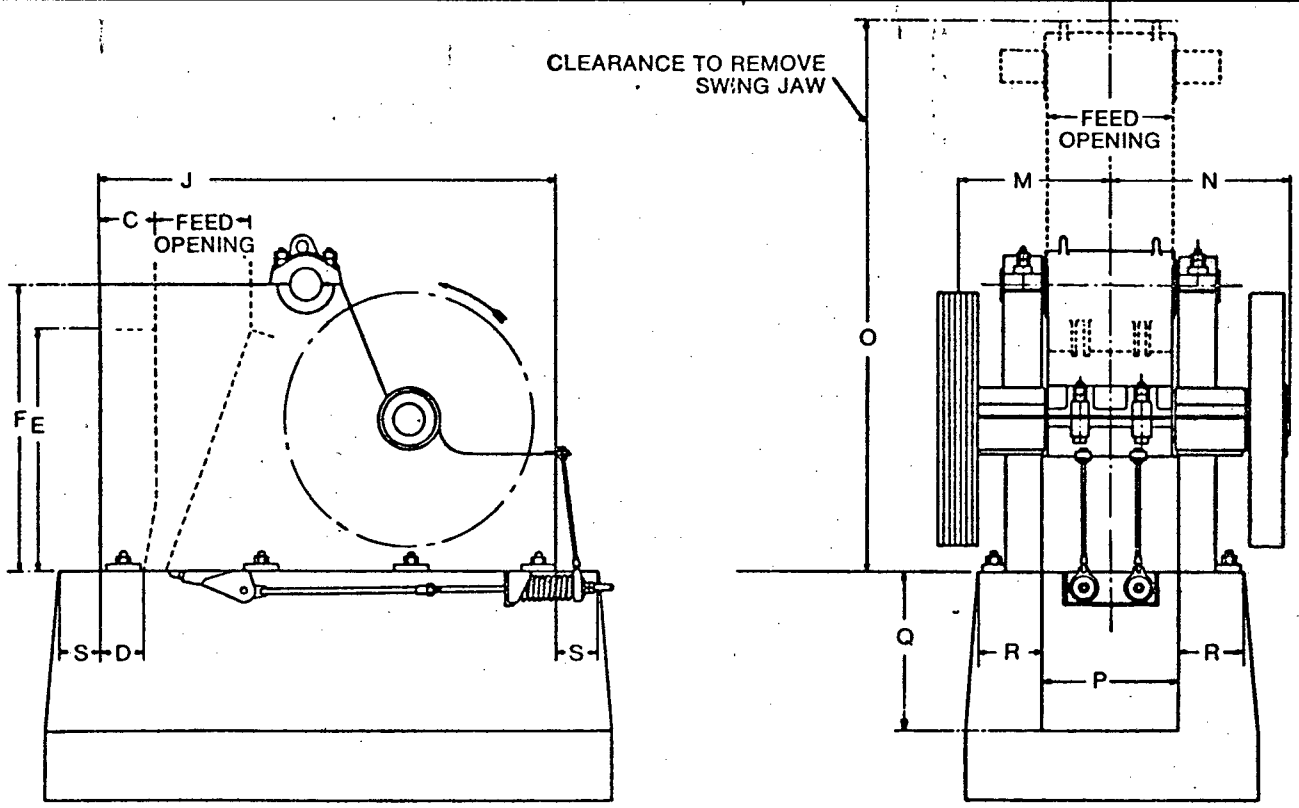
DRAWINGS:

Foundation outline and general drawings and list of parts will be furnished.

SPECIFICATION NOTE:

The Company reserves the right to revise these specifications to incorporate improvements, revisions in design, and changes in materials which have been found desirable in the elapsed time between the date of the proposal and the date upon which actual shop fabrication is started. The Purchaser will be given written notice of major changes.

For weights and dimensions, refer to Bulletin ACC-1296



APPROXIMATE DIMENSIONS

Dimensions are only approximate and should not be used for construction purposes

Crusher Model	C	D	E	F	J	M	N	O	P	Q	R	S	Flywheel Sheave Dia.	Flywheel Sheave Face
48 x 36	2'6"	2'6"	6'9"	7'10"	14'9"	5'0"	5'8"	16'9"	4'4"	6'0"	21"	15"	8'0"	18"
48 x 42	2'6"	2'6"	7'8"	9'1"	15'8"	5'0"	5'7"	17'8"	4'3"	6'0"	19"	14"	8'0"	18½"
60 x 48	3'2"	3'2"	8'7"	10'3"	18'9"	5'6"	6'2"	20'6"	5'4"	6'2"	2'3"	15"	8'0"	20"
84 x 60	3'1"	3'1"	10'5"	11'8"	22'3"	6'9"	7'7"	26'1"	6'1"	6'2"	4'0"	2'1"	12'4"	20"

APPROXIMATE CAPACITIES

Expressed in short tons (2000 pounds) per hour based on 100 pounds per cubic foot of material.

Crusher Model	Open Side Setting 5"	5½"	6"	6½"	7"	7½"	8"	9"	10"	11"	12"	Rpm	Max. Hp
48 x 36	250	275	300	325	350	375	400					180	150
48 x 42	380	400	420	450	470	490	510	540	580			180	150
60 x 48		450	480	500	530	550	570	610	660			170	250
84 x 60			786	808	830	853	876	918	968	1015	1045	120	450

APPROXIMATE LIFTING WEIGHTS (Lbs.)

Crusher Model	48 x 36	48 x 42	60 x 48	84 x 60
Upper side frame	9,960	10,800	13,500	62,750
Lower side frame	13,000	13,500	19,390	
Front piece	13,800	17,000	25,000	51,850
Back piece	6,600	6,235	11,160	28,500
W/O SHAFT Swing jaw assembly w/plates	22,000	24,000	38,000	84,000

Crusher Model	48 x 36	48 x 42	60 x 48	84 x 60
Jaw plates total Wt.	8,450	11,100	17,500	27,000
Pitman assembly	7,300	7,300	8,400	25,800
Flywheel - Sheave	9,400	10,100	10,640	29,100
Flywheel - Plain	8,100	8,100	9,230	27,750
Total Weight - Crusher	140,000	160,000	240,000	420,000

ALLIS-CHALMERS
CANADA LIMITED
Lachine 640, Quebec.
Printed in Canada
A-CC 1296

GARDNER-DENVER COMPANY
(CANADA) LIMITED

PLEASE REPLY TO: 7481 Mandeville Ave.,
Burnaby, B.C.
V5J 4Z3

February 3, 1977
Quotation No. 741-039

Canadian Mine Services Ltd.
745 Clark Drive
Vancouver, B.C.

Attn: Mr. Peter Stokes

Dear Sirs:

As requested by your Mr. Jack Cassidy, we are pleased to offer the following:

(1) 1 only Fan Drill Carrier includes:

(a) Pneumatic tired chasis w/four 7.50 X 15 HRL Pneumatic tires
(b) Model MMB 16 H.P. Traction Motor with disconnect Clutch
(c) Automotive type Power Steering
(d) Power Brakes
(e) Hyd. Brakes
(f) Parking Brake
(g) Four Leveling Jacks
(h) Pivoted Feed Mounting Arms
(i) 2'0" Feed Ext.
(j) Model 1028560 Remote Control
(k) JHPU Hyd. Pump and Tank
(l) JG1003 Alternator set w/2 lights
(m) Air Line Lubricators, etc.

PRICE----------$ 52,825.00

(2) Diesel Propelled Fan Drill as above but with Diesel Engine

PRICE----------$ 66,190.00

(3) Recommended Drilling Equipment

(a) 2 only PR123J Independent Rotation Drills Complete

PRICE EACH----------$- 10,410.00

Continued---------

(b) 2 only 2BFUWA70 Steel Shell type Screw Feeds with Removable Pneumatic Centralizer

PRICE EACH----------$ 7,340.00

(4) Alternative Feeds

(a) 2 BFUWA58 Steel Shell type Screw Feeds w/Removable Pneumatic Centralizer

PRICE EACH----------$ 6,900.00

(b) 2 BFUWA82 Steel Shell type Screw Feeds w/Removable Pneumatic Centralizer

PRICE EACH----------$ 7,780.00

The price on the Fan Drill is F.O.B. Woodstock, Ontario, all Taxes extra, and all prices will be held firm a period of 45 days.

We thank you for your inquiry and look forward to your favorable consideration.

Yours very truly,

W. G. Eckmier
Office Manager

WGE/kk
Enclosures: Terms & Conditions of Sale
Bulletin (1) 40-3-208
(1) 40-5-225
(1) 40-5-247
(1) 40-5-273

ASEA LIMITED
Head Office : Montréal Trois-Rivières Toronto Sudbury Winnipeg Vancouver

Our reference QFA 82229

Your reference

Vancouver, April 14, 1977

Mr. P. Stokes
Canadian Mine Services Ltd.
745 Clarke Drive
Vancouver, B. C.

Subject: Grum Traction Equipment

Dear Sir:

For a 2000 foot one way haul on a 0.3% 36 inch favourable grade, we 'estimate' the following equipment and budget pricings for 3600 tonne (3967 ton) haulage of 179 pound ore on a 6 hour 2 shift daily basis:-

1	LGB 9 locomotive with onboard battery charger	$142,500.
10	3 m^3 OK cars	$ 96,250.
1	OK car dump station	$ 19,250.
1	Points drive equipment for automatic track switching	$ 7,600.
1	Remote control system (RCS) for a locomotive and one chute	$ 5,400.
2	RCS for an additional 2 chutes	$ 6,050.
1	Spare locomotive battery	$ 28,000.

We shall be pleased to receive a finalized haulage layout for study and definitive equipment pricing.

Please contact me at your convenience for additional information on ASEA haulage equipment and haulage systems.

Yours very truly,

ASEA LIMITED

Roy H Paddon

R.H. Paddon, P. Eng.
Industrial Department

RHP/pb

Postal address The Bentall Centre, P.O. Box 49038 VANCOUVER. B.C. V7X 1C4
Civic address Three Bentall Centre, Suite 1703, 595 Burrard Street VANCOUVER, B.C.
Telephone (604) 683-0494 Telex 04-54406 Telegrams ASEA VANCOUVER

ASEA LIMITED
Head Office : Montréal Trois-Rivières Toronto Sudbury Winnipeg Vancouver

Our reference QFA 82065 Revision 1
FAS 478F412
Your reference

Vancouver, March 28, 1977

Mr. P. Stokes
Canadian Mines Services Limited
745 Clarke Drive
Vancouver, B. C.

Subject: Grum Mine Service and Production Hoists

Dear Sir:

We are pleased to offer head frame mounted ASEA multi-rope statically controlled friction hoists for Kerr Addison's Grum Mine near Faro in the Yukon Territory. As alternatives, we offer the more costly ground mounted friction and drum hoists.

PART A:- GRUM PRODUCTION HOIST

Alternative No. 1

General:

We offer a 4 rope 2.0 m (78.74 inch) 574 kW (769 HP) head frame mounted friction production hoist designed for fully automatic operation. It is rated at 225 metric tons per hour (248 short tons) balanced skipping to realize your parameters of 3967 short tons over 16 hoisting hours daily for a total skip station to dump scroll hoisting distance of 1817.12 feet (554.0 metres).

Payload:

The production hoist is designed for an ore payload of 12080 pounds (5481 Kg), a rope weight of 10517 pounds (4772 Kg) and a skip plus rope attachments weight of 15648 pounds (7100 Kg.) Total T1 plus T2 is 38246 pds (17353 Kg.)

Your parameters stated that payload would be 6 inch crushed lead-zinc ore weighing 162 pounds per cubic foot swelled.

