

## C A T A L O G O D E P R E C I O S U N I T A R I O S A L F A B E T I C O

Banco de datos:super

CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
S0020	SUMIDERO TIPO I	UN	MAT. : H.-E.: M. O.: REC. : TOTAL:	6,585.00 0.00 0.00 1,527.72 8,112.72	1,701.39 0.00 0.00 394.73 2,096.12
S0021	SUMIDERO TIPO II	UN	MAT. : H.-E.: M. O.: REC. : TOTAL:	2,150.00 0.00 0.00 498.80 2,648.80	555.56 0.00 0.00 128.89 684.45
S0022	SUMIDERO TIPO III	UN	MAT. : H.-E.: M. O.: REC. : TOTAL:	2,015.00 0.00 0.00 467.48 2,482.48	520.83 0.00 0.00 120.83 641.66
S0025	SUMIDERO TIPO IV	UN	MAT. : H.-E.: M. O.: REC. : TOTAL:	8,466.00 0.00 0.00 1,964.11 10,430.11	2,187.50 0.00 0.00 507.50 2,695.00
S0023	SUMIDERO TIPO R - II	UN	MAT. : H.-E.: M. O.: REC. : TOTAL:	370.00 0.00 0.00 85.84 455.84	95.61 0.00 0.00 22.18 117.79
S0024	SUMIDERO TIPO R-III	UN	MAT. : H.-E.: M. O.: REC. : TOTAL:	393.82 0.00 93.84 234.25 721.91	108.34 0.00 24.33 62.18 194.85
S0026	SUMIDERO TIPO V	UN	MAT. : H.-E.: M. O.: REC. : TOTAL:	2,285.00 0.00 0.00 530.12 2,815.12	590.28 0.00 0.00 136.94 727.22
S0004	SUMIDEROS DE PIEDRA CORTADA	UN	MAT. : H.-E.: M. O.: REC. : TOTAL:	465.56 0.00 97.02 255.73 818.31	126.95 0.00 25.14 67.73 219.82

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CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
T0028	TABURETES DE MADERA RADIO 25 CM ESP.= 2"	PZA	MAT. : H.-E.: M. O.: REC. : TOTAL:	40.25 0.15 12.87 28.97 82.24	10.36 0.04 3.33 7.49 21.22
T0022	TAPA CAMARA DE CONCRETO ARMADO PRECIO POR METRO CUADRADO ESPESOR DE 7 CMS DOSIF 1:2:4	M2	MAT. : H.-E.: M. O.: REC. : TOTAL:	36.13 0.00 13.86 29.49 79.48	9.29 0.00 3.59 7.62 20.50
T0034	TAPA DE HORMIGON ARMADO PARA CANALIZACION DE 1x0.5x0.1 M 1:2:4 REFORZADA CON PERFIL	PZA	MAT. : H.-E.: M. O.: REC. : TOTAL:	47.51 0.00 11.66 28.78 87.95	6.05 0.00 3.01 5.99 15.05
T0035	TAPA DE HORMIGON ARMADO PARA SUMIDERO DE 1x0.5x0.1 M 1:2:4 SIN REFUERZO	PZA	MAT. : H.-E.: M. O.: REC. : TOTAL:	21.97 0.00 6.77 15.40 44.14	5.65 0.00 1.75 3.99 11.39
T0090	TAPA DE HORMIGON ARMADO PARA CAMARA DE 1.00 X 0.50 X 0.10 MTS	PZA	MAT. : H.-E.: M. O.: REC. : TOTAL:	25.60 0.00 16.17 30.57 72.34	6.59 0.00 4.20 7.92 18.71
C1104	TEE DE F.G. DE 3/4" CONEXION	PZA	MAT. : H.-E.: M. O.: REC. : TOTAL:	8.05 0.00 2.70 6.74 17.49	2.08 0.00 0.70 1.75 4.53
U2004	TEE DE P.V.C. DE 3 x 3 x 2" PROVISION Y COLOCACION	PZA	MAT. : H.-E.: M. O.: REC. : TOTAL:	10.00 0.00 15.02 25.18 50.20	2.60 0.00 3.87 6.49 12.96
C1105	TEE, K Y K UNIVERSAL PARA TUBO DE F.G. 1/2" CONEXION	PZA	MAT. : H.-E.: M. O.: REC. : TOTAL:	6.75 0.00 2.70 5.68 15.13	1.74 0.00 0.70 1.48 3.92

