

1. Gyratory Crusher	[KOBE Steel Ltd]
1-1. Use;	Primary crushing of crude copper ore
1-2. Quantity;	1 set
1-3. Principal items;	
Nominal number and type:	42-65 Superior primary type
Feed mouth inlet opening:	1,070 mm
Effective diameter of mantle:	1,650 mm
Maximum dimension of feed ore:	700 mm × 950 mm × 1,400 mm
Eccentric throw of mantle:	38 mm
Revolutional speed of pinion shaft:	497 rpm
Open side setting:	165 mm
Cushing capacity:	1,150 metric tons/hour
Installed motor power:	300 kw
Driving method:	V-belt
1-4. Accessories;	
V-pulley:	1 set including motor side
V-belts (E-type × 15 pcs)	1 set
Lubrication system:	1 set
Cooler: Required flow rate of cooling water	100 litres/min
Hydroset system:	1 set
Control panel:	1 set cable 1.25 mm 2 × 4
1-5. Material of main parts;	
Top and bottom shell, and spider:	cast steel
Mantle and concave liners:	special high manganese steel
Main shaft and head center:	forged steel
Eccentric:	cast steel
Bushes for eccentric and bottomshell:	lead bronze
Pinion shaft:	forged steel
Pinion:	chromium molybdenum steel
V-pulleys:	cast iron
Initial oil charge: spider,	60 ℓ
lubrication system,	500ℓ
hydroset system,	140ℓ
pinion shaft,	3 ℓ
1-6. 3 phase induction motor;	[MITSUBISHI Electric Corporation]
Quantity:	1 set
Type:	Open drip-proof fan cooling wound core type
Out put:	300 kw
Voltage and cycle	6,000 V. 50Hz
Number of poles:	8 p

Synchronous speed:	750 rpm
Grade of insulation:	B class
Starting torque:	More than 200 %
Starting method:	Automatic register control

2. Apron Feeder

[KOBEL Steel Ltd]

2-1. Use;

Constant feed for #1 conveyor

2-2. Quantity;

1 set

2-3. Principal items;

Type:	Extra heavy duty
Model number:	18-66AFH
Width of apron plate:	1,800 mm
Distance between shaft centers:	6,550 mm
Maximum size of lump ore:	165 mm × 230 mm × 330 mm
Apron speed:	1.5~6.0 m/min
Capacity:	405~1,620 t/h

2-4. Accessories;

Central lubrication system:	1 set
Sprockets and roller chain:	1 set

2-5. Material of main parts;

Apron:	Steel plate
Link chain:	JIS Standardized goods
Shafts:	Carbon steel for mechanical structure
Sprockets:	Cast steel
Bearing blocks:	Cast steel
Bearing metals:	Bronze
Gear large side:	Cast steel
Gear small side:	Carbon steel for mechanical structure
Upper rollers:	Hard rubber and steel bar
Lower rollers:	Carbon steel for mechanical structure
Side plate liners:	Hard steel plate

2-6. Byelcyclo vari-speed induction motor; [SUMITOMO Electric Co.]

Type:	Totally enclosed fan cooling 3 phase out door type
Output:	30 kw
Speed:	270 ~1,080 rpm
Grade of insulation:	E class
Ratio of speed change:	1:4
Speed reduction ratio:	1:17

3. No. 1 Belt Conveyor

[SANKI Engineering Co. Ltd] See annexed paper

4. No. 2 Belt Conveyor

[SANKI Engineering Co.Ltd]See annexed paper

5. Coarse Ore Stock Pile

Effective capacity:	7,000 tons
Number of reclaiming mouths:	4
Maximum height and diameter:	25mH×65mφ
Angle of repose:	40°
Angle of drawing:	70°

6. Vibrating Feeders

[YASKAWA & Company]

6-1. Use;

Constant drawal from coarse ore stock pile

6-2. Quantity;

4 sets

6-3. Principal items;

Model number:	YUFB-1402L
Dimension:	1,400 mmW×2,400 mmL
Capacity:	1,000 t/h at 12° downward slope
Type of Uras vibrator:	KEB-75-4TU×1 without tacogenerator KEB-75-4TG×1with tacogenerator
Motor output:	3.7kw×2, at 400V, 50Hz, 3φ, 4p

6-4. Material of main parts;

Body and frame:	Mild steel plate
Liners:	High tension steel plate

6-5. Control board;

Type:	Enclosed dust proof, self-standing
Control system:	JRCB-4440C thyrister controller

7. No. 3 Belt Conveyor

[TOHOKU Kikai MFG Co.Ltd]See annexed paper

8. No. 4 & 5 Belt Conveyor

[TOHOKU Kikai MFG Co.Ltd] See annexed paper

9. Vibrating Screens

[KOBE Steel Ltd]

9-1. Use;

Primary screening of copper ore

9-2. Quantity;

2 sets

9-3. Principal items;

