

APP. II-7
PHYSICAL & CHEMICAL WATER ANALYSIS

APP. II-7

PHYSICAL & CHEMICAL WATER ANALYSIS

1. Kikuletwa River
2. Himo River
3. Yongoma River
4. Sesseni River
5. Hingilili River

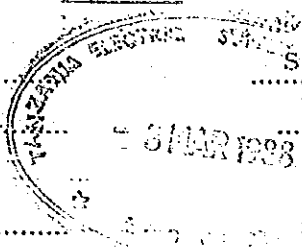
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27/3/88
DP/C Phu Engineer

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF WATER ENERGY, AND MINERALS

Telegrams: "NAJI UBUNGO" SOIL AND WATER LABORATORY
 Telephone: 49113 P.O. BOX 35066
 In reply please quote: DAD ES SAKAM
 Laboratory No. DWS/723/87 Dated 3/3/1988 19.....



PHYSICAL AND CHEMICAL WATER ANALYSIS REPORT

(1) ORIGIN OF THE SAMPLE

Analysis requested by TANESCO P. O. BOX 9024 DSM Ref. No. DP/CPL.E/MUP/II
 Dated 26/10/1987 Date received at the Laboratory 2/11/1987
 Date collected for analysis 6/10/1987 Time
 Temp. °C water source RIVER KIKULETWA
 Region KILIMANJARO District KILIMANJARO Ward
 Purpose of sampling PHYSICAL AND CHEMICAL
 Sampling position AT POWER STATION TAUGING SITE
 Preservative added/type of treatment to water before sampling.....

(2) PHYSICAL EXAMINATION

Appearance:	Colour..... 15.0 mg Pt/l
Turbidity 20.0 N.T.U.	Odeur..... 8.4
Settleable matter 1.55 THAN 0.1 ml/l	pH.....
Taste.....	Conductivity at 25°C 100 uS/cm.
Total filtrable residue at 105°C..... mg/l	Total Nonfiltrable residue at 105°C..... mg/l
Total volatile and fixed residue at 550°C..... mg/l	

(3) CHEMICAL EXAMINATION (In milligrams per litre)

Alkalinity (as CaCO ₃)	Hardness (as CaCO ₃).....	Calcium.....
Phenolphthalein 20.0	Carbonate.....	Magnesium.....
Total 570.0	Non Carbonate.....	Sodium.....
	Total.....	Potassium.....

admium.....	Total Nitrogen.....	Chloride.....	35.5
Chromium.....	Ammonical Nitrogen.....	Fluoride.....	
Copper.....	Organic Nitrogen.....	Permanganate Value	
Iron.....	Nitrate Nitrogen.....	(as mg KMnO ₄ /l).....	1.2
Lead.....	Nitrite Nitrogen.....	B.O.D. (5 days).....	
Manganese.....	Total phosphorus.....	Others.....	
Mercury.....	Orthophosphate.....		
Zinc.....	Sulphate.....		

(4) REMARKS

ALKALINE WATER

(5) RECOMMENDATION

TOO LITTLE WATER SAMPLE FOR COMPLETE ANALYSIS.

3/3/88
Date


Reporting Officer

Head of the Laboratory

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF WATER ENERGY, AND MINERALS

Telegrams: "MAJI UBUNGO"

SOIL AND WATER LABORATORY

Telephone: 49113

P.O. BOX 35066

In reply please quote:

DAR ES SALAAM

Laboratory No. DWS/727/87

Dated 2/3/1987

PHYSICAL AND CHEMICAL WATER ANALYSIS REPORT

(1) ORIGIN OF THE SAMPLE

Analysis requested by TANESCO H. OFF BOX 9024 DSM Ref. No. DP/CPL.E/MHO/11

Dated 26/10/1987 Date received at the Laboratory 19/10/1987

Date collected for analysis Time

Temp °C water source RIVER HIMO

Region KIJIMANJARO District MCSHI Ward TAVETA

Purpose of sampling PHYSICAL AND CHEMICAL

Sampling position MCSHI TAVETA

Preservative added/type of treatment to water before sampling

(2) PHYSICAL EXAMINATION

Appearance: Colour 20.0 mg Pt/l

Turbidity 14.0 NTU Odour

Settleable matter LESS THAN 0.1 MI/l pH 7.0

Taste Conductivity at 25°C 99 uS/cm

Total filtrable Total Nonfiltrable

residue at 105°C mg/l residue at 105°C mg/l

Total volatile and fixed

residue at 550°C mg/l

(3) CHEMICAL EXAMINATION (In milligrams per litre)

Alkalinity (as CaCO₃) Hardness (as CaCO₃) Calcium 10.8

Phenolphthalein NIL Carbonate 52.0 Magnesium 6.1

Total 60.0 Non Carbonate NIL Sodium

Total 52.0 Potassium

admium.....	Total Nitrogen.....	Chloride.....	3.6
Chromium.....	Ammonical Nitrogen.....	Fluoride.....	
	NIL		
Copper.....	Organic Nitrogen.....	Permanganate Value	
NII			
Iron.....	Nitrate Nitrogen.....	(as mg KMnO ₄ /l).....	1.8
	0.04		
Lead.....	Nitrite Nitrogen.....	B.O.D. (5 days).....	
	LESS THAN 0.001		
Manganese.....	Total phosphorus.....	Others.....	
Mercury.....	Orthophosphate.....		
Zinc.....	Sulphate.....		

(4) REMARKS

MODERATELY SOFT WATER

(5) RECOMMENDATION

ACCORDING TO THE ANALYSIS PERFORMED THE WATER CAN BE USED FOR DOMESTIC PURPOSES, BUT IT IS NECESSARY TO BOIL BEFORE DRINKING.

3/3/88
Date

[Signature]
Reporting Officer

Head of the Laboratory

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF WATER ENERGY, AND MINERALS

Telegrams: "MAJITI BUNGO" SOIL AND WATER LABORATORY
 Telephone: 49113 P.O. BOX 35066
 In reply please quote: DAR ES SALAAM
 Laboratory No. DWS/724/87 Dated 2/3/1988 19.....

PHYSICAL AND CHEMICAL WATER ANALYSIS REPORT

(1) ORIGIN OF THE SAMPLE

Analysis requested by TANESCO H. OFF. BOX 9024 DSW Ref. No. DP/CPL.E/MSB/111
 Dated 26/10/1987 Date received at the Laboratory 2/11/1987
 Date collected for analysis 3/10/1987 Time
 Temp °C water source RIVER YONGANA
 Region KILIMANJARO District SAME Ward KIHURIC
 Purpose of sampling PHYSICAL AND CHEMICAL
 Sampling position SAME KIHURIC ROAD
 Preservative added/type of treatment to water before sampling.....

(2) PHYSICAL EXAMINATION

Appearance: Colour 40.0 mg Pt/l
 Turbidity 50.0 NTU Odour
 Settleable matter LESS THAN 0.1 ml/l pH 8.2
 Taste Conductivity at 25°C 97 uS/cm.
 Total filtrable Total Nonfiltrable
 residue at 105°C mg/l residue at 105°C mg/l
 Total volatile and fixed
 residue at 550°C mg/l

(3) CHEMICAL EXAMINATION (In milligrams per litre)

Alkalinity (as CaCO₃) Hardness (as CaCO₃) Calcium
 Phenolphthalein Carbonate Magnesium
 Total Non Carbonate Sodium
 Total Potassium

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admium.....	Total Nitrogen.....	Chloride.....	8.5
Chromium.....	Ammonical Nitrogen.....	Fluoride.....	
Copper.....	Organic Nitrogen.....	Permanganate Value	
Iron.....	Nitrate Nitrogen.....	(as mg KMnO ₄ /l).....	4.6
Lead.....	Nitrite Nitrogen.....	B.O.D. ₅ (5 days).....	
Manganese.....	Total phosphorus.....	Others.....	
Mecury	Orthophosphate.....		
Zinc.....	Sulphate.....		

(4) REMARKS

ALFALINE AND SLIGHTLY TURBID

(5) RECOMMENDATION

THE WATER SAMPLE HAS TOO LITTLE TO COMPLETE THE ANALYSIS.

3/3/88
Date

[Signature]
Reporting Officer

[Signature]
Head of the Laboratory

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF WATER ENERGY, AND MINERALS

Telegrams: "MAJI UBUNGU"

SOIL AND WATER LABORATORY

Telephone: 49113

P.O. BOX 35066

In reply please quote:

DAR ES SALAAM

Laboratory No. DVS/725/87

Dated 3/3/1988 19

PHYSICAL AND CHEMICAL WATER ANALYSIS REPORT

(1) ORIGIN OF THE SAMPLE

Analysis requested by TANESCO P.O. BOX 2024 DSN Ref. No. DP/CPI. 8/MSIP/II

Dated 25/10/1987 Date received at the Laboratory 2/11/1987

Date collected for analysis 3/10/1987 Time

Temp. °C water source RIVER SESSEMI

Region KILIMANJARO District MOSHI Ward

Purpose of sampling PHYSICAL AND CHEMICAL

Sampling position AT MAJI GAUGING STATION

Preservative added/type of treatment to water before sampling

(2) PHYSICAL EXAMINATION

Appearance: 40.0 Colour 50.0 mg Pt/l

Turbidity N.T.U. Odour

Settleable matter MI/l pH

Taste Conductivity at 25°C 155 uS/cm

Total filtrable Total Nonfiltrable

residue at 105°C mg/l residue at 105°C mg/l

Total volatile and fixed

residue at 550°C mg/l

(3) CHEMICAL EXAMINATION (In milligrams per litre)

Alkalinity (as CaCO₃) Hardness (as CaCO₃) Calcium

Phenolphthalein Carbonate Magnesium

Total Non Carbonate Sodium

Total Potassium

admium.....	Total Nitrogen.....	Chloride.....	14.2
Chromium.....	Ammonical Nitrogen.....	Fluoride.....	
Copper.....	Organic Nitrogen.....	Permanganate Value	
Iron.....	Nitrate Nitrogen.....	(as mg KMnO ₄ /l).....	3.0
Lead.....	Nitrite Nitrogen.....	B.O.D. (5 days).....	
Manganese.....	Total phosphorus.....	Others.....	
Mecury	Orthophosphate.....		
Zinc.....	Sulphate.....		

(4) REMARKS

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(5) RECOMMENDATION

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THE WATER SAMPLE WAS TOO LITTLE TO COMPLETE THE ANALYSIS

3/3/88
Date

[Signature]
Reporting Officer

Head of the Laboratory

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF WATER ENERGY, AND MINERALS

Telegrams: "MAJI UBUNGO"
Telephone: 49113
In reply please quote:
Laboratory No. DWS/726/87

SOIL AND WATER LABORATORY
P.O BOX 35066
DAR ES SALAAM
Dated 3/3/1988

PHYSICAL AND CHEMICAL WATER ANALYSIS REPORT

(1) ORIGIN OF THE SAMPLE

Analysis requested by TANESCO P. OFF BOX 9024 DSM Ref. No. DP/CPL.E/MIP/II
Dated 20/10/1987 Date received at the Laboratory 2/11/1987
Date collected for analysis 2/10/1987 Time
Temp. °C water source RIVER HINGII II
Region I II INYAMBARA District Ward
Purpose of sampling PHYSICAL AND CHEMICAL
Sampling position VUJE VILLAGE
Preservative added/type of treatment to water before sampling

(2) PHYSICAL EXAMINATION

Appearance: Colour 20.0 mg Pt/l
Turbidity 25.0 N.T.U. Odour
Settleable matter MI/l pH
Taste Conductivity at 25°C 39 uS/cm.
Total filtrable Total Nonfiltrable
residue at 105°C mg/l residue at 105°C mg/l
Total volatile and fixed
residue at 550°C mg/l

(3) CHEMICAL EXAMINATION (in milligrams per litre)

Alkalinity (as CaCO₃) Hardness (as CaCO₃) Calcium
Phenolphthalein Carbonate Magnesium
Total Non Carbonate Sodium
Total Potassium

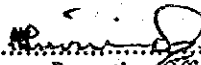
admium.....	Total Nitrogen.....	Chloride.....7.1.....
Chromium.....	Ammonical Nitrogen.....	Fluoride.....
Copper.....	Organic Nitrogen.....	Permanganate Value
Iron..... ^{NII}	Nitrate Nitrogen..... ^{0.12}	(as mg KMnO ₄ /l)..... ^{3.0}
Lead.....	Nitrite Nitrogen.....	B.O.D. (5 days).....
Manganese.....	Total phosphorus.....	Others.....
Mecury	Orthophosphate.....	
Zinc.....	Sulphate.....	

