



UNIVERSIDAD CATÓLICA SANTO TORIBIO DE MOGROVEJO
ESCUELA PROFESIONAL DE INGENIERÍA CIVIL AMBIENTAL
FACULTAD DE INGENIERÍA

DATOS GENERALES:

DISEÑO: DISEÑO HIDRÁULICO Y DIMENSIONAMIENTO

FECHA: Jun-18

TESISTA: MIKEY CARPIO DAVILA

CICLO: 2018 - I

TESIS: MEJORAMIENTO Y AMPLIACIÓN DEL SISTEMA DE AGUA POTABLE Y ALCANTARILLADO PARA LA ZONA URBANA DEL DISTRITO DE QUEROCOTO, PROVINCIA DE CHOTA, CAJAMARCA, 2017.

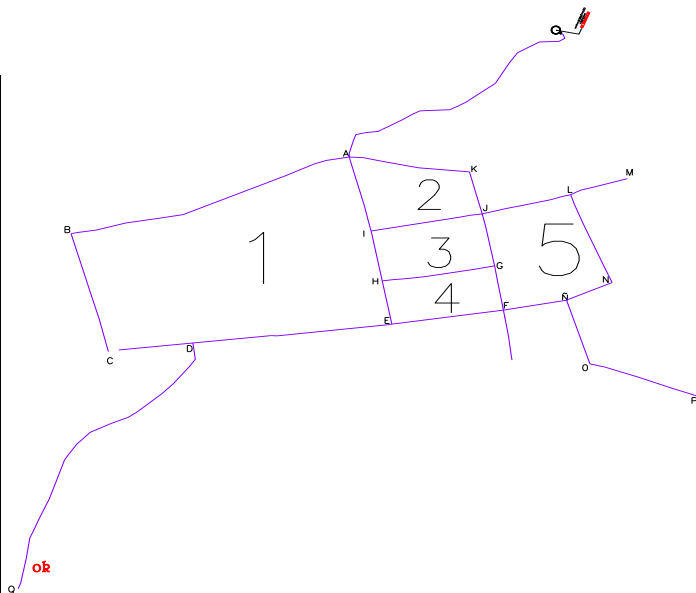
UBICACIÓN: DISTRITO DE QUEROCOTO, PROVINCIA DE CHOTA, CAJAMARCA

MEMORIA DE CALCULO HIDRÁULICO DE LA RED DE DISTRIBUCIÓN ZONA CENTRAL QUEROCOTO-MÉTODO HARDY CROSS

DATOS:

Cons.Max.Hor. (Q_{mh})= 4.59 l/s
Cons.Unitario. (Q_{unit})= 0.002507 l/s/m

TRAMO	LONGITUD "m"	GASROS X TRAMO
RES-A	204.934	
AB	212.94	0.534 l/s
BC	102.83	0.258 l/s
CD	61.597	0.154 l/s
DQ	257.213	0.645 l/s
DE	144.775	0.363 l/s
EF	81.465	0.204 l/s
EH	37.033	0.093 l/s
FG	37.701	0.095 l/s
FN	46.444	0.116 l/s
FR	42.564	0.106 l/s
GH	82.193	0.206 l/s
GJ	44.533	0.112 l/s
HI	43.181	0.108 l/s
IA	64.133	0.161 l/s
IJ	81.598	0.205 l/s
JK	36.497	0.091 l/s
JL	66.036	0.166 l/s
LM	43.069	0.108 l/s
LN	79.729	0.200 l/s
NN	36.232	0.091 l/s
NO	56.297	0.141 l/s
OP	85.432	0.214 l/s
AK	87.716	0.220 l/s
TOTAL	1831.01 m	4.59 l/s