Trip Cycle:

Designed trips per hour are 41.0 based on a total 1817.12 feet production hoisting cycle time of 87.7 seconds comprising the following:

A. 15.0 seconds loading
B. 12.5 seconds accelerating over 205.0 ft (62.5 m) at a rate of 2.62 ft/sec^2 (0.8 m/sec^2).

...../2

Postal address The Bentall Centre, P.O. Box 49038 VANCOUVER, B.C. V7X 1C4
Civic address Three Bentall Centre, Suite 1703, 595 Burrard Street VANCOUVER, B.C.
Telephone (604) 683-0494 Telex 04-54406 Telegrams ASEA VANCOUVER

C. 42.7 seconds constant speed hoisting at 1968 fpm (10 m/s) over 1400.6 feet (427.0 m).
D. 12.5 seconds retardation over 205.0 feet (62.5 m) at a rate of 2.62 ft/sec^2 (0.8 m/sec^2).
E. 5.0 seconds creep over 6.6 feet (2 m) at a rate of 78.72 feet per min.

DC Motor:

The production hoist's DC motor is a type LAB450LB rated for 574 kW (769 HP rms), 725.5 RPM. The motor moment of inertia (WR^2) is 32 Kgm^2 (761 pd ft^2).

Gear Reduction:

The DC motor is connected to the production hoist pulley via a reduction gear type UAAF 273 whose ratio is 7.598:1. The gear's moment of inertia is 1200 Kgm^2 (28548 pd ft^2).

Speed Control:

The hoist's speed control is obtained by an armature thyristor converter (6 pulse) and field converter.

Head Ropes:

The four hoist head ropes are each 22 mm (0.866 inches) in diameter weighing (2.009 Kg per metre) 1.349 pds per foot of length. Total head rope length is (594 m) 1948.3 feet. Rope safety factor is 7.25. T1/T2 is 1.462. Rope breaking force is 309 KN (69466 pds). Distance LC to LC of ropes is 7.87 inches (200 mm).

Tail Ropes:

We recommend 2 tail ropes of (4.017 Kg per metre) 2.699 pounds per foot length.

Hoist Pulley:

The (2000 mm) 78.74 inch diameter hoist pulley with roller bearings has a rotational speed of 95.5 RPM and a rope thread pressure of 236.41 psi, (1.63 MPa). Pulley to rope diameter ratio is 90.91 to 1. Pulley moment of inertia is 4300 Kgm^2 (102297 pd ft^2).

...../3

Braking:

Braking is obtained by three fail safe disc brake units type BSFG408 complete with support frames and 1 brake pump unit. They are capable of holding 3.69 times the unbalanced load (T1-T2). Obtainable retardation at T1-T2 unbalance is 3.96 m/sec^2 (12.99 ft/sec^2).

Scope of Supply:

Our packaged system's offer of a hoist motor, intermediate gear, hoist pulley and bearing pedestals, thyristor converters and braking system is reinforced by the provision of 2 couplings between the motor - gearbox and the gearbox - hoist pulley and 1 set of base plates for bearings, gearbox and brake supports.

Refer to the attached drawing FASK 1977027 for the dimensional layout and component weights for the above scope of supply. The drawing also notes the requirement of a 98.5 by 98.5 inch transport opening and a hook height requirement of 138 inches for installation purposes.

The scope of mechanical-electrical supply also includes the following:

1 LT distribution board
1 Control board
1 Control desk
1 Hoist regulator type TVNGD
1 Set of auxiliary control apparatus comprising:
  1 Centrifugal switches
  2 Tachogenerators
  1 Set of shaft apparatus involving the following:
    2 Tappet operated limit switches
    5 Magnet operated limit switches
    4 Magnets for above limit switches
    1 Apparatus box

The offered production hoist's scope of supply does not include a rectifier transformer, head or tail ropes and oil. We offer erection and commissioning on site as an adder to this supply scope.

Budget Pricing - Escalation:

The budget price for this 2.0 metre production hoist is $445,000. (four hundred and forty five thousand dollars) based on January 1977 for escalation in accordance with the attached price adjustment clause A.

Duty - Freight - Locale of Manufacture:

This budget price includes 15% Canadian duty, and freight FOB Vancouver as per your parameters. The above pricing is based on Swedish manufacture; however, final pricing for the selected hoists parameters can be reviewed based on Canadian manufacture.

...../4

Validity:

This quotation is valid to May 9, 1977.

Delivery:

Delivery is 13 working months ex works following order receipt. Allow an additional four to six weeks for delivery FOB Vancouver.

Progress Payments:

Progress payments can be mutually agreed upon; however, may we suggest the following:

No. 1 - 10% payable with the Letter of Intent.
No. 2 - 20% payable upon receipt of dimension drawings.
No. 3 - 30% payable 6 months from order placement date.
No. 4 - 30% payable upon receipt of shipping documents.
No. 5 - 10% payable 90 days after commissioning or 180 days after receipt of shipping documents, whichever comes sooner.

Payment No. 4 shall be adjusted as to all escalation factors and price alterations due to additions and deletions of equipment.

Warranty:

ASEA's standard warranty extends for 18 months after shipment from the factory or 12 months after installation at the mine site, whichever comes soonest.

Commissioning:

There are no erection or commissioning personnel included in the above prices. We are able to supply necessary electrical commissioning personnel to assist you in your installation at field price rates in effect at that date.

Spare Parts:

It is our policy to provide a cost reduction on all spare parts ordered as part of the original equipment delivery.

Training:

ASEA conducts regular training courses in static drives at their facilities in Vasteras Sweden, at no cost to their customers. These courses are in English and require four full days. Arrangements for these courses must be made 4 months in advance to the required date.

...../5

Training is also provided by our personnel during and after commissioning.

Enclosures:

Please refer to the following previously supply literature describing ASEA hoisting equipment.

Information booklet AS 100-101 E - Modern Vertical Transportation
Pamphlet AS 10-104E - One of the Worlds Largest Winder Installations
Pamphlet AS 10-102E - Mine Hoists with Thyristor Converters

Alternative No. 2

Electrical and mechanical equipment for a ground mounted 2000 mm pulley diameter 4 rope friction hoist with the same data and commercial conditions as for Alternative No. 1. The scope of supply also includes top sheaves. Budget price is $578,000.

Alternative No. 3

Electrical and mechanical equipment for a ground mounted 3800 mm pulley diameter drum hoist as generally described in drawing FASK 1977 029. The scope of supply also included top sheaves and DC current breaker. Budget price is $853,000.

PART B GRUM SERVICE HOIST

Alternative No. 1

General:

We offer headframe mounted 4 rope 1700 mm pulley diameter (66.93 inch) 115 kW (154 HP) counter weighted double deck cage hoist. It is designed for automatic and cage level paging operations between four underground levels as per your trip parameter of 26 men over a maximum 1843 feet hoisting distance involving 3 underground levels above the skip station level.

...../6

Payload:

The hoist is designed for a 26 persons manload of 5201 pounds (2360 Kg payload), a rope weight of 5638 pounds (2558 Kg) and a conveyance plus rope attachment weight of 8375 pounds (3800 Kg). The counter weight is 10976 pds (4980 Kg) i.e. half the payload plus the conveyance weight. Total T2 +T2 is 19214 pds (8718 Kg). Your parameters stated that heavy loads would be slung beneath the skip or go underground via the decline.

Trip Cycle:

Designed mantrips per hour are 15.5 based on a total 1843.4 foot (562.0 m) spill pocket to shaft collar hoisting cycle time of 116.4 seconds comprising the following:

A. 30 seconds manloading.
B. 11.4 seconds accellerating over 149.9 feet (45.7 m) at 2.30 ft/sec^2 (0.70 m/sec^2).
C. 58.6 seconds constant speed hoisting at 1574.7 fpm (8.0m/sec) over 1537.0 feet (468.6 m).
D. 11.4 seconds decellerating over 149.9 feet (45.7 m) at 2.30 ft/sec^2 (0.70 m/sec^2).
E. 5.0 seconds creep over 6.6 feet at 78.72 fpm, (0.40 m/sec).

DC. Motor:

The service hoist's DC motor is a type LAB315LB rated for 115 kW RMS 938.3 RPM. Motor moment of inertia (WR^2) is 4 Kgm2 (95.16 pd ft^2).

Reduction Gear:

The motor is connected to the service hoist pulley via a reduction gear type UAAF 268 whose ratio is 10.440 to 1. The gear's moment of inertia is 175 Kgm^2 (4163.3 pd ft^2).

Speed Control:

Hoist speed control is obtained by a 6 pulse armature thyristor converter with field converter.

Tail Ropes:

We recommend 2 tail ropes of 1.427 pounds per foot length (2.125 Kg per metre).

...../7

Head Ropes:

The four hoist head ropes are 0.63 inches in diameter (16 mm) weighing 0.713 pounds per foot of length (1.062 Kg/m). Total head rope length is 1974.6 feet (602 m). Rope safety factor is 7.63. T1/T2 ratio is 1.157. Rope breaking force is 163 KN (36644 pds). Distance LC to LC of ropes is 7.87 inches (200 mm).

Hoist Pulley:

The 66.93 inch (1700 mm) diameter pulley with roller bearings has a rotational speed of 89.9 RPM and a rope tread pressure of 213.20 psi. Pulley to rope diameter ratio is 106.3 to 1. Pulley moment of inertia is 2600 Kgm^2 (61854 pd ft^2).

Braking:

Braking is obtained by 2 fail safe disc brake units type BSF8 408 complete with support frames and 1 brake pump unit. They are capable of holding 11.67 times the unbalanced load, (T1-T2). Obtainable retardation at T1-T2 unbalance is 5.96 m/sec^2 (19.54 ft/sec^2).

Scope of Supply:

Our packaged systems offer of a hoist motor, intermediate gear, hoist pulley and bearing pedestals, thyristor converters and braking system is reinforced by the provision of two couplings between the motor-gearbox and the gearbox, hoist pulley and 1 set of base plates for bearings, gearbox and brake supports. Please refer to the attached drawing FASK 1977 028 for dimensional layout and component weights for the above scope of supply. The drawing also notes the transport opening and hook height requirement of 95 x 95 inches and 138 inches respectively.

The scope of mechanical - electrical supply also includes the following:

- 1 LT distribution board
- 1 control board
- 1 Control desk
- 1 Hoist regulator type TVNGD
- 1 Set of auxiliary control apparatus comprising:
  - 1 centrifugal switch
  - 2 Tachogenerators
  - 1 Set of shaft apparatus involving the following:
    - 2 tappet-operated limit switches
    - 20 magnetic-operated limit switches
    - 5 magnets for above limit switches
    - 5 change-over switches for blocking release
    - 5 control boxes
    - 5 alarm bells

...../8

Please refer to page No. 3 of previously supplied Pamphlet 8346 E describing the above included cage level paging system.

The offered service hoist's scope of supply does not include the rectifier transformer, either head or tail ropes and oil. We offer erection and commissioning on site as an adder to this supply scope.

Budget Pricing - Escalation:

The budget price for this 1:7 metre automatic service hoist is $352,000. (three hundred and fifty two thousand dollars). The base month for escalation is January 1977 in accordance with the attached price adjustment clause A.

Duty, Freight, Locale of Manufacture, Validity, Delivery, Progress Payments, Warranty, Commissioning, Training:

For the above commercial items refer to applicable remarks in Part Number A.

Alternative No. 2

Electrical and mechanical equipment for a ground mounted 1700 mm pulley diameter 4 rope friction hoist with the same data and commercial conditions as for alternative No. 1. The scope of supply also includes top sheaves. Budget priceing is $461,000.

Alternative No. 3

Electrical mechanical equipment for a ground mounted 2700 mm drum hoist as generally described in drawing FASK 1977 030. The scope of supply also includes top sheaves. Budget price is $559,000.

We trust that the above information will privide you and your client with required information for the available hoisting parameters.

...../9

ASEA

Please contact me at your convenience for further information on hoisting and rail haulage systems for this project.