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CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
C1106	TEE, K Y K UNIVERSAL PARA TUBO DE CONCRETO DE 4" CONEXION	PZA	MAT. : H.-E.: M. O.: REC. : TOTAL:	8.05 0.00 5.54 10.31 23.90	2.08 0.00 1.44 2.67 6.19
C1107	TEE, K Y K UNIVERSAL PARA TUBO DE CONCRETO DE 6" CONEXION	PZA	MAT. : H.-E.: M. O.: REC. : TOTAL:	10.80 0.00 5.54 10.95 27.29	2.78 0.00 1.44 2.84 7.06
T0100	TENDIDO DE TUBERIA DE P.V.C. DE 2"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	5.38 0.00 0.75 1.53 7.66	1.39 0.00 0.19 0.39 1.97
T0061	TENDIDO DE TUBERIA DE P.V.C. DE 6"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	22.38 0.00 1.50 7.49 31.37	5.79 0.00 0.38 1.93 8.10
T0062	TENDIDO DE TUBERIA DE P.V.C. DE 3"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	7.08 0.00 0.75 2.79 10.62	1.83 0.00 0.19 0.72 2.74
T0060	TENDIDO DE TUBERIA DE P.V.C. DE 4"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	10.28 0.00 1.01 3.92 15.21	2.66 0.00 0.26 1.01 3.93
T0010	TENDIDO DE TUBO PERFORADO DENTRO DE GALERIA PROVISION Y COLOCACION	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	42.33 0.00 15.56 33.51 91.40	10.93 0.00 4.04 8.68 23.65
T0036	TENDIDO TUBERIA ARMCO DE 48"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	298.88 0.00 16.86 95.01 410.75	77.28 0.00 4.35 24.55 106.18

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Banco de datos:super

CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
T0037	TENDIDO TUBERIA ARMCO DE 60"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	470.45 0.00 23.42 144.80 638.67	121.62 0.00 6.05 37.43 165.10
T0067	TENDIDO TUBERIA ARMCO D=48" (SIN PROVISION) (ICA)	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	11.90 0.00 9.15 16.70 37.75	3.07 0.00 2.37 4.32 9.76
T0066	TENDIDO TUBERIA ARMCO SIN MATERIAL	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	0.00 0.00 28.41 43.26 71.67	0.00 0.00 7.33 11.16 18.49
T0065	TENDIDO Y PROVISION DE TUBERIA ARMCO DE 80" DE DIA.	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	515.80 0.00 28.41 162.93 707.14	133.36 0.00 7.33 42.10 182.79
T0101	TENDIDO Y PROVISION DE CANERIA DE F.G. DE 1"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	11.48 0.00 1.50 4.96 17.94	2.99 0.00 0.38 1.27 4.64
T0056	TENDIDO Y PROVISION DE CANERIA DE F.G. DE 2"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	27.43 0.00 1.50 8.66 37.59	7.05 0.00 0.38 2.22 9.65
T0057	TENDIDO Y PROVISION DE CANERIA DE F.G. DE 2 1/2"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	34.58 0.00 1.50 10.32 46.40	8.92 0.00 0.38 2.65 11.95
T0125	TENDIDO Y PROVISION DE MALLA GALVANIZADA DE TRIPLE TORSION 8x10 CM D=2.7 MM	M2	MAT. : H.-E.: M. O.: REC. : TOTAL:	11.50 0.00 0.38 3.25 15.13	2.97 0.00 0.10 0.85 3.92

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Banco de datos:super

CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
T0123	TENDIDO Y PROVISION DE MALLA PARA TALUDES	M2	MAT. : H.-E.: M. O.: REC. : TOTAL:	18.52 0.00 0.60 5.21 24.33	4.78 0.00 0.16 1.35 6.29
T0124	TENDIDO Y PROVISION DE MALLA GALVANIZADA DE TRIPLE TORSION 8x10 CM DIAM=2.4 MM	M2	MAT. : H.-E.: M. O.: REC. : TOTAL:	9.80 0.00 0.38 2.86 13.04	2.54 0.00 0.10 0.75 3.39
T0053	TENDIDO Y PROVISION DE TUB DE FF DE 8"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	85.59 0.00 2.00 22.91 110.50	22.12 0.00 0.51 5.92 28.55
T0055	TENDIDO Y PROVISION DE TUB. DE FF DE 10"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	101.29 0.00 2.51 27.32 131.12	26.17 0.00 0.65 7.06 33.88
T0051	TENDIDO Y PROVISION DE TUB. DE FF DE 3"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	49.83 0.00 1.25 13.47 64.55	12.89 0.00 0.32 3.49 16.70
T0050	TENDIDO Y PROVISION DE TUB. DE FF DE 2"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	26.04 0.00 1.25 7.94 35.23	6.68 0.00 0.32 2.04 9.04
T0054	TENDIDO Y PROVISION DE TUB. DE FF DE 4"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	62.43 0.00 1.50 16.78 80.71	16.17 0.00 0.38 4.33 20.88
T0052	TENDIDO Y PROVISION DE TUB. DE FF DE 6"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	70.10 0.00 2.00 19.31 91.41	18.07 0.00 0.51 4.97 23.55