CIRCUITO	TRAMO "m"	LONG.	D	Q1	hf	Hf	Hf/Q1	Var Q	Otro	Q1
1	2	3	4	5	6	7	8	9	10	11
1	AB	212.94	4	-2.00 l/s	-0.78 l/s	-0.17 l/s	0.08 l/s	0.76 l/s		-1.24 l/s
	BC	102.83	4	-2.00 l/s	-0.78 l/s	-0.08 l/s	0.04 l/s	0.76 l/s		-1.24 l/s
	CD	61.597	2	-2.00 l/s	-22.84 l/s	-1.41 l/s	0.70 l/s	0.76 l/s		-1.24 l/s
	DE	144.775	2	-0.41 l/s	-1.21 l/s	-0.18 l/s	0.43 l/s	0.76 l/s		0.35 l/s
	EH	37.033	4	0.34 l/s	0.03 l/s	0.00 l/s	0.00 l/s	0.76 l/s	0.04 l/s	1.14 l/s
	HI	43.181	4	0.59 l/s	0.08 l/s	0.00 l/s	0.01 l/s	0.76 l/s	0.00 l/s	1.35 l/s
2	AI	64.133	4	1.09 l/s	0.25 l/s	0.02 l/s	0.02 l/s	0.76 l/s	0.31 l/s	2.16 l/s
	IA	64.133	4	-1.09 l/s	-0.25 l/s	-0.02 l/s	0.02 l/s	-0.31 l/s	-0.76 l/s	-2.16 l/s
	IJ	81.598	4	-0.50 l/s	-0.06 l/s	0.00 l/s	0.01 l/s	-0.31 l/s	0.00 l/s	-0.81 l/s
	JK	36.497	4	1.50 l/s	0.46 l/s	0.02 l/s	0.01 l/s	-0.31 l/s		1.19 l/s
3	AK	87.716	4	1.50 l/s	0.46 l/s	0.04 l/s	0.03 l/s	-0.31 l/s		1.19 l/s
	HI	43.181	4	-0.59 l/s	-0.08 l/s	0.00 l/s	0.01 l/s	0.00 l/s	-0.76 l/s	-1.35 l/s
	GH	82.193	4	-0.25 l/s	-0.02 l/s	0.00 l/s	0.01 l/s	0.00 l/s	0.04 l/s	-0.21 l/s
	GJ	44.533	4	1.00 l/s	0.22 l/s	0.01 l/s	0.01 l/s	0.00 l/s	-0.14 l/s	0.86 l/s
4	IJ	81.598	4	-0.50 l/s	-0.06 l/s	0.00 l/s	0.01 l/s	0.00 l/s	0.31 l/s	-0.19 l/s
	EF	81.465	4	-0.75 l/s	-0.13 l/s	-0.01 l/s	0.01 l/s	-0.04 l/s		-0.79 l/s
	EH	37.033	4	-0.34 l/s	-0.03 l/s	0.00 l/s	0.00 l/s	-0.04 l/s	-0.76 l/s	-1.14 l/s
	FG	37.701	4	1.25 l/s	0.33 l/s	0.01 l/s	0.01 l/s	-0.04 l/s	-0.14 l/s	1.07 l/s
5	GH	82.193	4	0.25 l/s	0.02 l/s	0.00 l/s	0.01 l/s	-0.04 l/s	0.00 l/s	0.21 l/s
	FG	37.701	4	-1.25 l/s	-0.33 l/s	-0.01 l/s	0.01 l/s	0.14 l/s	0.04 l/s	-1.07 l/s
	GJ	44.533	4	-1.00 l/s	-0.22 l/s	-0.01 l/s	0.01 l/s	0.14 l/s	0.00 l/s	-0.86 l/s
	JL	66.036	4	1.00 l/s	0.22 l/s	0.01 l/s	0.01 l/s	0.14 l/s		1.14 l/s
	LN	79.729	4	0.73 l/s	0.12 l/s	0.01 l/s	0.01 l/s	0.14 l/s		0.87 l/s
	FN	46.444	4	-1.59 l/s	-0.52 l/s	-0.02 l/s	0.02 l/s	0.14 l/s		-1.45 l/s
5	NN	36.232	4	0.73 l/s	0.12 l/s	0.00 l/s	0.01 l/s	0.14 l/s		0.87 l/s
						-0.02 l/s	0.07 l/s			

SE HIZO ITERACIONES CON LA FINALIDAD DE CORREGIR Y/O AJUSTAR LOS CAUDALES EN CADA CIRCUITO, EL CUAL DESPUES DE 9 ITERACIONES EN ADELANTE EL CAUDAL SE VUELVE CONSTANTE, Y LAS VARIACIONES SON MULTIPLOS DE 000. UNA VEZ CORREGIDOS LOS CAUDALES Q (l/s), SE PROCEDE A CALCULAR LAS VELOCIDADES Y PRESIONES EN EL CIRCUITO. **VER CUADRO RESUMEN N° 1.**