Yours very truly,

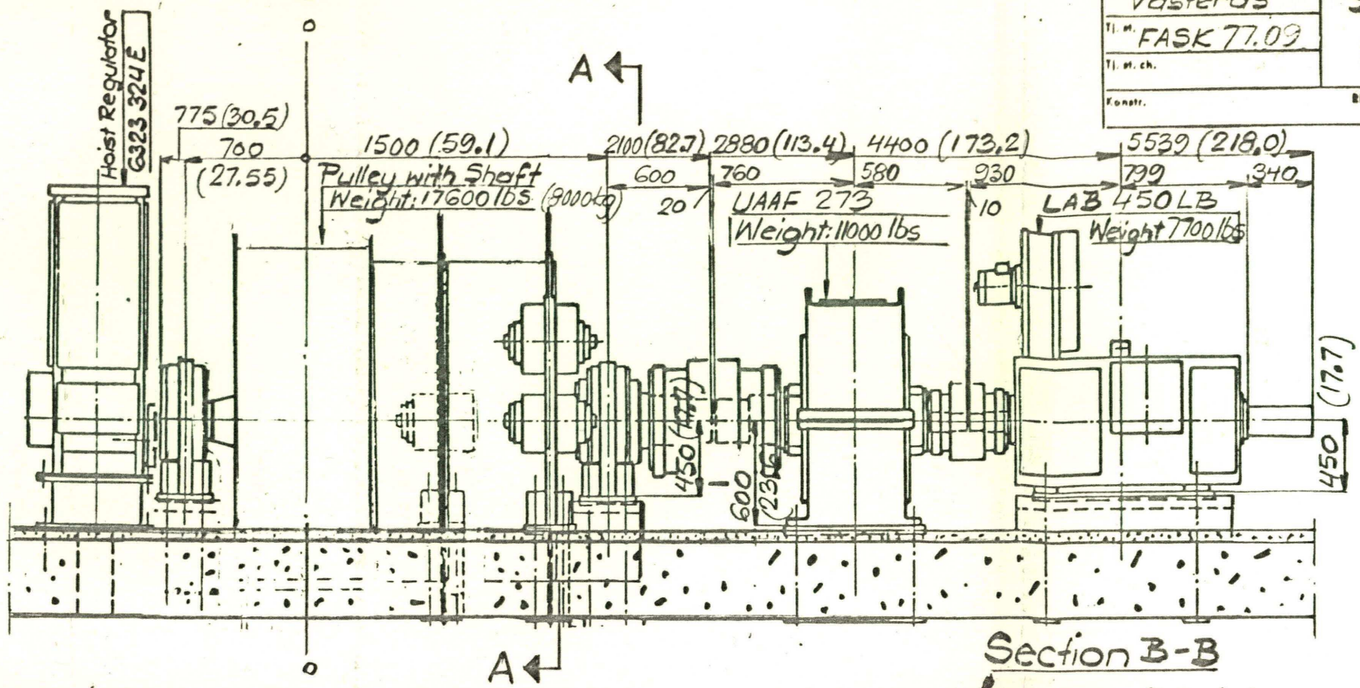
ASEA LIMITED

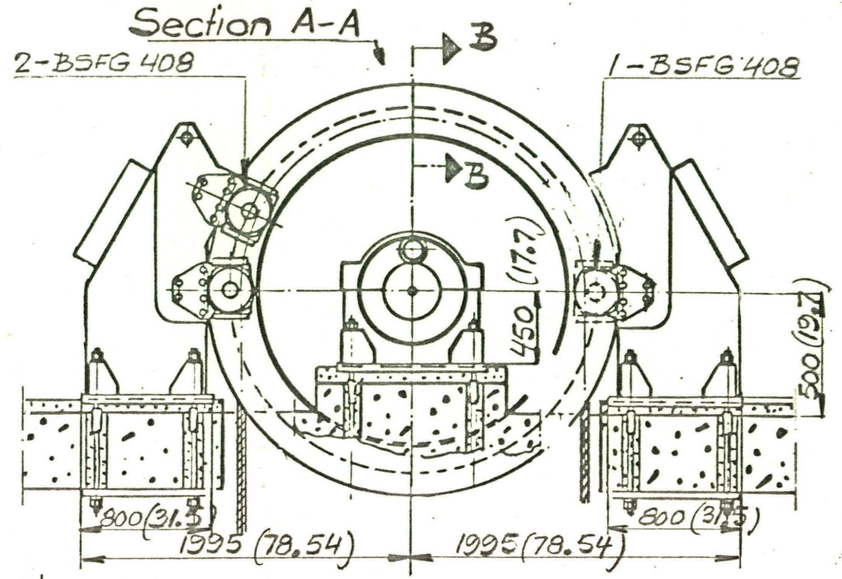
R.H. Paddon, P. Eng.
Industrial Department

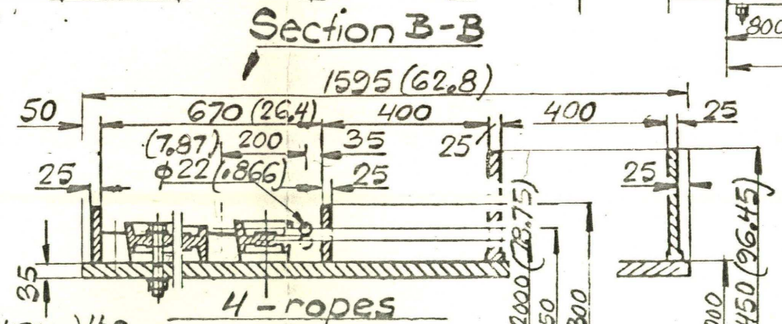
RHP/pb

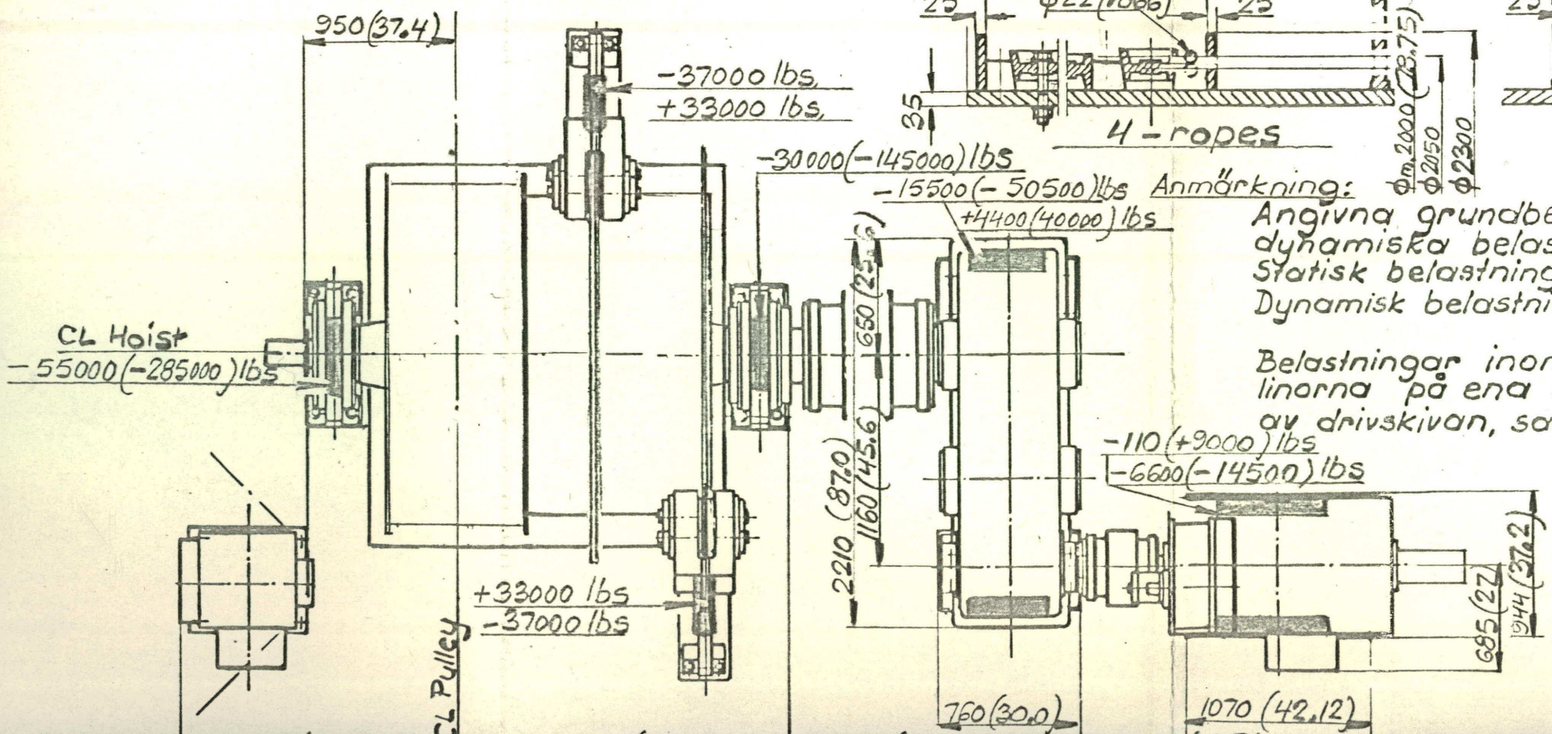
c.c. Mr. P. Janson, UCAM

ASEA	2m. Friction Winder Type: HSVE-2 Prodn Hoist - tower mounted - Crwn (Friction type)	FASK 1977027
Gm Västerås		Blad 1
Tj. nr FASK 77.09		Reg. / Forts. bl.
Tj. nr. ch.		Inköp / Ptal
Konstr. / Blt. MK / Kontr.		Ref. FAS 478 F 412-1









The biggest detail: Pulley 96.45×96.45×62.8 inch
The heaviest -"-: -"- 17600 lbs (8000 kg)
Transport opening: 98.5×98.5 inch
Hook height: ~138.0 inch

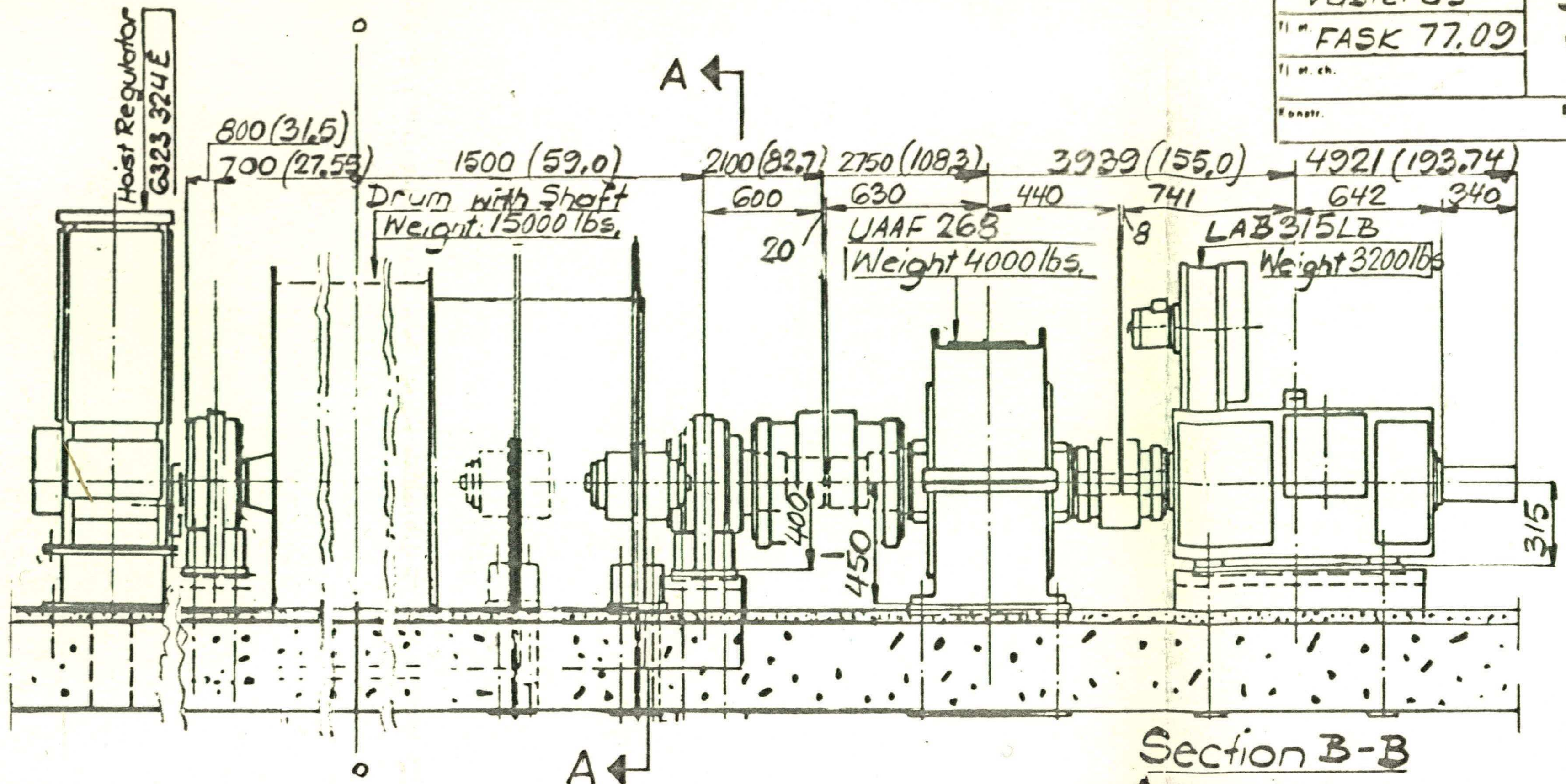
Anmärkning:
Angivna grundbelastningar utgör summan av statiska och dynamiska belastningar vid båda rotationsriktningarna.
Statisk belastning: Vikt av spelets delar plus statisk lindrag.
Dynamisk belastning: Största förekommande bromsmoment, spelmotorns maximalmoment.
Belastningar inom parantes motsvarar verklig brottlast på linorna på ena sidan plus 50% av brottlasten på andra sidan, av drivskivan, samt motors kortslutningsmoment.