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Banco de datos:super

CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
T0011	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 6" PERFORADA	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	19.27 0.00 2.77 8.68 30.72	4.97 0.00 0.72 2.25 7.94
T0005	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 10"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	28.10 0.00 5.08 14.25 47.43	7.26 0.00 1.32 3.71 12.29
T0023	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 12"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	38.69 0.00 6.93 19.53 65.15	9.99 0.00 1.80 5.06 16.85
T0040	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 10" DENTRO DE GALERIAS	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	33.14 0.00 10.16 23.15 66.45	8.57 0.00 2.63 5.98 17.18
T0003	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 6"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	14.81 0.00 2.77 7.65 25.23	3.82 0.00 0.72 1.99 6.53
T0013	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 24"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	118.27 0.00 16.93 53.22 188.42	30.56 0.00 4.37 13.75 48.68
T0014	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 40"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	265.00 0.00 26.22 101.39 392.61	68.47 0.00 6.77 26.19 101.43
T0015	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 8" PERFORADA	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	24.06 0.00 3.70 11.22 38.98	6.22 0.00 0.96 2.91 10.09

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CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
T0017	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 10" PERFORADA	ML	MAT. : H.-E. : M. O. : REC. : TOTAL:	33.01 0.00 5.08 15.39 53.48	8.53 0.00 1.32 4.00 13.85
T0018	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 12" PERFORADA	ML	MAT. : H.-E. : M. O. : REC. : TOTAL:	43.56 0.00 6.93 20.66 71.15	11.25 0.00 1.80 5.35 18.40
T0019	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 16" PERFORADA	ML	MAT. : H.-E. : M. O. : REC. : TOTAL:	51.92 0.00 9.50 26.53 87.95	13.43 0.00 2.45 6.84 22.72
T0020	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 18" PERFORADA	ML	MAT. : H.-E. : M. O. : REC. : TOTAL:	66.91 0.00 11.18 32.55 110.64	17.29 0.00 2.89 8.40 28.58
T0025	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 22" PERFORADA	ML	MAT. : H.-E. : M. O. : REC. : TOTAL:	93.59 0.00 15.43 45.20 154.22	24.18 0.00 3.98 11.67 39.83
T0026	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 24" PERFORADA	ML	MAT. : H.-E. : M. O. : REC. : TOTAL:	123.18 0.00 16.93 54.36 194.47	31.83 0.00 4.37 14.04 50.24
T0027	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 28" PERFORADA	ML	MAT. : H.-E. : M. O. : REC. : TOTAL:	148.47 0.00 21.13 66.63 236.23	38.36 0.00 5.46 17.21 61.03
T0033	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 32" PERFORADA	ML	MAT. : H.-E. : M. O. : REC. : TOTAL:	173.44 0.00 21.13 72.42 266.99	44.82 0.00 5.46 18.71 68.99

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CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
T0029	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 40" PERFORADA	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	269.87 0.00 26.22 102.53 398.62	69.73 0.00 6.77 26.48 102.98
T0032	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 48" PERFORADA	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	366.07 0.00 31.98 133.62 531.67	94.59 0.00 8.26 34.52 137.37
T0024	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 18"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	61.99 0.00 11.18 31.41 104.58	16.02 0.00 2.89 8.11 27.02
T0006	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 32"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	167.99 0.00 21.13 71.15 260.27	43.55 0.00 5.46 18.42 67.43
T0009	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 22"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	88.00 0.00 15.43 43.90 147.33	22.74 0.00 3.98 11.34 38.06
T0016	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 16"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	47.07 0.00 9.50 25.39 81.96	12.17 0.00 2.45 6.54 21.16
T0106	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 4"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	11.56 0.00 1.85 5.50 18.91	2.99 0.00 0.48 1.43 4.90
00009	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 12" DENTRO DE GALERIAS	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	39.95 0.00 11.55 26.85 78.35	10.33 0.00 3.00 6.97 20.30



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CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
T0021	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 48"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	361.20 0.00 31.98 132.49 525.67	93.33 0.00 8.26 34.23 135.82
T0004	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 8"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	18.89 0.00 3.70 10.03 32.62	4.87 0.00 0.96 2.60 8.43
T0063	TENDIDO Y PROVISION DE TUBERIA DE CONCRETO DE 28"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	143.93 0.00 21.13 65.57 230.63	37.10 0.00 5.46 16.92 59.48
I0125	TENDIDO Y PROVISION DE TUBO DE F.G. DE 1/2"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	12.14 0.00 2.51 6.64 21.29	3.15 0.00 0.65 1.72 5.52
I0126	TENDIDO Y PROVISION DE TUBO DE F.G. DE 3/4"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	18.44 0.00 2.51 8.10 29.05	4.75 0.00 0.65 2.09 7.49
C0015	TENDIDO Y PROVISION DE TUBO DE F.G. DE 1"	ML	MAT. : H.-E.: M. O.: REC. : TOTAL:	22.24 0.00 2.51 8.99 33.74	5.77 0.00 0.65 2.33 8.75
T0041	TETONES DEMARCADORES DE CARRILES DE CONCRETO INCLUYE TRANSPORTE	PZA	MAT. : H.-E.: M. O.: REC. : TOTAL:	4.16 0.00 0.92 2.43 7.51	1.07 0.00 0.24 0.63 1.94
T0070	TINGLADO PARA CLAROS DE 10 A 1 DE CLARO - CALAMINA # 28	M2	MAT. : H.-E.: M. O.: REC. : TOTAL:	57.71 0.00 12.45 32.34 102.50	14.82 0.00 3.23 8.35 26.40