(4) REMARKS

THE WATER WAS TCC LITTLE ECFE EPIL SCALE ANALYSIS

(5) RECOMMENDATION

3/3/88
Date


Reporting Officer

Head of the Laboratory

APP. III-1
GEOLOGIC LOGS OF DRILLHOLES
AND
CORE PHOTOGRAPHS

APP. III - 1 Standard of Rock Classification for Drilled Core

Weathering		Hardness		Core Cutting	
1	Very fresh. No weathering of mineral component.	1	Very hard. Broken into knifeedged pieces by strong hammer blow.	1	Over 30cm
2	Fresh. Some minerals are weathered slightly. Usually no brown crack.	2	Hard. Broken into pieces by strong hammer blow.	2	10 - 30cm
3	Fairly fresh. Some minerals are weathered. Cracks are stained and with weathered material.	3	Brittle. Broken into pieces by medium hammer blow.	3	3 - 10cm
4	Weathered. Fresh portions still remain partially.	4	Very brittle. Easy broken into pieces by medium hammer blow.	4	1 - 3 cm
5	Strongly weathered. Most minerals are weathered and altered to second minerals.	5	Soft. Able to dig with hammer.	5	Under 1 cm

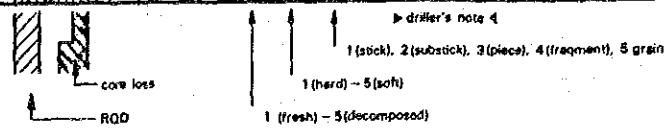
GEOLOGIC LOG OF DRILL HOLE

KIKULETWA No.1 PROJECT

HOLE No. K - 1 (SHEET 1 OF 2)

LOCATION	Power Station	DEPTH OF HOLE	25.32 m	COMMENCED	1 - 3 - '88
ELEVATION	878.72 m	DEPTH OF OVERBURDEN	0.60 m	COMPLETED	7 - 3 - '88
COORDINATE	X=8,693.84 ; Y=12,333.39	LENGTH OF ROCK DRILLING	24.72 m	DRILLED BY	J.D. M.O
ANGLE FROM HORIZONTAL	90	TOTAL LENGTH OF CORE	19.41 m	LOGGED BY	M.S
BEARING OF ANGLE HOLE	—	CORE RECOVERY	76.7 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER LUGEON	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING					
0m			0-100%							Overburden. Angular fine to coarse 0.6 lava gravel in silty clay matrix.		0m	878.72
1	Tuff breccia				Brownish grey	4	4	3-4		Tuff breccia.		1	878.12
2	Tuff breccia				Brownish grey	3	3	3		Lava fragments in weathered fine grained ashy matrix.	2.0	2	876.72
3	Tuff breccia				Brownish grey	3	3	2		2.7-3.15m		3	
4	Tuff breccia				Brownish grey	5	5	5		Strongly weathered.		4	
5	Clay				Brownish grey	3-4	3-4	2		464		5	874.08
6	Clay				Brownish grey	4	4	3		500 Dark grey clay	5.0	6	873.72
7	Limestone				Light brownish white	4-3	4-3	4-5		Limestone.		7	
8	Limestone				Light brownish white	5	4	5-4	3	Weathered aphanitic limestone.		8	
9	Limestone				Light brownish white	4-5	4-5	4		Irregularly machine broken white gravels.	7.3	9	871.42
10	Limestone				Light brownish white	4	4	3		Up to 6.6m		10	868.72
11	Limestone				Light brownish white	4	4	3		Strong weathered.		11	
12	Limestone				Light brownish white	4-5	4-5	4		Brownish Limestone.	10.0	12	
13	Limestone				Light brownish white	4-5	4-5	4		14.1-15.0m		13	
14	Limestone				Light brownish white	5	5	5		Strongly weathered. (no recovery)	15.0	14	863.72
15	Limestone				Light brownish white	4-5	4-5	4		15.6		15	863.12
16	Tuff breccia				Dark grey			3-4		Tuff breccia		16	
17	Tuff breccia				Dark grey	4	4	3		Weathered phonolitic tuff breccia of subangular.		17	
18	Tuff breccia				Dark grey			4		Phonolite and basalt fragments up to 3cm in fine grained matrix.		18	
19	Tuff breccia				Dark grey	4	4	4			19.0	19	859.72
20	Tuff breccia				Dark grey	3-4	3-4	2				20	858.72



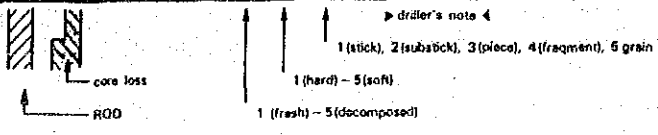
GEOLOGIC LOG OF DRILL HOLE

KIKULETWA No. 1 PROJECT

HOLE No. K - 1 (SHEET 2 OF 2)

LOCATION	Power Station	DEPTH OF HOLE	25.32 m	COMMENCED	1 - 3 - '88
ELEVATION	878.72 m	DEPTH OF OVERBURDEN	0.60 m	COMPLETED	7 - 3 - '88
COORDINATE X=8,693.84 ; Y=12,333.39		LENGTH OF ROCK DRILLING	24.72 m	DRILLED BY	J.D. M.O.
ANGLE FROM HORIZONTAL	90	TOTAL LENGTH OF CORE	19.41 m	LOGGED BY	M.S
BEARING OF ANGLE HOLE	—	CORE RECOVERY	76.7 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER LUGEON	DEPTH	ELEVATION		
					COLOR	WEATHERING	HARDNESS	CORE CUTTING						
20m			0→100%								20m	858.72 m		
1	Tuff - breccia	X	Imprignated H.M. Bit 86mm dia. Depth of casing : 17.5m	Dark grey	3-4	3-4	2		Tuff breccia	• Lu = 3 • K = 3.9 x 10 ⁻⁵ • Max. P = 4.1 kg/cm ² • Max. water Vol. = 7.6 l/min • Ground water table = 10.8 m	1			
2								Fresh phonolitic tuff breccia as above	2					
3											3			
4								3-4	3-4		1		4	
5												25.32	25.32	5
6								End of boro hole		10.8	6			
7								N.B/ Rotary auger 150 mm dia. 0.0~0.6m			7			
8								Rotary coring 101mm dia. 0.6~18.0m			8			
9								86 mm dia. 18.0~25.32m			9			
0											0			



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3

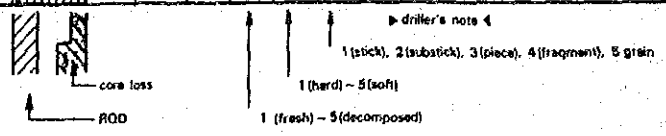
GEOLOGIC LOG OF DRILL HOLE

KIKULETWA No.2 PROJECT

HOLE No. KD-1 (SHEET 1 OF 1)

LOCATION <u>Intake Dam</u>	DEPTH OF HOLE <u>20 m</u>	COMMENCED <u>9 - 3 - '88</u>
ELEVATION <u>822.39 m</u>	DEPTH OF OVERBURDEN <u>0.15 m</u>	COMPLETED <u>13 - 3 - '88</u>
COORDINATE X= <u>7,688.70</u> ; Y= <u>13,405.00</u>	LENGTH OF ROCK DRILLING <u>19.85 m</u>	DRILLED BY <u>J. D. M.O.</u>
ANGLE FROM HORIZONTAL <u>- 90</u>	TOTAL LENGTH OF CORE <u>10.74 m</u>	LOGGED BY <u>M.S</u>
BEARING OF ANGLE HOLE <u>—</u>	CORE RECOVERY <u>53.1 %</u>	

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER LUGEON	DEPTH	ELEVATION		
					COLOR	WEATHERING	HARDNESS	CORE CUTTING						
0m			0 → 100%							0	822.39m			
1	Talus	△		Impregnated H. M. Bit 101mm dia.	Dark brown				Over barden angular fine to coarse lava gravels in silty clay matrix		1	820.89		
2	Tuff - breccia	⊗		Impregnated H. M. Bit 86 mm dia. Depth of casing 1.5 m	Brown	5-4	5-4	4	Tuff breccia	2.3 • Lu = 113 • K = 1.2 × 10 ³ cm/sec • Max. P = 3.3 kg/cm ² • Max. water Vol. = 102 l/min Ground water level = 4.0m	2	820.09		
3						3-4	3-4	3-2	Weathered tuff breccia of subangular lava fragments in fine grained matrix			3		
4						5	5	5					4	
5						4	4	3					5	817.39
6						4-3	4-3	4					6	816.39
7	Lime stone	□		Impregnated H. M. Bit 86 mm dia. Depth of casing 1.5 m	(Light brownish) White	3	4-3	3	Lime stone	6.0 • Lu = 54 • K = 6.3 × 10 ⁴ cm/sec • Max. P = 2.8 kg/cm ² • Max. water level = 61 l/min • Ground water level = 10.0m (DRY)	7			
8						3	4-3		Weathered aphanitic Lime stone with irregular fractures			8	814.39	
9						5	5	5					9	
10				Impregnated H. M. Bit 76 mm dia. Depth of casing 5.2 m	Dark grey	4-3	3-4	3	Tuff breccia	10.0 9.0 ~ 12.25, 16.5 ~ 20.0m Strongly weathered unconsolidated tuff breccia (recovered as sand)	10	812.39		
11						5	5	5	Weathered tuff breccia of angular lava fragments basalt and phonolite in fine grained ashy matrix			11		
12												12		
13												13	808.89	
14												14		
15	Tuff - breccia	⊗		Impregnated H. M. Bit 76 mm dia. Depth of casing 5.2 m	Dark grey	3-4	3-4	3-4	Occasional less weathered coarsely porphyritic fragments upto cobble size	15.0 • Lu = 2 • K = 2.0 × 10 ⁵ cm/sec • Max. P = 3.0 kg/cm ² • Max. water Vol. = 1.0 l/min • Ground water level = 9.7m	15	807.39		
16												16		
17												17		
18												18		
19				Impregnated H. M. Bit 76 mm dia. Depth of casing 5.2 m		5	5	5		12/3/88 • Lu = 8 • K = 1.0 × 10 ⁴ cm/sec • Max. P = 4.0 kg/cm ² • Max. water Vol. = 16 l/min • Ground water level = 9.6 m	19			
20						3-4	3-4	3				20	802.39	
20									20.0 End of bore hole	20.0				



GEOLOGIC LOG OF DRILL HOLE

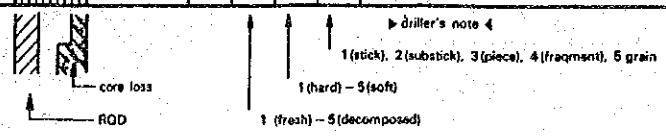
KIKULETWA No.2 PROJECT

HOLE No. KD-2 (SHEET 1 OF 1)