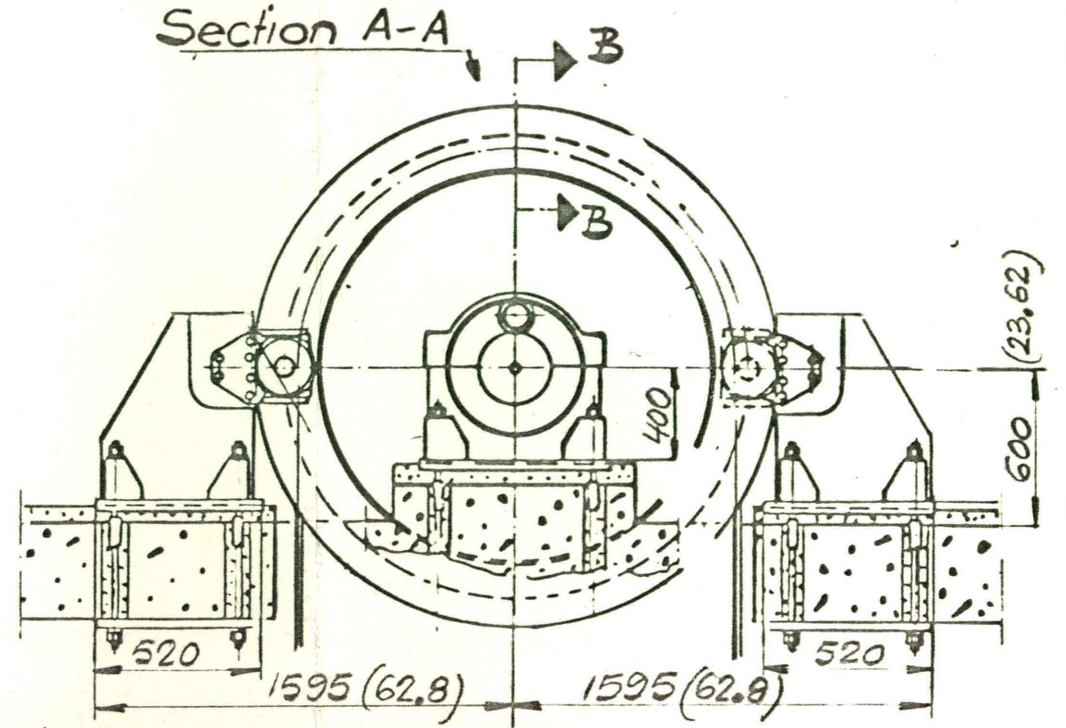
Note: The foundation loads stated are equal to the sum of static and dynamic loads in both direction of rotation. Loads in brackets correspond to the effective breaking strength of the ropes on one side plus 50% of the breaking strength on the other side of the driving pulley and the short circuit torque of the winder motor.

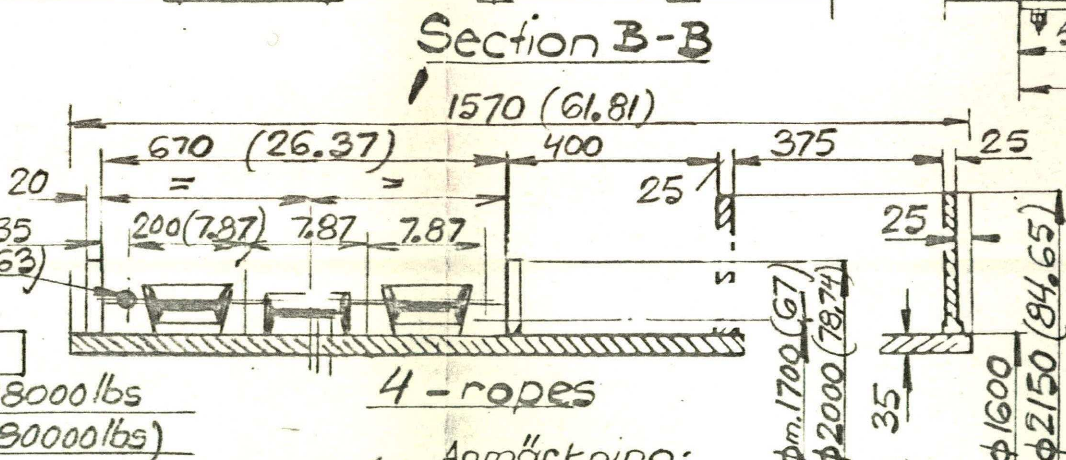
+ = pull; - = pressure.

Dimension: Milimeters (Inches)

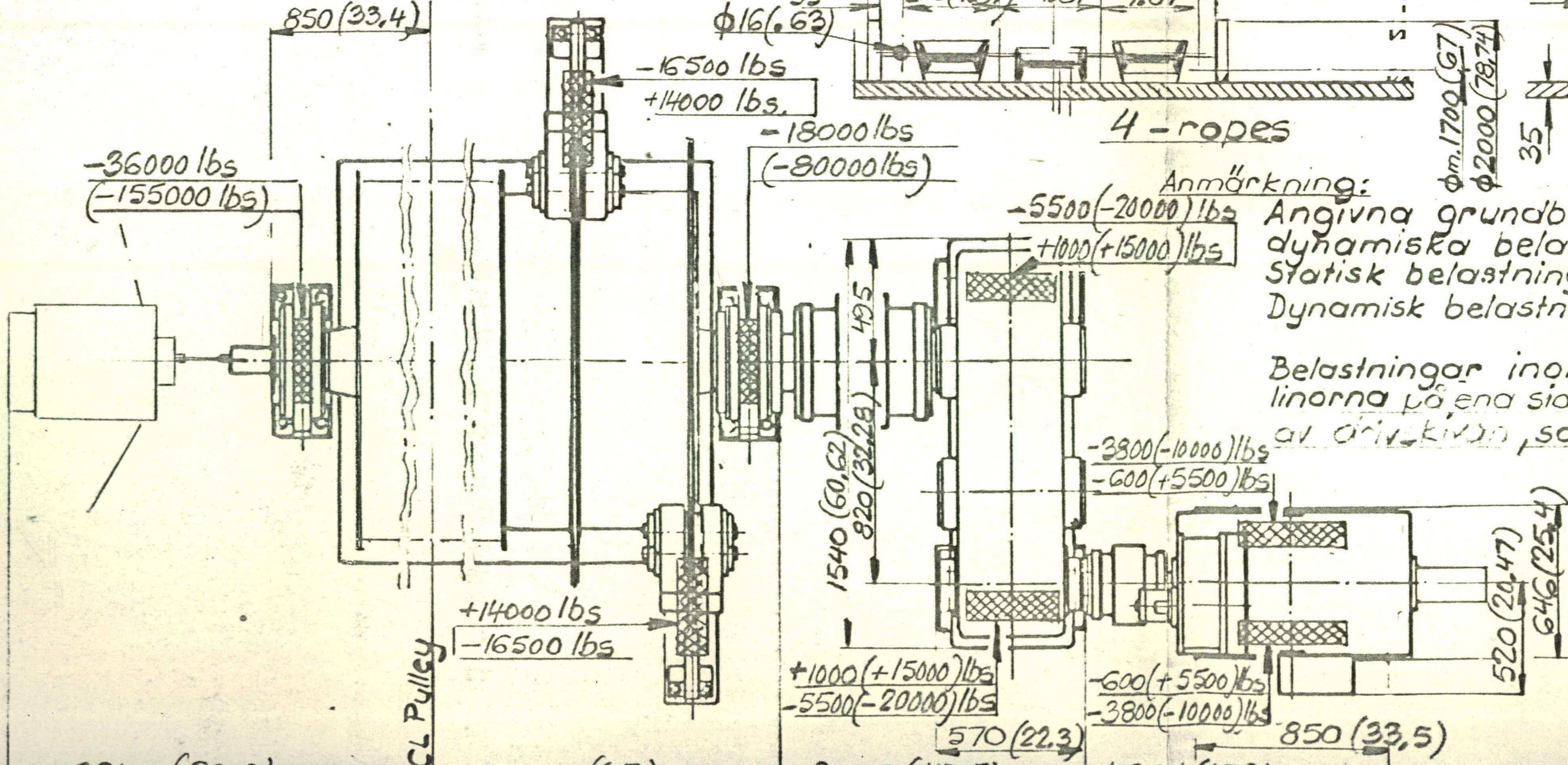
ASEA Västerås FASK 77.09	1,7 m. Friction Winder Type: HTVE-1,7 (67") Service Hoist - Drum - tower mounted	FASK 1977 028 Blad 1 Ref. FAS478F412-2







The biggest detail: Drum = 84,65×84,65×61,8 in.
The heaviest -"- ; -"- ~15000 lbs
Transport opening: 95×95 in.
Hook height: 138 in.



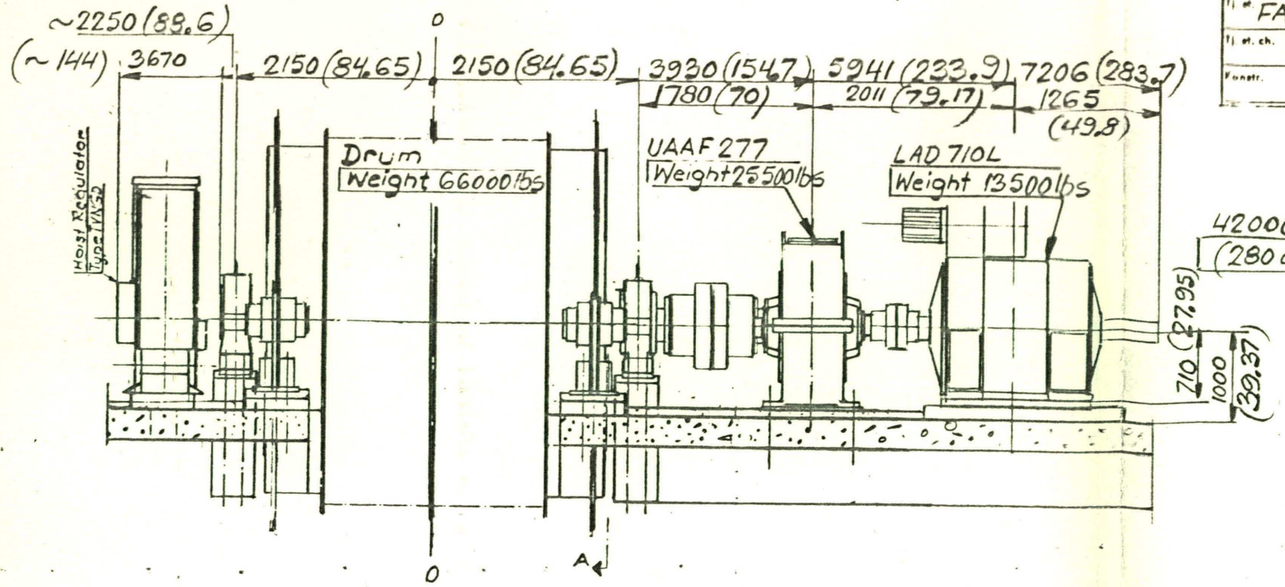
Anmärkning:
Angivna grundbelastningar utgör summan av statiska och dynamiska belastningar vid båda rotationsriktningarna.
Statisk belastning: Vikt av spelets delar plus statisk lindrag.
Dynamisk belastning: Största förekommande bromsmoment, spelmotorns maximalmoment.
Belastningar inom parantes motsvarar verklig brottlast på linorna på ena sidan plus 50% av brottlasten på andra sidan av drivskivan, samt motors kortslutningsmoment.