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CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
T0080	TRACTOR D7	HR	MAT. :	0.00	0.00
			H.-E.:	166.45	43.07
			M. O.:	1.09	0.28
			REC. :	40.20	10.41
			TOTAL:	207.74	53.76
T0002	TRANSPORTE A MENOS DE 100 MTS CON CARRETILLA	M3	MAT. :	0.00	0.00
			H.-E.:	1.10	0.28
			M. O.:	2.25	0.58
			REC. :	3.67	0.96
			TOTAL:	7.02	1.82
T0007	TRANSPORTE A MENOS DE 100 MTS. DENTRO DE GALERIAS CON CARRETILLA	M3	MAT. :	0.00	0.00
			H.-E.:	1.10	0.28
			M. O.:	6.00	1.55
			REC. :	9.40	2.44
			TOTAL:	16.50	4.27
T0039	TRANSPORTE DE AGREGADOS O TIERRA (2000 MT) CARGUIO CON MAQUINARIA	M3	MAT. :	0.00	0.00
			H.-E.:	7.54	1.95
			M. O.:	0.09	0.02
			REC. :	1.89	0.48
			TOTAL:	9.52	2.45
M0904	TRANSPORTE DE AGREGADOS O TIERRA (RADIO URBANO) CARGUIO CON PEON	M3	MAT. :	0.00	0.00
			H.-E.:	9.29	2.40
			M. O.:	2.40	0.62
			REC. :	5.80	1.50
			TOTAL:	17.49	4.52
T0012	TRANSPORTE DE AGREGADOS O TIERRA (RADIO URBANO) CARGUIO CON MAQUINARIA	M3	MAT. :	0.00	0.00
			H.-E.:	10.45	2.70
			M. O.:	0.00	0.00
			REC. :	2.42	0.62
			TOTAL:	12.87	3.32
M0018	TRANSPORTE DE AGREGADOS O TIERRA (1000 M) CARGUIO CON PEON	M3	MAT. :	0.00	0.00
			H.-E.:	8.71	2.25
			M. O.:	3.75	0.97
			REC. :	7.74	2.01
			TOTAL:	20.20	5.23
T0030	TRANSPORTE DE MATERIAL EXCEDENTE EN GALERIAS Y BOVEDAS MAS DE 1000 M.	M3	MAT. :	0.00	0.00
			H.-E.:	17.42	4.50
			M. O.:	3.75	0.97
			REC. :	9.75	2.53
			TOTAL:	30.92	8.00

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CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
E0022	TRANSPORTE DE PIEDRA HASTA 200 METROS A MANO	M3	MAT. : H.-E.: M. O.: REC. : TOTAL:	0.00 0.00 9.75 14.86 24.61	0.00 0.00 2.52 3.84 6.36
E0050	TRANSPORTE DE PIEDRA A 300 METROS A MANO	M3	MAT. : H.-E.: M. O.: REC. : TOTAL:	0.00 0.00 14.63 22.26 36.89	0.00 0.00 3.78 5.76 9.54
00008	TRANSPORTE DE PIEDRA HASTA 100 METROS CON CARRETILLA	M3	MAT. : H.-E.: M. O.: REC. : TOTAL:	0.00 1.10 4.50 7.12 12.72	0.00 0.28 1.16 1.84 3.28
E0080	TRANSPORTE DE PIEDRA A 400 METROS A MANO	M3	MAT. : H.-E.: M. O.: REC. : TOTAL:	0.00 0.00 19.50 29.69 49.19	0.00 0.00 5.04 7.68 12.72
00011	TRANSPORTE DE PIEDRA A 500 MTS A MANO	M3	MAT. : H.-E.: M. O.: REC. : TOTAL:	0.00 0.00 24.00 36.54 60.54	0.00 0.00 6.21 9.45 15.66
T0001	TRANSPORTE HASTA 25 METROS	M3	MAT. : H.-E.: M. O.: REC. : TOTAL:	0.00 0.00 2.25 3.42 5.67	0.00 0.00 0.58 0.88 1.46
T1003	TRANSPORTE MATERIAL BASE	M3KM	MAT. : H.-E.: M. O.: REC. : TOTAL:	0.00 1.51 0.05 0.42 1.98	0.00 0.39 0.01 0.11 0.51
T0031	TRANSPORTE MATERIAL SELECCIO- NADO A 500 M, INCLUYE CARGUIO	M3	MAT. : H.-E.: M. O.: REC. : TOTAL:	0.00 5.81 0.00 1.35 7.16	0.00 1.50 0.00 0.35 1.85