Model number:	8-20 double deck HX Ripl-Flo
Support type:	Coil spring floor support
Dimension:	2,440 mmW×6,100 mmL
Screening surface:	Upper deck; 70 mm square for guard Lower deck; 28 mm square for 25 mm screening

Maximum feed size:	165 mmW × 330 mmL × 230H
Amplitude and frequency:	9.5 mm × 850 cycle/min
Slope angle of screening deck:	20°
Feed rate:	Max @1,000 t/h, generally 625 t/h
Motor output:	22kw × 2 sets for each screen
Driving method:	V-belt drive

9-4. Accessories for 2 screens;

V-pulleys:	2 pieces
V-belts (C-type × 8 pcs):	2 sets
Coil springs and bases:	2 sets
Pivoted motor bases:	2 sets
Timing belts:	2 sets
Tools and tool boxes:	2 sets
Dust housing:	2 sets

9-5. Material of main parts;

Frame:	Mild steel plate and formed bars
Screen surfaces:	Upper deck, punched steel plate, Lower deck, woven 7.5 mmφ low manganese steel wire
Bearings:	Spherical roller bearings
V-pulley:	Cast iron
Initial charge oil:	30 ?

9-6. 3 phase induction motor;

Quantity:	4 sets
Type:	Totally enclosed special basket rotor
Output:	22kw, 400V, 4p

10. Standard Cone Crushers

[NORDBERG Manufacturing Company]

10-1. Use;

Secondary crushing of copper ore

10-2. Quantity;

2 sets

10-3. Principal items;

Model:	7 FT STD Symons crusher
Type of bowl :	Coarse
Type of liners:	Medium
Type of seal:	Water
Type of oil pump:	Independent
Revolutional speed of counter shaft:	435 rpm
Driving method:	V-belt drive, E240 ×
Motor:	260 kw
Clamping method:	8 hydraulic lock posts

10-4. Accessories;

Air operated power unit:	For bowl adjustment rams
Operator's console unit:	2 sets

11. No. 6 Belt Conveyor

[TOHOKU Kikai MFG Co.Ltd]See annexed paper

12. No. 7 Belt Conveyor

[TOHOKU Kikai MFG Co.Ltd]See annexed paper

13. Surge Bin

[TOHOKU Kikai MFG Co.Ltd]

13-1. Use;Uniform feed & distribution
for secondary screening**13-2. Quantity;**

1 set

13-3. Principal items;

Dimension:	7.0m ϕ × 8.7mH
Capacity:	250 tons live
Material:	Steel plate
Structure:	Cylindrical with roof and cover

14. Vibrating Feeders

[YASKAWA & Company]

14-1. Use;

Constant drawal from the surge bin

14-2. Quantity;

3 sets

14-3. Principal items;

Model number:	YUFB-1402L
Dimension:	1,400 mmW × 2,400 mmL
Capacity:	1,000 t/h at 12° downward slope
Type of Uras vibrator:	KEB-75-4TU × 1 without tacogenerator KEB-75-4TG × 1 with tacogenerator
Motor output:	3.7kw × 2, at 400V, 50Hz, 3 ϕ , 4p

14-4. Material of main parts;

Body and frame:	Mild steel plate
Liners:	High tension steel plate

14-5. Control board;

Type:	Enclosed dust proof, self-standing
Control system:	JRCB-4440C thyrister controller

15. No. 8, 9, & 10 Belt Conveyors

[TOHOKU Kikai MFG Co.Ltd] See annexed paper.

16. Vibrating Screens

[KOBE Steel Ltd]

16-1. Use;

Secondary screening of copper ore

16-2. Quantity;

3 sets

16-3. Principal items;

Model number:	8-20 single deck SH Ripl-Flo
Support type:	Coil spring floor support
Dimension:	2,440 mmW×6,100 mmL
Screening surface:	22 mm square for 20 mm screening
Maximum feed size:	40 mmW×45 mmL×80H
Amplitude and frequency:	9.5 mm × 850 cycle/min
Slope angle of screening deck:	20°
Feed rate:	Max @1,000 t/h, generally 625 t/h
Motor output:	15kw×2 sets for each screen
Driving method:	V-belt drive

16-4. Accessories for 3 screens;

V-pulleys:	3 pieces
V-belts (C-type ×8 pcs):	3 sets
Coil springs and bases:	3 sets
Pivoted motor bases:	3 sets
Timing belts:	3 sets
Tools and tool boxes:	3 sets
Dust housing:	3 sets

16-5. Material of main parts;

Frame:	Mild steel plate and formed bars
Screen surfaces:	Upper deck, punched steel plate, Lower deck, woven 7.5 mmφ low manganese steel wire
Bearings:	Spherical roller bearings
V-pulley:	Cast iron
Initial charge oil:	30 ℓ

16-6. 3 phase induction motor;

Quantity:	[MITSUBISHI Electric Corp.] 4 sets
Type:	Totally enclosed special basket rotor
Output:	15kw, 400V, 4p

17. Short Head Cone Crushers

[NORDBERG Manufacturing Company]

17-1. Use;