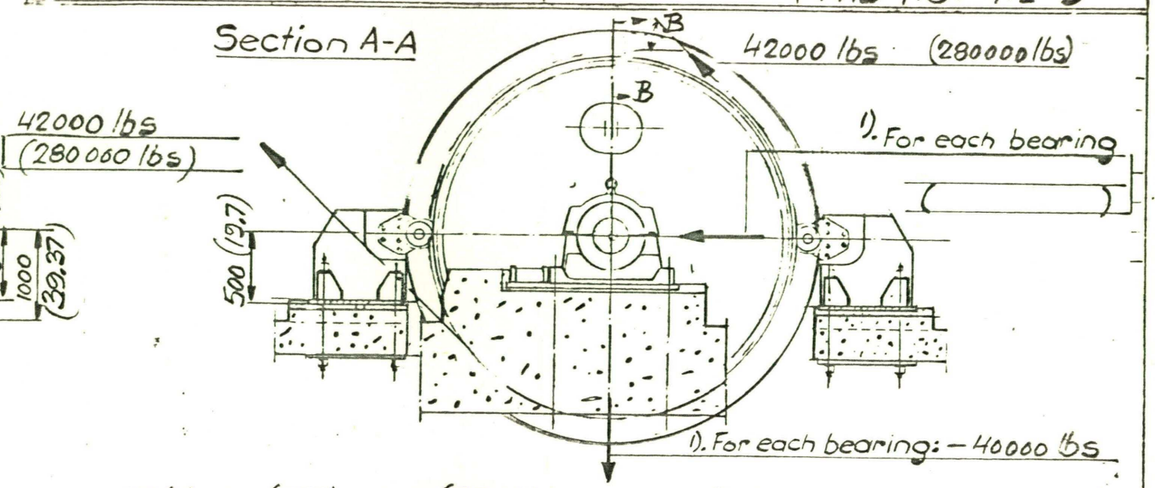
Note: The foundation loads stated are equal to the sum of static and dynamic loads in both direction of rotation. Loads in brackets correspond to the effective breaking strength of the ropes on one side plus 50% of the breaking strength on the other side of the driving pulley and the short circuit torque of the winder motor.

+ = pull; − = pressure.

Måttnoggrannhetsklass enligt A 2002 1030
[ ] Medel ☐ Fin

ASEA	3,8 m. Drum Hoist Type: HTVE-3,8 (149,6") Prodn Hoist - Ground mounted - Crane (HH #3)	FASK 1977 029 Blad 1
Västerås		Forts. bl.
FASK 177.09		Reg. / Inköp / Pkl
Tj. et. ch.		
Konstr.	Rit. MK Kontr.	Ref. FAS 478 F 412-3

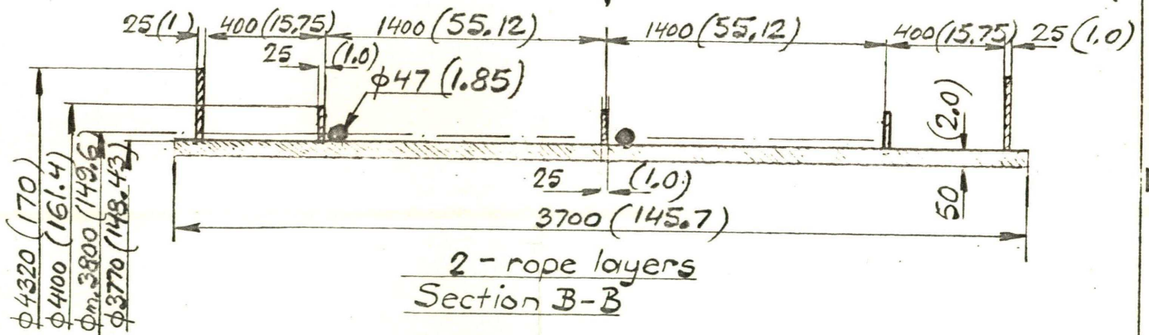




Section A-A

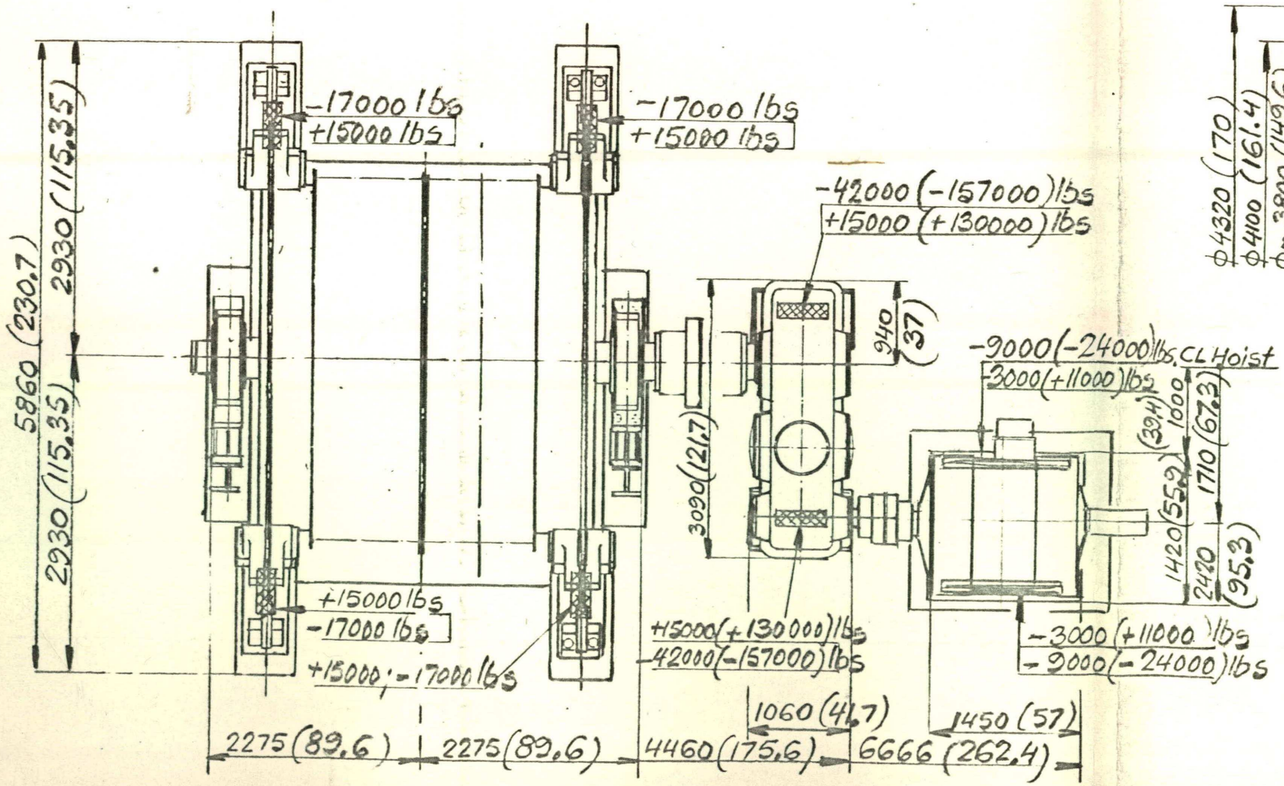
42000 lbs (280000 lbs)

1). For each bearing: – 40000 lbs



2 - rope layers

Section B-B



Anmärkning: Angivna grundbelastningar utgör summan av statiska och dynamiska belastningar vid båda rotationsriktningarna. Belastningar inom parantes motsvarar verklig brottlast på lina, samt motorns kortslutningsmoment. + = drag; – = tryck.

Note: The foundation loads stated are equal to the sum of static and dynamic loads in both directions of rotation. Loads in brackets correspond to the effective breaking strength of the rope and the short circuit torque of the winder motor. + = pull; – = pressure.

The biggest detail: Drum = 170 × 170 × 145.7 inch,
The heaviest detail: Drum = 66000 lbs
Transport opening ~ 175 × 175 inch,
Hook height ~ 235 inch,

ASEA

Västerås

"FASK"

2,7m. Drum Hoist
Type: HTVE-2,7 (106.3")

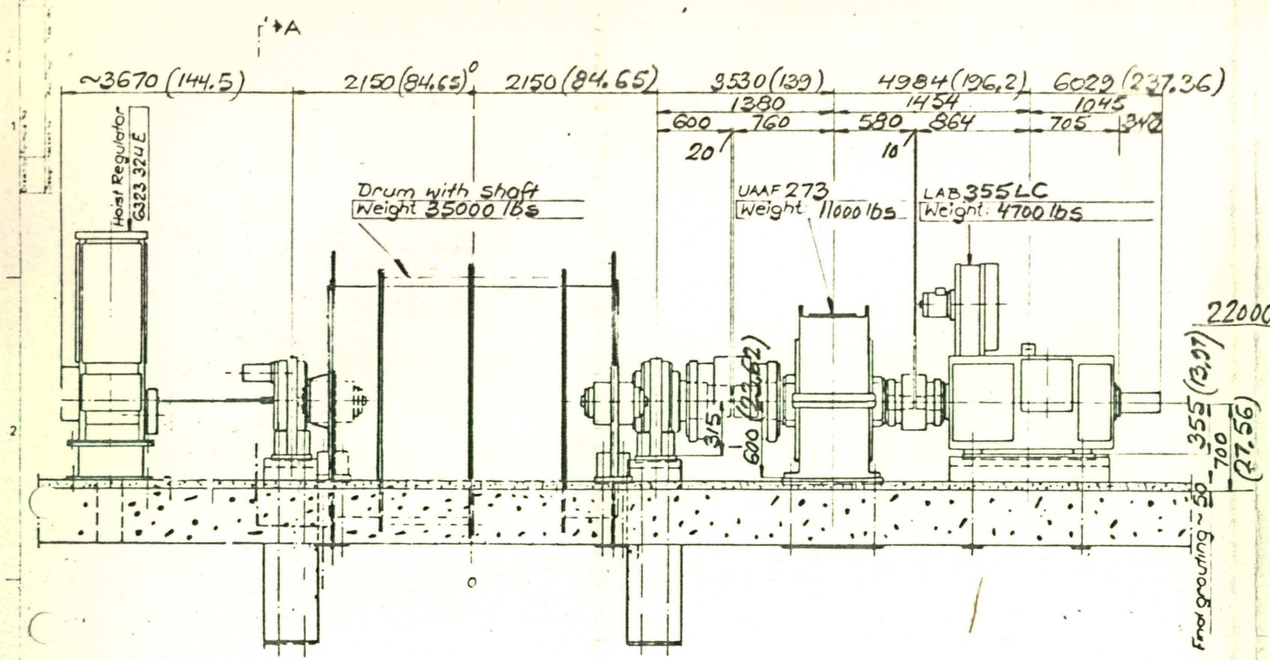
Service hoist - ground mounted
Drum type - Grum