## C A T A L O G O D E P R E C I O S U N I T A R I O S A L F A B E T I C O

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CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
T1002	TRANSPORTE SUB-BASE	M3KM	MAT. :	0.00	0.00
			H.-E.:	1.51	0.39
			M. O.:	0.04	0.01
			REC. :	0.41	0.11
			TOTAL:	1.96	0.51
T2000	TRATAMIENTO BITUMINOSO SUPERFICIAL TRIPLE	M2	MAT. :	13.06	3.34
			H.-E.:	15.54	4.02
			M. O.:	1.36	0.35
			REC. :	8.72	2.25
			TOTAL:	38.68	9.96
T1000	TRATAMIENTO BITUMINOSO SUPERFICIAL SIMPLE	M2	MAT. :	5.36	1.37
			H.-E.:	6.47	1.68
			M. O.:	0.38	0.10
			REC. :	3.32	0.87
			TOTAL:	15.53	4.02
T0064	TUBOS DE 2" REPOSICION PARA MALLA OLIMPICA	PZA	MAT. :	61.25	15.73
			H.-E.:	0.00	0.00
			M. O.:	0.80	0.21
			REC. :	15.43	3.97
			TOTAL:	77.48	19.91
T0042	TUBOS DE VENTILACION	PZA	MAT. :	259.40	66.97
			H.-E.:	326.40	84.00
			M. O.:	120.12	30.96
			REC. :	318.80	82.16
			TOTAL:	1,024.72	264.09
U2002	UNION UNIVERSAL DE F.G. DE 3" CONEXION	PZA	MAT. :	39.00	10.08
			H.-E.:	0.00	0.00
			M. O.:	12.52	3.23
			REC. :	28.12	7.25
			TOTAL:	79.64	20.56
U2001	VALVULA DE PASO DE B.R. DE 4" (COLOCACION Y PROVISION)	PZA	MAT. :	309.60	80.00
			H.-E.:	0.00	0.00
			M. O.:	12.52	3.23
			REC. :	90.90	23.47
			TOTAL:	413.02	106.70
U2005	VALVULA DE PASO DE BRONCE DE 3" PROVISION Y COLOCACION	PZA	MAT. :	232.20	60.00
			H.-E.:	0.00	0.00
			M. O.:	15.02	3.87
			REC. :	76.73	19.81
			TOTAL:	323.95	83.68

## C A T A L O G O D E P R E C I O S U N I T A R I O S A L F A B E T I C O

Banco de datos:super

CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
U2000	VALVULA DE PASO DE BRONCE DE 6" - COLOCACION	PZA	MAT. : H.-E.: M. O.: REC. : TOTAL:	387.00 0.00 15.02 112.65 514.67	100.00 0.00 3.87 29.09 132.96
V0001	VENTANA DE MADERA MARA DE 2" INCLUYE VIDRIO DOBLE COLOCADO EN OBRA	M2	MAT. : H.-E.: M. O.: REC. : TOTAL:	69.30 12.53 20.33 49.95 152.11	17.98 3.23 5.24 12.90 39.35
V0002	VENTANA METALICA INCLUYE VIDRIO DOBLE COLOCADO EN OBRA	M2	MAT. : H.-E.: M. O.: REC. : TOTAL:	112.76 0.15 11.84 44.22 168.97	29.17 0.04 3.06 11.43 43.70
L0006	VIDRIOS SIMPLES COLOCACION Y PROVISION	M2	MAT. : H.-E.: M. O.: REC. : TOTAL:	25.22 0.00 2.35 11.10 38.67	6.51 0.00 0.60 2.86 9.97
V0022	VIDRIOS TRANSPARENTES DOBLES PROVISION Y COLOCACION	M2	MAT. : H.-E.: M. O.: REC. : TOTAL:	29.10 0.00 2.35 10.33 41.78	7.57 0.00 0.60 2.68 10.85
V0021	VIDRIOS TRANSPARENTES TRIPLES PROVISION Y COLOCACION	M2	MAT. : H.-E.: M. O.: REC. : TOTAL:	39.39 0.00 2.35 12.71 54.45	10.19 0.00 0.60 3.28 14.07
V0029	VIGAS DE MADERA MARA	P2	MAT. : H.-E.: M. O.: REC. : TOTAL:	3.56 0.01 0.93 2.25 6.75	0.93 0.00 0.24 0.58 1.75
V0026	VIGAS DE MADERA MARA O ROBLE BARNIZADAS DE 2" x 6"	NL	MAT. : H.-E.: M. O.: REC. : TOTAL:	13.01 0.06 0.93 4.46 18.46	3.38 0.02 0.24 1.16 4.80