Tertiary crushing of copper ore

17-2. Quantity;

3 sets

17-3. Principal items;

Model:	7 FT SHD Symons crusher
Type of bowl :	Coarse
Type of liners:	Fine

Type of seal:	Water
Type of oil pump:	Independent
Revolutional speed of counter shaft:	435 rpm
Driving method:	V-belt drive, Sheave 42"/24.7"
Motor:	260 kw open drip-proof type
Clamping method:	8 hydraulic lock posts

17-4. Accessories;

Air operated power unit:	For bowl adjustment rams
Operator's console unit:	3 sets

18. No. 11 Belt Conveyor

[TOHOKU Kikai MFG Co.Ltd] See annexed paper

19. No. 12 Belt Conveyor

[TOHOKU Kikai MFG Co.Ltd] See annexed paper

20. No. 13 Belt Conveyor

[TOHOKU Kikai MFG Co.Ltd] See annexed paper

21. No. 14 & 15 Belt Conveyors

[TOHOKU Kikai MFG Co.Ltd] See annexed paper

22. Fine Ore Stock Piles

22-1. Use;	Uniform feed for grinding
22-2. Quantity;	2 sets
22-3. Principal items;	
Dimension:	59.4m ϕ × 21.5mH@ × 2
Capacity:	12,000 ton live, 36,000 ton dead
Structure:	Semi covered conical pile × 2

23. Vibrating Feeders

[YASKAWA & Company]

23-1. Use;	Constant drawal from the stock pile
23-2. Quantity;	8 sets

23-3. Principal items;

Model number:	YUSB-09515L
Dimension:	950 mmW × 1,500 mmL
Capacity:	250 t/h max. at 6° downward slope, generally 190 t/h
Type of Uras vibrator:	KEB-32-4TU × 1 without tacogenerator KEB-32-4TG × 1 with tacogenerator
Motor output:	1.5kw × 2, at 400V, 50Hz, 3 ϕ , 4p

23-4. Material of main parts;

Body and frame:	Mild steel plate
-----------------	------------------

Liners:	High tension steel plate
23—5. Controlboard;	
Type:	Enclosed dust proof, self-standing
Control system:	CB-444C thyrister controller
24. No. 16~19 Belt Conveyors	[TOHOKU Kikai MFG Co.Ltd]See annexed paper
25. No. 20 & 21 Belt Conveyors	[TOHOKU Kikai MFG Co.Ltd]See annexed paper
26. No. 22 & 23 Belt Conveyors	[TOHOKU Kikai MFG Co.Ltd]See annexed paper
27. Rod Mills	[KOBELITE Ltd]
27-1. Use;	Primary grinding of copper ore
27-2. Quantity;	2 sets
27-3. Principal items;	
Grinding method:	Wet open circuit
Work index:	Wi=10.8kwh/st
Grinding size:	Feed, 13,000 microns 80% passing Product, 900 microns 80% passing
Pulp density in mill:	65~75% by weight
Capacity:	@375 t/h on dry base
Discharge method:	Over flow
Support type:	Both sides trunnion
Dimension:	4,120 mm ϕ \times 5,800 mmL, 13' 1/2 \times 19'
Type of mill liners:	Single wave
Initial charge of grinding media	177 tons Max, normally 167 tons 35% of mill volume
Rod sizes initially charged:	90 mm ϕ \times 5,650 mmL, @62 tons 75 mm ϕ \times 5,650 mmL, @62 tons 65 mm ϕ \times 5,650 mmL, @53 tons
Revolutionary speed of shell:	13.15 rpm, 62.6% of critical speed
Revolutionary speed of pinion shaft:	130.43 rpm
Type of feeder:	Spout, 450 mm ϕ inside
Discharge trommel:	1,360 mm ϕ \times 1,500 mm L 10 mm opening wedge bar screen
Type of gear teeth:	Spur
Number of gear teeth (Drum/Pinion):	248/25
Diameter of pitch circles:	6,299.2 mm/635 mm
Lubrication method:	Gear, oil spray

Bearing, oil cup and oil pump

27-4. Material of main parts;

Shell:	Rolled steel for welded structure SM41B-P
Shell flange:	Mild steel SS41-P
Heads of feed and discharge end:	Cast steel SC46
Liners:	Chromium molybdenum steel
Main bearings:	Babbitt metal
Main bearing covers:	Mild steel SS41-P
Drum gear:	Special forged steel & mild steel SS41-P
Pinion:	Nickel chromium steel SNC21
Pinion shaft:	Forged steel SF60
Pinion shaft bearings:	Spherical roller bearings
Rods: [KOBEL Steel]	RMG85, hardness Brinell 250~300 0.8~0.89% C, 0.1~0.4% Si, 0.4~1.1% Mn, <0.05% P, <0.050% S Accuracy, Bending 3 mm/m, Length ± 40 mm, Diameter $\pm 3\%$

27-5. Motor;