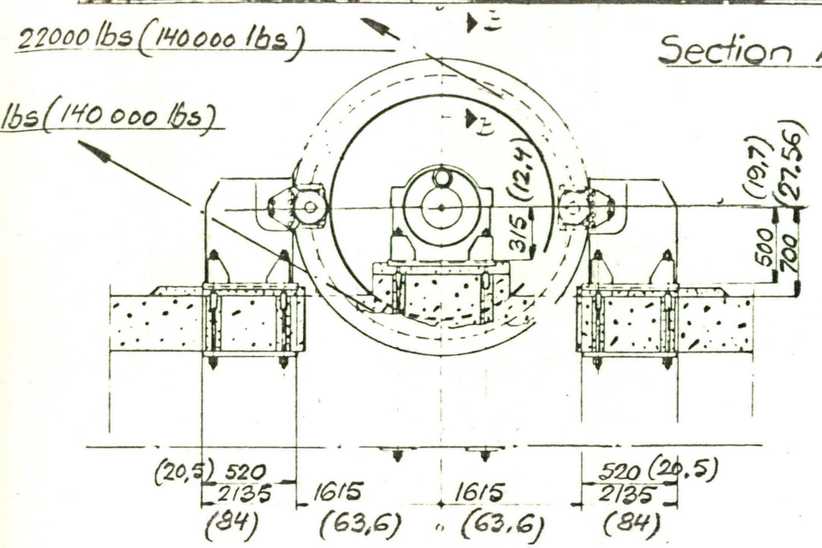
FASK 1977 030

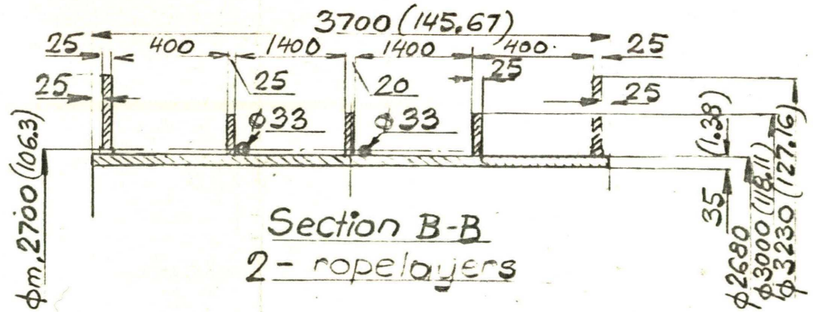
" 1

" 673,911

" FAS 478 F 412-4







Note:
The foundation loads stated are equal to the sum of static and dynamic loads in both directions of rotation.
Static load: Weight of winder parts plus static rope tension.
Dynamic load: Maximum braking torque, maximum torque of winder motor. Loads in brackets correspond to the effective breaking strength of the ropes and the circuit torque of the winder motor

+ = pull ; - = pressure

The biggest detail: Drum = 127,16 x 127,16 x 145,67 in,
The heaviest detail: " = 35000 lbs

V-1396

August 5th, 1976.

Canadian Mines Service Ltd.,
VANCOUVER, B.C.

One only "PARAMATIC" Electric Hydraulic model MJM-21H Jumbo, patented parallel automatic drilling, three boom, four wheel drive, centre articulated vehicle complete with:

2 only RP625 Rotabooms with 360° rotation and automatic parallelism;
1 only CS-3 swinging cut boom with universal head;
3 only ACH heavy duty hydraulic feeds with feed automatics;
3 only H70 independent rotation hydraulic rock drills;
4 only hydraulic jacks, front and rear;

Electric system consisting of:

4 only 50 HP TEFC 550/3/60 motors;
1 only control panel with:
- automatic phase reversal protection;
- automatic sequence starting;
- automatic shutdown for high oil temperature, low oil level, low water pressure, all with red indicator lights;

Type G cable (25 feet) supplied with main male and female connectors for coupling to mine supply; Cable size 2/0;
12 volt DC transformer for operating six sealed beam lights rear, two front;

Contd...

Model MJM-21H Jumbo, Contd.

Hydraulic System Consisting of:

Pressurized hydraulic reservoir;
3 only Commercial Shearing tandem constant volume hydraulic pumps;
1 only Vickers constant pressure hydraulic pump (variable displacement) with high pressure 10 Micron Filter;
1 oil cooler (water/oil) system;
1 return line, 25 Micron Filter;
1 pressurized hydraulic oil filler system consisting of hand pump and filter;
All necessary control valves, gauges, etc.

1 only four wheel drive, centre articulated carrier complete with:

Deutz F6L-912W, 78 HP engine;
Oxy-catalyst scrubber system;
4 speeds synchromesh transmission;
Orbitrol type steering;
Two 12 volt 95 amp hour batteries;
14 Imperial gallon fuel tank;
Full 72° steering;
Rear counterweight;
12:00 x 20, 12 ply HRLNY tires.

Approximate shipping weight - 35,000 lbs.

PRICE . . . . . $ 213,500.00

"TWO HUNDRED & THIRTEEN THOUSAND FIVE HUNDRED DOLLARS"

Cable Reel with 250 Foot of Conductor $ 9,500.00

Please Note:

1. Prices are F.O.B. North Bay, Ontario.
2. Prices are in Canadian Funds.
3. Prices do not include duty or sales taxes.
4. Delivery: 10 - 12 weeks
5. TERMS: Please see attached.

V-1395

August 5th, 1976.

Canadian Mine Services Ltd.,
VANCOUVER, B.C.

One only "WAGNER" Model ST8, four wheel drive diesel powered Scooptram complete with:

Deutz Model F10L-714, 222 HP mine service rating, diesel engine;
Power Shift transmission model 5420;
Industrial type torque converter 8502,
70500 front and rear axle;
4 wheel air over hydraulic brakes;
10 degree axle oscillation;
Heavy duty type mining bucket;
8 cu. yd. capacity;
Standard gauges and instrumentation.

Including the following extras:

1. Audio visual, high temperature low oil pressure alarm system;
2. Engine skid plate;
3. Disc brake isolation test system;
4. Air starting system (Bosch);
5. Oxy-catalyst Scrubber;
6. No-spin differential front axle;
7. 26.5 x 25, 26 ply SMC United tires.

PRICE . . . . . $ 141,910.00

"ONE HUNDRED & FORTY ONE THOUSAND NINE HUNDRED & TEN DOLLARS"

F.O.B. - Portland, Oregon

Delivery - 3-4 months.

Please Note:

"Prices are in Canadian funds based on the U.S. dollar being at par with the Canadian dollar. Prices will be adjusted to reflect the rate of exchange prevailing at the date of invoice."

CONDITIONS OF SALE

1. Terms of payment: Net 30 days, unless specifically arranged otherwise.

2. Prices are F.O.B. point of manufacture as specified.

3. Prices are in Canadian funds unless otherwise specified.

4. Prices do not include federal or provincial sales taxes.

5. Duty is not included. Generally, duty does not apply to equipment imported for use exclusively in underground mining. Duty if applicable, is extra.

6. Please certify order to confirm end use is underground mining. Also provide standard federal sales tax exemption certificate, if applicable.

7. This proposal is valid for 30 days.

8. Prices quoted for Jarvis Clark manufactured products are subject to adjustment to reflect any increase in labour, materials and components. For equipment ordered and delivered within six months of the date of this proposal, such increases shall be limited to a maximum of 10 per cent.

   For Jarvis Clark manufactured products where deliveries are estimated to be beyond six months, orders will not be accepted as to pricing; pricing will be that in effect at date of delivery.

   Equipment sold but not manufactured by Jarvis Clark, will be protected to the extent that the vendor protects Jarvis Clark. Pricing shall be adjusted to the extent of any increases received by Jarvis Clark from the manufacturer.

9. Cancellation: Unless specifically arranged otherwise, orders cancelled for any reason shall be subject to a charge of 10 per cent of the purchase price.

10. On export orders, packing, crating or container loading and blocking will be charged at cost.

October 1st, 1974.

WAJAX INDUSTRIES LIMITED

January 20, 1977

Canadian Mine Services
745 Clark Drive
Vancouver, B.C.

Attention: Mr. J. Cassidy

Dear Sir:

This is to confirm our telephone quoted prices for an Eimco 630 mucking machine and an Eimco 911 Load-Haul-Dump machine.

Item 1

One only Model 630 Eimco Excavator,

PRICE, each, U.S. Funds $32,690.00

F.O.B. .... Salt Lake City, Utah
TAXES ..... Extra.
DUTY ..... Free.
DELIVERY .. 2 months.

Item 2

One only Eimco Model 911 LHD complete with catalytic scrubber and B.C. Dept. of Mines specifications.

PRICE, each, U.S. Funds $41,900.00

F.O.B. .... Factory.
TAXES ..... Extra.
DUTY ..... Free.
DELIVERY .. 2 months.

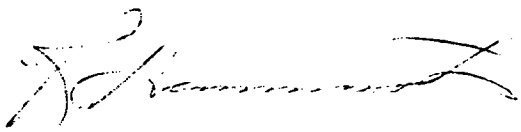
We may add that we have two only 911 units in our rental fleet that we could sell for about $25,000.00 each, if available when needed.

Canadian Mine Services

Please contact us if we can be of further service.

Yours truly,

WAJAX INDUSTRIES LIMITED



R. Hammermaster
Sales Representative
Mining Division

RH:dbp

JOY MANUFACTURING COMPANY (CANADA) LIMITED

FAN DIVISION

118 Midland Street, Winnipeg, Man. R3E 2Y6
Phone (204) 775-8531 — Telex 07-57886

PROPOSAL

Canadian Mine Services
745 Clark Drive
Vancouver, B. C.
V5L 3J4

Proposal No. V-77-69

Date February 2, 1977

Attention: J. Cassidy

We are pleased to quote on the following Joy air moving equipment subject to the terms and conditions shown on the reverse side.

Two (2) only Joy Model 48-26-1770 Series 1000 Axivane Fans complete with 75 h.p. 3-60-575 volt 1800 r.p.m. TEAO Motor, fan supports, inlet bell and inlet screen.

Price: $3,669.00 each

Performance: (2 fans in series) 50,000 c.f.m @ 13" S. P.

Price Quoted (Canadian Currency): As above

Shipment: 6 - 8 weeks F.O.B. Winnipeg, Manitoba

Federal Sales Tax: Extra

Provincial Sales Tax: Extra

This quotation is subject to written acceptance by Joy Manufacturing Company (Canada) Ltd. — Fan Division as well as terms described on the reverse side and in Attachment "B".

JOY MANUFACTURING COMPANY (CANADA) LIMITED

By G. Park

INDUSTRIAL EQUIPMENT CO. LTD.
Head Office: 8282 SHERBROOKE ST., VAN., B.C. V5X 4D8/PHONE 321-1221/TELEX 04-508757

January 28, 1977

Canadian Mine Services Ltd.,
745 Clarke Drive,
Vancouver, B.C.

Attention: Mr. J. Cassidy

Subject: 36" Wide Belt Conveyor

Gentlemen,

Further to our telephone conversation we are pleased to describe and provide an estimating price on a 36" Wide 35° Troughing Belt Conveyor having 70 feet horizontal centres operating at 100 feet per minute and employing a 3HP drive. The conveyor is designed to handle 250 short tons per hour of -6" lead-zinc ore weighing approximately 130 - 150 lbs. per cubic foot and would be fed by a vibrating feeder.

Both head and tail shaft would be 2 7/16" diameter with 18" diameter x 38" crown face welded steel heavy duty pulleys mounted. The head pulley would operate in Link Belt PB22439H spherical roller bearing pillow blocks and the take-up shaft in Link Belt DSB22439H-18 spherical roller bearing protected screw take-ups with 18" movement.