ITERACIÓN 8						ITERACIÓN 9					
hf	Hf	Hf/Q1	Var Q	Otro Circuito	Q2 "l/s"	hf	Hf	Hf/Q1	Var Q	Otro Circuito	Q2 "l/s"
*	78	79	80	*	81	*	82	83	84	*	85
-0.21 l/s	-0.04 l/s	0.05 l/s	0.00 l/s		-0.98 l/s	-0.21 l/s	-0.04 l/s	0.05 l/s	0.00 l/s		-0.98 l/s
-0.21 l/s	-0.02 l/s	0.02 l/s	0.00 l/s		-0.98 l/s	-0.21 l/s	-0.02 l/s	0.02 l/s	0.00 l/s		-0.98 l/s
-6.10 l/s	-0.38 l/s	0.38 l/s	0.00 l/s		-0.98 l/s	-6.10 l/s	-0.38 l/s	0.38 l/s	0.00 l/s		-0.98 l/s
2.54 l/s	0.37 l/s	0.60 l/s	0.00 l/s		0.61 l/s	2.54 l/s	0.37 l/s	0.60 l/s	0.00 l/s		0.61 l/s
0.25 l/s	0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	1.08 l/s	0.25 l/s	0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	1.08 l/s
0.29 l/s	0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	1.18 l/s	0.29 l/s	0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	1.18 l/s
0.80 l/s	0.05 l/s	0.03 l/s	0.00 l/s	0.00 l/s	2.02 l/s	0.80 l/s	0.05 l/s	0.03 l/s	0.00 l/s	0.00 l/s	2.02 l/s
	0.00 l/s	1.10 l/s					0.00 l/s	1.10 l/s			
-0.80 l/s	-0.05 l/s	0.03 l/s	0.00 l/s	0.00 l/s	-2.02 l/s	-0.80 l/s	-0.05 l/s	0.03 l/s	0.00 l/s	0.00 l/s	-2.02 l/s
-0.16 l/s	-0.01 l/s	0.02 l/s	0.00 l/s	0.00 l/s	-0.84 l/s	-0.16 l/s	-0.01 l/s	0.02 l/s	0.00 l/s	0.00 l/s	-0.84 l/s
0.51 l/s	0.02 l/s	0.01 l/s	0.00 l/s		1.59 l/s	0.51 l/s	0.02 l/s	0.01 l/s	0.00 l/s		1.59 l/s
0.51 l/s	0.05 l/s	0.03 l/s	0.00 l/s		1.59 l/s	0.51 l/s	0.05 l/s	0.03 l/s	0.00 l/s		1.59 l/s
	0.00 l/s	0.08 l/s					0.00 l/s	0.08 l/s			
-0.29 l/s	-0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	-1.18 l/s	-0.29 l/s	-0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	-1.18 l/s
0.00 l/s	0.00 l/s	0.00 l/s	0.00 l/s	0.00 l/s	-0.10 l/s	0.00 l/s	0.00 l/s	0.00 l/s	0.00 l/s	0.00 l/s	-0.10 l/s
0.30 l/s	0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	1.20 l/s	0.30 l/s	0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	1.20 l/s
-0.01 l/s	0.00 l/s	0.00 l/s	0.00 l/s	0.00 l/s	-0.16 l/s	-0.01 l/s	0.00 l/s	0.00 l/s	0.00 l/s	0.00 l/s	-0.16 l/s
	0.00 l/s	0.03 l/s					0.00 l/s	0.03 l/s			
-0.05 l/s	0.00 l/s	0.01 l/s	0.00 l/s		-0.47 l/s	-0.05 l/s	0.00 l/s	0.01 l/s	0.00 l/s		-0.47 l/s
-0.25 l/s	-0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	-1.08 l/s	-0.25 l/s	-0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	-1.08 l/s
0.35 l/s	0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	1.30 l/s	0.35 l/s	0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	1.30 l/s
0.00 l/s	0.00 l/s	0.00 l/s	0.00 l/s	0.00 l/s	0.10 l/s	0.00 l/s	0.00 l/s	0.00 l/s	0.00 l/s	0.00 l/s	0.10 l/s
	0.00 l/s	0.03 l/s					0.00 l/s	0.03 l/s			
-0.35 l/s	-0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	-1.30 l/s	-0.35 l/s	-0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	-1.30 l/s
-0.30 l/s	-0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	-1.20 l/s	-0.30 l/s	-0.01 l/s	0.01 l/s	0.00 l/s	0.00 l/s	-1.20 l/s
0.32 l/s	0.02 l/s	0.02 l/s	0.00 l/s		1.24 l/s	0.32 l/s	0.02 l/s	0.02 l/s	0.00 l/s		1.24 l/s
0.20 l/s	0.02 l/s	0.02 l/s	0.00 l/s		0.96 l/s	0.20 l/s	0.02 l/s	0.02 l/s	0.00 l/s		0.96 l/s
-0.38 l/s	-0.02 l/s	0.01 l/s	0.00 l/s		-1.36 l/s	-0.38 l/s	-0.02 l/s	0.01 l/s	0.00 l/s		-1.36 l/s
0.20 l/s	0.01 l/s	0.01 l/s	0.00 l/s		0.96 l/s	0.20 l/s	0.01 l/s	0.01 l/s	0.00 l/s		0.96 l/s
	0.00 l/s	0.08 l/s					0.00 l/s	0.08 l/s			