LOCATION	Intake Dam	DEPTH OF HOLE	15.0 m	COMMENCED	16 - 2 - '88
ELEVATION	812.41 m	DEPTH OF OVERBURDEN	0.0 m	COMPLETED	20 - 2 - '88
COORDINATE	X=7,658.50 ; Y=13,433.60	LENGTH OF ROCK DRILLING	15.0 m	DRILLED BY	A. W. H.W
ANGLE FROM HORIZONTAL	- 90 °	TOTAL LENGTH OF CORE	2.6 m	LOGGED BY	M. S.
BEARING OF ANGLE HOLE	—	CORE RECOVERY	17.0 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION				
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER						
0m			0 → 100%								0	812.41 m					
1	Tuff breccia	X		Impr. H.M. Bit 101 mm dia.	Dark grey	Brownish grey	2	2		Tuff breccia 0 ~ 0.6m Weathered porphyritic Phonolite boulder.		0	812.41 m				
2						4-3	3-4	3	5					5	5	0 ~ 16/2 '88	
3						4	4	3	5					5	5		
4						5	5	5	0.6 ~ 20.0 m Strongly weathered phonolitic tuff breccia of angular coarsely					5.0	5	5	17/2 '88
5						3-4	3-4	4									
6						5	5	5	Porphyritic lava fragments upto boulder size and occasional obsidian?					5.0	5	5	0
7						2	2	4									
8						5	5	5	Particles upto 3mm in fine grained unconsolidated ashy matrix.					5.0	5	5	0
9						3-2	3-2	4									
10						5	5	5	Occasional less weathered coarsely porphyritic fragments upto cobble size. (Recovered mainly as sand)					5.0	5	5	0
11	3-4	3-4	4	5	5	5	20/2 '88										
12	2	2	3	Impr. H.M. Bit 86 mm dia. Depth of casing: 7.0m	Brownish grey	5		5	5	5.0	5.0	0	797.41				
13	5	5	5				5							5	5		
14	5	5	5														
15									End of bore hole								

- Lu=1
- K=1.3 x 10⁻⁵ cm/sec
- Max. P. = 5 kg/cm²
- Max. water Vol. = 1.8 l/min
- Ground water level 8.0 = spring (5 l/min)



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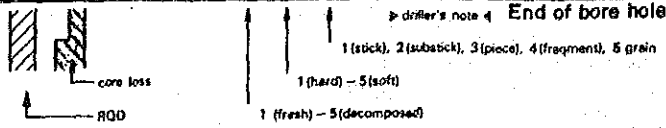
GEOLOGIC LOG OF DRILL HOLE

KIKULETWA No.2 PROJECT

HOLE No. KD-3 (SHEET 1 OF 1)

LOCATION	Intake	DEPTH OF HOLE	20.0 m	COMMENCED	21 - 2 - '88
ELEVATION	817.45 m	DEPTH OF OVERBURDEN	0.2 m	COMPLETED	23 - 2 - '88
COORDINATE	X=7,635.40 ; Y=13,456.40	LENGTH OF ROCK DRILLING	19.8 m	DRILLED BY	A.W. H.W.
ANGLE FROM HORIZONTAL	- 90 °	TOTAL LENGTH OF CORE	67.9 m	LOGGED BY	M.S.
BEARING OF ANGLE HOLE	-	CORE RECOVERY	34.0 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0m			0-100%									0m	817.45 ^m
0.2					Dark grey	4	4	4	0.2	Over burden Cobbly tuff breccia gravels in clay			817.25
0 ~ 5.0				Imprignated H. M. Bit 101 mm dia.	Brownish grey	4	4-3			Weathered tuff breccia of angular porphyritic phonolite fragments upto 5cm in fine grained ashy matrix.	2.5		814.95
5.0 ~ 17.7 m				Imprignated H. M. Bit 86 mm dia. Depth of casing : 14.0 m		4	4	2-3		Cracks subhorizontal to steep rough calcite lined ilmonite stained.	5.0	21 / 2 / '88	812.45
						5	5	5		Strongly weathered tuff breccia as above with unconsolidated ashy matrix. (Recovered as sand washings)		4.3	
17.7 ~ 20.0 m					Dark grey	5	5	5		Weathered cracks partly horizontally machine broken dark grey tuff breccia as above.		22 / 2 / '88	
						3-4	3-4	4			5.0		
						5	5	5				23 / 2 / '88	799.95
						4(3)	4-3	3			175		
20									200		200		797.45



4.45

GEOLOGIC LOG OF DRILL HOLE

KIKULETWA No.2 PROJECT

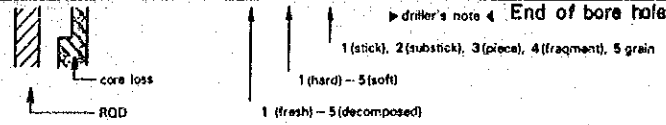
HOLE No. KD - 4 (SHEET 1 OF 1)

LOCATION	Head race Canal	DEPTH OF HOLE	20.0 m	COMMENCED	24 - 2 - '88
ELEVATION	825.89 m	DEPTH OF OVERBURDEN	0.2 m	COMPLETED	28 - 2 - '88
COORDINATE	X=6,952.37; Y=14,152.01	LENGTH OF ROCK DRILLING	19.8 m	DRILLED BY	A.W. M.O.
ANGLE FROM HORIZONTAL	- 90 °	TOTAL LENGTH OF CORE	14.4 m	LOGGED BY	M.S.
BEARING OF ANGLE HOLE	-	CORE RECOVERY	72.1 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BITTING CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING				
0m			0 → 100%							LUGEON	0m	825.89m
0.2									Over burden Gravelly clayey silt			825.89
1									Tuff breccia			
2									Weathered tuff breccia of angular porphyritic phonolite fragments upto 10cm occasionally upto boulder size, and obsidian particles upto 3mm in fine grained matrix.			
3									Cracks subhorizontal to steep rough clay lined ilmonite coated.			
4												
5												
6												
7												
8												
9												
10												
11									9.6 ~ 12.6 m			
12									Strongly weathered unconsolidated ashy tuff breccia.			
13									(Recovered as sand washings)			
14												
15									15.0 ~ 20.0 m			
16									Fresh tuff breccia of angular porphyritic ponolite fragments upto 3cm, occasionally			
17									Cobble size or boulder size feldspar crystals in fine grained matrix with sparse secondary calcite.			
18									Cracks horizontal or medium steep, rough black ilmonite stained,			
19												
20												

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Lu=1.3
K=1.7x10⁻⁵
Max. P.=4.4 kg/cm²
Max. water Vol. = 3.8/min
Ground water level = 14.2 m

Lu=3, K=3.4x10⁵
Max. P.=6.2 kg/cm²
Max. water Vol. = 4.1/min
Ground water level = 11.6 m

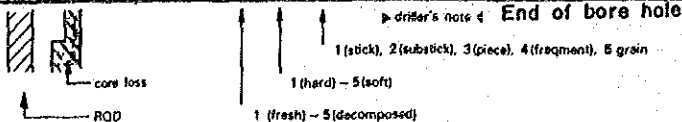
GEOLOGIC LOG OF DRILL HOLE

KIKULETWA No. 2 PROJECT

HOLE No. KD-5 (SHEET 1 OF 1)

LOCATION <u>Head race Canal</u>	DEPTH OF HOLE <u>20.00</u> m	COMMENCED <u>2 - 3 - '88</u>
ELEVATION <u>829.68</u> m	DEPTH OF OVERBURDEN <u>0.00</u> m	COMPLETED <u>11 - 3 - '88</u>
COORDINATE <u>X=6,264.63, Y=14,842.87</u>	LENGTH OF ROCK DRILLING <u>20.00</u> m	DRILLED BY <u>A.W. H.W.</u>
ANGLE FROM HORIZONTAL <u>90</u>	TOTAL LENGTH OF CORE <u>18.52</u> m	LOGGED BY <u>M.S.</u>
BEARING OF ANGLE HOLE <u>—</u>	CORE RECOVERY <u>92.6</u> %	

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION							
					COLOR	WEATHERING	HARDNESS	CORE CUTTING											
0			0 → 100%							0	829.68 ^m								
1	Tuff breccia		0 → 100%	Impregnated H. M. 101 mm dia.	Little brownish grey	3~4	3~4	3	Phonolitic tuff breccia. 0.9~1.5m Hard and fresh, fine grained coarsely porphyritic phonolite.	2.0 • Lu = 38 • K = 4.3 x 10 ⁻⁴ cm/s • Max. P. = 2.3 kg/cm ² • Max. water Vol. = 29.0 l/min • Ground water level = 3.1 m	1								
2					Grey	3	3	2~3			4		2	1.2					
3					Little brownish grey	3~4	3~4	2~3			Brownish grey, Occasionally brown colored weathered phonolitic tuff breccia of angular coarsely porphyritic fragments upto 5cm in fine grained matrix.		5.3 • Lu = 12 • K = 15 x 10 ⁻⁴ cm/s • Max. P. = 3.6 kg/cm ² • Max. water Vol. = 19.7 l/min • Ground water level = 5.7 m	3					
4					Little brownish grey	4~3	4	3						6	7				
5					Brown	3~4	3	Cracks generally subhorizontal rough limonite stained / clay lined.						9.8 • Lu = 3 • K = 4.3 x 10 ⁻⁵ cm/s • Max. P. = 3.4 kg/cm ² • Max. water Vol. = 5.8 l/min • Ground water level = 4.1 m	8				
6					Little brownish grey	4	3~2								2	9	10		
7					Little brownish grey	3	3								Toward the lower part. gradually shifting into fresh and hard.	15.0 • Lu = 4 • K = 5.1 x 10 ⁻⁵ cm/s • Max. P. = 34 kg/cm ² • Max. water Vol. = 6.6 l/min • Ground water level = 3.8 m	5.7		
8					Little brownish grey	4~3	4~3										2	6	1
9					Little brownish grey	3	3										18.2 ~ 20.0m Strongly weathered with close fractures brown phonolitic tuff-breccia.	4.9 • Lu = 4 • K = 5.1 x 10 ⁻⁵ cm/s • Max. P. = 34 kg/cm ² • Max. water Vol. = 6.6 l/min • Ground water level = 3.8 m	2
10					Little brownish grey	4~3	4~3												3~2
11	Little brownish grey	3	3	Especially 18.85~19.30m machine disintegrated to sand washings.	4.6 • Lu = 4 • K = 5.1 x 10 ⁻⁵ cm/s • Max. P. = 34 kg/cm ² • Max. water Vol. = 6.6 l/min • Ground water level = 3.8 m	9													
12	Little brownish grey	4~3	4~3			2	4		3										
13	Little brownish grey	3	3			20.0	5.2		4.9										
14	Little brownish grey	4~3	4~3						2	5	4								
15	Little brownish grey	3	3					20.0	5.2	6									
16	Little brownish grey	4~3	4~3							2	7	5							
17	Little brownish grey	3	3							20.0	5.2	8							
18	Little brownish grey	4~3	4~3									2	9	6					
19	Little brownish grey	3	3									20.0	5.2	10					
20	Little brownish grey	4~3	4~3											2	11	7			



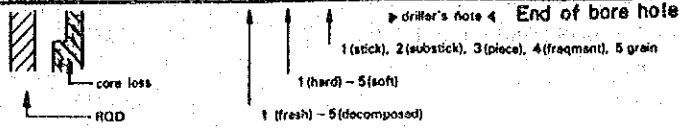
GEOLOGIC LOG OF DRILL HOLE

KIKULETWA No. 2 PROJECT

HOLE No. KD-6 (SHEET 1 OF 1)