Type:	[MITSUBISHI Electric Corp.]
Output:	Open drip-proof synchronous motor
Pole number:	1,400 kw
Synchronous revolutional speed:	46
Torque:	130.43 rpm
Grade of insulation:	Starting 40%, Pull in 30%, Pull out 225%
Rating:	B class
Power factor:	Continuous
Coupling:	1.0
	Air clutch

27-6. Accessories;

Air clutch:	Fawick D42VC1200
Manual high pressure oil pump:	1 set for emergency
Pressure gauge:	1 set with electrical control unit
Oil spray unit:	7S2C
Control panel:	2 sets
Special tools:	@ 1 set
Air volume for oil spray:	@ 960 \cdot /each spray time
Flowrate of cooling water:	@ 50 \cdot /min
Rod charging deck:	1 set with pneumatic motor drive

28. Pumps

[PACIFIC METALS Co. Ltd]

28-1. Use;	Feeding for primary cyclones
28-2. Quantity;	3 sets, 2 sets working, 1 set stand-by
28-3. Principal items;	See annexed paper SPECIFICATION OF SLURRY PUMPS
29. Cyclones	[KREBS ENGINEERS]
29-1. Use;	Classification of grinding products
29-2. Quantity;	16 sets, 14 sets operating, 2 sets stand-by
29-3. Principal items;	
Model number:	D26B
Inlet flanged adapter:	262FR-10
Inlet head liner:	262R-45
Vortex finder	265RS-12
Overflow flanged adapter:	265F-12
Cone liner reflax:	94-6CR
Apex:	678CR-4 1/2
Pulp density:	Feed 58% by weight, sp. gr. 1.580, 34% by volume, Overflow 35% by weight, sp. gr. 1.280, 17% by volume, Underflow 72% by weight, sp. gr. 1.830, 49% by volume,
Solids metric tons per hour:	Feed 1,782, O/F 396, U/F 1,386
Inlet pressure:	0.43 kg/cm ² , 6psi
29-4. Material of main parts;	
Head, cylindrical & cone sections:	Cast & fabricated steel
Lining:	Gum rubber
Vortex finder:	Rubber covered steel
29-5. Accessories;	
Feed manifold:	Feed pipe 20B, domed head 44-3/4B
Feed valves:	10B Wafer valves
30. Ball Mills	[KOBÉ Steel Ltd]
30-1. Use;	Primary grinding of copper ore
30-2. Quantity;	2 sets
30-3. Principal items;	
Grinding method:	Wet closed circuit with cyclones
Work index:	Wi=10.8kwh/st
Grinding size:	Feed, 900 microns 80% passing Product, 135 microns 80% passing
Pulp density in mill:	65~75% by weight, normally 72%

Capacity:	375 t/h on dry base
Discharge method:	Over flow
Support type:	Both sides trunnion
Dimension:	4,880 mm ϕ \times 7,350 mmL, 16' \times 23'
Driving method:	Single side drive
Type of mill liners:	SKEGA F-type rubber liner
Initial charge of grinding media	226 tons Max, normally 221 tons 38% of mill volume
Ball sizes initially charged:	50 mm ϕ , @88 tons 40 mm ϕ , @100 tons 25 mm ϕ , @33 tons
Revolutionary speed of shell:	13.58 rpm, 70.5% of critical speed
Revolutionary speed of pinion shaft:	125 rpm
Type of feeder:	Spout, 630 mm ϕ inside
Discharge trommel:	1,550 mm ϕ \times 2,100 mm L 10 mm wedge bar screen
Type of gear teeth:	Single helical with angle of 6°
Number of gear teeth (Drum/Pinion):	267/29
Diameter of pitch circles:	6,819 mm/740.657 mm
Lubrication method:	Gear, oil spray Bearing, oil cup and oil pump

30-4. Material of main parts;

Shell:	Rolled steel for welded structure SM41
Shell flange:	Mild steel SS41-P
Heads of feed and discharge end:	Cast steel SC46
Liners:	Rubber
Main bearings:	Babbitt metal
Main bearing covers:	Mild steel SS41-P
Drum gear:	Special forged steel & mild steel SS41-P
Pinion:	Nickel chromium steel SNC21
Pinion shaft:	Forged steel SF60
Pinion shaft bearings:	Spherical roller bearings

30-5. Motor;

	[MITSUBISHI Electric Corp.]
Type:	Open dripproof synchronous motor
Output:	2,500 kw, 6,000V, 50Hz
Pole number:	48
Synchronous revolutionary speed:	125 rpm
Torque:	Starting 40%, Pull in 30%, Pull out 175%
Grade of insulation:	B class
Rating:	Continuous