CUADRO N° 1: RESUMEN DEL CALCULO HIDRÁULICO DE LA RED DE DISTRIBUCIÓN ZONA CENTRAL QUEROCOTO-MÉTODO HARDY CROSS

TRAMO "m" (1)	GASTO		LONGITUD "m" (4)	DIAMETR O "Pulg" (5)	VELOCID A "m/s" (6)	PERD.CARGA		COTA.		COTA DEL TERRENO		PRESIÓN	
	TRAMO (2)	Qmd "l/s" (3)				UNI "o/oo" (7)	TRAMO "m" (8)	INICIAL (9)	FINAL (10)	INICIAL (11)	FINAL (12)	INICIAL (13)	FINAL (14)
TRAMO "m" (1)	GASTO		LONGITUD "m" (4)	DIAMETR O "Pulg" (5)	VELOCID A "m/s" (6)	PERD.CARGA		COTA.		COTA DEL TERRENO		PRESIÓN	
TRAMO (2)	Qmd "l/s" (3)	UNI "o/oo" (7)				TRAMO "m" (8)	INICIAL (9)	FINAL (10)	INICIAL (11)	FINAL (12)	INICIAL (13)	FINAL (14)	
RES-CRP	*****	4.59 l/s	166.220	4	0.6	3.643	0.605	2480.810	2480.205	2480.81	2463.98	0.000	16.22
CRP-A	*****	4.59 l/s	38.730	4	0.6	3.643	0.141	2463.980	2463.839	2463.98	2453.60	0.000	10.24
AB	*****	0.98 l/s	212.940	4	0.1	0.209	0.045	2463.839	2463.630	2453.6	2448.92	10.239	14.71
BC	*****	0.98 l/s	102.830	4	0.1	0.209	0.092	2463.630	2463.608	2448.92	2432.15	14.710	31.46
CD	*****	0.98 l/s	61.597	2	0.5	6.102	0.376	2463.608	2463.232	2432.15	2429.56	31.458	33.67
DE	*****	0.61 l/s	144.775	2	0.3	2.545	0.368	2463.232	2462.864	2429.56	2428.20	33.672	34.66
EH	*****	1.08 l/s	37.033	4	0.1	0.249	0.009	2462.864	2462.855	2428.2	2431.87	34.664	30.98
HI	*****	1.18 l/s	43.181	4	0.1	0.293	0.013	2462.855	2462.842	2438.5	2438.50	24.355	24.34
AI	*****	2.02 l/s	64.133	4	0.2	0.796	0.051	2463.839	2463.788	2453.6	2438.50	10.239	25.29
IJ	*****	0.84 l/s	81.598	4	0.1	0.158	0.013	2463.788	2463.775	2438.5	2437.63	25.288	26.14
JK	*****	1.59 l/s	36.497	4	0.2	0.514	0.019	2463.775	2463.756	2437.63	2442.07	26.145	21.69
AK	*****	1.59 l/s	87.716	4	0.2	0.514	0.045	2463.839	2463.794	2453.6	2442.07	10.239	21.72
GH	*****	0.10 l/s	82.193	4	0.0	0.003	0.000	2463.794	2463.794	2430.48	2431.87	33.314	31.92
GJ	*****	1.20 l/s	44.533	4	0.1	0.304	0.014	2463.794	2463.780	2437.63	2430.48	26.164	33.30
EF	*****	0.47 l/s	81.465	4	0.1	0.053	0.004	2462.864	2462.859	2428.2	2427.50	34.664	35.36
FG	*****	1.30 l/s	37.701	4	0.2	0.352	0.013	2462.864	2462.851	2430.48	2427.50	32.384	35.35
JL	*****	1.24 l/s	66.036	4	0.2	0.321	0.021	2463.775	2463.754	2437.63	2434.12	26.145	29.64
LN	*****	0.96 l/s	79.729	4	0.1	0.202	0.016	2463.754	2463.738	2434.116	2434.03	29.638	29.71
ÑÑ	*****	1.36 l/s	46.444	4	0.2	0.383	0.018	2462.864	2462.846	2427.5	2424.58	35.364	38.47
NN	*****	0.96 l/s	36.232	4	0.1	0.202	0.007	2462.846	2462.839	2424.38	2419.1	38.466	43.74