## C A T A L O G O D E P R E C I O S U N I T A R I O S A L F A B E T I C O

Banco de datos:super

CLAVE	CONCEPTO:	UNIDAD	RUBRO	COSTO EN Bs	COSTO EN \$us
G0001	ZOCALO DE CEMENTO-ARENA	M2	MAT. :	4.06	1.05
			H.-E.:	0.00	0.00
			M. O.:	7.31	1.90
			REC. :	12.07	3.14
			TOTAL:	23.44	6.09
Z0007	ZOCALO DE MADERA	ML	MAT. :	4.20	1.08
			H.-E.:	0.00	0.00
			M. O.:	1.85	0.47
			REC. :	3.80	0.96
			TOTAL:	9.85	2.51
Z0002	ZOCALO DE MOSAICO GRANITICO	ML	MAT. :	12.43	3.19
			H.-E.:	0.00	0.00
			M. O.:	3.23	0.84
			REC. :	7.79	2.02
			TOTAL:	23.45	6.05



#### **4. RESULT OF THE EXPERIMENTAL STUDY ON THE ACTIVATED SLUDGE PROCESS**



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La Paz -- Bolivia

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EXPERIMENTAL STUDY ON THE ACTIVATED SLUDGE PROCESS  
(FINAL REPORT)

1. INTRODUCTION.

This is the final report for the study on the activated sludge process to examined the effeccts and results obtained in a plant running at high altitude, city of La Paz - Bolivia, 3600 meters over sea level, according to MEMEORANDUM of December 2, 1992 from Mr. A. Takechi.

2. RECONSTRUCTION AND MODIFIES INTRODUCED TO THE PILOT PLANT.

The clear acrylic tank was modified to the shape shown in the copy attached, according to MEMORANDUM MEM-4.

The aireation tank was ready to use by December 10.

The schedule, characteristics of the study, parameters to be tested and sample points are shown in table NQ 1.

3. ACCLIMATION.

a) This process started on December 10, using waste water from Choqueyapu river at the bridge of Av. del ejercito (point R-5 for the JICA mission), according to the refered MEMO.

The sample was taken every 12 hours to start running of the plant.

The quantity of air was kept in such a way that all the suspended solids were suspended in the liquid.

This process of acclimation last at the fourth day of aireation (December 14) when we could see biological mass start growing.

4. CONDITIONS A.1.

This conditions started on December 14 until December 19. The volume of the aireation tank is 62.5 liters, so to keep a retention time of 5 days the influent flw was adjusted to 8.68 l/min and the temperature constant at 20°C.

Table NQ 2 shows the results obtained under this conditions, with the following conclutions:

- Efficiency for BOD = 88% (as an average)
- Efficiency for BODs = 89% (as an average)
- Efficiency for VSS = 47% (as an average)
- Content of DO = 4.8 mg/l (as an average)
- pH = 8.14 (as an average)

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- Samples taken every 12 hrs/day at Choqueyapu river (briddge of Av. del Ejercito).

#### 5. CONDITIONS A.2.

This conditions started on December 20 until December 24, with a retention time of 4 days, the influent flow was adjusted to 10.85 l/min.

Table NQ 3, shows the results and the following conclutions can be done:

- Efficiency for BOD = 92.5% (as an average)
- Efficiency for BODs = 94% (as an average)
- Efficiency for VSS = 56% (as an average)
- Content of DO = 4.28 mg/l (as an average)
- pH = 7.91 (as an average)
- Samples from Choqueyapu river also (same point).

#### 6. CONDITIONS A.3.

The plant was restarted on January 1993 from 8 to 11 the acclimation and the new conditions were established on January 12 to January 15 with 3 days of retention time, with a flow of 14.47 l/min.

Table NQ 4 shows the results and the following conclusion can be done:

- Efficiency for BOD = 90.4% (as an average)
- Efficiency for BODs = 89.6% (as an average)
- Efficiency for VSS = 54.8% (as an average)
- Content of DO = 4.97 mg/l (as an average)
- pH = 8.05 (as an average)
- Samples from Choqueyapu river also (same point).

#### 7. CONDITIONS A.4.

For a detention time of 2 days, the flow has been adjusted to 21.7 l/min. Table NQ 5 shows the results and the following conclutions can be done:

- Efficiency for BOD = 78.82% (as an average)
- Efficiency for BODs = 80.00% (as an average)
- Efficiency for VSS = 46.82% (as an average)
- Content of DO = 5.30 mg/l (as an average)
- pH = 8.16 (as an average)
- Samples from Choqueyapu river also (same point).