Power factor:	1.0
Coupling:	Air clutch
30-6. Accessories;	
Air clutch:	Fawick D51VC1600
Manual high pressure oil pump:	1 set for emergency
Pressure gauge:	1 set with electrical control unit
Oil spray unit:	6S2C
Control boards:	2 sets
Special tools:	@ 1 set
Air volume for oil spray:	@ 960 m ³ /each spray time
Flow rate of cooling water:	@50 m ³ /min
Jacking cradle:	2 sets with hydraulic jacks lifting 150 tons
31. Flotation cells	[SANKI ENGINEERING Co.Ltd]
31-1. Use;	Cu roughing & scavenging
31-2. Quantity;	32 cells in 4-4-4-4 ×2 row arrangement
31-3. Principal items;	
Model number:	Agitair #120
Driving method:	V-belt drive with 2 motors for 1 cell
Cell size:	1,524W×1,480W×762D
Type of cell:	Double overflow
Type of impellers:	Chile-X ,170 rpm
Motor output:	19 kw, 6p, 400V, 50Hz, Totally enclosed fan cooling type
Header pipe:	8B with Victaulic joints
Feed box:	2 sets
Junction boxes:	6 sets with level control bars
Discharge boxes:	2 sets with level control bars
31-4. Condition of Flotation	
Pulp density:	34% Wt
pH value:	7.4 natural
Flotation time	10 min
31-5. Material of main parts;	
Cells:	Mild steel plate partially rubber lined on bottom side
V-pulley:	Cast iron
Air consumption:	3.75Nm ³ /min
31-6. Blowers	[DENGYOUSHA Co. Ltd]
Type :	FTOP-CMM Turbo blower with single suction
Quantity:	4 sets, Tandem drive with 2 sets

Capacity :	660 Nm ³ /min, 825 Sm ³ /min
Air pressure :	Suction: -50mmAq, Delivery +1,300mmAq
Temperature :	17~23°C
Motor :	@150 kw×2 sets×2 Units、6,000V, 50HZ
Driving method :	Direct connection
Diameter of suction pipe :	1,000mmφ
Diameter of delivery pipe:	600 — 1,000mmφ
32. Pumps	[PACIFIC METALS Co. Ltd]
32-1. Use;	Pumping of roughing & scavenging froth
32-2. Quantity;	8 sets, all operating
32-3. Principal items;	See annexed paper SPECIFICATION OF SLURRY PUMPS
33. Pumps	[PACIFIC METALS Co. Ltd]
33-1. Use;	Feeding to regrinding cyclones
33-2. Quantity;	2 sets, 1 set operating, 1 set stand-by
33-3. Principal items;	See annexed paper SPECIFICATION OF SLURRY PUMPS
34. Cyclones	[KREBS ENGINEERS]
34-1. Use;	Classification of regrinding product
34-2. Quantity;	3 sets, 2 sets operating, 1 set stand-by
34-3. Principal items;	
Model number:	D15B-854
Inlet flanged adapter:	152FR-4, 4B Victaulic
Inlet head liner:	152R-11
Vortex finder:	155N-6
Overflow flanged adapter:	155F-6, 6B
Pulp density:	Feed 42% by weight, sp. gr. 1.46, 15% by volume Overflow 25% by weight, sp. gr. 1.23, 8% by volume Underflow 75% by weight, sp. gr. 2.29, 43% by volume
Inlet pressure:	0.7 kg/■, 10 psi
Circulating load ratio:	150%
34-4. Material of main parts;	
Head, cylindrical & cone section:	Cast & fabricated steel
Liners:	Natural rubber
Vortex finder:	Nihard
Apex valve:	Neoprene rubber
35. Ball Mill	[KOBE STEEL Ltd]
35-1. Use;	Regrinding of flotation products

35-2. Quantity;	1 set
35-3. Principal items;	
Grinding method:	Wet closed circuit with cyclones
Grinding size:	Feed 150 microns 80% passing Product 50 microns 80% passing
Work index:	11.0 kwh/st
Capacity:	40t/h approximately depending on feed Cu grade
Discharge method:	Overflow
Driving method:	Side drive
Dimension:	3,050 mm ϕ \times 3,542mmL
Thickness of shell:	25 mm
Type of liner:	SKEGA K-type rubber liner
Thickness of liner:	Lifters 110 mm, Plates 50 mm
Initial charge of grinding media:	Max 41.7 tons, normally 36.5 tons
Shell revolutionary speed:	18.1 rpm
Pinion revolutionary speed:	187.5 rpm
Feeder:	Drum
35-4. Motor;	[MITSUBISHI Electric Corp.]
Type:	Open drip-proof 3 phase induction motor
Output:	420 kw, 6,000V, 50Hz
Starting torque:	More than 125%
35-5. Material of main parts;	
Shell:	Mild steel SS41
Feed & discharge end:	Cast iron SC46
Main bearings:	Cast steel & Babbitt
Drum gear:	Special forged steel
Pinion gear:	Chromium molybdenum steel SCM4
Pinion shaft:	Forged steel SF60
Pinion shaft bearings:	Spherical roller bearings
36. Pumps	[PACIFIC METALS Co. Ltd]
36-1. Use;	Pumping of regrinding product
36-2. Quantity;	2 sets, 1 set operating, 1 set stand-by
36-3. Principal items;	See annexed paper SPECIFICATION OF SLURRY PUMPS
37. Flotation Cells	[SANKI ENGINEERING Co. Ltd]
37-1. Use;	Primary cleaning of rougher froth
37-2. Quantity;	24 cells in 6-6-6 \times 1 row arrangement
37-3. Principal items;	
Model number:	Agitair #60