LOCATION	Head race (tunnel)	DEPTH OF HOLE	20.0 m	COMMENCED	4 - 3 - '88
ELEVATION	811.33 m	DEPTH OF OVERBURDEN	1.0 m	COMPLETED	6 - 3 - '88
COORDINATE	X=5,813.64, Y=15,290.85	LENGTH OF ROCK DRILLING	19.0 m	DRILLED BY	A.W. H.W.
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	19.46 m	LOGGED BY	M.S.
BEARING OF ANGLE HOLE	—	CORE RECOVERY	97.3 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING				
0m			0 → 100%							0	811.33m	
1	Ta	△			Brown			1.0	Overburden. Brown silty clay sand.		810.33	
2		⊗				4	4	4	Phonolitic tuff breccia. 1.0~2.0m			
3		⊗						3-2	Strongly weathered brown tuff breccia of angular phonolite fragments upto 3cm in fine grained matrix.	3.0	808.33	
4		⊗						3-2	Weathered brownish grey tuff breccia of angular coarsely porphyritic phonolitic fragments, Occasionally upto boulder size in fine grained matrix.	<ul style="list-style-type: none"> Lu = 8 K = 7.8 x 10⁻⁵ cm/s Max. P. = 1.2 kg/cm² Max. water Vol. = 2.2 l/min Ground water level = 1.7m 		
5		⊗						3-2			5.4	805.93
6		⊗				3-2	3-2	3	Toward the lower part gradually shifting into fresh and hard.	5.75	805.58	
7		⊗						3	Cracks are subhorizontal medium steep, rarely steep, rough with calcite coating /clay veneer.	<ul style="list-style-type: none"> Lu = 6 K = 7.7 x 10⁻⁵ cm/s Max. P. = 1.5 kg/cm² Max. water Vol. = 4.1 l/min Ground water level = 5m 		
8		⊗									5.75	801.33
9		⊗							Tuff breccia	<ul style="list-style-type: none"> Lu = 4 K = 4.4 x 10⁻⁵ cm/s Max. P. = 3.4 kg/cm² Max. water Vol. = 6 l/min Ground water level = 4.2 m 		
10		⊗									5 / 3 / '88	
11		⊗							Imprignated H.M. 86 mm dia.	<ul style="list-style-type: none"> Lu = 4 K = 4.4 x 10⁻⁵ cm/s Max. P. = 3.4 kg/cm² Max. water Vol. = 6 l/min Ground water level = 4.2 m 		
12		⊗									5 / 3 / '88	
13		⊗							Imprignated H.M. 101 mm dia.	<ul style="list-style-type: none"> Lu = 4 K = 4.4 x 10⁻⁵ cm/s Max. P. = 3.4 kg/cm² Max. water Vol. = 6 l/min Ground water level = 4.2 m 		
14		⊗									5 / 3 / '88	
15		⊗							Imprignated H.M. 76 mm dia.	<ul style="list-style-type: none"> Lu = 4 K = 4.4 x 10⁻⁵ cm/s Max. P. = 3.4 kg/cm² Max. water Vol. = 6 l/min Ground water level = 4.2 m 		
16		⊗									5 / 3 / '88	
17		⊗							Imprignated H.M. 76 mm dia.	<ul style="list-style-type: none"> Lu = 4 K = 4.4 x 10⁻⁵ cm/s Max. P. = 3.4 kg/cm² Max. water Vol. = 6 l/min Ground water level = 4.2 m 		
18		⊗									5 / 3 / '88	
19		⊗							Imprignated H.M. 76 mm dia.	<ul style="list-style-type: none"> Lu = 4 K = 4.4 x 10⁻⁵ cm/s Max. P. = 3.4 kg/cm² Max. water Vol. = 6 l/min Ground water level = 4.2 m 		
20		⊗									5 / 3 / '88	
20.0								20.0		15.0	796.33	
										<ul style="list-style-type: none"> Lu = 0.5 K = 6.3 x 10⁻⁶ cm/s Max. P. = 1.2 kg/cm² Max. water vol. = 0.3 l/min Ground water level = 2.4m 		
										6 / 3 / '88		
											791.33	



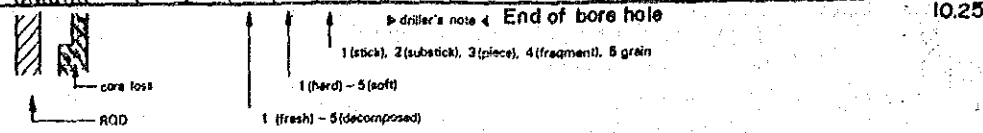
GEOLOGIC LOG OF DRILL HOLE

KIKULETWA No.2 PROJECT

HOLE No. KD - 7 (SHEET 1 OF 1)

LOCATION	Head Tank	DEPTH OF HOLE	20.15 m	COMMENCED	29 - 2 - '88
ELEVATION	807.59 m	DEPTH OF OVERBURDEN	0.30 m	COMPLETED	3 - 3 - '88
COORDINATE	X=5210.07, Y=16,201.66	LENGTH OF ROCK DRILLING	19.85 m	DRILLED BY	A.W. H.W
ANGLE FROM HORIZONTAL	90	TOTAL LENGTH OF CORE	19.76 m	LOGGED BY	M.S
BEARING OF ANGLE HOLE	---	CORE RECOVERY	98.1 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	LU				
0m			0→100%								0	807.59m	
0.3										Sandy clayey silt with some lava gravals.		807.29	
1	Tuff breccia				Little brownish grey	3-2	3-2	2		Tuff breccia			
2						2	2	3		Hard tuff breccia of subangular phonolite, devitrified glass, feldspar crystals, upto 3cm rarely upto 10cm in medium grained matrix.	2.0	805.59	
3						3-2	3-2	2~3		Cracks generally subhorizontal occasionally steep rough with clay veneer limonite coating.			
4						2	2-1					802.59	
5.9	Phonolite				Greenish grey	1-2	1			Phonolite		801.69	
6						2	2-1	1-2		Very hard and fresh with white feldspar spots fine grained porphyritic phonolite.			
7						1-2	1			Cracks is rare and clean			
8										7.4 ~ 9.6m tuff breccia.			
9.6	Phonolite				Greenish grey	2	2-1	2		Tuff breccia		797.99	
10						2	2-1	2		Hard tuff breccia of angular, Phonolite, feldspar crystals up to 3cm in fine grained little weathered matrix.		797.59	
11						2-3	2-3	1-2		With occasional large up to boulder size coarsely porphyritic phonolite fragments.			
12										Cracks are rare and coated with limonite.			
15.1	Tuff breccia				Little brownish grey	2	2-1	2				792.49	
16						2	2-1	2					
17													
18.6	Phonolite				Greenish grey	1	1			Phonolite		798.99	
19										Very hard and fresh with green tint. Porphyritic fine grained phonolite.			
20												787.59	



GEOLOGIC LOG OF DRILL HOLE

KIKULETWA No.2 PROJECT

HOLE No. KD-8 (SHEET 1 OF 2)

LOCATION <u>Penstock</u>	DEPTH OF HOLE <u>30.0 m</u>	COMMENCED <u>17 - 2 - '88</u>	
ELEVATION <u>779.57 m</u>	DEPTH OF OVERBURDEN <u>0.7 m</u>	COMPLETED <u>24 - 2 - '88</u>	
COORDINATE <u>X=4,458.82; Y=16,837.42</u>	LENGTH OF ROCK DRILLING <u>29.3 m</u>	DRILLED BY <u>T. D. ; M. O</u>	
ANGLE FROM HORIZONTAL <u>- 90</u>	TOTAL LENGTH OF CORE <u>25.3 m</u>	LOGGED BY <u>M.S</u>	
BEARING OF ANGLE HOLE <u>-</u>	CORE RECOVERY <u>84.2 %</u>		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION			
					COLOR	WEATHERING	HARDNESS	CORE CUTTING							
0m			0→100%							LUGEON	40	779.57 m			
0.7									Limestone gravel in silty clay matrix.			778.87			
1	Lime stone	[Pattern]			Little brownish whit	3	3	3	Limestone	3.2 • Lu=137 · K=1.3x10 ³ cm/s • Max.P= 3.4 kg/cm ² • Max. water Vol. = 84.6 l/min • Ground water level = 5.0 = 3.2 m	17/2/'88				
2									3~4				3~4	3~4	Weathered white fine and medium grained bioclastic limestone.
3									3~4				3~4	2~3	Occasional vugs upto 5cm empty or rarely filled with clay.
4									3~4				4	4	5.0 ~ 5.45, 9.35 ~ 9.80m Loosely consolidated bioclastic limestone as coarse sand.
5									3~4				4	3	
6									3~4				4	4	
7									4				4	4	
8									5				5	5	
9									4~3				4~3	3~4	
10									5				5	5	
10.0									10.0	19/2/'88	769.57				
11.0	Tuff breccia	[Pattern]			Brownish grey	4	4	3	Tuff-breccia	14.0 • Lu= 32 • K=4.1x10 ⁻⁴ cm/s • Max.P= 4.6 kg/cm ² • Max. water Vol.= 88.5 l/min • Ground water level = 17.5m	20/2/'88				
12									4~3				4~3	3	Weathered fine to coarse grained tuff with subround lava inclusions upto 1cm (11.0~13.75m) upto 5cm (13.75 ~ 14.5m)
13									4				4	4	
14									4~3				4~3	3	
15									4~3				4~3	3	
15.0									15.0	21/2/'88	765.57				
16	Tuff breccia	[Pattern]			Little brownish dark grey	4	(3)	4	Trachytic tuff breccia	15.0 • Lu= 19 • K=2.3x10 ⁻⁴ cm/s • Max.P= 2.7 kg/cm ² • Max. water Vol.= 25.3 l/min • Ground water level = 17.5m	22/2/'88				
17									4~3				4~3	4	Weathered dark grey with patches and green staining trachytic tuff breccia of subangular vesicular occasionally compact porphyritic, trachytic tuff breccia fragments upto 10cm occasionally upto boulder size in thin fine grained matrix.
18									4				4	4	
19									4~3				4~3	4	
20									4~3				4~3	4	
20.0									20.0	22/2/'88	759.57				

Impragnated H. M. 101 mm dia.
 Depth of casing : 1.5 m
 Depth of casing : 9.2 m
 Depth of casing : 12.7 m

▶ driller's note ◀
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
 1 (hard) - 5 (soft)
 1 (fresh) - 5 (decomposed)

Contd. Sheet 2

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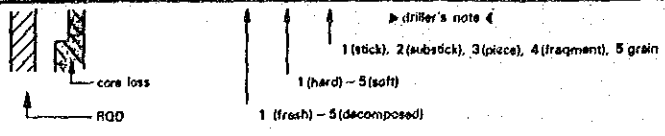
GEOLOGIC LOG OF DRILL HOLE

KIKULETWA No. 2 PROJECT

HOLE No. KD-8 (SHEET 2 OF 2)

LOCATION Penstock DEPTH OF HOLE 30.0 m COMMENCED 17 - 2 - '88
 ELEVATION 779.57 m DEPTH OF OVERBURDEN 0.7 m COMPLETED 24 - 2 - '88
 COORDINATE X=4,458.82 ; Y=16,837.42 LENGTH OF ROCK DRILLING 29.3 m DRILLED BY J. D. M.O.
 ANGLE FROM HORIZONTAL - 90 TOTAL LENGTH OF CORE 25.3 m LOGGED BY M.S.
 BEARING OF ANGLE HOLE --- CORE RECOVERY 84.2 %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION				
20m			0 → 100%							0	20m	779.57	
1	Tuff breccia			Impregnated H.M. 101mm dia. Depth casing : 14.0 m	Little brownish dark grey	4	4-5 (3)	4-3 4 4-3 5	Some vesicles filled with Ilmonite. Cracks subhorizontal to steep rough with green chlorite Voneer/limonite stain. 23.0 ~ 23.5 m Dark greyed ash	20.0	NIL	• Lu = 57 • K = 6.9×10^{-9} cm/sec • Max. P = 516 kg/cm ² • Max. water Vol. = 146.6 l/min • Ground water level = 22.5 m	
2													
3													
4													
5													754.57
6													23.4
7													• Lu = 0 • K = $< 10^{-6}$ cm/sec • Max. P = 5.27 kg/cm ² • Max. water Vol. = 0 l/min • Ground water level = 22.4 m
8													
9													
30													
30								End of bore hole	30.0	26.1	30		