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8. CONDITIONS A.5.

For a detention time of 1 day, the flow has been adjusted to 43.4 l/min and the following conclusions can be done:

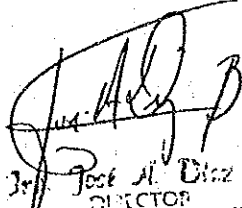
- Efficiency for BOD = 23.5% (as an average)
- Efficiency for BODs = 87.5% (as an average)
- Efficiency for VSS = 65.6% (as an average)
- Content of DO = 5.15 mg/l (as an average)
- pH = 8.01 (as an average)
- Samples from Choqueyapu river also (same point).

9. FINAL CONCLUSIONS.

From the results obtained in the tables we can conclude the following:

- The higher detention time the better efficiency obtained in BOD removal.
- The DO contents in the aeration tank kept all the time is high (the lowest figure is 4.28 mg/l).
- The volatile suspended solids removal is around 50% for all conditions.
- Temperature and pH can be considered constant both: 20°C and 8.0 respectively.
- BODs and BOD removal goes in the same way except in the last conditions for 1 day. The reason for this, is that the experiment has been carried out in rainy time.

La Paz, February 15, 1993.

  
Dr. José A. Díaz R.  
DIRECTOR  
INSTITUTO DE INGENIERIA SANTARIA  
UNIVERSIDAD BOLIVIANA

HAM/JICA  
THE STUDY ON CONTROL OF WATER CONTAMINATION OF THE RIVERS  
IN THE CITY OF LA PAZ

MEMORANDUM

TO : Ing. Jose A. Diaz B., IIS, U.M.S.A.  
FROM : A. Takechi  
DATE : December 2, 1992  
REF. NO : MEM-4  
SUBJECT : Revised Schedule of the Experiment

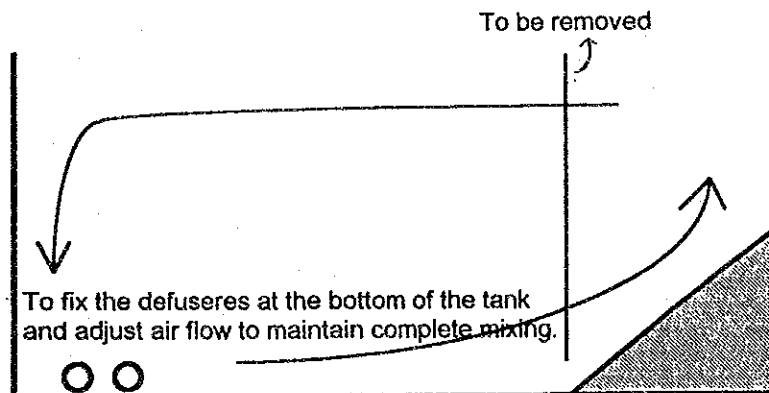
Sample: Choqueyapu river water

Detention time: 1, 2, 3, 4 and 5 days (start from 5 day detention time)

Water quality analysis: Once every day

Inlet: BOD, soluble BOD, SS  
outlet: BOD, soluble BOD, VSS (SS)

Temp. 20°C



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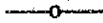


TABLE No. 1.

SCHEDULE AND CHARACTERISTICS OF THE EXPERIMENTAL  
 STUDY ON THE ACTIVATED SLUDGE PROCESS  
 (SECOND PART)

VOLUME OF THE TANK = 62.5 LITERS

No	NAME	CHARACTERISTICS		
		T(days)	Q(l/min)	start day
1	A.1	5	8.68	Dec. 14, 92
2	A.2	4	10.85	Dec. 20, 92
3	A.3	3	14.47	Jan. 12, 93
4	A.4	2	21.7	Jan. 17, 93
5	A.5	1	43.4	Jan. 20, 93

PARAMETERS AND SAMPLE POINTS

PARAMETERS	SAMPLE POINT		
	INLET	TANK	OUTLET
To		*	
pH		*	
DO		*	
TSS	*	*	*
FSS	*	*	*
VSS	*	*	*
BOD	*		*
soluble BOD	*		*
Flow	*		*

TABLE No 2.