Driving method:	V-belt drive with 1 motor for 2 cells
Cell size:	1,524W×1,480W×762D
Type of cell:	Single overflow
Type of impellers:	Chile-X ,170 rpm
Motor output:	19 kw, 6p, 400V,50Hz, Totally enclosed fan cooling type
Header pipe:	6B with Victaulic joints
Feed box:	1 set 1,536W×610L× 828H
Junction boxes:	3 sets 1,536W×610L×1,267H with level control bars
Discharge boxes:	1set 1,536W×610L×1,150H with level control bars

37-4. Material of main parts;

Cell:	Mild steel plate rubber lined bottom side
V-pulley:	Cast iron
Air consumption:	3.75Nm ³ /min

38. Pumps

[PACIFIC METALS Co. Ltd]

38-1. Use;

Pumping of primary cleaner froth

38-2. Quantity;

4 sets, all operating,

38-3. Principal items;

See annexed paper SPECIFICATION OF SLURRY PUMPS

39. Flotation Cells

[SANKI ENGINEERING Co. Ltd]

39-1. Use;

Recleaning of primary cleaner froth

39-2. Quantity;

24 cells in 6-6-6 ×1 row arrangement

39-3. Principal items;

Model number:	Agitair #60
Driving method:	V-belt drive with 1 motor for 2 cells
Cell size:	1,524W×1,480W×762D
Type of cell:	Single overflow
Type of impellers:	Chile-X ,170 rpm
Motor output:	19 kw, 6p, 400V,50Hz, Totally enclosed fan cooling type
Header pipe:	6B with Victaulic joints
Feed box:	1 set 1,536W×610L× 828H
Junction boxes:	3 sets 1,536W×610L×1,267H with level control bars
Discharge boxes:	1set 1,536W×610L×1,150H with level control bars

39-4. Material of main parts;

Cell:	Mild steel plate rubber lined bottom side
V-pulley:	Cast iron
Air consumption:	3.75Nm ³ /min
40. Pumps	[PACIFIC METALS Co. Ltd]
40-1. Use;	Pumping of recleaner froth
40-2. Quantity;	4 sets, all operating,
40-3. Principal items;	See annexed paper SPECIFICATION OF SLURRY PUMPS
41. Pumps	[PACIFIC METALS Co. Ltd]
41-1. Use;	Pumping of recleaner sink
41-2. Quantity;	2 sets, 1 set operating, 1 set stand-by
41-3. Principal items;	See annexed paper SPECIFICATION OF SLURRY PUMPS
42. Concentrate Thickener	[SANKI ENGINEERING Co. Ltd]
42-1. Use;	Thickening of copper concentrate
42-2. Quantity;	1 set
42-3. Principal items;	
Model number:	Dorr S-type S-120
Type of driving system:	Center post drive
Tank size:	26,000 mm ϕ \times 3,000 mmH (85' \times 10')
Center pier depth:	4,631 mmH
Number of arms:	Long \times 2, short \times 2
Revolutionary arm speed:	0.075 rpm, 4.5 revolution/h, clockwise
Over load alarm:	Closed type
Motor out put:	2.2 kw, 400V, 50Hz, \times 2 sets,
Bottom slope:	146/1,000 (8° 18')
Clearance between blade and bottom:	50 mm
Pulp density:	Feed 20% Wt, Spigot 60% Wt
Settling velocity:	0.21 m/h at 25% Wt and 25° C
Surface area:	530cm ²
43. Pumps	[PACIFIC METALS Co. Ltd]
43-1. Use;	Pumping of thickener spigot to filters
43-2. Quantity;	2 sets, 1 set operating, 1 set stand-by
43-3. Principal items;	See annexed paper SPECIFICATION OF SLURRY PUMPS
44. Filters	[SANKI ENGINEERING Co. Ltd]
44-1. Use;	Dewatering of copper concentratate
44-2. Quantity;	2 sets
44-3. Principal items;	

Model number:	CD-1014 dual valve Oliver type
Drum size:	3,050 mm ϕ \times 4,270mmL (10' ϕ \times 14')
Agitator:	Swing type
Cake discharge method:	Snap air blow system and blade scraper
Fixing method of filter cloth:	Wiring
Filter area:	@40.8m ² (433 sq ft)
Revolutionary drum speed:	0.13~0.58 rpm
Capacity:	@8.0 dry mt/h
Cake moisture:	8% wet base
Particle size of concentrate	minus 200 mesh 98%
Motor:	1.5 kw variable speed motor

44-4. Accessories;