Included in the estimate is 150 feet of 36" wide Plylon 2210 conveyor belt with 3/16" face and 1/16" back covers and sufficient mechanical fasteners for field splice. At the loading point, there would be four Link Belt No. 3630-36 35° troughing impact idlers with 6" diameter rubber treads. The balance of the trough idlers would be 14-Link Belt No. 3528-36 35° troughing idlers with 5" diameter steel rolls. The return idlers would be 6-3518-36 rubber tread return idlers.

The drive would consist of a 3 HP 1800 RPM totally enclosed motor, a Link Belt 215D24 shaft mounted reducer complete with shaft bushing and motor bracket for mounting of the motor. A V-belt drive and guard would be provided.

The steel frame would consist of 70 feet of 6" channel at 8.2 lbs. stringer with three foot legs and cross ties of 3" x 3" x 1/4" angle, leg diagonal bracing of 1 1/2" x 1 1/2" x 3/16" angle, a continuous number 14 gauge deck plate and fabricated steel head and tail support.

The approximate price of the foregoing described material would be $10,623.00 not including Federal or Provincial sales taxes, FOB our Vancouver manufacturing plant.

.../2

The estimated weight of machinery and belt would be 3,953 pounds. The estimated weight of the steel would be 2,906 pounds.

Yours very truly,

INDUSTRIAL EQUIPMENT CO. LTD.

Stu St. Clair
Sales Representative

StC/vgr

+
CANMS VCR

CANME ELLK
+
CANMS VCR

DOL ORIL
NOV 22/76 3:45 PM
ATTN J TATAK
YOUR REQUEST BUDGET PRICES FOR CURRENT PROJECT, YUKON TERRITORY,
WE ADVISE AS FOLLOWS:
A) 5 TON SKIPS LESS ROPE ATTACHMENTS OR GUIDE ROLLERS 25,000
DOLLARS EACH. EST WT 10,000 LBS EACH.
B) SERVICE CAGE FOR MEN AND MATERIALS, LESS ROPE ATTACHMENTS OR
GUIDE ROLLERS PER UNIT 20,000 DOLLARS, EST NET WT 5,000 LBS.
C) CAGE CWT LESS ROPE ATTACHMENTS OR GUIDE ROLLERS PER UNIT
10,000 DOLLARS, EST NET WT 8,500 LBS.
D) GUIDE ROLLERS FOR ABOVE UNITS. PRICE BASED ON SET - 1 SET PER
CONVEYANCE REQUIRED - 1,800 DOLLARS PER SET.
E) HOIST AND TAIL ROPE ATTACHMENTS FOR ALL CONVEYANCES
TOTAL - 90,000 DOLLARS
EST NET WT PER SET FOR SKIP 2,500 LBS.
EST NET WT PER SET FOR CAGE AND/OR CWT - 1,850 LBS.
THE TOTAL PRICE OF ROPE ATTACHMENT IS BASED ON EQUIPING TWO SKIPS
ONE CAGE AND ONE CAGE COUNTERWEIGHT.
F) DEFLECTION SHEAVES FOR 72'' DIA CAGE HOIST IF REQUIRED TWO
SHEAVES 72'' F D ON A COMMON SHAFT WITH BEARINGS.
PRICE TOTAL 20,000 DOLLARS.
G) DOUBLE COMPARTMENT LOADING STATION COMPLETE WITH LOWER AND
UPPER CHUTES FOR VOLUMETRIC MEASURING 5 TON LOADS.
PRICE TOTAL 40,000 DOLLARS. EST NET WT 36,000 LBS.
H) GRANEY CARS IN RANGE OF 80 - 100 CU FT CAPACITY.
9,000 DOLLARS EACH. EST NET WT 8,000 LBS EA.
I) RAMP DUMP ARRANGEMENT FOR GRANBY CARS, FIXED TYPE.
4,000 DOLLARS. MOVEABLE TYPE 5,500 DOLLARS.
PRICES ARE APPROX ONLY FOB ORILLIA TAX EXTRA IF APPLICABLE, AND
BASED ON CURRENT MATERIAL AND LABOUR COSTS.
J A FELL
+
CANMS VCR

DOL ORIL

Zephyr MOTORS
LEASING Lease (1960) LIMITED
130 W. BROADWAY, VANCOUVER, B.C. V5Y 1P3 • PHONE: (604) 872-7411 • TELEX: 04-53195

February 15, 1977

Canadian Mine Service
745 Clark Drive
Vancouver, B.C.

Attention: Jack Cassidy

Dear Sir:

We are pleased to submit the following quote.

1977 F 250 4 x 4

351 - V8
7700G.V.W.
H D trim
Oil bath air cleaner
Guages
Power steering
L P Mirrors
Shocks
Step bumper
7.50 x 16 10 Ply
Spare tire
Snow tread tires
4 speed transmission
3800 lb. axle

24 month lease rate: $304.00 monthly.
Purchase price: $7925.00.

1977 F 350 with 10' Flat Deck

10,000 G.V.W.
351 - V8
Power steering
Gauges
Oil bath air cleaner
West coast mirrors
Dual horns
Cigar lighter

68 amp. battery
4 shocks
Aux. rear spring
7.50 x 16 8 ply tires
(Mud & Snow on rear)
4 speed transmission
Opt. axle ratio

24 month lease rate: $256.00 monthly.
Purchase price: $6723.00.

The above rates are subject to 7% B.C. S.S. tax.

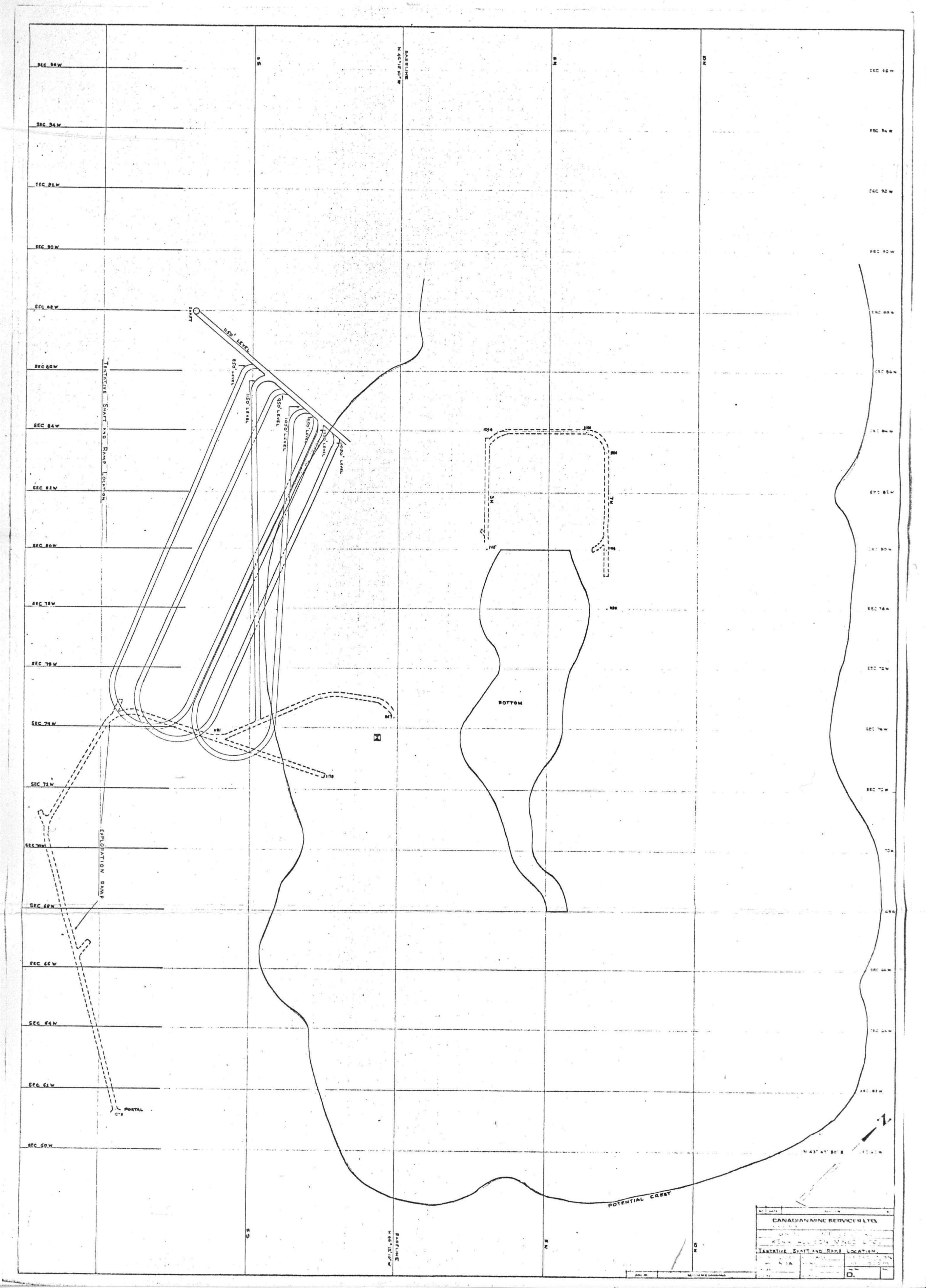
The above lease rates are for a non-maintenance lease.

We trust that the above will meet with your approval and that we may be favored with your most valued business.

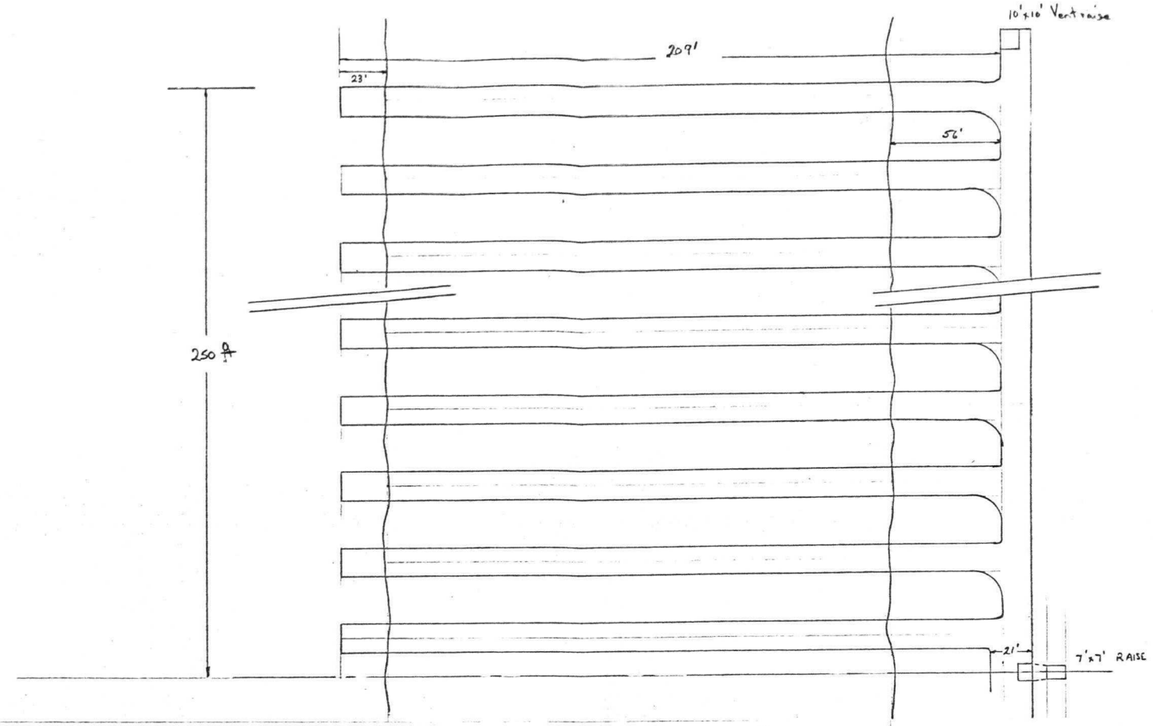
Sincerely,
ZEPHYR MOTORS LEASE (1960) LTD.