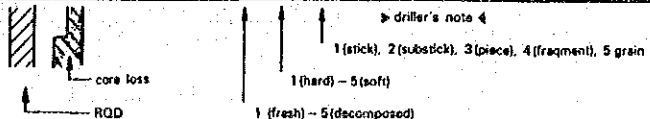
GEOLOGIC LOG OF DRILL HOLE

KIKULETWA No.2 PROJECT

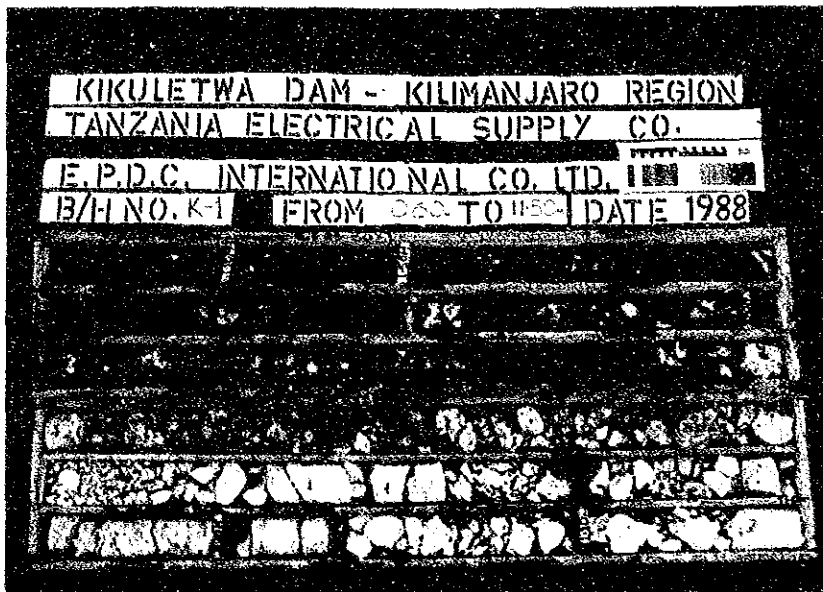
HOLE No. KD-9 (SHEET 1 OF 1)

LOCATION	Power Station	DEPTH OF HOLE	20.0 m	COMMENCED	25 - 2 - '88
ELEVATION	730.74 m	DEPTH OF OVERBURDEN	2.45 m	COMPLETED	29 - 2 - '88
COORDINATE	X=4,407.68 ; Y=17,049.50	LENGTH OF ROCK DRILLING	17.55 m	DRILLED BY	J.D. M.O.
ANGLE FROM HORIZONTAL	- 90 °	TOTAL LENGTH OF CORE	18.62 m	LOGGED BY	M.S
BEARING OF ANGLE HOLE	—	CORE RECOVERY	93.1 %		

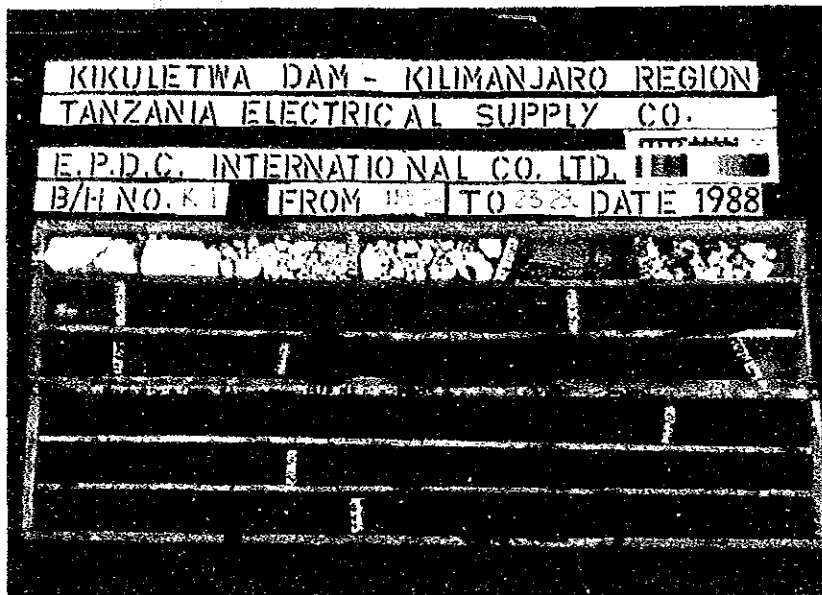
DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING			
0m			0 → 100%							0	730.74 m
0 ~ 2.0m	Over burden	Δ									
2.0 ~ 2.45m	Over burden	Δ									
2.45 ~ 5.05m	Over burden	Δ									
5.05 ~ 7.35m	Tuff breccia	⊗			Brownish grey	4	4	2	Tuff breccia Weathered tuff breccia of angular phonolitic fragments upto 3cm in finegrained matrix. Cracks subhorizontal rough clay veneer.		725.69
7.35 ~ 10.15m	Tuff breccia	⊗			Dark grey	2-3	2-3	1-2	Tuff breccia Fairly fresh and hard trachytic tuff breccia.	Lu=79 K = 9.7 × 10 ⁻⁴ cm/sec Max. P = 3.41 kg/cm ² Max. water Vol. = 139.2 l/min	723.39
10.15 ~ 11.0m	Conglomerate	○			Little brownish dark grey	4-5	4-5	4-3	Conglomerate 7.35 ~ 11.0m Weathered conglomerate mainly rounded phonolite fragments upto 10cm in fine grained matrix.	Ground water level = 3.8m	720.59
11.0 ~ 15.2m											Light grey
15.2 ~ 17.0m	Conglomerate	○			Dark grey	4-5	4-5	4-3	Weathered conglomerate, as above.	Lu=66 K = 8.3 × 10 ⁻⁴ cm/sec Max. P = 3.41 kg/cm ² Max. water Vol. = 112.6 l/min Ground water level = 3.8 m	715.74
17.0 ~ 20.0m											Light grey
20.0m					Brownish grey	5-4	5-4	3	End of bore hole		710.74



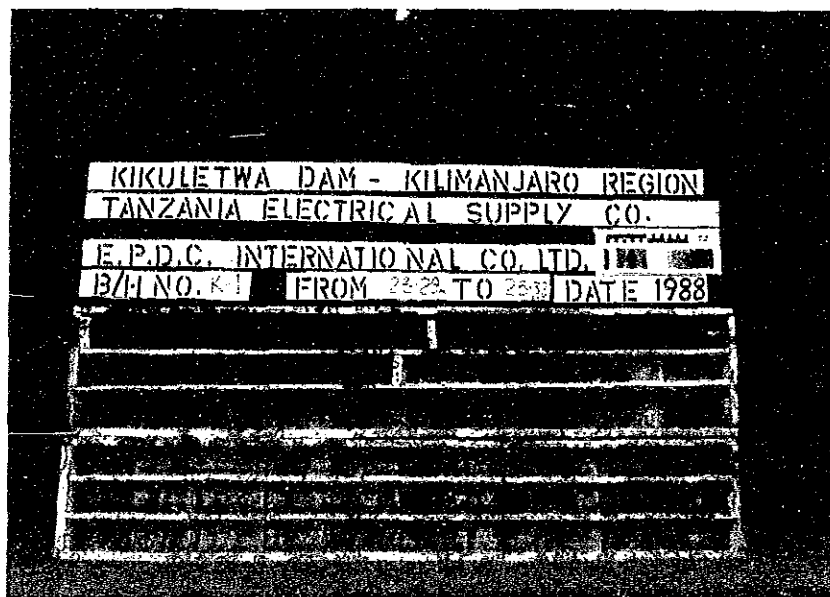
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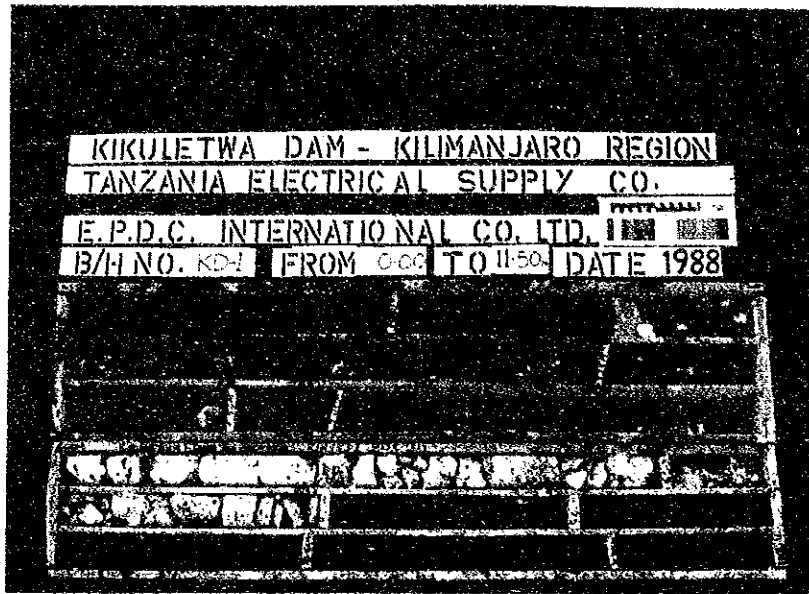
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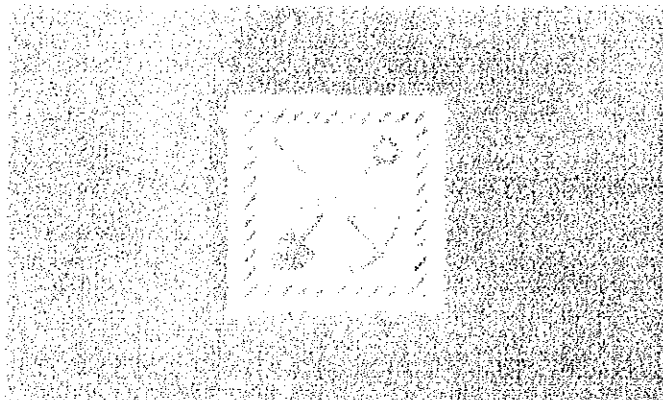
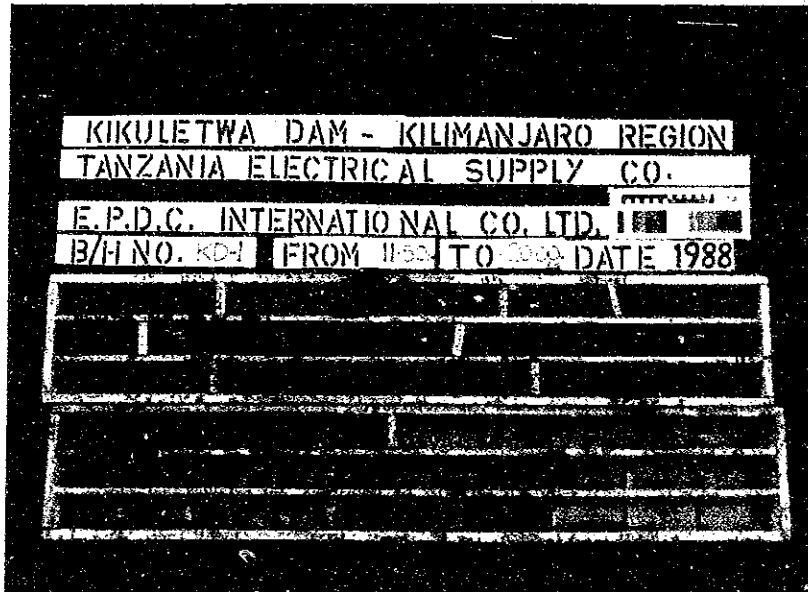
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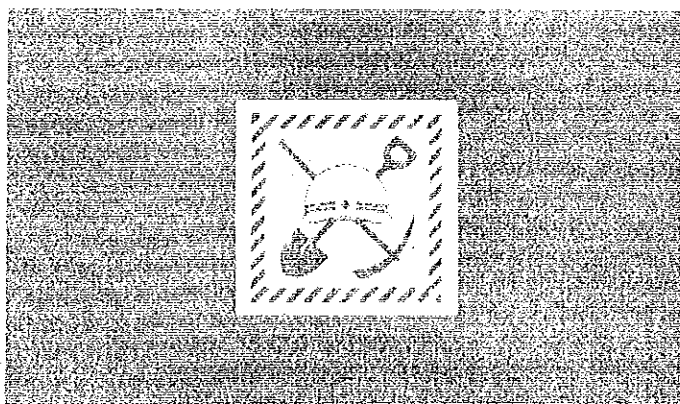
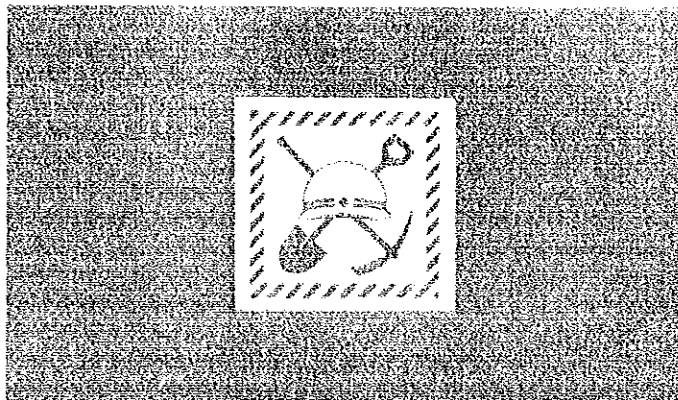
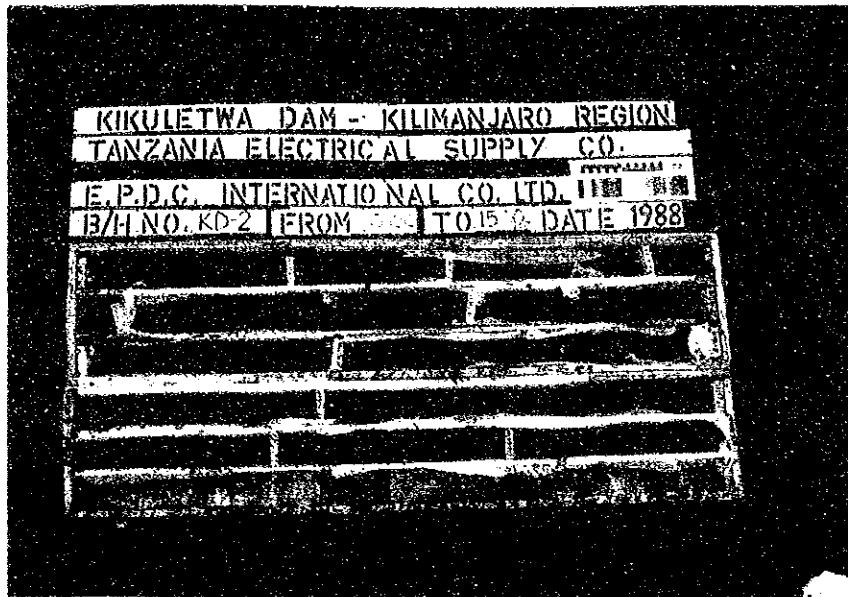