Vacuum receiver tanks:	R-30AA08 \times 4 sets
Moisture traps:	M-48AA10 \times 2 sets
Vacuum pumps:	UNOZAWA PVY923 \times 2 sets
Capacity,	@46m ³ /min \times -600 mHg at 230rpm
Cylinder size,	920 mm ϕ \times 350 mmL
Motor,	90 kw, 6p
Cooling water,	40 ℓ /min
Pipe flanges,	inlet 12B, outlet 12B
Compressor:	UNOZAWA VD-22 \times 2 sets
Capacity,	@46m ³ /min \times 4 kg/cm ² at 580 rpm
Cylinder size,	165 mm ϕ \times 140 mmL
Motor,	15 kw \times 6p
Cooling water,	cylinder jacket 6.5 ℓ /min, after cooler 30.0 ℓ /min,

44-5. Material of main parts;

Body:	Mild steel SS-41
Sectional screen:	Poly-propylene resin

45. No. 24 Belt conveyor

[TOHOKU KIKAI MFG Co. Ltd] See annexed paper

46. Stock yard**46-1. Use;**

Uniform and stable delivery of copper concentrate

46-2. Quantity;

1 set

46-3. Principal item;

Dimension:	12.0mW \times 40.0mL \times 6.0mH
Capacity:	3,000 tons max.
Structure:	Rectangular 1 floor with galvanized

Plate roof and concrete wall

47. Tailing Thickener

[SANKI ENGINEERING Co.Ltd]

47-1. Use;

Thickening of copper ore tailing

47-2. Quantity;

1 set

47-3. Principal items;

Model number:	Dorr S-type 122S3-48A
Type of driving system:	Center post drive
Tank size:	106,000 mm ϕ
Number of arms:	Long \times 2, short \times 2
Revolutional arm speed:	0.033 rpm, 2.0 revolution/h, clockwise
Over load alarm:	Closed type with hydraulic bellows
Motor out put:	7.5 kw, 400V, 50Hz, \times 3 sets,
Bottom slope:	62.5/1,000 (3° 34'), 166/1,000 (9° 25')
Pulp density:	Feed 32% Wt, Spigot 45% Wt
Settling velocity:	0.21 m/h at 25% Wt and 25° C
Surface area:	8,716m ²

[WASHING FACILITIES]

48. Washing Screen

[KINKI KOGYO Co.Ltd]

48-1. Use;

Washing of primary screen undersize

48-2. Quantity;

1 set

48-3. Principal items;

Type:	Floor mount double decked new low head screen
Dimension:	2,400 mmW \times 6,600 mmL (8' \times 22')
Feed size:	+25 mm 28%, +5 mm 36%, -5 mm 36%<
Capacity:	900 mt/h
Screen surface:	U/D 18 mm sq rubber lined punched steel plate L/D 5 \times 11 Ton-Cap SUS304 woven wire (2.6 ϕ) cloth
Amplitude & frequency:	13 mm 45° ahead \times 850 rpm with elliptic path
Driving method:	V-belts with D-112 \times 5 pcs
Suspension:	Pneumatic spring AS-22201-A62 at 3.4~3.8kg/cm ²
Loading conditions:	Screen weight 13.0t Vertical dynamic load 26.0t Horizontal dynamic load for longitudinal direction 13.0t Horizontal dynamic load for crosswise direction 6.5t
Characteristic frequency of support:	More than 43 cycles/sec

49. Akins Classifiers

[TOHOKU KIKAI MFG Co.Ltd]

49-1. Use;

Classification of washing screen undersize

49-2. Quantity;	2 sets
49-3. Principal items;	
Type:	Single shaft double spiral high weir type
Dimension:	2,000 mmW × 8,300 mmL
Slope of tank :	18°
Capacity:	@162 dry t/h
Feed rate:	@11.3m ³ /min at 37% by Wt
Tonnage of rake-up sand:	@84 dry t/h with 15% moisture
Tonnage of overflow:	@78 dry t/h with 23 % density and @9.5m ³ /min
Spiral:	1,800 mmφ × 900 mm pitch × double
Sprocket wheels:	1ry RS-160 NT=16 PCD=260.39 φ, 2ry RS-160 NT=48 PCD=776.7
Bevel gears:	Pinion Module=10, NT=35, PCD=350, S35C Gear Module=10, NT=120, PCD=1,200, SC46
Lifting device of spiral:	Motor SF-FD 1.5KW, Coupling Motor/Reducer TSUBAKIMOTO CR-5016-J Reducer/Drum TSUBAKIMOTO CR-12022-J Winding drum 400 mmφ Wire 16 mmφ (19 elements × 6 strand) Lifting range 2,200 mmL × 0.8 m/min
Bearings:	Head side NTN#3924 thrustball bearing, Seal NDK AB724AD Tank side NTN32318 conical roller bearing, Seal AE4451 × 2, AE4212 × 3, AD4905 × 2
Spiral ribbon liners:	Divided into 8 pcs, fixing bolts @M12-40 × 6
Pinion shaft:	95/100/105/100 mmφ supported by BC6 plane bearings
Motor:	GM-AM 7.5 kw, 6p, 1/30, 400V, 50Hz
49-4. Material of main parts;	
Tank:	Mild steel plate SS41 6t
Screw ribbons:	High tension steel 9t
Screw shaft:	Structural carbon steel pipe STK 41, 558.8 mmφ × 16t
Paint:	Anti-corrosion 1 time, Finishing 7.5GY6/3, 2 times coated
50. Warman Pump	[PACIFIC METALS Co.Ltd]
50-1. Use;	Feeding to slime cyclone
50-2. Quantity;	1 set
50-3. Principal items;	
Model number:	10-8FAH EL 4VM VL