Barry Enge

BE/lk

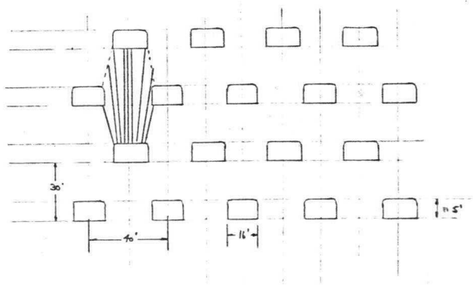

SEC 96 W
SEC 94 W
SEC 92 W
SEC 90 W
SEC 88 W
SEC 86 W
SEC 84 W
SEC 82 W
SEC 80 W
SEC 78 W
SEC 76 W
SEC 74 W
SEC 72 W
SEC 70 W
SEC 68 W
SEC 66 W
SEC 64 W
SEC 62 W
SEC 60 W
BASELINE
TENTATIVE SHAFT AND RAMP LOCATION
SHAFT
1150' LEVEL
850' LEVEL
1150' LEVEL
950' LEVEL
1050' LEVEL
EXPLORATION RAMP
PORTAL
BOTTOM
POTENTIAL CREST
N 43° 47' 80" E
CANADIAN MINE SERVICES LTD.
TENTATIVE SHAFT AND RAMP LOCATION
D.

Sub-level Plan



ore dipping at 30° 20m wide.

Longitudinal section



Cross-section.

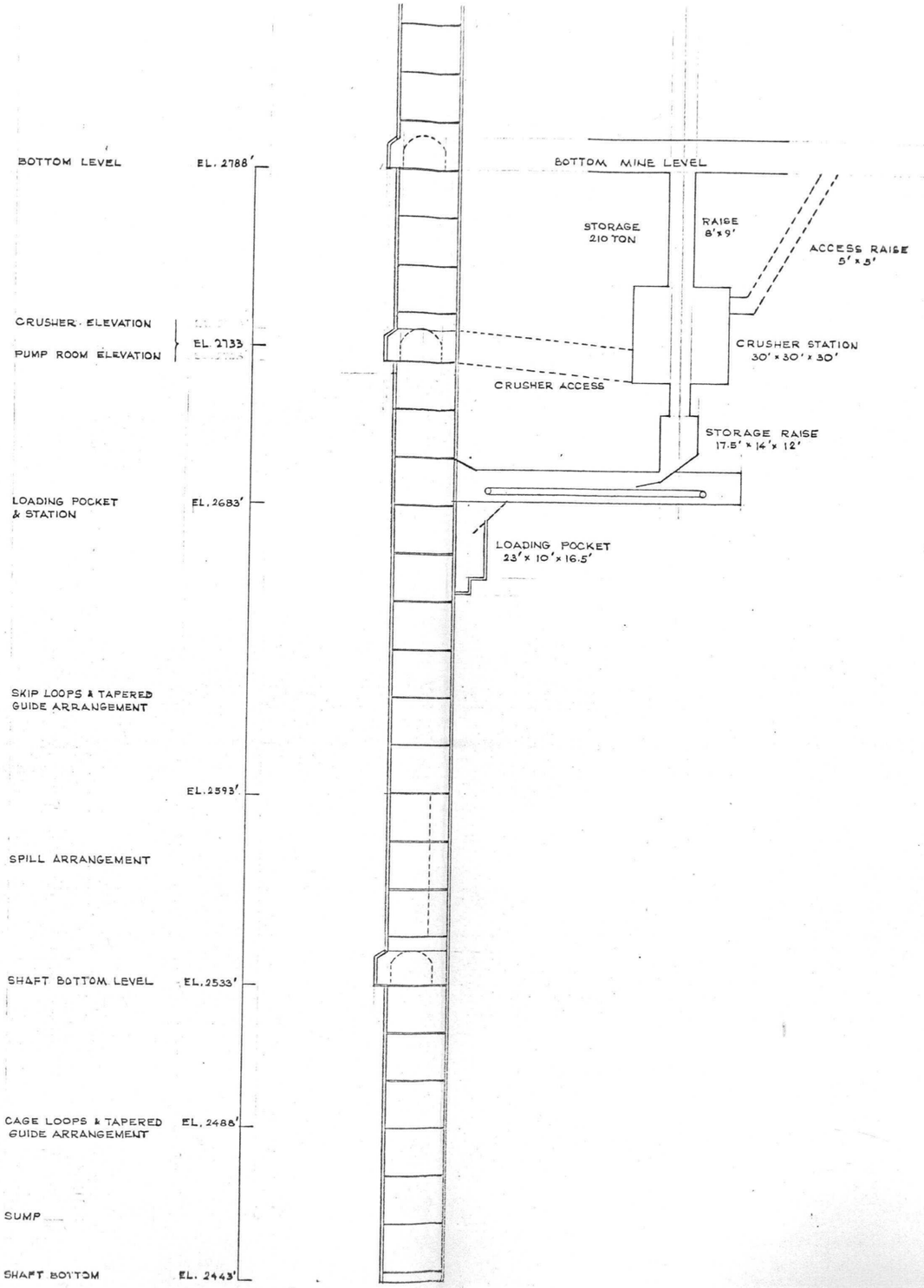
NO.	DATE	REVISION	BY

CANADIAN MINE SERVICES LTD.
VANCOUVER, B.C. CANADA

GRUM JOINT VENTURE
SUB-LEVEL LAYOUT
IDEALIZED OREBODY

DESIGNED WPS	BILL OF MAT'L	DATE APR. 15 '77	
DRAWN WPS	JOB. NO.	SCALE NTS.	
TRACED	CLIENT	Dwg. No. D. 2805	Rev. C
CHECKED	APPROVED		

DWG. NO.	REFERENCE DRAWINGS



NO.	DATE	REVISION	BY

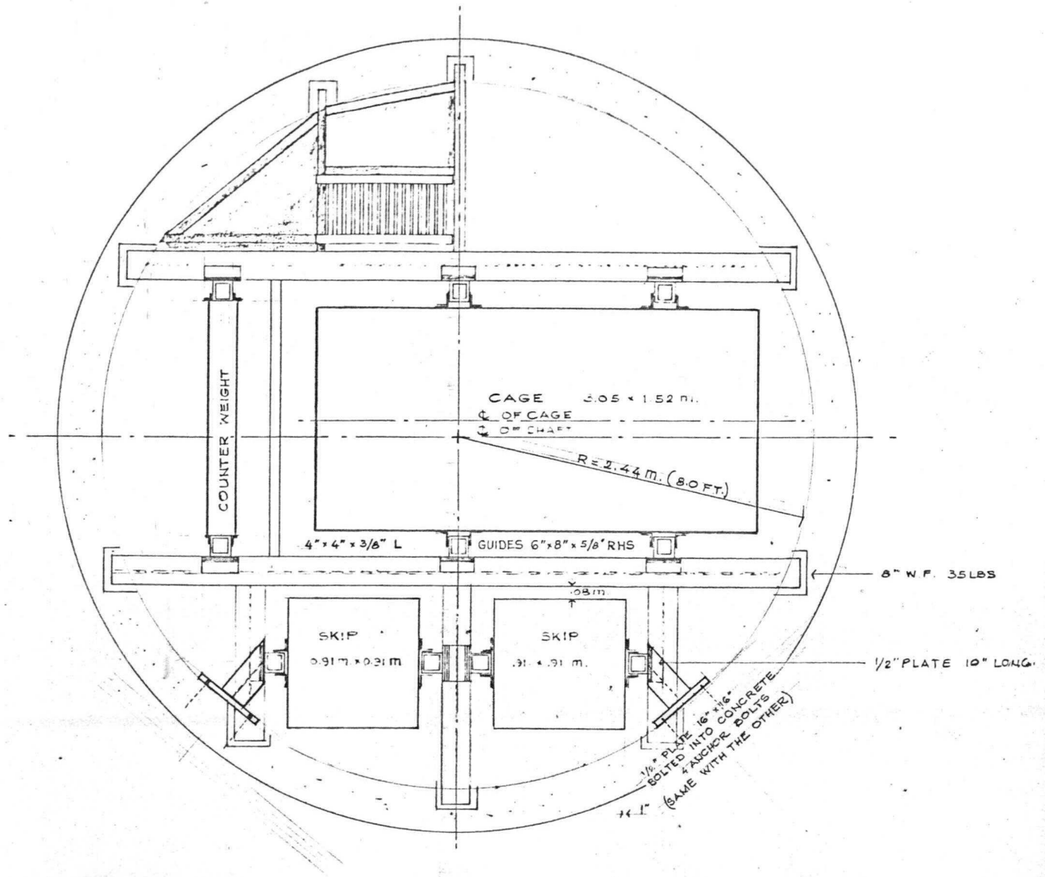
CANADIAN MINE SERVICES LTD.
VANCOUVER, B.C. CANADA

GRUM JOINT VENTURE

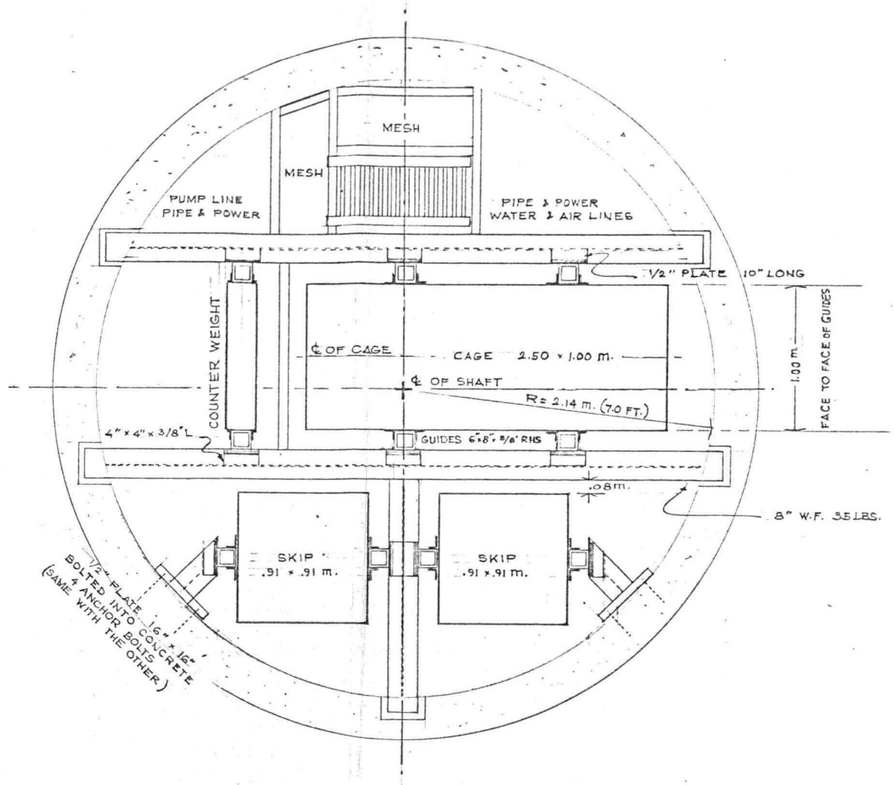
TENTATIVE SHAFT BOTTOM LAYOUT

DESIGNED CMS	BILL OF MAT'L	DATE APR. 18 '77	
DRAWN CMS	JOB. NO.	SCALE 1:20 m	
TRACED	CLIENT	Dwg. No. D-2803	Rev. 0
CHECKED	APPROVED		

DWG. NO.	REFERENCE DRAWINGS



PLAN
SHAFT No. 1
ALTERNATE PROPOSAL (a.)



PLAN
SHAFT No. 2
ALTERNATE PROPOSAL (b)

NO	DATE	REVISION	BY

CANADIAN MINE SERVICES LTD.
VANCOUVER B.C. CANADA

GRUM JOINT VENTURE
ALTERNATIVES FOR SHAFT LAYOUT

DESIGNED CMS	BILL OF MAT'L	DATE APR 18 '77
DRAWN RDA	JOB NO	SCALE 1:20 M.
TRACED	CLIENT	Dwg No D. 2804 Rev .0
CHECKED	APPROVED	

DWG NO | REFERENCE DRAWINGS