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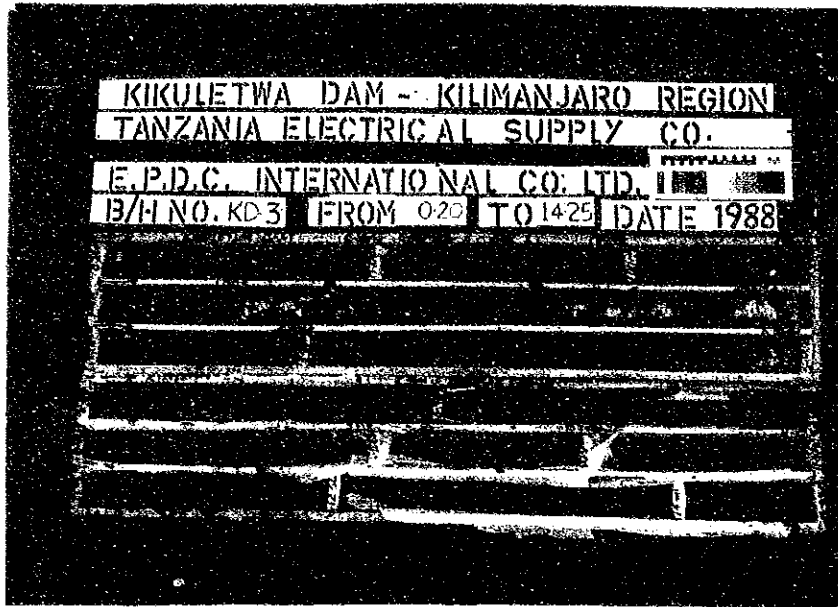


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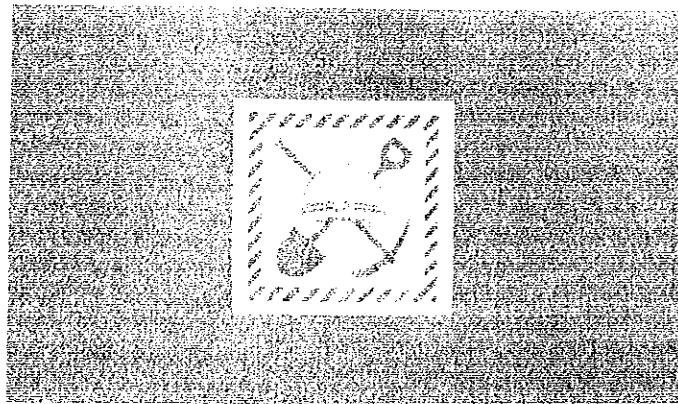
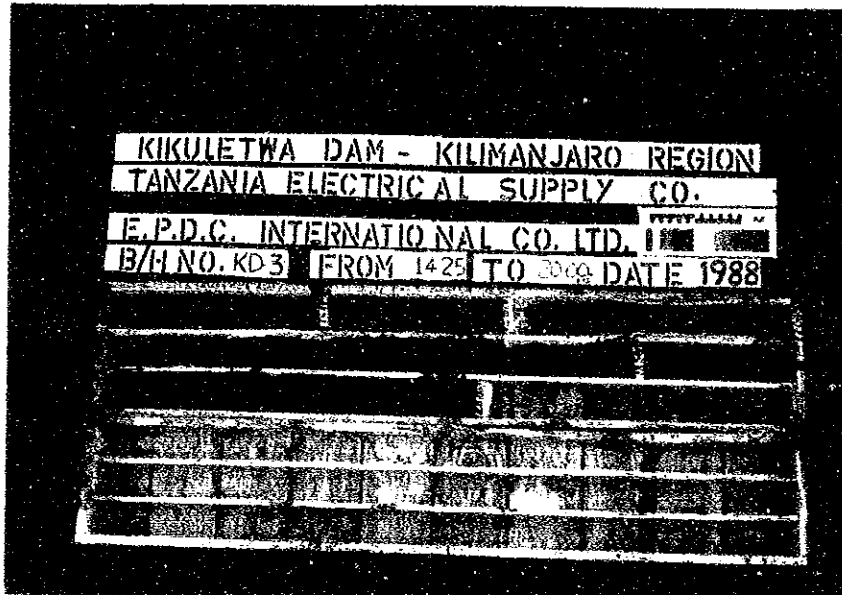




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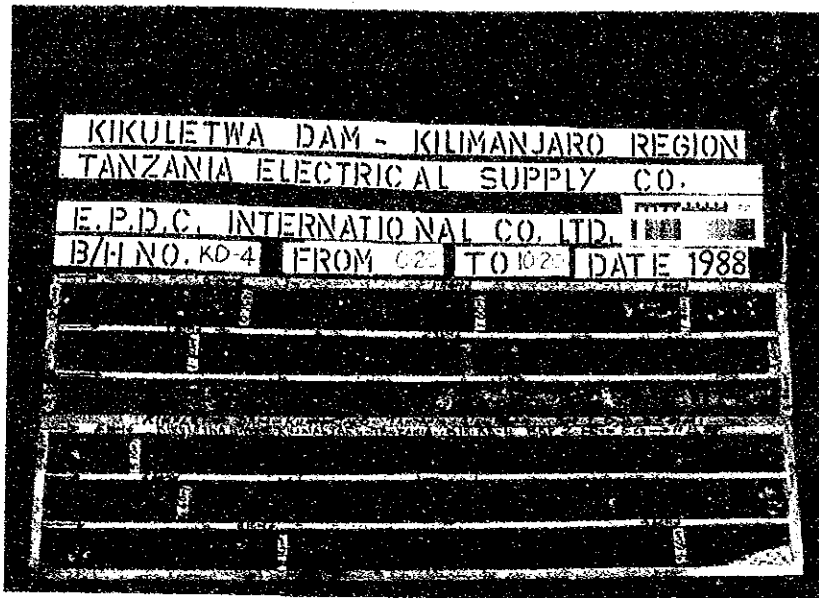


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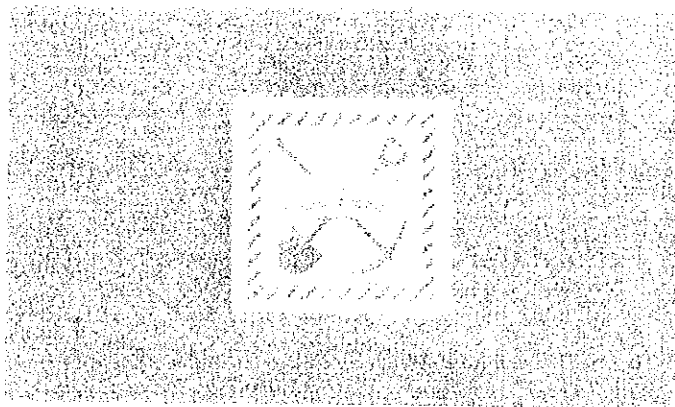
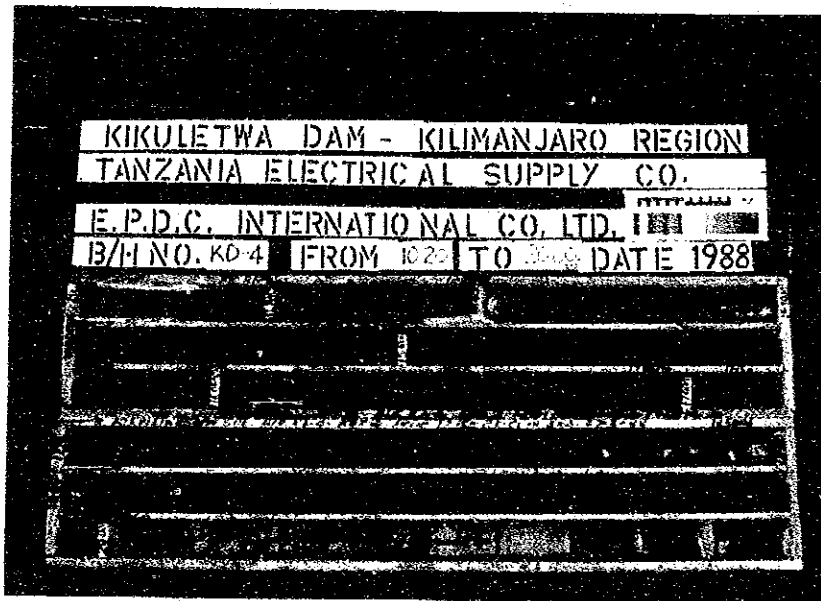