Capacity:	10.3 m ³ /min
Total head:	30 m
Revolutionary pump speed:	810 rpm
Power required:	78 kw
Motor installed:	110 kw, 4p, 400V, 50Hz × 1,450 rpm
Total pump efficiency:	65%

51. Krebs Cyclone

[KREBS ENGINEERS]

51-1. Use;

Classification of primary slime

51-2. Quantity;

1 set

51-3. Principal items;

Model number:	D26B-1085
Inlet flanged adapter:	262 FR-10
Inlet head liner:	262R-45
Vortex finder:	265R-12
Apex orifice:	678CR 4"1/2, & 5" Refrax
Overflow flanged adapter:	265F-12
Inlet pressure:	0.8 kg/cm ² (11 psi)
Inlet feed speed:	3.05 m/sec

52. No. 11 Belt Conveyor

[TOHOKU KIKAI MFG Co.Ltd] See annexed paper

53. W-1~W-6 Belt Conveyors

[TOHOKU KIKAI MFG Co.Ltd] See annexed paper

[USKAN PORT FACILITIES]

54. S-1~S-5 Belt Conveyors

[SANKI Engineering Co.Ltd] See annexed paper

55. Ship Loader

[SANKI Engineering Co.Ltd]

55-1. Use;

Loading of copper concentrate to ship

55-2. Quantity;

1 set

55-3. Principal items;

Type:	Shuttling tower with belt conveyor boom
Capacity:	400 t/h
Boom conveyor:	Conveyor size 750 mmW × 17 m × 120 m/min
	Conveyor belt: Banlon#400 2 ply,
	Rubber thickness 4/2
	Belt length 38m
	Slope angle ±15°
	Power required 9.02, Motor installed 15 kw
	Maximum tension 982 kg

	Belt strength 30,000 kg Banlon #400
	Safety factor 30
Boom hoist:	Tip speed 9.0 m/min
	Hoisting range $\pm 15^\circ$ Resting position 70°
Magnetic brake:	TOSHIBA MB-A160M Braking torque $14\text{kg} \cdot \text{m}$
Speed reducer:	SUMITOMO H30-59, $i=1/29$, load=22kw
Winding drum:	PCD $500\phi \times 968\text{L}$, 22ϕ rope $\times 44$ turns
Wire rope:	$20\phi \times 90\text{ m}$
Height of boom:	10.15m at horizontal position
	Motor MITSUBISHI 15 kw, 4p, 400V, 50Hz
Swivelling system:	Range Right 35° ,Left 105° ,Radius 15.8m
Tip speed:	30 m/min at horizontal position
Thruster brake:	TOSHIBA MB-T132N,
Braking torque:	$6.7\text{kg} \cdot \text{m}$
Fluid coupling:	NIIGATA Converter 10.6EMF
Speed reducer:	MITSUBISHI CEHV #200 $i=1/180$
	Pinion Module=12, NT=20, PCD=240 mm ϕ
	Drum gearModule=12, NT=76, PCD=912 mm ϕ
	Motor MITSUBISHI 5.5kw, 4p, 400V, 50Hz
Shuttling system:	Range 4.5m
	Speed 5.0m/min
	Winding drum PCD 320ϕ 14ϕ rope $\times 7/8$ turn
Speed reducer:	MITSUBISHI Cavex CEUH 200B $i=1/250$
Thruster brake:	TOSHIBA MB-T132N, Braking torque $6.7\text{kg} \cdot \text{m}$
Wire rope:	$14\phi \times 100\text{m}$
Motor:	MITSUBISHI 5.5kw, 4p, 400V, 50Hz
Tower:	
Total height:	19,300 mm
Width:	3,500 mm
Length:	4,000 mm
Counter weight:	35 tons
Total weight:	38.5 tons excluding counter weight

56. Appendices

56-1. EQUIPMENT LIST OF MAMUT MILL

56-2. SPECIFICATION OF BELT CONVEYORS (1)

56-3. SPECIFICATION OF BELT CONVEYORS (2)

56-4. SPECIFICATION OF BELT CONVEYORS (3)

56-5. SPECIFICATION OF BELT CONVEYORS (4)

56-6. SPECIFICATION OF BELT CONVEYORS (5)

56-7. SPECIFICATION OF BELT CONVEYORS (6)

56-8. SPECIFICATION OF SLURRY PUMPS

56-9. SPECIFICATION OF SHIPPING CONVEYORS AT USKAN PORT