RESULTS OF THE EXPERIMENTAL STUDY ON THE ACTIVATED SLUDGE PROCESS  
(SECOND PART)

CHARACTERISTICS: A.1

START DATE: December, 14 1962

PARAMETER	1			2			3			4			5			
	I	T	O	I	T	O	I	T	O	I	T	O	I	T	O	
To		20.00			19.90			20.10		20.50		20.10		20.10		
pH		7.96			8.11			8.17		8.25		8.17		8.22		
DO (mg/l)		4.40			4.90			4.90		5.00		4.90		4.90		
TSS (mg/l)	101.00	114.00	41.00	98.00	98.00	58.00	116.00	28.00	48.00	59.00	59.00	48.00	30.00	30.00	19.00	
FSS (mg/l)	47.00	50.00	11.00	28.00	44.00	27.00	66.00	16.00	23.00	27.00	27.00	23.00	17.00	11.00	7.00	6.00
VSS (mg/l)	54.00	64.00	30.00	69.00	50.00	29.00	50.00	12.00	23.00	32.00	32.00	18.00	18.00	19.00	15.00	13.00
BOD (mg/l)	80.00		18.00	84.00		7.50	90.00		6.00	51.00	51.00	3.00	28.00	28.00	6.00	6.00
BOD <sub>5</sub> (mg/l)	60.00		6.00	73.00		6.00	78.00		7.50	34.00	34.00	3.00	21.00	21.00	4.00	4.00
Q <sub>1</sub> (l/min)	8.55			8.90			8.60			9.00				8.90		

I = INLET  
T = TANK  
O = OUTLET

TABLE No 3.

RESULTS OF THE EXPERIMENTAL STUDY ON THE ACTIVATED SLUDGE PROCESS  
(SECOND PART)

CHARACTERISTICS: A.2

START DATE: December, 20 1962

PARAMETER	1		2		3		4	
	I	O	I	O	I	O	I	O
T <sub>o</sub>		20.60		20.60		20.60		20.60
pH		8.02		7.92		7.80		7.90
DO (mg/l)		4.20		4.10		4.20		4.60
TSS (mg/l)	57.00	22.00	54.00	56.00	63.00	24.00	66.00	46.00
FSS (mg/l)	13.00	9.00	12.00	24.00	41.00	4.00	22.00	15.00
VSS (mg/l)	44.00	13.00	42.00	32.00	22.00	20.00	44.00	31.00
BOD (mg/l)	182.00	10.00	120.00		114.00		116.00	6.00
BOD <sub>5</sub> (mg/l)	128.00	12.00	105.00		102.00			
Q (l/min)	10.80		10.80		11.00		11.00	

I = INLET  
T = TANK  
O = OUTLET

TABLE No 4. RESULTS OF THE EXPERIMENTAL STUDY ON THE ACTIVATED SLUDGE PROCESS  
(SECOND PART)

CHARACTERISTICS: A.3

START DATE: January, 12 1993

PARAMETER	1			2			3		
	I	T	O	I	T	O	I	T	O
To		19.20			20.60			19.80	
pH		7.93			8.13			8.10	
DO (mg/l)		5.00			5.10			4.80	
TSS (mg/l)	25.00	25.00	40.00	89.00	44.00	28.00	90.00	52.00	42.00
FSS (mg/l)	5.00	9.00	12.00	44.00	17.00	8.00	40.00	24.00	19.00
VSS (mg/l)	20.00	16.00	28.00	45.00	27.00	20.00	50.00	28.00	23.00
BOD (mg/l)	54.00		6.00	30.00		2.00	33.00		3.60
BODs (mg/l)	34.00		4.80	30.00		2.00	25.00		
Q (l/min)	14.50			15.00			14.00		

I = INLET

T = TANK

O = OUTLET



TABLE NO 5.

RESULTS OF THE EXPERIMENTAL STUDY ON THE ACTIVATED SLUDGE PROCESS  
(SECOND PART)

CHARACTERISTICS: A.4

START DATE: January, 17 1993

PARAMETER	1			2		
	I	T	O	I	T	O
To		19.50			20.30	
pH		8.21			8.10	
DO (mg/l)		5.45			5.15	
TSS (mg/l)	83.00	23.00	34.00	73.00	28.00	47.00
FSS (mg/l)	52.00	12.00	17.00	40.00	16.00	30.00
VSS (mg/l)	31.00	11.00	17.00	39.00	12.00	17.00
BOD (mg/l)	18.00		-	17.00		3.60
BODs (mg/l)	13.00		-	15.00		3.00
Q (l/min)	22.00			21.60		21.60

I = INLET

T = TANK

O = OUTLET

TABLE No 6.

RESULTS OF THE EXPERIMENTAL STUDY ON THE  
ACTIVATED SLUDGE  
(SECOND PART)

CHARACTERISTICS: A.5 START DATE: January 20, 1993

PARAMETER	1		
	I	T	O
To		19.90	
pH		8.01	
DO (mg/l)		5.15	
TSS (mg/l)	94.00	28.00	29.00
FSS (mg/l)	62.00	17.00	18.00
VSS (mg/l)	32.00	11.00	11.00
BOD (mg/l)	34.00		26.00
BODs (mg/l)	24.00		3.00
Q (l/min)	43.00		

I = INLET  
T = TANK  
O = OUTLET

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