II-1
17

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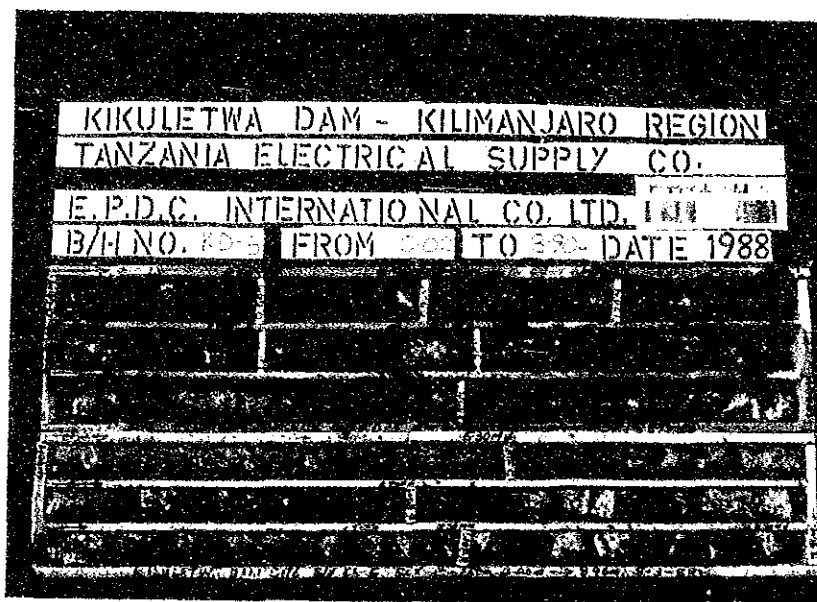


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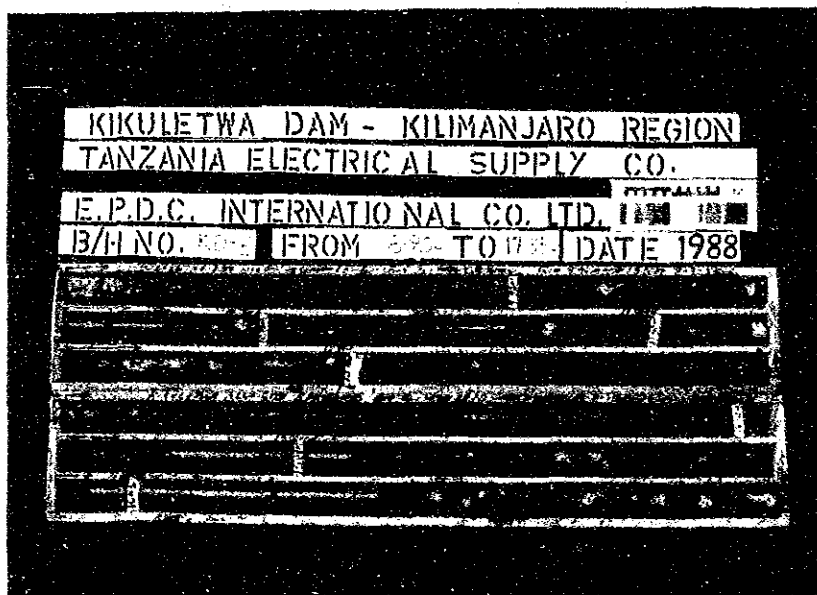


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18

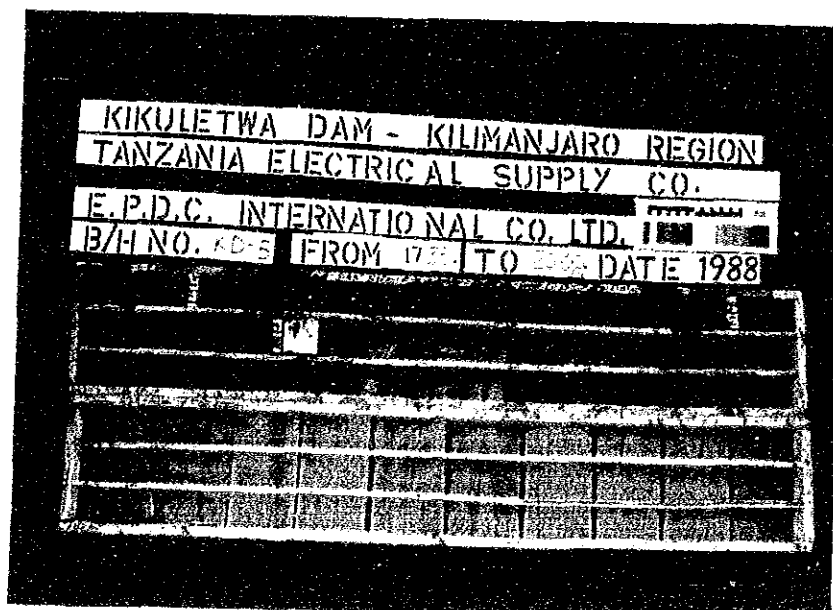
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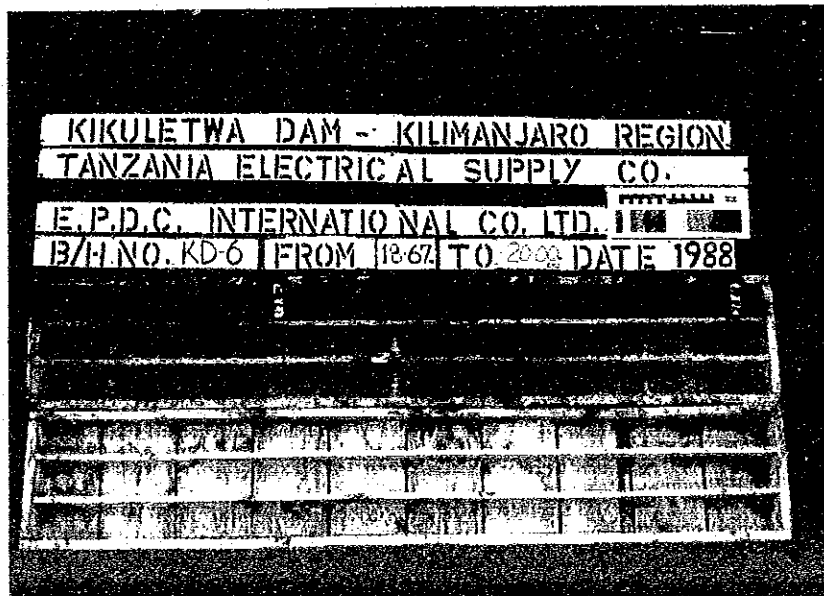
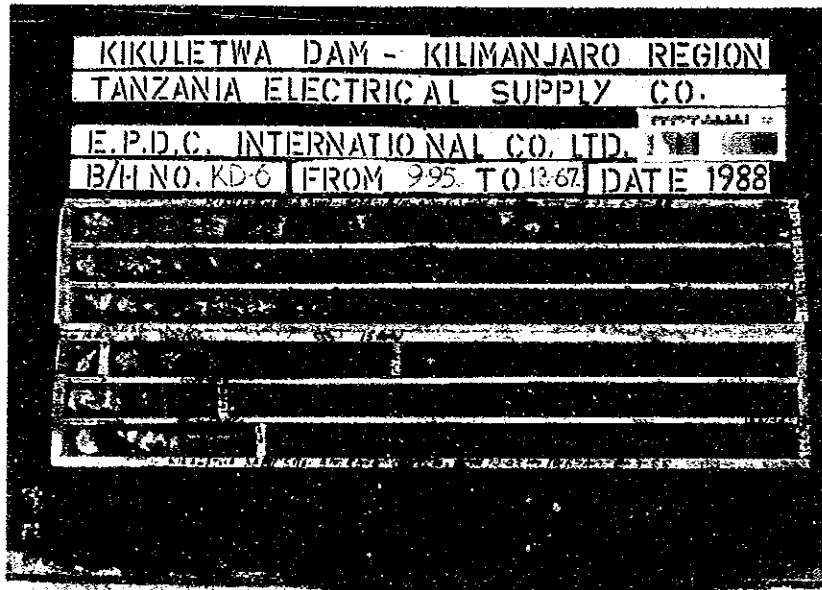
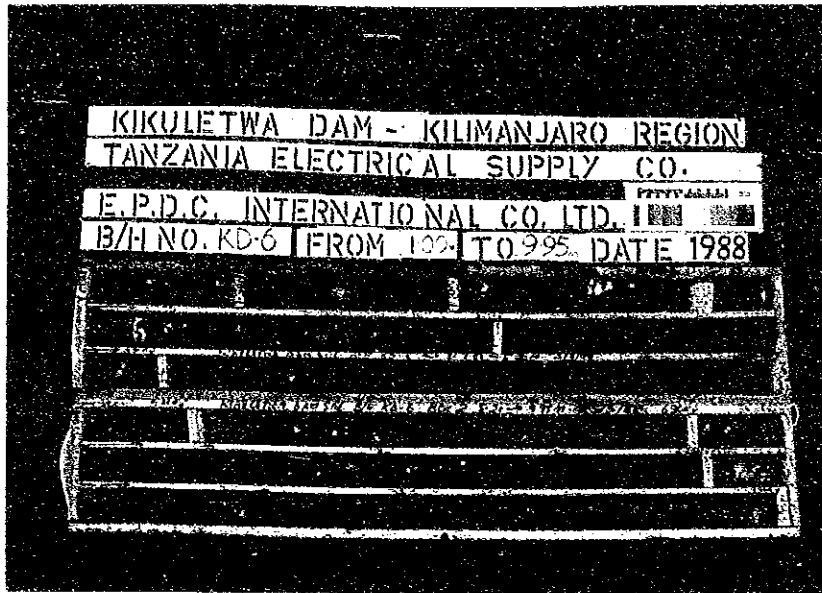


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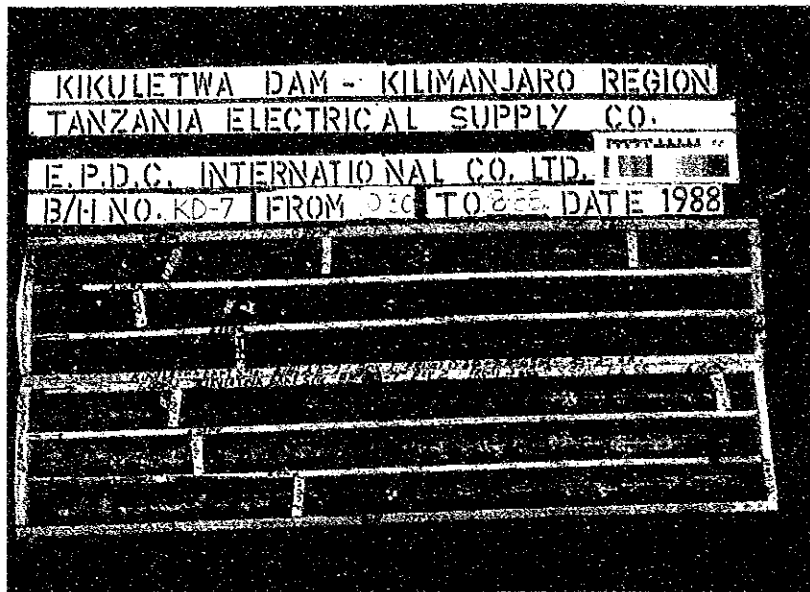


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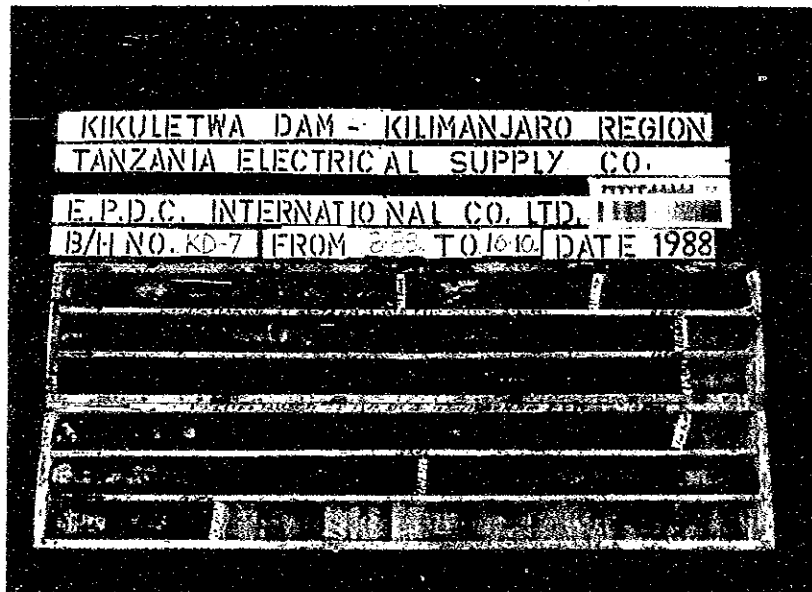




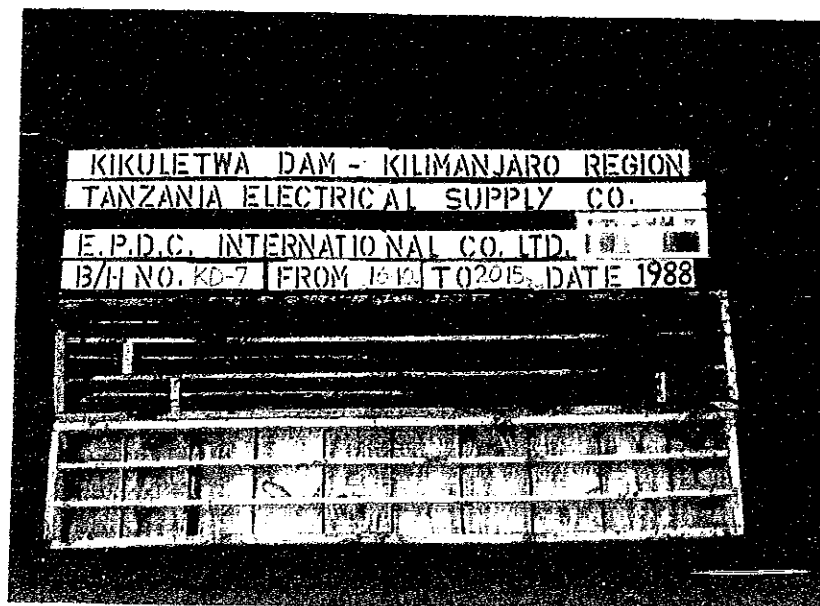
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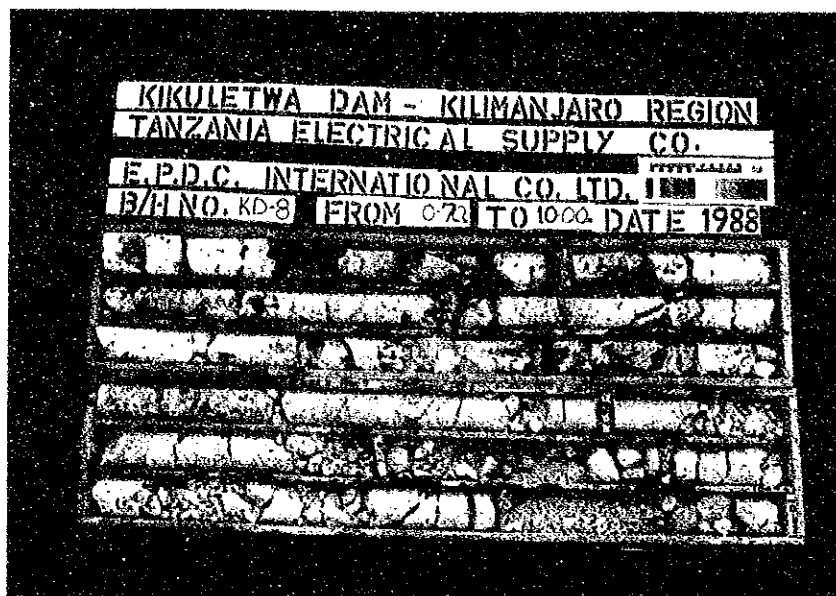
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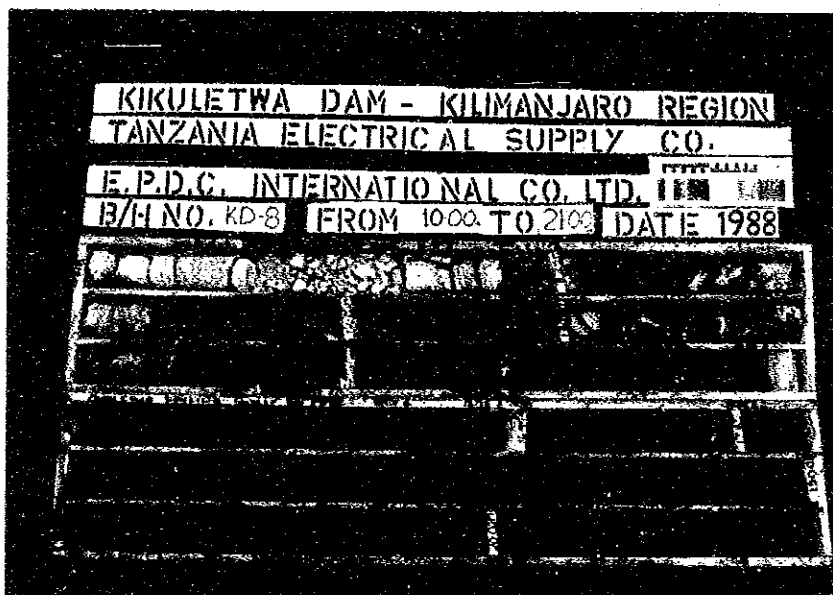
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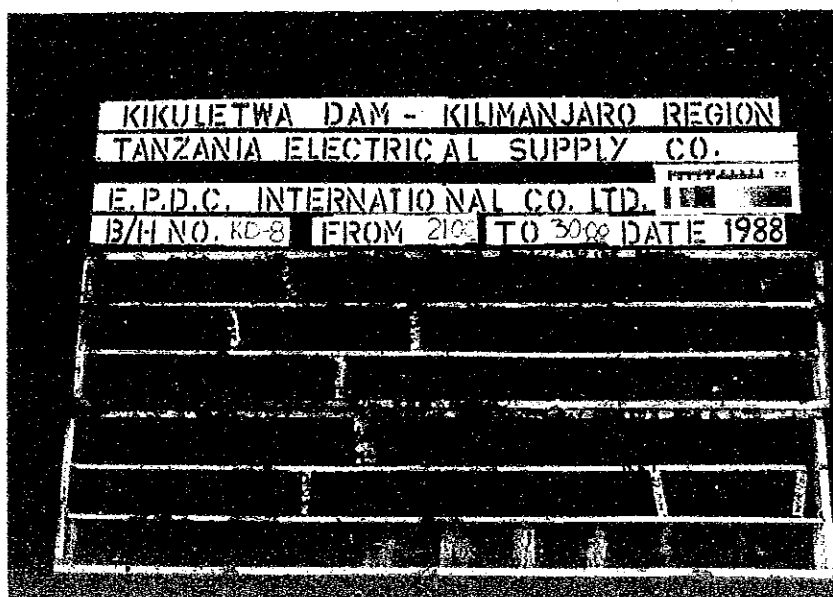
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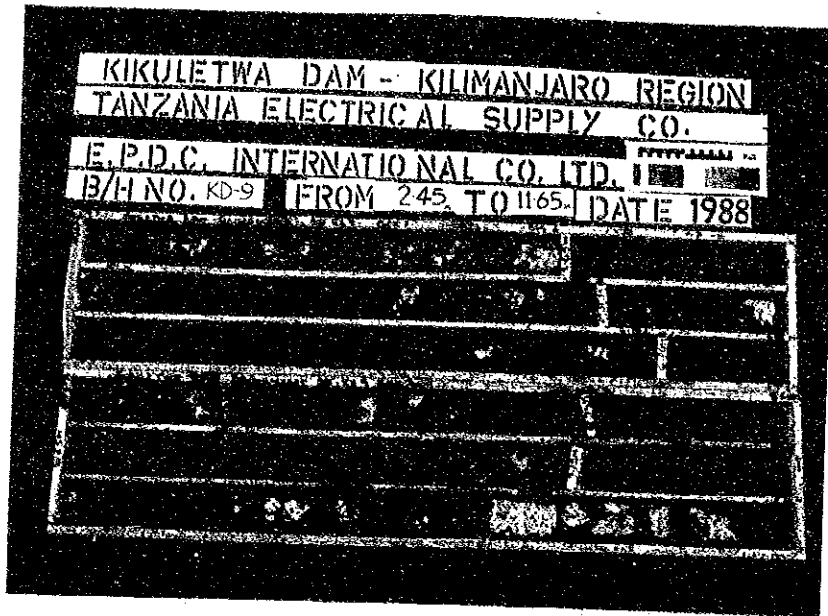
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KD-8



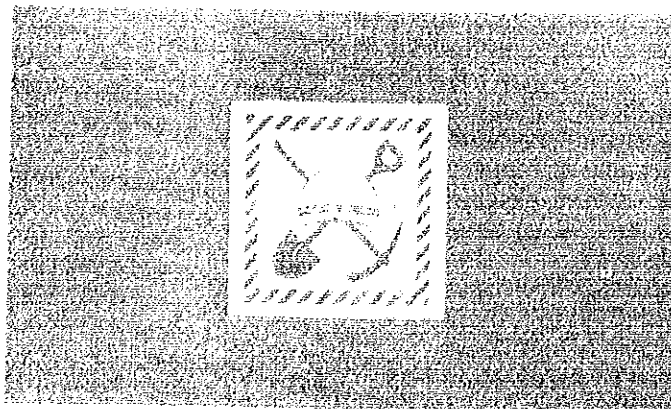
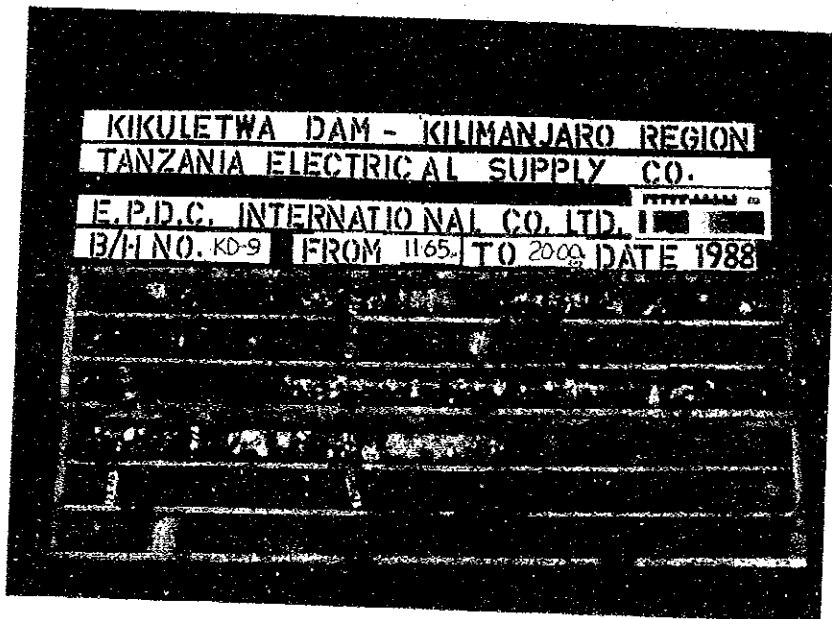
KD-8



KD-9



KD-9



U-1

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